Methodical Approach To Assessing Sustainable Development Of Social And Labor Relations Of Single-Industry Cities

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Abstract—**In this article we consider one of the tools for managing a single industry town – a method for its social and labor relations sustainability assessment. We describe a mathematical model of calculating the integrated index and give instant assessment examples.**

Keywords—*method; social and labor relations; sustainability; single industry town; town forming enterprise.*

I. INTRODUCTION

Social and labor relations of town forming enterprises and single industry towns have special significance for regional economies. [1].

The total population of single-industry towns, as of 01.07.2015, comprises 9,3 % of the whole population of Russia. 16,6 % of the working population are employed at town forming enterprises [2].

The level of unemployment surpassed the average national level in 70 single-industry town the indicator is twice as high as the average.

Monitoring agency "News Effector" together with the Fund of regional research "Regions of Russia" conducted a study "Happiness Index of Russian Cities". 100 most populated cities (11 of which were single industry towns) were interviewed [3, 4].

The extract shows that most single industry towns surveyed (9 out of 11) rank very low in the index (lower than 50). Nearly half of all single industry towns surveyed are in social and economic crises which are aggravating.

Single industry towns located in Kemerovo region (Novokuznetsk, Prokopyevsk) rank lowest. Kemerovo region can itself be called a single industry region (out of 34 municipalities 17 are single industry towns) with economy relying basically on one sector - coal and ore mining (64,7 %).

Social and labor relations of town forming enterprises are the basis of social and economic sustainability of a single industry town and the welfare of local population [5, 6]. The purpose of the given research is to validate the approach to single industry towns social and economic indicators monitoring.

II. THEORETICAL FRAMEWORK

Based on an analysis of the extant methodologies can be concluded that the issue is highly understudied, namely there are no methods for comprehensive assessment of social and labor relations and their sustainability in single industry environment as they do not take into account the specifics of single industry conditions and the influence of the town forming enterprise. [7, 8, 9, 10].

In order to efficiently manage of social and labor relations sustainable development we developed a method for assessing the social and labor relations sustainability of a town forming enterprise and a single industry town (Method).

This Method comprised of four parts:

1) methodological part;

2) analytical part (express diagnostics and full assessment) [11];

3) forecasting part [12];

4) purpose-oriented analysis (fig. 1).

The goal of instant assessment is to define the problematic areas using the key indicators.

Examples of indicators used in instant assessment are given in Table 1.

The method is flexible and can be adjusted for every town forming enterprise. The Method is facilitating pin-point detection of problems and trends in social and labor sphere.

An advantage of the method is the possibility to analyze the dynamics of sustainability both in general and in particular.
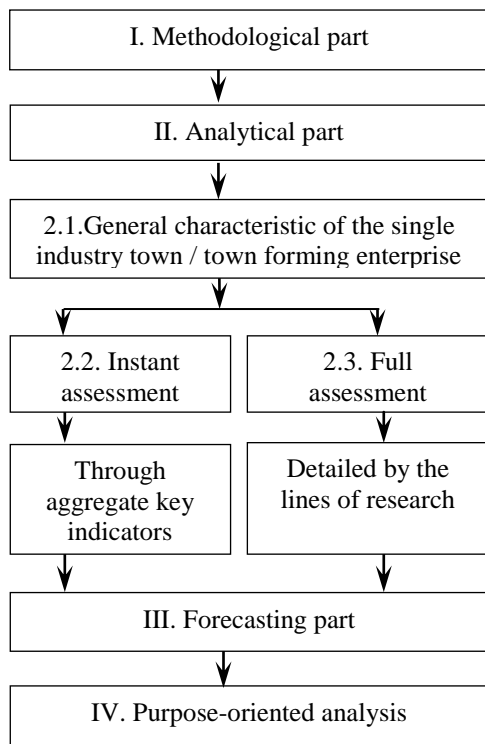
Fig. 1. Method structure

TABLE 1 INDICATORS FOR INSTANT ASSESMENT

Sub-section	Indicator	Calculations and characteristic	Threshold	
			max	min
Section 1. Social and labor relations of town forming enterprises				
1.1 Social sub-system	Share of population employed at the town forming enterprise	Population employed at the town forming enterprise divided by the total employment of the single industry town. Characterizes local employment diversification.	1	0
1.2 Technical sub-system	Investment in human resources and technical modernization of the town forming enterprise	Investment in human resources and technical modernization divided by total investment in the single industry town. Characterizes the single industry town's investment dependence on the town forming enterprise	2	0
1.3 Institutional sub-system	Profit margin of the town forming enterprise	Net profit of the town forming enterprise divided by its revenues	1	0,4
Section 2. Social and labor relations of a single industry town				
2.1 Social sub-system	Unemployment level	The number of unemployed divided by total number of employed and unemployed	1	0
2.2 Technical sub-system	Skilled workforce level	Number of skilled workers divided by total work force of the single industry town	1	0,15
2.3 Institutional sub-system	Measures taken to improve employment	Real divided by planned expenses of the local budget on employment stimulation expenses	2	0
Section 3. Sustainability level of the social and labor relations in total				
3.1 Social sub-system	Social partnership	Number of workers in the social partnerships divided by total employed population of the single industry town	1	0
3.2 Technical sub-system	Environmental sustainability of the town forming enterprise	Town forming enterprise's expenses on environmental protection divided by total investment in the single industry town	×	×
3.3 Institutional sub-system	Measures taken to improve social responsibility	The indicator characterizes local government's influence on social responsibility improvement. Real divided by level of budgetary expenses on boosting civil institutions and responsible entrepreneur-ship	2	0

III. MATHEMATICAL MODEL OF THE PROPOSED METHOD

We use both quantitative and qualitative indicators. As they are not equally quantifiable we used standardization technique. The sustainability level then is measured in three steps.

Step 1. Calculation of coefficients:

a) for quantitative indicators we use the method of multidimensional comparative analysis based on threshold minimum and maximum values:

- coefficient formula for indicator directly correlating with sustainability level (1):

$$k_i = \frac{xi - min\,(xi)}{max\,(xi) - min\,(xi)},\qquad(1)$$

- coefficient formula for indicator inversely correlating with sustainability level (2):

$$k_i = \frac{max\,(xi) - xi}{max\,(xi) - min\,(xi)},\qquad(2)$$

where

k_i is coefficient measuring the level of social and labor relations' development by each value of the indicator (xi), further in the text - coefficient;

max (xi), min (xi) are threshold values of the indicator.

Threshold values of each indicator are derived from statistical data and research databases.

b) for qualitative indicators we use the scoring method and expert evaluation.

Indicators are evaluated using interval scale corresponding to value range of sustainability indicator of 0 to 1: $k_i \leq 0,3$ – low sustainability; $0,3 < k_i \leq 0,6$ – medium sustainability; $0,6 < k_i < 1$ – high sustainability.

To assess the interview results we find a coefficient calculated as arithmetic mean of expert scores (3).

$$k_i = \sum \frac{s_j}{n},\qquad(3)$$

where

k_i is arithmetic mean of expert scores of index i;

S_j is score obtained from expert j;

n is number of experts.

Step 2. Calculation of integrated indices for each section. Presented as geometric mean of coefficients obtained from each part (4):

$$I_n = \sqrt{M\,K_j},\qquad(4)$$

where

M is multiplication;

K_j stands for social and labor relations sustainability index for sub-section j: social, technical and institutional subsystem;

I_n is social and labor relations sustainability index for section n.

Step 3. Calculation of social and labor relations sustainability integrated index (SII) (5):

$$I_{SII} = \sqrt[3]{I_1 \times I_2 \times I_3},\qquad(5)$$

where

I_{SII} stands for social and labor relations sustainability integrated index;

I_1 is social and labor relations sustainability index for section 1 "Social and labor relations of town forming enterprises";

I_2 is social and labor relations sustainability index for section 2 "Social and labor relations of a single industry town";

I_3 is social and labor relations sustainability index for section 3 "Sustainability level of the social and labor relations in total".

So the result of the analytical part will be calculation of the integrated index of social and labor relations sustainability in single industry environment (high, medium and low) in the range 0-1.

If $I_{SII} \geq 0,6$, it means a high level of social and labor relations sustainability.

If $0,6 > I_{SII} \geq 0,3$, it means a medium level of sustainability.

If $I_{SII} < 0,3$, it means a low level of social and labor sustainability.

We suggest applying the method to detect problematic areas and negative trends on a quarterly basis.

IV. CONCLUSIONS

General positive outcomes of the proposed methodology are as follows:

− it takes into account specifics of social and labor relations in town forming enterprises and single industry towns;

− it implies both express diagnostics and full assessment of problematic areas, as well as forecasting;

− it has applicable software for quick and easy calculation (software patent No 2014661200 of 24.10.2014).

In general the method focuses on the mismatched goals of sustainable development and social and labor policies. Thus, the method helps to define the negative tendencies.

The method allows assessing the levels of sustainability/safety of social and labor relations as well as local public and corporate policy effects.

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