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NEW INDICATORS OF THE LEVEL OF SOCIAL DISSATISFACTION IN THE PLANNING OF SOCIAL-ECONOMIC DEVELOPMENT OF THE REGION [1]

The article is devoted to the urgent problem related to the development of the region, namely, the creation of tools for the assessment of the level of social dissatisfaction in the region. The assessment of the level of social dissatisfaction is one of the most important tasks of state organizations in political and social spheres. The article considers the concept of "social dissatisfaction" and associated terms, it substantiates the author's position on the content of this notion. The authors have investigated the existing national and international approaches to the assessing of social tensions of the population. The system of socio-economic development indicators doesn't contain indicators allowing to assess the level of social dissatisfaction without the results of public polls. We propose two models in the article. In the first model, the assessment is basedon the single factor (the index of social dissatisfaction based on income differentiation). The second complex model takes into account a number of factors (the index of social dissatisfaction based on complex assessment). For the calculation of the proposed indicators, the authors use the statistical data of the Federal State Statistics Service. The methodological research tools include the mathematical methods of statistical data processing. We have evaluated the methodological tools on the example of the Republic of Ingushetia. The assessment has showed the dynamics of a decline in the level of social-economic dissatisfaction in the region (1995–2011). The models of social dissatisfaction constitute a tool for rapid and up-to-date assessment of socio-economic system sustainability, and of the willingness of the population to participate in protests. The application of the results of this study is the support of decision-making regions and state structures in working out plans of the socio-economic development of the regions.

Keywords: mathematical model, assessment of the levels of social dissatisfaction, Boltzmann principle, income distribution, social and economic system sustainability, open source statistics, planning of the regional socio-economic development, index of social dissatisfaction based on income differentiation, index of social dissatisfaction based on complex assessment, willingness of the population to participate in protests

Introduction

Designing of mathematical models that demonstrate the level of social dissatisfaction is one of the most important goals of security services, social technologies and political science. Despite a lot of research conducted in this area, the problem in question is still of high importance due to the lack of practical application of the existing models at the governmental level.

The purpose of this work is to develop a mathematical model of social tension assessment that would serve as a means of preventing social conflicts.

The first model is based on the estimate of deviation of the socio-economic system from the steady state. Social conflicts are the most dangerous form of socio-economic system instability. At

[1] © Dolomatov M. Yu., Martynov V. V., Zhuravleva N. A., Zakieva E. Sh. Text. 2017.

that, stability is evaluated by differentiation (not polarization) of population incomes.

National Security Concept of the Russian Federation states that the priority of economic factors in the social sphere is of fundamental importance for strengthening the state, for ensuring real implementation of social safeguards based on state support, for developing mechanisms for collective responsibility, democratic decision-making, and social partnership. In this respect, a socially fair and economically effective income distribution policy is very important[1].

The index is designed to be the indicator reflecting people's readiness to join public protests. If this index reaches or exceeds the critical value, it can be indicative of a high risk of protest activity. Well-timed preventive actions can help to resolve a conflict situation by peaceful means.

The second model allows us to estimate the dynamics of social tension, depending on several factors.

In this study, the second model included the selected factors that had the greatest impact within the investigation period. Thus, a set of factors included in the model is not clearly established, it can vary.

Both developed indices are the indicator of public readiness to join protest actions.

The mathematical models, suggested in this research, can be utilized by various organizations and institutions, for instance, by the Security Service for designing security measures, by politicians and economists for decision-making purposes in the sphere of regulating distribution and redistribution of government revenues, as well as other professional domains, related to governmental processes. Besides, the algorithmic method proposed in the study can be useful for the organizations that specialize in conflicts studying (Center of Conflictology, Mediation Center, etc.).

Theory

Social dissatisfaction as a phenomenon exists in any group or team irrespective of its level. It may be found within an organization, a region, or at the state level. Pirogov [1] understands social dissatisfaction as a characteristic of the state of a social system, which can be described as an increase in instability due to the violation of the rights of individuals.

In other research papers, devoted to this subject [2–14], the wording of the concept of «social dissatisfaction» is replaced by the synonymous term of «social polarization», which means inequality, or fractionalization.

The general index of polarization [11] proposed by Esteban, Ray can be shown in the formula:

$$P(\varepsilon) = \sum_{i=1}^{m}\sum_{j=1}^{m} n_i n_j \delta_{ij}, \quad (1)$$

where n is the group size; δ_{ij} is the «distance» between groups i and j; m is the number of groups; ε is width of each equi-spaced uniform basic densities of population distribution.

The level of ethnolinguistic fractionalization is a numerical indicator of ethnic heterogeneity. Fractionalization has negative effects: it disturbs economic growth, reduces the income of the population and decreases the desired effects of a governmental policy [15]. In other research papers, this variable can be described with the help of the Hirschman-Herfindahl fractionalization index:

$$F = \sum_{i=1}^{m} n_i(1-n_i), \quad (2)$$

where n is the i-th group size; m is the number of groups.

In the articles by Fusco and Silber, social polarization is understood as the distance between various social groups. It is defined on the basis of such variables as: race, religion or ethnic origin, which may hypothetically be the cause of a conflict. Besides, there is an index proposed by Reynal-Querol [16] that may be used for the calculation of changes at the level of polarization:

$$\tilde{P} = \sum_{i=1}^{m} n_i^2(1-n_i), \quad (3)$$

where n is the i-th group size; m is the number of groups.

In their work [14], the authors assess the extent of social polarization with the help of the variable — health self-assessment. The authors analyze the data based on a person's citizenship status; therefore, we can speak of the existence of two groups: immigrants and citizens of the country. The authors suggest two strategies for the assessment of social polarization: the first one is a "stratification approach". It allows the analysts to assess the degree of non-overlapping of the distributions of serial variables characterizing various subgroups of the population. The second one, an "opposite approach", implies that social polarization of the serial variable will be maximized if the respondents that belong to this subgroup of the population are

[1] Russia's National Security Concept (approved by the Presidential Decree of December 17, 1997 № 1300) (as amended by the Decree of the President of the Russian Federation on January 10, 2000 № 24). Retrieved from: http://www.scrf.gov.ru/documents/1.html (date of access: 29.06.2016).

in the same medical category (either at the lowest, or the highest health condition level).

According to Esteban and Ray, [2] polarization is based on the interaction of intragroup identity versus alienation. It can be identified as an increasing function of the number of people who belong to the same income class. It is true for any respondent that the more is the number of people belonging to the same income group, the stronger is the identification of the person with that group. The function of alienation characterizes the antagonism caused by social class differentiation and differentiation of incomes. A respondent, in this case, does not associate himself/herself with a group and feels alienated from his/her peers who are too "far" from him.

In other studies [4, 9], the authors emphasize the distinction between the social concepts of inequality and polarization. The authors suggest using the following inequality indicators: the Gini's coefficient and the generalized entropy (GE — Generalized Entropy). The indicators of polarization (ER — Esteban-Ray index, W — Wolfson index, TW — Tsui-Wang index) are mentioned in these studies as well. In this work, the authors [9] also emphasize the difference between inequality and polarization.

Within the context of the current research, social dissatisfaction is understood as a special condition of public consciousness and interactions between the subjects, as well as a specific state of the perception of reality. In this case, social dissatisfaction is considered to be the generalized characteristic of a conflict situation; it is characterized by a high level of people's dissatisfaction, caused by some factor or a number of factors (inflation, deficiency of goods and services, etc.).

Esteban and Ray [11] proposed the index that determines the level of conflict according to the complex indicator that includes the general index of polarization and the index of fractionalization:

$$\hat{\rho}c'(\hat{\rho}) = \lambda P(\varepsilon) + (1-\lambda)F(\varepsilon), \qquad (4)$$

where $P(\varepsilon) = \sum_{i=1}^{m}\sum_{j=1}^{m} n_i^{2+\varepsilon} n_j \delta_{ij}$ is the general index of polarization; τ is constant $\tau \in [0.25, 1]$; δ_{ij} is the «distance» between groups i and j; n is the i-th group size; m is the number of groups; $F(\varepsilon) = \sum_i (1-n_i) n_i^{1+\varepsilon}$ is the index of fractionalization.

For the assessment of income inequality, the entropy approach was used (The Theil inequality index):

$$I(f) = \int \log \frac{\mu}{x} f(x)dx, \qquad (5)$$

where x is the income level in the income group; μ is the average level of income; $f(x)$ characterizes income density within each group.

Zhang and Kanbur [4] adjusted Theil 's formula in terms of intragroup and intergroup interaction:

$$p^{ZK} = \frac{I^B}{I^W} = \frac{\sum_{i=1}^{K} \log \frac{\mu}{\mu_i} \pi_i}{\sum_{i=1}^{K} \pi_i I(f_i)}, \qquad (6)$$

where $I(f)$ is the Theil inequality index; I^B is the Theil inequality index for intergroup interaction; I^W is the Theil inequality index for intragroup interaction; μ is the average level of income; μ_i is the average level of the i-th group income; K is the number of groups; π is coefficient, $\pi = \frac{n_i}{N} \cdot \frac{\mu_i}{\mu}$; n_i is the population of the i-th group; N is the total population.

Up to a certain point, social dissatisfaction does not constitute a threat; but there is a critical value of social dissatisfaction, the excess of which may result in conflicts, uprisings and wars. Oftentimes, dissatisfaction increases slowly, until there are particular events that act as a trigger and make a feeling of disappointment erupt outside.

Besides, for a real conflict to occur, there should be some conditions and resources necessary for the organized group activities. Lack of such resources can inhibit the emergence of open conflicts, a conflict, in that case, may remain latent. According to the theory of a plurality of conflicts by L. Coser, the greatest threat to the dynamics of evolutionary processes in a social system is connected with a growing tension level, which may result in the polarization of social groups' interests and escalation of conflict to a higher level.

However, foreign scientists don't consider conflicts to be the only phenomenon resulting from increased levels of social polarization in modern societies. Authors of the articles in this field [7] associate polarization with financial deficiency and inflation. In this case, the scientists conclude that high polarization levels correspond to financial deficiency and subsequently result in high inflation.

Thus, the analysis of Russian and foreign literature has shown that no complex model has so far existed that was designed for the assessment of the level of social dissatisfaction according to a number of factors, the model that would not rely on sociological poll results and could allow the continuous monitoring of the level of social dissatisfaction to be conducted practically cost-free.

The object of the research is social dissatisfaction in society. The scope of the research did not

include the study of interactions leading to open conflicts.

Data and Methods

The assessment of the social dissatisfaction level is one of the most important goals of Security services, organizations that focus on social technologies and political science. The results of the research may be used for the development and implementation of optimal strategies of conflict prevention. Although there is a lot of research work in the field, there emerged a necessity of designing alternative assessment techniques, for most of the existing ones are time-consuming and expensive.

At present, the Russian government does not conduct regular assessments of the social dissatisfaction level; they are only conducted by the researchers in their academic work. However, tension within society exists at different governmental levels: in the regions of the Russian Federation, in Russia as a whole, and in the majority of the countries in the world. In view of this, it becomes important to develop a set of indicators of social dissatisfaction as part of the system of social and economic development indicators of the Russian Federation. A system of indices in question is vital for the economic and social policy of the country and is presented in the Concept of the Long-term Social and Economic Development of the Russian Federation for the period until 2020. Due to the transition of Russian governmental institutions to paperless technologies, and because of the development of the unified information space and e-government, it becomes very important to develop the automated information system for calculating the proposed indicators because state statistical agencies are bound to use these indicators in their work.

Two models of social tension (dissatisfaction) were used in the current study:

1) Model of social dissatisfaction based on income differentiation;

2) Model of social dissatisfaction based on the complex assessment.

The authors of the current research have developed the information system for calculations linked to the suggested models.

Models

Model of Social Dissatisfaction Based on Income Differentiation

The core principle of the income-based social dissatisfaction research methodology relies on the Boltzmann distribution that is utilized in statistical physics. Previously, the Boltzmann distribution was used for the assessment of the sustainability of social and economic systems [17]. In accordance with this principle, the equilibrium condition of a closed system is associated with maximum entropy and any deviation from equilibrium results in a non-equilibrium system, also known as social dissatisfaction. In this case, social dissatisfaction is assessed with the help of the Boltzmann principle and is calculated as the difference between the actual income level and the income based on the log-normal distribution model, which illustrates the equilibrium of a socio-economic system. The assessment model of income-based social dissatisfaction is written as:

$$\delta_{ST} = \sum_{j=1}^{k} \left| f_j - f_j' \right|, \quad (7)$$

where δ_{ST} is the index of social dissatisfaction, ISD, (Fig.1); f_j — frequency of empirical distribution of the population for each year in the j-th income group; f_j' — frequency of theoretical distribution (8) of the population for each year in the j-th income group.

The most likely distribution of household income that has a clear thermodynamic grounding and is characteristic of the equilibrium state, is a lognormal distribution of income, with respect to which the indicator of the level of social tension on income differentiation is calculated [18]. We will provide some examples to illustrate it later.

Consider a closed macroeconomic system with the volume of gains V, separated from the environment in which the economic agent acts. Suppose that the system interacts with the environment through the exchange of money. Let the number of agents be N. Single out from this amount those groups that have a similar ability to exchange N_1, $N_2, \ldots, N_i$, and whose share of income is $C_1, C_2, \ldots, C_i$ respectively. In this case, we have:

$$N = \sum_{i=1}^{n} N_i, \quad (8)$$

where n is the number of groups of entities. We introduce another characteristic of complex systems, i. e. a function of the state of the entity, which denotes financial potential $\Psi_i(V, C_i, N)$. Given the state has a constant volume of income and entities of the economy it is a function of one variable, that is income. Obviously, changes in the income of one entity will cause correspondingly a slight change in the function of state and will amount to $d\Psi_i$. This small amount is proportional to the share of the entity income:

$$dC_i = \gamma \cdot C_i \cdot d\Psi_i, \quad (9)$$

where γ is a constant that depends on the method of measuring the financial potential (e.g. exchange

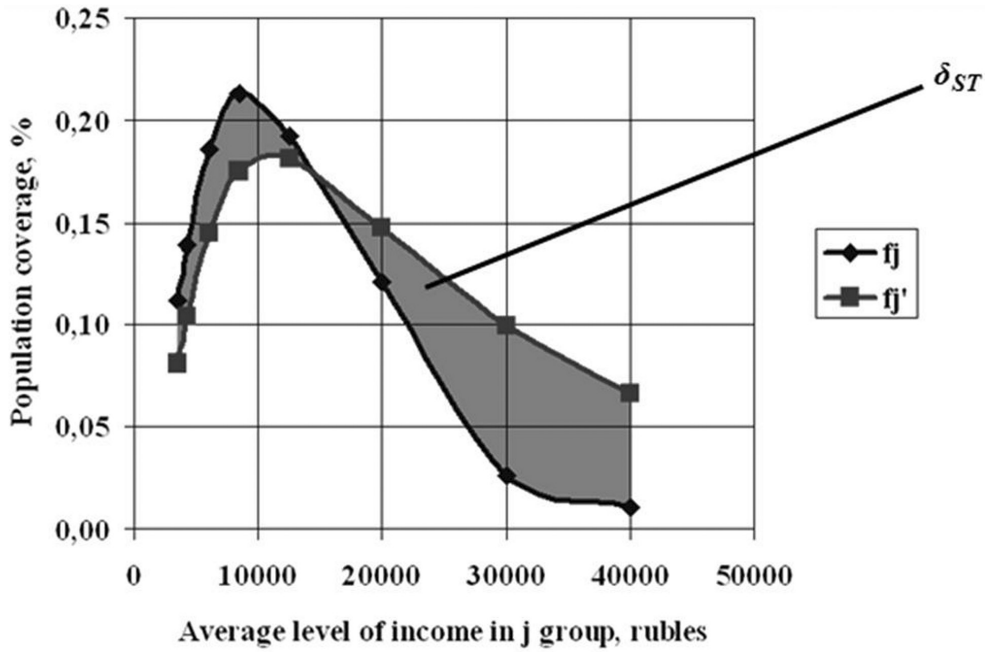

Fig.1. *Index of social dissatisfaction (ISD) in the Russian Federation in 2011, calculated according to income distribution*

rate). In further calculations, for the sake of convenience, we assume $\gamma = 1$.

Divide the variables and integrate them:

$$\int_{C_0}^{C} \frac{dC}{C} = \gamma \int_{\Psi_0}^{\Psi} d\Psi. \quad (10)$$

We have the following:

$$\ln \frac{C}{C_0} = \gamma \cdot \Psi. \quad (11)$$

Integrating and separating the variables, we obtain the law of normal distribution for financial potentials:

$$\frac{\Delta N}{N} = \frac{1}{\sigma \Psi_i \sqrt{2\pi}} \exp\left\{-\left[\frac{\Psi_i - \overline{\Psi}}{\sigma\sqrt{2}}\right]^2\right\}, \quad (12)$$

where Ψ_i and $\overline{\Psi}$ are the financial potential of entities and average financial potential of all system entities; σ is a dispersion of income within a macro system.

Taking into account the relationship (2) we obtain from (3) the law of log-normal distribution (Pareto's law):

$$\frac{\Delta N}{N} = \frac{1}{\sigma C_i \sqrt{2\pi}} \exp\left\{-\left[\frac{\ln C_i - \ln \overline{C}}{\sigma\sqrt{2}}\right]^2\right\}. \quad (13)$$

The obtained equation is the law of lognormal distribution of income under conditions of equilibrium; a deviation from it is a measure of the economic system non-equilibrium.

In this case, the formula for calculation f_j' is as follows:

$$f_j' = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(\ln X_j - \ln \overline{X})^2}{2\sigma^2}}, \quad (14)$$

where σ^2 is the dispersion, and it is calculated with the help of the following formula:

$$\sigma^2 = \frac{\sum_{j=1}^{k} (\ln X_j - \ln \overline{X})^2 \cdot f_j}{\sum_{j=1}^{k} f_j}, \quad (15)$$

where X_j is the level of income within the *j*-th group; $\overline{X}$ is the average income level within the *j*-th group.

Assessment of social dissatisfaction, illustrated by this model, is carried out with the help of the following algorithm:

1. Primary acquisition is the population's income distribution on an annual basis. In the current study, the basic data are taken from the public domain, in particular, from the Federal State Statistics Service database (Russian Federation).

2. Theoretical distribution of the population income is calculated, using the data of the actual income distribution with the help of the formula (14).

3. Eventually, the value of social dissatisfaction is calculated according to the designed model (7) (Table 1).

That said, the information system[1] for the assessment of income-based social dissatisfaction

[1] Dolomatov, M. Yu. & Zhuravliova, N. A. (2013). Information system of an social dissatisfaction assessment. Certificate of computer program registration No. 2013661801.

was created within the context of the current research [18].

The number of people who demonstrate high levels of dissatisfaction due to the deviation from equilibrium can be calculated by multiplying the index of social dissatisfaction by the population:

$$N_{dis} = \delta_{ST} \cdot N, \quad (16)$$

where N is the number of people whose data were used in the research (in the case of social dissatisfaction at the federal level — the number of people in the country was used). For the calculation of social dissatisfaction at the regional level the researchers used the number of people in the region, whereas for the calculation of social dissatisfaction at the organizational level — the number of people in an organization was taken).

In this article the critical value of the proposed indicator is accepted to be 0.33 and is based on the studies existing in the field of research [19].

Model of Social Dissatisfaction Based on Complex Assessment

For the designing of a social dissatisfaction model based on complex assessment, the authors of the study used an entropy approach.

The mathematical model, in this case, is based on the entropy approach, which allows estimating a social dissatisfaction level, and it was calculated according to the formula of Shannon entropy:

$$H_c = \sum_{i=1}^{n} p_i \log_2 p_i, \quad (17)$$

where H_c — the index of social dissatisfaction based on complex assessment CAISD; pi is the probability of the influence of the i-th factor level on social dissatisfaction. It can be calculated with the help of the formula:

$$p_i = \frac{X_i}{X_{\max}}, \quad (18)$$

where X_i is the current level of the i-th factor; $X_{\max}$ — is the greatest possible level of the i-th factor.

Preliminary selection of the factors influencing the level of social dissatisfaction is carried out with the help of the expert evaluation method on the basis of the analysis of historical facts and official statistical information — (concordance index is 0.92; opinion consistency of experts is high). Selection of the most significant factors to be included into the model of social dissatisfaction level based on the entropy approach is carried out by means of the correlation analysis[1].

The complex model proposes indicator δ^{ST} that can be interpreted as the level of social dissatisfaction, based on the income differentiation. The developed mathematical model can include sets of various characteristics (factors) which depend directly on the management level (federal, regional, level of an organization).

As it was previously mentioned, a social dissatisfaction level may not necessarily reflect a threat, however, there is a critical value of social dissatisfaction, the excess of which may result in the emergence of conflicts, social unrest and wars. The critical value of the proposed indicator accepted in this article is 0.33 based on the data of the existing studies in the field of research [19].

Using this approach, the authors of the study have designed the information system of assessing social dissatisfaction level, which includes the model of assessing income-based social dissatisfaction and the model of complex assessment of social dissatisfaction [18].

Social dissatisfaction does not present a threat up to a certain point; however, there is a critical value of social dissatisfaction the excess of which may lead to conflicts, uprisings and wars. Oftentimes, the process of dissatisfaction growth occurs slowly until there is a particular event that acts as a trigger mechanism, causing frustration.

The authors of the current research have developed the information system for performing calculations by the proposed models.

Results

The ISD index calculation.

As a result of this study, the ISD index has been calculated. The calculations of social dissatisfaction in Russia (Tables, Figures) and in the Republic of Ingushetia (Tables, Figures) were performed by means of the method developed on the basis of this study.

The primary data for ISD calculations are presented in Table 1.

Besides the ISD values, the graph of the Gini index dynamics is shown in table 2 and in fig. 2.

The CAISD index calculation. The most important factors, influencing the level of social dissatisfaction, have been selected based on the method of expert evaluations. The significance level of the selected factors is specified by means of correlation analysis. The selected factors have been included into CAISD; the factors reflecting socio-economic levels in Russia (primary data for CAISD calculations) are presented in Table 3. The

[1] Hassanova EI, Dolomatov M. Yu, Zhuravleva NA The use of correlation and regression analysis to assess and predict the level of social tension in the Russian Federation / Collected materials of All-Russian scientific and practical conference "Mathematical methods and intelligent systems in economy and education", Izhevsk, December 2013.

Table 1

Primary data for ISD calculation in 1995

Income X_j, rubles	Average level of income groups $\overline{X}_j$, rubles	Population N, persons	f_j
до 1500,0	750	1500000	0,01
1500,1–2500,0	2 000	5400000	0,04
2500,1–3500,0	3 000	8600000	0,06
3500,1–4500,0	4 000	10200000	0,07
4500,1–6000,0	5 250	15800000	0,11
6000,1–8000,0	7 000	19200000	0,14
8000,1–12000,0	10 000	28600000	0,20
over 12000,0	13 500	51700000	0,37
Total		141000000	1,00

Table 2

Inequality indices based on income in Russia and Ingushetia

Years	ISD, Russia	ISD, Ingushetia	Gini Index (www.gks.ru)
1995	1,26	1,04	0,387
1996	0,80	1,29	0,387
1997	0,58	1,15	0,390
1998	0,53	1,30	0,394
1999	0,62	1,25	0,400
2000	0,87	1,34	0,395
2001	0,54	1,26	0,397
2002	0,50	1,03	0,397
2003	0,66	1,13	0,403
2004	0,83	1,06	0,409
2005	0,96	0,77	0,409
2006	0,72	1,00	0,415
2007	0,90	0,73	0,422
2008	0,34	0,57	0,421
2009	0,41	0,56	0,421
2010	0,46	0,46	0,421
2011	0,45	0,49	0,417
2012	0,35	—*	0,420
2013	0,34	—	0,419
2014	0,33	—	0,416
2015	0,34	—	0,412

* No data available.

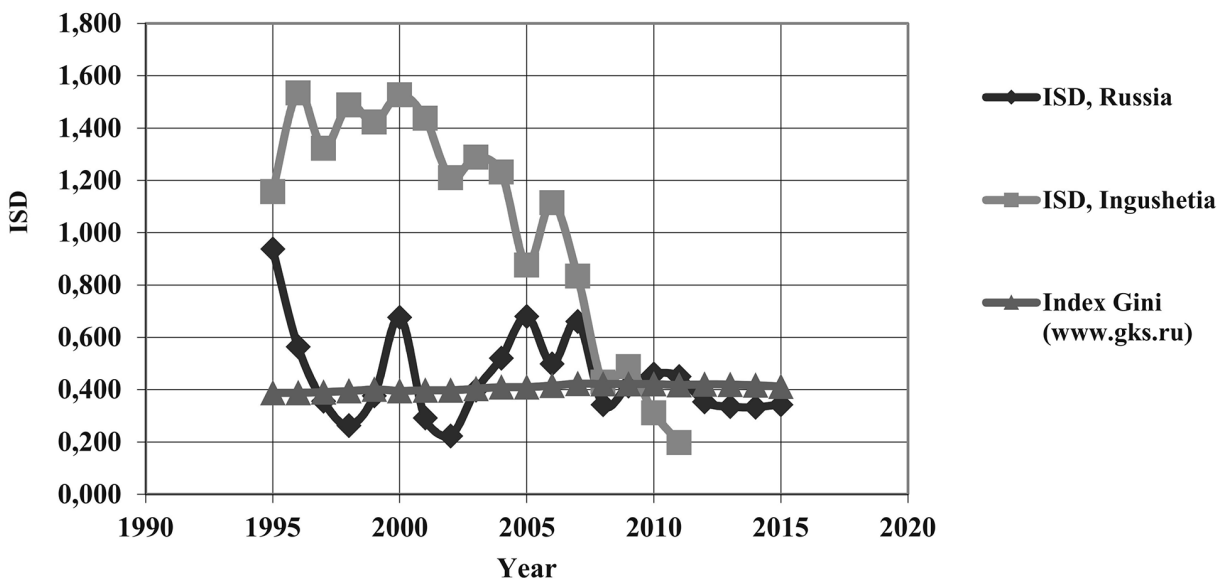

Fig. 2. *Inequality indices based on income in Russia and Ingushetia*

Table 3

The most important factors influencing social dissatisfaction in Russia

Years	ISD	Rate of unemployment, %	Number of registered crimes, thousand	Gross domestic product (GDP), billion rubles	Inflation	CAISD
2000	0,94	11	2952,4	7306	20	–1,19
2001	0,51	9	2968,3	8944	19	–1,57
2002	0,45	8	2526,3	10831	15	–1,66
2003	0,58	8	2756,4	13208	12	–1,61
2004	0,72	8	2893,8	17027	12	–1,50
2005	0,89	7	3554,7	21610	11	–1,50
2006	0,70	7	3855,4	26917	9	–1,67
2007	0,91	6	3582,5	33248	12	–1,62
2008	0,42	6	3209,9	41277	13	–1,94
2009	0,24	8	2994,8	38807	9	–2,00
2010	0,35	7	2 628,8	39 762	9	–1,91
2011	0,34	7	2 404,8	41 458	6	–1,88
2012	0,33	6	2 302,2	61 798	7	–1,96
2013	0,34	6	2 206,2	62 589	6	–1,97
2014	0,35	5	2 190,6	63 031	11	–2,00
2015	0,34	6	2 388,5	60 682	13	–2,02

Table 4

The most important factors influencing social dissatisfaction in Ingushetia

Years	ISD	Rate of unemployment, %	Number of registered crimes	Gross Regional Product (GRP), million rubles	CAISD
2000	1,53	30	1746	2619	–1,23
2001	1,44	33	1740	3604	–1,32
2002	1,21	44	1634	3582	–1,45
2003	1,29	56	1541	4757	–1,49
2004	1,23	44	1486	6210	–1,50
2005	0,88	63	1662	7419	–1,76
2006	1,11	58	1914	9034	–1,70
2007	0,83	47	2104	16812	–1,88
2008	0,43	53	2275	19173	–2,00
2009	0,49	53	2297	18953	–1,99

Table 5

CAISD in Russia and Ingushetia

Year	CAISD, Ingushetia	CAISD, Russia
2000	–1,30	–1,23
2001	–1,39	–1,54
2002	–1,53	–1,61
2003	–1,56	–1,55
2004	–1,58	–1,42
2005	–1,80	–1,46
2006	–1,75	–1,65
2007	–1,92	–1,63
2008	–1,98	–1,98
2009	–1,98	–1,95
2010	—*	–1,91
2011	—	–1,88
2012	—	–1,96
2013	—	–1,97
2014	—	–2,00
2015	—	–2,02

* No data available.

factors reflecting socio-economic levels of the Republic of Ingushetia (primary data for CAISD calculations) are presented in Table 4.

The values of CAISD calculated for the Russian Federation and Ingushetia from 2000 to 2009 are presented in Table 5 and in Fig. 3.

Discussion and Implications

The analysis of the results of calculating social dissatisfaction indices shows that the dynamics of both indicators are similar; this observation reflects a current state of the socio-economic system within the stated period of time.

In general, social dissatisfaction levels in Russia within the period from 1995 to 2001 can be characterized as high. It can be explained by a number of reasons, for instance: the events, connected with the first and second Chechen wars, high instability of public administration. Vladimir Putin's presidency that started in 2001 is characterized by increased stability, except for

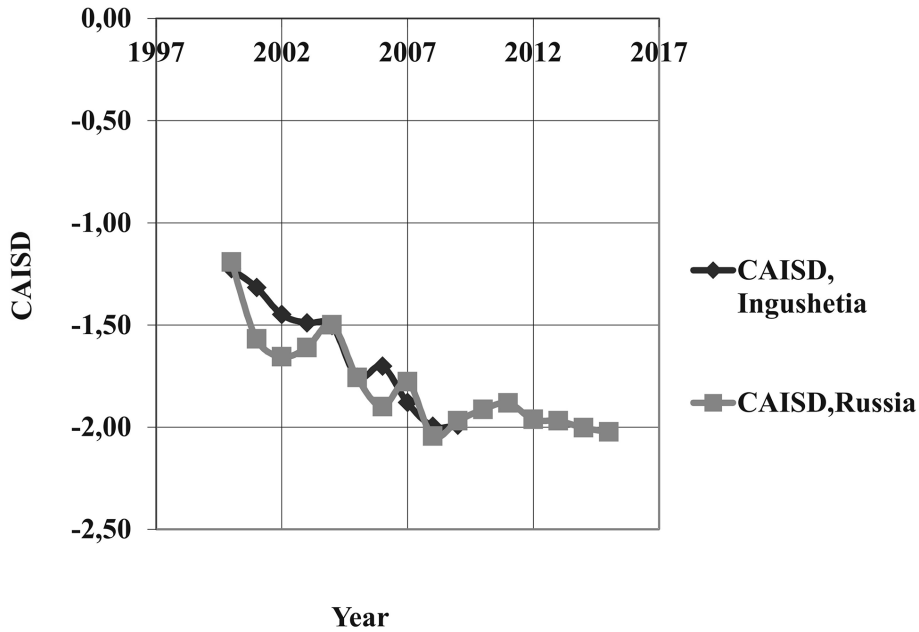

Fig. 3. *CAISD in Russia and Ingushetia*

the discrete points, connected with the world financial crisis in 2008 in the course of which the social dissatisfaction level was high. Thus, within the studied period, the researchers of the current project observed a trend of social dissatisfaction decrease, the system, in general, can be characterized as stable, and the decreased ISD index confirms this statement. The entropy decreased (CAISD), i.e. the system became more organized and sustainable. The comparison analysis of ISD with the Gini index showed that there is no correlation between the stated indices, for the Gini index has a physical meaning and does not account for the income distribution and the state of sustainability.

Thus, the comparison of the results of the scientific analysis with the results of the theoretical and pilot experiments showed that the indicators of social dissatisfaction in the Russian Federation and at the regional level in Ingushetia, calculated by means of the developed models, are dependent on the events that occurred within the studied period of time. The results can be characterized as adequate, and therefore they allow the trends of social dissatisfaction to be analyzed and the measures of conflict prevention to be proposed.

Conclusions

As a result of the current study, two mathematical models of assessing social dissatisfaction have been created for the purpose of preventing conflicts. The integrated indicators, proposed in this work, are free from political bias and objectively reflect the role of the socio-economic situation on a national and regional scale over a wide range of time

The study uses the data from open sources issued by the Federal Statistics Agency; the poll results have not been used in the research. The social dissatisfaction assessment index calculated for the Russian Federation can be used to measure the probability of civil disorders or wars. The information system that represents mathematical methods proposed by this study can be used for the assessment of the socio-economic development of the Russian Federation based on a set of key indicators. This system may be employed by executive authorities, in organizations of statistics or other governmental structures.

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