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Differentiation of Russian regions by the level of economic growth and the life quality

Olga Vladimirovna Kapitanova[1][1], *Iurii Alekseevich* Kuznetsov[1], *Aleksei Valer'evich* Semenov[1], *Veronika Vyacheslavovna* Kisova[2], and *Irina Alekseevna* Koneva[2]

[1]Lobachevsky State University, Institute of Economics and Entrepreneurship, Nizhny Novgorod, Russia
[2]Minin Nizhny Novgorod State Pedagogical University, Department of Special Pedagogy and Psychology, Nizhny Novgorod, Russia

Abstract. The paper analyzes three key indicators of economic growth and life quality from the National Development Goals of the Russian Federation. The following equivalents of these indicators were identified to form regions into clusters and highlight the main trends in their development: the growth rate of gross regional product (GRP), life expectancy, and poverty level. We studied the nationwide data based on the indicators, analyzed the distribution of regions, and carried out a cluster analysis according to 2017-2019 data. Our results suggest expanding the list of the Russian Federation subjects that require additional support in their development. More than one-third of the regions of the Russian Federation have been developing at a rate of less than one percent per year in the last three years. Considering the consequences of the pandemic, it can lead to serious problems in achieving the declared growth rates. Plans to increase life expectancy have already been adjusted. Considering the little-studied consequences of coronavirus infection, additional measures in the medical field will be required. The level of poverty of the population also demonstrates a significant degree of differentiation of the Russian Federation regions.
Keywords: economic growth, quality of life, regional disparities, cluster analysis

1   Introduction

In July 2020, Presidential Decree No. 474 approved national development goals up to 2030. It formulates strategic goals that the Government of the Russian Federation and regional authorities should achieve [1]. It specifies the main indicators that can quantify the degree of their implementation. The government has formed a unified plan for achieving the national development goals of the Russian Federation for up to 2024 and for the planning period up to 2030 (hereinafter – the Plan), which contains a breakdown of goals and indicators [2].

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[1] Corresponding author: kapitanova@iee.unn.ru

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Economic growth per se and life quality are not directly on this list but are closely related. The growth rate of gross domestic product (GDP) is used to measure economic growth, labor efficiency, and the success of the entrepreneurial activity, while the quality of life of the population characterizes most of the indicators under consideration.

When analyzing these documents, we should consider the overall situation in the country and the development of individual regions. Given the vast territories and large differences in development between regions, it is appropriate to consider the main indicators in the context of territorial differentiation.

The works [3-5] consider various aspects of the differentiation of Russia's regions. In [3], trends and problems of the spatial development of Russian regions in the context of integration of the domestic economy in the transition period are studied. In [4], Russian regions are differentiated by basic indicators, and a quite obvious division into developed industrial and backward agrarian regions is obtained. Work [5] identifies several markers for identifying entities whose development can be called sustainable, with particular attention to environmental factors and digital development. In [6, 7], the authors describe an approach to the formation of indicators of socio-economic development, which can serve as a basis for regional differentiation and identification of the peculiarities of regional socio-economic development.

Among the works on regional differentiation are [8], which describes the influence of socio-cultural indicators on regional economic growth, and [9], which examines regional differences in economic growth in the United States, depending on political factors. An alternative approach to studying regional differentiation is presented in [10].

In [11], it is pointed out that the level of differentiation is one of the factors of regional sustainability. Some differences in the level of development of regions are quite natural and logical, based on their history, socio-cultural characteristics, geographical location, and mineral reserves. However, too high differentiation degree can also lead to negative economic results. In this regard, we note the work [12], which shows that most regions are more or less behind the average Russian level for a number of indicators of goal achievement. Therefore, more attention needs to be paid to the regional aspects of the goals and related indicators.

The study aims to analyze the three main indicators that characterize national goals from a regional perspective and identify clusters consisting of regions with similar development trends. This makes the study highly relevant. The review of the literature above confirms that no similar studies have previously been conducted.

Section 2 of this paper describes the data on which the study was based and the methods used. Section 3 is devoted to describing the results and the resulting cluster distributions. Section 4 contains a discussion that allows analyzing the results and drawing conclusions. At the end of the paper, there is a conclusion and a list of references.

2   Materials and methods

The work is devoted to the study of a number of indicators included in the Unified Plan to achieve the national development goals of the Russian Federation for the period up to 2024 and up to 2030. The study aims to analyze the three main indicators that determine the degree of fulfillment of the national goals in the regional aspect and identify clusters consisting of regions with similar development trends. The following research objectives were formulated to achieve this objective:

1. Identify Plan indicators that can be used to describe economic growth and quality of life;

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2. Analyze the values of these indicators for the Russian Federation since 2000;

3. Determine similar indicators for the regions of the Russian Federation for 2017-2019;

4. Analyze the distribution of regions by indicator values;

5. Conduct clustering of regions according to selected indicators;

6. Draw conclusions.

Below are used such scientific research methods as analysis, synthesis, comparison, generalization, and economic-statistical methods, which allow for processing statistical data on various indicators, in particular, cluster analysis. Cluster analysis divides a set of objects into groups so that objects within the group have similar characteristics, and between groups, they differ greatly (see, for example, [13]).

When analyzing the Plan, it was found that in the section of indicators describing the achievement of the national goal "Decent, efficient work and successful entrepreneurship", the GDP growth rate, %, is given. This is a direct characteristic of the economic growth rate. At the regional level, GDP can be replaced by GRP, and to describe the growth rate, the "GRP volume index" was taken, which has the same meaning.

To describe the life quality of the population, among all the Plan indicators, two main ones were chosen: life expectancy at birth, in years, and the poverty rate, in %. The classification proposed in [14] was taken as the basis when selecting the quality of life indicators. These indicators are considered under the goal "Population Preservation, Health, and Well-Being". Thus, within the framework of official statistics, both in the all-Russian and regional aspects, the following indicators can be used: life expectancy at birth (number of years) and the number of population with monetary income below the subsistence minimum (as a percentage of the total population of the member of the Russian Federation).

Statistical data were obtained from the website of the Federal State Statistics Service [15]. When analyzing the poverty dynamics, it should be taken into account that when using the data on the value of the subsistence level determined in a comparable methodology, the trend of poverty reduction has not changed.

3   Results

3.1   Economic growth rates

One of the main economic indicators is GDP, the rate of change of which is a basic way of describing economic growth. The Plan states that the country's growth rate should be higher than the global average. For 2021, 104.2% is planned, and then the goal is 103%.

Let us consider the dynamics of GDP growth rates since 1996 (Fig. 1). Hereinafter, the solid line shows the real values, the dotted line – estimate 2021 and planned values up to 2030. It should be noted that the dynamics of the growth rate are negative. The GDP diagram in real prices shows a slowdown. The average GDP growth rate for this period is only about 102.7%.
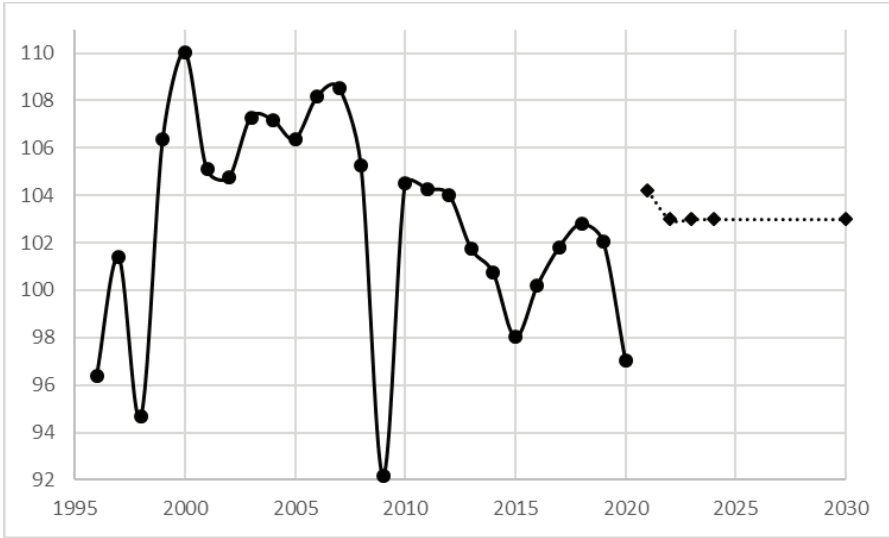
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Fig. 1. GDP growth rate of the Russian Federation, in %: actual and planned. *Source:* compiled by the authors.

Let us consider the distribution of regions by category according to the growth rate of GRP over three years (Fig. 2). The GRP growth rate in constant prices is shown on the abscissa, and the number of regions in the group is shown on the ordinate.
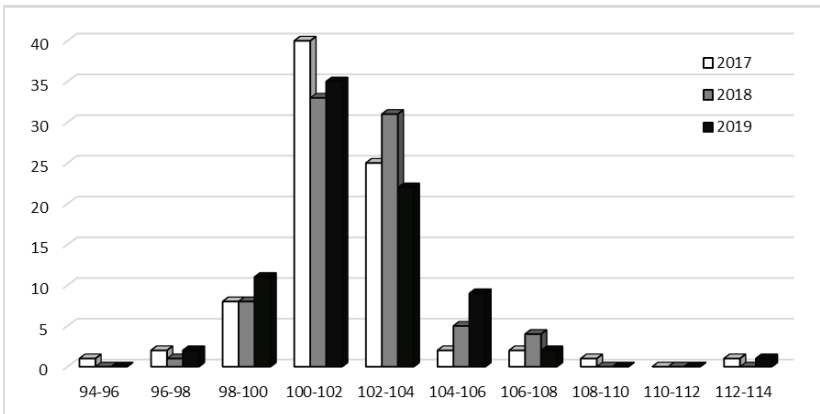

Fig. 2. Distribution of the GRP growth rate of the Russian Federation, in %, 2017-2019. Source: compiled by the authors.

Fig. 2 shows that most regions do not show very high growth rates. The distributions are skewed to the left; nevertheless, regions with positive dynamics prevail. It should be noted that the number of regions with the growth of 104-106% and a decline of 98-100% increase in 2019.

To identify trends in GRP dynamics, we clustered regions according to data on the growth rate of real GRP. All regions were divided into 4 clusters using the k-means method in the Statistica package. Fig. 3 shows the dynamics of the average values by cluster.
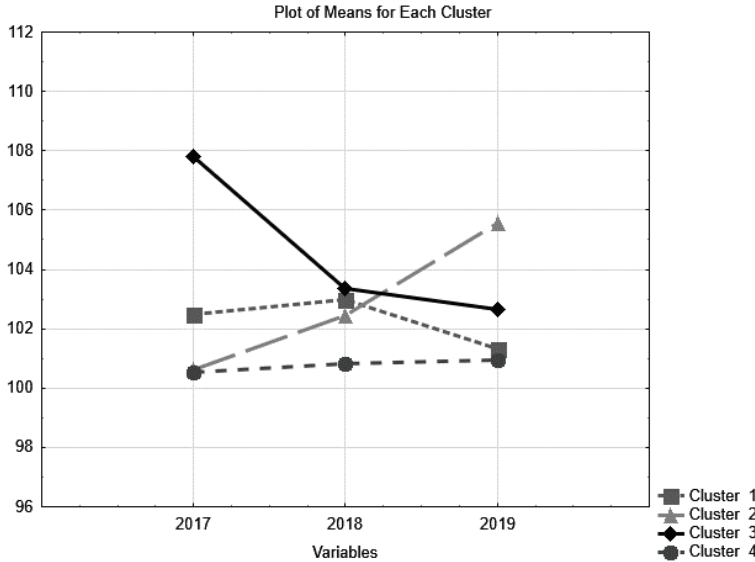
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Fig. 3. Dynamics of average growth rates in each cluster 2017-2019. *Source:* compiled by the authors.

The first cluster (33 regions) consists of "mediocrities". The growth rates of these regions were average over the three years. The second cluster – 12 regions – shows an acceleration. This includes the Nizhny Novgorod region. The third cluster is characterized by a slowdown in development. This includes 5 regions that require special attention from governing bodies to reverse the trend. The fourth cluster (32 regions) contains very slow growth regions, although with positive dynamics. The first and fourth clusters are more homogeneous (their dispersion is lower), with the most regions. The distribution of regions by clusters is shown in Fig. 4.

Fig. 4. Regional distribution by clusters. *Source:* compiled by the authors.

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3.2   Life expectancy

Fig. 5 shows the dynamics of life expectancy in the Russian Federation since 2000. In two decades there has been an increase of 8 years. The plan was adjusted to account for the pandemic.
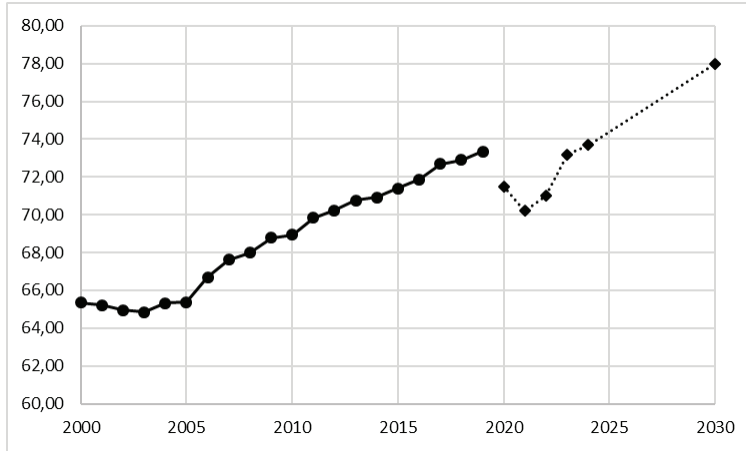

Fig. 5. Life expectancy in Russia in years: actual and planned. *Source:* compiled by the authors.

Consider the situation in the regions. Fig. 6 shows the distribution of regions by life expectancy. On the abscissa axis are intervals of life expectancy in years; on the ordinate axis – the number of regions. The median and mean values of life expectancy are increasing.
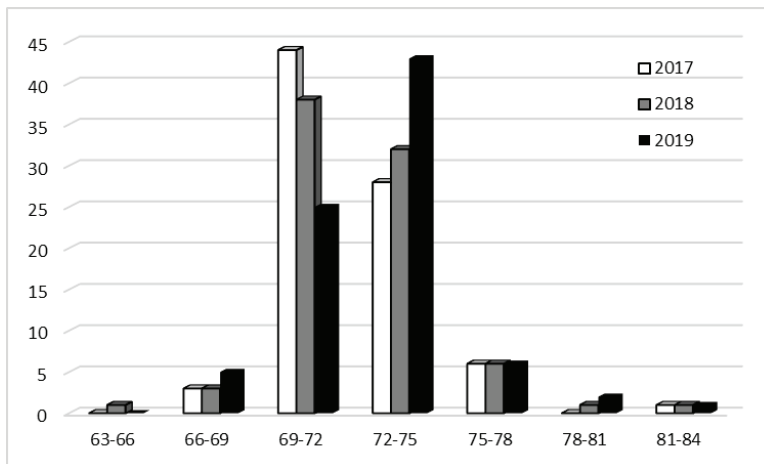

Fig. 6. Regional distribution by life expectancy. *Source:* compiled by the authors.

A cluster analysis of indicators for three years was carried out to identify the specifics of the dynamics of life expectancy. Life expectancy in each cluster remained virtually unchanged over the three years. Fig. 7 shows diagrams showing changes in the average life expectancy values within clusters.
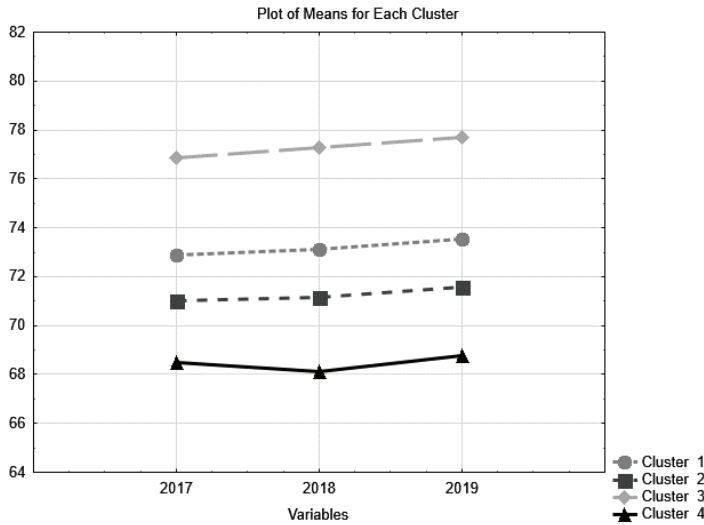
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Fig. 7. Dynamics of average values of life expectancy in each cluster 2017-2019. *Source:* compiled by the authors.

In the first cluster (31 regions), life expectancy is slightly higher than in Russia as a whole. In the second cluster (35 regions), life expectancy is slightly less than the national value. Life expectancy is significantly higher than average in the third cluster (8 regions) and is close to the target. The fourth cluster (8 regions) demonstrates the lowest life expectancy in the Russian Federation. Fig. 8 shows a regional distribution map by clusters.

Fig. 8. Regional distribution by clusters. *Source:* compiled by the authors.

3.3   Poverty level

Another indicator of the life quality of the population is the poverty rate (%). The solid line in Fig. 9 shows the values of population with monetary incomes below the subsistence minimum (as a percentage of the total population of the member), which tend to decrease.
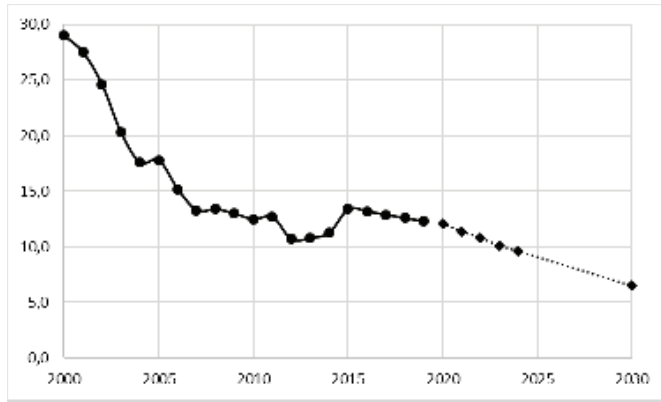
Fig. 9. Poverty level in Russia (in %): actual and planned. *Source:* compiled by the authors.

Fig. 10 shows the distribution of regions by category according to the values of the poverty level during 2017-2019. Poverty level intervals (in %) are on the abscissa axis, and the number of regions is on the ordinate axis. The histogram shows that poverty reduction in the regions is a very slow process and that the number of the poorest regions has remained virtually unchanged for three years.
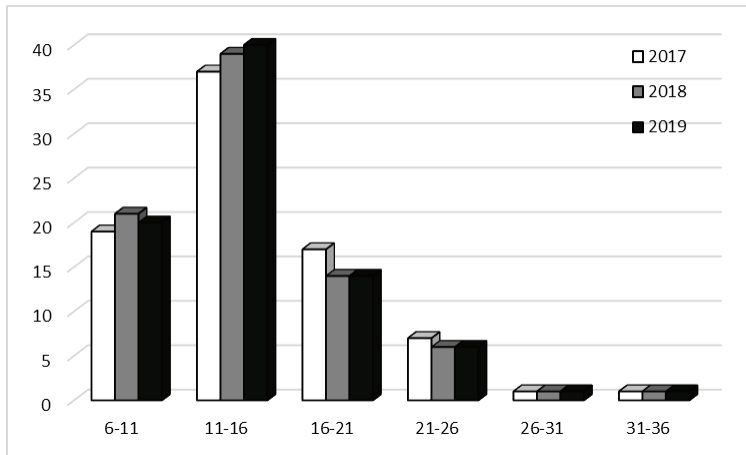

Fig. 10. Distribution of regions by poverty level. *Source:* compiled by the authors.

A cluster analysis of poverty rates over three years reveals any dynamic patterns in this case. Fig. 11 shows graphs of the average values of the poverty level in each cluster.
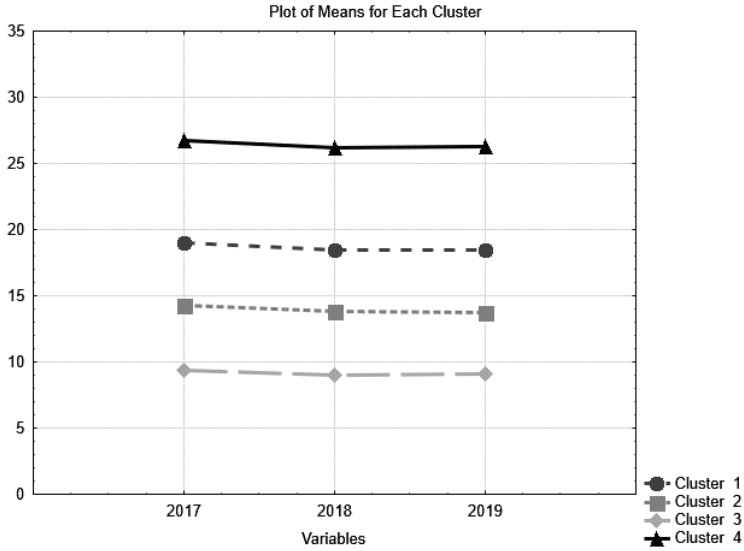
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Fig. 11. Dynamics of the average poverty level in each cluster 2017-2019. *Source:* compiled by the authors.

In the regions of the first cluster (15 regions), the poverty level is slightly higher than the national average. In the second cluster (39 regions), the poverty level is slightly lower than the national average but still higher than the national average. The third cluster is the 21 regions with the best indicators in Russia. The fourth cluster represents regions with the highest poverty level (7 regions). Fig. 12 shows the territorial division into clusters.

Fig. 12. Regional distribution by clusters. *Source:* compiled by the authors.

4　　Discussion

From a macroeconomic point of view, high rates of economic growth are one of the most important factors ensuring sustainable development. However, for the Russian economy,

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this indicator is strongly linked to the price of extractive industry products. Therefore, the task of ensuring a rate no less than 3% is greatly complicated by the country's resource dependence. The diagrams show that the situation in the regions is not too optimistic either. And although the Plan does not imply a breakdown of this goal by region, unlike indicators of the life quality, and GRP is not a decomposition indicator for GDP, nevertheless, in most regions, it repeats all-Russian trends and correlates strongly with them. Therefore, this indicator is quite representative of the current situation.

The cluster analysis allows identifying the regions whose economic activity over three years causes the greatest concern: these are the five regions with negative dynamics: the Kaluga, Astrakhan, and Magadan regions, the Jewish Autonomous Region, and the city of Sevastopol. Unfortunately, among the regional programs aimed at developing the Far East, there are no special programs for the two regions in question. The situation is more favorable for Sevastopol: it is planned to create a free economic area there. This can create conditions for its rapid development. An individual program of socio-economic development is being developed for the Astrakhan region, aimed at creating engineering and transport infrastructure. From the trends, we have found that the situation in Kaluga Oblast is very alarming and should not go unheeded by the authorities. It should be noted that more than a third of RF regions are growing very slowly (not more than one percent per year) for three years, which, given the effects of the pandemic, could lead to serious problems in achieving the stated growth rates.

Life expectancy in Russia shows a positive trend: over the past 20 years, the indicator has increased by almost 8 years. According to the Plan, it is expected to increase by about 5 more years by 2030. However, it should be assumed that due to the poorly studied effects of coronavirus infection, the Plan will undergo further adjustments, and the rate of life expectancy growth will slow down.

In most regions, let us look at the regional decomposition of this indicator. It is required to increase life expectancy by 7-8 years, not even by 5, which, of course, requires a significant improvement in the quality of medicine and other life areas. The cluster of 8 regions in Eastern Siberia and the Far East, where life expectancy does not exceed 70 years, raises the greatest concern in this regard.

The poverty rate in Russia decreased very rapidly in the 2010s, but then the process slowed down. The increase in 2015 is associated primarily with a change in the methodology for calculating the indicators. After 2015, the trend slowed down. Although the Government's forecasts generally continue the existing trend, but the obvious acceleration of it requires serious work on the situation in the regions. The most serious concerns are raised by 7 Russian regions in which about a quarter of the population has incomes below the subsistence level: the Karachay-Cherkess and Kabardino-Balkar republics, the republics of Ingushetia, Kalmykia, Altai, and Tyva, as well as the Jewish Autonomous Region. It should be noted that a separate Federal project defines the development of the North Caucasus. The Republics of Kalmykia, Altai, and Tyva are included in the set of measures to support and develop regions with a level of socio-economic development below the Russian level. On the other hand, the Jewish Autonomous Region deserves closer attention and a separate development program.

5   Conclusion

Based on the study, the clustering of Russian regions was carried out. A high degree of differentiation of regions for all three indicators was revealed, and groups of regions with similar development trends for each variable were identified.

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Note that most of the problem regions are already covered by a variety of Federal programs and projects, but regions have been identified that need additional attention from the authorities (Kaluga Region, Jewish Autonomous Region, etc. in the Far East). The trends observed in these regions raise certain concerns. In several regions, there is some inconsistency in the development of territories. Analysis of the GRP growth rate in this part of the country shows a lack of positive dynamics. And this fact requires further study and elaboration of a set of measures not only for the development of remote areas but also to improve the situation in the central part of the country.

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