Assessment of socio-economic security of the region in terms of demographic indicators

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Abstract. The authors consider the issues of assessing the level of socio-economic security of the region. The purpose of the study is to create a system of indicators to assess the socio-economic security of the region. The developed system of indicators should meet the needs of the modern economy. The article assesses socio-economic security on the example of the Kirov region. Objects of analysis: indicators of the level and quality of life, demographic indicators. Demographic indicators are the most important for assessing the level of socio-economic security of the region. Demographic indicators are the result of socio-economic policy. The positive dynamics of these indicators ensures the future of the territory. Study period: from 2010 to 2021. When assessing the level of socio-economic security of the region, information from the Federal State Statistics Service and indicators of the emission system are used. According to the results of the study, it was determined that the indicators of the quality and standard of living of the population in the Kirov region are currently worse than the average in Russia. Negative dynamics is observed in a significant number of indicators. The level of socio-economic security of the Kirov region is currently low. The deterioration of the demographic indicators of the region is a confirmation of this thesis.

1 Introduction

Researchers are studying different aspects of security. Socio-economic security characterizes a certain level of quality of life of the population. The quality of life is related to the level of income of citizens. This level should ensure the reproduction and development of human potential. This study is relevant due to the presence of a large number of socio-economic threats in most regions of Russia.

We have studied a large number of scientific papers on the issue of socio-economic security. We have made a number of conclusions based on the results of the review of scientific publications.

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There is no consensus among researchers on the content of the term "socio-economic security". Some authors use the term "economic security of the social sphere". This term corresponds to the concept of "socio-economic security".

Researchers from the point of view of society, the state and demography consider Socio-economic security.

In particular, Borisova O.V. [1] suggests the existence of two types of definitions of socio-economic security: widespread and private. A common definition of social security is a definition of the security of society as a whole. A particular definition of socio-economic security is the issues of reproduction of the population.

M.S. Syupova [2] believes that socio-economic security is the sustainable development of the economy and public institutions.

The literature also highlights the factors of threats to socio-economic security. The first factor is the difference in income, standard of living and personal interests of citizens. The second factor is the influence of political and macroeconomic phenomena on the economy and social sphere of the territory.

Many authors investigate the risks of stratification of society, the risks of the disappearance of the middle class, the risks of lumpenization of a significant part of the population [3-8].

The main content of the research is the study of threats to the socio-economic security of the region, the definition of indicators of socio-economic security. Now there is no single list of indicators. There is also no single list of criteria for selecting indicators, as well as optimal values of indicators [6].

Borzykh L.A. [9] writes that demographic indicators are mainly used as indicators. In addition, the author uses indicators of the absolute value of income and indicators of the ratio of income and wages of the population in relation to the subsistence minimum. A similar approach is also considered in the works of other authors [10-11], where the set of indicators used is somewhat different. Some authors use only derived indicators from demographic indicators [12].

The availability of primary data for the calculation of indicators is a general principle for the analysis [13-15].

When assessing the level of socio-economic security of the region, information from the Federal State Statistics Service and indicators of the emission system are used.

Understanding the purpose of socio-economic security is common in the studies under consideration. The purpose of ensuring the socio-economic security of the territory is to create conditions for ensuring the vital needs of citizens: the need for the birth of children and the need for the development of their abilities.

The purpose of our research is to form a system of indicators for assessing the socio-economic security of the region. This system should meet the needs of the modern economy.

2 Materials and methods

The study uses data from the Federal State Statistics Service, methods of statistical analysis and comparison. The research area is the Kirov region. The study period is 2010-2021.

The available data of the Federal State Statistics Service were used for the study: indicators of fertility, mortality, population growth, income and quality of life of citizens.

As part of the study, we will formulate the concept of threat. For the purposes of research, we will consider as a threat a factor that hinders social development.

As part of the study, the authors selected a list of indicators used. Further, the authors analyzed the significance of indicators for the socio-economic security of the region. After that, the authors determined how much the value of some indicators affects the value of others.
Further, the authors formulated quantitative criteria for evaluating indicators. After that, the general goal of analyzing the socio-economic security of the territory was formulated.

The authors suggest that economic indicators are a reflection of social processes in the region. At the same time, social processes also affect the state and prospects of the region's economy.

The state of the territory at a certain moment reflects income indicators, as well as indicators of the quality of the social environment in the region. These are the amount of income of citizens, the level of medical care, the level and quality of education, the crime rate and a number of other indicators.

However, in different circumstances and under different conditions, the population may perceive the indicators presented above differently.

The same values of indicators at different times and in different regions are either an acceptable situation or a problem for the population. Migration from the region is considered the optimal solution to the problem.

Consequently, indicators of the level and quality of life of people are not an indicator of the socio-economic security of the territory. A common indicator of socio-economic security is people's perception of the situation in the region. The measurement of people's attitude to the region should be carried out objectively.

Based on objective indicators, it is possible to determine how citizens relate to the current situation and the future of the region. The conclusions of citizens regarding the prospects of living in the region are the propensity of citizens to migrate and demographic behavior.

Consequently, the indicators of demographic behavior and migration objectively reflect the level of socio-economic security of the region. Consider a region with a high level of socio-economic security. In such a region, people do not seek migration and have a positive attitude towards the birth of children.

If the level of socio-economic security is low, the trends are opposite. Why is the demography of the territory a consequence of the level of socio-economic security? This situation is a consequence of the demographic behavior of citizens in modern conditions.

For most citizens, demographic behavior is rational. This behavior depends to a small extent on traditions or propaganda. With favorable prospects for the territory, citizens decide on the birth of children.

Thus, the researcher should take into account the following factors of socio-economic security. These are indicators of income of the population, indicators of the development of healthcare, education, indicators of the criminogenic situation. The most important indicators of socio-economic security of the territory are demographic indicators.

Demographic indicators are the result of the activities of the regional authorities. They determine the overall level of socio-economic security of the territory.

The general scheme for assessing the socio-economic security of the territory is shown in Figure 1.

![Fig. 1. General scheme of assessment of socio-economic security of the territory.](image-url)
Mathematically, the assessment is carried out according to several indicators. Indicators are calculated based on simple indicators. Official statistics are used. An important issue is the comparison and comparison of different indicators, as well as the formation of summary indicators. For these purposes, the values of the indicators are converted into points.

The method of conversion to points is as follows [3]:
- a 100-point scale is used, 100 points is the best value of the indicator;
- conversion into points is carried out by piecewise linear approximation (scaling). When changing the indicator value from minimum to maximum, the indicator's influence on the socio-economic security value looks like an S-shaped curve. Summary indicators are calculated as an arithmetic mean.

The limits of the indicator values (1 point and 100 points) are set because of indicators from the socio-economic development programs of the region. The boundaries of the indicators were adjusted by expert means.

The methodology uses two options for converting the actual values into points.

If the high value of the indicator corresponds to a high level of socio-economic security of the region, then the upper boundary value and large values are set to a score of 100 points. The lower boundary value and lower values are given a score of 1 point. The values in the interval between the upper and lower boundary values are converted into points. The score is set in proportion to the deviation from the lowest value of the indicator.

In this case, the recalculation of the point values is carried out by formula 1:

\[
\begin{cases}
  x < a; y = 1 \\
  x > b; y = 100 \\
  a \leq x \leq b; y = \frac{(x - a)}{(b - a)} \cdot 99 + 1
\end{cases}
\]

where:
- \(x\) - is the value of the indicator
- \(a\) - is the lower bound of the evaluation range;
- \(b\) - is the upper bound of the evaluation range;
- \(y\) - score in points.

If the low value of the indicator corresponds to a high level of socio-economic security of the region, then the following formula is used:

\[
\begin{cases}
  x < a; y = 100 \\
  x > b; y = 1 \\
  a \leq x \leq b; y = \left(1 - \frac{(x - a)}{(b - a)}\right) \cdot 99 + 1
\end{cases}
\]

There are two levels in the range of indicator points: 34 and 67 points.

If the result of the assessment is less than or equal to 34 points, then the socio-economic security of the region is low.

If the result of the assessment is greater than or equal to 67 points, then the socio-economic security of the region is high.

If the result of the assessment is more than 34 and less than 67 points, then we see an intermediate level of socio-economic risks. As part of the analysis, the indicators of 2010-2020 are considered, values for 2021 are presented for individual indicators.

The authors evaluated each indicator according to the following algorithm:
- checking the indicator for compliance with the general development goals of the region;
- selection of the highest and lowest values of the indicator (which correspond to the values of 1 and 100 points)
- selection of the formula (1) or (2) for calculating the indicator score;
- conversion of indicator values into points;
- analysis of changes in the actual and point values of the indicator;
- assessment of the indicator's compliance with the required value.

Next, an integral indicator is determined for each group of indicators. It is calculated as the arithmetic mean of all the scores of indicators in this group.

### 3 Research results and discussion

The authors obtained the following results. Indicators were used to analyze the standard of living of the population. They are in Tables 1, 2. (The source of the information was data for 2021: Information from the Kirov Territorial Authority of the Federal State Statistics Service. Access mode: https://kirovstat.gks.ru/folder/23689. Date of application: 12.12.2022. Table 2 is also compiled based on data from the Federal State Statistics Service. Data for 2010-2020: Appendix to the collection "Regions of Russia. Socio-economic indicators". Access mode: https://rosstat.gov.ru/folder/210/document/47652. Date of application: 12.12.2022).

#### Table 1. Indicators of the standard of living of the population in the Kirov region.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>The criterion of the best value of the indicator</th>
<th>Indicators value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in real disposable incomes of the population, %</td>
<td>less than 96%</td>
<td>more than 104%</td>
<td>110.1/100 96.7/1 100.9/16 97/1 100.1/3</td>
</tr>
<tr>
<td>Coefficient of funds, times</td>
<td>less than 6 times</td>
<td>more than 8 times</td>
<td>11.2/14 9.9/36 9.3/46 8.8/54 1</td>
</tr>
<tr>
<td>Share of food expenses, %</td>
<td>less than 30%</td>
<td>more than 35%</td>
<td>36.3/46 39.4/36 36.1/47 35.2/50 33.8/54</td>
</tr>
<tr>
<td>The share of the population with incomes below the subsistence minimum,</td>
<td>more than 15%</td>
<td>less than 12%</td>
<td>14.2/17 15.3/1 14.7/7 14/21 1</td>
</tr>
<tr>
<td>The ratio of the average monthly nominal accrued salary and the subsistence minimum, times</td>
<td>less than 3</td>
<td>more than 4.5</td>
<td>2.44/1 2.38/1 2.92/1 3.05/4 3.37/26</td>
</tr>
<tr>
<td>The ratio of per capita monetary income and the subsistence minimum in the region, times</td>
<td>less than 2</td>
<td>more than 3</td>
<td>2.45/46 2.32/33 2.28/29 2.26/27 2.46/47</td>
</tr>
<tr>
<td>The ratio of the average size of assigned pensions and the subsistence minimum for pensioners in the region, times</td>
<td>less than 2</td>
<td>more than 3</td>
<td>1.43/1 1.40/1 1.65/1 1.71/1 1.67/1</td>
</tr>
</tbody>
</table>

Disposable incomes of the population in the region are declining. The increase in income in real terms during the analyzed period is lower than the increase in expenses in real terms. If we consider the data as a cumulative result, the decrease in real disposable incomes of citizens amounted to 6.7%.

The standard of living of pensioners is increasing during 2010-2020. This dynamic is favorable. This indicator does not depend much on the regional authorities.

In general, there is a deterioration of the situation in terms of socio-economic security of the region.

Indicators were used to compare the standard of living of the population of the Kirov region and other regions. They are in table 2.
Table 2. Comparative indicators of the standard of living of the population in the Kirov region and other regions of Russia.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>Criterion of the best indicator value</th>
<th>Indicator value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>The ratio of the average monthly accrued salary in the region and the average value of the average monthly accrued salary in 21 regions of Russia with the largest amount of wages, %</td>
<td>less than 0.5</td>
<td>more than 0.7</td>
<td>0.41/1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>less than 0.6</td>
<td>more than 0.8</td>
</tr>
</tbody>
</table>

The choice of a comparison base for 21 regions with the best income indicators is due to the following. The selected database avoids incorrect comparison with regions. There is the highest level of income. At the same time, comparison with the average indicators for all regions does not sufficiently show the desire of citizens to move to another region.

The income level of citizens in the Kirov region is significantly lower than the average for other regions with the highest incomes (the difference is about 1.6 times).

The integral indicator of socio-economic security of the region by the level of income of the population is presented in Table 3.

Table 3. Integral indicator of the standard of living of the population in the Kirov region.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Indicator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integral indicator of the standard of living of the population, points</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

During the study period, there was no increase in the socio-economic security of the region due to an increase in the standard of living of the population.


In 2010-2020, there is a decrease in the incidence of the population. At the same time, there are no publicly available data on the incidence in 2021. This limitation is caused by the contradictory statistics of the pandemic.

The general health situation in the region has worsened during the pandemic. The reasons are a decrease in the provision of citizens with the necessary number of doctors and medical
personnel, a reduction in the number of places in hospitals, a reduction in the total number of medical institutions.

The pandemic has led to the cessation of treatment of chronic, psychiatric and a number of other diseases. This adversely affected the overall demographic indicators of the region. This thesis is indirectly confirmed by a significant increase in child mortality in 2021.

It is necessary to ensure the sustainable development of the network of medical institutions, an increase in the bed stock. It is also necessary to increase the number of doctors and medical personnel in the region.

Table 4. Indicators of the quality of life of the population in the Kirov region (healthcare).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>Criterion of the best indicator value</th>
<th>Indicator value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>Number of hospital beds per 10,000 population, beds at the end of the year</td>
<td>less than 80</td>
<td>more than 100</td>
<td>111.1/100</td>
</tr>
<tr>
<td>Capacity of outpatient polyclinic organizations, visits per shift at the end of the year, per 10,000 people of the population</td>
<td>less than 250</td>
<td>more than 300</td>
<td>254.1/9</td>
</tr>
<tr>
<td>The number of doctors of all specialties per 10,000 people of the population, people</td>
<td>less than 40</td>
<td>more than 60</td>
<td>48.9/45</td>
</tr>
<tr>
<td>The number of secondary medical personnel per 10,000 people of the population, at the end of the year, people</td>
<td>less than 100</td>
<td>more than 120</td>
<td>129.9/100</td>
</tr>
<tr>
<td>Morbidity per 1000 people of the population, diseases were registered in patients with a diagnosis established for the first time in their lives</td>
<td>more than 900</td>
<td>less than 750</td>
<td>804.5/64</td>
</tr>
<tr>
<td>Infant mortality rates (number of children who died before the age of 1 year per 1000 live births)</td>
<td>more than 5</td>
<td>less than 4</td>
<td>7.6/1</td>
</tr>
</tbody>
</table>

Table 5 presents indicators of the quality of life of the population. They relate to education.

Table 5. Indicators of the quality of life of the population in the Kirov region (education).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>Criterion of the best indicator value</th>
<th>Indicator value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>The number of students per teacher in organizations engaged in educational activities, people</td>
<td>more than 15</td>
<td>less than 10</td>
<td>11.2/76</td>
</tr>
<tr>
<td>Gross coverage rate of preschool education, %</td>
<td>less than 60</td>
<td>more than 80</td>
<td>70.7/54</td>
</tr>
</tbody>
</table>
An increase in the number of students per teacher in secondary school is a negative trend in education, as well as a decrease in the training of skilled workers. This contributes to a decrease in the quality of school education. The second factor worsens the production potential of the region in the future.

An increase in the coverage of preschool education, as well as an increase in the volume of training of middle-level specialists are positive trends. When developing education in the region, it is necessary to pay attention to schools and other institutions of secondary education. It is also necessary to expand the training of skilled workers.

The indicator of the crime rate in the region is presented in Table 6.

**Table 6. Crime rate indicator in the Kirov region.**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>Criterion of the best indicator value</th>
<th>Indicator value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime rate. The number of thefts, robberies, robberies, murders, intentional harm to health, rape, extortion, hooliganism per 1000 people of the region's population</td>
<td>less than 5</td>
<td>more than 7</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.15/38</td>
</tr>
</tbody>
</table>

The level of socio-economic security of the region associated with the indicator is increasing. The value of the indicator will be determined by the overall socio-economic situation in the country.

The general indicator of the quality of life of the population of the region is presented in Table 7.

**Table 7. Integral indicator of the quality of life of the population in the Kirov region.**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Indicator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integral indicator of the quality of life of the population, points</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>48</td>
</tr>
</tbody>
</table>

Consequently, during 2010-2021, the quality of life of the population in the Kirov region is increasing; however, the level of socio-economic security is currently low.

At the end of the study, we will analyze demographic indicators. These indicators are the result of the activities of regional authorities.

Demographic indicators of socio-economic security of the Kirov region are presented in Tables 8 and 9. Tables 8, 9 are compiled based on data from the Federal State Statistics.

Table 8. Demographic indicators of socio-economic security of the Kirov region (birth rates, mortality rates, natural population growth).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>Criterion of the best indicator value</th>
<th>Indicator value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total fertility rate (number of births per 1000 population)</td>
<td>less than 12</td>
<td>more than 14</td>
<td>8.2/1</td>
</tr>
<tr>
<td>Total mortality rate (number of deaths per 1000 population)</td>
<td>more than 14</td>
<td>less than 11</td>
<td>18.5/1</td>
</tr>
<tr>
<td>The coefficient of natural population growth per 1000 people of the population</td>
<td>less than 0.1</td>
<td>more than 2</td>
<td>-11.3/1</td>
</tr>
</tbody>
</table>

During the study period, there has been a steady decline in the population in the Kirov region. This decrease occurs in all age groups. The total fertility rate is decreasing; the total mortality rate is increasing. A significant increase in the mortality rate is observed in 2021. This year saw the largest number of victims of the pandemic, and the worst health situation.

The dynamics of mortality and fertility rates suggests that the pandemic has exacerbated existing trends. The main reason for negative demographic trends is the lack of economic growth.

The demographic indicators of the Kirov region are worse than the average in Russia. The demographic behavior of citizens in the region is rational. The standard of living is low compared to the most affluent regions. As a result, citizens refuse to have children.

Table 9. Demographic indicators of socio-economic security of the Kirov region (coefficients of demographic load, migration population growth).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>The criterion of the worst value of the indicator</th>
<th>Criterion of the best indicator value</th>
<th>Indicator value / score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic load factor for persons under working age (there are persons under working age per 1000 people of working age)</td>
<td>less than 350</td>
<td>more than 450</td>
<td>339/1</td>
</tr>
<tr>
<td>Demographic load factor for people over working age (there are people over working age per 1000 people of working age)</td>
<td>more than 500</td>
<td>less than 400</td>
<td>523/1</td>
</tr>
<tr>
<td>The coefficient of migration growth of the population per 10,000 people of the population</td>
<td>less than 20</td>
<td>more than 0</td>
<td>-14/31</td>
</tr>
</tbody>
</table>
The demographic burden on people younger than working age in the region is increasing. This is a positive trend.

The increase in the proportion of children and adolescents is the result of an increase in the birth rate in the second half of the 2000s. If measures are not taken to stimulate the birth rate, the proportion of children in the population of the region will begin to decrease again.

The demographic burden on citizens of retirement age is steadily growing. The exception is 2021. The reason for this situation is the high mortality rate of elderly citizens during the pandemic. This situation indicates a deterioration in the level of socio-economic security of the region.

Migration of citizens outside the region has significantly decreased during the study period. The decrease in migration in 2020 - 2021 is caused by the impact of the pandemic. The further dynamics of the indicator will depend on the ratio of the pace of development of the region and other regions of the country.

The demographic situation in the region is unfavorable. The level of socio-economic security is low. It is calculated based on demographic indicators.

The reason for the current situation is the low rates of economic development of the region. To ensure high rates of development of the region, a significant number of young economically active people are needed.

Citizens should see positive prospects for living in the region. This will ensure favorable dynamics of population reproduction and low migration outflow. The integral demographic indicator of the socio-economic security of the region is presented in Table 10.

Table 10. Integral demographic indicator of socio-economic security of the Kirov region.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Indicator value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>Integral demographic indicator, points</td>
<td>24</td>
</tr>
</tbody>
</table>

Thus, the demographic situation in the Kirov region needs to be improved. Measures are needed to stimulate the birth rate and reduce migration outflow from the region.

4 Conclusions

The authors consider the issues of assessing the level of socio-economic security of the Kirov region. The authors analyzed indicators of the level and quality of life in the region, as well as demographic indicators of the region. Indicators of the quality and standard of living of the population in the Kirov region are currently worse than the average in Russia. A significant number of indicators show negative dynamics.

The level of socio-economic security of the Kirov region is currently low. The deterioration of the demographic indicators of the region is a confirmation of this thesis.

We see the solution to the problem in stimulating the birth rate and improving the demographic indicators of the region. This should be ensured by improving the quality of life and increasing the incomes of the population.

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