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# FROM THE CHIEF EDITOR

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## Modernisation issues of Russia's regions

Currently, profound changes are going on in the world economy. Its leaders (the USA, Japan, the European Union) try to preserve their dominance at all costs, and the Asian Tigers, aspiring to take their place, are increasingly expanding the spheres of their influence to the international level. China has been actively developing in the context of economic integration; it asserted itself as a global power, implementing a wide range of political, economic, military, cultural and other modernisation transformations that lay the foundations for the mighty modern state[1].

Advanced development of new technological modes is crucially important in the implementation of modernisation. Domestic researchers note that in order to join the fastest-growing economies through an actual breakthrough, Russia should establish the technological mode, which would make it possible to achieve 8% of the sixth mode and 31% of the fifth mode by 2020. By 2030 these modes should prevail in the structure of the Russian economy – 20% and 40%, respectively[2]. At the same time, it is necessary to make significant progress in science, education, healthcare, social development in general. Now it is very important not to miss the available opportunities, and first of all – to enhance the efficiency of state management.

In recent years Russia has been undertaking certain measures to accelerate modernisation reforms. The centre for the development and commercialization of new technologies "Skolkovo", the Russian Corporation of Nanotechnologies "RUSNANO" were established. The stratification of the higher education system was initiated, with the allocation of federal and national research universities and universities with special status (Moscow State University and Saint Petersburg State University).

[1] Sharko S.V. Russia and China: opportunities for and development of regional integration: monograph. Moscow: OOO "In-kvarto", 2010.

[2] Kuzyk B.N. Innovation model of Russia's development. The journal of the New Economic Association. 2010. No. 7. P. 153.

Certain measures are being taken to increase the salaries of the staff of academic institutes and institutions of higher and secondary professional education, and school teachers. R&D on the grant basis is being developed. Strategic plans for the development of the leading branches of national economy are being elaborated.

Immediately after assuming office as Russia's President, on May 7, 2012, V.V. Putin signed 11 Decrees[3] aimed at the implementation of his election programme. They contain instructions to the RF Government concerning the implementation of tasks, determining the rate of modernisation acceleration in economic and social spheres; they also determine the indicators, the achievement of which will ensure a sharp increase in Russia's competitiveness, enhancement of national security, creation of decent living conditions for its citizens. Essentially, these are the actions that will facilitate a sharp reduction in the gap between Russia and the world economic leaders, and place Russia among the modern economies with a high quality of life.

The nature, trends, factors and specifics of modernisation have been extensively studied by scientists in different countries. Efficient methods for measuring the level of modernisation are being developed, based on the comparison of key parameters of the socio-economic situation in a certain country and the states leading in innovation development.

A lot of analytical and forecasting research in this area has been recently performed by Chinese scientists. In particular, the scientists at the China Center for Modernisation Research, Chinese Academy of Sciences (headed by Professor He Chuanqi) analysed the data on the development of 131 countries and defined the modernisation stages these countries undergo[4]. Thus it has been revealed that in 2006 12 countries still represented a traditional agrarian society; 90 countries were in the primary stage of modernisation, which, in fact, solves the problems of capitalism accompanied by socio-cultural evolution; 29 countries entered a stage of secondary modernisation characterised by the high quality of life, ecologisation, informatisation of society.

According to the proposed methodology, Russia ranked 41st (97% as compared to the level of the leading countries) in 2006 in the primary modernisation (PM) rating, 31st (66%) in the secondary modernisation (SM) rating and 37th (59%) in the integrated modernisation (IM) rating.

By 2010, the country's position in the world rating has changed insignificantly. It ranks 43rd by PM, 29th – by SM, 36th – by IM *(tab. 1)*. At present, Russia is among the group of countries with a medium level of development, alongside Spain, Greece, Portugal.

How can it be that our country with its enormous production, labour, intellectual, raw materials and other basic resources is among the 'average performers'?

[3] Decree "On the Presidential programme on the improvement of qualification of engineering personnel for 2012–2014" No.594; Decree "On the long-term state economic policy" No.596; Decree "On the activities for the implementation of the state social policy" No.597; Decree "On the improvement of state policy in health care sphere" No.598; Decree "On the measures for the implementation of state policy in the sphere of education and science" No.599; Decree "On the measures for providing the citizens with affordable and comfortable housing and enhancing the quality of housing and communal services" No.600; Decree "On the main guidelines of improving the state management system" No.601; Decree "On the provision of inter-ethnic concord" No.602; Decree "On the implementation of plans (programmes) for the construction and development of the Armed Forces of the Russian Federation, other forces, military formations and bodies, and modernisation of the defense-industrial complex" No.603; Decree "On the further improvement of military service in the Russian Federation" No.604; Decree "On the measures for the implementation of the foreign policy of the Russian Federation" No.605; Decree "On the measures for the implementation of demographic policy in the Russian Federation" No.606. Source: Decrees of the President of the Russian Federation V.V. Putin dated May 7, 2012. Available at: http://www.rsronline.ru/doc/2012_06_25/6.pdf

[4] He Chuanqi. Survey report on modernisation in the world and in China (2001–2010). Translated from English under general editorship of N.I. Lapin, foreword by N.I. Lapin, G.A. Tosunyan. Moscow: Ves Mir, 2011.

Table 1. National modernisation of Russia (among 131 countries)

| Modernisation indicator | 2000 | 2005 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Primary modernisation index (Rank of the PM index) | 92 (52) | 96 (45) | 99.7 (40) | 99.9 (41) | 99.9 (43) |
| Secondary modernisation index (Rank of the SM index) | 62 (29) | 66 (29) | 70 (30) | 70 (30) | 72 (29) |
| Integrated index of modernisation (Rank of the IM index) | 54 (37) | 58 (39) | 63 (36) | 65 (38) | 66 (36) |

Source: Research Group for China Modernization Strategies, et al. 2008. China Modernization Report 2008: International Modernization. Beijing: Peking University Press. World Bank. 2008. World development Indicators 2008. Washington DC: World Bank.

According to most analysts and experts[5], the reforms, connected with the change in the social system, that Russia went through over the past 20 years, have been implemented with gross errors (first of all, in privatisation, liberalisation of foreign trade relations, organisation of compensatory measures for the conservation of people's savings). This led to deindustrialisation, the aggravation of territorial differentiation, extension of social degradation, significant reduction in the level of the country's competitiveness, and to other negative phenomena.

Taking into account the fact that in its historical past the Soviet Union was actually the number two power in the world, the key guidelines of V.V. Putin's activity during his third presidency were aimed at achieving by 2018–2025 of the development indicators ensuring a significant increase in the country's competitiveness and enhancement of national security in all the spheres of socio-economic development.

Modernisation of the country in general is determined by the modernisation of its regions. In this regard, defining the trends in the level and rate of modernisation in the regions is the most important research and practical task. This issue became the basis of a major research project "Socio-cultural modernisation of Russia's regions", which has been implemented since 2006 by the Centre for the Study of Social and Cultural Change of the Institute of Philosophy of RAS under the leadership of RAS Corresponding Member N.I. Lapin with the support of the Russian Humanitarian Science Foundation. At that, the tools of Chinese colleagues were adapted to Russian conditions[6].

[5] See, for example: Modernisation and economic security of Russia. Vol.1. Ed. by Academician N.Ya. Petrakov. Moscow: Finance and credit, 2010; Modernisation and economic security of Russia. Vol.2. Ed. by Academician N.Ya. Petrakov. Moscow, Saint Petersburg: Nestor-Istoriya, 2010; Glazyev S.Yu., Lokosov V.V. Assessment of the critical threshold values of the indicators of the state of Russian society and their use in the socio-economic development management. Herald of the Russian Academy of Sciences. 2012. Vol. 82. No.7; Glazyev S.Yu., Fetisov G.N. On the strategy of Russia's sustainable development. Ekonomist. 2013. No.1; Ivanter V.V., Ksenofontov M.Yu. The concept of constructive forecast of the growth of Russia's economy in the long-term. Problemy prognozirovaniya. 2012. No.6; Evaluation of growth factors and the forecast of the socio-economic development of Russia's regions. Ed. by. RAS Academician A.I. Tatarkin, RAS Academician P.A. Minakir. Russian Academy of Sciences. Ural Department. Institute of Economics; Far Eastern Branch. Economic Research Institute. Yekaterinburg: IE Ural RAS Department, 2012; Russian transformation: 20 years later. Ed. By J. Sapir. Moscow: Magistr, 2013; etc.

[6] Lapin N.I. On the experience of analysing modernisation. Obshchestvenniye nauki i sovremennost. 2012. No.2. P. 5357. The tools have been adapted to Russian conditions (some indicators, relevant for Russia, were added), the changes have been made according to the specifics of regional statistics. So, in the SM index the "Number of TV sets per 1000 persons" has been replaced with the "Number of TV sets per 100 households," in the SM and IM indices the "Number of Internet users per 100 people" has been replaced with the "Number of personal computers per 100 households". In addition, two indicators have been added to the evaluation indicators of the secondary modernisation: the "Share of innovation goods, works and services in the total volume of shipped production, in %" and the "Share of R&D expenditures in GDP, in %". These indicators provide for a better differentiation of the regions according to the SM phases. He Chuanqi agreed with the usefulness of the inclusion of these indicators, explaining that they are absent in the methodology of the China Center for Modernization Research, Chinese Academy of Sciences, because there are no such indicators in the statistics of several countries.

Participating in the project since 2010, the Institute of Socio-Economic Development of Territories of RAS has developed an information and analytical system "Modernisation". For determining the indices, phases and levels of modernisation, 25 necessary statistical indicators reflecting the level of socio-economic development were selected for the years 2000, 2005, 2008, 2009 and 2010. The data cover 83 subjects of the Russian Federation, 8 federal districts and Russia as a whole.

According to the analysis conducted by ISEDT RAS, most of Russia's territories have by 2008 passed the stage of primary modernisation (PM index by the federal districts ranged from 91 up to 99.9). The completion of primary transformations in some districts, (North Caucasian, Southern and Siberian) was hampered, first of all, by an insufficient duration of life of the population. As a result, national average life expectancy in Russia in 2010 was significantly lower than in the leading states.

As for secondary modernisation, its index in Russia as a whole over the last decade has grown by 10 percentage points and reached 72% in 2010. Moreover, the growth was mainly provided by the Central and Northwestern Federal Districts *(tab. 2)*.

Other districts in the 2005–2010 period experienced a decline in the pace of modernisation processes due to the decrease in the value of gross regional product. If this trend remains unchanged, the secondary modernisation in the country will have been completed not earlier than by 2022–2025.

Since the integrated modernisation is a coordinated interaction between both stages, the ratings of these territories according to the integrated indicator turn out to be the result of

Table 2. Dynamics of secondary modernisation indices of Russia's federal districts, %*

| Federal District | Year | | | | | Growth | |
|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2008 | 2009 | 2010 | 2000–2005 | 2005–2010 |
| Central | *With an average level of development* | | *With a high level of development* | | | 7.8 | 7.4 |
| | 68.9 | 76.7 | 82.8 | 84.2 | 84.1 | | |
| Northwestern | 66.7 | 72.6 | *With an average level of development* | | | 5.9 | 6.4 |
| | | | 77.4 | 78.3 | 79 | | |
| Ural | 56.2 | 63.1 | 67.4 | 66.6 | 66.1 | 6.9 | 3 |
| Volga | 55 | 61 | 63.4 | 63.4 | 64.4 | 6 | 3.4 |
| Siberian | 52.6 | 59.2 | 62.8 | 63.2 | 63.2 | 6.6 | 4 |
| Far Eastern | *With a preliminary level of development* | 58.6 | 62.4 | 62.1 | 62.1 | 7.2 | 3.5 |
| | 51.4 | | | | | | |
| Southern | 50.3 | 55.6 | 58.3 | 59.5 | 59.1 | 5.3 | 3.5 |
| North Caucasian | 44.2 | *With a preliminary level of development* | 51.7 | 52.7 | 53.6 | 5.4 | 4 |
| | | 49.6 | | | | | |
| **Russia as a whole** | **61.6** | **66.2** | **69.8** | **70.4** | **72** | **4.6** | **5.8** |

* The data on the districts are ranked according to 2010.
SM levels: with a high level of development – 81 and more; with an average level of development – 52–80 (the upper third – 72–80; the middle third – 62–71; the lower third – 52–61); with a preliminary level of development – 31–51.
Source: Calculations have been carried out by the Institute of Socio-Economic Development of Territories with the use of information-analytical system of monitoring the parameters of Russian regions' modernisation (IS "Modernisation", patent No.2012661285, 2012), in accordance with the methodological developments of the Centre for the Study of Social and Cultural Change of the Institute of Philosophy of RAS.

summing up the two previous measurements. The Central and Northwestern Federal Districts are also the leaders by the integral index. But even these best values of the indicator correspond only to the average level of modernisation standards, calculated according to the leading countries. In the rest of the districts (Ural, Far Eastern, Volga, Siberian, Southern, North Caucasian) the indicators are below average *(tab. 3)*. The reduction in the rate of modernisation in these districts, and, respectively, in the whole country in 2005–2010 was caused by the crisis and post-crisis phenomena occurring in the given time period.

Thus, the assessment of modernisation rate at the regional level has shown that in Russia's regions this process is going on unevenly. Modernisation in cultural-cognitive and production spheres is especially poor.

The main factor hampering the pace of modernisation in Russia is a considerable differentiation of its regions by the level of economic and social development. The regions with substantial economic resources for modernisation have only a quarter of the country's population, the 'second-rate' regions – almost 2/3 and underdeveloped regions – about 15% of the Russian citizens.

The analysis proves that the small number of agglomerations, which are the centres for modernisation, is another factor that influences the rate of modernisation. Russia has only 11 cities with population of 1 million and more; 38% of the population lives in the cities with population over 250 thousand, and 36% live in small towns, rural areas and villages that have minimum resources for modernisation.

Table 3. Dynamics of integrated indices of modernisation in Russia's federal districts, %*

| Federal District | Year | | | | | Growth | |
|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2008 | 2009 | 2010 | 2000–2005 | 2005–2010 |
| Central | *Below average* 57.7 | *Average* 65.8 | 72.4 | 73.7 | 73.2 | 8.1 | 7.4 |
| Northwestern | 53.9 | *Below average* 60.9 | 66.2 | 67.3 | 68.4 | 7 | 7.5 |
| Ural | 49.3 | 57.3 | 62.6 | *Below average* 61.6 | 61.7 | 8 | 4.4 |
| Far Eastern | 47.8 | 55.6 | 60.1 | 60.4 | 59.9 | 7.8 | 4.3 |
| Volga | *Low* 47.7 | 55.3 | 58.6 | 58.9 | 59.9 | 7.6 | 4.6 |
| Siberian | 46.4 | 54.2 | 59.2 | 59.7 | 59.6 | 7.8 | 5.4 |
| Southern | 44.8 | 52 | 55.5 | 56.5 | 56 | 7.2 | 4 |
| North Caucasian | 41.1 | *Low* 47.3 | 50.2 | 51.1 | 51.6 | 6.2 | 4.3 |
| **Russia as a whole** | **51.1** | **57.9** | *Below average* **62.5** | **63.5** | **65.4** | **6.8** | **7.5** |

* The data on the districts are ranked according to 2010

Intervals of the indices: high – 88 and more; above average – 78–87; average – 64–77; below average – 48–63; low – 33–47; very low – 32 and less.

Source: Calculations have been carried out by the Institute of Socio-Economic Development of Territories with the use of information-analytical system of monitoring the parameters of Russian regions' modernisation (IS "Modernisation", patent No.2012661285, 2012), in accordance with the methodological developments of the Centre for the Study of Social and Cultural Change of the Institute of Philosophy of RAS.

The main limiting factors determining the level of human capital development include low life expectancy and a great differentiation of the population by income. In recent years the difference between decile groups with the highest and lowest incomes has been 15–16 times. The main reason for low incomes lies in the insufficient level of wages in some sectors, especially in the budget sphere. The approved minimum wage still lags far behind the income enough for decent living. The insufficient level of information and innovation culture of the population adversely affects the pace of modernisation as well.

The President's Decrees dated May 7, 2012 provide for fundamental changes in the key areas, determining the rate of modernisation *(tab. 4)*.

ISEDT RAS calculations show that the values of the main indicators of modernisation processes for the target scenario (by the Decrees of the RF President) will outpace the inertial trend formed in 2000–2010.

If life expectancy by 2020, in accordance with the inertial forecast is estimated at 74.3 years, then in accordance with the target indicators it will be equal to 75.2 years *(tab. 5)*.

Table 4. Objectives for the modernisation of the economy, set out in the Decrees dated May 7, 2012 by the RF President

| Presidential Decree | Main targets set out in the Decree |
|---|---|
| 'On the long-term state economic policy' No. 596 | – improvement of Russia's position in the World Bank rating of business environment up to the 50th in 2015 and up to the 20th in 2018; |
| | – 1.3-fold increase in the share of hi-tech and knowledge-intensive production in the gross domestic product by 2018 as compared to 2011; |
| 'On the activities for the implementation of the state social policy' No. 597 | – 1.4–1.5-fold increase in real wages by 2018; |
| | – bringing the average salaries of kindergarten teachers to the regional average in the sphere of general education in the specific region; |
| | – increase in the number of highly qualified workers by the year 2020 so that it would amount to not less than one third of the number of qualified workers; |
| | – creation of up to 14.2 thousand jobs for disabled persons annually in the period of 2013 – 2015; |
| | – creation of not less than 5 centres for cultural development in small towns by 2015; |
| | – 2-fold increase in the number of exhibition projects realized in the constituent entities of the Russian Federation by 2018; |
| | – increase in the number of children participating in creative activities and events up to 8% of the total number of children by 2018; |
| 'On the improvement of state policy in health care sphere' No. 598 | – reduction of death rate from cardiovascular diseases to 649.4 cases per 100 thousand population; |
| | – reduction of death rate from neoplasms (including malignant) to 192.8 cases per 100 thousand population; |
| | – reduction of death rate from tuberculosis to 11.8 cases per 100 thousand population; |
| | – reduction of death rate in road traffic accidents by 10.6 cases per 100 thousand population; |
| | – reduction of infant mortality, in the first place through its reduction in the regions with a high value of its indicator, to 7.5 per 1000 live births; |
| | – increase in the volume of domestic production of medicines according to the list of strategically important medicines and the list of vital and essential pharmaceuticals up to 90%; |

Continuation of table 4.

| | |
|---|---|
| 'On the measures for the implementation of state policy in the sphere of education and science' No. 599 | – increase from 3% up to 25% by 2020 in the share of secondary vocational education institutions and higher education institutions, the premises of which are adjusted for educating people with disabilities; |
| | – increase up to 2.44% by 2020 in the share of publications by Russia's scientists in the total number of publications in the world scientific journals included in the Web of Science data base; |
| | – increase by 2015 of the domestic expenditures on R&D up to 1.77% of GDP with the increase in the share of higher education institutions in these expenditures up to 11.4%; |
| 'On the measures for providing the citizens with affordable and comfortable housing and enhancing the quality of housing and communal services' No. 600 | – increase in the share of borrowed funds in the total volume of capital investments in heat supply systems, water supply and sewerage systems and wastewater treatment up to 30% by 2017; |
| | increase in the number of granted mortgage loans up to 815 thousand a year; |
| | – provision of Russia's citizens with an opportunity to improve their housing conditions no less than once every 15 years ; |
| | – reduction in the price for 1 square metre of living space by 20% through increase in the volume of commissioned economy class housing; |
| | – provision of affordable and comfortable housing to 60% of Russian families willing to improve their housing conditions; |
| 'On the main guidelines of improving the state management system' No. 601 | – reduction in the average number of appeals from the representatives of business community to the state government body of the Russian Federation (local government body) for obtaining one state (municipal) service connected with entrepreneurial activity to 2 by the year 2014; |
| "On the implementation of plans (programmes) for the construction and development of the Armed Forces of the Russian Federation, other forces, military formations and bodies, and modernisation of the defense-industrial complex" No.603 | – priority development of nuclear deterrence forces, air and space defense systems, communications, intelligence and control systems, electronic warfare, complexes of unmanned aerial vehicles, robotized missile strike systems, modern transport aviation, precision weapons and counterweapons, the systems of individual protection of military personnel |
| | – development of the Navy, first of all, in the Arctic zone of the Russian Federation and in the Far East, for protecting the strategic interests of the Russian Federation |
| 'On the further improvement of military service in the Russian Federation' No. 604 | – provision of housing to the military personnel of the Russian Federation Armed Forces, other forces, military formations and bodies to the full extent in 2013 in accordance with the legislation of the Russian Federation; |
| | – formation of the military housing fund by 2014; |
| | – establishment of money allowances of military personnel at a level not less than the remuneration of employees at the enterprises of the leading sectors of the economy; |
| | – annual increase in the pensions of citizens dismissed from military service by not less than 2% above inflation rate; |
| | – annual increase in the number of military personnel serving under the contract not less than by 50 thousand people, over the period of 5 years.; |
| 'On the measures for the implementation of demographic policy in the Russian Federation' No. 606 | – provision of increase in cumulative birth rate up to 1.753 by 2018; |
| | – provide the increase in life expectancy in the Russian Federation up to 74 years by 2018; |
| | – co-financing, at the expense of federal budget allocations, of expenditure obligations of the subjects of the Russian Federation, emerging at the awarding of payment, in those subjects of the Russian Federation, in which the demographic situation is unfavourable and the value of total fertility rate is below the national average. |
| Source: Decrees of the President of the Russian Federation V.V. Putin dated May 7, 2012. Available at: http://www.rsr-online.ru/doc/2012_06_25/6.pdf | |

Table 5. Life expectancy in Russia, years

| Federal District, country | Actually by the years | | | Growth | | | 2020, expert forecast | |
|---|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2010 | 2000–2005 | 2005–2010 | 2000–2010 | inertial* | targeted** |
| Central | 66.1 | 66.5 | 71.2 | 0.4 | 4.7 | 5.1 | 76.3 | 76.7 |
| Northwestern | 64.5 | 64.2 | 70.1 | -0.3 | 5.9 | 5.6 | 75.7 | 75.5 |
| Southern | 66.6 | 67.1 | 70.7 | 0.5 | 3.6 | 4.1 | 74.8 | 76.2 |
| North Caucasian | 68.8 | 69.9 | 72.6 | 1.1 | 2.7 | 3.8 | 76.4 | 78.2 |
| Volga | 65.5 | 65.3 | 69.2 | -0.2 | 3.9 | 3.7 | 72.9 | 74.6 |
| Ural | 64.6 | 65.2 | 69.4 | 0.6 | 4.2 | 4.8 | 74.2 | 74.8 |
| Siberian | 63.7 | 62.7 | 67.7 | -1 | 5 | 4 | 71.7 | 72.9 |
| Far Eastern | 63.2 | 62.2 | 66.4 | -1 | 4.2 | 3.2 | 69.6 | 71.5 |
| **Russia as a whole** | **65.3** | **65.4** | **69.8** | **0.1** | **4.4** | **4.5** | **74.3** | **75.2** |
| *For comparison* | | | | | | | | |
| USA | 77 | 77.9 | 79 | 0.9 | 1.1 | 2 | – | – |
| China | 71 | 72.5 | 76 | 1.5 | 3.5 | 5 | – | – |

* Inertial forecast is based on the invariability of annual growth rate for each region and the country in general (the value in 2020 in each region and in Russia was obtained by multiplying the indicator of 2010 by the number of years (10) and average annual growth).
** Targeted forecast is based on the prolongation of the value of the indicator set out in the RF President's Decree No.606 up to the year 2020 (the value of the indicator for 2020 in the RF was calculated by multiplying the indicator of 2010 by the number of years (10) and average annual growth obtained as a result of forecast calculation. An average annual increase for the country as a whole was used provisionally for the regions).
Source: Russia's regions. Socio-economic indicators. 2012: stat. digest. Rosstat. Moscow, 2012.; UN data (world health statistics, 2012, 2013). Available at: http://www.who.int/gho/publications/world_health_statistics/en/index.html; ISEDT RAS calculations.

At the same time it should be noted that the efforts aimed at health modernisation and demographic development of the country in the period from 2005 to 2010 facilitated a noticeable increase in population's life expectancy by reducing infant mortality (from 11% in 2005 to 7.4% in 2010) and mortality of working-age population (from 8.3% in 2005 to 6.3% in 2010). And if the initiated measures are carried on and life expectancy increase rates remain at the 2005–2010 level, then by 2020 the country can achieve the value of the indicator amounting to 78 years (which exceeds the benchmarks outlined in the Decree of the RF President)

However, these growth rates will not be enough to reach the modernisation standards of the leading countries[7]. The life expectancy of 80 years (national average) can possibly be achieved by 2025–2030. Meanwhile, the experience of many countries shows that this period can be substantially reduced.

China, where life expectancy was 76 years in 2010, will have crossed the threshold of 80 years by 2017–2020. In Japan, Sweden, Canada (where life expectancy was 82–83 years in 2011) life expectancy at birth will exceed 85–86 years by 2020.

The absolute and relative amounts of domestic expenditures on research and development are crucial for accelerating the pace of modernisation.

As domestic experts and analysts note, "the level of R&D expenditures in our country is extremely low; the share of these expenditures in Russia's GDP is 3–4 times less than in developed countries"[8].

In Russia as a whole, the share of expenditures on R&D is currently 1.4% of GDP *(tab. 6)*. The RF President V.V. Putin set a task to increase this figure to 2.1% by 2020. However, the countries leading in R&D expenditures

[7] According to the standard methodology, a 100% level of secondary modernisation by the indicator of life expectancy is considered to be achieved, if life expectancy at birth is 80 years.

[8] From the report of the Director of the Institute for US and Canadian Studies S.M. Rogov. Shock therapy and the "reform" of RAS: the realities of the Russian science. Available at: http://www.ras.ru/news/shownews.aspx?id=4c3d3366-ea114a33a18c799aa0a52070

Table 6. Internal R&D expenditures, % of GDP (GRP)

| Federal District, country | Actually by the years | | | Growth | | | 2020, expert forecast | |
|---|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2010 | 2000–2005 | 2005–2010 | 2000–2010 | inertial* | targeted** |
| Central | 2.08 | 1.91 | 2.16 | -0.17 | 0.25 | 0.08 | 2.2 | 2.8 |
| Northwestern | 1.86 | 1.72 | 1.81 | -0.14 | 0.09 | -0.05 | 1.8 | 2.3 |
| Southern | 0.73 | 0.72 | 0.57 | -0.01 | -0.15 | -0.16 | 0.4 | 0.7 |
| North Caucasian | 0.30 | 0.27 | 0.30 | -0.03 | 0.03 | 0 | 0.3 | 0.5 |
| Volga | 1.30 | 1.37 | 1.32 | 0.07 | -0.05 | 0.02 | 1.3 | 1.7 |
| Ural | 0.58 | 0.44 | 0.58 | -0.14 | 0.14 | 0 | 0.6 | 0.7 |
| Siberian | 0.70 | 0.77 | 0.83 | 0.07 | 0.06 | 0.13 | 1.0 | 1.1 |
| Far Eastern | 0.53 | 0.60 | 0.46 | 0.07 | -0.14 | -0.07 | 0.4 | 0.6 |
| **Russia as a whole** | **1.33** | **1.28** | **1.40** | **-0.05** | **0.12** | **0.07** | **1.5** | **2.1** |
| *For comparison* | | | | | | | | |
| USA | 2.64 | 2.68 | 2.79 | 0.04 | 0.11 | 0.15 | – | – |
| China | 0.76 | 1.34 | 1.7 | 0.58 | 0.36 | 0.94 | – | – |

* Inertial forecast is based on the invariability of annual growth rate for each region and the country in general (the value in 2020 in each region and in Russia was obtained by multiplying the indicator of 2010 by the number of years (10) and average annual growth).
** Targeted forecast is based on the prolongation of the value of the indicator set out in the RF President's Decree No.606 up to the year 2020 (the value of the indicator for 2020 in the RF was calculated by multiplying the indicator of 2010 by the number of years (10) and average annual growth obtained as a result of forecast calculation. An average annual increase for the country as a whole was used provisionally for the regions).
Source: Russia's regions. Socio-economic indicators. 2012: stat. digest. Rosstat. Moscow, 2012.; OECD, Main Science and Technology Indicators database, February 2011. RK Statistics Agency, 2011; ISEDT RAS calculations.

are planning to increase funding of research up to 3% of GDP (USA, Germany, France) and even up to 4% of GDP (Finland, Sweden, South Korea, Japan)[9].

It should be emphasized that most of the advanced industrialized countries are now changing the attitude to the industry and industrial policy, actually setting ambitious targets for re-industrialisation.

The 2012–2013 post-crisis situation clearly showed that the reserves of Russia's development model based on the export of raw materials have been exhausted. V.I. Matviyenko, the Chairperson of the Council of Federation of the Federal Assembly of the Russian Federation, points out in her recent article: *"Russia requires a large-scale restructuring of its economy on the basis of a new industrialisation, capable of providing the innovation revival of the industry and the development of human potential"*[10].

The Head of the Upper Chamber of the RF Parliament claims that Russia is facing a daunting task: to take a worthy place in the development of advanced industrial mode under a simultaneous innovation-based recovery of the industries of the previous mode. This can be achieved only with the formation of the balanced long-term state industrial policy. The successful implementation of state programmes, according to V. Matviyenko, will require substantial governmental support: "Despite the fact that some of the RF subjects have already adopted laws on industrial policy, the majority of our colleagues in the regions are already suggesting the adoption at the federal level of the basic law defining the goals, objectives and tools of providing state support to industrial development".

V.I. Matviyenko continues: "I would like to note that the Russian Government does not unanimously support the need for such a law and, moreover, they believe that it is unnecessary. In my opinion, the elaboration and adoption of such a law are long overdue, as it will help

[9] Ibidem.
[10] Matviyenko V.O. On the new industrialisation of Russia. Ekonomist. 2013. No.7. P. 3.

to define the main vector of industrial policy in Russia, as well as the powers and responsibilities of the authorities of all levels in this sphere"[11].

We can add that for implementing the large-scale and indeed ambitious tasks set out by President V.V. Putin Russia and all of its regions will require significant efforts of federal and regional authorities to bridge the gap in many aspects of economic and social modernisation. These issues require profound scientific and public discussion in order to elaborate a system of solutions for changing the existing modernisation trends and reducing the gap in the level of modernisation between Russia and the leading countries.

It is important to introduce the key indicators of modernisation into the assessment of the performance of the regional and federal authorities and to consider them as the criteria of national security. An efficient public control of the activity is required in this sphere. Socio-economic reforms are a success when the most significant forces like power, business and civil society are consciously and responsibly involved in them.

We would like to dwell upon the issue concerning the efficiency of state management, which plays a key role in the implementation of strategic plans for enhancing national security.

We have already noted that a fragile model of state management, the implementation of which was dictated by the circumstances (2008–2011), the so-called 'power tandem', is fading into the past very slowly. Unfortunately, the backbone of the team, which was formed during D.A. Medvedev's Presidency, smoothly flowed into the government and is trying to pursue the same course of extreme liberalism, large-scale withdrawal of the state from the spheres of economic and social policy[12]. This course under the current state of affairs, in essence, leads to the undermining of V.V. Putin's election programme, set out in the Presidential Decrees dated May 7, 2012.

A remarkable example supporting this conclusion can be found in the Resolution of the RF Government dated January 31, 2013 "Main guidelines of activities of the Government of the Russian Federation up to 2018". Out of the 30 figure indicators, contained in Presidential Decrees, the Resolution lacks 19 indicators; the intermediate or final values of five indicators are absent; and the planned values of two indicators have been changed.

During the session in Elista held April 16, 2013 the President responded in the following way: *"How do we work? The quality of the work is pitiful, everything is done superficially. If we continue this way, we won't do a thing! But if we work persistently and competently, we will make it. Let's raise the quality of our work. It ought to be done! If we don't do it, it will have to be admitted that it is either me working inefficiently or it is you failing to do your job properly. Take notice that, judging by the current situation, I, personally, lean toward the latter. I think it's clear. No one should have any illusions"*[13]. Such reaction reveals all the acuteness of the situation at the highest levels of Russia's power.

**One more related example concerns the submission of the draft law "On the Russian Academy of Sciences and the reorganisation of the state academies of sciences" by the RF Government to the State Duma and its accelerated passage[14].**

[11] Ibidem. P. 4.

[12] Ilyin V.A. Anxious expectations remain. Economic and social changes: facts, trends, forecast. 2013. No.2(26). P. 917.

[13] NEWSru.com. News of Russia. Wednesday, April 17, 2013.

[14] Dynamics of the bill's movement is as follows: June 27, 2013 at a government session a draft law "On the Russian Academy of Sciences and the reorganisation of the state academies of sciences" was promulgated; July 2, the Lower House of the Parliament proceeded to the consideration of the draft law on reforming the Russian Academy of Sciences; July 3, the deputies of the State Duma approved the government bill in the first reading. 234 deputies voted for the adoption of the document, which only slightly exceeded the required minimum of 226 votes; July 5, the State Duma voted for the draft law in the second reading. 344 deputies voted for the document (nobody voted against and one MP abstained).

**The short-lived decisions were met with the waves of public outrage, people expressed their discontent not only with the form and methods of passing the draft law through the State Duma, but mainly with its content aimed at the virtual elimination of the Russian Academy of Sciences and the transfer of all the powers, set out in the charters of the academies, to the officials of the Ministry of Education and Science.**

The liquidation of the Russian academies of sciences, in fact, opens the way for the privatisation of academies' considerable assets. It can be assumed that oligarchs and officials are already carving them up sneakily: who will get what and for how much? **This leads to the ultimate stagnation of the Russian Federation among the countries with the catch-up type of development based on the sales of raw materials (this is exactly what the efforts of our geopolitical rivals have been focused on over the last 25 years).**

V.V. Putin had to held a series of consultations[15] personally, after which he suspended the process of passing the draft law in the third reading, giving time to the academic community for preparing amendments[16].

It can not be allowed that Head of State had no tool for ensuring the scientific and technological competitiveness of the country. RAS Academician V.B. Betelin states: "What was the Academy of Sciences in the Soviet Union? It was a tool for promoting the country's technological competitiveness, it was a tool of the state. Targets were set before us, and the government provided us with the conditions for their implementation"[17].

In an open letter to the RF President Vladimir V. Putin, Academician Zh.I. Alferov pointed out: *"The struggle for the preservation of the RAS is not only a struggle for the future of Russian science, it is a struggle for the future of the country. And we really wanted to fight for this together with you"*[18].

Will the President have enough strength to fulfil his election programme? Is Vladimir V. Putin ready to run for 2018 Presidency to head the Russian Federation again?

...Anxious expectations remain.

[15] July 3, the Head of State held meetings with the President of the Russian Academy of Medical Sciences Ivan Dedov, Rector of Moscow State University Viktor Sadovnichy, RAS Academician Yevgeny Primakov and former Head of RAS Yury Osipov. July 4, there was a meeting with the President of the Russian Academy of Agricultural Sciences Gennady Romanenko.

[16] By August 7, 2013 the comments from the academic community have been prepared, published and placed in the Internet, sent to the President of the Russian Federation, the State Duma of the Russian Federation, the relevant committee of the State Duma. The general meeting of RAS is appointed at September 9, 2013.

[17] The long-term competitiveness. Interview with the Director of the Scientific Research Institute for System Studies of RAS, Director of the Institute of Microtechnologies, National Research Centre "Kurchatov Institute" Vladimir Betelin. Expert. 2013. No. 32. 12-18 August.

# Open letter of Academician Zh. Alferov to the President of the Russian Federation Vladimir V. Putin

**Dear Vladimir Vladimirovich,**

I assume that President of any country is to be always the greatest patriot of his country and to hold an interest in the successful development of the state just by virtue of office. The revival of high-tech industries is the major challenge for the country. You have formulated it as a task for business: to create 25 million jobs in high technology sectors by 2020.

This is the task not only for business but for the country, science and education. In order to meet the challenge, it is necessary to return the focus to scientific research, to increase dramatically the role of the Academy of Sciences, to address constantly the demand of the economy and society for results, to develop the system of higher professional education, primarily science and technology education from a new angle.

Under the conditions of severe international competition for markets, including Russian ones, we can win only by creating fundamentally new technologies based on national scientific developments, and the RAS laboratories are, undoubtedly, the most effective for carrying out research. Our Academy has always been the country's supreme research institution, determining its scientific and technological progress, training of top-qualification personnel and coordination of research works in the field of Natural and Social Sciences.

At the time of 2000 Nobel Prize Award ceremony, BBC TV carried out a roundtable with new laureates, and I remember my neighbour at this table was Professor James Heckman, an American economist, who, answering a question, said the following: "In the second part of the twentieth century, the scientific technological progress was determined by competition of the Soviet Union and the United States. And from this point of view, it's a great pity that this competition is now over."

The Academy of Sciences has not only offered large-scale projects to the country, but also made landmark contribution to the projects implementation (the creation of a nuclear shield; nuclear energy and nuclear fleet; the development

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of outer space and the Northern sea route; Siberia and the Far East with the establishment of new scientific centres in these territories; radio determination and semiconductor "revolution", etc.).

The leading industrial ministries (Ministry of Medium Machine-Building, Ministry of General Machine-Building, Ministry of Electronic Industry, Ministry of Radio Industry, etc.) were established with the active participation of the Academy of Sciences and the Academy's leading scientists. Under favourable circumstances, had the reforms been carried out in a different way and by different people, they could have become successful multinational companies, competitive on the world market in the development of modern technologies and production. However, that did not happen.

After the toughest reforms in the 1990s, the RAS, having lost a lot, managed to keep its scientific potential much better than specialized science and higher educational institutions. The opposition of academic and institutional science is absolutely unnatural and can only be set by the individuals, pursuing their own and very odd political goals, which have little to do with the country's interests.

The Law on reorganization of the RAS and other state academies of sciences, hastily proposed by Dmitry Medvedev and Dmitry Livanov, and your support for which is now obvious, by no means solves the task of increasing the efficiency of scientific research. I dare say that any reorganization, even much more reasonable than the one stipulated by the aforementioned Law, will not resolve the matter. The main problem of Russian science is the lack of demand for our scientific results in the economy and society.

Back in 2001, my fellow academicians approached me with the proposal to put my candidacy for RAS President. I refused, believing that solid prospects are ahead of us: new President of our country immediately met with the RAS leading scientists. It seemed that the economic course of the country's development will positively change.

For the past 12 years much has changed, yet much is still the same. The statements that the Academy should be an elite club as in "civilized" countries, and science should be developed in universities, that the RAS is the heir of the totalitarian Soviet regime (the Academy of Sciences was severely attacked in the 1920s as well, only under the slogan "the Academy is the heir of the totalitarian tsarist regime") still continued and multiplied. The fact that we are the heirs of the reforms of Peter the Great, the founder of the Academy of Sciences, was completely ignored.

As to the so-called "Club of eminent scholars", let me remind you: the RAS maintains in operative management a huge federal property that you, fortunately, did not manage to privatize. And what will become of it, if the Academy is transformed into a club? We proceed from the interests of Russia and Russian science, intended to serve the country. But the question is who will profit from changing the Academy's status? Maybe, those, who are looking to pilfer the property? Wouldn't the federal agency, proposed by the draft Law, become the Academservis, as in case with the notorious Oboronservis?

Dmitry Medvedev's arguments that RAS organization corresponds to 1930–1940s and does not correspond to the 21st century are farfetched and meaningless.

In the organizational and structural context, the Academy of Sciences is a conservative institution in the best sense of the term. Both the US National Academy of Sciences, which celebrated its 150th anniversary this year, and the Royal Society of London that passed the milestone of 350 years, have little changed the principles of organization and structure during their history, nevertheless, they have played and continue playing a crucial role in the development of science and technology of their countries even at present. The same can be said about our RAS.

Over the last two decades our Academy has mainly adhered to "the survival philosophy". In order to switch to the "development philosophy", not only a considerable increase in financing, but, above all, highly-skilled and competent setting of new tasks in science and technology, are needed. At present only the RAS has really highly-qualified personnel in all areas of modern science, and we often witness the situation, in which the officials of the research agencies only create artificial fund distribution channels, and do not set real research goals, or a task to solve, the resolution of which requires the allocation of certain funds.

The aim, you did state, will be achieved only by effectively developing the Academy of Sciences, changing the status of its branches, creating new instead of inefficient ones, and not by "reforming" the Academy. Recently I set forth the RAS development programme during the RAS president elections. We need specific tasks, the solution of which by the most promising directions will enable the country to take up leading positions in modern science and technology. Such tasks can be set by the RAS scientists but not by Mr. Fursenko and Mr. Livanov with all their administration, since they have never done anything noteworthy for science. Should you now liquidate the Ministry of Education and the Department of Science and Education, headed by Aleksandr Khlunov, in your government, all teachers, professors and researchers would sigh with relief, and the country would not simply take notice of that.

The Presidential Council on Science, Technology and Education should comprise distinguished scientists and heads of the country's main high-tech companies, preparing for you new decisions on fundamental issues concerning the development of science, technologies and education. What we have instead is the Commission on the State prize, the Presidium of which is headed not by you (the person who makes and in fact, takes all decisions), but an official of the presidential administration. By the way, I can not imagine that the RAS Presidium would be led not by the President of the Academy, but by an employee of the Presidium apparatus. And, of course, no place could be found for the only Russian Nobel prize laureate in science in the Presidential Council.

And this is the Council you are going to entrust with the task of appointing the Directors of the RAS institutes!

Absolutely far-fetched is the integration of the Russian Academy of Sciences (RAS), the Academy of Medical Science, and the Academy of Agricultural Science, the unification of which will only destroy the normal functioning of all three of them. Moreover, the organization of cooperation and joint research does not require such reorganization. By the way, the USA, which is at present the most advanced country in science and modern technologies, has three national Academies (I have been the foreign member of two of the Academies already for a quarter of a century). One of the Academies, the Institute of Health, i.e. the US National Academy of Medical Sciences, has been rapidly developing nowadays, having huge budget and, in fact, even a number of universities and institutes at its disposal.

In general, the word "reform" has become a common noun, and is often perceived as a synonym of "collapse" and "defeat". "Reforms" are immediately associated with Chubais privatization and the USSR breakup. Also, we managed to preserve our Academy of Sciences due to the fact that all organizations of the USSR Academy of Sciences were located on the territory of the RSFSR, and during the Soviet collapse the Academy of Sciences was naturally maintained as the Russian Academy of Sciences.

Instead of the law currently submitted to the State Duma, the status of the Russian Academy of Sciences as the top scientific institution is to be spelled out in the Federal Law and inscribed in the Academy's Charter.

Our most important challenge is to make science in-demand. It is impossible to take the science out of the current disastrous situation without meeting this challenge. The funds for the implementation of scientific developments are always found, when science is in demand. Such conditions are to be created in our country now. The Russian Academy of Sciences is to become the real tool for solving the task. We can do this, and the authorities are obliged to help us.

When I was ten, I read a wonderful book "Two captains" by Veniamin Kaverin. And for all my life I have been following the principle of the novel's main character Sanya Grigoryev: "To strive, to seek, to find and not to yield." When doing so, it is important to understand what you are fighting for.

The struggle for the preservation of the RAS is not only a struggle for the future of Russian science; it is a struggle for the future of the country. And we really wanted to fight for this together with you!

*Zhores Alferov, RAS Academician,*
*winner of 2000 Nobel Prize in Physics*

*July 24, 2013*

# Public opinion monitoring of the state of the Russian society

As in the previous issues, we publish the results of the public opinion monitoring of the state of the Russian society conducted by ISEDT RAS in the Vologda Oblast [1].

The following tables show the dynamics of a number of parameters indicating the social feeling and socio-political sentiment of the Vologda Oblast population on average for the last 6 surveys (October 2012 – August 2013) in comparison with the data for 2012, as well as for 2011, when D.A. Medvedev's presidential term was due to expire, and for 2007, the last year of V.V. Putin's second Presidency.

## Estimation of performance of the authorities

The data. presented in *table 1* show that from February 2013 the level of approval concerning the performance of Russia's President has not been rising and remains about 55%, which is 20 p.p. lower than it was at the end of V. Putin's second presidential term in 2007 (75%). The share of disapproving estimates on the average for the past 6 surveys in comparison with 2007 has increased almost by the same value (by 20 p.p. from 11% to 31%).

Table 1. Dynamics of the answers to the question: "How do you assess the current performance of..?", % of the number of respondents

| Indicator | 2007 | 2011 | 2012 | Aug. 2012 | Oct. 2012 | Dec. 2012 | Feb. 2013 | April 2013 | June 2013 | Aug. 2013 | Average for the last 6 surveys | Dynamics (+/-), the last 6 surveys in comparison to 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RF President** | | | | | | | | | | | | |
| Approve | 75.3 | 58.7 | 51.7 | 53.7 | 50.9 | 53.3 | 55.5 | 55.5 | 54.3 | 55.1 | 54.1 | +2 |
| Do not approve | 11.5 | 25.6 | 32.6 | 31.1 | 32.1 | 34.6 | 29.2 | 31.5 | 29.3 | 28.9 | 30.9 | -2 |
| **Chairman of the RF Government** | | | | | | | | | | | | |
| Approve | - | 59.3 | 49.6 | 48.5 | 47.1 | 48.3 | 47.9 | 48.5 | 46.2 | 50.4 | 48.1 | -2 |
| Do not approve | - | 24.7 | 33.3 | 34.5 | 32.8 | 35.9 | 34.4 | 35.7 | 33.2 | 30.4 | 33.7 | 0 |
| **Governor** | | | | | | | | | | | | |
| Approve | 55.8 | 45.7 | 41.9 | 45.3 | 43.6 | 42.5 | 43.0 | 44.4 | 44.3 | 44.8 | 43.8 | +2 |
| Do not approve | 22.2 | 30.5 | 33.3 | 32.7 | 33.7 | 35.4 | 33.8 | 34.9 | 31.9 | 31.1 | 33.5 | 0 |

[1] The polls are held six times a year in Vologda, Cherepovets, and in eight districts of the oblast (Babayevsky District. Velikoustyugsky District, Vozhegodsky District, Gryazovetsky District, Kirillovsky District, Nikolsky District, Tarnogsky District and Sheksninsky District). The method of the survey is a questionnaire poll by place of residence of respondents. The volume of a sample population is 1500 people aged from 18 and older. The sample is purposeful and quoted. Representativeness of the sample is ensured by the observance of the proportions between the urban and rural population, the proportions between the inhabitants of settlements of various types (rural communities, small and medium-sized cities), age and sex structure of the oblast's adult population. Sampling error does not exceed 3%.

More details on the results of ISEDT RAS polls are available at http://www.vscc.ac.ru/.

The absence of positive changes in the evaluation of the President's performance from February 2012 is proved by the dynamics of the answers obtained in the different social groups of population *(tab. 2)*. The average value for the last 6 surveys is also significantly (by 20% and more) worse than it was in 2007.

Table 2. Dynamics of the RF President's activity approval by different social groups of population, % of the number of respondents

| Indicator | 2007 | 2011 | 2012 | Aug. 2012 | Oct. 2012 | Dec. 2012 | Feb. 2013 | April 2013 | June 2013 | Aug. 2013 | Average for the last 6 surveys | Dynamics (+/-), the last 6 surveys in comparison to 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sex* | | | | | | | | | | | | |
| Men | 73.6 | 55.6 | 48.9 | 52.5 | 47.7 | 49.2 | 53.1 | 54.3 | 53.5 | 53.1 | 51.8 | +3 |
| Women | 76.7 | 61.2 | 53.9 | 54.6 | 53.4 | 56.6 | 57.5 | 56.5 | 54.9 | 56.8 | 56.0 | +2 |
| *Age* | | | | | | | | | | | | |
| Under 30 | 76.6 | 58.3 | 49.7 | 51.6 | 50.8 | 50.1 | 55.6 | 56.6 | 48.1 | 50.9 | 52.0 | +2 |
| 30–55 | 75.1 | 57.6 | 50.9 | 54.5 | 48.2 | 54.3 | 53.0 | 53.5 | 57.7 | 57.3 | 54.0 | +3 |
| Over 55 | 74.6 | 60.7 | 54.6 | 54.0 | 55.1 | 54.5 | 59.5 | 57.9 | 53.6 | 55.1 | 56.0 | +1 |
| *Education* | | | | | | | | | | | | |
| Secondary, incomplete secondary | 70.3 | 54.9 | 46.0 | 48.3 | 47.1 | 44.2 | 52.0 | 50.1 | 51.6 | 51.1 | 49.4 | +3 |
| Secondary vocational | 76.4 | 59.8 | 51.8 | 47.5 | 51.8 | 54.8 | 55.9 | 57.1 | 55.2 | 54.2 | 54.8 | +3 |
| Higher, incomplete higher | 80.1 | 61.3 | 56.6 | 65.2 | 53.5 | 59.9 | 58.6 | 59.7 | 56.3 | 60.1 | 58.0 | +1 |
| *Income groups* | | | | | | | | | | | | |
| 20% of the poorest people | 65.1 | 45.7 | 40.9 | 41.2 | 40.7 | 36.6 | 40.9 | 43.4 | 52.8 | 47.0 | 43.6 | +3 |
| 60% of the people with middle-sized income | 78.0 | 60.4 | 53.8 | 57.2 | 53.0 | 55.1 | 59.2 | 58.2 | 53.9 | 54.3 | 55.6 | +2 |
| 20% of the most prosperous people | 82.6 | 68.9 | 59.4 | 60.3 | 59.3 | 66.0 | 63.9 | 64.9 | 60.8 | 66.7 | 63.6 | +4 |
| *Territories* | | | | | | | | | | | | |
| Vologda | 74.1 | 58.3 | 51.6 | 53.3 | 54.0 | 53.4 | 51.5 | 54.7 | 51.1 | 54.1 | 53.1 | +2 |
| Cherepovets | 82.8 | 68.5 | 62.3 | 65.0 | 61.5 | 63.2 | 64.1 | 61.4 | 65.3 | 62.8 | 63.1 | +1 |
| Districts | 72.2 | 53.9 | 46.3 | 48.0 | 44.3 | 48.3 | 53.1 | 52.8 | 49.9 | 51.5 | 50.0 | +4 |
| Oblast | 75.3 | 58.7 | 51.7 | 53.7 | 50.9 | 53.3 | 55.5 | 55.5 | 54.3 | 55.1 | 54.1 | +2 |

## Assessment of success in coping with challenging issues

The answers of the Vologda Oblast residents to the question "How successful is the RF President's activity in dealing with challenging issues?" are presented in *table 3*. They show that in 2007 the level of "successful" estimates of President V. Putin's performance was higher than that of "unsuccessful" estimates by all the positions. As for 2011, during D. Medvedev's Presidency, the opposite situation was observed: the share of negative assessments was significantly higher than the share of positive ones (by 15–20%).

For the 16 months of the third presidential term, the assessment of V. Putin's performance in dealing with key issues has remained on the level of 2011. The population sees no significant difference between the performance of D. Medvedev as President and V. Putin during his third Presidency on these key issues so far.

Table 3. How successful, in your opinion, is the RF President's activity in coping with challenging issues?, % of the number of respondents*

| Indicator | 2007 | 2011 | 2012 | Aug. 2012 | Oct. 2012 | Dec. 2012 | Feb. 2013 | April 2013 | June 2013 | Aug. 2013 | Average for the last 6 surveys | Dynamics (+/-), the last 6 surveys in comparison to 2012 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 2007 | 2011 | 2012 |
| **Strengthening Russia's standing in world affairs** | | | | | | | | | | | | | | |
| Successful | 58.4 | 46.2 | 43.1 | 47.2 | 41.9 | 44.1 | 45.1 | 46.7 | 41.7 | 45.3 | 44.1 | -14 | -2 | +1 |
| Unsuccessful | 24.9 | 33.7 | 37.9 | 34.9 | 39.4 | 39.0 | 34.4 | 39.5 | 37.1 | 36.4 | 37.6 | +13 | +4 | 0 |
| *Success index*** | *133.5* | *112.5* | *105.2* | *112.3* | *102.5* | *105.1* | *110.7* | *107.2* | *104.6* | *108.9* | *106.5* | -27 | -6 | +1 |
| **Imposing order in the country** | | | | | | | | | | | | | | |
| Successful | 53.2 | 36.6 | 35.4 | 40.9 | 34.8 | 37.5 | 37.7 | 37.2 | 35.1 | 39.9 | 37.0 | -16 | 0 | +2 |
| Unsuccessful | 34.0 | 50.0 | 50.7 | 45.6 | 50.1 | 50.7 | 46.5 | 49.9 | 49.9 | 46.7 | 49.0 | +15 | -1 | -2 |
| *Success index*** | *119.2* | *86.6* | *84.7* | *95.3* | *84.7* | *86.8* | *91.2* | *87.3* | *85.2* | *93.2* | *88.0* | -31 | +1 | +3 |
| **Protection of democracy and strengthening the citizens' freedoms** | | | | | | | | | | | | | | |
| Successful | 44.4 | 32.4 | 28.8 | 33.0 | 26.7 | 28.5 | 30.0 | 30.4 | 29.1 | 34.7 | 29.9 | -15 | -3 | +1 |
| Unsuccessful | 37.0 | 48.3 | 52.3 | 48.1 | 54.0 | 54.7 | 49.8 | 54.9 | 50.0 | 48.5 | 52.0 | +15 | +4 | 0 |
| *Success index*** | *107.4* | *84.1* | *76.5* | *84.9* | *72.7* | *73.8* | *80.2* | *75.5* | *79.1* | *86.2* | *77.9* | -30 | -6 | +1 |
| **Economic recovery, increase in the citizens' welfare** | | | | | | | | | | | | | | |
| Successful | 47.2 | 30.7 | 28.5 | 34.7 | 25.3 | 29.3 | 30.7 | 31.9 | 28.2 | 32.6 | 29.7 | -18 | -1 | +1 |
| Unsuccessful | 39.1 | 56.1 | 57.9 | 51.4 | 61.1 | 59.6 | 53.9 | 59.6 | 56.7 | 53.4 | 57.4 | +18 | +1 | -1 |
| *Success index*** | *108.1* | *74.6* | *70.6* | *83.3* | *64.2* | *69.7* | *76.8* | *72.3* | *71.5* | *79.2* | *72.3* | -36 | -2 | +2 |

* Ranked according to the average value of the indicator for the last 6 surveys.

** For calculating each index the share of negative answers is subtracted from the share of positive answers, after that 100 is added to the obtained figure in order to avoid negative values. Consequently, fully negative answers would give the total index 0, fully positive answers – index 200, the balance between the former and the latter – index 100, which is. in fact, a neutral mark.

## Estimation of social condition

*Table 4,* representing the dynamics of population's estimation of their social condition, shows that the share of positive answers about the mood and stock of patience on average for the last 6 surveys was higher than in 2007 (by 4.3% and 5.6%).

At the same time, the indicators of social self-identification for the same period have deteriorated: the share of people considering themselves to be "poor" and "extremely poor" increased by 5 p.p. (from 42% to 47%), the share of people with "average income" decreased (from 48% to 44%); Consumer Sentiment Index declined (by 15 p.p. – from 106 to 91).

Perhaps, these trends indicate that there is some conservation of the positive expectations from the authorities of all levels, people tend to concentrate more on their personal, family and private life. In our opinion, this is an alarming trend, for it establishes the principle of "it is good that it is not worse". If the authorities do not seek to enhance the efficiency of their efforts to restore order in the country, promote the growth of the economy, increase the welfare of the population, protect democracy, secure the rights and freedoms of citizens, this may lead to very undesirable consequences. It is essential that people actually see the changes in their life on these key issues.

Table 4. Estimation of social condition, % of the number of respondents

| Answer options | 2007 | 2011 | 2012 | Aug. 2012 | Oct. 2012 | Dec. 2012 | Feb. 2013 | April 2013 | June 2013 | Aug. 2013 | Average for the last 6 surveys | Dynamics (+/-), the last 6 surveys in comparison to 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mood** | | | | | | | | | | | | |
| Usual condition, good mood | 63.6 | 63.1 | 67.3 | 71.3 | 69.0 | 68.0 | 66.6 | 68.6 | 66.4 | 68.7 | 67.9 | +1 |
| Feeling stress, anger, fear, depression | 27.8 | 28.9 | 27.0 | 23.3 | 25.5 | 26.5 | 30.5 | 26.0 | 25.9 | 26.3 | 26.8 | 0 |
| **Stock of patience** | | | | | | | | | | | | |
| Everything is not so bad; it's difficult to live, but it's possible to stand it | 74.1 | 74.8 | 76.6 | 73.2 | 77.5 | 79.9 | 75.5 | 77.9 | 77.8 | 79.7 | 78.1 | +2 |
| It's impossible to bear such plight | 13.6 | 15.3 | 15.8 | 17.0 | 15.6 | 13.7 | 16.1 | 16.5 | 13.7 | 14.7 | 15.1 | -1 |
| **Social self-identification** | | | | | | | | | | | | |
| The share of people who consider themselves to be poor and extremely poor | 42.4 | 44.3 | 44.5 | 44.2 | 44.1 | 47.0 | 45.9 | 48.2 | 48.3 | 46.8 | 46.7 | +2 |
| The share of people who consider themselves to have average income | 48.2 | 43.1 | 44.7 | 43.4 | 44.7 | 43.4 | 44.3 | 42.6 | 41.9 | 44.9 | 43.6 | -1 |
| **Consumer Sentiment Index** | | | | | | | | | | | | |
| Index value, points | 105.9 | 89.6 | 91.5 | 92.3 | 91.7 | 91.7 | 92.3 | 90.4 | 89.8 | 91.0 | 91.2 | 0 |

## Attitude of the population toward political parties

The lack of positive changes is observed in the level of support of the ruling party. By the end of V. Putin's second Presidency (2007) and during D. Medvedev's Presidency (2011), as well as in 2012 and 2013 the level of support of "United Russia" was 29–30% *(tab. 5)*. At that, the share of the oblast's residents, whose interests are expressed by no party, is continuing to increase (in 2007 – 18%, in 2011 – 29%, in 2012 – 31%, on average for the last 6 surveys – 34%).

Table 5. Which party expresses your interests?, % of the number of respondents

| Party | 2007 | Election to the RF State Duma 2007, fact | 2011 | Election to the RF State Duma 2011, fact | 2012 | Aug. 2012 | Oct. 2012 | Dec. 2012 | Feb. 2013 | April 2013 | June 2013 | Aug. 2013 | Average for the last 6 surveys | Dynamics (+/-), the last 6 surveys in comparison to 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United Russia | 30.2 | 60.5 | 31.1 | 33.4 | 29.1 | 31.4 | 26.6 | 30.4 | 30.5 | 28.5 | 31.3 | 29.6 | 29.5 | 0 |
| KPRF | 7.0 | 9.3 | 10.3 | 16.8 | 10.6 | 9.5 | 10.4 | 12.2 | 9.7 | 11.0 | 11.3 | 12.0 | 11.1 | +1 |
| LDPR | 7.5 | 11.0 | 7.8 | 15.4 | 7.8 | 6.7 | 6.8 | 7.2 | 6.3 | 7.1 | 6.6 | 6.8 | 6.8 | -1 |
| Just Russia | 7.8 | 8.8 | 5.6 | 27.2 | 6.6 | 5.6 | 5.5 | 5.5 | 5.3 | 5.1 | 4.7 | 4.3 | 5.1 | -2 |
| Other | 1.8 | – | 1.9 | – | 2.1 | 2.3 | 2.4 | 3.5 | 3.5 | 3.4 | 2.0 | 3.4 | 3.0 | +1 |
| No party | 17.8 | – | 29.4 | – | 31.3 | 33.2 | 36.1 | 32.5 | 35.3 | 37.1 | 31.7 | 33.4 | 34.4 | +3 |
| It is difficult to answer | 21.2 | – | 13.2 | – | 11.7 | 11.1 | 12.3 | 8.7 | 9.3 | 7.8 | 12.3 | 10.5 | 10.2 | -2 |

As in the previous issues, we publish the journal articles rating in this one.

The first twenty articles, published in 2010–2013, according to the number of views for the whole accounting period

| Rating | Article | Number of views for the whole accounting period | Issue | Release date | Authors |
|---|---|---|---|---|---|
| 1 | Agriculture of the Vologda Oblast on the eve of Russia's accession to the World Trade Organisation | 214 | No.21 | June 2012 | Anishchenko Nikolay Ivanovich, Ivanova Marina Nikolayevna, Bilkov Valentin Alekseyevich |
| 2 | Fiscal federalism and inter-budget relations in the Russian Federation | 207 | No.13 | February 2011 | Avetisyan Ishkhan Artashovich |
| 3 | Methodology of the comparative estimation of the scientific and technical potential of the region | 194 | No.12 | December 2010 | Zadumkin Konstantin Alekseyevich, Kondakov Igor Anatolyevich |
| 4 | Modernization of the Russian economy as the imperative of the country's prospective innovative development | 190 | No.16 | August 2011 | Kondakov Igor Anatolyevich |
| 5 | Threats to the region's economic security and the ways to overcome them | 176 | No.14 | April 2011 | Uskova Tamara Vitalyevna, Kondakov Igor Anatolyevich |
| 6 | Intellectual resources as innovation development factor | 172 | No.11 | September 2010 | Ilyin Vladimir Aleksandrovich, Gulin Konstantin Anatolyevich, Uskova Tamara Vitalyevna |
| 7 | Agriculture on the European North: All-Russian agricultural census results | 146 | No.11 | September 2010 | Ivanov Valentin Aleksandrovich, Ivanova Yelena Valentinovna |
| 8 | Demographic problems of the Republic of Belarus and their solutions | 116 | No.16 | August 2011 | Shakhotko Lyudmila Petrovna |
| 9 | Small business is an important reserve for development of a one company town | 100 | No.11 | September 2010 | Tkachuk Stepan Nikolayevich |
| 10 | Technologies substituting hospitalization in regional health: economic-organizing aspect | 89 | No.10 | June 2010 | Duganov Mikhail Davidovich, Shabunova Aleksandra Anatolyevna, Kalashnikov Konstantin Nokolayevich |
| 11 | Investment process in the region: the new century – old problems | 85 | No.11 | September 2010 | Gubanova Yelena Sergeyevna, Vorontsova Tatyana Vladimirovna |
| 12 | Strategic reserves of growth in labour productivity in regional economy | 73 | No. 9 | March 2010 | Ilyin Vladimir Aleksandrovich, Gulin Konstantin Anatolyevich, Uskova Tamara Vitalyevna |
| 13 | Budget provision of municipal entities in the Vologda region: state, problems and improvement ways | 65 | No.9 | March 2010 | Povarova Anna Ivanovna, Uskova Tamara Vitalyevna |
| 14 | Principles and practice of operation of foreign technology transfer centers | 64 | No.13 | March 2011 | Terebova Svetlana Viktorovna, Volkova Lyubov Alekseyevna |
| 15 | Foreign economic activity of the NWFD regions and the Republic of Belarus: condition and methodological aspects of modelling | 62 | No.12 | December 2010 | Uskova Tamara Vitalyevna, Asanovich Valeriy Yakovlevich, Dedkov Sergey Maratovich, Selimenkov Roman Yuryevich |
| 16 | Social development of rural areas – a basis of agriculture stability | 53 | No.11 | September 2010 | Chekavinskiy Aleksandr Nikolayevich |
| 17 | The post-crisis economic development and prospects of innovation activity in the Tomsk region | 46 | No.15 | June 2011 | Myakota Yekaterina Aleksandrovna, Vorobyov Aleksandr Grigoryevich, Putilov Aleksandr Valentinovich, Zhiganov Aleksandr Nikolayevich |
| 18 | Public-private partnership in the scientific and technological sphere of defense industry: Russian and foreign experience | 45 | No.20 | April 2012 | Nikolayev Aleksey Yevgenyevich |
| 19 | Topical issues of the improvement of intergovernmental dealings in the system of local government | 45 | No.19 | March 2012 | Uskova Tamara Vitalyevna Pechenskaya Mariya Aleksandrovna |
| 20 | Problems of sustainable development of rural areas in the Vologda Oblast | 44 | No.17 | October 2011 | Shestakov Sergey Aleksandrovich |

* Account of the site's viewing has been carried out since 2009, December, 12.

The first twenty articles, published in 2010–2013,
according to the frequency of their viewing for the recent 12 months (September 2012 – August 2013)

| Rating | Article | Total time of reading for the recent 12 months | Issue | Release date | Authors |
|---|---|---|---|---|---|
| 1 | Agriculture of the Vologda Oblast on the eve of Russia's accession to the World Trade Organisation | 213 | No.21 | June 2012 | Anishchenko Nikolay Ivanovich, Ivanova Marina Nikolayevna, Bilkov Valentin Alekseyevich |
| 2 | Demographic problems of the Republic of Belarus and their solutions | 66 | No.16 | August 2011 | Shakhotko Lyudmila Petrovna |
| **3** | Threats to the region's economic security and the ways to overcome them | 43 | No.14 | April 2011 | Uskova Tamara Vitalyevna, Kondakov Igor Anatolyevich |
| 4 | Assessment of the critical threshold values of the indicators of the state of Russian society and their use in the socio-economic development management | 43 | No.22 | August 2012 | Glazyev Sergey Yuryevich, Lokosov Vyacheslav Veniaminovich |
| 5 | Methodology of the comparative estimation of the scientific and technical potential of the region | 31 | No.12 | December 2010 | Zadumkin Konstantin Alekseyevich, Kondakov Igor Anatolyevich |
| 6 | Problems of sustainable development of rural areas in the Vologda Oblast | 29 | No.17 | October 2011 | Shestakov Sergey Aleksandrovich |
| 7 | Public-private partnership in the scientific and technological sphere of defense industry: Russian and foreign experience | 24 | No.20 | April 2012 | Nikolayev Aleksey Yevgenyevich |
| 8 | Fiscal federalism and inter-budget relations in the Russian Federation | 23 | No.13 | March 2011 | Avetisyan Ishkhan Artashovich |
| 9 | Socio-economic transformation of Russian society | 23 | No.22 | August 2012 | Perova Margarita Borisovna, Perov Evgeniy Viktorovich |
| 10 | Topical issues of the improvement of intergovernmental dealings in the system of local government | 20 | No.19 | February 2012 | Uskova Tamara Vitalyevna, Pechenskaya Mariya Aleksandrovna |
| 11 | The budget process as a tool for managing the public and municipal finances | 19 | No.19 | February 2012 | Avetisyan Ishkhan Artashovich |
| 12 | Institutional reasons for economic problems in Russia's local self-government | 19 | No.22 | August 2012 | Dyadik Vladimir Vladimirovich |
| 13 | Economic risks of agricultural organizations' activity in the Vologda Oblast in the context of Russia's membership in WTO | 17 | No.24 | December 2012 | Ivanova Marina Nikolayevna |
| 14 | Methodological foundations of sustainable development of the agricultural sector | 16 | No.16 | August 2011 | Ivanov Valentin Aleksandrovich, Ponomareva Anna Sergeyevna |
| 15 | On the strategy of sustainable development of Russia's economy | 16 | No.25 | December 2012 | Glazyev Sergey Yuryevich, Fetisov Gleb Gennadyevich |
| 16 | Intensification and innovation approach toward the dairy livestock breeding in Vologodsky District | 16 | No.23 | October 2012 | Bilkov Valentin Alekseyevich, Shaverina Marina Valentinovna, Medvedeva Nataliya Aleksandrovna |
| 17 | Analysis of trends and development forecast of small enterprises in Russia | 16 | No.21 | June 2012 | Pinkovetskaya Yuliya Semenovna |
| 18 | Agriculture on the European North: All-Russian agricultural census results | 15 | No.11 | September 2010 | Ivanov Valentin Aleksandrovich, Ivanova Yelena Valentinovna |
| 19 | Industrial policy as a tool of neo-industrialization of regional industrial systems | 14 | No.24 | December 2012 | Lavrikova Yuliya Georgiyevna, Romanova Olga Aleksandrovna |
| 20 | On the issue of socio-economic modernization of Russian regions | 14 | No.22 | August 2012 | Gulin Konstantin Anatolyevich |

* Account of the site's viewing has been carried out since 2009, December, 12.

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LBC 65.54(4Bel+2)


# Integration in the framework of the Union State as the strategy for enhancing Russia and Belarus' security

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July 3–5, 2013 the Vologda Oblast hosted the 9th Session of the InterAcademy Council (IAC) of the Russian Academy of Sciences and the National Academy of Sciences of Belarus. A number of roundtable discussions and a research-to-practice conference were held in the framework of the Session, which focused on integration processes in various spheres of both countries as the basis for maintaining security of the Union State.

The region's guests visited the cities of Vologda and Cherepovets, Kirillovsky District, they also visited industrial enterprises (OAO Severstal, JSC PhosAgro, OAO Cherepovets

Casting and Mechanical Plant, JSC Vologda Optical and Mechanical Plant (VOMZ), LLC Optimech, LLC Aleksandra Plus), social institutions (cultural and recreational centre "Zabota", youth centre "GOR.COM 35"), educational and research institutions (Cherepovets State University, Institute of Socio-Economic Development of Territories of RAS).

In the run-up to the InterAcademy Council's major activities, the session of the young scientists' section was held for the first time with the participation of young researchers from Russia, Belarus, Ukraine and Kazakhstan (July 2, 2013). They discussed the issues of trade-economic and innovation cooperation, food security, socio-humanitarian development. According to IAC members, these annual meetings will contribute to the establishment of scientific cooperation between scientists from all the countries participating in integration associations like the Customs Union, Common Economic Space (CES), Eurasian Economic Union. Such meetings will also enhance their science and technology potential in the long term.

In the course of the 9th Session of the InterAcademy Council, its participants expressed their agreement with the position of MAC Co-Chairman, Deputy State Secretary, member of the Permanent Committee of the Union State A.A. Kubrin. He pointed out that under the ongoing reorganization of science in Russia and Belarus it is crucially important to maintain and develop horizontal and interdisciplinary cooperation between research organizations and scientists, to enhance the potential of fundamental science on this basis. An important task consists in the enhancement of innovation component of research by means of direct interaction with economic entities, interaction between regions, also with coordinating support provided by management bodies of the Union State. In this connection, it is advisable to create an information database, which includes a list of promising projects to be implemented in the Union State and CIS, as well as innovation solutions for interregional cooperation.

The establishment of an international innovation centre with the participation of CES countries, Ukraine, and other CIS countries is another promising project. It requires that all the member states should unanimously agree that the right of ownership of R&D results should belong to the author of the R&D product rather than its customer. Furthermore, it is necessary to adopt legal documents on the property of the Union State, to develop a long-term industrial policy of the Union State and the strategy of its implementation. For enhancing the role of IAC in solving these issues, it is advisable to create working groups within IAC on sectoral basis with the participation of specialists from the two academies.

The InterAcademy Council backed up the decision of the Permanent Committee of the Union State concerning the elaboration and adoption in 2013 of a long-term target programme of the Union State on the development of flax industry of Belarus and Russia, considering this area of cooperation to be the most important issue of integration and economic security.

The InterAcademy Council expressed its solidarity with the opinion of IAC Co-Chairman P.A. Vityaz about the necessity of developing the Union State on the basis of science and technology development process, the elaboration of coordinated industrial policy on its basis, and its implementation by means of joint programmes and projects of the Union State. This will eliminate unnecessary competition within integration associations; it will also enhance the role of scientists in the elaboration of an efficient competition policy of the Union State in the world market. It requires active participation of the legislative bodies of the Union State in the establishment of an efficient legal base for its functioning, in

particular, finding legal solution to such issues as co-financing of joint programmes and projects, securing property rights to objects created in the course of their implementation. Belarusian and Russian scientific community, in turn, should provide legislators with appropriate methodological support.

InterAcademy Council members approved the experience of the Vologda Oblast in attracting young employees to the oblast's government, enterprises (JSC VOMZ) and educational institutions (ISEDT RAS Science and Education Centre) and recommended it to be generally used in the regions of Russia and Belarus.

The InterAcademy Council also supported the initiatives concerning the elaboration and implementation of joint programmes on the development of potato and Jerusalem artichoke production, agricultural machinery, and the conclusion of an agreement between the NAS of Belarus and the Department of Science of the Vologda Oblast Government on the scientific support of rape cultivation in the Vologda Oblast.

The InterAcademy Council agreed with Corresponding Member R.S. Grinberg that the Union State is the consolidating core of the post-Soviet states, its most advanced form. Therefore, it is possible and necessary to work out a programme (strategy) for overcoming the "primitivization" of member-states' economies in the framework of the Union State, taking into account the experience of JSC VOMZ, OAO Severstal and other high-tech enterprises of the Vologda Oblast and many Belarusian enterprises.

This problem is especially relevant in the conditions of accession of Russia and other CES countries to the WTO. The InterAcademy Council can serve as an expert platform in the elaboration of the Programme. Related research institutes are able to assist in identifying the competitive advantages of countries, regions and sectors, to determine the instruments of their realization in the world market.

IAC members backed the proposal of the Deputy Chairman of the Standing Committee of the House of Representatives of the National Assembly of the Republic of Belarus on Education, Culture and Science, member of the Commission for Social Policy, Science, Culture and Humanitarian Issues of the Parliamentary Assembly of the Union State A.I. Segodnik about the necessity of elaborating the Concept of the Union State Development under the formation of new integration associations. IAC should provide a legal basis for funding IAC activities in order to solve this task and support the ongoing organizational and research activities.

IAC members agreed with the standpoint of the Parliamentary Assembly of the Union of Belarus and Russia, expressed in the recommendations of the 31st session of the permanent workshop "Scientific potential of Belarus and Russia in the field of fundamental and applied research as an important component of innovation development of the Union State" in general, and with the following proposals in particular:

– introduction of amendments to the development and implementation of the Union State programmes, that envisage a streamlined procedure of their consideration and approval, with IAC participation;

– impetus to the development of a draft list of the Union State programmes taking into account main spheres of fundamental and applied research, and to its adoption in the established order;

– organization of a contest among young scientists of the Union State in the framework of the Union State;

– establishment of the Union State prize for outstanding achievements gained during the implementation of R&D programmes of the Union State, joint integration R&D and innovation projects.

The InterAcademy Council session considered the issues connected with the activity of the Council, determination of its role in the development of the Union State, financing of research projects.

The InterAcademy Council expressed its sincere gratitude to IAC Co-Chairman, Academician A.D. Nekipelov, who has been working for the benefit of its effective operation for many years, promoting inter-academy relations between RAS and the NAS of Belarus, handling topical issues of R&D cooperation between Russia and Belarus, and facilitating the Union State construction.

According to the results of the round table "Innovation development as a factor in enhancing competitiveness of the territory", held at JSC VOMZ on 3 July 2013, inter-Academy Council members noted the expansion of cooperation between Belarus and the Vologda Oblast, including in the framework of the Agreement on trade-economic, scientific, technological and cultural cooperation between the Government of the Republic of Belarus and the Vologda Oblast Government (dated 20 September 2006) and the Programme on the development of cooperation for 2011–2013 (dated 8 September 2008).

The Council also highlighted the efficiency of establishing long-term cooperative links between economic entities on the development and adoption of innovation products, such cooperation has been established between the Vologda Optical and Mechanical Plant and JSC Planar (Republic of Belarus). This cooperation resulted in the production of a new range of thermal imaging devices that are in demand in the domestic and world markets. In this regard it is advisable to streamline the development and adoption of "Thermal imager", the joint R&D programme of the Union State.

The roundtable participants pointed out that consolidating the efforts of the Vologda Oblast enterprises, such as LLC Optimech, LLC Aleksandra Plus, and organizations of the NAS of Belarus in the production of power ultrasonic devices for the decontamination of nuclear power stations' solid waste and in the production of equipment for water and fluids purification could be very profitable in the framework of public-private partnership.

At the round table "Research and educational centre as a component of the region's scientific and technological potential development", held at the Institute of Socio-Economic Development of Territories of RAS on 3 July 2013, the participants of the InterAcademy Council Session got acquainted with the experience of the research and educational centre as a system of multilevel training of academic staff. The Academician of NAS of Belarus P.A. Vityaz and other scientists praised the work of the Institute and noted an important role it performs in the issues concerning the integration of fundamental science and education. This experience will be useful both for Belarus and for the regions of Russia and the Union State as a whole.

The International Research-to-Practice Conference "Integration within the Union State as the main tool for the implementation of Russia and Belarus security strategy" (3–4 July 2013) became a major event. The conference was attended by leading scientists of the Russian Academy of Sciences and the National Academy of Sciences of Belarus, scientists from Kazakhstan, Ukraine, representatives of the Permanent Committee of the Union State, Parliamentary Assembly of the Union of Belarus and Russia, representatives of research and educational institutions, heads and specialists of federal and regional authorities, representatives of business community and social sphere institutions (about 300 people all in all).

The main purpose of this event consisted in the search and substantiation of opportunities for promoting integration within the Union State. According to the participants of the conference, the task can be solved by developing

the cooperation between Belarus and Russia in trade, economic, scientific-innovation and socio-humanitarian spheres.

Opening the plenary session of the conference, the Director of the Institute of Socio-Economic Development of Territories of RAS, Doctor of Economics, Professor **V.A. Ilyin** noted the importance of the forum and expressed gratitude to the Vologda Oblast Government and Vologda City Administration for their support and assistance in organizing this very important event.

The importance of the conference in finding ways for the sustainable socio-economic development of the Union State countries was emphasized in the introductory reports of the heads of the Russia-Belarus InterAcademy Council: the Academician of NAS of Belarus P.A. Vityaz, Deputy Governor of the Vologda Oblast A.V. Kozhevnikov, Deputy Chairman of the Standing Committee of the House of Representatives of the National Assembly of the Republic of Belarus on Education, Culture and Science, Member of the Commission for Social Policy, Science, Culture and Humanitarian Issues of the Parliamentary Assembly of the Union State A.I. Segodnik, and the Director of RAS Institute of Economics, Member of the IAC Expert Advisory Committee, RAS Corresponding Member R.S. Grinberg. It was also noted that Belarusian and Russian scientists will continue their cooperation in the spheres of space research, information technology, and medicine.

The central idea of the conference consisted in the search for and substantiation of opportunities for promoting integration within the Union State through further development of cooperation in trade-economic, scientific-innovation and socio-humanitarian spheres, which will enhance the security of Russia and Belarus.

The Chief of Staff of NAS of Belarus, Co-Chairman of the InterAcademy Council of RAS and NASB, Academician **P.A. Vityaz** noted in his report that at present, a lot of countries experience adverse processes in their economy, which forces their leadership to take radical measures for the development of different spheres of governmental activities. According to the speaker, these measures should be implemented through competent economic and managerial decisions both in Russia and Belarus.

The speaker highlighted the importance of the Union State development and underlined the necessity of promoting further cooperation between Russia and Belarus, of searching for mutually beneficial spheres, for example, military and energy security, of enhancing science-intensive production.

In addition, P.A. Vityaz spoke about the main functions of the National Academy of Sciences of Belarus and joint research of Belarusian and Russian scientists in the fields of space research, information technology, and medicine. As it has been noted, the drafted Union State programmes were elaborated in these spheres; many of the programmes, which are comprehensive and promising for the economy of both countries, should be continued.

In conclusion P.A. Vityaz noted that the next step in the development of the Union State should consist in the integration within the CIS countries, which will promote the further growth of economies of the Commonwealth States and their access to world markets.

The report of the Deputy Governor of the Vologda Oblast **A.V. Kozhevnikov** was focused on the issues of the oblast's socio-economic development in the post-crisis period, and on the key directions of objectives and strategies of its economic modernization. The report also highlighted some spheres of cooperation between the Vologda Oblast and Belarus.

Speaking about the geographic position of the Vologda Oblast and Belarus, A.V. Kozhevnikov pointed out that the Republic of Belarus is the oblast's key partner. Among the CIS

countries Belarus is the leader by the volume of trade with the Vologda Oblast: the share of the Republic in the volume of trade turnover with the oblast is 54.2%. The Vologda Oblast-Belarus trade turnover amounted to 570 billion US dollars in 2012. Compared with the 2010 level, it increased by 55%.

A.V. Kozhevnikov spoke about the logistics potential of the Vologda Oblast, the present-day condition of its transport system. He paid special attention to the introduction on 24 December 2013 of the flight Cherepovets-Minsk, which promoted cooperation between the Vologda Oblast and Belarus.

Further on, the report highlighted the main indicators of the Vologda Oblast's economic development, which is based on the large metallurgical and chemical enterprises, located in Cherepovets. A.V. Kozhevnikov noted that the economy of the Vologda Oblast is export-oriented; consequently, the region is susceptible to the influence of external markets. This situation needs to be kept under control and its impact has to be handled through innovation economic development.

According to A.V. Kozhevnikov, cooperation with Belarus is carried out within the framework of trade, agreements between the region's major industrial enterprises, the inter-academy and inter-university cooperation, as well as cooperation within various associations. In conclusion A.V. Kozhevnikov considered the main forms of further cooperation between the Vologda Oblast and Belarus including trade fair and exhibition activity, and the establishment of joint ventures.

The Deputy Chairman of the Standing Committee of the House of Representatives of the National Assembly of the Republic of Belarus on Education, Culture and Science, Member of the Committee for Social Policy, Science, Culture and Humanitarian Issues of the Parliamentary Assembly of the Union State **A.I. Segodnik** delivered the report "Cross-border cooperation as a factor in enhancing security of Belarus and Russia's regions, located at the outer border of the Union State".

The speaker outlined the essence of cross-border cooperation and named its forms, which include trade and economic cooperation, social, scientific, technological, cultural, educational, humanitarian, ecological cooperation, etc.

A.I. Segodnik noted that, on the one hand, cross-border cooperation potential is formed on the basis of similarity of the economies of border areas and expediency of applying joint efforts to handling common issues of socio-economic development of adjacent countries. On the other hand, this potential implies the differences in the quality of economic structures within the frontier zone, which is also a factor in the development of international economic cooperation.

The speaker pointed out that the development of cross-border cooperation between neighbouring states is a priority sphere in dealing with security issues of border regions of the Union State. However, the potential of such cooperation has not yet been used to the full extent in the interests of intensive development and enhancement of security in the border areas of Russia and Belarus.

Director of RAS Institute of Economics, RAS Corresponding Member, Member of the IAC Expert Advisory Committee **R.S. Grinberg** focused mainly on the issues of world economy globalization, economic and political problems of the post-Soviet space, the role of the government in modern economy.

The speaker noted that at present global processes are volatile; they are full of contradictions that need to be resolved. The 2008–2009 crisis was a result of economy deregulation, and nowadays these processes are continuing. R.S. Grinberg quoted Marx, saying that "all great wealth is being transferred to one – two percent of the world's population. Large-scale poverty is spreading, polarization of income is emerging".

At present, the most significant trends in the world economy are as follows: concentration and centralization of capital, the emergence of economic giants and multinational companies; the return of economic cycles; oligopolization of world economy (development of strong regional units), the return of political economy and government's intervention into economic sphere.

R.S. Grinberg spoke about such threats to global community as international terrorism, based on Radical Islam; global warming; the increase of the gap between the rich and poor; degeneration of democratic procedures and the crisis of multiculturalism.

Speaking about the specific problems of the Union State of Russia and Belarus, R.S. Grinberg highlighted, first of all, the primitivization of economic structure, anti-social nature of economy and the underdevelopment of small business and institutional structures.

The Director of the Institute of Philosophy of NAS of Belarus, Ph.D. in Philosophy **A.A. Lazarevich** spoke on the issues of humanitarian cooperation between Belarus and Russia in the context of Eurasian integration policy.

He noted that a distinctive feature of the modern era consists in the fact that its essence can not be characterized by the conditions and regularities of functioning of various socio-economic and socio-political systems, local cultures, internal features of formation and realization of national interests, the specifics of the mental structures of consciousness and behaviour, since all this has been experiencing serious external influence and acquiring the features of universality and interdependence.

According to A.A. Lazarevich, at present, universality and interdependence are inseparably linked to such phenomenon as globalization, which, undoubtedly, is the dominant sign of the modern era. Globalization is the process that has alternatives and options, or it is an inevitable unidirectional and imperative process.

A.A. Lazarevich emphasized that the 21st century will be the century of humanitarian science. The topic of his report, attempting to find solutions to contemporary problems in view of humanitarian science, is devoted to the interaction of Russian and Belarusian humanitarian science, its connection to the issues that should be solved.

The speaker highlighted several groups of issues that, in his opinion, should be focused on within the framework of Russia-Belarus humanitarian cooperation: humanitarian science (the set of modern means of scientific analysis, which could reveal a complex mechanism of Belarusian and Russian societies development); research into the place and function of the national government in the system of regional integration and global policy; the study of characteristic features of the national culture as a joint activity aimed at the development of educational system, worldview, behaviour of the Belarusian and Russian people; the approbation of methods for enhancing innovation culture.

The Rector of the Cherepovets State University Ph.D. in Social Sciences, Associate Professor **D.V. Afanasyev** spoke about the integration of education and science as a factor in innovation development of the territory. He also outlined the promising directions of cooperation between universities, including CSU, and academic institutions.

The major topic of the report was the synergy of education and science as a factor in innovation development of the territory. D.V. Afanasyev presented certain promising spheres of interaction between universities and academic institutions, the main aspects of cooperation between universities and research institutes. He dwelled on the forms of cooperation between CSU and various research institutions: the Institute of Socio-Economic Development of Territories of RAS; RAS Institute of Metallurgy and Materials Science named after A.A. Baykov; RAS Institute of Archaeology; the

Russian Geographical Society; RAS Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry.

In conclusion, D.V. Afanasyev noted that CSU is currently working on the creation of the centre for collective use of hardware-software computing complex, which will be involved in the processes of mathematical modeling of complex systems.

The Director of the Centre for Strategic Research and System Analysis of the National Academy of Sciences of Belarus, Ph.D. in Economics, Associate Professor **S.M. Dedkov** spoke on the security strategy in the sphere of science and technology in certain countries.

In his opinion, in modern conditions, national security is provided by increasing the scientific-technological component of all its spheres, development of intellectual capital, and a high level of competitiveness. The maintenance of national security in developed countries is based solely on the use of scientific and technological achievements.

The provision of national security in Russia and Belarus is considered in the following spheres:

– political security (security of a certain political system against external and internal threats that provides the realization of national interests in all the spheres of national security);

– economic security (state of the economy, which guarantees the security of national interests from internal and external threats);

– scientific and technological security (state of domestic scientific and technological and education potential, facilitating the realization of national interests in scientific and technological sphere);

– social security (protection of life, health and welfare of citizens, spiritual and moral values of society from internal and external threats);

– demographic security (state of security of society and state from demographic phenomena and trends, the socio-economic consequences of which have a negative impact on the country's sustainable development);

– information security (protection of balanced interests of an individual, society and state against external and internal threats in information sphere);

– military security (state of protection of national interests against military threats);

– environmental security (state of protection of the environment, life and health of citizens from threats arising as a result of man-made impacts, as well as the factors, processes and phenomena of natural and anthropogenic character).

The report also dwelled upon the issues of interaction between the state and private sectors, and the forms of international cooperation on ensuring security in science and technology sphere.

The Deputy Director of RAS Institute of State and Law, Doctor of Juridical Science, Professor **N.I. Mikhailov** in his report presented the ways to harmonize the legal base of Russia and Belarus in the trade and economic sphere.

At present, there is a need for scientific substantiation and definition of perspective guidelines for the further development of Russia-Belarus interstate economic cooperation, primarily in three main areas – foreign trade, investment and monetary and financial cooperation. The following issues remain most relevant: the completion of the formation of the Russia-Belarus single customs space, handling the issues of cooperation in the spheres of transport, tariff, price and tax policy, the ambiguity of the role of political factors in current economic relations between Russia and Belarus.

N.I. Mikhailov spoke in detail about the positive and problem aspects of Russia-Belarus economic cooperation, he considered the peculiarities of national legislation of the two countries in connection with the establishment of the Customs Union and Russia's accession to the WTO.

The reports were delivered at four sections in the framework of the conference. The sections were attended by about 115 people, and 67 participants made their presentations there.

The participants of *Section 1 "Integration of Russia and Belarus as a basic condition for enhancing economic security"* dwelled upon the following subjects: threats to economic security and ways to overcome them; integration and its importance in enhancing economic security; socio-economic processes in the regions of Russia and Belarus; spheres and forms of trade and economic cooperation between the regions of Russia and Belarus; political and legal aspects of international and interregional relations in trade and economic sphere; opportunities and prospects for facilitating trade and economic cooperation and enhancing its efficiency.

The reports delivered at S*ection 2 "Innovation development as a factor in enhancing security and competitiveness of the territories of Russia and Belarus"* disclosed the state and development problems of scientific and innovation potential of the regions; the demand of the government and business in the results of R&D and innovation activities in the regions; the prospects of integration of the regions' scientific and innovation space; the possibilities and prospects of consolidating the regions' efforts for the development of knowledge economy infrastructure; the promotion and development of international and interregional academic mobility for improving the regions' scientific potential.

The topics discussed at *Section 3 "Ways of promoting the security of Russian and Belarusian territories in the socio-demographic sphere"* included socio-demographic processes in Russia and Belarus, threats to the socio-demographic security of the territories; the experience of Russia and Belarus' regions in enhancing public health and maintaining socio-demographic security; labour potential and safety in the labour sphere of Russia and Belarus.

In the framework of *Section 4 "Humanitarian cooperation for ensuring the security of Russia and Belarus in the sphere of culture and education"* the following issues were discussed: development of social sphere in the regions of Russia and Belarus (education, health and social protection, culture); opportunities and prospects for cooperation on the development of social sphere; the possibilities and prospects for cooperation on the preservation of cultural heritage and development of tourism potential of the regions; the development of information relations between Russia and Belarus.

Following the conference, its participants adopted a resolution. In order to develop harmonized and adequate measures for preventing and handling challenges and threats to the national interests of the member-states, several proposals were submitted to the Union State management bodies. These proposals and recommendations concern the following issues: elaboration of the draft strategy for ensuring the security of the Union State for the period up to 2025–2030; further development of interdepartmental cooperation of Belarus and Russia, consolidation of efforts for ensuring the Union State security in the trade-economic, R&D, socio-demographic, educational, cultural spheres.

The participants of the conference and the InterAcademy Council members agreed that it would be useful to organize annual research-to-practice workshops on the issues of Russia-Belarus integration in trade and economic, research and innovation socio-humanitarian and other spheres, including with the support of the Belarusian Republican Foundation for Fundamental Research, Russian Humanitarian Science Foundation and Russian Foundation for Basic Research.

*The round table "Enhancement of competitiveness and security of municipalities"* was held in Kirillovsky Municipal District of the Vologda Oblast on 5 July 2013. The participants met with the leadership of

the district administration, discussed the development of the district's tourism potential, expressed a number of suggestions for enhancing the sustainability of the territory's socio-economic development.

During *the round table discussion "Innovation development as a factor in enhancing the competitiveness of the industrial city"*, held in the Cherepovets State University on 5 July 2013, the InterAcademy Council members, representatives of the Mayor's Office of Cherepovets, OAO Cherepovets Casting and Mechanical Plant, OAO Severstal, JSC PhosAgro-Cherepovets, Cherepovets State University agreed on a number of joint decisions:

– the usefulness of organizing the InterAcademy Council sessions and research-to-practice conferences in the regions of Russia and Belarus possessing unique resources, experience and initiatives;

– the necessity of further promotion and expansion of cooperation between the academic community, enterprises and regions, the enhancement of practical orientation of conducted R&D on the basis of the orders of the real sector of the economy;

– creation of a joint foresight centre of the Institute of Economics of NAS of Belarus, Grodno State University, Regional Technology Transfer Centre, Cherepovets State University and ISEDT RAS.

The InterAcademy Council session on the issues of development of the Union State and the events within its framework showed that the interest of Russia and Belarus in the process of integration, despite all the difficulties, facilitates the efficiency of economic cooperation between the regions, expands their cooperation in research and innovation sphere, creates conditions for enhancing the quality of life and human potential development.

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# Trends in the development of education sphere in Russian regions

*The article presents the analysis of the dynamics of education development in the subjects of the Russian Federation in 2010–2012. The regions are classified by the growth rate of the indicators of education development. The place of the Vologda Oblast in these processes, as well as the degree of compliance of regional education development with the national results, are defined.*

*Education sphere, integral criterion, dynamics of education development.*

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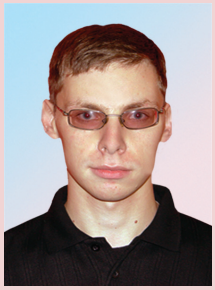

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The current situation in the sphere of education is characterized by frequently changing objectives of its development. The policy documents of the Russian Government set the task of switching to the innovation way of Russian education development, which attaches certain dynamism and the pursuit of international competitiveness to the processes in this sphere.

The latest messages to the system of Russian education are associated with the introduction of the regulatory mechanisms of financing costs, of a new remuneration system (NRS), the approval of new state educational standards for primary and secondary (complete) general education and the adoption of the new Law "On education" in 2012, which will come into effect in September, 2013.

These circumstances greatly alter the structure of national and regional education systems, expanding the liabilities of the regulatory and administrative authorities and demanding a new quality of technical and staffing support of education process, the expansion of forms of educational institutions management, transparency of education systems[1].

However, not all the territories of the Russian Federation are prepared to the new functioning conditions of the education sector. For the most part, this is conditioned by the socio-economic differentiation of Russian regions that affect the functioning of regional education systems, particularly, the resource endowment necessary for learning activities. The citizens' level of satisfaction with education depends directly on the place of residence and provides the basis for the propagation of social and economic inequality of the regions, since the educational level of population largely determines the investment attractiveness and opportunities for effective economic growth [4, p. 43-44].

In this regard, of special importance is the evaluation of trends in the development of regional education systems, which is the purpose of the present study.

In 2011 ISEDT RAS staff members held a pilot phase of the monitoring of the development of the education systems of the Vologda Oblast municipalities. In the course of this study a number of deficiencies in the methods of complex evaluation were revealed, to eliminate which it is necessary:

1. To consider the most important and relevant parameters of the education system coordinated with the topical directions of education policy, as well as with the indicators adopted in the official monitoring systems (for example, CPEM – complex program of education modernization "Our new school").

2. To evaluate the dynamics of the level of education development. It is reasonable to begin the assessment since 2010, the start implementation of CPEM "Our new school", as in the course of the project implementation new educational standards were introduced, and higher educational institutions were to meet new requirements in the short time.

3. It is extremely important to consider the share of individual evaluation indicators in the system of indicators, when making calculations.

4. To supplement the data calculation with the medium-term forecast of indicators by the basic directions of education system development, in order to formulate specific proposals for the improvement of educational services[2].

In 2012–2013 the evaluation method was adjusted, the data necessary for calculation were collected, and the weighting coefficients of each indicator were determined by expertise, the development level of regional education systems in the dynamics was estimated.

The analysis of normative-legal documents, regulating the functioning of the education system at the federal and regional levels and determining the strategic priorities of its development [5, 10, 11], made it possible to single out four of the most actual in the current conditions development directions of this sphere:

1) to search for and support gifted and talented youth;

2) to develop education human resource;

3) to develop education material and technical base;

4) to create conditions for life protection and health support of children in educational institutions.

[1] Order of the Russian Ministry of Education and Science No. 373 as of October 6, 2009, Order of the Russian Ministry of Education and Science No. 413 as of May 17, 2012.

[2] More detail on the territories assessment by education indicators can be found in: Shabunova A.A., Golovchin M.A. Evaluation of education development in municipal territories. Problems of development of territory. 2012. No. 1(57). P. 91-96.

The list of 18 indicators was formed in compliance with these directions. As a result of the necessity to calculate target state objectives in the education field, individual indicators for monitoring the effectiveness of the Complex programme of education modernization "Our new school" were introduced in the system of indicators[3].

The selected indicators were combined into 4 thematic blocks. The list and characteristics of the indicators included in blocks are presented in *table 1*.

The method of multidimensional comparative analysis, based on the Euclidean distance method was applied, in order to determine the assessment parameters of education development level under the developed system of indicators [12, P. 91-96]. This method allows considering not only the absolute indicator values of each territory, but the degree of proximity (distance) to the indicator-standard as well[4].

The sub-indices by the indicator of the education sphere development ($k_i$) were calculated according to the following formula (1):

$$K_i = k_t \times \frac{x_{it}}{x_{st}}, \quad (1)$$

where $x_{it}$ – the value of the *i*-th indicator in the region in the *t*-th year;

$x_{st}$ – average Russian index value, taken as a unit;

$k_t$ – weighing coefficient of the significance of *i*-th indicator.

The index method, allowing different characteristics to be reduced to a comparable form, is used in the study in order to calculate the integral index of the development of educational services.

Table 1. Indicators for assessing the level of education development in the regions of the Russian Federation

| Block | Indicator |
|---|---|
| **1. Search for and support of gifted and talented youth** (4 indicators) | Share of the schoolchildren, participating in all stages of Olympiads |
| | Share of students at educational institutions, supported under the programmes for the support of gifted children and talented youth |
| | Share of students provided with modern conditions for creative activities |
| | Share of graduates (11-12th forms), who received the General Certificate of Education for gold and silver medalists (calculations by indicator has been made for 2011-2012) |
| **2. Development of education human resource** (5 indicators) | Share of teachers, attested with qualification grade |
| | Share of teachers, who underwent in-service teacher training in the total number of teachers in educational institutions |
| | Teachers' average salary as compared to the average salary in the region's economy |
| | Staffing of educational institutions with teachers, having higher professional education |
| | Share of teachers under 30 years of age in the total number of teachers in educational institutions |
| **3. Development of education material and technical base;** (5 indicators) | Share of students, provided with the opportunity to use study equipment for practical works in accordance with the new FSES PGE (Federal State Educational Standard of Primary General Education) |
| | Share of students, provided with the opportunity to use modern libraries and media resources. |
| | Share of students, provided with modern conditions for exercises |
| | Share of schools with broadband Internet (at least 2 Mb/sec) |
| | Share of educational institutions equipped with modern canteens |
| **4. Protection and promotion of child and youth health** (4 indicators) | Share of students, studying at institutions with a licensed medical office |
| | Share of students, studying at institutions where at least 1 qualified health worker is present |
| | Share of students at educational institutions, who are provided with high quality hot meals |
| | Share of schoolchildren, whose educational plan provides for more than 3 hours of physical education per week |

[3] RF Government Decree of September 9, 2010 No. 1507-p (edited December 5, 2011) "On the implementation of national education initiative 'Our new school'".

[4] Average Russian value of the indicator is considered as a standard.

Such index construction gives the opportunity to reflect the significance of each of the indicators constituting the system.

Heads of the education governing bodies were polled, in order to determine the weighing coefficients by individual indicators in the second quarter of 2013. Heads of two regional education authorities (Yaroslavl and Kirov oblasts) and 9 municipal education authorities of the Vologda Oblast (Belozersky, Kichmengsko-Gorodetsky, Gryazovetsky, Kharovsky, Babayevsky, Ustyuzhensky, Mezhdurechensky, Kirillovsky districts, Cherepovets) participated in the survey.

The calculations made it possible to follow the dynamics of the integral index of education development in the territorial context for the 2010–2012 period. In order to simplify the dynamics analysis, the regions of the Russian Federation were ranked by growth (decline) rates of the indices and formed in five groups:

*1. Regions with extremely high development rates (more than 134%) – 12 subjects of the Russian Federation*. These are the territories, which demonstrate the highest growth of the indicators of the education development level, indicating large interest of regional authorities in the results of educational reforms and the reasoning of educational policy.

*2. Regions with high development rates (from 104 to 134%) – 33 subjects of the Russian Federation*. These are the territories, which demonstrate steady growth of the indicators of the education development level (at least 3%). The control and administration authorities in these territories should affect the adoption of measures on maintaining the existing high development rates of the regional educational system.

*3. Regions with moderate development rates (from 98 to 102%) – 9 subjects of the Russian Federation*. These are the territories, characterized by lack of significant changes in the level of education development for the studied time period, that preserved but not improved their positions by the calculated index. The specific management actions, improving the effectiveness of the education system and monitoring its results, are to be adopted for the development of these territories.

*4. Regions with low development rates (from 84 to 97%)* – 15 subjects of the Russian Federation. These are the territories demonstrating the drop in the index values (at least 3%). The inclusion of the region in this group shows the loss of previously accumulated potential for education development, the government's disregard of the resolution of education issues.

*5. Regions with extremely low development rates (less than 84%) – 12 subjects of the Russian Federation*. These are the territories that demonstrate the greatest decline in indicators of the education development level, indicating the necessity to take urgent measures on creating conditions for the effective development of both infrastructure and personnel of educational institutions.

The assessment of indicators of the education development level showed that the regions of the Russian Federation are sharply differentiated by its rate of development in the 2010–2012 period *(tab. 2)*. Thus, 45 (out of 81) of the subjects of the Russian Federation were able to improve their positions in this time period, while the positions of 27 subjects deteriorated.

The highest growth rates by the dynamics of support provided to talented youth are inherent in the Vologda Oblast (growth of indices for 2010–2012 amounted to 937%), the lowest rates are observed in the Republic of Buryatia (33%).

The dynamics of the indicators of the development level of personnel potential in the education sphere is more positive in the Samara Oblast (118%), and the least positive in the Republic of Bashkortostan (86%).

The survey results suggest that the development of education material and technical base is at the fastest pace in the Vologda Oblast (10.2 times), at the slowest pace in the Omsk Oblast (23%).

The most advantageous position by the dynamics of the protection and promotion level of child and youth health is taken by the Republic of Dagestan (193%), while Kamchatka Krai takes the least advantageous position (39%).

Cross-grouping of the regions showed that in general, the trends of education development coincide with the level achieved in the course of this development. It should be noted that the group of territories with high rates and level of development, significantly broader than the group with low rates and level of development (12 subjects against 6 subjects of the Russian Federation).

The peculiarity of the grouping is that large academic centres (Moscow and Saint Petersburg) were included in the group of "the falling behind" in terms of development rates, which is explained by high development level that had been already reached by their regional education systems.

The level of education development is significant for the strengthening of the territory's economic potential and competitiveness, which is evidenced by the assessment of the dual interrelation between the index of education development in the regions of the Russian Federation and the size of the gross regional product in constant prices, calculated by the Pearson correlation. In 2012, the correlation coefficient is 0.31 ($r = 0.314$ ($p(0.01)$), that confirms the existence of a significant interrelation between indicators. It should be noted that the closeness of the interrelation has been increasing over time.

The Vologda Oblast is included in the group of regions with extremely high rates and level of development. Constant improvement of the level of each sub-index in the region provided for a favorable situation in terms of education development: thus, in 2010 the integral index was 0.19 units, in 2012 – 0.63 units (3 times higher). The level achieved by the Vologda Oblast exceeds the indicators of the neighbouring Northwestern regions: the Pskov Oblast (33%), the Arkhangelsk Oblast (34%), the Murmansk Oblast (32%), the Novgorod Oblast (20%), the Kaliningrad Oblast (9%), Saint Petersburg (16%), the Republic of Karelia and the Komi Republic (27% and 24% respectively), which became possible due to the notable achievements of the region in the sphere of support for talented youth (100% from the leading position) and the development of education personnel potential (77% from the leading position).

High growth rate indicators of the education development in the Vologda Oblast determine the availability of broad options for resolving strategic development issues of the territory by improving the education system. The critical level was determined for the comparative analysis of the obtained results. It represents lower threshold, the achievement of which impedes the normal functioning of the education sphere. In this study it is calculated as the arithmetic average of indices by all regions of the Russian Federation ($x_{st}$).

According to the survey results, a number of important indicators of the education system exceeded the limit of the critical level in the Vologda Oblast for 2010–2012, which is a positive trend for the region's education development (*tab. 3*). This applies to such indicators as:

– the share of schoolchildren – participants of all the stages of All-Russian Olympiads (deviation is 10.9%);

– share of students in educational institutions, provided with support within the programmes for the support of gifted children and talented youth (deviation amounts to 43.7%), which is the maximum value of the indicator for 2012;

Table 2. Matrix comparing the RF subjects by the pace and level of development of the education sphere for the 2010–2012 period

| Level | Rates | | | | |
|---|---|---|---|---|---|
| | **Extremely high** (more134%) | **High** (from 104 to 134%) | **Moderate** (from 98 to 102%) | **Low** (from 84 to 97%) | **Extremely low** (less than 84%) |
| **High** (over 0.53) | **Vologda Oblast (335)** | Republic of Mordovia (120)<br>Kaliningrad Oblast (105) | Belgorod Oblast (102)<br>Leningrad Oblast (102)<br>Penza Oblast (98) | Republic of Khakassia (91)<br>Moscow (89) | Yamalo-Nenets AO (80)<br>Saint Petersburg (74)<br>Tyumen Oblast (68)<br>Buryat Republic (61) |
| **Above average** (from 0.49 to 0.53) | Amur Oblast (141)<br>Magadan Oblast (136) | Chukotka AO (125)<br>Mari El Republic (122)<br>Republic of North Ossetia–Alania (118)<br>Tambov Oblast (118)<br>Jewish AO (115)<br>Samara Oblast (113)<br>Sakha Republic (Yakutia) (106) | | Krasnoyarsk Krai (89) | Khanty–Mansi AO (79)<br>Krasnodar Krai (75)<br>Omsk Oblast (63)<br>Ivanovo Oblast (58) |
| **Average** (from 0.43 to 0.48) | Stavropol Krai (177)<br>Yaroslavl Oblast (148)<br>Ryazan Oblast (138) | Kemerovo Oblast (134)<br>Komi Republic (130)<br>Astrakhan Oblast (125)<br>Chelyabinsk Oblast (125)<br>Kostroma Oblast (123)<br>Perm Krai (120)<br>Moscow Oblast (119)<br>Kaluga Oblast (118)<br>Republic of Kalmykia (116)<br>Lipetsk Oblast (106)<br>Kabardino-Balkar Republic (104) | Novosibirsk Oblast (102)<br>Ulyanovsk Oblast (101)<br>Chuvash Republic (101)<br>Murmansk Oblast (98) | Tomsk Oblast (97)<br>Republic of Karelia (93)<br>Saratov Oblast (92)<br>Volgograd Oblast (91)<br>Nizhny Novgorod (91)<br>Sverdlovsk Oblast (84) | Voronezh Oblast (77)<br>Novgorod Oblast (76)<br>Republic of Adygea (65)<br>Altai Krai (56) |
| **Below average** (from 0.40 to 0.42) | Sakhalin Oblast (165)<br>Udmurt Republic (141) | Republic of Bashkortostan (127)<br>Smolensk Oblast (123)<br>Irkutsk Oblast (117)<br>Khabarovsk Krai (113)<br>Tula Oblast (110)<br>Arkhangelsk Oblast (105) | Orenburg Oblast (101)<br>Tver Oblast (98) | Oryol Oblast (96)<br>Pskov Oblast (94)<br>Kurgan Oblast (92)<br>Rostov Oblast (88) | |
| **Low** (less than 0.40) | Chechen Republic (218)<br>Altai Republic (189)<br>Republic of Dagestan (175)<br>Primorsky Krai (154) | Nenets AO (134)<br>Republic of Ingushetia (133)<br>Karachay–Cherkess Republic (123)<br>Zabaykalsky Krai (120)<br>Kursk Oblast (115)<br>Bryansk Oblast (113)<br>Kirov Oblast (113) | | Kamchatka Krai (97)<br>Tuva Republic (89) | |

Source: author's calculations.
Note. The calculations were not made for the Vladimir Oblast and Republic of Tatarstan due to lack of the data for 2010.
The percentage ratio of the 2012 to 2010 indices is specified in brackets, next to the regions. The regions with high rates and level of education development are in yellow, low rates and level of education development are in purple.

– share of teachers, attested with qualification grade (deviation is 4.3%);

– staffing of educational institutions with teachers, having higher professional education (deviation is 1.5%);

– share of students, provided with the opportunity to use study equipment for practical works in accordance with the new FSES PGE (deviation amounts to 23.9%);

– share of students at educational institutions, who are provided with high quality hot meals (deviation is 2.9%);

– share of students, studying at institutions with a licensed medical office (deviation is 8.8%);

– share of students, studying at institutions where at least 1 qualified health worker is present (deviation is 2.5%).

It is necessary to highlight a rather high level of support provided to talented youth in the Vologda Oblast (the region takes leading positions by the share of talented children provided with support under state programmes). It points to a rather active position of the regional education system in the sphere of using available opportunities for creating conditions for the development of the gifted and talented, support of gifted schoolchildren and students in their undertakings, as well as the protection of their individual rights, creation of a secure development environment, formation of favorable emotional background and positive public opinion.

At the same time, the analysis of the calculations results showed that high growth rates of a number of the indicators of the regional education system development are conditioned by low starting positions of the Vologda Oblast. For example, in 2010 the share of students, provided with the modern conditions for exercises made up 10%, and the percentage of schools with broadband Internet amounted to 7%. This fact prevented the oblast from reaching the limiting values by most indicators, leaving them beyond the boundaries of the critical level that applies to such indicators as:

– share of graduates 11th (12th) forms, who received the General Certificate of Education for gold and silver medalists (the indicator is below threshold level by 2.12%);

– share of students provided with modern conditions for creative activities (the indicator is below threshold level by 8.40%);

– teachers' average salary as compared to the average salary in the region's economy (the indicator is below threshold level by 12.01%);

– share of teachers under 30 years of age in the total number of teachers in educational institutions (the indicator is below threshold level by 1.28%);

– share of teachers, who underwent in-service teacher training in the past school year (the indicator is below threshold level by 1.80%);

– share of students, provided with the opportunity to use modern libraries and media resources (the indicator is below threshold level by 14.71%);

– share of schools with broadband Internet (the indicator is below threshold level by 21.73%);

– share of educational institutions equipped with modern canteens (the indicator is below threshold level by 9.89%);

– share of students, provided with modern conditions for exercises (the indicator is below threshold level by 3.88%);

– share of schoolchildren, whose educational plan provides for more than 3 hours of physical education per week (the indicator is below threshold level by 10.10%).

Of special attention is the fact that the level of teachers' salary in the Vologda Oblast was under the threshold value by 13% in 2012, despite a notable rise (1.9 times for the 2010–2012 period). Still greater disparity (1.4 times) is observed in comparison with the region leading by this indicator (Moscow). According to the Complex of measures on

Table 3. Comparison of indicators of education system development in the Vologda Oblast in 2012 to the limiting and maximum values throughout the Russian Federation

| Indicators | Actual value (2012) | Critical level | | Maximum level | | |
|---|---|---|---|---|---|---|
| | | Value | Deviation | Value | Region | Deviation |
| Share of students in educational institutions, supported within the programmes for the support of gifted children and talented youth, % | 45.54 | 1.88 | 43.66 | 45.54 | Vologda Oblast | 0 |
| share of students, provided with the opportunity to use study equipment for practical works in accordance with the new FSES PGE, % | 99.42 | 75.55 | 23.87 | 100 | Tyumen Oblast | -0.58 |
| Share of the schoolchildren–participants of all stages of the All-Russian Olympiad, % | 60.61 | 49.72 | 10.9 | 74.35 | Jewish AO | -13.74 |
| Share of students, studying at institutions with a licensed medical office, % | 87.75 | 78.99 | 8.76 | 100 | Tyumen Oblast | -12.25 |
| Share of teachers, attested with qualification grade, % | 17.99 | 13.68 | 4.31 | 52.92 | Samara Oblast | -34.93 |
| Share of students at educational, who are provided with high quality hot meals, % | 30.43 | 27.58 | 2.85 | 73.1 | Moscow | -42.67 |
| Share of students, studying at institutions where at least 1 qualified health worker is present, % | 83.41 | 80.94 | 2.47 | 100 | Tyumen Oblast | -16.59 |
| Staffing of educational institutions with teachers, having higher professional education, % | 97.41 | 95.88 | 1.53 | 98.84 | Chuvash Republic | -1.43 |
| Share of teachers under 30 years of age in the total number of teachers in educational institutions, % | 11.93 | 13.21 | -1.28 | 27.74 | Republic of Ingushetia | -15.81 |
| Share of teachers, who underwent in-service teacher training in the past school year, % | 38.37 | 40.17 | -1.8 | 60.84 | Novgorod Oblast | -22.47 |
| Share of graduates (11-12th forms), who received the General Certificate of Education for gold and silver medalists, % | 5.49 | 7.61 | -2.12 | 13.1 | Kursk Oblast | -7.61 |
| Share of students, provided with modern conditions for exercises , % | 14.53 | 18.41 | -3.88 | 80.76 | Tyumen Oblast | -66.23 |
| Share of students provided with modern conditions for creative activities, % | 31.44 | 39.84 | -8.4 | 88.73 | Leningrad Oblast | -57.29 |
| Share of educational institutions equipped with modern canteens , % | 35.64 | 45.53 | -9.89 | 99.56 | Tyumen Oblast | -63.92 |
| Share of schoolchildren, whose educational plan provides for more than 3 hours of physical education per week, % | 12.15 | 22.25 | -10.1 | 53.52 | Buryat Republic | -41.37 |
| Ratio of teachers' average salary to the average salary in the region's economy, % | 94.65 | 106.66 | -12.01 | 135.08 | Moscow | -40.43 |
| Share of students, provided with the opportunity to use modern libraries and media resources, % | 18.06 | 32.77 | -14.71 | 89.66 | Yamalo-Nenets AO | -63.92 |
| Share of schools with broadband Internet (at least 2 Mb/sec), % | 5.7 | 27.43 | -21.73 | 98.09 | Saint Petersburg | -92.39 |
| Calculated by the monitoring data of CPEM "Our new school". Available at: http://www.kpmo.ru | | | | | | |

modernization of general education [5], the ratio of the teachers salary to the average salary in the region's economy should reach 100% at the end of 2013; yet it is not enough for the oblast to overcome the critical threshold and to attract young, innovatively active teachers to the education sphere.

Similar situation indicates the problems, the urgent solution of which is required for the harmonious development of the region's education system, but is impeded due to the stand of the official authorities. Thus, a lot of indicators, which are to be considered, either are not reflected in strategic documents (share of schoolchildren, whose educational plan provides for more than 3 hours of physical education per week; share of students provided with modern conditions for creative activities), or their planned values are too small for the qualitative transition beyond the critical values. In this regard, it is appropriate to consider the assessment and the calculated threshold values, when elaborating the Complex of measures on the development of education system of the Vologda Oblast for 2014.

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# Overcoming social disintegration as a factor in promoting social health*

*The article dwells on the key indicators, reflecting the state of social health. The data is presented geographically among different demographic groups. The results of the public opinion monitoring, held by ISEDT RAS, with regard to public mental health in the Vologda Oblast are revealed. The article considers the process of social disintegration as a factor, negatively affecting the state of social health. The effect of a victim behaviour on the prevalence rate of social pathologies is analysed.*

*Social health, social disintegration, victimization, mortality, human capital.*

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At the end of the 20th century Russia entered into a phase of system transformations, continuing up to the present time. Social, economic, cultural and political processes of the last two decades have changed the fundamental living standards of the Russians, their mutual economic relations, political priorities, the social structure of a society [23, p. 6].

In this context, the interest arose in the key problems of classical Russian sociological theory, such as social integration and disintegration, the doctrine of which was developed by A. Comte, H. Spencer, E. Durkheim, P. Sorokin, T. Parsons and others, who saw different meaning in and placed different accents at these issues *(tab. 1)*.

* The paper has been prepared with support of RFBR grant №12-06-33046 'Economic assessment of wrongful death influence on the development of territories'.

Table 1. Theoretical approaches to the understanding of social disintegration

| Author | Thesis |
|---|---|
| Herbert Spencer (1820–1903) | Herbert Spencer reduced the concept of evolution to a continuous redistribution of corporeal particles and their motion, fusion (integration), and dispersion (disintegration). He attempted to subsume all phenomena – from the inorganic to the moral and social ones – under this mechanistic conception of evolution.<br>Disintegration – reverse movement, from the highest to the lowest type of development, from complex to simple.<br>Integration – process or the action, resulting in integrity; unification, junction, reestablishment of the unity. |
| Auguste Comte (1798–1857) | General mechanism of social integration (order) and society structure result from anthropological concept of man as predominantly a selfish creature, inclined to aggression, guided by feelings rather than reason. This fact necessitates the existence of specialized institutions, regulating the behaviour of individuals from 'the inside', through the world of feelings and emotions (e.g. religion). |
| Emile Durkheim (1858–1917) | Disintegration and collapse of norms, guaranteeing social order, are defined as anomie, i.e. an absence of clear societal norms and moral instability of society caused by a change in the hierarchy of values. The concept of anomie defines the state of society, which is characterized by disintegration and collapse of norms, guaranteeing social order.<br>Anomie causes such psychological state of an individual, which is characterized by the sense of disorientation in life that occurs when the hierarchy is broken, and the new one could not yet be immediately established. E. Durkheim noted that anomic states occur most often in society under conditions of economic crises and dynamic reforms.<br>Later anomie was also understood as the state in society caused by the excess of norms, including contradictory ones (Robert Merton). Under these conditions, the person is lost, not knowing what standards to follow. The unity of the normative system, the system regulating social relations are destroyed. People are socially disoriented, feel anxious, socially isolated. |
| Pitirim Sorokin (1889–1968) | Two contrary processes – integration and disintegration –interact dialectically and dynamically, as society is in the process of constant development. "The study of any integrated sociocultural system shows that all of its basic elements are to a different degree of intensity interdependent… It is impossible to find such interdependency in non-integrated and disintegrated sociocultural clusters." |
| Talcott Parsons (1902–1979) | The mechanisms of social disorganization:<br>1. Deadapation of the whole system, its separate subsystems and factors to the conditions of the external environment;<br>2. Management crisis – the impossibility of adequate goal-setting and as a consequence of goal-achievement, low control or loss of control, the absence of conventional, standardized aims and means of their achievement (towards these ends) in the political sphere.<br>3. Demobilization is the inability to mobilize resources to achieve the goals.<br>The system of societal unity, which includes all institutions of social control performs the function of social system integration. Thus, both the cause and the consequence of disorganization is the crisis of the system of social control, as well as the crisis of value-normative system – deligitimisation of the elements of social and cultural institutions, low level of self-regulation and consent. |

The fact that the state of general population can be described as social apathy indicates the disintegration processes taking place in Russian society.

The issue of social apathy is closely connected with the anomie issue, introduced to the conceptual framework of Social sciences by E. Durgeim in his work *On the division of social labour* and developed further in his work *Suicide*. Social categories "apathy" and "anomie" are essentially and conceptually connected, as both social phenomena result from the fact of social economic development advancement (according to Durkheim, consisting in progressive division of labour) relative to moral development of collective consciousness.

At first glance, in post-Soviet Russia the situation was controversial and paradoxical: a high proportion of the displeased was combined with a relatively low share of those, who were ready to protest and still less of those, really taking part in protests. For example, repeated devaluation of the ruble in August 1998, did not result in mass demonstrations the government's economic policy, whereas similar events in Indonesia (1998) and Argentina (2001–2002) gave rise to mass street riots.

Figure 1. Dynamics of the protest potential in the Vologda Oblast (% of the number of respondents)


The series of terrorist acts in August 2004 (two aircraft bombings and the explosion in Moscow near Rizhskaya underground station) did not have any implications in that sense, while terrorist attacks, comparable in number of victims, in Madrid a few months later caused million protests and the Cabinet shuffle as a result of parliamentary elections.

The results of Russian studies show that the share of those, who are ready to openly protest on average makes up 20–25% of the population in the country as a whole [8]. According to the monitoring of public opinion, held by ISEDT RAS[1], the share of people in the Vologda Oblast, willing to support protests amounts to 20–22% since 2007 *(fig. 1)*.

The reasons for protest moods both on regional and federal levels are of socio-economic nature *(tab. 2)*. According to the Doctor of Sociology, Director of the projects "FOM-Terry" L.P. Pautova, "direct political reasons occupy 4th–5th places. People note social and economic problems most frequently. Above all, the growth of prices, growth of public utilities fees, unemployment, and considerably insecurity in tomorrow" [16].

At the same time unconditional predominance of patience over active protest, adaptation over rebellion, passive discontent over the struggle for civil rights is a distinctive characteristic of the mass reaction on endless series of trials, miseries, hardships, experienced by an individual in the Russian society throughout practically all pre-Soviet, Soviet and current post-Soviet history [9].

In recent years the number of Russians, not participating in any form of public or political activities, ranges from 32 to 52% [14]. According to the ISEDT RAS monitoring, in 2013 the percentage of the Vologda Oblast residents, not participating in public and political activities, made up 29% (as compared to 20% in 2011), almost half of the region's population describes its involvement in social and political life as "passive". The share of those, who believe they can somehow influence the situation in the country or, at least, in the region is minimal (3–7%).

[1] The monitoring of public opinion of the Vologda Oblast population has been carried out by ISEDT RAS since 1996. 1500 people in 10 municipal districts of the oblast (Kirillovsky, Vozhegodsky, Sheksninsky, Gryazovetsky, Nikolsky, Babayevsky, Tarnogsky, Velikoustyugsky, the cities of Vologda and Cherepovets) are polled once a year. The sample is purposive and quota. Sampling error does not exceed 3%. The information is technically processed by SPSS and Excel programmes.

Table 2. The most acute problems for Russia in general, in the opinion of the Vologda Oblast population, (% of the number of respondents)*

| Answers | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Low living standards, poverty | 41.4 | 44.5 | 48.4 | 49.4 | 43.2 |
| Stratification of the population into 'rich' and 'poor' | 31.4 | 28.4 | 34.5 | 36.2 | 37.5 |
| Problems regarding housing provision, low housing affordability | 36.3 | 25.7 | 24.9 | 24.8 | 28.6 |
| Growth of alcohol consumption | 26.5 | 26.5 | 31.7 | 27.1 | 27.3 |
| High crime rate, lack of protection from criminals, hooliganism, etc. | 28.4 | 24.9 | 28.3 | 29.3 | 25.5 |
| Poor quality of engineering infrastructure (utilities, roads, transport etc) | – | – | 16.3 | 19.0 | 25.3 |
| Social insecurity of citizens | 24.8 | 22.9 | 22.5 | 23.1 | 22.3 |
| Corruption, bribery | 17.5 | 16.7 | 18.7 | 21.8 | 19.8 |
| Inaccessibility of health services, poor quality of medical services | 15.8 | 13.8 | 16.0 | 13.8 | 18.5 |

* The questionnaire list comprised 20 most acute problems of modern life. The given issue includes only the first ten (in descending order according to the results of the latest survey).

Annually the most common reasons for people being passive in social life and not taking a stand on the question of civil rights are disbelief in the possibility to affect the authorities, indifference to joint activities, and the habit of relying on 'having got it made' (27, 24 and 22% respectively).

Thus, social apathy can be named one of the characteristics of modern Russian society, which is important for understanding its functioning, social and spiritual development. However, proper attention has not been previously paid to the research of social apathy [22]. Moreover, apathy is the main manifestation of anomie, which in turn, is characterized (according to E. Durkheim's approach) as a state of society undergoing disintegration.

On a personal level social disintegration is revealed through such psychological characteristics as self-doubt, anxiety, suggestibility, emotional instability, pessimism. As follows from the results of the research in the Vologda Oblast, such features are displayed by 13–40% of the population *(tab. 3)*.

During extended periods of social disintegration and in the absence of timely intervention, negative personality traits can transform into behaviouristic characteristics, i.e. they become displayed at the "external", visible level. Such behaviour is accompanied by various manifestations of social deadaptation, up to the extreme – complete isolation of an individual. It is characterized by frequent mood swings, passiveness in difficult situations, tendency to social isolation. The individuals with similar characteristics, i.e. those, frequently finding themselves in conflict situations, addicted to alcohol and violating accepted norms, or those, characterized by a high degree of conformity, i.e. trying to avoid decision-making situations and not to stand out from their common social group.

The results of the research showed that such traits are displayed by 7–25% of the Vologda Oblast population *(tab. 4)*.

The deterioration of social health is one of the negative consequences of social disintegration. Social health is a characteristic of a healthy society with the minimal level of social diseases [17, p. 143].

According to N.M. Rimashevskaya, an increasing number of the cases of antisocial behaviour, such as alcoholism, drug addiction, criminalization of the social environment, and a sharp increase in the number of suicides, are the criteria that indicate the urgency of the issue of social ill-health of the Russian society [19]. Social pathologies most objectively reflect the state of social health in a particular area.

Table 3. The share of the Vologda Oblast residents with psychological characteristics, indicating social disintegration (% of the number of respondents)

| Answer | 2011 |
|---|---|
| I experience fatigue, apathy* | 41.3 |
| I feel lonely | 38.6 |
| I drink alcohol to get rid of nervous tension * | 37.4 |
| I experience inner stress | 34.1 |
| I lack self-confidence | 30.8 |
| Share of people displaying symptoms of anxiety ** | 27.1 |
| I experience tension, annoyance, fear, anguish | 24.3 |
| I consider myself a pessimist | 17.2 |
| I have frequent mood swings | 12.8 |

* 2009 data.
** Hospital anxiety and depression scale was used to estimate the number of people displaying symptoms of anxiety.
Source: The monitoring data on public mental health in the Vologda Oblast.

Table 4. Share of the Vologda Oblast residents displaying behaviouristic characteristics, indicating social disintegration (% of the number of respondents)

| Answer | 2011 |
|---|---|
| I often regret my actions | 24.4 |
| I am not willing to make social contacts, to enlarge the circle of my acquaintances* | 24.3 |
| My working relationship can be described as conflict* | 21.9 |
| I find it difficult to get acquainted with new people | 21.1 |
| I find it hard to maintain a conversation upon acquaintance | 18.3 |
| Consume alcohol 1 – 2 a week or more often* | 19.1 |
| My family relationship is tense and conflict* | 19.1 |
| I often get in conflict situations | 16.8 |
| I'm not satisfied with the relationship with my husband | 9.7 |
| I'm not satisfied with the relationship with my friends, intimate friends | 6.4 |

* 2009 data
Source: The monitoring data on public mental health in the Vologda Oblast

According to the World Health Organization, Russia is among the top five countries by the number of murders and suicides. At the same time, it should be noted that these causes of mortality are only 'the tip of the iceberg'. According to the formula, elaborated by WHO experts, the 'n' of completed suicides accounted for 10–20n of parasuicides, 8n of the close ones and relatives of the suicider (included in high-risk suicidality group), 100n of people, thinking about suicide or engaged in self-destructive actions subconsciously. Therefore, the problem of suicidal behaviour may comprise in general up to 4.2 million people, i.e. 2.9% of the population.

The range of the crime issues, covers not only lawbreakers, but crime victims, as well as convicts. All of them, one way or another, are 'excluded' from full social life. The number of inmates in Russia for the 1990–2010 increased by 57% (from 537.6 thousand to 845.1 thousand people), their age structure, at the same time, practically has not changed: over half of them (52%) belong to the 14–30 age group.

Thus, one of the most acute problems for modern Russian society is high mortality of the population, above all from external causes, including homicides, suicides, poisonings, injuries, car accidents, etc. wide spread of which caused great losses that has become

the peculiarity of our statistics, assumed continuous and sustainable character in most regions of the country [1, p. 65].

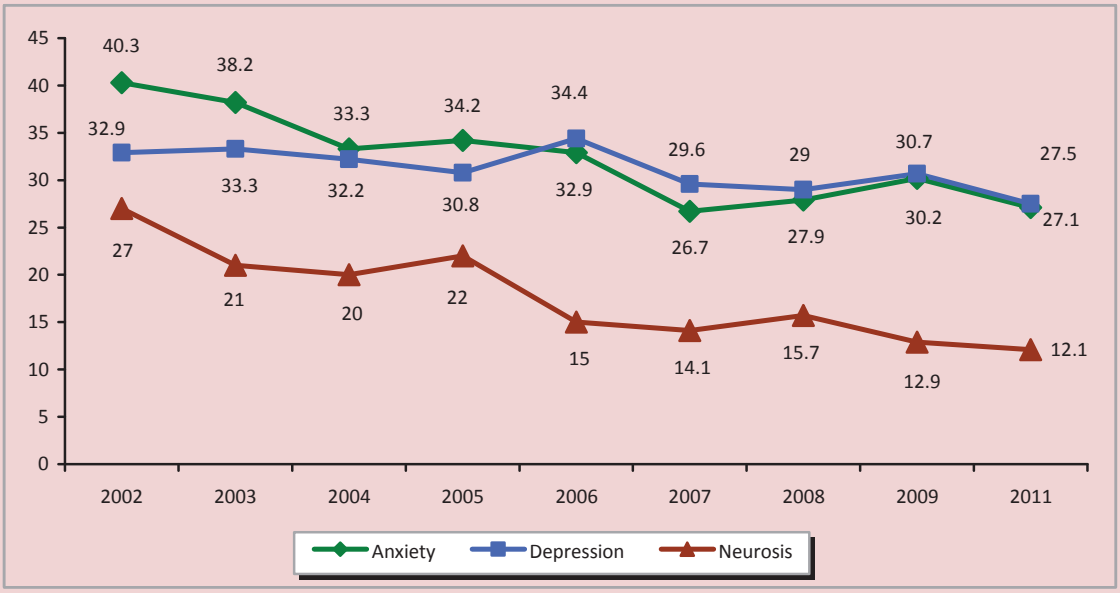
Homicides and suicides are critical and, therefore, the most striking manifestations of social ill health. At that, homicides to a greater degree reflect external evidences (the standard and quality of living, social structure of the population), while suicides – internal ones (relations in microsociety, the state of psychological climate). In addition, homicides and suicides, as forms of deviant behaviour, are forms of protest and aggression against people around (in the first case) and against themselves (in the second case). So, the expansion dynamics of these social pathologies reflects indirectly, on the one hand, the attitude of people to each other, and on the other hand, the psychological perception of the individual's own place in society.

According to different studies, the symptoms of depressive disorder were noted in almost all cases of completed suicides or suicide attempts. This influenced the fact that depression is called 'driving mechanism of suicide'. About a third of the Vologda Oblast population (31–32%) showed signs of depression. Moreover, the indicator has remained stable in the 2002–2011 period *(fig. 2)*. The results of the conducted study revealed that people with socio disintegrated personality traits or behaviour are likely to show signs of depression about twice the rate of the rest of the population.

Thus, it is important to examine the processes and manifestations of social disintegration in terms of the monitoring of suicidal tendencies and prevention of suicides among the population. Similarly, social disintegration affects the formation of victimization behaviour, i.e. acts as the crime factor as a social phenomenon.

Victimization researches as an information source provide more accurate and complete information about the crime rate rather than the official statistics. The advantage of such analysis is that it allows taking into account

Figure 2. Expansion dynamics of anxiety, depression and neurosis symptoms
(% of the number of respondents)




Source: ISEDT RAS monitoring data on the public mental health.

latent crime processes, and is also of preventive character (the results of the victimization research consist in revealing social and economic, demographic, etc. characteristics of individuals comprising the group at risk of becoming crime victims).

The elaboration of a regional monitoring with regard to victimization situation is a long-run objective for preventing crime situations in the early stages of development, as for now we can make judgements about the victimogenity level of society on the basis of the official statistics and the results of sociological researches.

Victim qualities of citizens depend on their age, gender, experience, readiness for action in dangerous situations, personal characteristics. For example, the victimization of children is determined by their lack of experience and knowledge of life, increased suggestibility, while for old people and the disabled it is the limited abilities to quickly orient in space and to move.

A certain degree of victimization is inherent in the conditions of socialization, existing in society, including unfavourable socialization factors contributing to the formation of socio-psychological predisposition of an individual to victim behaviour. For example, when it comes to family relations, increased victimity may be observed in any of the family members, who is characterized as immoral, antisocial, inclined to abuse and harassment of other family members, to the creation of stressful environment.

The number of cases, when an individual exhibits different forms of victimization behavior, increases in the periods of social innovations and changes, accompanied by chaotic economic development of social relations, accelerated social differentiation, social mobility, reduced threshold of individual and public safety. The major factors in the population victimization are psychological stress and decreasing adaptation of people due to rapidly changing living conditions [3].

The level of social victimization in modern Russia is significantly higher than in European countries [7, p. 38]. The number of victims has been annually increasing across the Russian Federation during the last decade. The share of violent crimes (with the use of violence) against the victims, has remained stable since 2004 and accounts for 17–18% of the total number of committed criminal offences. According to 2011 data the most tense situation is observed in the Ural, Siberian and Volga Federal Districts *(tab. 5)*.

Table 5. Number of violent crimes against the victims

| Territory | 2004 | | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | thou-sand | % | thou-sand | % | thou-sand | % | thou-sand | % | thou-sand | % | thou-sand | % | thou-sand | % | thou-sand | % |
| *Russian Federation* | *518.6* | *17.9* | *658.8* | *18.5* | *684.3* | *17.7* | *618.3* | *17.3* | *570.6* | *17.8* | *531.0* | *17.7* | *451.2* | *17.2* | *403.5* | *16.8* |
| Federal Districts | | | | | | | | | | | | | | | | |
| Ural | 65.1 | 19.8 | 80.7 | 19.5 | 77.8 | 17.8 | 71.2 | 18.3 | 72.3 | 21.7 | 66.8 | 21.4 | *58.3* | *20.4* | *50.4* | *20.0* |
| Siberian | 92.7 | 19.8 | 118.6 | 20.8 | 119.9 | 19.5 | 113.0 | 19.0 | 110.1 | 19.9 | 101.9 | 19.7 | *87.7* | *19.2* | *79.4* | *19.0* |
| Volga | 120.1 | 20.0 | 156.9 | 19.3 | 174.5 | 19.3 | 155.4 | 19.6 | 135.7 | 19.5 | 122.6 | 19.2 | *103.6* | *18.7* | *93.1* | *19.0* |
| Northwestern | 55.0 | 20.1 | 68.2 | 20.9 | 68.7 | 19.8 | 60.6 | 18.7 | 53.2 | 18.8 | 49.7 | 18.6 | *40.2* | *17.2* | *36.1* | *16.5* |
| Far Eastern | 27.3 | 17.5 | 35.8 | 18.7 | 45.4 | 19.0 | 39.3 | 17.9 | 33.9 | 17.5 | 29.5 | 17.6 | *24.3* | *17.0* | *20.4* | *15.8* |
| Central | 108.4 | 16.4 | 141.5 | 18.1 | 138.5 | 17.1 | 123.5 | 16.2 | 114.5 | 16.5 | 110.8 | 16.6 | *95.8* | *15.9* | *86.3* | *15.3* |
| Southern | 44.9 | 15.5 | 50.1 | 15.2 | 52.2 | 14.1 | 49.0 | 13.4 | 46.2 | 13.8 | 45.6 | 14.7 | *28.5* | *13.9* | *26.1* | *13.5* |

* Ranked by indicator value in 2011 ( %).
Source: Database of the Federal State Statistics Service. Available at: www.gks.ru

The given indicator is higher than the Russian average in 39 regions. Its maximum values are observed in the Republic of Karelia (37.9%), the Tyva Republic (29.8%), the Kurgan Oblast (27.5%), the Chuvash Republic (27.4%).

1.6 million people fell victim to crimes (1158 per 100 thousand of population) throughout Russia in 2011. The given indicator in 4 out of 8 Federal Districts is higher than the national average *(fig. 3)* due to high crime rates (1643 per 100 thousand of population in the Volga Federal District, 2077 people in the Ural Federal District, 2176 in the Siberian Federal District, 2061 in the Far Eastern Federal District, 1682 – the Russian average).

The number of victims makes up 1619.1 per 100 thousand people in the Vologda Oblast *(fig. 4),* i.e. higher than the average of Russia and the Northwestern Federal District. For the whole 2011, 19.4 thousand of the Oblast residents fell victim to crimes, which accounts for 12.3% out of the total number of victims on the territory of the Northwestern Federal District. By this indicator, the Vologda Oblast comes third after Saint Petersburg (24%) and the Arkhangelsk Oblast (12.5%).

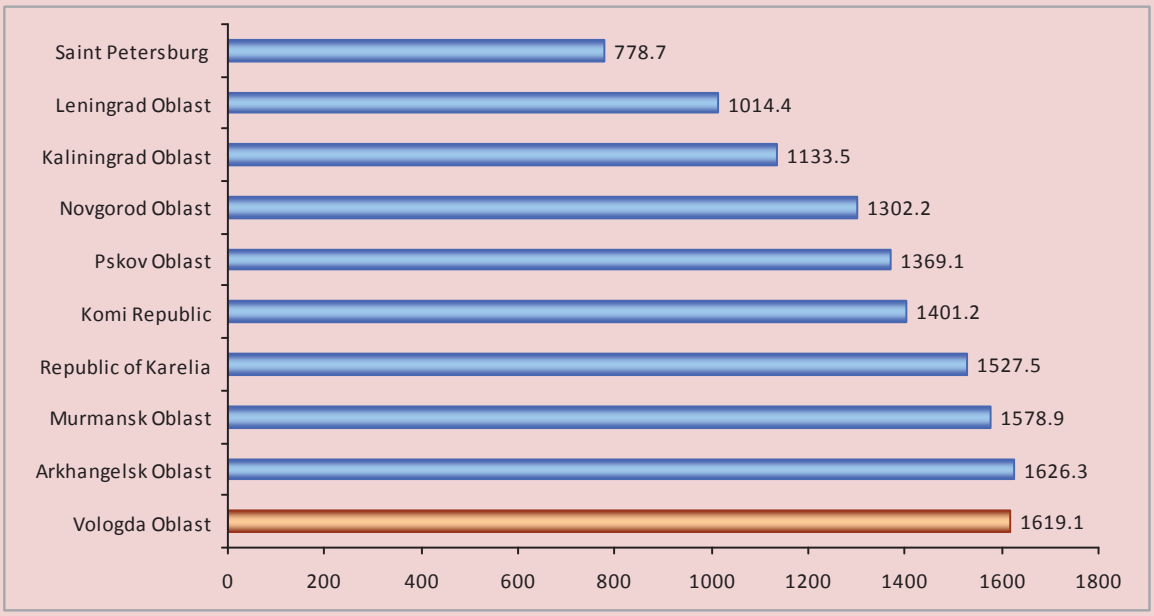
According to the survey conducted on the territory of the Vologda Oblast, the share of its residents who fell victim to crimes and acts of hooliganism in the 2002–2012 period decreased *(fig. 5)*. Men and women fall victim to crimes with equal frequency (7 and 5% respectively), while people under 30 years of age (10%) and urban residents (7%) are the most victimized groups.

According to official statistics data, property crimes (thefts, robberies, frauds) are much more frequent than such offences as homicide or deliberate infliction of grave harm to health. Nevertheless, it is these types of crimes that account for the largest number of victims.

Figure 3. Number of crime victims in Federal Districts (per 100 thousand of population, 2011)

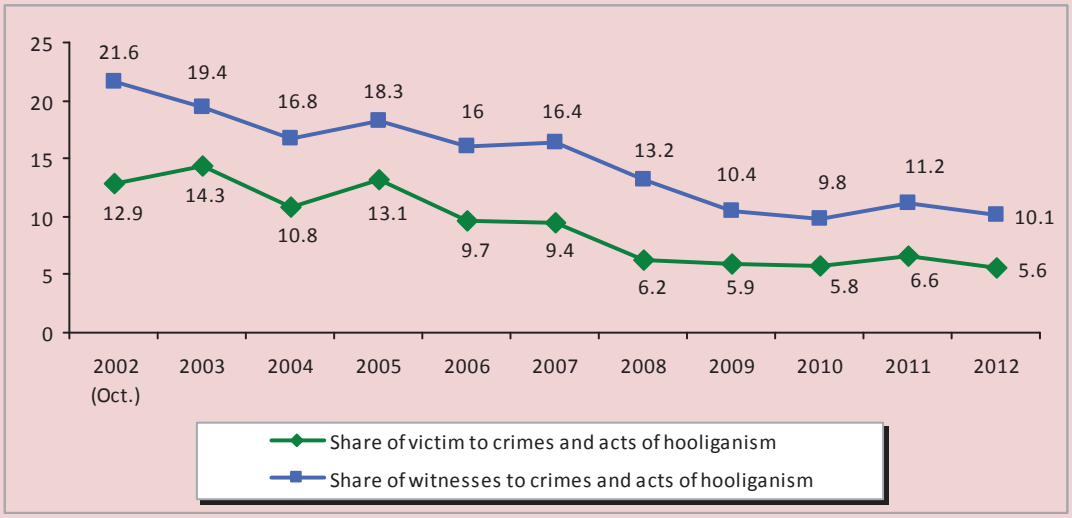

Source: Social status and living standards of Russian population in 2012: statistical digest, Rosstat.

Figure 4. Number of crime victims in federal districts (per 100 thousand of population, 2011)




Source: Social status and living standards of Russian population in 2012: statistical digest, Rosstat.

Figure 5. The number of victims and witnesses to crimes and acts of hooliganism in the Vologda Oblast (% of the number of respondents)




Source: ISEDT RAS public opinion monitoring data on the changing living conditions of the Vologda Oblast population.

The share of homicides in the structure of crimes decreased almost twice in the 2003–2011 period (1.1–0.6%), however the victimity rate with regard to this type of offences increased from 9358.2 to 9580.4 per 10 thousand of the population *(tab. 6)*. Thus, the number of victims increases in each specific case of murder or attempted homicide, i.e. the criminal subculture has been strengthening.

Table 6. The coefficient of specific (selective) victimity by types of crime in the Russian Federation (number of crimes with victims per 10 thousand crimes of the type)*

| Types of crime | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|
| *Total* | *6702.6* | *6854.3* | *7136.1* | *7056.6* | *6877.0* | *6704.3* | *6786.7* | *6927.1* | *6981.9* |
| Deliberate infliction of grave harm to health | 9739.5 | 9746.8 | 9729.9 | 9761.0 | 9778.7 | 9816.0 | 9858.0 | 9899.2 | 9896.1 |
| Homicide and attempted murder | 9358.2 | 9412.7 | 9465.5 | 9467.6 | 9493.0 | 9523.3 | 9558.3 | 9551.3 | 9580.4 |
| Heist | 9372.0 | 9541.3 | 9630.1 | 9652.9 | 9587.5 | 9518.1 | 9484.9 | 9477.2 | 9397.5 |
| Robbery | 9163.2 | 9306.0 | 9407.7 | 9487.5 | 9466.4 | 9387.5 | 9340.2 | 9346.9 | 9353.2 |
| Hooliganism | 8960.8 | 8432.1 | 8458.4 | 9429.2 | 9341.8 | 9139.7 | 9098.6 | n/d | 8750.0 |
| Misappropriation of a car or other vehicle without the intent to steal (car theft) | 8345.5 | 8074.4 | 8309.5 | 8930.2 | 8976.1 | 8884.4 | 8945.5 | n/d | n/d |
| Theft | 7600.1 | 7861.3 | 8104.3 | 8186.1 | 8088.9 | 8018.3 | 8321.7 | 8287.6 | 8207.2 |
| Fraud | 6367.8 | 6648.3 | 6928.3 | 6572.7 | 6181.5 | 5896.4 | 6189.0 | 6252.3 | 6406.8 |

* Ranked by indicator value in 2011
Source: calculated on the basis of the statistical digest "Russia's regions: social and economic indicators". Rosstat. Moscow, 2012.

The most victimised population groups include the citizens, who are more likely to fall victim to crimes, due to age and gender characteristics (e.g., minors, women, the elderly), profession (law enforcement officials, cash collectors, etc.) or because of their own behaviour and lifestyle (abusers, antisocial individuals).

Children and the youth, having no life experience because of their young age, are more suggestible and curious at the same time, they are inclined to display new behaviour patterns. Furthermore, children and adolescents are dependent on the parents with regard to the social status and are not able to make independent decisions.

A trend of decreasing homicide and suicide mortality rate was observed in the 2001–2011 period in all age groups of the Vologda Oblast population *(tab. 7)*. It should be noted that in all categories the suicide rate considerably exceeds homicide mortality rate (this is particularly evident among people aged from 10 to 19 and over the age of 60).

The increased suicide rate among the youth is noted in other Russian studies. For example, according to A.Yu. Myagkov[2] and S.V. Yerofeev[3], who analyzed the situation in the Ivanovo Oblast, "the youth cohort aged 14–29 years is the most vulnerable group with regard to suicides. Stable negative dynamics is observed here along with extremely high level of suicides. At present, suicidality index among the youth exceeds citywide rate more than twice. Moreover, over the past six years it has increased by 19%" [13, p. 47].

Children and adolescents are at greater risk of committing suicide, due to the fact that they, having the higher level of mental instability, at the same time have no life experience that would be sufficient for a constructive response to stressful situations. The increased risk of late-life suicide is associated with the deterioration of physical health and concurrent retirement, that is, an individual loses the sense of belonging to a social group (work collective) and has to change the usual lifestyle (occupation). In addition, the majority of the wealthy falls for the elderly people, who are, therefore, at greater risk of becoming crime victims.

[2] Myagkov Aleksandr Yurievich – Doctor of Sociology, Professor, Head of the Department of Sociology, Ivanovo State Power University.

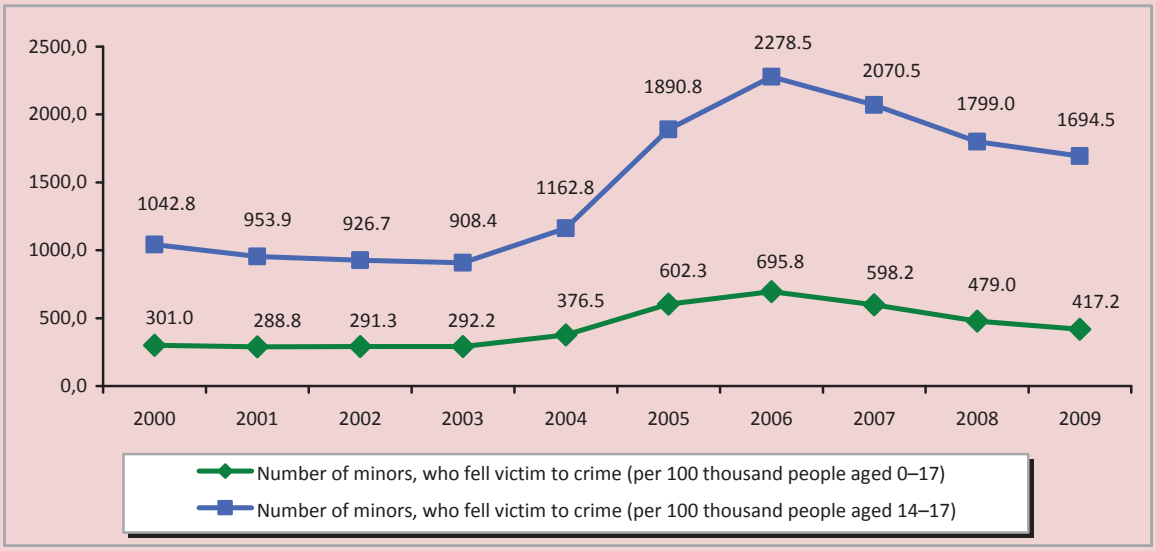
[3] Yerofeev Sergei Vladimirovich – Doctor of Medicine, Head of the Department of Forensics, Medical Law and Bioethics, Ivanovo State Medical Academy; Chief of the forensic medical examination bureau of the Ivanovo Oblast.

Table 7. Age structure of homicide and suicide mortality rate of the Vologda Oblast population (per 100 thousand of population)

| Age group | Year | | | | | | | | | | | 2011 in % to 2001 | 2011 in % to 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | | |
| *Suicides* | | | | | | | | | | | | | |
| Aged 0 – 9 | 0.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Aged 10– 19 | 12.0 | 15.2 | 12.1 | 9.1 | 11.9 | 9.1 | 11.9 | 7.2 | 7.0 | 9.7 | 12.1 | 101.1 | 125.1 |
| Aged 20 – 39 | 56.4 | 57.0 | 61.7 | 55.6 | 40.9 | 42.9 | 37.5 | 25.3 | 33.7 | 27.8 | 23.7 | 42.1 | 85.4 |
| Aged 40 – 59 | 80.6 | 74.7 | 75.9 | 64.3 | 58.2 | 56.0 | 46.7 | 37.8 | 38.7 | 33.8 | 31.1 | 38.5 | 91.9 |
| Aged 60 and over | 68.6 | 63.4 | 59.5 | 60.2 | 46.7 | 58.0 | 47.3 | 36.7 | 36.9 | 31.9 | 59.1 | 86.2 | 185.3 |
| *Homicides* | | | | | | | | | | | | | |
| Aged 0 – 9 | 0.0 | 0.0 | 0.0 | 0.9 | 0.9 | 0.9 | 0.8 | 4.0 | 0.8 | 3.8 | 3.8 | 0.0 | 98.9 |
| Aged 10– 19 | 5.1 | 1.0 | 9.1 | 3.2 | 3.4 | 4.9 | 5.9 | 5.7 | 5.4 | 0.0 | 2.6 | 51.0 | 0.0 |
| Aged 20 – 39 | 33.4 | 24.5 | 28.7 | 31.5 | 27.0 | 25.6 | 22.2 | 17.5 | 17.0 | 16.1 | 15.9 | 47.6 | 98.8 |
| Aged 40 – 59 | 49.0 | 47.6 | 43.3 | 29.4 | 39.4 | 25.1 | 26.2 | 22.3 | 22.0 | 20.6 | 16.8 | 34.3 | 81.5 |
| Aged 60 and over | 23.3 | 22.9 | 15.4 | 16.1 | 15.4 | 9.8 | 6.1 | 8.0 | 12.1 | 13.4 | 13.9 | 59.6 | 103.6 |

Source: calculated on the basis of the data of statistical digests "Demographic yearbook of the Vologda Oblast in 2000–2011" and "Sex and age structure of the Vologda Oblast population in 2000–2011" .

Figure 6. Victimization rate among minors in the Russian Federation




Source:Youth in Russia, 2010: statistical digest. UNICEF, Rosstat. Moscow: Russian Statistics, 2010.

On the territory of the Russian Federation in the 2000–2011 period the number of underage crime victims (up to 17 years old inclusively) declined from 104.1 to 93.2 thousand people. In the same period, the given indicator fell from 1991.4 to 1656.7 thousand people among the rest of the population. However, criminal activity under 14 years of age is very low, hence, it would be more correct to consider the 14–17 age group, the indicator in which is 3 times higher *(fig. 6)*.

Table 8. Homicide and suicide mortality rate among men and women (per 100 thousand of population)

| Population category | | 2000 | 2003 | 2005 | 2007 | 2009 | 2010 | 2011 | 2011 to 2000, % | 2011 to 2005, % |
|---|---|---|---|---|---|---|---|---|---|---|
| *Vologda Oblast** | | | | | | | | | | |
| Men | Suicides | 101.2 | 98.2 | 71.3 | 65.8 | 52.8 | 57.7 | 47.0 | 46.4 | 65.9 |
| | Homicides | 61.3 | 54.5 | 49.8 | 40.1 | 32.7 | 26.9 | 24.6 | 40.1 | 49.4 |
| Women | Suicides | 18.9 | 12.5 | 11.8 | 9.2 | 9.6 | 4.5 | 7.1 | 37.6 | 60.2 |
| | Homicides | 11.8 | 14.9 | 12.8 | 6.6 | 5.6 | 8.2 | 6.8 | 57.6 | 53.1 |
| Russian Federation | | | | | | | | | | |
| Men | Suicides | 70.3 | 64.9 | 58.1 | 51.6 | 47.3 | n/d | n/d | – | – |
| | Homicides | 45.2 | 47.2 | 40.4 | 29.2 | 24.4 | n/d | n/d | – | – |
| Women | Suicides | 11.8 | 11.0 | 9.8 | 9.6 | 8.5 | n/d | n/d | – | – |
| | Homicides | 13.3 | 13.4 | 11.5 | 8.1 | 7.0 | n/d | n/d | – | – |

* Data on the homicide mortality rate in the Vologda Oblast – for able-bodied population.
Source: Demopgraphic yearbook of the Vologda Oblast for 2000–2012.

Homicide and suicide mortality rate is 5–6 times higher among men than women. This ratio has remained stable in the 2000–2011 period in the Vologda Oblast, as well as in the country on average *(tab. 8)*.

The increased level of suicides among men is noted in many classical (P. Sorokin, E. Durkheim) and modern (D. Wasserman[4], G.V. Starshenbaum[5]) studies. Scientists agree that lack of social integration, the sense of loneliness, mental anguish constitute the main factor in suicidal behaviour. For example, the fact that most suicides are committed by men of 45–50 years of age, who at this age start developing health problems and don't know how to deal with ageing. As a result of this, they no longer feel supported by their wives, who are much-in-demand at this period by children or grandchildren. In addition, men painfully react to the loss of employment that is the main source of family income, and work team that is one of their most important social groups for them.

The number of crime victims among men is annually higher than among women *(fig. 7)*, due to the differences in terms of socialization, as well as the greater involvement of men in outdoor activities [4, p. 116].

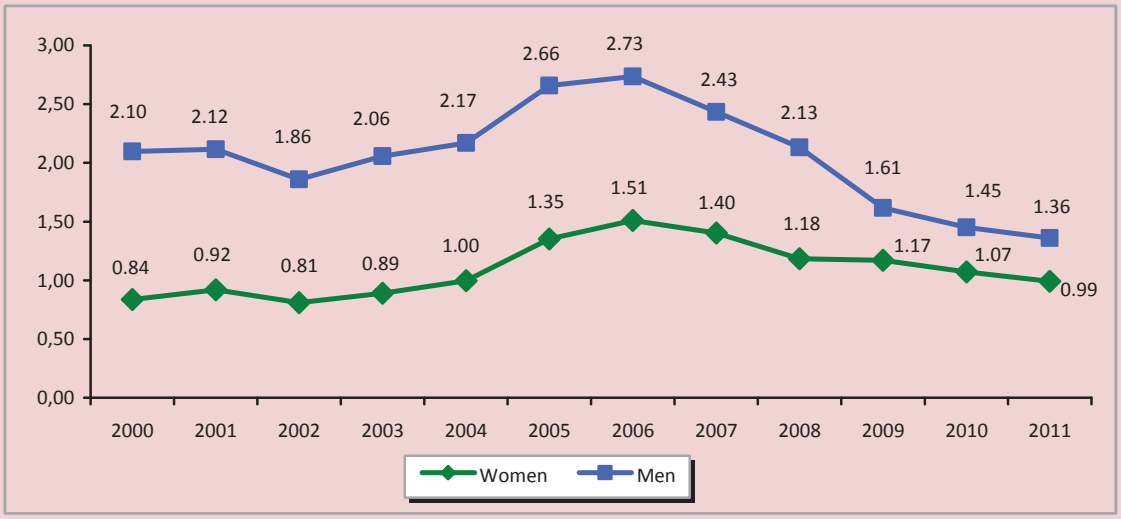
Crime tendencies in both population categories under review are generally identical: decline in the number of crime victims in the 2002–2004 period due to the adoption of the revised Code of Criminal Procedure (July 2002), according to which many acts that had been previously considered serious crimes, fell under the category of medium-gravity crimes, whereas the number of the registered facts of such crimes remained practically unchanged. The number of crime victims since 2006 has been decreasing worldwide (in the EU countries this tendency has been observed since 2004) [27].

It should also be noted that the ratio of the number of crime victims among men and women considerably reduced throughout the country in the 2000–2011 period (2.5 times in 2000, 1.4 times in 2011), which may be an indirect result of the emancipation process. Thus, as early as in the 19th century, experts predicted that gender equalization would either reduce or completely eliminate the differences in the criminal activities of men and women. However, the differences yet remain [4, p. 109].

[4] Danuta Wasserman – Doctor of Medicine and Philosophy, Professor of Psychiatry and Suicidology at the National Institute for Psychosocial Medicine, Stokholm Karolinska Institute (Sweden), Head of the Swedish National Centre for Suicide Research and Prevention of Mental Ill-health.

[5] Starshenbaum Gennadii Vladimirovich – Board Certified in Psychiatry and Psychotherapy, Ph.D. in Medicine, Associate Professor at the RAS Institute of Psychology and MSU Institute of Psychoanalysis.

Figure 7. Share of male and female crime victims (% of the population size of each gender)




Source: Russian statistical yearbook. 2012: statistical digest. Rosstat. Moscow, 2012.

At the regional level, the "convergence" tendency of the victimization level among men and women is even more distinct. According to the opinion polls, conducted on the territory of the Vologda Oblast, the share of men and women among the victims to offences or acts of hooliganism is almost the same (as follows from 2012 data, 52.4 and 47.6%, respectively).

The ratio of suicides and homicides in urban and rural territories of the Vologda Oblast is similar to the all-Russian one: rural population dies by homicide or suicide approximately 1.52 times more often than the urban population *(tab. 9)*. According to the authors, the main reason lies in harsher social and economic living conditions in rural areas. Thus, in 2010 the income of urban and rural residents amounted to 12.921 and 9.234 rubles per month respectively, the total amount of available resources made up 14.309 and 10.912 rubles per month. The expenses on alcoholic drinks accounted for 1.8 and 2.5% respectively out of total expenditures (1.8 and 2.9% in 2009). The number of the unemployed among the urban and rural population in 2010 amounted to 6.5 and 11.2% out of the total number of economically active population (6.9 and 10.4% in 2009).

The increased level of homicides and suicides in rural territories is typical not only for the Vologda Oblast, but for the rest of NWFD regions *(tab. 10)*. It should also be noted that the Vologda Oblast occupies the 4th place among Northwestern regions with regard to the urgency of the issue in rural areas.

Social minorities of different kinds (immigrants, refugees, displaced persons) are representatives of risk groups, which is associated with their adaptation and assimilation in a new society.

High dependency on the state of social health results in the increased victimization of these population categories. For example, women, children, the elderly depend on the stability of the family as a social institution. At the same time, the number of immigrants, alcohol abusers and other categories is a direct consequence of social processes, the degree of population adaptation to the changing social environment.

Table 9. Homicide and suicide mortality rate in urban and rural territories (per 100 thousand of population)

| Territory | | 1990 | 1995 | 2000 | 2005 | 2010 | 2011 | 2011 to 1990 (%) | 2011 to 2005 (%) |
|---|---|---|---|---|---|---|---|---|---|
| *Vologda Oblast* | | | | | | | | | |
| City | Suicides | 26.3 | 49.8 | 47.3 | 29.0 | 16.6 | 14.8 | 56.3 | 51.0 |
| | Homicides | 13.9 | 25.8 | 26.1 | 21.1 | 9.8 | 10.3 | 74.1 | 48.8 |
| Village | Suicides | 40.2 | 71.1 | 79.3 | 60.9 | 47.5 | 46.8 | 116.4 | 76.8 |
| | Homicides | 16.4 | 20.1 | 27.9 | 26.8 | 24.0 | 16.0 | 97.6 | 59.7 |
| *Russian Federation* | | | | | | | | | |
| City | Suicides | 24.2 | 37.8 | 33.8 | 26.4 | 18.1 | n/d | – | – |
| | Homicides | 13.9 | 32.3 | 28.7 | 24.2 | 12.0 | n/d | – | – |
| Village | Suicides | 32.7 | 51.5 | 53.9 | 47.9 | 38.2 | n/d | – | – |
| | Homicides | 15.4 | 26.5 | 27 | 26.9 | 16.8 | n/d | – | – |

Source: Federal State Statistics Service database. Available at: www.gks.ru

Table 10. Suicide rate in urban and rural areas by NWFD (deaths per 100 thousand population, 2010)*

| Territory | Urban territories | | Rural territories | |
|---|---|---|---|---|
| | Suicides | Homicides | Suicides | Homicides |
| **Russian Federation** | 18.1 | 12.0 | 38.2 | 16.8 |
| **Northwestern Federal District** | 17.1 | 10.6 | 44.6 | 21.8 |
| Republic of Karelia | 22.0 (4) | 12.5 (5) | 45.2 (5) | 16.2 (6) |
| Komi Republic | 28.0 (2) | 17.7 (1) | 82.1 (1) | 42.7 (1) |
| Arkhangelsk Oblast | 31.3 (1) | 16.0 (2) | 63.2 (2) | 26.6 (3) |
| **Vologda Oblast** | **16.6 (7)** | **9.8 (8)** | **47.5 (4)** | **24.0 (4)** |
| Kaliningrad Oblast | 21.3 (5) | 9.6 (9) | 31.0 (7) | 12.2 (8) |
| Leningrad Oblast | 20.8 (6) | 13.2 (4) | 26.5 (8) | 15.2 (7) |
| Murmansk Oblast | 13.9 (9) | 10.5 (7) | 12.2 (9) | 8.7 (9) |
| Novgorod Oblast | 22.7 (3) | 15.1 (3) | 44.5 (6) | 29.5 (2) |
| Pskov Oblast | 16.2 (8) | 11.4 (6) | 49.0 (3) | 19.3 (5) |
| Saint Petersburg | 10.8 (10) | 7.5 (10) | 0.0 (10) | 0.0 (10) |

* The region's position in NWFD is shown in brackets.
Source: Federal State Statistics Service database. Available at: www.gks.ru

Victim lifestyle is characterized by an individual's choice of the behaviour type (conscious or unconscious, independent or influenced by circumstances), increasing the degree of danger and possibilities of becoming a victim of violence. High victimity is characteristic of the lifestyle of marginalized population groups (homeless people, neglected children, beggars, etc.), refugees, forced migrants, immigrants, and those population categories that are to deal with objective difficulties of socialization (such as low income, lack of employment). The number of people, defined as high-risk crime victims, is presented in *table 11*.

Thus, social situation forms a certain level of victimization on the territory of the country, that is, creates a social stratum, the representatives of which are at greater risk of falling victim to crime due to their personal qualities and behavioural stereotypes. Their number depends on the standard and quality of living of the population, political and economic stability, operating efficiency of social institutions. The number of victims on the territory of the Russian Federation has been decreasing since 2005, following the decline in the crime rate. Nevertheless, the urgency of the victimization issue remains acute due to rather high share of the population, included in the risk group.

Table 11. Social groups with high victimity risk

| Population category | Russian Federation | | | Northwestern Federal District | | | Vologda Oblast | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2005 | 2010 | 2000 | 2005 | 2010 | 2000 | 2005 | 2010 |
| Number of the unemployed (per 10 thousand people) | 525.3 | 367.8 | 394.5 | 497.9 | 304.1 | 341.3 | 424.7 | 274.1 | 433.3 |
| Number of persons receiving substandard income (in % of total population) | 29.0 | 17.7 | 12.5 | 33.2 | 17.3 | 13.9 | 25.5 | 18.3 | 16.8 |
| (per 100 thousand of population) | 40.4 | 6.2 | 1.5 | 28.0 | 1.1 | 0.4 | 18.6 | 0.1 | 0.0 |
| Number of arrived migrants (per 10 thousand of population) | 181.6 | 145.9 | n/a | 170.3 | 130.8 | n/a | 146.2 | 101.9 | n/a |
| Number of alcoholics and people diagnosed with alcoholic psychosis (per 100 thousand of population) | 130.6 | 146.2 | 107.7 | 131.1 | 141.9 | 99.0 | 98.8 | 150.2 | 104.4 |
| Number of drug addicts (per 100thousand of population) | 50.7 | 17.0 | 17.4 | 35.6 | 17.7 | 18.3 | 28.6 | 11.6 | 11.0 |
| Source:Russian Statistical yearbook, 2010: statistical digest. Rosstat. Moscow., 2011. | | | | | | | | | |

The research conducted on the territory of the Vologda Oblast, showed that every third oblast resident displays symptoms of depression and experiences such negative emotions, like fear, anguish, apathy, anger. From 20 to 30% of the oblast residents are socially passive, often get in conflict situations and have problems with communication.

The significant share of population with characteristics of social disintegration, does not imply that all these people will attempt to commit suicide or fall victim to crimes.

However, they are at risk, and their growing number is a factor contributing to the urgency of the issues of crime and suicidal behaviour as social phenomena and social health indicators. This necessitates more thorough study of the issues, related to the characteristics of the social disintegration of the population, and the execution of research on the given subject, as well as the adoption of measures eliminating the risk factors of the social environment, furthering the transformation of an individual into a crime and suicide victim.

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# Territorial mobility of population in the context of search for happiness

*The author of the article suggests considering the territorial mobility of population as the migration, aimed at finding happiness. Such factors as 'health', 'employment security', 'standard of living', 'justice' have been examined as the components of happiness. These factors affect the psychological state of people, their positive or negative feelings. Differentiation of the given factors was revealed to influence the territorial mobility of the population of the studied territories in case of the republics and oblasts of the Volga Federal District, with the two factors, i.e. 'employment security' and 'standard of living', being decisive in shaping the direction and intensity of migration flows of population in the pursuit of happiness.*

*Territorial mobility, migration, factors of happiness, emotions, health, standard of living, employment security, justice.*

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The mobility of certain individuals, social communities and population in general, living within the boundaries of various territorial formations, is one of the social processes used in the adaptation practices of the people in response to environmental changes and differentiation.

The term 'mobility' has several meanings. According to a well-known English sociologist J. Urry, this term is used to define something that moves or is capable of moving (mobile man, mobile phone, etc.); in the sense of a mob, an unruly crowd; as upward or downward social mobility in a clear cut vertical hierarchy of social positions; and to define migration flows [1, p. 201].

The present article examines mobility processes, manifesting themselves as territorial movement (migration) of people.

The scale of the territorial mobility of population can be observed through migration flows resulted from the change of political forces and factors within the boundaries of the Russian Empire, later the Soviet Union throughout the 20th century.

High rates of urbanization of the Russian Empire in the beginning of the 20th century caused massive relocation of residents of Russian rural areas to cities. This led to the fact that, as Zh. A. Zayonchkovskaya notes, in the 1897–1913 period the number of citizens increased by 55%, while the total population of the country rose by 21% [2, p. 3].

Military actions and associated food shortages in the cities during the First World War and later the Civil War caused part of the urban population to resettle back to rural areas, and compelled defeated participants of the White movement, members of their families and numerous representatives of the social classes, facing repressions, to emigrate from the country.

The migration in the Soviet during the 1920s–1930s was determined by the country's industrialization, the construction of transportation infrastructure. During the Great Patriotic War, the migration was related to the need to evacuate civilian population rearward, and in later periods it was connected with the implementation of the Party's and Government decisions to reclamate virgin and fallow lands, Nonblack Soil Zone (the second virgin land), to build the Baikal-Amur Mainline, etc.

In modern conditions the territory of the country is sufficiently developed, but economically it is heterogeneous. Stable peaceful life is observed in most constituent entities of the Russian Federation; however, there are several problem territories, living on which is quite dangerous. Multidirectional migration flows are observed in various constituent entities of the Russian Federation due to the specified circumstances.

A.Yu. Zavalishin defines migration as a behavior constituting a 'system of economic behavioral practices, based on the determination to use the differences of economic conditions (labour costs, living standards, etc.) in different parts of the country or world, by moving from a less favorable to a more favorable territory in socio-economic terms' [3, p. 24].

The author of the article shares the opinion of A.Yu. Zavalishin with regard to the fact that human behaviour, including the territorial mobility of certain individuals and social groups, is determined by their economic interests and economic way of thinking.

However, the author believes that economic interests of any subject of migration are only one of several reasons for territorial mobility. Therefore, the article suggests to examine the peculiarities of population territorial mobility, with regard to the sensory aspects of this phenomenon, on the basis of J. Urry's point of view that certain actants depend on specific feelings, and mobility to or out of particular places is founded on certain ways of feeling [4, p. 19], namely when population searches for happiness, and is ready to change or has been changing its position in space.

Therefore, the article solves a number of tasks. Firstly, the analysis of migration flows in the republics and oblasts of the Volga Federal District (VFD) was carried out. Secondly, the intensity and direction of these flows was compared to the rate of 'happiness indicators', typical of comparable territories and defining migration attractiveness of the areas.

Ancient thinkers and modern philosophers, sociologists and economists expressed there opinion of happiness. Happiness is understood differently due to the religious beliefs, age, sex, well-being, cultural traditions, etc. of the people, willing to achieve happiness or trying to describe this state of mind.

The author based this study on the ancient Greek philosopher Plato's conception of happiness, in the first place, and on the work of modern American scientist M. Argyle, in the second place. Plato considered the following five components of happiness: reasonable desires, sound feelings and body, success in activities, good reputation among people and wealth [5, p. 82-83].

When responding to the question how to study and measure happiness, M. Argyle concluded that 'happiness is a single factor of human experience, but it consists of, at least, three somewhat independent factors: life satisfaction, positive emotions and the absence of negative emotions' [6, p. 33].

When comparing these statements, a certain correlation can be found between these views, in spite of the huge time gap. All of the happiness components, marked out by Plato, if present in the life of a man of any time period, lead to life satisfaction and the prevalence of positive emotions over negative ones in the man's life. Thus, an individual experiences happiness according to characteristics distinguished by M. Argyle.

Russian scientists consider the issue of human happiness both in theory and in practice. For example, V.S. Bochko believes that human happiness becomes the target vector of integrative strategic development of the territory, when governing a region. In this case, happiness is manifested in subjective satisfaction with life and is related to life quality. Noting the complexity of the concept of happiness, which includes material, moral and sociocultural components, V.S. Bochko points out the scientific category of a person's 'economic happiness', which is, according to him, 'a feeling of satisfaction and well-being, manifesting itself in the absence of anxieties about work, the certainty of more or less decent income, accessibility of professional education, guaranteed quality medical care and balanced receipt of other social benefits' [7, p. 27].

Another representative of the Ural scientific school V.A. Antropov, arguing with V.S. Bochko, denotes the 'circularity' of the above definition and the impossibility of its application to diagnose the state of happiness, which, according to V.A. Antropov, is a psychological condition of an individual in the process of achieving the desired goal [8, p. 99-100].

It should be noted that in order to assess the population's life in the RF regions, A.S. Akhremenko uses some of the components, contributing to people's positive emotions, such as the ability to be healthy, to live in a safe environment, etc. [9, p. 593-603].

Obviously, the territories characterized by high life quality are attractive for living and to a certain extent can be considered as areas with high happiness potential. But while A.S. Akhremenko links the ratings of the life quality of the population of the territory to successful governance, the author of the article sets another objective. The assessment of the regions in the context of potential happiness of the people, living on a specified territory, and the study of the extent to which migration activity is connected with 'the pursuit of happiness' is a distinctive feature of the approach suggested in this article.

The second important distinctive feature is the suggestion of A.S. Akhremenko to include the region's migration attractiveness in the calculation to determine the rating of regions by indicators of life quality, among 12 indicators, proposed by him, equating it to coefficients of migration growth. In contrast to A.S. Akhremenko, the author of this article assumes that the rate of migration growth can not be used for the calculations to determine the integral indicator of the territory attractiveness neither in the context of the life quality of the population of the territory, nor in the context of search for happiness when moving from one territory to another. Indicator of migration growth is derived from the variables determining the territory attractiveness (indicators of health, living standards, etc.), and depends on them.

The hypothesis of the research is that high – low satisfaction degree continuum with regard to the conditions of living on a certain territory, contingent on health capacity, life quality, justice as a factor of psychological comfort and employment security, i.e. components affecting the psychological sphere of an individual, determines positive or negative emotions experienced by an individual or a group of individuals and ultimately causes the population of the territory, which is unfavourable for living due to the above characteristics, to decide in favour of relocation.

In order to confirm the suggested hypothesis, the author collected, structured and analyzed the required amount of statistical data and conducted analytical work to identify this dependence. At the first stage of the research, migration flows in the republics and oblasts of the Volga Federal District were analyzed; the average values of the indicators of the migration growth for the 2005–2011 period were calculated *(tab. 1)*.

All of the necessary calculations were performed afterwards and the intensity and direction of migration flows was compared to the indicators of life expectancy, unemployment rate, purchasing power rate, and the Gini coefficient, i.e. the indicators characterizing health, employment security, well-being, and the degree of psychological comfort of the population in the studied regions *(tab. 2 – 6)*.

The comparison of the territories is based on statistical data of the Federal State Statistics Service of the Russian Federation for the 2005–2011 period [10]. The seven-year time series is sufficient for dynamic comparisons and allows the possibility of determining trends in the development of the studied processes.

As follows from table 1, in the period under review migration population growth was observed only in 5 out of 14 subjects of the Russian Federation included into VFD, with the highest indicators of the migration growth being registered in the Samara and Nizhny Novgorod oblasts and in the Republic of Tatarstan. The Volga Federal District, as a whole, is characterized by migration decrease. The Kirov and Orenburg oblasts, Perm Krai, Udmurt and Chuvash republics are among the areas with the most negative indicators of migration growth.

The factors of 'life expectancy' and 'rate of diseases (among patients with a diagnosis confirmed for the first time)' were examined as the indicators characterizing population health in the republics and oblasts of VFD for 2005 and 2011 *(tab. 2)*.

According to the above data, the indicators of life expectancy have significantly increased in the period under review in all the subjects of the Russian Federation included into the Volga Federal District, without exception. On average, the expected longevity increase in the Volga Federal District makes 4 years.

Table 1. Dynamics of migration indicators in the republics and oblasts of VFD in 2005 – 2011 (persons per 10 000 population)

| Territory | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Annual average | Rating position |
|---|---|---|---|---|---|---|---|---|---|
| **VFD** | **-8** | **-7** | **2** | **2** | **5** | **-12** | **-4** | **-3.1** | |
| Samara Oblast | 65 | 50 | 36 | 40 | 31 | 19 | 26 | 38.1 | 1 |
| Republic of Tatarstan | 22 | 36 | 31 | 30 | 32 | 10 | 32 | +27.6 | 2 |
| Nizhny Novgorod Oblast | 13 | 11 | 21 | 20 | 15 | 11 | 21 | +18.9 | 3 |
| Penza Oblast | 21 | 25 | 18 | 9 | 13 | -3 | -3 | +11.4 | 4 |
| Republic of Bashkortostan | -3 | -6 | 13 | 14 | 17 | 2 | -23 | 2 | 5 |
| Saratov Oblast | -16 | -8 | -3 | -5 | 5 | -15 | -4 | -6.6 | 6 |
| Republic of Mordovia | 3 | -2 | -8 | -21 | -10 | -9 | -41 | -12.6 | 7 |
| Mari El Republic | -1 | -16 | -16 | -18 | -10 | -31 | -33 | -17.9 | 8 |
| Ulyanovsk Oblast | -23 | -32 | -9 | -8 | -9 | -35 | -25 | -20.1 | 9 |
| Chuvash Republic | -44 | -37 | -14 | -10 | -8 | -27 | -22 | -23.1 | 10 |
| Udmurt Republic | -12 | -17 | -23 | -24 | -26 | -35 | -25 | -23.1 | 11 |
| Perm Krai | -49 | -46 | -30 | -25 | -27 | -46 | -3 | -32.3 | 12 |
| Orenburg Oblast | -87 | -83 | -34 | -37 | -6 | -47 | -35 | -47.1 | 13 |
| Kirov Oblast | -86 | -80 | -56 | -45 | -37 | -54 | -42 | -57.1 | 14 |
| Source: the information was collected and classified based on [7, p. 90]. | | | | | | | | | |

Table 2. Dynamics of health indicators in the republics and oblasts of VFD in 2005 and 2011

| Territory | Life expectancy, years | | Rating position | | Number of diseases per 1000 people | | Rating position | |
|---|---|---|---|---|---|---|---|---|
| | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 |
| **VFD** | **65.29** | **69.24** | - | - | **810.3** | **877.9** | - | - |
| Republic of Tatarstan | 67.93 | 71.30 | 1 | 1 | 804.5 | 849.8 | 6 | 5 |
| Penza Oblast | 65.61 | 70.23 | 7 | 2 | 848.8 | 760.9 | 8 | 3 |
| Republic of Mordovia | 66.66 | 70.11 | 2 | 3 | 681.8 | 710.3 | 1 | 1 |
| Saratov Oblast | 65.87 | 69.86 | 6 | 4 | 688.4 | 756.4 | 2 | 2 |
| Chuvash Republic | 66.34 | 69.66 | 4 | 5 | 858.6 | 996.9 | 11 | 13 |
| Ulyanovsk Oblast | 65.38 | 69.50 | 8 | 6 | 858.5 | 946.1 | 10 | 11 |
| Kirov Oblast | 64.12 | 69.32 | 11 | 7 | 739.9 | 788.5 | 4 | 4 |
| Republic of Bashkortostan | 66.59 | 69.04 | 3 | 8 | 807.0 | 860.6 | 7 | 7 |
| Samara Oblast | 66.05 | 69.02 | 5 | 9 | 855.3 | 1019.1 | 9 | 14 |
| Udmurt Republic | 64.43 | 68.88 | 10 | 10 | 893.7 | 947.7 | 13 | 12 |
| Nizhny Novgorod Oblast | 63.42 | 68.48 | 13 | 11 | 739.5 | 881.9 | 3 | 9 |
| Orenburg Oblast | 64.86 | 68.31 | 9 | 12 | 891.4 | 851.9 | 12 | 6 |
| Mari El Republic | 63.53 | 68.31 | 12 | 13 | 743.3 | 863.5 | 5 | 8 |
| Perm Krai | 62.28 | 67.52 | 14 | 14 | 894.4 | 937.3 | 14 | 10 |

Source: the information was collected and classified based on [7, p. 346].

However, these indicators varied considerably in 2005, as well as in 2011 in the republics and oblasts of the Volga Federal District (5.75 per year in the first case and 3.78 year in the second case, respectively between the Republic of Tatarstan and the Perm Krai, having polar values of these indicators). Comparing the rating values of the analyzed indicators, it is possible to see that the Republic of Tatarstan, the Republic of Mordovia, and the Penza Oblast were among the most prosperous territories in 2011. The indicators of the Republic of Bashkortostan, the Samara and Orenburg oblasts have worsened. Perm Krai, the Mari El Republic, the Nizhny Novgorod Oblast and the Udmurt Republic were among outsiders (demonstrated the worst indicators).

The table shows the dynamics of disease per 1000 of population. A number of authors suggest using this indicator to assess the territory competitiveness [11]. But when using this indicator, contradictions arise with regard to its estimation. On the one hand, growing number of diseases may indicate health deterioration of the region's population. But, on the other hand, this may be the result of the improving performance of the regional health services, the advancement of diagnostic procedures, a greater number of people, covered by medical examination, etc. Therefore, this parameter of evaluating population health will not be taken into account in further calculations.

Living standards, characterized by the ability of an individual to maintain the required level of life activities, buying necessary goods and services, durables, as well as housing, transport, luxuries, high-status articles, undoubtedly affects the person's satisfaction with life and his/her emotions. This in turn largely affects man's happiness or unhappiness. At the same time these feelings are highly individual in each case, and sometimes 'the rich cry too'.

In order to make an objective comparison of living standards in the studied subjects of the Russian Federation included into the Volga Federal District, the percentage ratio of the fixed market basket price[1] to the nominal accrued wages of workers was determined.

[1] Fixed market basket is a statistical indicator applied for interregional comparisons of population purchasing power throughout the Russian Federation and in regions separately. It is calculated based on consumption volumes and average prices across Russia and its subjects. The fixed market basket includes 83 items of goods and services, comprising 30 types of food products, 41 type of non-food goods, and 12 service types.

As a result, the values characterizing the purchasing power of population in the studied regions have been obtained *(tab. 3)*.

According to the author, this indicator rather objectively reflects living standards of the population of the analyzed regions, as it takes into account the amount of wages, and prices of goods and services, sold within the boundaries of the compared territories.

When comparing the living standards of the population of the studied territories, the author assumes that the higher the ratio of fixed market basket price to wages, the lower the purchasing power, hence, the living standards of the region's population. In such a case, people are not able to save (accumulate) money, spending it only on truly vital needs. Conversely, low percentage of the fixed market basket price indicates a higher well-being of people, the possibility of population to incur expenditures on education, purchase of real property, cars, payment of travel expenses, luxury goods, etc.

As follows from table 3, the percentage ratio of the fixed market basket price to the amount of wages for the analyzed period in the Volga Federal District as a whole and in all constituent regions has decreased considerably, which enables to conclude that population living standards in all regions of the Volga Federal District have been rising. For example, the population of the Republic of Tatarstan (the most prosperous in terms of the given indicator) spent 56% of wages for the most necessary products and services in 2005, but only 39% in 2011.

Population expenses on the fixed market basket of goods and services decreased from 79 to 60% in the Republic of Mordovia, which is at the bottom of the rating. Thus, the reduction of the population expenditures on the fixed set of goods and services amounted to 17, and 19% respectively.

At the same time, the regional differentiation of population purchasing power practically remained the same, which is illustrated by the following facts. The gap between the Republic of Tatarstan ranking first by the purchasing power indicator, and the Republic of Mordovia which is at the bottom of the rating, made up 23% in 2005, and 21% in 2011.

Table 3. Dynamics of the purchasing power of population incomes in the republics and oblasts of VFD in 2005 and 2011

| Territory | Nominal accrued wages of workers, rubles per month* | | Fixed market basket price, rubles per month** | | The ratio of fixed market basket price to wages, % | | Rating position | |
|---|---|---|---|---|---|---|---|---|
| | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 |
| **VFD** | **6473.3** | **17543.6** | **4225.1** | **8180.7** | **65** | **47** | - | - |
| Republic of Tatarstan | 7067.8 | 20009.4 | 3939.9 | 7797.3 | 56 | 39 | 1 | 1 |
| Republic of Bashkortostan | 6612.0 | 18397.0 | 3966.6 | 7939.9 | 59 | 43 | 2 | 2 |
| Orenburg Oblast | 6163.5 | 17024.9 | 3898.1 | 7726.3 | 63 | 45 | 5 | 3 |
| Nizhny Novgorod Oblast | 6533.4 | 18492.4 | 4502.0 | 8608.1 | 69 | 47 | 7 | 4 |
| Saratov Oblast | 5439.3 | 16204.7 | 4056.6 | 7545.0 | 75 | 47 | 10 | 5 |
| Perm Krai | 7748.9 | 18773.3 | 4725.5 | 9215.2 | 61 | 49 | 3 | 6 |
| Udmurt Republic | 6373.3 | 15843.3 | 3945.8 | 7821.9 | 62 | 49 | 4 | 7 |
| Penza Oblast | 5206.8 | 16362.2 | 4054.3 | 8027.5 | 78 | 49 | 13 | 8 |
| Samara Oblast | 7764.9 | 18600.3 | 5086.2 | 9325.1 | 66 | 50 | 6 | 9 |
| Ulyanovsk Oblast | 5343.8 | 15008.6 | 4105.7 | 7927.8 | 77 | 52 | 12 | 10 |
| Chuvash Republic | 5073.1 | 14896.3 | 3754.4 | 7822.2 | 74 | 53 | 8 | 11 |
| Mari El Republic | 4938.2 | 14001.2 | 3740.0 | 7633.3 | 75 | 54 | 9 | 12 |
| Kirov Oblast | 5695.8 | 14579.0 | 4330.4 | 8559.5 | 76 | 59 | 11 | 13 |
| Republic of Mordovia | 5060.7 | 13305.1 | 4012.7 | 7985.0 | 79 | 60 | 14 | 14 |

Source: the information was collected, classified and calculated independently based on [7, p. 171*; p. 956**].

The purchasing power disparity in the regions has changed only by 2% in seven years indicating the stability of this phenomenon in Russia.

The sense of justice, felt by an individual, particularly concerning the fair income distribution in society, has a great influence on human emotions and emotional overtones, hence, on the person's happiness or unhappiness. The Gini coefficient (index of income concentration), estimated for the region, allows the fairness of income distribution to be assessed. The Gini coefficient characterizes the deviation degree of the line of actual total income distribution from the line of equal income distribution. The coefficient value may vary from 0 to 1, the higher the value, the more uneven the distribution incomes. Obviously, an ordinary man does not survey data books and does not possess exact information on the subject. Nevertheless, he/she eagerly absorbs information concerning the surrounding reality and sharply feels income inequality in society, when assessing the quality of housing, cars, leisure time activities, etc. of other people.

As follows from *table 4,* the gap between the rich and the poor has been widening in all the studied territories. About one third of the regions has maintained the same rating position with regard to income inequality in the seven-year period (the Samara and Kirov oblasts, Perm Krai, the republics of Tatarstan and Bashkortostan). The rating positions of other regions have changed insignificantly. Faster rates of social stratification by income level are observed in the regions with the initially low Gini coefficient (the Penza, Nizhny Novgorod and Kirov oblasts, the Udmurt and Mari El Republics). However, the growth rates of the Gini coefficient have decreased in the Samara, Perm and Ulyanovsk oblasts, the republics of Tatarstan and Bashkortostan, i.e. the territories with the highest income inequality.

Unemployment level has been already mentioned as one of the indicators of population employment security. Lower unemployment rate results in a higher level of employment security, as in this case the sellers of labour services reinforce their positions: when the unemployment is low, they have better chances of increasing wages and improving working conditions. Growing unemployment in the regions leads to reverse processes.

The statistical indicators characterizing general unemployment dynamics and disparity in the republics and oblasts of the Volga Federal

Table 4. Dynamics of the Gini coefficient in the republics and oblasts of VFD in 2005 and 2011

| Territory | Gini coefficient | | Rating position | | Absolute growth 2011–2005 | Rating position by absolute growth |
|---|---|---|---|---|---|---|
| | 2005 | 2011 | 2005 | 2011 | | |
| Kirov Oblast | 0,323 | 0,362 | 1 | 1 | 0,039 | 11 |
| Chuvash Republic | 0,335 | 0,363 | 4 | 2 | 0,028 | 8 |
| Republic of Mordovia | 0,337 | 0,367 | 5 | 3 | 0,030 | 9 |
| Udmurt Republic | 0,324 | 0,372 | 2 | 4 | 0,048 | 13 |
| Saratov Oblast | 0,353 | 0,375 | 7 | 5 | 0,022 | 6 |
| Penza Oblast | 0,330 | 0,378 | 3 | 6 | 0,048 | 14 |
| Orenburg Oblast | 0,357 | 0,382 | 9 | 7 | 0,025 | 7 |
| Ulyanovsk Oblast | 0,368 | 0,387 | 10 | 8 | 0,019 | 3 |
| Mari El Republic | 0,356 | 0,388 | 8 | 9 | 0,032 | 10 |
| Nizhny Novgorod Oblast | 0,350 | 0,393 | 6 | 10 | 0,043 | 12 |
| Republic of Tatarstan | 0,391 | 0,411 | 11 | 11 | 0,020 | 4 |
| Republic of Bashkortostan | 0,405 | 0,426 | 12 | 12 | 0,021 | 5 |
| Perm Krai | 0,420 | 0,426 | 13 | 13 | 0,006 | 2 |
| Samara Oblast | 0,438 | 0,442 | 14 | 14 | 0,004 | 1 |

Source: the information was collected, classified and calculated independently based on [7, p. 183].

District in 2005 and 2011 *(tab. 5)*, show that the overall unemployment rate throughout the Volga Federal District decreased by 0.7%. But region-wise the changes were extremely uneven: while in the Chuvash Republic the unemployment rate reduced by 3.7% (from 11.4 to 7.7%), in the Kirov Oblast it increased by 1.3% in absolute terms (from 7.1 to 8.4%).

The author notes that the Kirov and Nizhny Novgorod oblasts, Perm Krai, the Mari El Republic and the Republic of Bashkortostan are at the bottom of the rating of overall unemployment rate in 2011 and its decline in the 2005–2011 period, with the regions taking 9th–14th positions, except for the Chuvash Republic, which ranked 12th by the unemployment level in 2011, but has the fastest rate of unemployment decrease.

In 2011 the number of the unemployed in six regions of the Volga Federal District at the top of the rating decreased faster than in the regions, which were among outsiders, except for the Samara Oblast, in which the unemployment rate declined slowly, due to the fact that in 2005 the oblast was one of the leaders in this indicator among the republics and oblasts of VFD.

In order to prove the thesis that it is the employment security and living standards in the regions that are the crucial factors in the decision to relocate, *table 6* was filled in by the certain algorithm:

1. The rating values of the republics and oblasts of VFD by the indicators of life expectancy, the ratio of the fixed market basket price to wages, the Gini coefficient and overall unemployment for 2005 and 2011 were transferred from *tables 2, 3, 4* and *5* to *table 6*.

2. The average rating values of the above indicators for the studied periods were estimated.

3. The average rating values of the indicators for 2011 were compared with the rating values of the indicators of the average annual population growth in the regions.

The author highlights that *table 6* comprises the average rating values of the indicators both for 2011 and for 2005, making it possible to observe the dynamics of the compared indicators, and to consider its effect on the rate of population territorial mobility in the studied regions.

Table 5. Dynamics of overall unemployment in the republics and oblasts of VFD in 2005 and 2011

| Territory | Overall unemployment, % | | Rating position by unemployment | | 2011 to 2005 unemployment growth rate, % |
|---|---|---|---|---|---|
| | 2005 | 2011 | 2005 | 2011 | |
| **VFD** | **7.3** | **6.6** | - | - | **-0.7** |
| Republic of Tatarstan | 6.7 | 4.7 | 4 | 1 | -2.0 |
| Samara Oblast | 5.3 | 5.1 | 1 | 2 | -0.2 |
| Republic of Mordovia | 7.0 | 5.2 | 5 | 3 | -1.8 |
| Penza Oblast | 6.5 | 5.3 | 3 | 4 | -1.2 |
| Saratov Oblast | 9.1 | 6.0 | 11 | 5 | -3.1 |
| Orenburg Oblast | 9.4 | 6.3 | 12 | 6 | -3.1 |
| Ulyanovsk Oblast | 7.7 | 6.9 | 9 | 7 | -0.8 |
| Udmurt Republic | 7.8 | 7.0 | 10 | 8 | -0.8 |
| Nizhny Novgorod Oblast | 6.0 | 7.2 | 2 | 9 | 1.2 |
| Perm Krai | 7.0 | 7.6 | 6 | 10 | 0.6 |
| Republic of Bashkortostan | 7.1 | 7.7 | 7 | 11 | 0.6 |
| Chuvash Republic | 11.4 | 7.7 | 14 | 12 | -3.7 |
| Kirov Oblast | 7.1 | 8.4 | 8 | 13 | 1.3 |
| Mari El Republic | 9.9 | 10.0 | 13 | 14 | 0.1 |

Source: the information was collected, classified and calculated independently based on [7, p. 171; p. 956].

Table 6. Bridge table of the rating values of the factors affecting population emotions to migration growth in the republics and oblasts of VFD in 2005 and 2011*

| Territory | Rating position | | | | | | | | Average values of rating positions by four indicators | | Rating position | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Life expectancy | | Ratio of the fixed market basket price to wages | | Gini coefficient | | Overall unemployment | | | | Average rating values by four indicators in 2011 | Annual average migration growth in 2005–2011 |
| | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 | 2005 | 2011 | | |
| Republic of Tatarstan | 1 | 1 | 1 | 1 | 11 | 11 | 4 | 1 | 4.25 | 3.50 | 1 | 2 |
| Saratov Oblast | 6 | 4 | 10 | 5 | 7 | 5 | 11 | 5 | 8.50 | 4.75 | 2 | 6 |
| Penza Oblast | 7 | 2 | 13 | 8 | 3 | 6 | 3 | 4 | 6.50 | 5.00 | 3 | 4 |
| Republic of Mordovia | 2 | 3 | 14 | 14 | 5 | 3 | 5 | 3 | 6.50 | 5.75 | 4 | 7 |
| Orenburg Oblast | 9 | 12 | 5 | 3 | 9 | 7 | 12 | 6 | 8.75 | 7.00 | 5 | 13 |
| Udmurt Republic | 10 | 10 | 4 | 7 | 2 | 4 | 10 | 8 | 6.50 | 7.25 | 6 | 11 |
| Chuvash Republic | 4 | 5 | 8 | 11 | 4 | 2 | 14 | 12 | 7.50 | 7.50 | 7 | 10 |
| Ulyanovsk Oblast | 8 | 6 | 12 | 10 | 10 | 8 | 9 | 7 | 9.75 | 7.75 | 8 | 9 |
| Republic of Bashkortostan | 3 | 8 | 2 | 2 | 12 | 12 | 7 | 11 | 6.00 | 8.25 | 9 | 5 |
| Nizhny Novgorod Oblast | 13 | 11 | 7 | 4 | 6 | 10 | 2 | 9 | 7.00 | 8.50 | 10 | 3 |
| Kirov Oblast | 11 | 7 | 11 | 13 | 1 | 1 | 8 | 13 | 7.75 | 8.50 | 11 | 14 |
| Samara Oblast | 5 | 9 | 6 | 9 | 14 | 14 | 1 | 2 | 6.50 | 8.50 | 12 | 1 |
| Perm Krai | 14 | 14 | 3 | 6 | 13 | 13 | 6 | 10 | 9.00 | 10.75 | 13 | 12 |
| Mari El Republic | 12 | 13 | 9 | 12 | 8 | 9 | 13 | 14 | 10.5 | 12.00 | 14 | 8 |

* The author's calculations based on Rosstat data.

The table data shows that four out of the fourteen compared regions (the Republic of Tatarstan, the Saratov Oblast, the Penza Oblast, the Republic of Mordovia) topped the rating of the average values of the indicators characterizing the factors affecting population emotions. The same regions were included in the first half of the list with regard to the indicators of annual average migration growth in 2011 (last column of tab. 6), taking the places from the 2nd (the Republic of Tatarstan) to the 7th (Republic of Mordovia) in the corresponding rating.

Three out of four territories (the Mari El Republic, Perm Krai, the Kirov Oblast) are among outsiders, being at the bottom of the list with regard to the indicators of annual average migration growth. The exception is the Samara Oblast that occupies the twelfth place out of fourteen by the average values of the indicators characterizing the factors affecting population emotions, but is the leader in the rating of migration growth.

The Orenburg and Nizhny Novgorod oblasts are in the middle of the list. Their values of indicators contradict the theses of originally formulated hypothesis on the complex impact of such factors as health, living standards, justice, employment security (indicators of 'happiness' or 'unhappiness' on migration flows. The Orenburg Oblast ranks 5th by the average values of 'happiness' indicators, but next to last in the rating of migration growth. The Nizhny Novgorod Oblast, on the contrary, occupies the 10th place in the rating of 'happiness', but tops the rating of the annual average population growth in the studied territories.

Given that the studied correlation between 'happiness' factors and territorial mobility of population has not been confirmed only in three cases out of fourteen, these cases could have been considered as exceptions to the rule. However, in order to look into the causes of incomplete correlation of the analyzed values,

Table 7. Bridge table of rating positions of the ratio of the fixed market basket price to wages and overall unemployment to migration in the republics and oblasts of VFD in 2005 and 2011*

| Territory | Average values of rating positions by two indicators | | Rating position | |
|---|---|---|---|---|
| | 2005 | 2011 | Average rating values by two indicators in 2011 | Annual average migration growth in 2005–2011 |
| Samara Oblast | 3.5 | 5.5 | 4 | 1 |
| Republic of Tatarstan | 2.5 | 1.0 | 1 | 2 |
| Nizhny Novgorod Oblast | 4.5 | 6.5 | 6 | 3 |
| Penza Oblast | 8.0 | 6.0 | 5 | 4 |
| Republic of Bashkortostan | 4.5 | 6.5 | 7 | 5 |
| Saratov Oblast | 10.5 | 5.0 | 3 | 6 |
| Republic of Mordovia | 9.5 | 8.5 | 10 | 7 |
| Mari El Republic | 11.0 | 13.0 | 13 | 8 |
| Ulyanovsk Oblast | 10.5 | 8.5 | 11 | 9 |
| Chuvash Republic | 11.0 | 11.5 | 12 | 10 |
| Udmurt Republic | 7.0 | 7.5 | 8 | 11 |
| Perm Krai | 4.5 | 8.0 | 9 | 12 |
| Orenburg Oblast | 8.5 | 4.5 | 2 | 13 |
| Kirov Oblast | 10.5 | 13.0 | 14 | 14 |

*The author's calculations based on Rosstat data.

the author made additional calculations, in the result of which the average rating values of only two, but not four indicators (the value of the indicator characterizing the ratio of the fixed market basket price to wages, and overall unemployment rate) have been found *(tab. 7)*.

As follows from the table, when considering not four, but only two factors, six regions, leading in the average rating values of indicators of the ratio of the fixed market basket price to wages and overall unemployment rate, and in the indicators of migration growth, top the list of the territories compared. Apart from the Orenburg Oblast, all the other regions from the Republic of Mordovia to the Kirov Oblast, are in the middle and in the bottom of the rating lists under review. It should be noted that the compared paired values vary by no more than three points in all other regions, except for the Mari El Republic and the Orenburg Oblast.

Certainly, the results of the adjusted calculation can not evidence the complete correlation of the analyzed values. But the dependence tendency of the migration growth upon the rate of employment security and population well-being, defined by unemployment in the first case, and by the ratio of the fixed market basket price to wages in the latter, is much more obvious.

Thus, it can be concluded that all four of the examined factors affect the territorial mobility of population. However, such factors as unemployment and living standards are decisive inn shaping the direction and intensity of population migration flows of population in the pursuit of happiness.

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# Assessment of possibilities and mechanisms of innovation development of the regional economy*

*The article dwells on the problems and directions of innovation policy at the federal and regional levels. It is based on the methods of system analysis and expert estimations. The authors prove that it is industrialization that will be the most important factor of scientific and technical progress in the coming years. The capabilities of innovation processes in the North and in the Russian Arctic are analyzed and presented on the basis of expert estimations and forecast trends, among other things.*

*Strategy, economic processes, development, innovation, the North and the Arctic, industrialization, forecast, expert estimations.*

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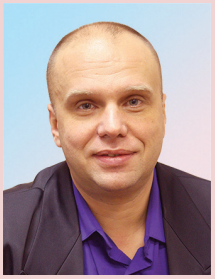

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The Strategy for the development of the Arctic zone of the Russian Federation and national security for the period up to 2020 assumes significantly increased attention to innovation factors of the industrial modernization. In particular, the main threats and risks to socio-economic development are the following: high energy intensity and low efficiency of natural resources extraction, increased costs of the northern production, lack of modern technical means and technologies for search, exploration and development of offshore hydrocarbons in the Arctic conditions, etc.

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In this regard, the measures on state support and stimulation of the economic entities operating in the Arctic zone of the Russian Federation, primarily in the field of the development of hydrocarbon resources, other minerals and aquatic biological resources through the introduction of innovation technologies, the development of transport and innovation infrastructure, are to be elaborated and implemented. It is proposed to stimulate the realization of new projects on the economic development of the Arctic territories by the co-financing out of the budgetary sources of the different levels of the Russian Federation budget system and non-budgetary sources.

In the context of the national plan, it is industrialization that is noted to be the main landmark for the country's economic development. The extent of the 'deindustrialization' of recent years is simply disastrous: while in 1990 Russia accounted for more than 90 thousand of machine tools (including 20 thousand of numerical control machines), in 2012 the country produced only 5 thousand items. Machinery deterioration exceeds 70%.

In these circumstances, it is necessary not only to restore the industrial potential within the fourth technological mode, but also to implement actively the innovation dynamics in the fifth mode. When briefly formulating the conceptual problems of the selection, necessitating Russia's innovation development in the strategic plan, the alternatives are the following:

• spontaneous 'sliding' of the model into 'semi-colonial' economy, which means the consolidation of the country's role as the world's raw materials appendage;

• passive acceptance of standards of conduct and 'participation' in the division of labor, emanating from transnational institutions, considering Russia's interests to a minimum degree;

• reasonable choice of the national strategy for innovation industrial development, suggesting the rightful participation of the country in the formulation and solution of global and national problems;

• elaboration of the proper vector of industrial development due to the preservation of competitive advantages of the resource-based sector, on the one hand, and gradual transition to a new technological mode, based on import substitution, among other things, on the other hand.

The implementation of the last two principles of the strategic choice for the Northern regions will denote the policy of innovation industrialization, differentiated depending on natural-resource potential, and based on the coordination of interests and partnership of the federal and regio-nal authorities, industrial corporations and infrastructure enterprises on construction, transport, etc.

In this regard, the main research objective of the article is to analyze the specifics of the production complex of the Russian North from the positions of industrialization, and to evaluate the opportunities for its dynamics on the basis of innovation. Accordingly, it is proposed to solve the following tasks:

• to consider the need for and features of the national economy industrialization;

• to identify the major constraints and risks for the management in special climatic conditions;

• to analyze statistical data and expert estimates concerning investment and innovation processes in the country's Northern regions;

• to evaluate (draw conclusions) the opportunities for and factors in the innovation development of the regional economy.

Obviously, the Northern regions will retain the raw-material orientation with rather high gravity of export products in the foreseeable future. Possible to increase The production of liquefied natural gas is likely to grow, while some increase in manufacturing industries, in

particular shipbuilding and ship repair, will be observed in the European part. Such strategy, focused on the real demand, complies with the prospective conditions of the global industrial cooperation with long-term conservation of or even increased demand for relevant types of raw materials. At the same time the prospects of raw material orientation of the industrial sector of the Northern regions have certain restrictions and risks that should be considered when forecasting the trends of innovation industrialization:

1. Higher production costs, caused by high labor costs and additional transportation, energy, and other cost types. This can be a significant negative factor in the conditions of increasing international competition.

2. High fluctuation of global commodity markets, caused by growing demand in developing countries, on the one hand, and by the policy of resource conservation, implemented almost everywhere, on the other.

3. The trend of decline in profitability of the commodity sector, due to deteriorating conditions of production, increasing environmental constraints and the rate of deductions for environmental protection.

4. Strategic risks, associated with the constant improvement of opportunities and indicators of transition to alternative types of resources have been growing. This applies first of all to fuel and energy sectors, and, to a lesser extent, to metallurgical sectors.

It is innovation modernization of the resource sectors of the North and the Arctic that will be one of the main factors reducing the risks. In this regard, the fundamental importance is to provide domestic science and technology complexes and enterprises with the orders for new equipment. The Strategy for the development of the Arctic zone of the Russian Federation, which have been already mentioned, stipulates the promotion of sustainable solvent demand for high-tech products, innovation technologies, materials and services in the Arctic zone of the Russian Federation, taking into account the necessity of the formation of the infrastructure when extracting hydrocarbon materials, particularly by improving state procurement system, the procurement system of companies with state participation and the subjects of natural monopolies. It is important to ensure the demand is supplied by domestic producers, based on import substitution, among other things [1].

As for new projects, the investment attractiveness of the Northern and the Arctic regions, in particular, constantly occupy the leading position. Thus, indices of investment competitiveness exceed 1 in most of the regions, make 3.8 in Khanty–Mansi Autonomous Okrug, and 4.1 in Chukotka Autonomous Okrug. Investment competitiveness determines the potential, i.e. the ability of the regions to compete (natural resources, labor potential, transport and energy infrastructures, etc.), while investment activity *(tab. 1)* determines how this potential is used [2].

As the second criteria shows, the Northern and Arctic regions are leading across the country, taking the first five places. This suggests that the industrial production of the resource sectors is the leading ordering customer of the new high-tech equipment.

Under fierce competition in external markets, one can assume that the most effective will be the process of industries development, primarily aimed at securing the country's large internal market, based on import substitution, among other things. It is necessary to create such conditions, in which the leading industries (resource ones in our country) will simultaneously act as 'cluster-forming' links, that is they will produce orders and 'drag along' supplying spheres and enterprises (machine-building, metallurgy, electronics, chemicals, etc), which will be given some preferential

Table 1. Change on the regions' positions in terms of investment activity

| Region | Position (the lower the number, the higher the investment activity) | | | | | |
|---|---|---|---|---|---|---|
| | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 | 2008–2009 | 2009–2010 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nenets AO | 1 | 1 | 1 | 1 | 1 | 1 |
| Yamalo-Nenets AO | 2 | 2 | 2 | 2 | 2 | 2 |
| Sakhalin Oblast | 3 | 3 | 3 | 3 | 5 | 5 |
| Khanty-Mansi AO | 4 | 4 | 4 | 4 | 4 | 3 |
| Chukotka AO | 5 | 5 | 7 | 7 | 6 | 6 |
| Republic of Sakha (Yakutia) | 13 | 10 | 6 | 6 | 3 | 4 |
| Komi Republic | 8 | 6 | 10 | 10 | 7 | 8 |
| Murmansk Oblast | 36 | **26** | **55** | 55 | 36 | 48 |
| Magadan Oblast | 48 | 60 | 64 | 64 | **40** | **21** |
| Arkhangelsk Oblast | 17 | **15** | **46** | 46 | 61 | 71 |
| Kamchatka Krai | **67** | **19** | 63 | 63 | **33** | **14** |
| Republic of Karelia | **25** | **47** | 66 | 66 | 73 | 79 |

advantages within the state programmes, on the one hand, and which will have no other choice but to raise their standards, competing with foreign manufacturers, on the other. That is the concept of the 'third' industrialization, the way the authors view it.

It is obvious that the Northern and Arctic regions will take specific position in the process of innovation industrialization. Machine-building (including machine-tool) factories will not be built here, as it is not economically profitable due to the increased cost caused by special economic conditions. However, the efficiency of the resource-based sector should sharply increase owing to the set of measures on advancing the extraction and processing depth of raw materials. The important thing is that extractive industries and corporations with vast financial resources at the first stage of industrialization can and should act as strategic customers of equipment and new technologies by processing industries [3].

It is extremely important that the whole system of innovation activity financing and scientific and technical activity commercialization is being actively formed at present. It includes involving the federal and regional target programmes, Russian Venture Company, Seed Fund, Corporation 'RUSNANO', etc.

However, 'integration' of federal and regional links still remains the weak point for at least two reasons. First of all, the regions often lack funds necessary for equity participation in projects. Secondly, scientific and technical potential of the majority of the RF subjects has significantly decreased during the reform years, it lacks the necessary infrastructure, experimental base, etc. [1].

At the same time, all territorial systems have their own characteristic features. Thus, the number of research personnel in the Northern economic region has decreased by more than 30% for the last 15 years, however, in the Vologda Oblast it remained almost unchanged, while in the Arkhangelsk Oblast the number even increased. When considering the indicators characterizing the level of innovation development of the Northern regions in general, it can be noted that the share of organizations implementing technological innovations out of the total number of organizations practically corresponds to the average Russia's indicators. However, the volume of the produced innovation products out of the total volume is 3 times below, which is explained by the fact that the Northern industrial enterprises are mainly consumers, rather than suppliers of technology transfer *(tab. 2)* [4].

Table 2. Main indicators characterizing the level of innovation development of the Northern regions in 2009. [5]

| Region | Share of organizations implementing technological innovations, % | Share of innovation products, works, services, % | Number of filed patent applications per 10000 research fellows | Number of granted patents per 10000 research fellows | Share of personnel engaged in research and development, % of the total workforce | Share of employees with academic degrees out of the total number of the personnel engaged in research and development, % |
|---|---|---|---|---|---|---|
| Republic of Karelia | 10.0 | 0.8 | 5.3 | 3.1 | 0.5 | 38.1 |
| Komi Republic | 9.7 | 4.7 | 5.1 | 4.7 | 0.4 | 35.4 |
| Arkhangelsk Oblast | 8.0 | 0.1 | 7.0 | 7.3 | 0.5 | 7.1 |
| Murmansk Oblast | 7.9 | 0.2 | 6.8 | 8.2 | 0.5 | 49.6 |
| Regions of the European North | 9.0 | 1.6 | 6.2 | 5.5 | 0.5 | 31.1 |
| Russian Federation | 9.4 | 5.0 | 26.9 | 5.3 | 1.1 | 26.9 |

The target-oriented approach is non-alternative in the conditions of insufficient means, with regard to the mechanism of the industrial innovation policy in territorial systems. It is considered the most relevant for the development and implementation of complex regional programmes, which determine the complex of activities, coordinated by resources, performers and time frames.

This complex comprises economic, technical, industrial, research, and business activities, which should involve many industries, sectors of activity and the regional authorities, which altogether allow a certain scientific and technological or socio-economic problem to be solved.

In order to make estimates for the forecast of innovation industrialization, an expert survey was conducted among the participants of the conference 'The North and the Arctic in the new paradigm of world development' (Luzin Readings – 2012), which was held in April 12-14, 2012 in Apatity. Qualified composition of participants comprised 7 Doctors of Science, 16 Ph.D. in Sciences and 5 members with no scientific degree; five participants work in higher educational institutions, nineteen are from scientific organizations, two are engaged in production, and two work in state administrative agencies [6].

Most of the issues were devoted to the possibilities and problems of the innovation economic development of the region. For example, it was suggested to score hindrances to mutually beneficial cooperation between science and business (5 points, if the hindrance is maximal). The differentiation is very high, as follows from the scoring, presented in *table 3.*

The authors have not determined positions (1 to 10) intentionally, in order to demonstrate that the clarity of assessments is actually very low and almost all the hindrances got the score of higher than 3, i.e. above average. The only option that scored below 3 is 'price of scientific developments prohibitively high for business'; nevertheless, the point of 2.96 is rather high. This assumes that the distribution is not normal, while the displacement to the right side is considerable (all kinds of hindrances were estimated as high enough).

The top three hindrances are the following:

1. High degree of risk – 4.08.

2. Weak business demand for innovations – 3.96.

3. Inactive position of the authorities on cooperation support – 3.96.

Table 3. Assessment of the opportunities and problems of the innovation economic development of the Northern region

| Hindrance | Scoring | | | | | Average score |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Both parties lack the need for cooperation, and are willing to do everything themselves | 2 | 3 | 9 | 6 | 5 | 3.36 |
| Lack of information on potential opportunities for cooperation between science and business | 3 | 4 | 6 | 8 | 5 | 3.31 |
| Scientists lack information about the requirements of business for innovation | 5 | 4 | 4 | 9 | 4 | 3.12 |
| Lack of knowledge concerning forms and methods of cooperation | 1 | 4 | 11 | 7 | 3 | 3.27 |
| Low level of trust in partners | 3 | 3 | 5 | 6 | 14 | 3.81 |
| Price of scientific developments prohibitively high for business | 5 | 6 | 4 | 7 | 4 | 2.96 |
| Weak business demand for innovations | 3 | 1 | 3 | 6 | 13 | 3.96 |
| Inactive position of the authorities on cooperation support | 1 | 3 | 4 | 7 | 12 | 3.96 |
| Poor protection of property rights for innovation products | 3 | 2 | 3 | 9 | 9 | 3.81 |
| High degree of risk | 2 | - | 4 | 7 | 12 | 4.08 |
| Other (specify what) | | | | | | |

When answering the question: 'In your opinion, what are the key external obstacles to the innovation activity of the industrial enterprises of the Murmansk Oblast? (multiple choice option)', the distribution of opinions was the following *(tab. 4)*:

As the table shows, it is possible to single out two obvious leaders: the fourth (difficulty in attracting financing) and the second (insufficient demand for innovation products) answers. The next three external obstacles (options 14, 6 and 5) that come close are the following:

– underdevelopment of innovation infrastructure;

– imperfect tax stimulation of innovations;

– weak prevalence of budgetary co-financing mechanisms of innovation

One can safely assert that table 3 and table 4 show the innovation specifics of not only the Murmansk Oblast, but of all the Northern regions, and, apparently, of the whole country.

The ninth question considered the possibility of the transfer of the industrial complex of the Murmansk Oblast to mainly innovation-based development. Only 43% of the specialists responded affirmatively, 25% gave negative answer, the rest were unable to choose the answer. As for the transition period, the main share of the respondents, who gave positive answer, consider the date beyond 2025 as the most likely one. In this regard, the experts noted the proportion of the produced innovation products (61%), the proportion of organizations implementing technological innovations (50%), and the number of patents granted (25%) as the main features characterizing innovation dynamics.

The opinions divided greatly on the magnitude of these signs (indicator characterizing the transition to predominantly innovation dynamics). Thus, the share of innovation organizations, experts expressed as follows *(tab. 5)*.

Assuming that this indicator made up 7.9% in the Murmansk Oblast in 2010, the majority of experts highlighted the need for a 2–3-fold increase. 80% of the respondents consider 2020 and later terms as the most probable date when such level will be achieved. More significant dynamics is required with regard to the share of the produced innovation products.

As follows from *table 6*, the distribution in the 6–9% range is rather median. Considering that in 2010 the amount was equal to 0.2%, it is expected to increase by a factor of tens, with 80% of the experts defining the date beyond 2025 as possible for achieving such rate.

Table 4. The distribution of experts opinions concerning the external obstacles to innovation activity development

| № p/p | Option | Position |
|---|---|---|
| 1 | No serious external obstacles for innovation | 2 |
| 2 | Insufficient demand for innovation products | 16 |
| 3 | The long payback period of innovation | 7 |
| 4 | The difficulty in attracting financing for realization of innovation projects | 18 |
| 5 | Weak prevalence of budgetary co-financing mechanisms of innovation | 13 |
| 6 | Insufficient and/or imperfect tax stimulation of innovations | 14 |
| 7 | Limited amount of the state procurement of innovation products | 5 |
| 8 | Low predictability of the industrial and innovation policy of the state | 9 |
| 9 | Lack of stability in the conditions of economic activity | 8 |
| 10 | High administrative barriers to innovation (certification, licensing, etc.) | 10 |
| 11 | High customs duties on imported equipment | 4 |
| 12 | The complexity and imperfection of customs control procedures | 4 |
| 13 | Introduction of new technologies will lead to the emergence (sthrengthening) of technological gap with partners on the technological chain | - |
| 14 | Underdevelopment of innovation infrastructure (industrial parks, technology transfer centres, etc.) | 14 |

Table 5. Assessment of the proportion of innovation organizations

| The proportion of organizations, % | 10 | 15 | 20 | 25 | Above 25 |
|---|---|---|---|---|---|
| Distribution of answers, % | 12 | 12 | 40 | 20 | 16 |

Table 6. Assessment of the dynamics of the proportion of produced innovation products

| The proportion of innovation products, % | 3 | 6 | 9 | Higher than 9 |
|---|---|---|---|---|
| Distribution of answers, % | 19 | 33 | 29 | 19 |

The authors could not but comment on the expert estimates. The denoted strategic growth is possible, if the plant producing such high-tech products, as liquefied natural gas is constructed and attains projected capacity of 30–40 million tons. The formation of the Kola center of strategic materials, comprising hydrometallurgical complex for the production of concentrates of rare and rare-earth metals, could be the second element of this innovative breakthrough.

In order to identify the most important directions of the state support to innovation activities, the ranking was done based on the 4 factors, presented in *table 7*. That is, the minimum rank (place) shows the maximum value.

At this point, the authors note that the rank of science funding is somewhat overrated for the federal level. Apparently, this is due in no small part to the fact that the majority of experts are members of the academic community.

The primary sources that are most suitable and probable for obtaining funds for innovation activity, are the following:

– venture capital funds (71%),
– budget funds (61%),
– own resources of companies (57%).

Among the measures contributing to the development of innovation activity on the basis of public institutions of science and higher education, the only two directions with over 50% of the experts votes are the improvement of innovation activity financing and the professional management of innovation projects. The basic directions of stimulating the development of small innovation enterprises

Table 7. Ranking of the factors of the state support to innovations

| № p/p | Support measures | Places (ranks) at the level | |
|---|---|---|---|
| | | federal | regional |
| 1. | Increased financing of science | 1.8 | 3.2 |
| 2. | General education improvement | 3.7 | 1.6 |
| 3. | Improvment training of technical specialists | 2.3 | 2.8 |
| 4. | Increased support of business, implementing scientific-technological developments | 2.2 | 2.4 |

under State-run Educational Institution of science and higher school (also got the approval of more than 50% of respondents) are the improvement of the legal framework, increased interest of business in the implementation of developments, the improvement of the state support system [6].

As have been already mentioned in the beginning of the article, investment projects are the most important tool of innovation modernization of the economy. The largest of the projects under the Strategy for socio-economic development of the Murmansk Oblast up to 2025 are presented below. The respondents were asked to rate and evaluate the possible date of the first phase (stage) completion.

*Table 8* shows the number of experts, who placed the investment project at the appropriate place in order of importance. The number of specialists, evaluating this or that project, does not match, as not all of them have ranked each project.

The Shtokman project is an obvious leader, and in the authors' opinion, the crucial factor here is not so much the scale of the project (according to the latest estimates total investment may exceed 80 billion US dollars), as high innovation level. Many technological solutions for aimed at the project's implementation is unrivalled in the world. Unfortunately, possible terms of the project's duration turned out to be rather pessimistic: 72% of the experts answered that 'first amount of gas' can be obtained only after 2020.

It is necessary to note that the complex development and modernization of the operating mining and processing plants is on the 2nd place, comprising not only technical upgrading of production, but also release of new kinds of innovation products, including the already mentioned components for strategic materials output.

Innovation processes in any economic system is mostly connected with the diversification of production.

Table 8. Ranking of major investment projects of the Murmansk Oblast

| Project | Place (rating) | | | | | | | | | Average rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| Shtokman project (1 phase) | 13 | 6 | 1 | 1 | - | - | - | - | - | 1.52 |
| The second stage of Kola Nuclear Power Plant (5th power unit) | 2 | 4 | 1 | 2 | 3 | - | 1 | - | - | 3.31 |
| Complex development of Murmansk transport node | 4 | 2 | 6 | 2 | 4 | - | - | - | - | 3.02 |
| Mining and processing plant (GOK) 'Fedorovo – Tundrovskoe' (platinoids) | 1 | 3 | 1 | 1 | 3 | 3 | 2 | 3 | 1 | 5.22 |
| GOK CJSC 'North-Western Phosphorous Company' (apatite, nepheline) | 1 | 4 | 5 | 5 | - | 3 | 1 | - | - | 3.63 |
| GOK 'South-Eastern Gremyakha' (ilmenite-titaniferous magnetite) | - | 1 | - | - | 2 | 3 | 4 | 4 | 1 | 6.58 |
| GOK LLC 'Northern Chrome Company' | - | 2 | - | 1 | 3 | 3 | 2 | 2 | 3 | 6.12 |
| Complex development and modernization of the operating mining and processing plants | 6 | 3 | 5 | 5 | - | 1 | - | - | - | 2.65 |
| The construction of coal-run thermal power plants in the Oblast territory (Murmansk, Monchegorsk, Kovdor, etc.) | - | 2 | 2 | 2 | 2 | 1 | 3 | 1 | 4 | 5.71 |

However, the matter of whether it would be useful to develop deep processing of mineral resources in the North (not in general, but namely in the North) has always been considered controversial. In the course of the survey 17 specialists (61% of respondents) answered affirmatively, 25% answered negatively and the rest were unable to choose the answer.

Thus, the following conclusions have been made with regard to the challenges and opportunities of innovation industrialization of the North and the Arctic zone of Russia:

• at the national level, innovation industrialization is the main landmark and tool for economic development of the Russian Federation with the view of consolidating the country's position in the fifth technological mode;

• high investment attractiveness and investment activity in the Northern and Arctic regions of the country determine the regions' opportunities and role in technical re-equipment of the country's industrial complex;

• innovation level of development of the Northern regions is characterized by high share of organisations implementing technological innovations (about 9%, while the national average is 9.4%) and relatively low share of innovation products (services) (1.5–2%, while the average made up 5%);

• weak business demand for innovation, high degree of risk and insufficient support from authorities at all levels are the main factors constraining scientific and technological progress;

• experts evaluation of the forecast indicators of the basic directions amounted to 20–25% with regard to the organizations implementing technological innovations, and 6–9% with respect to the production of innovation products and services by 2025;

• the leading factor of the long-term state support for innovation at the federal level is the increased financing of science, while at the regional level it is the improvement of the general education system. Increased support of business, implementing innovations is highlighted as important for both levels.

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# On transformation of science and innovation space of a macroregion: the case study of the Northwestern Federal District

*The article presents the research results of science and innovation space in order to identify problem fields as the directions of its possible transformation. The analysis of the unevenness of science and innovation space by several indicators helped to identify the key problem fields in science and innovation activity in specific local fields. The article shows that the results of science and innovation activity in the regions with extractive industries are underestimated. It indicates the need for intensive support of large processing enterprises, the necessity to introduce indicative planning of the activity on the execution of federal and regional scientific and technological programmes. The tendencies of science and innovation space of a macroregion on the example of the Northwestern Federal District, contributing to its transformation in resolving the issues of upsurge in innovation activity, are determined.*

*Macroregion, science and innovation space, problem fields, directions of transformation, tendencies.*

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Transformation of social relations is caused by any violation of balance in the living conditions of people. It is aimed at overcoming the already existing negative phenomena and preventing crisis and the system collapse in the future.

Economic innovation activity has been remaining on a low level for a long time, the share of innovation products in Russia ranges from 4.4% in 2000 to 6.3% (2011), in the Northwestern Federal District – from 5.7% to 5.2% respectively, compared with 34.3% (2002) in Germany.

The functioning of enterprises with low-level innovation activity in the conditions of the global market with the country's accession to WTO may lead to irreversible consequences.

The actions correcting the balance between the need for innovation renewal and production activity are associated with the necessity of profound transformation of science and innovation sphere.

Let us consider some issues of science and innovation activity in spatial dimension as the direction of its possible transformation on the example of the NWFD macroregion.

**Identifying directions for the transformation of science and innovation space of the macroregion**

The transformation of science and innovation space as an essential change of its characteristics is becoming socially necessary, in case problems hindering the development of science and innovation activity and innovation economy dynamics are revealed in the structure of the space. The problems that are characteristic of the considered space, form its problem fields.

The unevenness of science and innovation activity in space with its fields of condensation and rarefaction is considered the traditional problem field of the extension property of science and innovation space. As a rule, it is characterized by uneven territorial distribution of science and innovation potential. The analysis of unevenness showed that from the perspective of determining the directions of transformation it may be more productive to estimate the unevenness in terms of other characteristics, as opposed to such approach.

*Table 1* presents the indicators of the distribution of the scientific potential kernel (the number of researchers), as well as attracted resources and the results of science and innovation activity on the example of the Northwestern Federal District space.

The table data indicates the unevenness not only in the distribution of the research potential, but also in the resources, attracted to science and innovation research, scientific results and innovation output.

Scientific potential of Russia's North-West space is distributed across the territory very unevenly: from 0.5 (Vologda Oblast) to 3.5 (Leningrad Oblast) researchers per 1000 of the employed in the economy by local zones, subjects of the Russian Federation, with the sharp increase to 17.9 people in Saint Petersburg. Saint-Petersburg, which is the largest science and innovation centre, as follows from the table, clearly distinguishes itself from other subjects of the Russian Federation. It plays a central role in the hierarchy of the Northwestern science and innovation centres [1].

Saint Petersburg can be attributed to the space defined as the force field [2], from which centrifugal and centripetal forces proceed.

Table 1. Indicators of the science and innovation space of the Northwestern Federal District for 2011

| Region | Potential kernel | Resource | Result | |
|---|---|---|---|---|
| | Number of researches per 1000 of the employed in the economy, people | Costs of research, development and technological innovations, billion rubles | Number of patents granted per 10 thousand of the employed in the economy | Share of innovation products, % |
| Vologda Oblast | 0.5 | 10.0 | 1.4 | 3.7 |
| Pskov Oblast | 0.8 | 0.3 | 1.1 | 2.3 |
| Arkhangelsk Oblast | 1.1 | 4.1 | 1.2 | 0.2 |
| Kaliningrad Oblast | 1.4 | 1.5 | 1.3 | 0.2 |
| Republic of Karelia | 1.5 | 2.8 | 1.2 | 0.3 |
| Novgorod Oblast | 1.6 | 1.7 | 1.4 | 4.8 |
| Murmansk Oblast | 2.3 | 2.9 | 1.0 | 0.2 |
| Komi Republic | 2.3 | 17.1 | 0.8 | 7.8 |
| Leningrad Oblast | 3.5 | 13.4 | 1.6 | 2.5 |
| Saint Petersburg | 17.9 | 107.3 | 8.8 | 9.0 |
| *NWFD* | *7.7* | *160.0* | *4.0* | *5.2* |

Source: the author's calculations based on the data: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2011.

As follows from the data of table 1, the share of expenses on science and innovation activity by local areas, subjects of the Russian Federation, is not proportional to the magnitude of scientific potential. For example, with relatively equal number of researchers, the expenses on research and innovation activity in the Arkhangelsk Oblast, in comparison with the Pskov Oblast, are much higher with share of innovation products being low. A similar ratio is observed in the Murmansk and Novgorod oblasts. Extremely low value of the innovation activity indicator can point that its role in the mentioned regions is insignificant or the given indicator does not reflect its real state. The effect of both factors can be assumed.

The data indicates the importance of the spatial approach, consisting in the establishment of not only local differences in science and innovation activity, but also in the realization of the necessity to identify and compare its factors.

Uneven results under equal or even fewer attracted resources (researchers and costs) by separate local zones, the subjects of the Russian Federation may serve as the basis for improving the measurement and the elaboration of measures for the transformation of science and innovation space of the macroregion in order to develop science and innovation activity.

The analysis of the extension properties of science and innovation space allowed us to discover its heterogeneity by profile of science and innovation activity, caused by the economic structure of the macroregion – the ratio of extractive and manufacturing industries. In the regions identified a clear connection between the share of extractive industries and the innovation indicator – the share of innovation products. Most vividly this connection can be illustrated by the following example: In 2010 in the Nenets Autonomous Okrug the share of extractive industries in the structure of gross value added amounted to 78.6%, the share of innovation products to 0.0%; in Saint Petersburg – 0.0 and 8.0% respectively; in the Novgorod Oblast – 0.2 and 6.9% [3]. These data indicate partial sufficiency of the applied indicator of the share of innovation products for measuring the innovativeness of extractive industries, which are inherent not only in food, but process innovations as well. The indicators characterizing the entire volume of process innovation are not singled out in state statistics. The indicator of 'technological innovation costs' includes the cost of development and introduction of new products and processes. The indicators 'number of created advanced manufacturing technologies' and 'number of applied advanced manufacturing technologies' reflect technologies, controlled by a computer, summarizing manufacturing and extractive industries.

In regions with the considerable share of extractive industries innovation cannot be estimated only by the indicator of the innovation products share. "In modern conditions the natural resources sector of the economy (first of all, the oil and gas industry) is no more 'technologically simple'. Extraction of raw materials is carried out with the use of increasingly complex technology. Therefore, one can assert that oil, gas and other raw products are increasingly becoming knowledge-intensive products" [4].

The indicator for process innovation estimation can be suggested in analogy to the specific indicator of the innovation products share. It is defined as the share of used innovation production technologies as the ratio of the volume of production, produced under technologies, subjected to various changes during the last three years, to the overall volume of production in percentage.

The problem of technological development of extractive industries is acute in Russia's North-West with its forest industry, oil production and processing, gas, extractive and metallurgical industries. Thus, according to experts, "the extractive complex requires serious modernization and improvement, as

it does not ensure the full utilization of raw materials (at the functioning enterprises up to 60% of potentially valuable components are wasted, piled up at dumps and tailing pits, dispersed in the environment)" [5]. The need to move towards "deep complex of wasteless (low-waste) recycling of raw materials extracted from earth depths" is highlighted. The assessment of the innovativeness of extractive industries and control over it as an essential component of transforming science and innovation space remains a problem field.

Domestic raw materials extracting and manufacturing companies of hydrocarbon specialization, as well as non-ferrous and ferrous metallurgical corporations, etc have necessary means for complex modernization, increasing share of the used innovation production technologies unlike many manufacturing industries that do not have own required investment resources.

By world standards low level of science and innovation activity, can be considered a problem field in the regions, where manufacturing industries dominate in the economic structure.

*Table 2* presents the data on the economic innovativeness of Russia's Northwestern regions with manufacturing industries, predominating in the added value.

As follows from the given data, the share of innovation products cannot be considered as satisfactory, due to the low level of innovation activities in the manufacturing industries of the regions, and not because of the assessment indicator. The amount of own funds allocated by enterprises to innovation activities, which is rather low by world standards, is one of the main factors of such situation. Thus, the volume of investments in scientific and technological development of the company Power Machines (Saint Petersburg, number of employees is over 12 thousand people) amounted to 1.99 billion rubles in 2009, while the specialization-related German company Siemens spent 5.7 billion US dollars for scientific research and development alone in 2002, and the Japanese company Matsushita Electric and the German company Volkswagen spent 4.3 billion each. [6].

The world experience shows that non-state financing of innovation activity as the main source is possible only under the condition that the state has large monopolies of the international standard, which may have effect from investments at costs, comparable with the corresponding expenses of the state [7].

Transnational corporations determine and form the scientific and technological progress in the world. In Russia large enterprises create science and innovation image of the industry. As follows from the data presented in *table 2*, the share of innovation products is considered in the statistics only by large and medium-sized enterprises.

It is not only small business, but large business of the manufacturing industries as well, that requires intensive state support for laying the foundation of innovation modernization of the economy and integrating into the global innovation system.

Table 2. Regions with predominating manufacturing industries and the share of innovation products in 2010, % [3]

| Region | Extractive industries | Manufacturing industries | Share of innovation products |
|---|---|---|---|
| *NWFD* | *7.7* | *21.6* | *4.1* |
| Saint Petersburg | 0.0 | 24.1 | 8.0 |
| Novgorod Oblast | 0.2 | 30.0 | 6.9 |
| Pskov Oblast | 0.2 | 18.9 | 2.7 |
| Vologda Oblast | 0.0 | 39.4 | 1.6 |
| Leningrad Oblast | 0.9 | 23.8 | 2.4 |
| Kaliningrad Oblast | 5.9 | 16.9 | 0.1 |

The connectivity characteristic, which is displayed through the interaction of industrial enterprises and scientific organizations and mainly created due to the functioning of federal and regional programmes, is an inherent part of science and innovation space. 14 federal and 13 regional scientific and technological programmes have been operating in the Northwestern Federal District [8]. Scientific and innovation programmes, comprising sectors and regions, form a network of extensive cooperation, jointly carried out by the organizations and enterprises of science and innovation projects. Network panorama of science and innovation space is yet poorly studied from the perspective of the methodological principle of the network organization of activities. At the moment its fragments are combined, loosely coupling and complementing each other.

The opportunities for arranging specific partnerships, knowledge transfer, based on trusted connections of informal and formal nature, are not implemented in full [9]. Scientific and innovation programmes become an active factor in the formation of science and innovation space. However, their role in this process is depreciated due to the absence of the mechanism of indicative and planning control over the programmes, generating a problem field in the application of the programme method of the macroregion's science and innovation development.

The identified problem fields indicate possible directions for the transformation of science and innovation space. Their research involves the quantitative and qualitative assessment of the state of science and innovation space, and its transformation as well.

**Indicators, characteristics, tendencies of the region's science and innovation space as the basis for its transformation**

The problem fields are identified as the result of current trends in science and innovation space of the macroregion and are examined on the example of NWFD based on the following indicators of the state statistics, and indicators in dynamics for 2005–2011calculated on their basis: number of scientific research and development organizations, including researchers; the results of science and innovation activity – the number of granted patents for inventions and utility models, the share of innovation products, as compared to the indicator of the share of innovation-active organizations.

The dynamics of the number of scientific organizations *(tab. 3)* shows that in the Northwestern Federal District the number of scientific organizations is inclined to decrease.

Table 3. Dynamics of the number of scientific research and development organizations, %

| Region | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Russian Federation | 97.5 | 101.6 | 109.2 | 92.6 | 96.4 | 98.7 | 105.4 |
| *NWFD* | *97.1* | *99.1* | *114.1* | *87.9* | *97.2* | *96.9* | *102.4* |
| Republic of Karelia | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 118.7 |
| Komi Republic | 90.5 | 126.3 | 95.8 | 108.7 | 88.0 | 104.5 | 91.3 |
| Arkhangelsk Oblast | 100.0 | 96.1 | 120.0 | 106.7 | 103.1 | 100.0 | 100.0 |
| Vologda Oblast | 107.1 | 120.0 | 116.7 | 95.2 | 95.0 | 89.5 | 105.9 |
| Kaliningrad Oblast | 87.5 | 100.0 | 107.1 | 93.3 | 78.6 | 100.0 | 100.0 |
| Leningrad Oblast | 94.4 | 105.9 | 111.1 | 85.0 | 88.2 | 93.3 | 100.0 |
| Murmansk Oblast | 96.5 | 92.8 | 96.1 | 96.0 | 100.0 | 104.2 | 108.1 |
| Novgorod Oblast | 100.0 | 100.0 | 118.2 | 92.3 | 100.0 | 100.0 | 108.3 |
| Pskov Oblast | 90.9 | 100.0 | 140.0 | 85.7 | 100.0 | 108.3 | 92.3 |
| Saint Petersburg | 96.0 | 96.8 | 116.3 | 84.1 | 98.1 | 95.5 | 102.4 |

Source: the author's calculations based on the data: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2012.

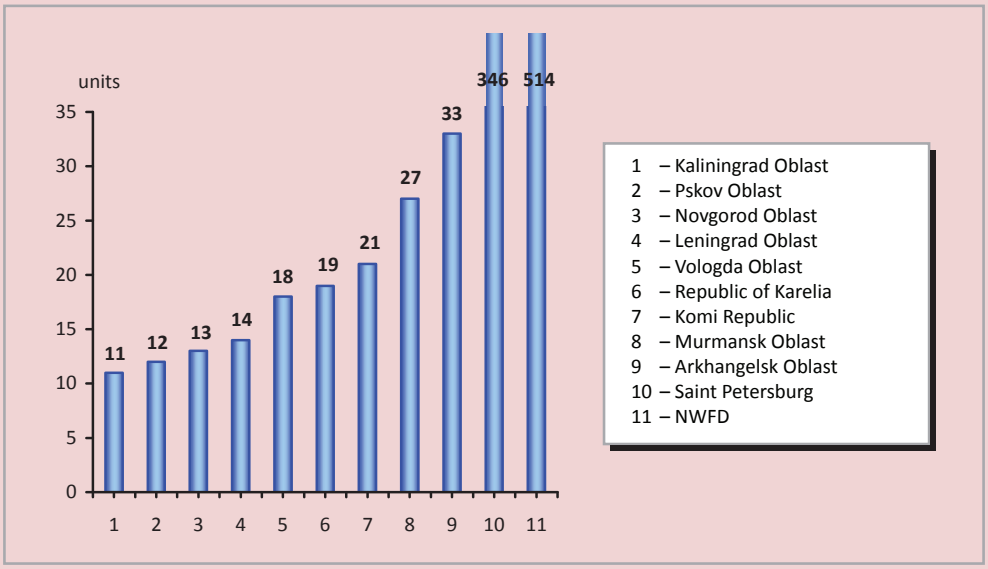
The reduction was observed in all the subjects of the Russian Federation in certain years, especially in 2008–2009 – in the period of economic crisis, except for the Republic of Karelia and Arkhangelsk Oblast, where this number did not decline. The tendency of the decreasing number of scientific organizations throughout the macroregion is caused by their reduction in Saint Petersburg almost every year with its share in the total number of the macroregion's scientific organizations amounting to 70%.

The chart *(fig. 1)* confirms the earlier conclusion that scientific potential is distributed irregularly on the territory of the macroregion.

The indicator 'number of scientific organizations', used to evaluate the scientific potential, does not fully reflect the magnitude and dynamics of the potential in space, due to the changing number of researchers per one organization (consolidation, or disaggregation).

Data, presented in *table 4,* indicate the tendency of a steady decrease in the number of the employed in the scientific sphere.

Figure 1. Number of scientific research and development organizations in 2011*




* The dimension wasn't maintained for positions 10 – 11.

Table 4. Dynamics of scientific research and development staff, %

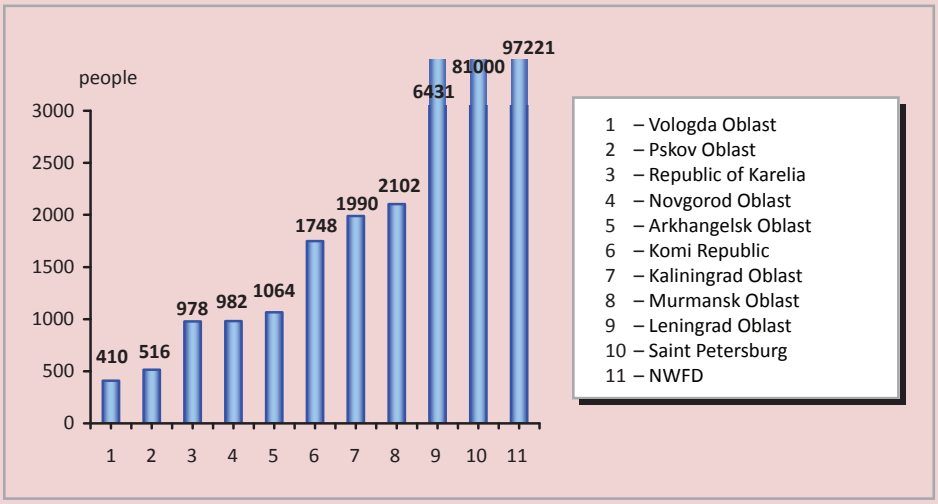
| Region | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Russian Federation | 96.9 | 99.2 | 99.3 | 95.0 | 97.5 | 99.2 | 99.8 |
| *NWFD* | *97.0* | *98.9* | *100.2* | *95.8* | *98.1* | *98.1* | *101.4* |
| Republic of Karelia | 82.0 | 92.7 | 109.0 | 100.6 | 95.4 | 103.0 | 104.7 |
| Komi Republic | 89.1 | 100.1 | 101.9 | 101.0 | 89.7 | 95.6 | 96.8 |
| Arkhangelsk Oblast | 97.9 | 170.6 | 98.2 | 98.7 | 49.6 | 77.9 | 92.7 |
| Vologda Oblast | 82.4 | 120.9 | 83.6 | 103.0 | 96.5 | 103.4 | 85.1 |
| Kaliningrad Oblast | 99.5 | 97.5 | 96.9 | 96.7 | 94.8 | 103.3 | 107.0 |
| Leningrad Oblast | 99.1 | 100.5 | 100.7 | 98.6 | 101.4 | 100.2 | 99.3 |
| Murmansk Oblast | 92.5 | 93.6 | 95.8 | 98.5 | 99.3 | 101.9 | 100.2 |
| Novgorod Oblast | 88.8 | 101.7 | 96.9 | 96.6 | 106.5 | 102.2 | 110.1 |
| Pskov Oblast | 79.3 | 102.5 | 91.3 | 87.8 | 120.0 | 115.2 | 162.3 |
| Saint Petersburg | 97.6 | 97.1 | 100.5 | 95.3 | 99.7 | 98.0 | 101.5 |

Source: the author's calculations based on the data: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2012.

In the Russian Federation the number of scientific research and development staff in the 2005–2011 period decreased by 77.934 people (from 813.207 to 735.273 respectively), in the Northwestern Federal District – by 7531 people (from 752.104 people to 221.97 people), in Saint Petersburg – by 6861 people (from 87.861 people to 81.000 people).

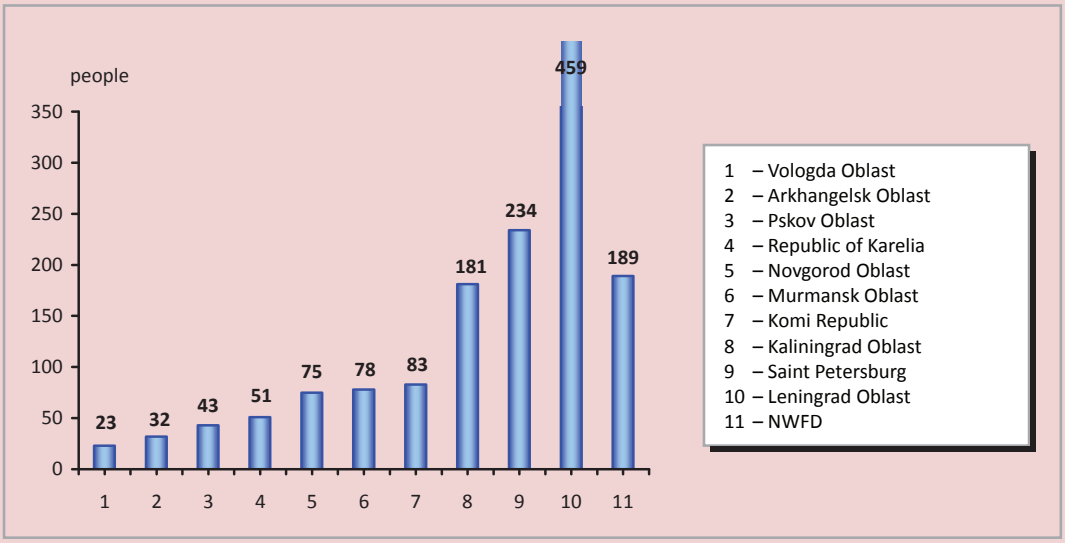
Research and development staff is mainly concentrated in the Leningrad Oblast (6431 people) and Saint Petersburg (81 thousand people) *(fid. 2)*. As follows from the *figure 3*, the scientific organizations of the District, the largest ones in the employment volume, are concentrated in the Kaliningrad, Leningrad oblasts and Saint Petersburg.

Figure 2. Number of scientific research and development staff in 2011




* The dimension wasn't maintained for positions 10 – 11.

Figure 3. Number of scientific research and development staff per one organization in 2011



In addition to the indicators of the dynamics of research and development staff, *table 5* contains data on the number of researchers, for the purpose of clarifying an earlier conclusion that the number of the employed in the scientific sphere of the macroregion is inclined to reduce.

As follows from the table, the dynamics of the number of researchers by the subjects of the RF Northwestern Federal District is also characterized by an overall tendency of reduction with some increase in certain years.

In the period under review the number of researchers decreased by 16.330 people (from 391.121 people to 374.791 people respectively) in the Russian Federation, by 2287 people (from 54.532 people to 52.245 people respectively) in the Northwestern Federal District, by 2206 people (from 46.882 people to 44.676 people) in Saint-Petersburg.

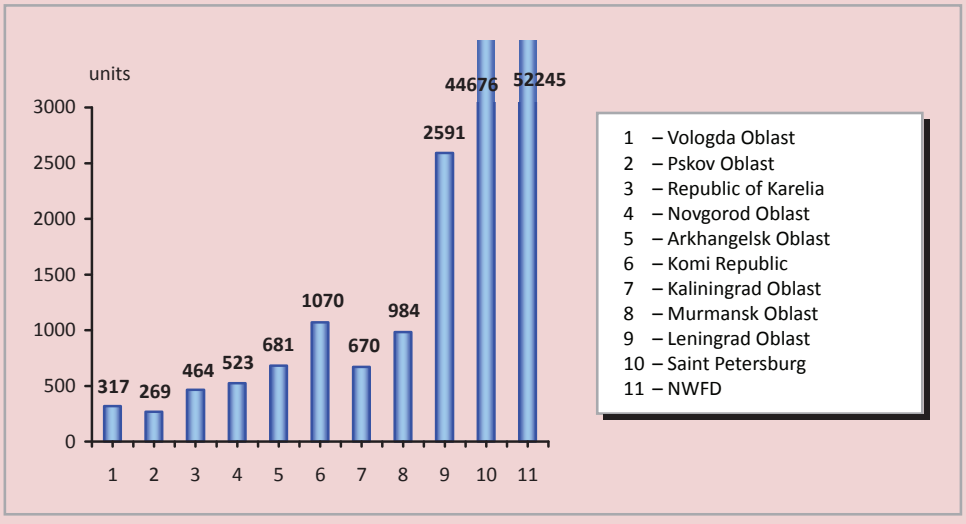
The chart (*fig. 4*) illustrates the distribution of the researchers on the territory of NWFD, which is generally consistent with the distribution of the number of research and development staff (see fig. 2).

Table 5. Dynamics of the number of researchers, %

| Region | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Russian Federation | 97.4 | 99.4 | 101.0 | 95.7 | 98.2 | 99.9 | 101.6 |
| *NWFD* | *96.0* | *100.1* | *101.7* | *95.8* | *97.8* | *97.8* | *102.5* |
| Republic of Karelia | 102.3 | 90.8 | 97.3 | 100.6 | 89.8 | 106.2 | 97.1 |
| Komi Republic | 89.6 | 100.3 | 105.9 | 104.4 | 89.6 | 95.7 | 96.8 |
| Arkhangelsk Oblast | 98.8 | 277.4 | 100.4 | 89.5 | 48.1 | 81.2 | 93.4 |
| Vologda Oblast | 86.7 | 126.9 | 70.8 | 140.4 | 97.3 | 100.0 | 96.9 |
| Kaliningrad Oblast | 98.2 | 96.6 | 98.5 | 87.4 | 94.3 | 105.2 | 107.4 |
| Leningrad Oblast | 98.2 | 100.0 | 101.4 | 95.0 | 103.5 | 105.8 | 120.0 |
| Murmansk Oblast | 92.6 | 96.1 | 96.3 | 100.6 | 98.6 | 100.6 | 104.7 |
| Novgorod Oblast | 82.1 | 95.1 | 101.7 | 102.3 | 104.7 | 100.4 | 102.3 |
| Pskov Oblast | 69.9 | 139.6 | 92.5 | 89.2 | 113.8 | 95.2 | 149.4 |
| Saint Petersburg | 96.4 | 97.5 | 97.8 | 93.0 | 107.4 | 97.5 | 102.6 |

Source: the author's calculations based on the data: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2005, 2008, 2009, 2012.

Figure 4. Number of researchers in 2011




* The dimension wasn't maintained for positions 10 – 11.

Table 6. Share of researchers, %

| Region | Share of researchers out of the total number |
|---|---|
| Vologda Oblast | 77 |
| Pskov Oblast | 52.0 |
| Republic of Karelia | 47.0 |
| Novgorod Oblast | 53.0 |
| Arkhangelsk Oblast | 64.0 |
| Komi Republic | 61.0 |
| Kaliningrad Oblast | 34.0 |
| Murmansk Oblast | 47.0 |
| Leningrad Oblast | 40.0 |
| Saint Petersburg | 55.0 |
| *NWFD* | *54.0* |

At the same time, while in the Vologda Oblast the share of researchers is high – 77% *(tab. 6),* it makes up 34% in the Kaliningrad Oblast, 40% in the Leningrad Oblast , 54% with the average level of the macroregion amounting to 54%.

The dynamics of the results of science and innovation activity is presented in *tables 7,8.*

Data presented in table 7 indicates an overall positive dynamics of the number of granted patents. In NWFD the growth in the period under review amounted to 3%. When comparing the data of table 7 and table 4 (dynamics of the number of research and development staff) and table 5 (dynamics of the number of the researchers employed), one can see that some increase in the number of granted patents, with reduction in the number of the employed in the scientific field in the Arkhangelsk Oblast, Kaliningrad Oblast, Saint-Petersburg may indicate the growth of scientific productivity in these regions. However, definite positive relation between the number of granted patents and the number of the employed in the scientific field is not revealed in other regions. Moreover, in some regions (Komi Republic, Vologda Oblast, Leningrad Oblast) the first indicator has been decreasing, while the latter has been increasing.

The low level of innovation activity in the Northwestern regions is confirmed by its results presented in table 8.

A steady tendency of retaining innovation output share at less than 1% is inherent in the Republic of Karelia, Arkhangelsk Oblast, Murmansk Oblast. The Komi Republic, Vologda Oblast, Leningrad Oblast, Novgorod Oblast, Pskov Oblast and Saint Petersburg can be noted among other regions with the best performance indicators.

The data on innovation-active organizations *(tab. 9)* show that except for Saint Petersburg, their share by regions does not exceed the average value across the Northwestern Federal District (11.2%), formed mainly by Saint Petersburg (18.9%).

The Republic of Karelia, Arkhangelsk Oblast, Vologda Oblast, Leningrad Oblast, Murmansk Oblast, Pskov Oblast, Saint Petersburg are among the regions with relatively large number of innovation-active organisations.

When assessing to what extent the data of tables 8 and 9 correlate, it appears that, while the share of innovation products is relatively low, the share of innovation-active organizations is higher in a number of regions: the Republic of Karelia, Arkhangelsk Oblast, Murmansk Oblast, Leningrad Oblast, Pskov Oblast. The situation in the Komi Republic is the reverse. These indicators correlate more or less in the Vologda, Kaliningrad, Novgorod oblasts, Saint Petersburg.

Table 7. The dynamics of the number of granted patents for inventions and utility models

| Region | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Russian Federation | 26405 | 28303 | 27742 | 31510 | 36794 | 34814 | 30910 |
| *NWFD* | *2651* | *2814* | *2749* | *2665* | *3380* | *2683* | *2740* |
| Republic of Karelia | 17 | 27 | 15 | 16 | 27 | 26 | 38 |
| Komi Republic | 49 | 20 | 57 | 45 | 38 | 35 | 36 |
| Arkhangelsk Oblast | 59 | 39 | 72 | 92 | 71 | 53 | 72 |
| Vologda Oblast | 114 | 110 | 100 | 86 | 138 | 89 | 86 |
| Kaliningrad Oblast | 62 | 68 | 60 | 80 | 71 | 80 | 63 |
| Leningrad Oblast | 140 | 144 | 95 | 126 | 121 | 124 | 123 |
| Murmansk Oblast | 50 | 54 | 54 | 69 | 61 | 59 | 42 |
| Novgorod Oblast | 38 | 43 | 45 | 42 | 39 | 28 | 44 |
| Pskov Oblast | 40 | 43 | 48 | 56 | 66 | 32 | 35 |
| Saint Petersburg | 2072 | 2237 | 2203 | 2083 | 2748 | 2157 | 2202 |
| Source: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2008; 2009, 2012. | | | | | | | |

Tablea 8. Dynamics of innovation activity share, %

| Region | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Russian Federation | 5.0 | 4.7 | 4.6 | 5.0 | 4.5 | 4.8 | 6.3 |
| *NWFD* | 3.3 | 4.4 | 3.4 | 3.7 | 3.1 | 4.1 | 5.2 |
| Republic of Karelia | 0.4 | 0.5 | 0.3 | 0.7 | 1.7 | 1.3 | 0.3 |
| Komi Republic | - | 4.3 | 5.5 | 4.7 | 0.6 | 3.2 | 7.8 |
| Arkhangelsk Oblast | 0.4 | 0.3 | 0.1 | 0.1 | 0.3 | 0.4 | 0.2 |
| Vologda Oblast | 4.5 | 5.6 | 7.5 | 6.2 | 2.6 | 1.6 | 3.7 |
| Kaliningrad Oblast | 9.2 | 9.5 | 13.4 | 9.6 | 2.8 | 0.1 | 0.2 |
| Leningrad Oblast | 0.5 | 0.4 | 0.3 | 1.4 | 1.8 | 2.4 | 2.5 |
| Murmansk Oblast | 3.5 | 0.6 | 0.2 | 0.2 | 0.3 | 0.5 | 0.2 |
| Novgorod Oblast | 19.1 | 6.7 | 6.9 | 10.4 | 7.5 | 6.9 | 4.8 |
| Pskov Oblast | 1.0 | 1.3 | 0.9 | 1.2 | 1.4 | 2.7 | 2.3 |
| Saint Petersburg | 3.1 | 6.1 | 2.3 | 2.8 | 5.5 | 8.0 | 9.0 |
| Source: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2008; 2012. | | | | | | | |

Table 9. Dynamics of the share of innovation-active organizations, %

| Region | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Russian Federation | 9.7 | 9.9 | 10.0 | 9.4 | 9.3 | 9.5 | 10.4 |
| *NWFD* | 9.4 | 11.0 | 9.8 | 8.9 | 9.8 | 9.4 | 11.2 |
| Republic of Karelia | 5.6 | 6.1 | 5.8 | 6.1 | 5.3 | 6.6 | 9.2 |
| Komi Republic | 7.1 | 8.1 | 8.1 | 9.7 | 6.3 | 7.5 | 6.1 |
| Arkhangelsk Oblast | 8.4 | 8.6 | 9.9 | 8.0 | 8.8 | 9.0 | 9.3 |
| Vologda Oblast | 8.4 | 8.9 | 8.3 | 9.8 | 7.6 | 7.4 | 9.3 |
| Kaliningrad Oblast | 4.6 | 14.1 | 10.1 | 5.1 | 5.5 | 3.2 | 3.3 |
| Leningrad Oblast | 6.9 | 8.8 | 6.7 | 5.6 | 8.6 | 9.4 | 9.1 |
| Murmansk Oblast | 13.5 | 12.3 | 8.0 | 7.9 | 7.6 | 9.7 | 8.5 |
| Novgorod Oblast | 9.9 | 10.2 | 8.9 | 10.3 | 9.7 | 8.7 | 7.5 |
| Pskov Oblast | 9.5 | 10.6 | 9.8 | 6.2 | 8.7 | 9.6 | 10.0 |
| Saint Petersburg | 12.7 | 14.1 | 13.1 | 12.5 | 14.0 | 13.0 | 18.9 |
| Source: Russia's regions. Socio-economic indicators: statistical digest. Rosstat. Moscow, 2012. | | | | | | | |

The difference between the indicators of innovation products share and the share of innovation-active enterprises is based on different values of shares of innovation products per company in the region.

The analysis of the dynamics of state statistics indicators characterizing research and innovation space, on the example of the NWFD permit the following:

• the tendency of decreasing number of the employed in the scientific field;

• a slight increase in the results of scientific activity – the number of granted patents for inventions and utility models;

• low level of innovation activity.

The state of science and innovation space of the macroregion indicates the need for the development and implementation of measures to change the situation concerning science and innovation activity in the regions, which is inadmissible in the context of the progress towards innovation economy.

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# Forecasting of indicators of the region's socio-economic development

*The article analyses the statistical data on the volumes of investment in different spheres of the socio-economic system of the Udmurt Republic in the 1996–2010 period. The values of production and human capitals are predicted for the next five years with regard to the forecasting of the dynamics of investment volume based on economic and mathematical models. The article resolves the task of modeling dynamics of the gross regional product in the Udmurt Republic by applying production function constructed on the basis of statistical methods of correlation and regression analysis, and the issue concerning the forecasting of the dynamics of production and human capitals.*

*Investment, production assets, human capital, gross regional product, forecasting.*

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**Introduction**

In the modern world, economic forecasts are needed to determine priority directions of the development of economic systems, to assess mathematically the consequences of the planned economic decisions, when building optimal economic management strategies. In this regard, forecasting is one of the important tools used in the formation of social development strategy and tactics.

Production capital, human capital, and the gross regional product are the main macroeconomic indicators assessing the state of the regional economy.

Production capital (basic production assets – BPA) is understood as the material and technical basis of the production process, which is replenished with capital investments. It is also exposed to wear and tear, as it loses its properties due to various factors. In contemporary economy the compliance of production assets to the level of modern scientific and technological progress is the main criterion determining the necessity of production assets renewal. Thus, production assets require the investment, optimal from the standpoint of the current state of the economic system.

The authors use econometric methods to forecast the volume of investments in production capital, and the model of production capital to forecast the dynamics of the production capital [1].

*Human capital* is another important macroeconomic indicator, which represents a storage of knowledge, skills, experience, health and culture. The authors distinguish the following components of human capital: education capital, health capital, culture capital. Human capital, as well as production capital is exposed to replacement, its amortization, however, differs from material-technical resources. During the first years of human capital functioning, the economic value of the employee's storage of knowledge and abilities is not reduced, as is the case with physical capital, but on the contrary, increases due to his/her physical ageing and accumulation of practical experience. As a rule, the rate of physical and moral retirement of the knowledge accumulated and qualification start exceeding the values of the continuous accumulation of production experience by the end of the second decade of service. Only since this moment begins the process of human capital 'devaluation'.

The authors distinguish investments in the components of human capital: education, health care and culture. The volume of investments in human capital is forecast by applying econometric methods. The forecasting of the dynamics of the human capital is based on the human capital model [2].

Production functions, reflecting the effect of production factors on the output indicators of the economic system are used, when solving the issues concerning the forecasting of the economic dynamics. The authors consider production and human capitals as input factors, i.e. production factors, and the gross regional product as an output indicator of the economic system.

*Gross regional product* (GRP) is the main characteristic of the production results, which is used to evaluate the level of economic development, economic growth rate, the analysis of labour productivity.

The authors forecast the gross regional product based on the constructed production function.

*Figure 1* shows the logical diagram of the study.

Thus, the authors conduct the forecasting of macroeconomic indicators in three stages: the investments in production and human capitals are forecast by econometric methods at the first stage; the values of production and human capitals are predicted based on mathematical models of these factors at the second stage; the third stage comprises the forecasting of the gross regional product with

Figure 1. Logical structure of the study

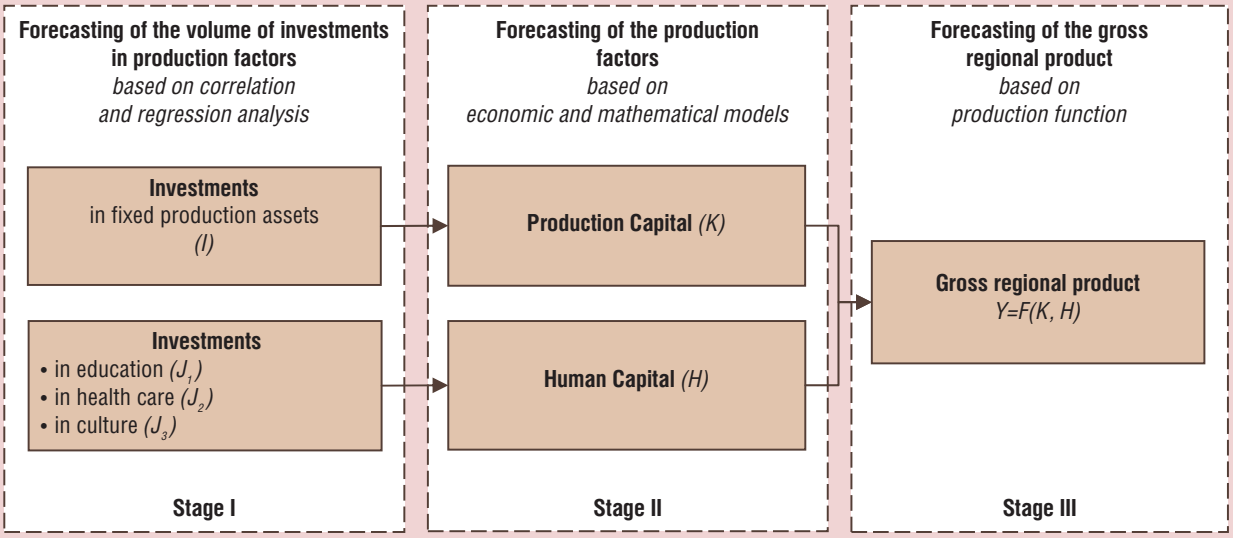
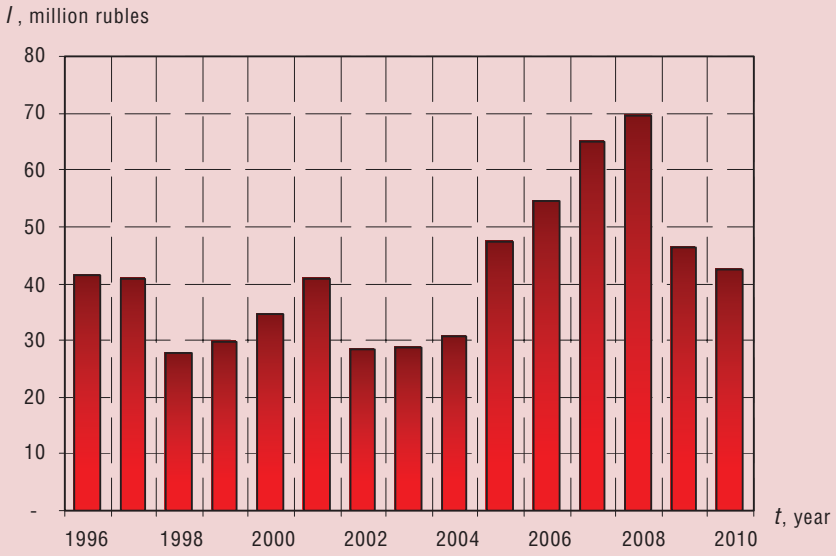



Figure 2. Dynamics of investments in production capital of the Udmurt Republic in the 1996 – 2010 period




regard to the value and dynamics of production and human capitals on the basis of constructed production function. The indicators of socio-economic development of the region are predicted in the case of the economic system of the Udmurt Republic (UR).

**1. Analysis of the dynamics of the volume of investments in production factors**

Investments in production capital (I) are the total expenditures on the creation and renewal of fixed production assets, comprising new construction, reconstruction and modernization of objects, the acquisition of machines, equipment, vehicles, etc.

The dynamics of investments in production capital of the Udmurt Republic in the 1996–2010 period [3] is shown in *fig. 2.*

The largest share of investments, involved in the region's production capital in 2008, amounted to 69 570 thousand rubles in 2010 prices, while the smallest volume fell on 1998 (27 870 thousand rubles). A high growth rate

of investments in production assets of the UR (24%) was observed in 2005–2008. A sharp decline in investments in production capital after 2008 can be attributed to the global crisis. In general, the average growth rate made up 2.8% in the 1996–2010 period.

*Investments in human capital* comprise investments in education (J1), health care (J2) and culture (J3). Investments in education contribute to the formation of highly qualified specialists, whose work has the largest impact on economic growth [4]. Investments in health care lead to the reduction of morbidity and mortality, prolonged working life of an individual [5]. Investments in culture reduce the level of social criminalization, increase the creative potential of an individual, shape moral values of a person, ultimately affecting the economic efficiency.

Statistical data on the investments in human capital of the Udmurt Republic in the 1996–2010 period [6] are shown in *figures 3, 4 and 5*.

The highest value of investment in education of the Udmurt Republic was observed in 2007 and amounted to 14.402 million rubles, while the least value fell on 1997 (5.457 million rubles). In general, there has been a tendency towards the indicator growth in the 1996 – 2010 period. The annual rate of the indicator growth for the period under review made up 6.4%.

The highest value of investment in the health care of the Udmurt Republic was observed in 2009 and amounted to 13.051 million rubles, while the least value fell on 1997 (4.447 million rubles). In general, there has been a tendency towards the indicator growth in the 1996–2010 period. The annual rate of the indicator growth for the period under review made up 9.5%.

The highest value of investment in culture of the Udmurt Republic was observed in 2008 and made up 2.780 million rubles, while the least value fell on 1997 (964 thousand rubles). In general, there has been a tendency towards the indicator growth in the 1996–2010 period. The annual rate of the indicator growth for the period under review amounted to 6.5%.

**2. Forecasting of the volume of investments in production factors.**

Investments in production factors pertain to economic indicators with a rather complicated structure. The values of these indicators

Figure 3. Dynamics of investments in education of the Udmurt Republic in the 1996 – 2010 period in 2010 prices

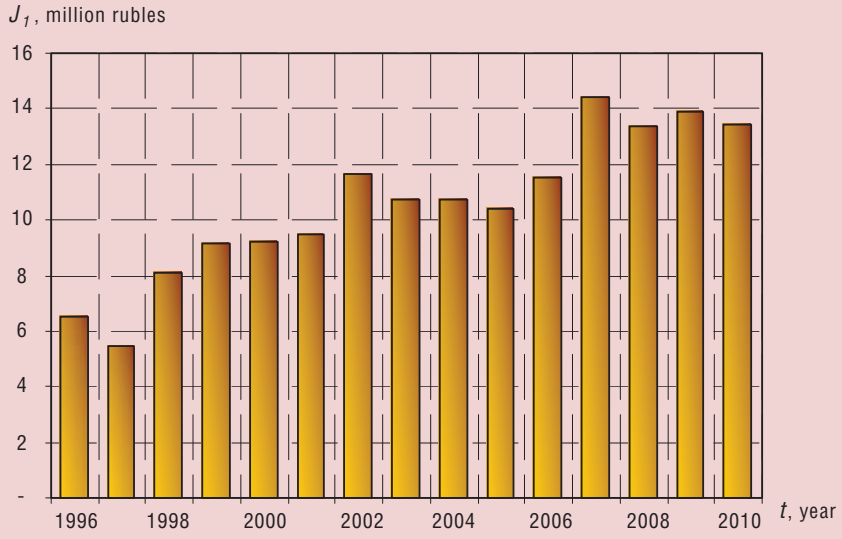


Figure 4. Dynamics of investments in the health care of the Udmurt Republic in 1996–2010

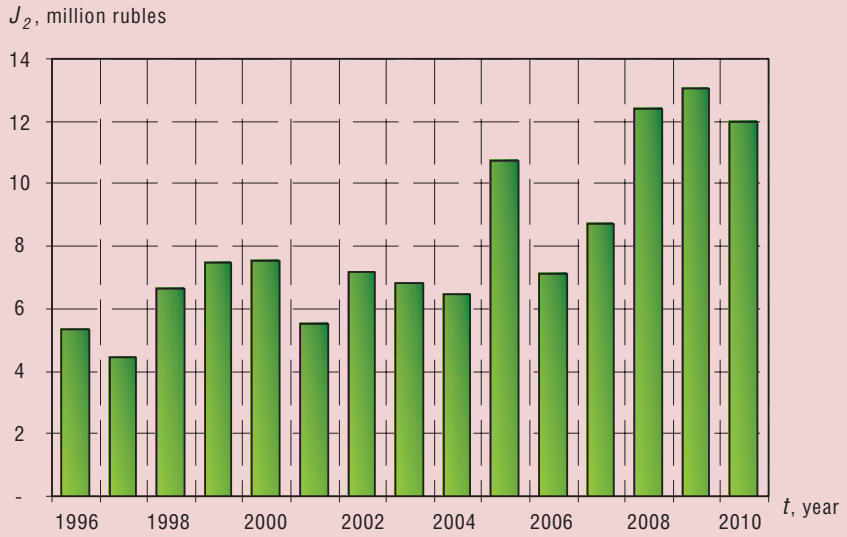
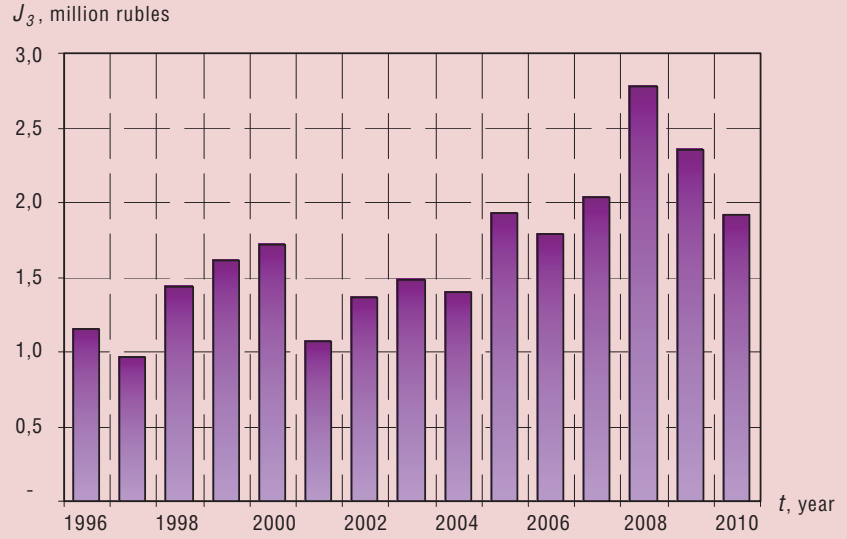



Figure 5. Dynamics of investments in culture of the Udmurt Republic in the 1996–2010 period




change over time in real life due to reasons and factors, that prevent constructing of a suitable classic multifactor econometric model, because of their multiplicity, measurement difficulty, insufficiency of theoretical assumptions concerning interrelations with the indicators. Therefore, the assumption is made with regard to the indicators of investments in production factors suggesting that internal regularities in the development dynamics are formed under the cumulative impact of various factors influencing the indicators, making it possible to apply an econometric model of the specific class of time series models.

Economic time series modeling by constructing the model of trend, seasonal and cyclical components does not lead to satisfactory results, while the residuals series frequently has statistical regularities. In such a case, autoregressive-moving-average models *ARMA* [7] are used to describe stationary time series.

But, as a rule, the economic indicators are nonstationary time series, therefore, autoregressive-integrated-moving average *ARIMA* (*p,q,k*) models are being used more widely. This model is also known as the Box-Jenkins model, a general view of which is represented by the formula:

$$\Delta^k y(t) = \mu_0 + \mu_1 \cdot y(t-1) + ... + \mu_p \cdot y(t-p) + \\ + \varepsilon(t) - \theta_1 \cdot \varepsilon(t-1) - ... - \theta_q \cdot \varepsilon(t-q), \quad (1)$$

where $y(t)$ – level value of the series at time $t$;

$k$ – order (lag) difference;

$\mu_0$, $\mu_1$,…$\mu_p$, $\theta_1$, $\theta_q$ – estimated model parameters;

$p$ – order of autoregressive process *AR*;

$q$ – order of moving average *MA* process;

$\varepsilon(t)$ – error (white noise).

The order difference $k$ in the model denotes a cyclic period and is determined on the basis of the sample autocorrelation function *AC* ($k$), which describes the correlation between the values of the studied process at different points in time. It is necessary to select such an order of difference, at which the value of the function *AC* ($k$) is significant [7].

In order to check the validity of the forecast models and the choice of the model forecasting short-term investments, let us calculate the following indicators:

– the determination coefficient:

$$R^2 = \frac{\sum_{t=1}^{T} (\tilde{y}_t - \bar{y})^2}{\sum_{t=1}^{T} (y_t - \bar{y})^2},$$

where $\tilde{y}_t$ – the series value under the calculated model;

– the Fisher statistic:

$$F = \frac{R^2}{1-R^2} \cdot \frac{T-m}{m-1},$$

where $m$ – the number of estimated parameters in the model;

– the standard deviation:

$$\sigma = \sqrt{\frac{\sum_{t=1}^{T} (\tilde{y}_t - y_t)^2}{T-m}},$$

– the Akaike criterion:

$$AIC = 2\frac{p+q}{T} + \ln\left(\frac{\sum_{t=1}^{T} (\tilde{y}_t - y_t)^2}{T}\right),$$

– the Schwarz criterion:

$$SHC = \frac{(p+q)\ln T}{T} + \ln\left(\frac{\sum_{t=1}^{T} (\tilde{y}_t - y_t)^2}{T}\right),$$

– the Durbin–Watson statistic:

$$DW = \frac{\sum_{t=2}^{T} ((\tilde{y}_t - y_t) - (\tilde{y}_{t-1} - y_{t-1}))^2}{\sum_{t=1}^{T} (\tilde{y}_t - y_t)^2}.$$

The characteristic roots of the autoregressive process and moving average process are used for verifying the stationarity and reversibility of the estimated models. The obtained roots should be of modulus <1 [7].

Let us consider the application of the Box-Jenkins model to forecast the volume of investments in production and human capital of the Udmurt Republic.

The model parameters *ARIMA* (*p,q,k*) for simulating the dynamics of investments in production capital will be estimated using sample and partial autocorrelation function *(tab. 1)*.

The coefficients of sample and partial autocorrelation functions of the first order are clearly significant, therefore, the following models have been chosen to simulate the dynamics of investments in production capital: *ARIMA* (1,0,0), *ARIMA* (0,1,0), *ARIMA* (1,1,0), *ARIMA* (1,0,1), *ARIMA* (0,1,1), *ARIMA* (1,1,1).

Table 1. Values of the sample autocorrelation function for investments in basic production assets

| Function | Order, *k* | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *AC* (*k*) | 0.706 | 0.326 | 0.009 | -0.136 | -0.186 | -0.188 | -0.202 |
| *t*-statistic *AC* (*k*) | 3.861* | 1.336 | 0.035 | 0.532 | 0.733 | 0.741 | 0.799 |
| *PAC* (*k*) | 0.706 | -0.342 | -0.132 | 0.045 | -0.083 | -0.064 | -0.108 |
| *t*-statistic *PAC* (*k*) | 3.861* | 1.410 | 0.516 | 0.174 | 0.323 | 0.248 | 0.421 |
| * Significance at the 5% level. | | | | | | | |

As follows from *table 2,* it is necessary to use the model *ARIMA* (1,0,0), the parameters of which are represented in *table 3,* to simulate the dynamics of investments in production capital.

Thus, the Box-Jenkins model describing the dynamics of investments in the production capital of the Udmurt Republic is as follows:

$$\tilde{I}(t) = 12384.9 + 0.71 \cdot I(t-1). \qquad (2)$$

with the determination coefficient $R^2$ of the model amounting to 0.72, and which has been used as the basis for forecasting investments in the production capital of the Udmurt Republic for the 2011–2015 period (see fig. 2)

The forecasting of investments in basic production funds by the model (2) demonstrates stable investment volume that will be observed up to 2015 inclusively (see tab. 7).

The parameters *ARIMA* (*p,q,k*) of the model for the forecasting of the volume of the investments in education $J_1$ (*t*), health care $J_2$ (*t*) and culture $J_3$ (*t*) are estimated similarly to the forecasting of investments in production capital.

The model *ARIMA* (2,2,0) is chosen to simulate the dynamics of investments in education *(tab. 4)*.

Thus, the Box-Jenkins model describing the dynamics of investments in the education of the Udmurt Republic ($R^2$ = 0.82) is the following:

$$\tilde{J}_1(t) = 18091.9 + 0.87 \cdot J_1(t-2) + \varepsilon(t) - 0.94 \cdot \varepsilon(t-2). \qquad (3)$$

The forecasting of investments in education by the Box-Jenkins model (3) assumes average growth of investments by 2.2%, which will be observed until 2015 (see tab. 7).

Let us estimate the parameters of the Box-Jenkins model to simulate the dynamics of investments in health care *(tab. 5)*.

The Box-Jenkins model forecasting the investments in the health care of the Udmurt Republic ($R^2$ = 0.60) is as follows:

$$\tilde{J}_2(t) = 15465.9 + 1.23 \cdot J_2(t-1) - 0.28 \cdot J_2(t-2) + \varepsilon(t) - 1.00 \cdot \varepsilon(t-1). \qquad (4)$$

The forecast values of investments in education according to the Box-Jenkins model (4) are represented in table 7. The average growth rate for the forecast period will make up 1.0% annually.

Let us estimate the Box-Jenkins model parameters for modeling the dynamics of investments in culture *(tab. 6)*.

The Box-Jenkins model forecasting the investments in the culture of the Udmurt Republic ($R^2$ = 0.69) is as follows:

$$\tilde{J}_3(t) = 2675.5 - 0.70 \cdot J_3(t-1) + 0.21 \cdot J_3(t-2) + \varepsilon(t) - 0.99 \cdot \varepsilon(t-2). \qquad (5)$$

The forecasting of investments in culture shows that the given indicator will grow up to 2015 by average 3.5% per year.

The results of the forecast of the volume of investments in production factors are represented in *table 7 and fig. 6*.

Table 2. Performance assessment of the models for forecasting investments in basic production assets

| Model | $R^2$ | F | σ | AIC | SHC | DW | Roots | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | AR | MA |
| *ARIMA* (1,0,0) | 0.50 | 11.89* | 13520.8 | 21.38 | 21.47 | 1.51 | 0.71 | - |
| *ARIMA* (0,1,0) | 0.45 | 10.49* | 13029.3 | 21.39 | 21.49 | 1.54 | - | -0.71 |
| *ARIMA* (1,1,0) | 0.54 | 6.41* | 13520.8 | 21.44 | 21.58 | 1.92 | 0.56 | -0.33 |
| *ARIMA* (1,0,1) | 0.02 | 0.23 | 10797.0 | 21.61 | 21.70 | 1.85 | 0.14 | - |
| *ARIMA* (0,1,1) | 0.02 | 0.30 | 103375.4 | 21.51 | 21.61 | 2.01 | - | 0.17 |
| *ARIMA* (1,1,1) | 0.58 | 6.89* | 14122.0 | 20.93 | 21.06 | 2.00 | 1.49 | 2.29 |
| * Significance at the 5% level. | | | | | | | | |

Table 3. Identification parameters of the model for forecasting investments in basic production funds

| Coefficient | Value | *t*-statistics |
|---|---|---|
| $\mu_0$ | 12384.9 | 1.38 |
| $\mu_1$ | 0.71 | 3.45* |
| * Significance at the 5% level. | | |

Table 4. Identification parameters of the model for forecasting investments in education

| Coefficient | Value | *t*-statistics |
|---|---|---|
| $\mu_0$ | 18091.9 | 7.78* |
| $\mu_2$ | 0.87 | 7.33* |
| $\theta_2$ | -0.94 | 14.47* |
| * Significance at the 5% level. | | |

Table 5. Identification parameters of the model for forecasting investments in health care

| Coefficient | Value | *t*-statistics |
|---|---|---|
| $\mu_0$ | 15465.9 | 0.50 |
| $\mu_1$ | 1.23 | 2.89* |
| $\mu_2$ | -0.28 | 0.56 |
| $\theta_2$ | -1.00 | 3.80* |
| * Significance at the 5% level. | | |

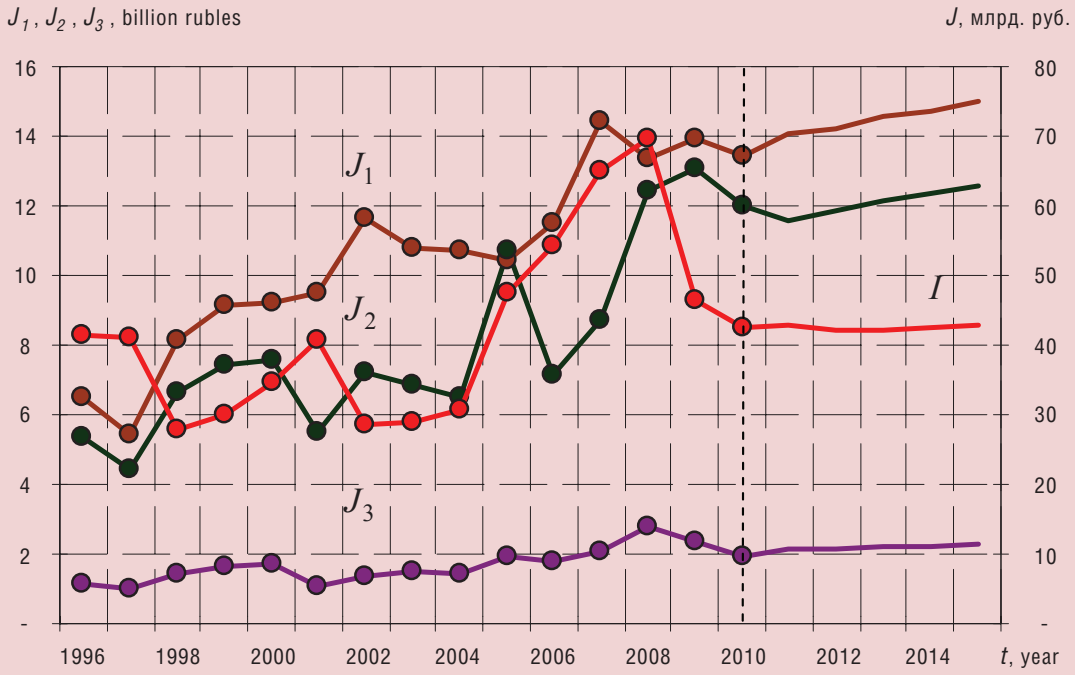
Table 6. Identification parameters of the model for forecasting investments in culture

| Coefficient | Value | *t*-statistics |
|---|---|---|
| $\mu_0$ | 2675.5 | 1.77** |
| $\mu_1$ | -0.70 | 2.48* |
| $\mu_2$ | 0.21 | 0.74 |
| $\theta_2$ | -0.99 | 3.91* |
| * Significance at the 5% level.<br>** Significance at the 10% level. | | |

Table 7. Summary table of the forecasts of investments in the production factors of the Udmurt Republic for 2011–2015 period, million rubles in 2010 prices

| Year | Investments in production capital | Investments in education | Investments in health care | Investments in culture | Total investments in human capital |
|---|---|---|---|---|---|
| 2011 | 42 772.04 | 14 057.52 | 11 603.93 | 2 124.80 | 27 786.25 |
| 2012 | 42 113.50 | 14 205.43 | 11 881.01 | 2 166.48 | 28 252.92 |
| 2013 | 42 012.77 | 14 576.43 | 12 138.21 | 2 205.00 | 28 919.65 |
| 2014 | 42 346.72 | 14 705.27 | 12 376.97 | 2 240.60 | 29 322.84 |
| 2015 | 42 933.72 | 15 028.44 | 12 598.59 | 2 273.51 | 29 900.54 |

Figure 6. Dynamics of investments in the production factors of the Udmurt Republic in the 1996–2010 and their forecast for the 2011–2015 period in 2010 prices




Having forecast the volumes of investment in production assets and human capital of the regional economy for the 2011–2015 period, it is possible to forecast the value of production and human capital for the same period.

### 3. Production factors forecast

The dynamics of the production capital of the Udmurt Republic is shown in *fig. 7*.

As follows from the chart, the basic production assets of the Udmurt Republic have been decreasing by 5.4% annually.

The following economic and mathematical model was used to simulate the dynamics of basic production assets [1]:

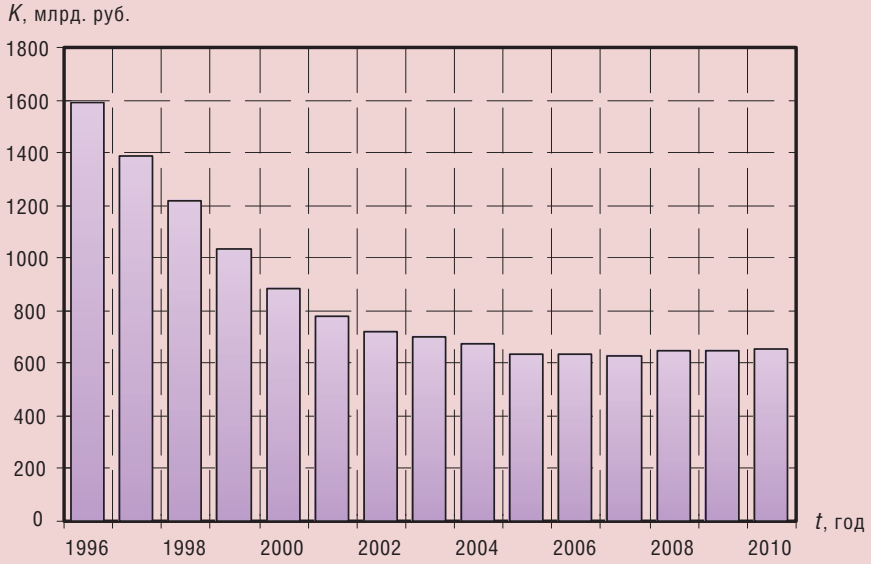
$$\frac{dK(t)}{dt} = I(t) - \eta K(t), \qquad (6)$$

with the initial conditions:

$$K(t = t_0) = K_0, \qquad (7)$$

where $K(t)$ – the amount of production assets at the specific time $t$; $I(t)$ – the amount of investments in production capital at the specific time $t$;

Figure 7. Dynamics of the production capital of the Udmuurt Republic in the 1996–2010 period in 2010 prices (smoothed data)




η – the retirement rate of production capital, determined as the weighted average value from the formula:

$$\eta = \frac{\sum_{t=1}^{T-1} K(t) \cdot (I(t) - \Delta K(t))}{\sum_{t=1}^{T-1} K^2(t)}, \qquad (8)$$

where $\Delta K(t) = K(t+1) - K(t)$.

The coefficient η for the Udmurt Republic makes up 0.116.

The forecast values of the production capital of the Udmurt Republic for the 2011–2015 period were obtained from the solution of the differential equation (6)–(7) using the numerical scheme of the explicit Euler method and with account of the forecast values of investments in basic production funds (see fig. 9, tab. 8).

The dynamics of the human capital of the Udmurt Republic is shown in *fig. 8*.

As follows from the chart, the human capital of the Udmurt Republic has been steadily increasing, amounting to 7.1% per year.

The economic and mathematical model of the human capital dynamics is represented in [2]:

$$\frac{dH(t)}{dt} = \bar{\varepsilon} J(t) - \chi H(t), \qquad (9)$$

$$H(t = t_0) = H_0, \qquad (10)$$

where $H(t)$ – the amount of human capital at the specific time $t$; $J(t)$ – the amount of investments in human capital at the specific time $t$; $\chi$ – human capital depreciation rate; $\bar{\varepsilon}$ – average share of population involved in production.

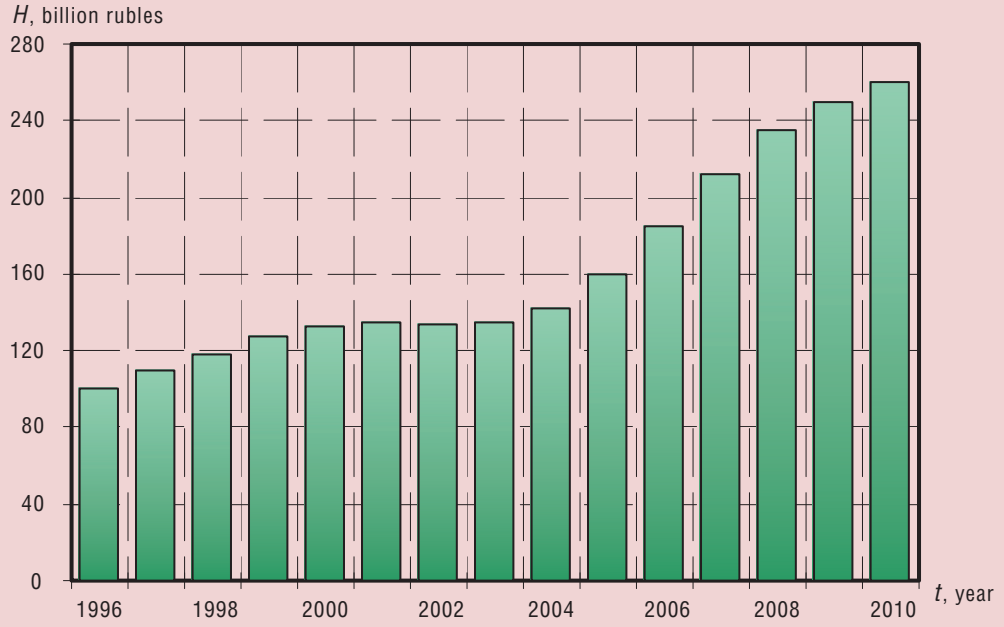
The parameters $\bar{\varepsilon}$ and $\chi$ have been estimated by the least square method according to the formula:

$$\begin{pmatrix} \bar{\varepsilon} \\ \chi \end{pmatrix} = \begin{pmatrix} \sum_t J^2(t) & -\sum_t J(t)H(t) \\ \sum_t J(t)H(t) & -\sum_t H^2(t) \end{pmatrix}^{-1} \cdot \begin{pmatrix} \sum_t J(t)\Delta H(t) \\ \sum_t H(t)\Delta H(t) \end{pmatrix} \qquad (11)$$

where $\Delta H(t) = H(t+1) - H(t)$.

Coefficients c and , calculated according to the statistics for the economic system of the Udmurt Republic make up 0.016 and 0.739 respectively.

Figure 8. Dynamics of human capital of the Udmurt Republic in the 1996–2010 period in 2010 prices (smoothed data)




The explicit Euler scheme has been also used for the numerical solution of differential equations (9)-(10). *Figure 9* represents the dynamics of the forecast values of the human capital of the Udmurt Republic for 2011–2015 years based on the forecast values of investments in human capital.

The production capital is expected to decrease (4.5% per year), while the human capital is forecast to increase (5.0 % per year) up to the year 2015 (see tab. 8).

Subsequently, understanding further development tendencies of the main production factors of the Udmurt Republic, it is possible to forecast the gross regional product.

**4. Gross regional product forecast**

Consider the production function in the form of the Cobb-Douglas function [8]:

$$Y(t) = A[K(t)]^{\alpha}[H(t)]^{\beta}. \qquad (12)$$

Let us restrict the linear homogeneity of the production function ($\alpha+\beta=1$), as the parameters of the evaluated function are statistically insignificant without considering the given condition due to high dependence (multicollinearity) between the input factors and *H*. Taking into account the conditions of homogeneity, the formula (12) is reduced to the form:

$$y_H(t) = A[k_H(t)]^{\alpha}, \qquad (13)$$

where $y_H(t)$=Y(*t*)/H(*t*), $k_H(t)$=K(*t*)/H(*t*).

The production function (13) was constructed on the basis of the smoothed statistical data on the values of human capital, production assets and gross regional product for the 1996–2010 period [6, 7].

The production function of the Udmurt Republic is the following (see fig. 4):

$$Y(t) = 0.84[K(t)]^{0.35}[H(t)]^{0.65}, \qquad (14)$$

with determination coefficient $R^2 = 0.84$, the Fisher statistic $F = 67.3$.

Figure 9. Dynamics of production and human capitals of the Udmurt Republic in 1996–2010 and their forecast for 2011–2015 in 2010 prices

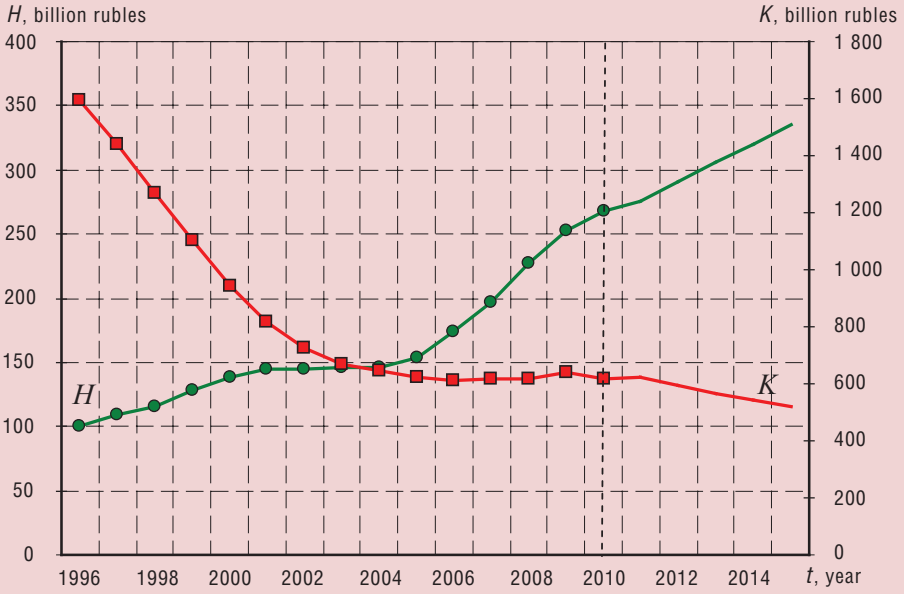



*Figure 10* represents the graph of the production function of the Udmurt Republic in specific values. It should be noted that the model of the production function is close to the statistical values ($k_H, y_H$) across the Udmurt Republic.

The coefficient A = 0.84 shows that the level of technical progress for the region's economic system is low. The values of the elasticity coefficients of production capital ($\alpha = 0.35$) and human capital ($\beta = 0.65$) show that the increasing expenditures on production funds and human capital by 1% correspond to the rise in the production output by 0.35%, while the increasing expenditures on human capital by 1% comply with the increase in output by 0.65%. The elasticity coefficients ratio is $\alpha/\beta = 0.54$, hence, the economic system of the Udmurt Republic has been operating under the conditions of the second input factor (human capital) deficiency, extensive (fundreserving) growth.

When analyzing the production function, the authors consider the indicator, characterizing the possibility of replacing one factor with another, i.e. the marginal substitution rate of human capital with production funds [9]:

$$S_{HK} = \frac{\partial Y/\partial H}{\partial Y/\partial K} = \frac{\beta}{\alpha} k_H. \qquad (15)$$

The corresponding values (15) during the analyzed time-period are represented in *fig. 11*:

The value determines the increment ratio of the resources, separately resulting in the increment of one and the same production volume. Thus, for example, for the 2010, where $S_{HK} = 1.05$, it follows that in order to increase the production of one and the same number of $Y$, the factor $K$ requires the increment 1.05 higher than the factor $H$. The obtained result, represented in fig. 10, indicates that the increase of investment in human capital is still more profitable ($S_{HK} > 1$).

The forecast dynamics of production and human capital gives the possibility to forecast the estimated production function (14) and the gross regional product of the Udmurt Republic *(fig. 12)*.

Figure 10. Graph of the production function and statistical data ($k_H$, $y_H$) of the Udmurt Republic

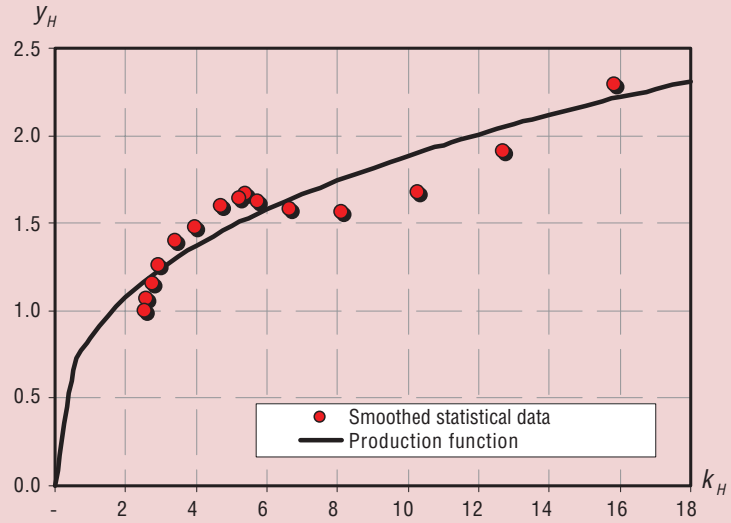
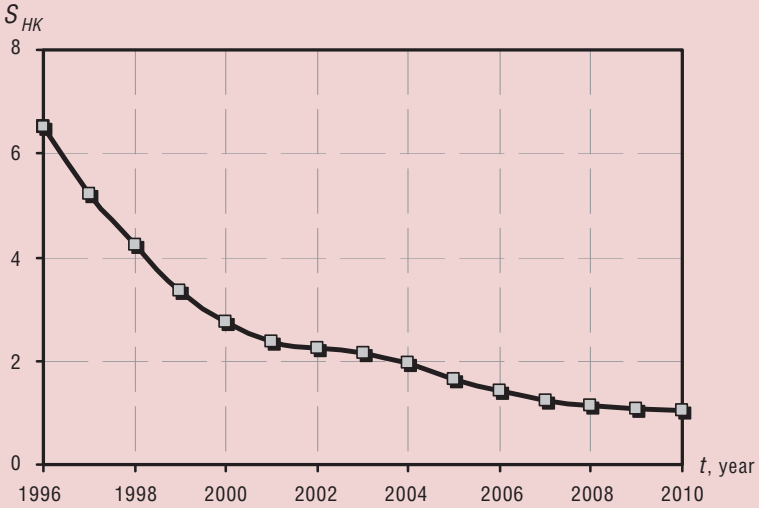



Figure 11. Marginal substitution rate of human capital with production capital in the 1996–2010 period




According to the conducted assessments, the GDP indicator is expected to grow up to the year 2015, due to the increasing growth rate of the region's human capital. The average growth rate of the GDP volume in 2011–2015 will reach 1.8%. In the most favourable economic conditions the forecast value of GDP in 2015 will amount to 330 926 million rubles, i.e. 9.0% higher than in 2010.

**Conclusion**

The results of the short-term forecasting of the main indicators of socio-economic development of the Udmurt Republic for the 2011 – 2015 period *(tab. 8)* have been obtained during the research, conducted according to the method, described in the work (see fig. 1).

Thus, we received the forecast values of the macroeconomic indicators of the Udmurt Republic for the 2011–2015 period, which have been obtained on the basis of the current trends in the development of the region's economic system. The expected further decrease in the volume of production assets will make on average 4.5% per year, the annual growth of

Figure 12. Dynamics of the Udmurt Republic GDP in specific (a) and basic (b) figures in the 1996–2010 period and its forecast for the 2011–2015 period in 2010 prices

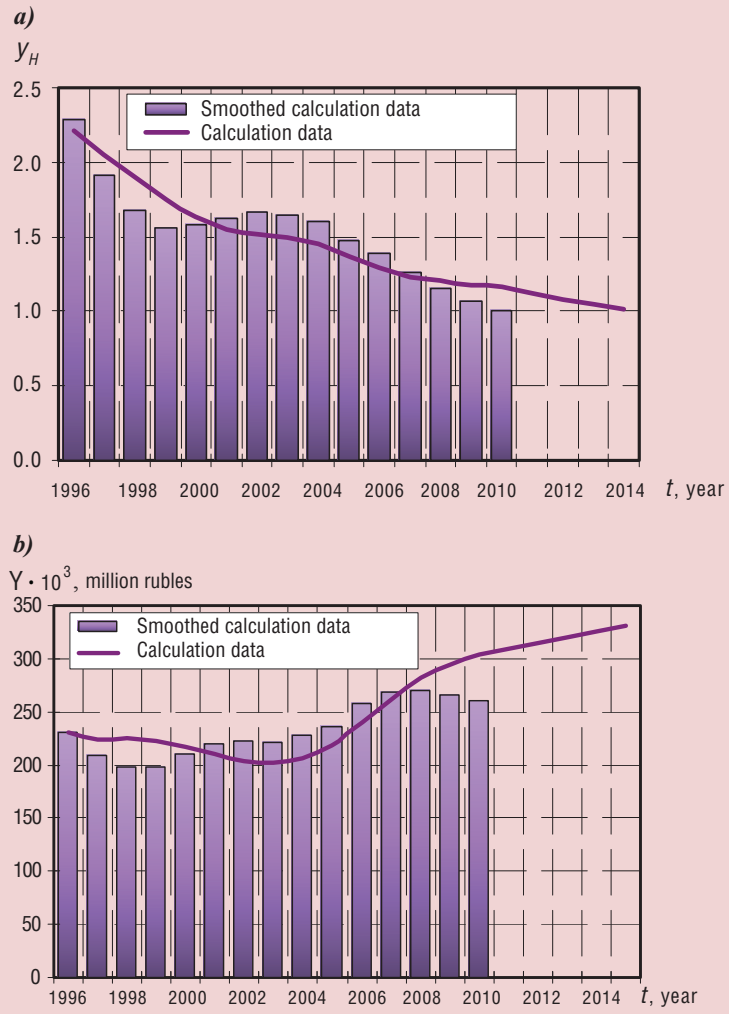



Table 8. Summary table of the forecasting of the Udmurt Republic macroeconomic indicators in 2011–2015

| Year | Production capital | | | Human capital | | | Gross regional product | | |
|---|---|---|---|---|---|---|---|---|---|
| | Forecast. million rubles | % to the previous year | % to 2010 | Forecast. million rubles | % to the previous year | % to 2010 | Forecast. million rubles | % to the previous year | % to 2010 |
| 2011 | 623 752.20 | 95.8 | 95.8 | 276 099.10 | 106.5 | 106.5 | 309 879.87 | 102.1 | 102.1 |
| 2012 | 593 660.53 | 95.2 | 91.2 | 290 775.58 | 105.3 | 112.2 | 315 045.34 | 101.7 | 103.8 |
| 2013 | 567 001.35 | 95.5 | 87.1 | 305 599.92 | 105.1 | 117.9 | 320 255.87 | 101.7 | 105.5 |
| 2014 | 543 393.60 | 95.8 | 83.5 | 320 578.31 | 104.9 | 123.7 | 325 542.29 | 101.7 | 107.3 |
| 2015 | 522 495.40 | 96.2 | 80.3 | 335 712.14 | 104.7 | 129.6 | 330 926.04 | 101.7 | 109.0 |

human capital will amount to an average of 5.0%. The gross regional product will increase by an average of 1.8% per year. It should be noted, that the forecast dynamics, obtained in the result of mathematical simulation, coincides with the moderately optimistic forecast of the

Udmurt Republic development up to 2015 [10]. The main condition of a moderately optimistic scenario development is the recovery of the region's economic sectors, with preserving the orientation to the exploitation of the available resources that include production and human capital.

The calculations showed that investments in human capital are more profitable, since the Udmurt Republic economy is currently under the conditions of the human capital deficiency, as follows from the production function of the region's economic system, obtained from the statistical data for the period 1996–2010.

The mathematical forecast method, presented in the paper, permits conducting parametric studies and analyzing ways to increase the growth rate of the region's macroeconomic indicators. Thus, for instance, it is necessary to implement one of the following scenarios, in order to increase the gross regional product by 5% annually in the 2011–2015 period:

To increase the volume of investment in production capital by 44.8% per year (i.e. 35 billion rubles per year) with maintaining the growth rate of investments in human capital. In this case, the current tendency towards the reduction of the production capital will change, and production capital will be annually increasing by 5.5% per year.

To increase the volume of government investments in human capital by 32.5% per year (i.e. 14 billion rubles per year) with maintaining the growth rate of investments in production capital. In this case, growth rates of human capital will rise from 5.0 to 9.9% per year.

To promote economic growth through the simultaneous increase of investments in production and human capital. In this case, to achieve an annual 5% growth of GRP, investments in production capital are to be increased by 20.8% per year (i.e. 12 billion rubles per year), and investments in human capital are to be increased by 18.8% per year (6 billion rubles per year). Besides, the volume of production assets will grow by 0.1% per year and the amount of human capital will rise by 7.8% per year.

Thus, in order to increase the current development rate of the socio-economic system of the Udmurt Republic, it is necessary to transfer the system to the new level of development, having upgraded the technological base in the priority sectors of the economy and having established an improved system of human resources capitalization.

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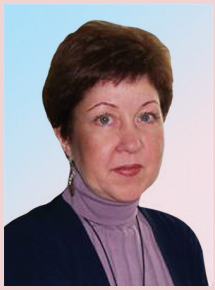
# Typing the region's economy for staffing requirements forecasting

*The article considers a method that defines type zones in the region's economy in accordance with the intensity of modernization and innovation diffusion processes. The author substantiates the application of unified approaches to forecasting the professional qualification components of staffing requirements in the type zones in accordance with the nature of structural changes. The article presents the results of typing the economy of Krasnoyarsk Krai and its municipalities. It indicates that the use of this approach enhances the accuracy and relevance of the results of the long-term forecast of personnel demand of the regional economy.*

*Regional economic system, economy typing, segments of the economy, staffing requirements, forecast, structure, standard of employment.*



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**Purpose of the work**

Staffing requirements of the regional economic system are difficult to forecast due to the fact that a unified approach can't be used for predicting professional qualification components of staffing requirements by the types of economic activity (TEA), since they are *sharply differentiated* according to modernization rate and diffusion of innovation. There is a great probability of obtaining incorrect results of the forecast, because it is difficult to ensure their accuracy and reliability due to fact that the model of staffing requirements should take into account structural changes of the elements of a market subsystem and the differences in the timing of their emergence.

Therefore, the author considers that the task of enhancing the quality of the staffing requirements forecast results brings forward the necessity of typing the region's economy. *The purpose of typing the region's economy* lies in defining among the TEA the segments, within which it is possible, due to a similar rate of economic transformations, to apply similar approaches to forecasting professional qualification changes in the components of staffing requirements, and also to determine the relationship between the degree of professional qualification changes in staffing requirements, and the intensity of modernization and updating processes in the segments of the economy (by TEA).

**Method of typing**

*Structural changes* in the elements of the region's market subsystem, caused by modernization processes and region's transition to innovation development, affect different types of local markets (product market, market of qualified staff, professional education market). The economy witnesses changes in the structure of production and employment by types of economic activity, levels of education, professions and qualifications. Labour markets experience changes in the demand for professions and qualifications, in the requirements to the training of professional staff. The demand for education services (levels of education, professions and qualifications) changes in the sphere of professional education. Violation +– of interrelations in structural changes leads to the imbalances of supply and demand in regional markets of products, labour and professional education.

*Time lag* between the emergence of the need for qualified employees in the economy and the possibility of their training by the regional education system complicates the problem of forecasting professional qualification components of staffing requirement, due to the following reasons: firstly, due to the length of professional personnel training process and impossibility of adjusting the already established methods; secondly, due to the differences in the duration periods of professional training for different levels: 4–5 years for institutions of higher professional education (HPE); 3–4 years for secondary vocational education (SVE) institutions; 1–2 years for primary vocational education (PVE) institutions. Since the staffing demand of the economy is satisfied mostly at the expense of professional staff, trained for the labour market by the regional education system, the extent and professional qualification structure of personnel requirement should be known in advance. This will make it possible to train professional staff according to the changing requirements of the economy to ensure the specified growth rate at an appropriate level of technological development.

*Different rate of the processes* of modernization and upgrading of the region's economy by the types of economic activities leads to simultaneous existence of local markets of different technological levels (traditional, perspective, innovation-based), forming different needs with regard to professional qualification structure of employees. Establishment of relationship between the extent of the changes in the professional qualification structure of staffing requirements and intensity of economic modernization and renovation in *standard economic zones* (segments according to TEA) will, from our point of view, increase the relevance and accuracy of the results of forecasting professional qualification structure of staffing requirements of the regional economy.

Projected *components* of staffing requirements, due to different reasons, with varying degrees of dependence on the pace of economic growth and the level of technological development of the economy, are the following:

– *"for replacement"* – a component, formed due to the necessity of annual replenishment of the number of employees, dismissed for various reasons (retirement, long absence at the workplace, natural loss and other). Professio-nal qualification structure of the component "for replacement" is identical to the existing employment structure (by the levels of training – HPE, SVE, PVE; specialties and professions) and is determined according to the prevailing regulations of employment of young specialists by the types of economic activities [1];

– *"supplementary"* – a component that estimates the increase in the number of professional staff that the region's economy needs in accordance with its strategic guidelines, socio-economic and innovation development programmes, investment policy. The value

of the component is connected with the emergence of new jobs in the economy, the structure (by levels of training, professions and specialties) depends on the scale and nature of influence of investment and innovation factors in economic growth.

Investment projects, approved for implementation in the region, are the key **investment factors** promoting economic growth, changing the size and structure of staffing requirements. Depending on the scale of their impact, investment projects are divided into two categories: significant for individual economic entities and large-scale. *Investment projects (IP) significant for individual economic entities* upgrade the activities of an individual enterprise for increasing its efficiency, but they don't influence the change in the structure of the regional economy and employment due to the lack of inter-sectoral multiplicative effects. IP implementation results in the updating and reconstruction of production assets, enhancement of labour productivity in small and medium business. IP implementation terms don't exceed 1–2 years. *Large-scale IP* have a significant impact on economic modernization and growth in a municipal entity, changing the structure of the economy and employment in the areas of IP implementation and related industries. Consequently, the structure of employment is redistributed (by types of economic activity, levels of training, professions and specialties) due to the emergence of new jobs with modern technological equipment, and the regional structure of professional education also changes (new specialties and professions emerge in the framework of existing spheres of professional training). Krasnoyarsk Krai has such large-scale investment projects as [2] "Integrated development of the Lower Angara area", "Organization of wood processing in the Kezhemsky District of Krasnoyarsk Krai", "Expansion of wood processing industry by producing a new type of goods and the creation of forest infrastructure for the development of new woodlands" etc., they affect several types of economic activity at the same time (manufacturing, energy, transport, construction).

Innovation projects are considered to be **innovation factors** promoting the changes in staffing requirements of the economy. These projects introduce innovations in the economy and contribute to the formation of *new labour markets* due to the emergence of demand for new professions, specialties and qualifications. Innovation projects promote qualitative structural changes in the economy, employment and professional education in the region. Priority directions of innovations development are determined by the strategies for innovation development of Russia up to 2020 [3] and its regions, including Krasnoyarsk Krai [4].

The simultaneous impact of innovation and investment growth factors in the region's economy creates the **segments** (by TEA) of various technological types (traditional, prospective, innovation-driven), the operation of which requires the staff, which is different according to the volume and professional qualification composition, and also the levels and programmes of their training in the system of professional education.

*Segment 1 "Traditional technologies"* unites the types of economic activities, for which modernization processes are the weakest. This segment of economy, due to the fact that the majority of manufacturers use conventional technological developments reflecting the average production level, is characterized by stable demand for traditional professions and qualifications within the existing levels (HPE, SVE, PVE) and training areas (28 enlarged groups of specialties (EGS)). Therefore, the structures of staffing requirements (by TEA, levels of training, 28 EGS) can be determined by the retrospective period and used when making a forecast.

*Segment 2 "Modernization and development"* unites the TEA with the active processes of technological modernization and expansion of the economy. This segment of the economy differs from the previous one by the use of innovative technology possessing technological and economic advantages in comparison with traditional analogous technologies; it has an expanding demand for traditional and new professions and qualifications within the existing training areas (28 EGS). When forecasting the staffing requirements of the component, the "additional" professional qualification structure is determined in accordance with IP staffing.

*Segment 3 "Transitional to innovation economy"* includes TEA with active introduction of innovation technologies that are distinguished by novelty and uniqueness. This part of the economy is characterized by a qualitative change in the demand for professional staff (by levels of training, new specialties and professions) and the formation of new labour markets. When forecasting staffing requirements of the component, the "additional" professional qualification structure is determined by expert assessments, formed by the participants of regional technology platforms, in the framework of which innovation projects are developed and their results are implemented in the economy.

The economy has segments with different requirements concerning the size and composition of professional staff. This fact that provided the basis for applying **different approaches to forecasting** professional-qualification components of staffing requirements, and for *developing a method* of allocating **type zones** in the region's economy in accordance with the intensity of modernization and innovation diffusion processes.

The following two indices served as the criteria for **typing the region's economy**:

– the index *"potential of the types of economic activity (TEA potential)"* (formula 1), which characterizes the intensity and efficiency of modernization and updating by all the types of economic activity of the regional economy. Depending on its values, the types of economic activity in the municipal entity are divided into those forming 1) traditional and 2) potential labour markets;

– the index *"innovativeness of the types of economic activity (TEA innovativeness)"* (formula 2), which characterizes the intensity of innovations diffusion in the region's economy. In accordance with the values of this index, the third group is allocated: types of economic activity forming new labour markets.

The index of potential for the i-th type of economic activity ($I^{plm}_i$) is calculated according to the formula:

$$I^{plm}_i = \alpha_1 \times d^{nee}_i + \alpha_2 \times d^{tps}_i + \alpha_3 \times d^{ifa}_i, \quad (1)$$

where $d^{nee\_in}_i$ represents the rate of increase in the number of people engaged in the i-th type of economic activity: it reflects the impact of labour market on the scale and dynamics of employment as an indicator of social stability of the region's development;

$d^{tps}_i$ represents the rate of turnover of goods and services of the i-th type of economic activity in the regional economy: it characterizes the changes in the scale of branch-wise production, competitiveness of products and/or services of the industry;

$d^{ifa}_i$ represents the rate of investments in fixed capital for the i-th type of economic activity in the region's economy: it reflects the rate of modernization by the types of economic activity in the regional economy;

$\alpha_1$, $\alpha_2$, $\alpha_3$ – are weighing coefficients reflecting the importance of each parameter included in the index of "*TEA potential"*, they are defined by expert assessments. Depending on the values of the potential index, the structure of *Segment 1* in the region's economy is determined.

Index of TEA innovativeness ($I^{inn}_i$) is calculated for the types of economic activity according to the formula:

$$I^{inn}_i = \beta_1 \times d^{nee\_in}_i + \beta_2 \times d^{tps\_in}_i + \beta_3 \times d^{inv\_in}_i, \quad (2)$$

where $d^{nee\_in}_i$ is the rate of increase in the number of people engaged in the development and implementation of innovations in the i-th type of economic activity among the TEA, forming potential labour markets: it characterizes the penetration of innovations in employment processes for the i-th type of economic activity, the share of persons engaged in innovation activity has a "new" professional structure;

$d^{tps\_in}_i$ is the rate of turnover of innovation products and services of the i-th type of eco-nomic activity: it characterizes the pace of innovations penetration into production processes, reflects the ability of TEA to form external demand;

$d^{inv\_in}_i$ is the rate of investments in innovation for the i-th type of economic activity among the TEA, forming potential labour markets: it reflects the innovation activity of the i-th type of economic activity;

$\beta_1$, $\beta_2$, $\beta_3$ are weighing coefficients reflecting the importance of each parameter included in the index of *"TEA innovativeness"*, they are defined by expert assessments. Depending on the values of the innovativeness index, the structure of *Segment 2* and *Segment 3* are determined in the region's economy.

The calculations of indexes "TEA potential" and "TEA innovativeness" for the economy of Krasnoyarsk Krai have been carried out on the basis of statistical data [5, 6], forecast indicators of socio-economic and innovation development of Krasnoyarsk Krai, surveys of employers, representatives of science and education as the expert participants of regional technology platforms.

Algorithm of the region's economy typing contains five steps performed in sequence.

*Stage 1. Calculation of the index "TEA potential"* according to the formula ($\overline{I^{plm}}$) (1).

*Stage 2. Grouping of the types of economic activity by the value of the indicator "TEA potential"*:

a) calculation of the arithmetic mean value of the TEA potential index *()*;

b) arrangement of the types of economic activity in the region into two groups in accordance with the arithmetic mean value of the TEA potential index;

c) determination of the boundaries of each TEA group on the basis of calculating meansquare deviations ($\sigma_1$ and $\sigma_2$), minimum ($I^{plm}_{min}$) and maximum ($I^{plm}_{max}$) values;

d) determination of the segment of the regional economy, to which TEA belongs, in accordance with the rule:

$$\text{If } I^{plm}_j \in \begin{cases} \left[I^{plm}_{min}; \overline{I^{plm}} + 3\sigma_2\right), & \text{then j} \in \text{group I – Сегмент 1} \\ \left[\overline{I^{plm}} + 3\sigma_2; I^{plm}_{max}\right], & \text{then j} \in \text{group II – Segment 2 + Segment 3} \end{cases} \quad (3)$$

Types of economic activity of group I form *Segment 1 "Traditional technologies"*.

*Stage 3.* Calculation of the index *"TEA innovativeness"* is carried out among the types of economic activity from "Group II" by the formula (2).

*Stage 4. Rearrangement of the types of economic activity by the value of the index "TEA innovativeness"* by the allocation of a set of TEA, for which the value of this index exceeds the average level, into a separate group. Types of economic activities that meet this condition, form *Segment 3 "Transitional to innovation economy". Segment 2 "Modernization and development"* comprises the TEA, for which the value of the index *"TEA innovativeness"* turned out to be below the average level.

As a result of the typing, the segments of economy have been allocated that form labour markets with the same set of components and a similar character of structural changes *(tab. 1)*. The selected characteristics of economy seg-ments make it possible to use the

Table 1. Characteristics of the components of staffing requirements by the segment of regional economy

| Components of staffing requirements | Segment 3 "Transitional to innovation economy" | Segment 2 "Modernization and development" | Segment 1 "Traditional technologies" |
|---|---|---|---|
| "For replacement"; "additional", in connection with the rate of SED | Invariable:<br>- structure of the component by 28 EGS<br>- standards of employment by TEA | Invariable:<br>- structure of the component by 28 EGS<br>- standards of employment by TEA | Invariable:<br>- structure of the component by 28 EGS<br>- standards of employment by TEA |
| "additional" in connection with the rate of modernization and development of the economy | Structure of the component is redistributed quantitatively by 28 EGS<br>Standards of employment by TEA change in accordance with the index of TEA potential | Structure of the component is redistributed quantitatively by 28 EGS<br>Standards of employment by TEA change in accordance with the index of TEA potential | Component is absent |
| *Including* "for the implementation of large-scale IP" | In accordance with the staffing of investment projects (by the results of surveys of employers and/or experts) | In accordance with the requirements for the staffing of IP (by the results of surveys of employers and/or experts) | |
| "Additional" in connection with the transition to innovation development | Structure of the component can change quantitatively and/or qualitatively<br>Standards of employment by TEA change in accordance with the index of TEA innovativeness | Component is absent | Component is absent |
| *Including* "for the implementation of innovation projects" | In accordance with the staffing of a project or by the results of surveys of experts | | |
| Note: SED – socio-economic development; EGS – enlarged group of specialties; TEA – types of economic activities; IP – investment project. | | | |

general rules when defining the professional qualification set of forecast components of staffing requirements within the segment and provide the basis for the application of unified procedures in economy segments for predicting the professional qualification structure of staffing requirements.

*Segment 1 "Traditional technologies*". The components of staffing requirements – *"for replacement", "supplementary",* due to the pace of socio-economic development and traditionally existing structure of employment (by TEA, levels of training, 28 EGS) are characterized by constant standards ($da^{l}_{ij}{}^{L}$) of employment of young specialists with the level of training (L) by the types of economic activity (i) determined according to annual monitoring results [1]. Let us use $a^{l}_{ij}{}^{L}$ to denote the number of young specialists with the following characteristics: level of education - L (HPE, SVE, PVE); field of training – j (one of the 28 EGS); type of economic activity for employment – i. Then the standard of employment of young specialists will be assumed as the share that the value $a^{l}_{ij}{}^{L}$ comprises in every thousand of employed young specialists with the level of education L in the i-th TEA [1].

*Segment 2 "Modernization and development"*. During the forecast period, the standards of staffing requirements according to the levels (HPE, SVE, PVE) and training areas (28 EGS) vary in direct proportion to the value of the index *"TEA potential"* (formula 1) and are adjusted annually according to the results of the young specialists employment monitoring [7].

When determining the professional-qualification structure of the components of staffing requirements, the following rules are used:

- *"for replacement"* – determined by the existing structure of employment (by 28 EGS) using the vector of normalized coefficients $\{da^{l}_{ij}{}^{L}\}$ that remain unchanged throughout the forecast period;

• *"additional"* in connection with the rate of modernization and development of the economy, it is determined by the existing structure of employment and new standards of employment by TEA ($da^{2}_{ij}{}^{L}$) with subsequent normalization of coefficients according to the equations:

$$da^{2}_{ij}{}^{L}(t_n) = da^{1}_{ij}{}^{L}(t_0) \times (1 + I^{plm}_{i}(t_n) \times d_i^{L}(t_n))$$

$$da^{2}_{ij}{}^{L}(t) = da^{1}_{ij}{}^{L}(t_0) + (da^{2}_{ij}{}^{L}(t_n) - da^{1}_{ij}{}^{L}(t_0))/(t_n - t_0) \times (t - t_n), \quad (4)$$

where $t_0$, $t_n$, $t$ represent the initial, last and current year of the forecast period, respectively;

$da^{2}_{ij}{}^{L}$ is the new standard of employment of young specialists with the level of education trained in the field *j* in the i-th TEA from segment 2;

$I^{plm}_{i}(t_n)$ is the index of potential of the i-th TEA by the end of the forecast period, $t_n$, it is determined on the basis of programmes for socio-economic development, modernization of the region's economy and the forecast of the number of people employed according to TEA;

$d_i^{L}(t_n)$ is the share of people employed in the i-th TEA with the level of professional education L (HPE, SVE, PVE) to the end of the forecast period $t_n$;

• *"For the implementation of large-scale investment projects"* is defined as part of the previous component in accordance with the number of personnel and structure of their professional training, declared in IP, or according to the results of a survey of employers and/or experts.

*Segment 3 "Transitional to innovation economy"*. At the beginning of the forecast period, the standards of professional staffing requirements by the levels (HPE, SVE, PVE) and spheres (28 EGS) of professional training are determined, which by the end of the period vary in direct proportion to the index *"TEA innovativeness"* (formula 2) and annually revised (with regard to "new" professions) according to the results of expert survey. When determining the components of staffing requirements, the following rules are used (see tab. 1):

– *"for replacement"* – determined by the structure of employment (by 28 EGS) on the basis of the vector of normalized coefficients $\{da^{1}_{ij}{}^{L}\}$;

– *"additional"* in connection with the rate of modernization and development of the economy, it is determined by the existing structure of employment and the amended standards for the employment of young specialists in accordance with the index of TEA potential on the basis of the formula (4);

– *"additional"* in connection with the transition to innovation development, it is initially determined by the existing structure of employment and the amended standards for the employment of young specialists by TEA, calculated in accordance with the index of TEA innovativeness. The subsequent iterations, by the results of expert survey, admit possible adjustments to the existing structure of professional training. New standards of employment in this segment of the economy are determined on the basis of transforming the standards of employment ($da^{2}_{ij}{}^{L}$) to the last year of the forecast period ($t_n$) with subsequent normalizing and calculating the even changes in the standard ($da^{3}_{ij}{}^{L}$) for each step of the forecast period, according to the equations:

$$da^{3}_{ij}{}^{L}(t_n) = da^{2}_{ij}{}^{L}(t_n) \times I^{inn}_{i}(t_n),$$

$$da^{3}_{ij}{}^{L}(t) = da^{2}_{ij}{}^{L}(t_0) + (da^{3}_{ij}{}^{L}(t_n) - da^{2}_{ij}{}^{L}(t_0))/(t_n - t_0) \times (t - t_n), \quad (5)$$

where $da^{3}_{ij}{}^{L}$ is the standard of employment of young specialists with the level of education, trained in the field j in the i-th TEA from Segment 3;

$I^{inn}_{i}(t_n)$ is the index of innovativeness of the i-th TEA by the end of the forecast period, $t_n$, it is determined on the basis of socio-economic development programmes, the strategy for the modernization and innovation development of the region;

– *"for the implementation of innovation projects"* – is defined as part of the previous component in accordance with the number of personnel and structure of their professional training, declared in IP or according to the results of expert survey. The issues of changes in the structure of professional training in connection with the emergence of the demand for new professions and specialties is not considered in this article.

**Results obtained**

The composition of the segments (by TEA) of the regional economy up to 2017 *(tab. 2)* has been determined as a result of typing the Krasnoyarsk Krai economy in 2012 taking into account the forecasts of socio-economic, investment and innovation development, the results of development of the regional technological platform "Food security of Siberia. Innovation technologies in production, processing and logistics of agricultural products".

The following documents serves as strategic guidelines for determining the conditions and trends of economic development of Krasnoyarsk Krai:

– strategy for innovation development of Krasnoyarsk Krai for the period up to 2020;

– forecast of the Krasnoyarsk Krai socio-economic development for 2012 and for the planned period of 2013–2014;

– main results of the krai's socio-economic development in 2011;

Table 2. Composition of the segments of the Krasnoyarsk Krai economy in 2013–2017

| Economy segment | Types and sub-types of economic activity (TEA) | Total TEA |
|---|---|---|
| Segment 1 "Traditional technologies" | B: Fishing, fish-breeding<br>DA: Production of foodstuffs including drinks and tobacco DB: Textile and clothing manufacture<br>DC: Manufacture of leather, leather articles and shoemaking<br>DD: Woodworking, manufacture of wooden products<br>DE: Pulp and paper production; publishing and printing<br>DF: Manufacture of coke, oil products<br>DG: Chemical production<br>DH: Production of rubber and plastic articles<br>DI: Production of other non-metal mineral commodities<br>DK: Manufacture of machinery and equipment excluding weapons and ammunition<br>DL: Manufacture of electrical equipment, electronic and optical equipment<br>DM: Manufacture of transport vehicles and equipment<br>DN: Other productions<br>H: Hotels and restaurants<br>J: Financial activity<br>L: State management and provision of military security; compulsory social assistance<br>N: Healthcare and provision of social services<br>O: Provision of other public utility services, social services and personal services | 19 |
| Segment 2 "Modernization and development" | C: Mining<br>DJ: Metallurgical production and manufacture of finished metal products<br>E: Production and distribution of power, gas and water<br>K: Real estate operations, rent and provision of services | 4 |
| Segment 3 "Transitional to innovation economy" | A: Agriculture, hunting and forestry<br>F: Building<br>G: Wholesale and retail trade; repair of vehicles, motorcycles, household appliances and articles of personal use<br>I: Transport and communications<br>M: Education | 5 |

– concept of the long-term target programme "Development of innovation-based activity in Krasnoyarsk Krai for 2012–2014";

– concept of the long-term target programme "Staffing of the krai's economy for 2012–2014";

– passport of the regional technological platform "Food security of Siberia. Innovation technologies in production, processing and logistics of agricultural products";

– supplements to the automated information system for monitoring the socio-economic indicators of Kraskoyarsk Krai municipal entities "Staffing requirements of the enterprises implementing investment and innovation projects in professional qualification perspective"; "Information on the need for qualified workers and specialists (by the organizations of the municipal entity)"; "Aggregate data and the need for qualified workers and specialists".

The obtained results have been used when forming the forecast of staffing requirements in the Krasnoyarsk Krai economy up to 2017 *(tab. 3)*. When making staffing requirements forecast, it has been considered that every segment of the economy is developing according to the following scenarios:

*Segment 1 "Traditional technologies"*: annual growth rates of GRP – 104.3% (in the prices of 2000); average growth rate of investments in fixed capital by TEA is 101.9%; average growth rate of social labour productivity – 101.4% (in the prices of 2000).

*Segment 2 "Modernization and development"* and *Segment 3 "Transitional to innovation economy"*: average annual GRP growth rate – 106.3% (in the prices of 2000); average growth rate of investments in fixed capital by TEA is 104.9%; average growth rate of social labour productivity – 102.9% (in the prices of 2000).

The definition of professional qualification composition of staffing requirements of the regional economy on the basis of the equations (4, 5), made it possible to establish the necessary structure of professional training (for enlarged groups of specialties) and to define the most demanded groups of professions by education levels (HPE, SVE, PVE) up to 2017 *(tab. 4)*.

Table 3. Forecast of the needs of the Krasnoyarsk Krai economy in the qualified staff in 2013–2017, thousand people

| Component of staffing requirement in the segment of the economy | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| **"For replacement", total** | **55.5** | **52.1** | **49.1** | **51.2** | **56.8** |
| Segment 1 | 17.3 | 14.7 | 12.8 | 13.0 | 17.0 |
| Segment 2 | 9.1 | 8.7 | 9.6 | 9.5 | 10.6 |
| Segment 3 | 29.1 | 28.7 | 26.7 | 28.7 | 29.2 |
| **"Additional" in connection with the rate of socio-economic development, total** | **20.5** | **24.3** | **22.7** | **22.5** | **30.7** |
| Segment 1 | 4.8 | 4.7 | 2.3 | 1.8 | 4.3 |
| Segment 2 | 7.2 | 7.2 | 7.9 | 6.8 | 8.0 |
| Segment 3 | 8.5 | 12.4 | 12.5 | 13.9 | 18.4 |
| **"Additional" in connection with the rate of modernization and development of the economy, total** | **2.3** | **2.4** | **1.2** | **0.5** | **0.4** |
| Segment 2 | 0.8 | 1.1 | 0.4 | 0.1 | 0.1 |
| Segment 3 | 1.5 | 1.3 | 0.8 | 0.4 | 0.3 |
| **Total** | **78.3** | **78.8** | **73.0** | **74.2** | **87.9** |

Table 4. Forecast of the changes in the professional qualification structure of staffing requirements among the 10 most popular EGS (by HPE) in the Krasnoyarsk Krai economy by 2017, %

| EGS code | EGS name | 2013 | 2017 |
|---|---|---|---|
| 080000 | Economics and management | 9.5 | 7.5 |
| 050000 | Education and pedagogy | 7.8 | 5.8 |
| 030000 | Humanities | 7.0 | 5.6 |
| 230000 | Informatics and computer engineering | 5.8 | 5.7 |
| 060000 | Health care | 5.6 | 4.2 |
| 140000 | Energy, power engineering and electrical engineering | 5.3 | 7.8 |
| 190000 | Vehicles | 5.1 | 7.9 |
| 260000 | Technology of foodstuffs and consumer goods | 4.7 | 5.0 |
| 270000 | Construction and architecture | 3.9 | 3.8 |
| 020000 | Natural sciences | 3.7 | 3.3 |
| - | The rest 18 EGS | 41.6 | 43.4 |
| - | **Total** | **100.0** | **100.0** |

Table 5. Forecast of the changes in the professional qualification structure of staffing requirements among the 10 most popular EGS (by SVE) in the Krasnoyarsk Krai economy by 2017, %

| EGS code | EGS name | 2013 | 2017 |
|---|---|---|---|
| 080000 | Economics and management | 10.2 | 8.1 |
| 190000 | Vehicles | 7.0 | 9.5 |
| 060000 | Health care | 7.0 | 5.1 |
| 050000 | Education and pedagogy | 6.6 | 4.9 |
| 150000 | Metallurgy, mechanical engineering and materials processing | 6.4 | 8.0 |
| 270000 | Construction and architecture | 5.8 | 5.5 |
| 260000 | Technology of foodstuffs and consumer goods | 5.7 | 6.3 |
| 230000 | Informatics and computer engineering | 5.7 | 5.4 |
| 140000 | Energy, power engineering and electrical engineering | 5.5 | 7.7 |
| 030000 | Humanities | 5.4 | 4.4 |
| - | The rest 18 EGS | 34.7 | 35.1 |
| - | **Total** | **100.0** | **100.0** |

Table 6. Forecast of the changes in the professional qualification structure of staffing requirements among the 10 most popular EGS (by PVE) in the Krasnoyarsk Krai economy by 2017, %

| EGS code | EGS name | 2013 | 2017 |
|---|---|---|---|
| 190000 | Vehicles | 11.8 | 13.7 |
| 100000 | Services sphere | 10.5 | 10.3 |
| 080000 | Economics and management | 10.4 | 9.8 |
| 110000 | Agriculture and fishery | 7.8 | 6.9 |
| 270000 | Construction and architecture | 7.4 | 6.5 |
| 140000 | Energy, power engineering and electrical engineering | 6.0 | 7.9 |
| 150000 | Metallurgy, mechanical engineering and materials processing | 5.7 | 5.9 |
| 260000 | Technology of foodstuffs and consumer goods | 5.6 | 5.5 |
| 230000 | Informatics and computer engineering | 3.9 | 3.8 |
| 050000 | Education and pedagogy | 3.4 | 2.5 |
| - | The rest 18 EGS | 27.3 | 27.1 |
| - | **Total** | **100.0** | **100.0** |

**Conclusions**

Thus, the proposed method of typing the region's economy and the application of standard procedures to determine the professional qualification components of staffing requirements in the segments of economy enhance the accuracy, reliability and relevance of the results of forecasting staffing requirements of municipalities taking into account structural changes in the economy, employment and professional education in the regional economic system.

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# Principles of strategic programming in the fuel and energy complex considering the interests of small petroleum companies*

*The article deals with the issues concerning Russia's fuel and energy complex. It specifies the conceptual principles of the programme approach to the management of its development. The authors propose a list of activities on the sustainable development of small oil business in the framework of strategic programming. A conceptual model of an economic mechanism of strategic management of small oil business in Russia is presented in the article.*

*Fuel and energy complex, programme approach, strategy, hydrocarbon resources, small petroleum companies.*

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**Problems of Russia's fuel and energy complex**

Fuel and energy complex (FEC) of Russia, due to the export-oriented nature of its economy, is a major source of consolidated budget revenues. In particular, the share of oil and gas revenues in the federal budget amounted to 50% in 2011 [3]. The significant dependence of national economy on FEC requires careful consideration of its activities, detection and prevention of problems and elaboration of a strategic programme and forecast of its sustainable development.

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To date, a large number of research works are devoted to the problems of the sector. The main ones dwell upon the following: the rate of minerals extraction outpaces their prospecting; investments in fixed assets are low, the degree of hydrocarbon resources processing is insufficient. In most cases it is connected with the unwillingness of enterprises' owners to invest in the reproduction of raw materials base, in the updating of fixed capital (most businesses use facilities, created in the Soviet period) and also with the inexpediency of investments due to certain flaws in the modern legal base (taxation, licensing, provision of access to transport capacities, etc.).

Some basic problems of the FEC oil and gas sector and ways to their solution are presented in the *table*.

The analysis showed that one of the main problems of the modern Russian fuel and energy complex is the low development level of small oil companies sector (SOC). Foreign experience proves that it is independent oil producers that are most interested in the further exploitation of 'exhausted' oilfields after their abandonment by vertically-integrated oil companies (VIOC); consequently, these independent oil producers seek to introduce innovation technologies and techniques for a further and more profound exploitation of the fields.

So, in the countries with highly developed oil and gas industry, the USA and Canada, for instance, the share of independent producers in the total oil production is 40% and 30% respectively; and in the UK small companies play a major role in the provision of oilfield services [5].

In order to improve the efficiency of Russia's FEC, the present paper suggests some approaches to strategic planning and forecasting for the small and medium-sized oil companies sector.

**Strategic programming**

As opposed to the planning approach, which proceeds from a proper state (what should be), the **programme approach** stems from the problems and options for their resolution, available at the initial moment of development, i.e. this approach proceeds from the actual state (what is), and selects such changes, which can transform the real state of affairs for the better.

Problems of the hydrocarbon sector of FEC and ways to their solution [4, 6, 9]

| Problem | Solutions |
|---|---|
| Volatility of world energy markets and energy prices | Increasing Russia's strategic presence in the markets of high-tech products and intellectual services in energy sphere<br>Geographical and production diversification of Russia's energy exports<br>Transition from the sale of primary commodities and energy resources abroad to the sales of the products of their deep processing<br>Development of major parts of the international energy infrastructure on the territory of Russia |
| Depletion of profitable hydrocarbon deposits | Completion of non-profitable deposits development by small and medium-sized businesses on preferential terms<br>Increase of profitability of using conventional and alternative energy sources |
| Remoteness of hydrocarbon extraction sites from the regions of their consumption | Enhancement of reliability and security of energy transmission systems<br>Development of new technologies for hydrocarbons transportation<br>Ensuring the non-discriminatory access of small and medium-sized companies to transporting capacities |
| Switching to offshore deposits difficult to access | Elaboration of efficient schemes of interaction with foreign companies possessing necessary technologies<br>Creation of consortiums involving different types of capital |
| Negative impact on the environment | Enhancement of ecological safety<br>Collection and utilization of associated petroleum gas (APG)<br>Reduction of $CO_2$ emissions |

*Figure 1* shows a flow diagram of the sequence of actions in the programme approach. A certain problem is the starting point of each stage, and management actions taken for its solution are repeated cyclically and include such actions as the analysis of a problem, the formation of alternative options for its solution, the choice of the optimal solution under given conditions, the development of methodology for implementing the solution and the choice of means by which the problem will be solved. The final stages represent the actual implementation of the decision and control of its execution.

The main instruments for implementing this approach are strategic guidelines, priorities and other parameters influencing the decision-making. A doubtless advantage of programme approach consists in the possibility to adjust the movement at every stage, in accordance with the actual progress and dynamics of external environment. The use of programme approach requires a great amount of resources; however in the conditions when the variability and unpredictability of external environment is increasing, this approach is the best [1].

For all its importance for market reforms in the economy, the fuel and energy complex, in methodological respect, complies with the general principles of socio-economic development of a country and its regions.

As a rule, the **programme** includes the following sections set out in the respective sub-programmes of respective economic complexes, FEC being their representative [2]:

**A. Analysis of the initial condition of the problem to be solved on a programme basis.**

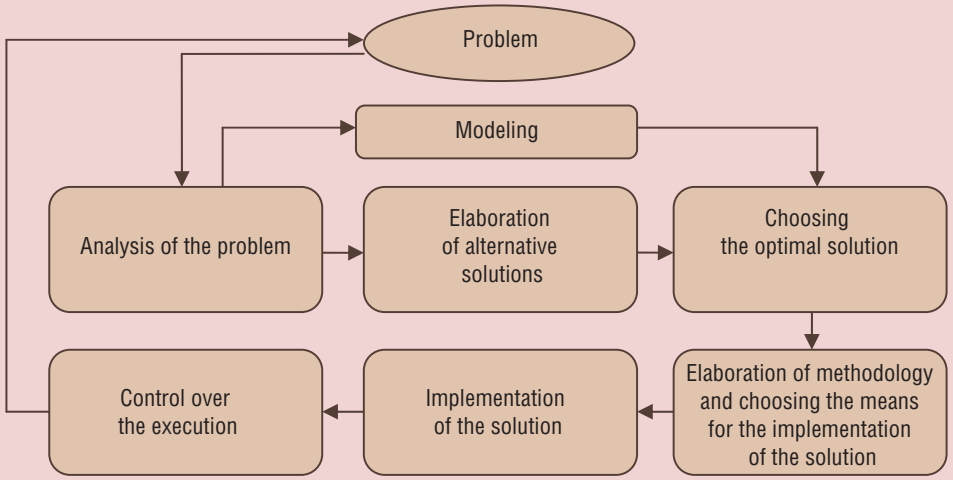
Russia's small oil business (SOB) is facing significant difficulties. The threat of slide in oil prices may cause a reduction in liquidity and financial stability of such companies and may hamper their further development. Besides, the reserves for self-sustained development of small oil companies are virtually exhausted, as most companies are barely capable of conducting expanded reproduction by their own efforts alone. Further development of small oil business is impeded by many objective reasons that small oil companies can not overcome on their own.

**B. Goals and objectives of the programme.**

According to the authors, the main objectives in enhancing the performance of Russia's small oil business and FEC on the whole comprise:

1. Integration with major vertically integrated oil companies.

Figure 1. Sequence of actions in the program approach [1]



2. Formation of reserves and creation of national oil stock exchanges.

3. Indirect methods of stimulation.

4. Economic mechanisms of the carbon market.

The next paragraph of the programme contains the detailed description of the ways to fulfill these objectives.

**C. List of activities for the implementation of the programme.**

*1. Integration with major vertically integrated oil companies.*

Substantiating the interaction between individual enterprises provides an opportunity to get additional effects generated through joint actions, including through the improvement of the intrasectoral technological and economic links, project financing, specialization and cooperation, exchange of qualified personnel. Eventually, in the framework of joint projects implementation, all this can lead to the emergence of a specific competitive advantage based on synergy.

The search for possible ways of cooperation between small oil business and major vertically integrated oil companies should find incentives for obtaining efficient results and pool the available economic interests and resources.

A theoretical model for achieving sustainability of small oil business and the spheres, in which entrepreneurial activity can be developed, depend on the degree of integration, chosen by each enterprise on its own. Small oil business can also have various development scenarios. They can include independent functioning of enterprises with self-sustainable fulfillment of all production and service functions, as well as their inclusion as structural units into larger corporate formations.

Thus, the strategic development guidelines for small oil business can be based on the following scenarios:

• merging with oil corporations and the loss of production and commercial independence;

• reorganization and restructuring of small oil companies through their incorporation into vertically integrated oil companies as subsidiaries, with the preservation of a certain niche of activities (e.g. the development of hard-to-recover reserves);

• formation of an integration structure of independent oil companies and large corporations in the form of a consortium (for instance, for the implementation of projects on a temporary basis).

Consortium, as a form of organization, is able to provide favourable conditions for infrastructure servicing. Such cooperation provides an opportunity to develop diversification and integration that contribute to the unification of total production resources for carrying out the entire production cycle, from the exploration and development of fields, transportation and processing of hydrocarbons up to the sales of oil products to ultimate users [8].

An important role in the functioning and development of a highly efficient oil market belongs to the pooling of efforts by large companies and small business on the basis of subcontracts and outsourcing.

The financing and implementation of various projects on the use of idle wells and marginal fields belonging to the major vertically integrated oil companies can be implemented with the involvement of small oil companies, which can be engaged not only in oil extraction, but also in the overhaul repair of wells and processing of associated petroleum gas.

The expediency of the projects is largely determined by their scale and the place of their implementation: new or old districts and provinces in the first place. The scope of participation of small companies within the whole oil complex and their interaction with other market participants are presented in *figure 2*. At that, the role of the government for the different types of projects in different regions and provinces is substantially changed.

For large projects it is the participation in funding (infrastructure), promotion of investment, creation of conditions for the use of market mechanisms to reduce greenhouse gas emissions.

For small and medium projects it is the facilitation of small production and service companies' development, the promotion of investments in the use and processing of associated petroleum gas.

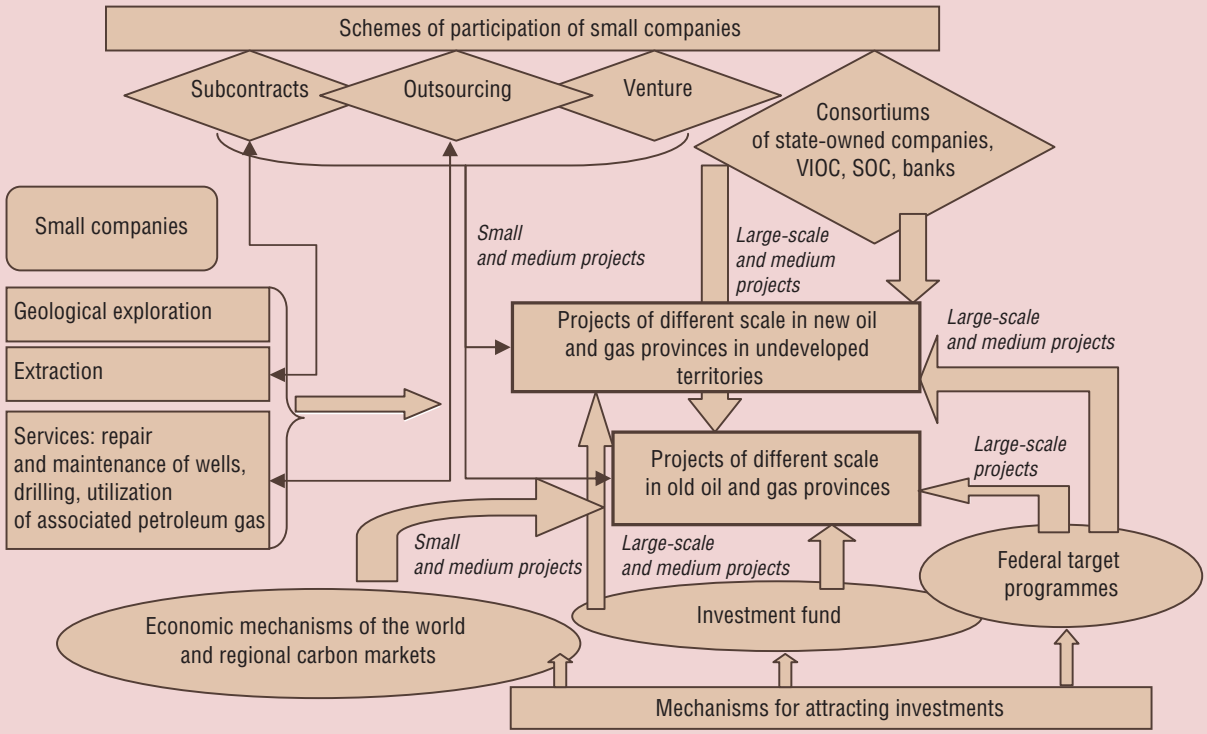
In the framework of such projects like the development of new hydrocarbon deposits, including marine deposits, the construction of port infrastructure and oil loading terminals, the competitiveness clusters can be created with the participation of small business, but mainly in the service sector.

The clusters of small enterprises can be developed spontaneously or in an organized way. An organized way is possible provided that it is initiated by either a leading company that has a substantial capital or by local authorities, or representatives of small business, which hired managing specialists. It should be noted that the support on the part of regional structures could contribute to the consolidation of local business into a network organization. As the level of mutual trust between the participants of the prospective cluster rises, a gradual transition to more risky projects begins [7, 8].

*2. Formation of reserves and creation of national petroleum stock exchanges.*

Considering the institute of public administration of the oil complex from a historical perspective, we can point out that the state was and is in a constant search for the optimal way of state management of the oil complex and interaction with its economic entities.

Figure 2. Possible schemes of participation of small oil business in oil and gas projects



The organization of a number of market institutions in Russia can contribute to the formation of market prices and mitigation of volatility in prices, including:

- an exchange as a mechanism for objective determination of equilibrium price for oil and oil products by the independent subjects of the market;
- a futures market of oil contracts as a tool for pricing, for determining the price targets set by the market itself for the foreseeable future, with its inherent tools of price risks insurance;
- an oil and oil products reserve under the operational control of the government, which is represented by the commercial stocks of oil required for enhancing the state's regulatory role in the oil market.

The current structure of the oil market, despite its dominance by major oil companies, has a free resource potential in the segment of crude oil and in a more developed segment of oil products as well. It allows organizing a full (classical) commodity exchange section with the calculations through the deliveries of tangible goods and according to the spot price, used on its basis, to create futures platform for trading in standard contracts for oil and oil products. The absence of market of contracts on oil and oil processing products in Russia prevents from setting real market prices and determining the price targets that are based on the expectations of the market itself. Russian manufacturers exporting oil and oil products annually lose up to 500 million US dollars due to the lack of direct costing system (directly effected exchange trading) for the domestic Urals crude and exported oil products, by signing contracts with a discount from the results of exchange trades in London on Brent crude and from Platt's quotations.

*3. Indirect methods of stimulation.*

A weak link in the state regulation of the oil industry can be found in the lack of efficient indirect methods, i.e. incentives that encourage companies to upgrade their production facilities, to introduce technologies for intensifying oil production, to create products with higher added value and quality (for the oil-refining segment of the industry).

It is proposed that the governmental economic policy should use the stimulating functions of the tax and monetary methods of state regulation for the development of raw materials base in the oil industry on the basis of public-private partnership.

The stimulating tools of the tax method are the tools that fundamentally affect the specifics of investment projects' implementation in the oil complex: a reasonable change in the order of tax bases calculation; a reasonable change in tax rates; the development of special tax regulations. Specific tax tools encouraging the development of small business in the oil complex are given in *figure 3*.

The guidelines for improving the tools of monetary method are as follows: the formation of specialized sectoral credit institutions or an inter-sectoral institute; the development of credit products relevant for long-term and capital-intensive investment projects; the development of institutions and mechanisms for securing loans.

Experts of the Centre for Problem Analysis and State and Management Planning developed the concept and substantiated the expediency of establishing the state extrabudgetary investment and credit fund. The minimum estimation of the available investment funds is 124 billion US dollars annually. The fund's sources actualize the emissive investment money supply, the liabilities of banks with the state-owned share of the capital, a part of the RF Central Bank's profit, a part of the gold and currency reserves, the Pension Fund, the revenues from privatization, and natural resource rent. Meanwhile, the source for the fund's formation can be also found in the prospective government's share of the profits from oil sales in developed projects and the projects prepared for development

Figure 3. Methods and tools for the state regulation of the oil and gas complex

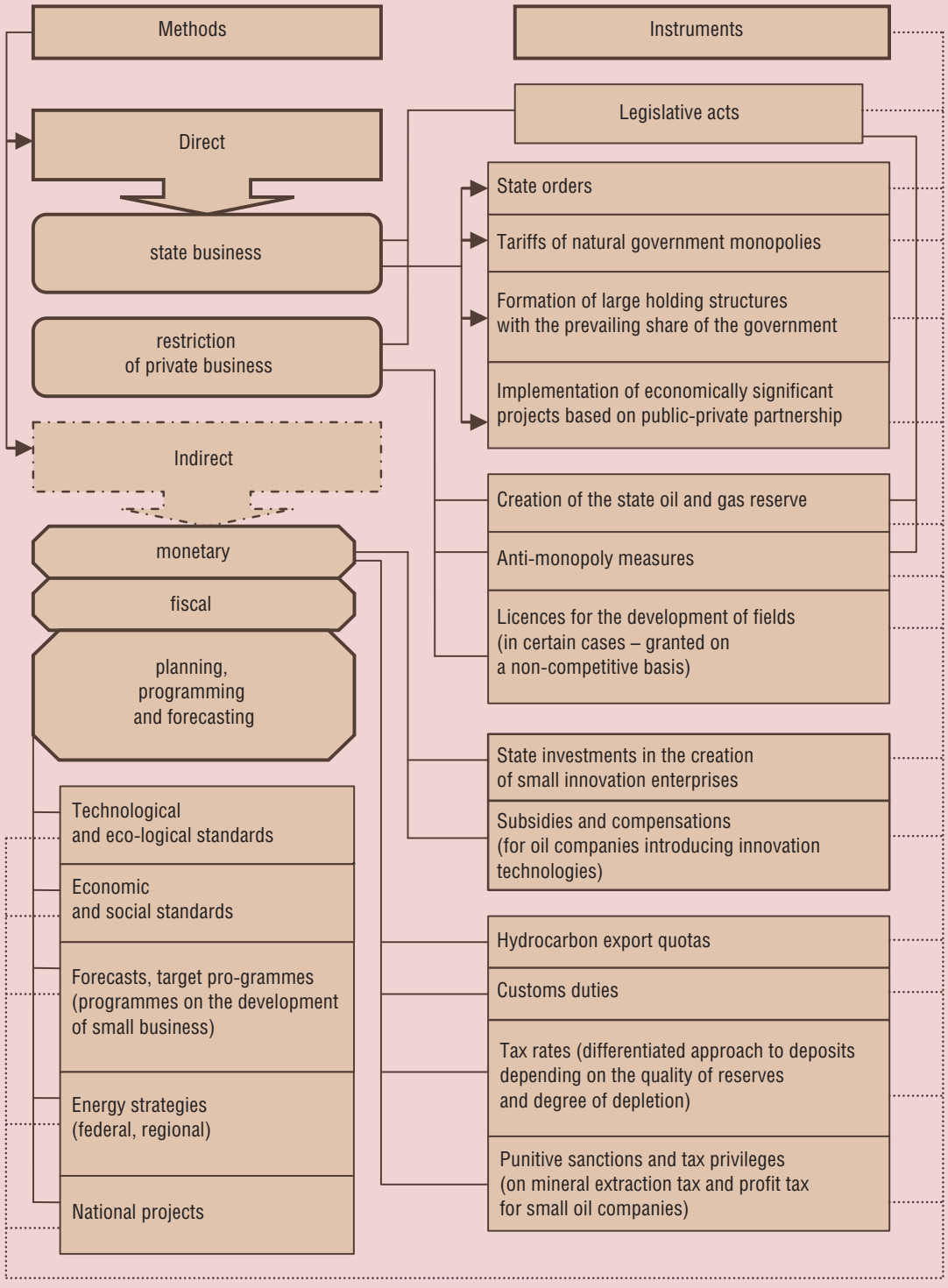
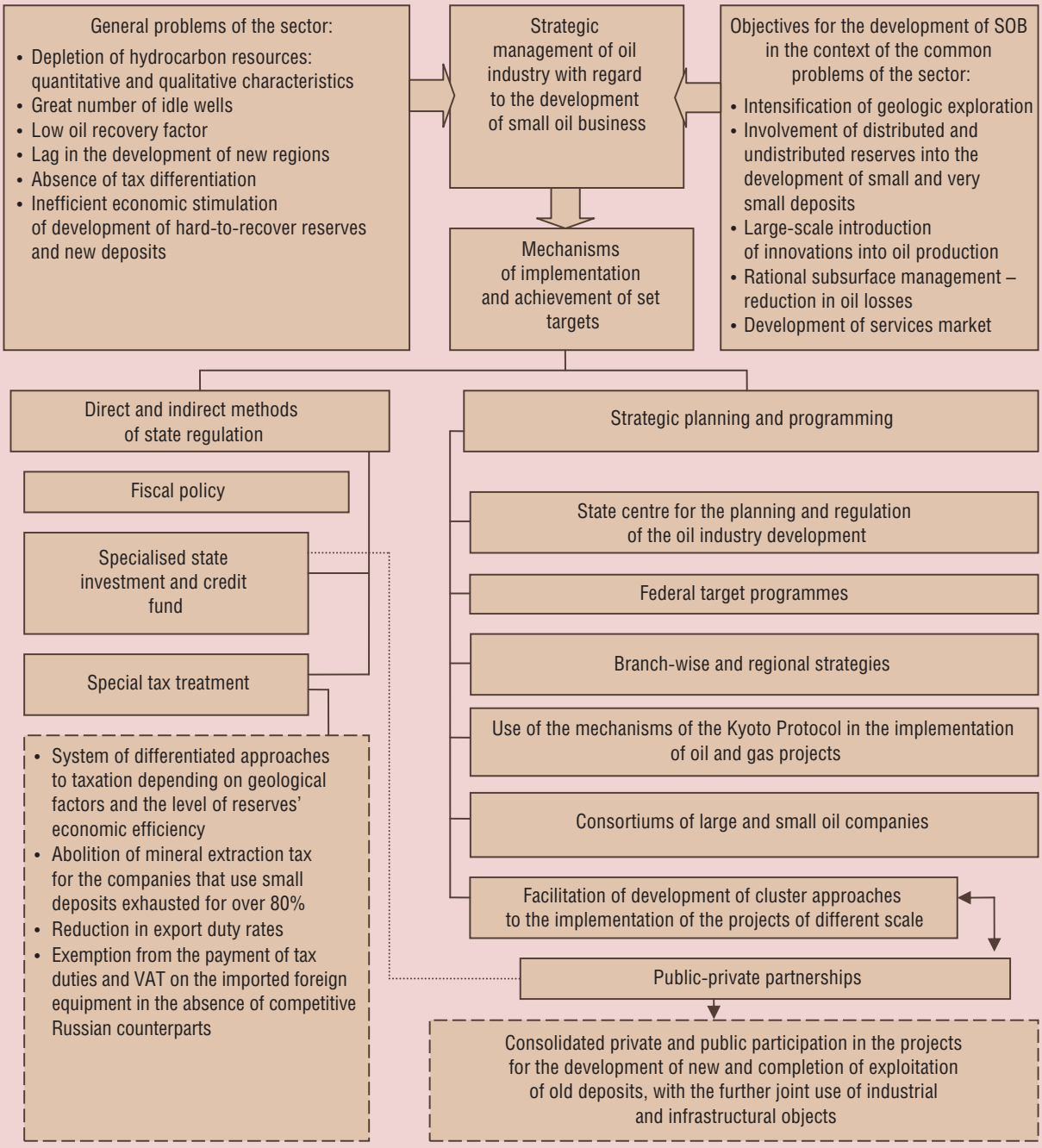


Figure 4. Conceptual model of the economic mechanism for strategic management of small oil business in Russia



(e.g. projects, implemented on the basis of the production sharing agreement). A certain part of the state oil reserve could also perform the role of a pledge fund of a high liquidity product at the organization of investment projects' financing. The resources of the specialised state investment fund may serve as a guarantor of the collateral for the funds borrowed by Russian companies for financing the projects in the fuel and energy complex.

*4. Economic mechanisms of the carbon market.*

The economic mechanism of the carbon market, used in Europe, the USA and Australia under the Kyoto Protocol or on the basis of regional and governmental initiatives (the example of the USA) is promising from the point of view of investments source and risks insurance.

For small oil companies, as well as vertically integrated oil companies, the use of these mechanisms could promote the attraction of additional investment in resource-saving and energy-saving projects, facilitating the reduction of $CO_2$, $CH_4$, $N_2O$ emissions.

In general, the implementation of mechanisms for the joint implementation of the projects used in the European market, represents the following: the company, which is experiencing difficulties in meeting the quantitative commitments to reduce greenhouse gas emissions, provides partial funding ("carbon financing") for the implementation of projects of energy efficiency and promoting the reduction of greenhouse gas emissions to the enterprise working in another country where the cost of reducing emissions of one ton of these gases is significantly lower [8].

**Conclusions**

Therefore, the conceptual model of strategic management of small oil business in Russia can be represented in *figure 4*.

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# Innovation development of dairy cattle breeding in the North-West of the Russian Federation as the basis for enhancing the competitiveness of milk production

*The article considers the implementation of innovation technologies in dairy livestock breeding as the main factor enhancing the production competitiveness in the conditions of Russia's accession to the WTO and the establishment of the Customs Union. The article also reviews the capabilities of innovation technologies in achieving the target production indicators on the one hand (enhancement of manageability, cost reduction, improvement of production quality, increase of the period of productive use of cows), and in minimizing the influence of human factor on the final results, on the other hand. The indicators of production and economic efficiency at the innovation farms of the Vologda and Leningrad oblasts have been analysed.*

*Dairy cattle breeding, innovation technologies, modernization, efficiency.*

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The implementation of resource-saving and eco-friendly innovation technologies in dairy cattle breeding is becoming a necessary prerequisite for the enhancement of competitiveness of milk production after Russia's accession to the WTO and the establishment of the Customs Union.

Increasing competition in product and resource markets equalizes the domestic and world prices for milk and key production factors. It becomes impossible to provide competitiveness on the basis of extensive resource-consuming production due to the low prices for fuel and lubricants, power, grain; low wages; insufficient expenditures on the environmental safety of production. High resource intensity of production increases the gap between the growth rate of production costs and selling prices, which has negative consequences for milk producers. For instance, in the Vologda Oblast farms this gap was 19 percentage points in 2012, having increased more than twice in comparison with 2011 (8 p.p.) *(fig. 1)*.

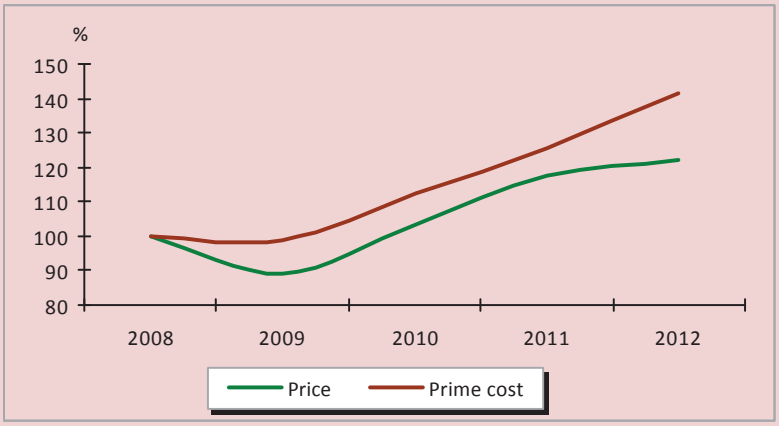
The climatic conditions for milk production in the North-West of Russia are not so good in comparison with Russia's main competitor states; this economic sector is lagging behind in technology development and receives a smaller amount of state support. Consequently, competitiveness in the conditions of globalization can be ensured if the advantages of returns to scale are realized to the fullest degree, which is conditioned by the following factors:

- availability of sufficient areas of grassland;
- experience of efficient milk production by major agricultural producers;
- possibility of increasing the production output of processing enterprises, oriented toward urban markets.

The main comparative advantage of dairy cattle breeding is connected with the ability of cows, as ruminants, to digest cheap voluminous (herbal) feed and produce expensive products. Therefore, the realization of potential benefits associated with the concentration of livestock population, should not lead to increasing problems in fodder production, herd reproduction, and disposal of manure.

Currently, the management level allows the economies of scale to be implemented only partially. The competitive level according to the costs, quality, and ecological safety of milk production is not achieved.

Figure 1. Growth rates of price for and prime cost of milk production at the Vologda Oblast farms, in % to 2008 [1]



Consequently, the level of profitability in the industry on the whole and in the leading dairy farming regions of Russia's North-West remains very low *(fig. 2)*.

As a result, the opportunities for extended reproduction are limited, and the volumes of milk production remain at the 2008 level *(fig. 3)* given a significant decrease in cow population *(tab. 1)*.

The management of milk production in Russia's agricultural organizations and agricultural holding companies is still more 'art', than 'technology'; this fact leads to the increase in the direct and opportunity costs, risks, management costs related to the delegation of authority and responsibility, complexity of organizing efficient control with regard to foreign competitors.

In order to enhance the competitiveness of milk production, the following conditions should be fulfilled:

- high fodder conversion and their low cost;
- low costs of labour and other resources per cow and per unit of production (at the level of leading world competitors);

Figure 2. Profitability of dairy cattle breeding at the farms of the Vologda and Leningrad oblasts excluding subsidies, % [1, 2]

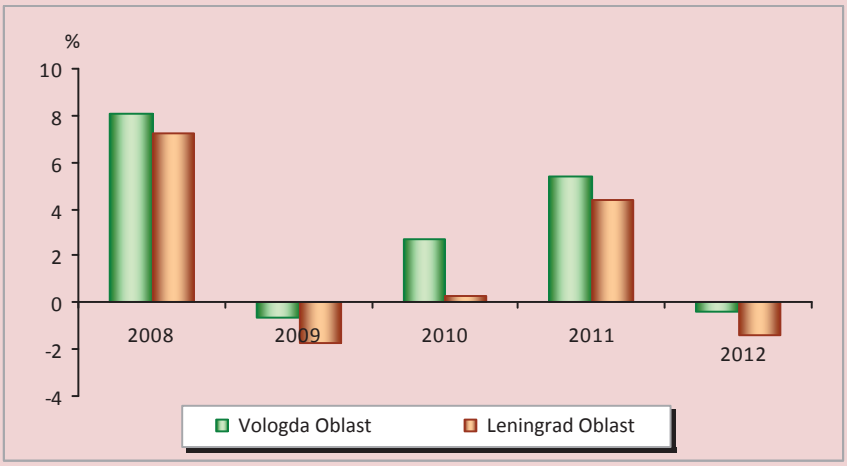



Figure 3. Growth rates of milk production at the farms of the Vologda and Leningrad oblasts, in % to the 2008 level [1, 2]

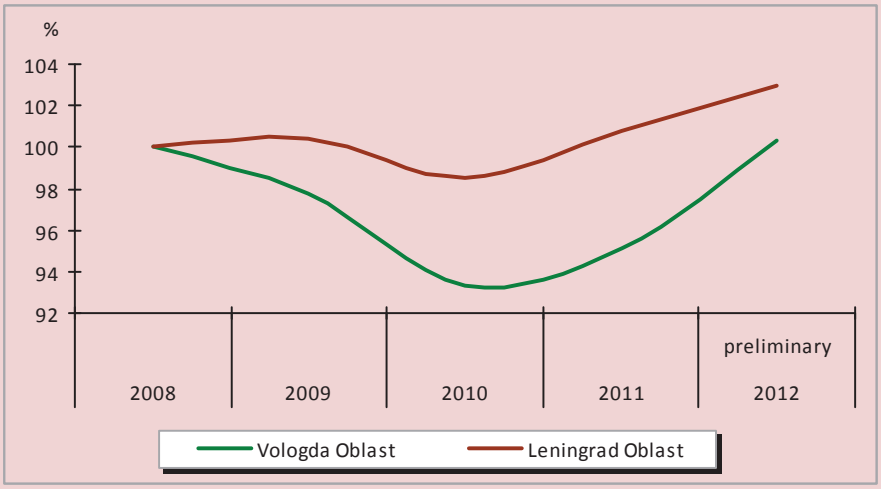


Table 1. Cow population in agricultural organizations of the Vologda and Leningrad oblasts [1, 2]

| Indicators | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| *Cow population, thousand head* | | | | | |
| Vologda Oblast | 87.4 | 81.9 | 80.3 | 77.0 | 74.5 |
| Leningrad Oblast | 77.5 | 77.6 | 76.5 | 76.2 | 73.8 |
| *Rates of cow population decrease, % to the 2008 level* | | | | | |
| Vologda Oblast | 100.0 | 93.7 | 91.9 | 88.1 | 85.2 |
| Leningrad Oblast | 100.0 | 100.1 | 98.7 | 98.3 | 95.2 |

• maintaining the health of cows, their long productive use, high reproductive function in animals;

• high quality of products, efficient logistics, meeting the requirements of the most attractive market segments;

• environmental safety of production.

Handling the issues concerning the enhancement of manageability in the industry, the reduction of production costs and improvement of product quality requires the transition to advanced technologies of cow milking and housing. On the one hand, these technologies should ensure the achievement of target production indicators, on the other hand – minimize the influence of human factor. However, better technologies have greater capital intensity, which results in more strict requirements to the quality of assessing investments efficiency.

When choosing a modernization technology, it is necessary to consider, in particular, whether it will contribute to the fulfilment of the conditions of state support for the industry. Thus, the share of subsidies in the revenues of the Vologda Oblast dairy farms accounted for 5.2% in 2012 and significantly influenced the profitability of dairy farms.

The state programme for the development of agriculture in 2013–2020 establishes the grading of milk as an indicator determining the amount of subsidy per litre of milk. Besides, it contains strict requirements to the recipients of subsidies on the health of livestock and indicators of herd reproduction. The choice of guidelines for the sector's development, the estimation of efficiency of investment projects, including those related to the choice of cow housing option and type of milking equipment should be oriented toward the achievement of target indicators set in the state programme.

The pace of innovation-investment activity in the farms of the Vologda and Leningrad oblasts is higher than in Russia *(tab. 2)*, but it is still insufficient to enhance the competitiveness of the entire sector.

At the same time, the indicators of production and economic efficiency of innovation enterprises in comparison to the region average show the positive experience of introducing innovation capital-intensive technologies.

The analysis of items of expenditures for producing 1 centner of milk for different milking technologies has been conducted using the 2009 – 2011 average data of the Collective Farm Named after the 50th Anniversary of the USSR (Vologda Oblast). The analysis of various technologies used by one farm complies with the comparison condition 'all other conditions being equal' and levels the annual fluctuations of external factors *(fig. 4, tab. 3)*.

In comparison with linear milking installation, voluntary milking technologies provide a 65% reduction of labour costs; as for milking in milking parlours, it reduces labour costs by 62%. Fodder costs are higher, but it is connected with a greater productivity of animals due to the use of advanced milking equipment and loose housing. The expenses on medicines, insemination, spare parts and electricity are lower as well.

Table 2. Development of innovation technologies of cow housing and milking at the farms in the Vologda and Leningrad oblasts [1, 2]

| | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| *Number of milking parlours* | | | | | |
| Vologda Oblast | 19 | 25 | 25 | 29 | 33 |
| Leningrad Oblast | 36 | 41 | 46 | 48 | 50* |
| *Number of milking robots* | | | | | |
| Vologda Oblast | 3 | 3 | 14 | 14 | 17 |
| Leningrad Oblast | 0 | 2 | 6 | 10 | 13 |
| including a 3-box robotic milking system | 0 | 0 | 0 | 1 | 3 |
| *Number of reconstructed and upgraded facilities in Russia* | 368 | 176 | 148 | 92 | data not available |

* According to the Leningrad Oblast Board on the Agroindustrial Complex, by 2012 30 farms have shifted to the milking in milking parlours [1], the total number of milking parlours in the oblast is more than 50.

Figure 4. Items of expenditures in the costs of production of 1 centner of milk using different types of milking equipment in the Vologda Oblast Collective Farm Named after the 50th Anniversary of the USSR, on average for 2009 – 2011, rubles [3]

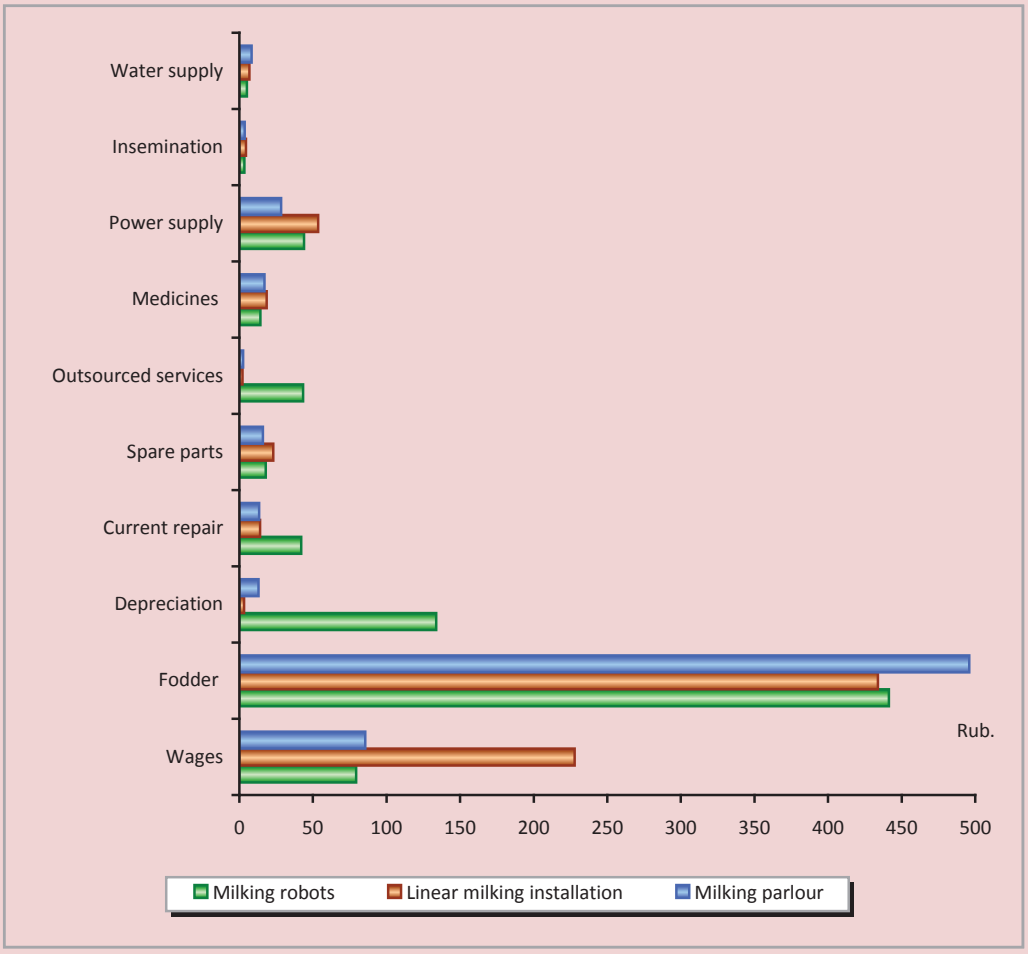


Table 3. Items of expenditures on milk production using different milking technologies at the Collective Farm Named after the 50th Anniversary of the USSR, on average for 2009 – 2011 (in % to the indicators of the linear milking systems) [3]

| Items of expenditures | Level of expenditures compared to similar items when using linear milking systems, % | |
|---|---|---|
| | Milking robots | Milking parlour |
| Wages | 35 | 38 |
| Fodder | 102 | 114 |
| Depreciation | 4096 | 398 |
| Current repair | 299 | 95 |
| Spare parts | 78 | 69 |
| Outsourced services | 2057 | 127 |
| Medicines | 77 | 92 |
| Power supply | 82 | 53 |
| Insemination | 76 | 81 |
| Water supply | 76 | 121 |
| Total expenditures | 104 | 88 |
| **Total expenditures excluding depreciation** | **91** | **87** |

At the same time, depreciation costs and equipment maintenance costs (including outsourced services) are the main items of expenditures, by which milking robots and parlours exceed linear milking machines. The excess of costs according to the item 'current repair' is conditioned by the specific allocation of expenses during the upgrading of cattle-breeding premises.

In general, the direct production costs for 1 centner of milk excluding depreciation (since it is not reflected in the cash flow) are lower by 8.6% when using milking robots and by 13.0% when using milking parlours in comparison to linear milking installations.

It should be kept in mind that the expenses for herd reproduction are not included in the calculations and depend significantly on the milking technology and housing type. According to experts, the transition to robotic milking systems can reduce the rejection of cows on average up to 25% of the herd, i.e. reduce the loss on cattle meat, especially at breeding farms.

However, the growth rate of milk production costs over three years when using milking robots is more than 20% lower in comparison with other types of milking equipment *(fig. 5)*.

Besides, it should be kept in mind that, compared to widely used milking parlours and linear milking installations, voluntary milking systems have the capacity to reduce costs over time due to the optimization of processes, adjustment of the equipment, reduction of expenses on the current repair in the industry in general and at the enterprise in particular.

For instance, in Finland, where milking robots have been used since 2000, the profitability of voluntary milking systems is increasing annually, while the profitability of milking parlours tends to decline *(fig. 6)*.

Despite the high costs of reconstruction, including current repair and outsourced services, and a significant increase in depreciation expenses, the cost-effectiveness of milk production at innovative farms after their modernization significantly exceeds the oblast average indicator *(tab. 4)*.

Some decrease in profitability at the Breeding Farm Krasnogvardeyskiy in 2008–2009 was caused by the fact that the modernization of cattle-breeding premises was carried out simultaneously with production processes.

Figure 5. Growth rate of costs for the production of 1 centner of milk when using different types of milking equipment at the Collective Farm Named after the 50th Anniversary of the USSR for 2009 – 2011 [3]

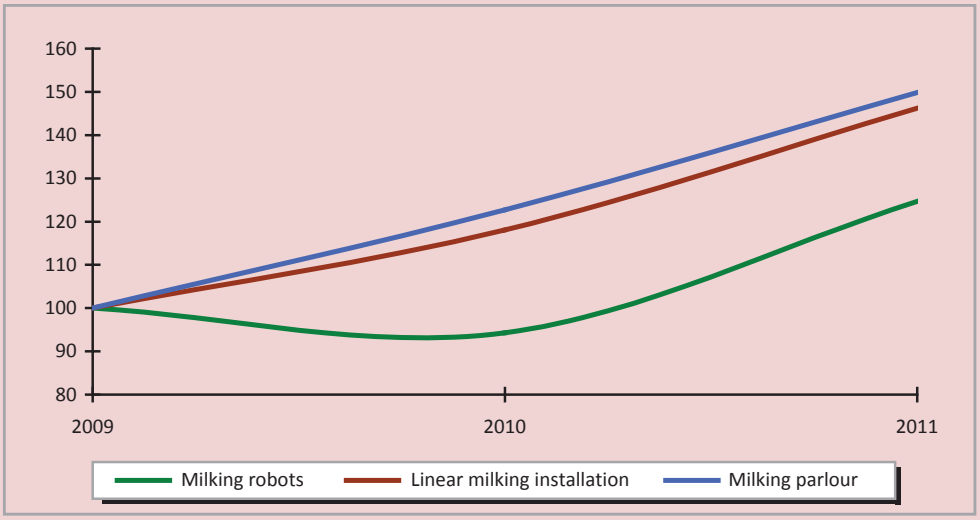
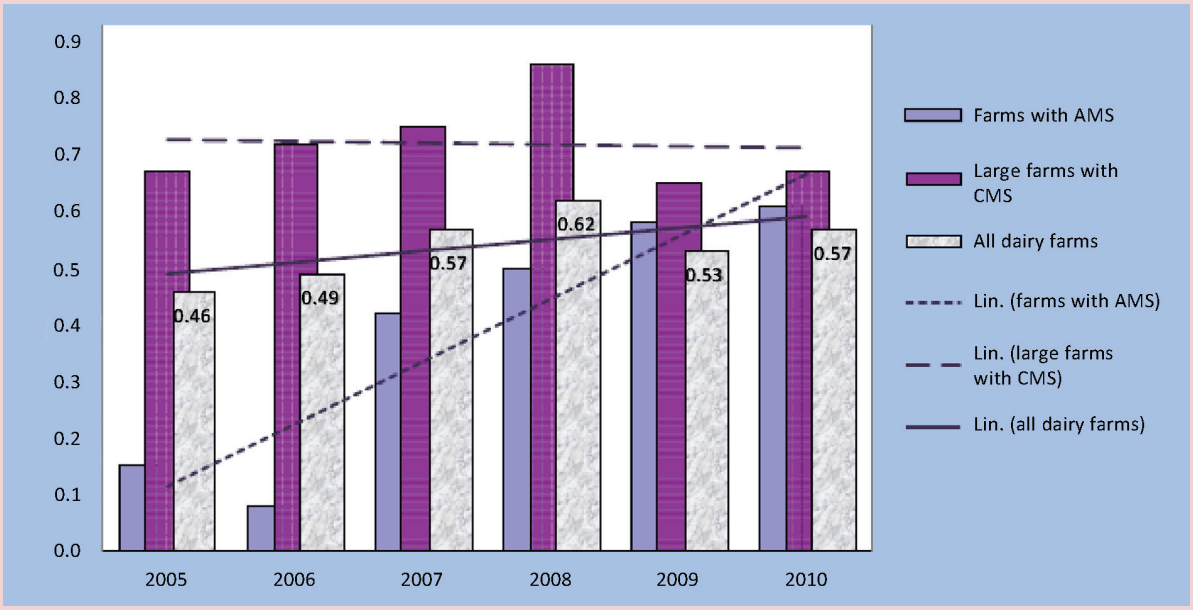



Figure 6. Profitability ratio of dairy farms in Finland for different types of milking equipment* [4]




* AMS – voluntary milking systems, CMS – milking parlours. Profitability ratio was calculated as the ratio of the farm's revenues to the wages and return on capital employed.

CJSC Breeding Farm Krasnogvardeyskiy in the Leningrad Oblast is upgrading milk production by combining voluntary milking systems and automated linear installations (DelPro). Despite the reconstruction carried out in 2008–2011, growth rates of milk production at the enterprise are higher than oblast average and district average.

While in the Leningrad Oblast, given the virtually unchanged number of cows, milk production increased by 4.7%, produc-tivity – by 2.4% (which is typical of the national average indicators as well), the cow population in CJSC Breeding Farm Krasnogvardeyskiy increased by 20.0%, milk production – by 45.3%, productivity – by 21.4% [3].

Table 4. Cost-effectiveness of milk sales in agricultural organizations of the Vologda and Leningrad oblasts, % [1, 2, 3]

| Indicators | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| On average at the Vologda Oblast farms | 26.9 | 11.2 | 21.5 | 20.1 |
| *Collective Farm Rodina* | *44.6* | *8.1* | *24.0* | *29.0* |
| *Collective Farm Named after the 50th Anniversary of the USSR* | *75.2* | *24.9* | *56.1* | *31.4* |
| On average at the Leningrad Oblast farms | 26.7 | 14.8 | 17.6 | 17.2 |
| *Breeding Farm Krasnogvardeyskiy* | *23.5* | *10.8* | *19.3* | *26.9* |

The cost-effectiveness of milk sales has increased by 3.5 percentage points, which under stage-by-stage reconstruction makes it possible to compensate for part of investment expenses by the revenues from operating activities.

In the conditions of current reconstruction, high-tech equipment makes it possible to conduct purposeful work on the enhancement of productivity: according to this indicator, the farm moved from the 27th to the 16th place over five years in the oblast rating. The productivity of cows has increased from 6735 kg to 8174 kg or 24.1% for 5 years, while the regional average productivity growth amounted to only 2.4%. As a result, the share of the enterprise in the oblast milk production and livestock population is growing.

In the course of the reconstruction, the main production and livestock indicators haven't worsened that is usually observed in the modernization of dairy complexes when animals are transferred to loose housing with milking in high-tech milking parlours. A number of indicators have even improved.

In addition, due to the phased reconstruction and transition to the new equipment that is possible when modernization is based on robotic milking, the adaptation period of transition from one technology to another is reduced to minimum, as well as the time period, during which the new technologies will reach their full capacity.

Thus, when making decisions on the options and rates of investment and innovation development of dairy cattle-breeding, the farms should consider the whole range of information on the efficiency of technologies; they should select investment projects not from the position of **'expensive or cheap',** but taking into account the **'costs and results'** in both short-term and long term periods.

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LBC 65.32-21


# Staffing for the modernization of agriculture in the northern and Arctic territories (case study of the Komi Republic)*

*The article substantiates the necessity of modernization and the role of highly qualified personnel in the technological and socio-economic development of the agrarian sector in the Komi Republic. The article considers the provision of agriculture with personnel in the pre-reform period and describes the current situation concerning the professional level of managers, specialists of agricultural enterprises and workers of mass professions. The factors impeding the retaining of personnel in rural areas have been revealed. Besides, the article proposes a set of managerial, organizational and economic measures for the staffing of modernization and innovation development of agricultural production.*

*Modernization, staffing, human potential, agriculture, agrarian enterprises, rural periphery, Arctic territories, Komi Republic.*

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## The need to modernize agricultural production in the Komi Republic

Modernization of agricultural production in the republic is conditioned by the necessity to overcome its technological and engineering backwardness, to enhance its positions in the provision of population with local agricultural products, the necessity to create competitive advantages on the local and regional markets, to use natural and human capital rationally, improving the level and quality of life of agricultural workers.

In the course of transformation of market relations and agrarian reforms, the Northern territories faced the deterioration of facilities, equipment and infrastructural base in agriculture, the reduction in areas under crops, cattle population and the number of agricultural workers; production of all kinds of agricultural products declined, as well as the standard of living of rural community [1].

Basic production assets in cattle breeding in the Komi Republic are worn out by 70%, due to a sharp reduction in the construction and reconstruction of facilities. The number of tractors in agricultural organizations in 1990–2011 decreased 7.2-fold, seeding machines – 8.6-fold, balers – 11.1-fold, solid organic fertilizer applicators – 24.4-fold, liquid organic fertilizer applicators – 10.6-fold, milking machines – 10.9-fold, the amount of energy facilities – 5.4-fold.

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The manifold reduction in the purchases of machinery and equipment adversely affected their upgrading. The retirement rate of machinery 1.5–2 times exceeds the rate of its renewal. Consequently, the equipment and machinery are rapidly ageing. Agricultural organizations have only 4% of tractors aged under 3 years, and the share of vehicles aged 9 years and over amounts to 84%; the figures are 8% and 75% respectively concerning farms and individual entrepreneurs.

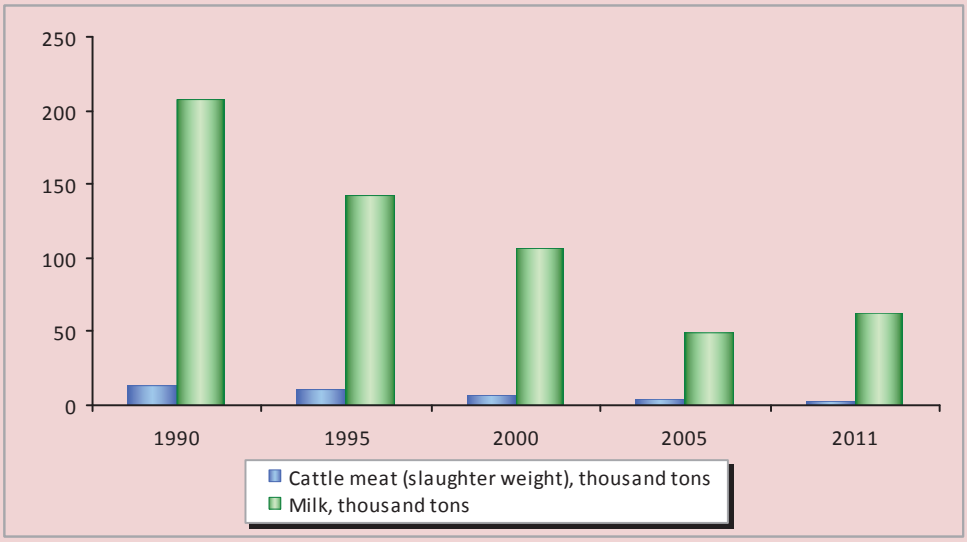
During the years of reforms, the commissioning of production facilities for cattle decreased 7 times, land clearing stopped in the early 2000s, land reclamation hasn't been carried out since 2007. The application of mineral fertilizers related to 100% of nutrients per 1 ha of crops decreased from 135 kg in 1990 to 22 kg in 2011, application of organic fertilizers – from 18 to 4.2 tons, respectively.

Milk production in all categories of farms declined 3.3-fold, beef and veal production – 4.6-fold *(fig. 1)*. The drop in production output was especially significant at collective farms: the production of milk declined 9.2-fold, meat – 22.5-fold, potato – 30.1-fold, vegetables – 108.3-fold. Decline in production has been caused by the decrease in the area of arable land and livestock population.

One should bear in mind that agriculture fulfills diverse economic functions. It provides people with fresh wholesome food, promotes the development of the food industry, stabilizes employment and prevents monopolization of local food markets by individual suppliers of products, controls food prices thus enhancing the standard of living of the region's population. Agriculture preserves the traditional lifestyle of rural population, spirituality, culture, traditions of indigenous peoples, improves the demographic situation, population's settlement, conservation of environment and natural landscapes. Agriculture also satisfies the recreation needs of society (rural tourism).

The current trends in the agricultural sector may lead to the elimination and reduction of rural Northern territories that have been inhabited for centuries. Modernization is the

Figure 1. Production of milk and cattle meat in all categories of farms in the Komi Republic for 1990 – 2011, thousand tons



key factor in overcoming the crisis situation in agriculture. An important role in enhancing modernization and innovation development of agriculture belongs to highly qualified workers, managers and specialists.

Staffing, as a complex socio-economic phenomenon of social production, being its mandatory component at all management levels, is characterized by a variety of external and internal relations and performed functions [2]. The basic problem of personnel policy consists in the socio-professional orientation of the younger generation toward qualified labour in agriculture, as well as the selection, education, retraining and improvement of qualification of employees, their placement in accordance with their abilities and knowledge, their retaining at the chosen workplace, labour motivation of managers, specialists and representatives of mass working professions.

**Staffing of agriculture in the pre-reform period**

The 1960s–1980s was the most favourable period in the history of agriculture development of the Komi Republic. Annual average growth rate of gross production amounted to 4.3%, and labour productivity in the public sector grew by 4.4% per year [3] as a result of facilities and infrastructure upgrading and personnel potential improvement. The enhancement of the conditions and standard of living of rural population, bringing them closer to those of urban residents, was the major area of social policy.

The level of agricultural labour mechanization was steadily increasing, progressive trends were observed in educational and professional level of agricultural workers, in the development of villages; there was an increase in aggregate income of rural families, its level was approaching urban indicators. In 1989, the average monthly wages of agricultural workers in relation to the average in the region's economy was 81%. The employment of population was no problem at all.

The training of qualified personnel for agriculture in these years was mainly carried out at vocational schools and directly on site: at state farms, training centres of the Ministry of Agriculture and the USSR State Committee for Technology and Infrastructure Support of Agriculture (Goskomselkhoztekhnika) that had a network of training facilities on the basis of district associations, and in rural secondary schools. In the mid-1980s agriculture received about 2.3 thousand qualified workers annually. The distribution of people by professions calculated per 1000 of workers trained for agriculture each year was as follows: tractor-drivers – 228 people, car drivers – 215 people, livestock breeders – 60 people. Full-time vocational education institutions trained 4.3 thousand qualified workers for agriculture in 1985–1990 alone. And at that, the number of workers trained on-site 1.9 times exceeded the number of those trained at vocational schools. State farms trained the personnel for 20 occupations and professions, mostly subspecialists, that don't require long-term learning.

Rural secondary school contributed a lot to the professional training of young people. 52 secondary schools of the republic trained annually about 1000 farm machinery operators, 700 milking machine operators, a significant number of car drivers. In 1981–1985 secondary schools fulfilled an additional need for livestock breeding personnel by 11.2%, tractor drivers – by 17.6%, car drivers – by 4.5%. Annually over 500 secondary school graduates were employed by agricultural enterprises. For example, Storozhevskaya high school of Kortkerossky District trained 892 farm machinery operators for the district's agricultural enterprises in 1962–1998.

In the pre-reform period, much attention was paid to vocational guidance of rural schoolchildren and to their involvement in agricultural labour. The task of educating children and simultaneously guiding them in

the choice of their occupation was solved by combining their studies with participation in socially useful work both during the school year and summer holidays. Pupils' working teams and camps for work and recreation played a very important part in preparing children for working in the fields and farms. In 1983 at state farms and secondary schools there were 53 pupils' working teams, 123 camps for work and recreation, where about 4 thousand schoolchildren annually gained working experience. In fact, virtually all the high school students were involved in this activity. Under the guidance of experienced tutors they cultivated about 500 ha of arable land and grew mostly potatoes and vegetables; in addition, they were engaged in fodder production. Annually they harvested about 9000 tons of hay, 2000 tons of silage, 140 tons of woody forage, weeded over 300 hectares of vegetable and root crops beds, cultivated over 700 tons of potatoes and vegetables.

At the beginning of the 1990s, 25 thousand people worked at state farms of the republic's Ministry of Agriculture, among them there were 5.1 thousand people with higher and secondary vocational education, i.e. one in five working in the industry. Among the specialists with higher education, engineers comprised 25%, agronomists, zootechnicians, vets – 47%, economists – 18%, other professions – 10%. Specialists with higher education were graduates from Timiryazev Agricultural Academy, the Leningrad, Kirov, Vologda and other agricultural universities. Specialists with secondary vocational education were mainly graduates from the Syktyvkar Training College.

In the pre-reform period, the Komi Republic carried out significant work aimed at enhancing the skills and qualification of agriculture staff. 10.9 thousand agricultural workers out of 37 thousand, or one in three, attended advanced training courses in 1989. Training was conducted at management schools, at production and economic courses, specialized courses, schools for the study of advanced work techniques and methods. Each farm conducted annual winter advanced training courses in all spheres of agriculture with the subsequent certification of employees. Farm machinery operators were awarded the title of tractor operator of I and II class, workers of animal husbandry – the title of master of livestock breeding of I and II class. They were given a premium to their wages in the amount of 20% and 10% respectively. The share of tractor operators of I and II class reached 50%, and the share of milkmaids – 30% at the state farms of the Komi Republic in 1989.

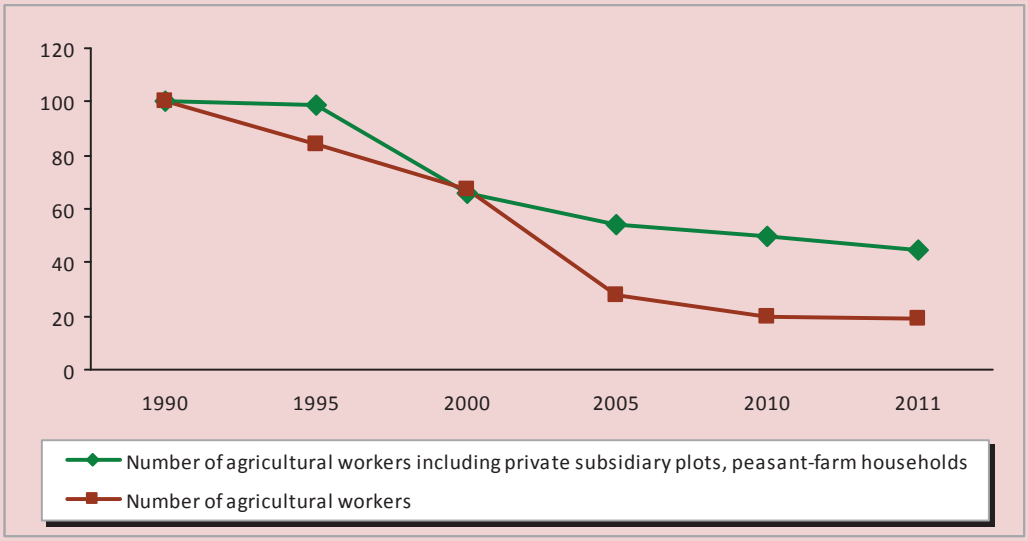
**Current situation in the human resources potential of agriculture**

Specific features of the modern Russian rural labour market include a limited choice and low quality of jobs; underdeveloped infrastructure of labour market; endemic unemployment; low price of agricultural labour, remuneration in kind; low level of human capital development; absence of bargaining skills in workers and lack of contractual relations between employees and their employer; violations of labour legislation by employers that remain unpunished [4]. These features are characteristic for the Komi Republic as well.

During the years of agrarian reforms, the number of people employed in agriculture in the Komi Republic reduced 2.2-fold, in agricultural enterprises – 5.3-fold *(fig. 2)*. This was caused by the ill-considered reorganization of collective farms, the weakening of state regulation of the agrarian sector.

Demographic processes serve as the natural basis for providing the village with labour resources and personnel potential. For 1990–2011 the number of rural population, despite the administrative-territorial transformations of urban settlements into rural ones, decreased by 101 thousand people or by 33.3%. The share of people under working age decreased from 31% to 18.8%, the share of persons over working age

Figure 2. Dynamics of the annual average number of workers in agriculture of the Komi Republic for 1990 – 2011 (1990 = 100%)




increased from 15% to 20.2%. The number of deaths per 1000 people exceeded the number of births by 0.9 people. Thus, we witness the reduction in human resources capacity for the development of agriculture and other sectors of rural economy.

The most acute problems of the rural labour market are as follows: unemployment, poor employment in the agricultural sector, weak entrepreneurial activity, trends of returning to primitive technologies and manual labour, orientation toward low-profit activities in private subsidiary plots, underdevelopment of non-agricultural labour in rural areas; besides, rural residents don't feel very confident about the future. At the end of 2011 the number of unemployed citizens in rural areas was 15.5 thousand, and the number of the registered unemployed was only 5.8 thousand people. Labour market tension in rural areas amounted to 11 persons per one vacancy. The level of total unemployment in relation to the number of economically active rural population amounted to 13.7%, and the registered unemployment rate was 5.2%. Currently, when the need of the agricultural sector in labour resources is generally satisfied, it is necessary to enhance the quality of labour force. Labour supply in the labour market by qualitative parameters doesn't match the structure of demand for qualified personnel.

Tension in the demographic situation and socio-labour sphere of the village is caused by the unattractiveness of working conditions and the quality of life in rural areas.

The characteristics of human resources include age, health, personal qualities, professional training and the lifelong education ability, work experience in this specialty, etc. Agriculture remains the branch, in which the share of workers with professional education has dropped over the last decade. Agrarian transformations focus on the formation of private sector, development of small-scale production, small business entities. The motivation of employees has been undermined, the level and quality of life of rural population have worsened dramatically; the number of medium and large agricultural enterprises has reduced greatly, as well as the number of specialists in agriculture; socio-professional characteristics of managers

and specialists deteriorated by the level of professional education, age, work experience of managerial activity. The system of lifelong and further professional education has become inefficient. This led to serious problems in the system of staffing in agriculture. In 1990 the share of agricultural enterprises' managers with higher education was 77.8%, in 2012 – only 45.3%. In 1990 only 0.7% of managers didn't have higher and secondary vocational education, and in 2012 – 21.1%. The share of managers with the work experience exceeding 10 years has decreased over the period from 21% to 17%.

Negative trends are evident in the educational level of specialists. In the mid-1980s, the share of chief specialists with higher education was over 72%, but it reduced to 57% in 2012. According to the data for 2012, 3.9% of chief specialists and 20.1% of specialists, 28.7% of middle managers did not have higher or secondary vocational education *(tab. 1)*. Many highly qualified managers and specialists have moved into other spheres of activity and commercial structures. The level of qualification among the representatives of working professions is also low.

Some results of the monitoring of agriculture staffing show that in 2000 – 2012 there is a tendency of increase in number of retirement age workers: heads of agricultural enterprises – from 1.7% to 7.8%, chief specialists – from 1.3% to 7.8%.

The situation has become complicated in the sphere of improvement of specialists' qualification. In 2012 only one in 30 managers and specialists of agriculture attended advanced training courses.

The peculiarity of the modern condition of agricultural labour market lies in the fact that agriculture still experiences a lack of qualified personnel even at a significant reduction in production volumes.

The dropout rate of qualified staff, particularly managers and specialists, remains significant (13.3%). Low prestige of the profession, low motivation, and poor mechanization of labour make it difficult to cover the deficit of personnel.

An insufficient staffing of agricultural organizations with specialists arouses serious concern. For example, in 2012 medium and large agricultural enterprises were staffed with chief specialists by 87%, with specialists – by 93%, with middle managers – by 96%. The enterprises experience a shortage of chief specialists, agronomists, livestock experts, veterinarians, engineers, accountants, technicians.

Table 1. The level of education of the managers and specialists in agricultural organizations of the Komi Republic in 2012, %

| Managers and specialists | Education | | |
|---|---|---|---|
| | Higher | Secondary vocational | Don't' have higher education or secondary vocational education |
| Managers and specialists | 39.0 | 42.3 | 18.7 |
| Heads of organizations | 45.3 | 33.6 | 21.1 |
| Chief specialists, among them | 57.1 | 39.0 | 3.9 |
| agronomists | 63.6 | 36.4 | - |
| livestock experts | 50.0 | 50.0 | - |
| veterinarians | 81.8 | 18.2 | - |
| engineers | 50.0 | 40.6 | 9.4 |
| economists | 83.3 | 16.7 | - |
| accountants | 49.2 | 46.0 | 4.8 |
| Specialists, excluding chief specialists | 34.2 | 45.7 | 20.1 |
| Middle managers | 28.7 | 42.6 | 28.7 |

In many small enterprises there is only one employee in agronomic, zootechnical, engineering services. The number of employees of economic service decreased as well. For instance, in the 1980s there were an average of 8 specialists with higher professional education and 40 specialists with secondary vocational education per state farm, nowadays one agricultural enterprise has only 4 specialists with higher professional education and 4 specialists – with secondary vocational education. At the same time, over a thousand people with secondary vocational education, and more than four hundred people with higher professional education are mere workpeople.

In the total number of workers of agro-industrial complex 9.7% are with higher professional education, 21.3% – with secondary vocational education, 28.5% – with initial vocational education, and 40.5% – without vocational education; the qualification of farm employees is also low. Meanwhile, in 1991–2010 the annual number of graduates from secondary vocational education institutions decreased from 217 to 117. Employment rate of young specialists is also low. Agricultural enterprises of the Komi Republic take not more than 10–15% of the graduates from universities and agricultural colleges.

Research conducted by the agrarian economics laboratory at the Institute of Socio-Economic and Energy Problems of the North Komi Science Centre of the Ural RAS Department in the late 2000s showed that only 8% of respondents were willing to work in agriculture, and 92% were determined to stay in town and find a job there. Specialists don't want to go to rural areas mainly because of low wages in agriculture (pointed out by 70% of respondents), underdeveloped social infrastructure (65%), lack of decent housing (43%), limited career prospects (33%), poor facilities and infrastructure at agricultural enterprises (20%).

In 2012 the Centre for Organizational and Methodological Support of Modernization of Professional Education, Komi Republican Institute of Education Development conducted a monitoring aimed at identifying vocational intentions of 9th and 11th grade students of the Komi Republic. The survey shows that the graduates are not interested in such spheres of professional activity as trade, forestry, and agriculture. Students rank their motives for choosing a career as follows: 1st place – wages, 2nd place – interesting content of a job, 3rd place – prestige of a job.

**Personnel potential of the rural periphery and Arctic territories**

Food security is becoming the key problem of agricultural development of the Northern regions. It is understood as the elimination of threats to the health of people living in the North and Arctic on the part of suppliers of inferior (chemically harmful) products. Production of ecologically clean products is an urgent necessity and it could be organized on the agricultural land of the taiga.

But the ill-considered reforming of agricultural organizations had a particularly adverse effect on the composition and structure of labour resources in the rural peripheral areas and Arctic territories of the Komi Republic. Along with the aggravation of long-standing socio-economic problems of the village, such as the narrow scope of labour application, staff turnover, migration of rural population, lag in the development of production and non-production spheres, the new problems have emerged that are connected with the development of the market – employment problems. By the end of 2011 remote areas accounted for 2.4 thousand registered unemployed, or 40% of the unemployed registered in the rural areas of the Komi Republic.

The number of workers employed in agricultural organizations of peripheral areas, due to the reorganization of many state farms,

production decline, unfavourable demographic situation and low wages, decreased 8-fold in 1989–2011, and in the Arctic zone of the Republic – 4.4-fold. Over 15 thousand people were dismissed during this period, mostly livestock breeders and machine operators, i.e. qualified personnel. As a rule, those, who remained, were mainly the specialists of pre-retirement and retirement age, and low-qualified workers. The modern market of agricultural labour is characterized by high labour turnover due to low wages, as well as the low quality of jobs in agriculture.

Educational level of agricultural sector workers is low. In 2011 the share of employees with higher education in agricultural organizations of rural periphery made up 3.5%, with secondary education – 15.3%, with initial vocational education – 22.3%. Among the workers with vocational education 8.6% had higher education, 37.2% – secondary vocational education, and 54.2% – initial vocational education.

The comparison of education level of managers and specialists in the Arctic sub-region and rural periphery with other areas of the Komi Republic is presented in *table 2*.

Almost one in four managers and specialists of agricultural enterprises in peripheral areas and more than half of middle managers don't have higher and secondary vocational education. At that, 64.5% of managers have non-core education, although one in three received economic or managerial education.

Among managers and specialists more than two thirds are women. One in three employees doesn't have higher or secondary vocational education, only few have improved their qualification in the system of continuing professional education.

Currently, the agricultural sector of the peripheral and Arctic areas is experiencing a particularly acute shortage of specialists: livestock specialists, veterinarians, engineers, accountants, middle managers and skilled workers – machine operators and livestock breeders.

High turnover is observed among managers and specialists (10%). Thus, in 2011 there were 22.6% of agricultural enterprises' managers in peripheral areas with work experience under three years, and 12.9% – with the experience of 10 years and more. A similar situation is observed in the Arctic areas.

Such factors as the absence of obligatory job placement for university and college graduates, lack of financial assistance in solving such pressing issues as housing, etc., combined with no motivation to work in the village lead to a poor staffing of agriculture with young specialists. In 2011, agricultural organizations of the peripheral districts recruited only five young specialists graduated in the reporting year. The share of managers and specialists of agricultural enterprises aged under 30 is 9%; a similar situation is observed in the Komi Republic as a whole (12%).

Table 2. Education level of the managers and specialists in agricultural organizations of the Arctic sub-region and peripheral areas of the Komi Republic in 2011, %

| Managers and specialists | Higher education | | | Secondary vocational education | | | Don't have higher education or secondary vocational education | | |
|---|---|---|---|---|---|---|---|---|---|
| | Arctic sub-region | Peripheral areas | The rest of the territories | Arctic sub-region | Peripheral areas | The rest of the territories | Arctic sub-region | Peripheral areas | The rest of the territories |
| Heads of organizations | 52.0 | 32.2 | 47.2 | 32.0 | 42.0 | 29.2 | 16.0 | 25.8 | 23.6 |
| Middle managers | 19.4 | 2.4 | 37.7 | 43.3 | 40.5 | 39.7 | 37.3 | 57.1 | 22.6 |
| Chief specialists | 50.9 | 26.7 | 62.7 | 41.5 | 68.9 | 31.7 | 7.6 | 4.4 | 5.6 |
| Specialists | 24.4 | 12.7 | 48.3 | 45.8 | 61.8 | 38.4 | 29.8 | 25.5 | 13.3 |

Representatives of working occupations are also characterized by the low level of qualification.

A poll of specialists, held in 2012 in Agricultural Production Cooperatives (APC) Pomozdinsky, Chernutyevsky, Yugor, Vashko, Zarya showed that only one out of 64 livestock breeders had the title "Master of livestock breeding of I class", and five had the title "Master of livestock breeding of II class". At that, the activities aimed at enhancing the skills of personnel were unsatisfactory.

Thus, it will not be an easy task to take the Komi Republic agriculture out of the crisis, due to the adverse staffing situation in the agrarian sector, especially in the peripheral and Arctic regions. It is becoming especially important to improve the system of training of specialists and qualified workers of mass professions, and to retain them at the enterprises under the ongoing technological re-equipment of agricultural production and transition to the innovation stage of development of the sector.

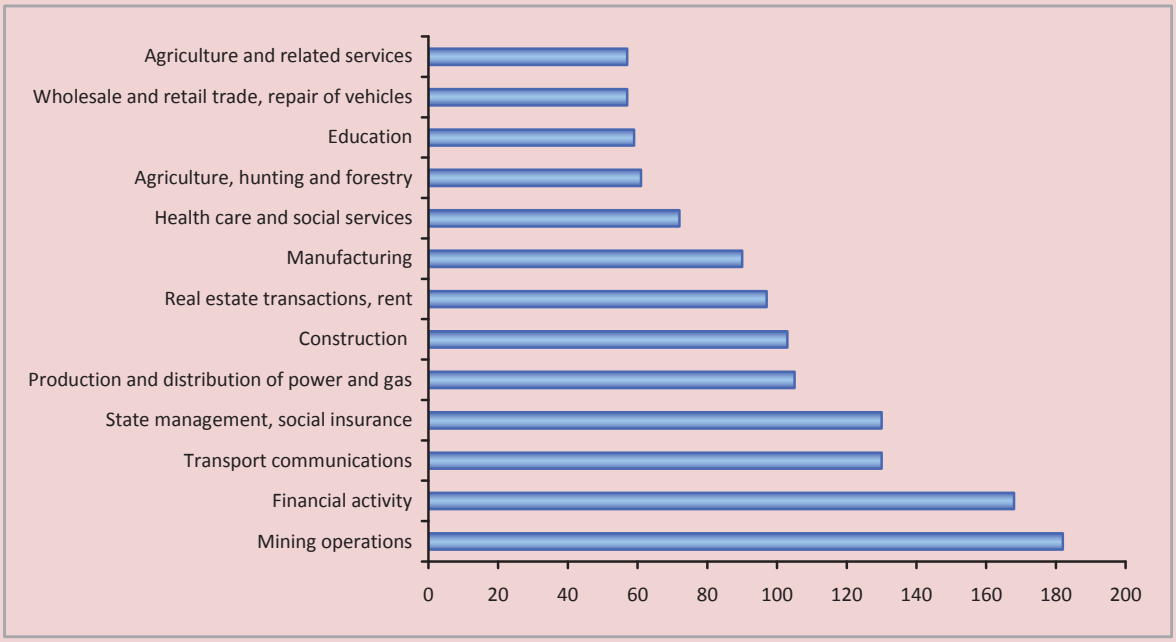
**Current situation with regard to the living conditions in the village**

Young people do not want to put up with the existing way of life in the village, since it does not meet their requirements concerning the quality of life.

Low prestige of agricultural work due to arduous working conditions and insufficient level of wages, the absence of decent living conditions along with underdeveloped social infrastructure of rural settlements cause the turnover of specialists and workers, and put off any desire to settle down in the village. Agricultural labour remuneration lags almost twofold behind the economic average in the Komi Republic *(fig. 3)*.

In 2011, when the average monthly nominal accrued wages (excluding small businesses) in the Komi Republic amounted to 31.6 thousand rubles, the average monthly wages of agricultural enterprises' workers amounted to 16.4 thousand rubles, specialists – 21.6 thousand rubles, tractor drivers – 13.3 thousand rubles

Figure 3. The ratio of average wages by individual kinds of economic activities to the average level for the Komi Republic in 2011, %



milking machine operators 12.2 thousand rubles. At the same time, labour remuneration in the agriculture of peripheral districts (Izhemsky, Ust-Tsilemsky, Udorsky, Troitsko-Pechorsky, Ust-Kulomsky, Koygorodsky) was only 26% of that in the Komi Republic economy on the whole, and 50% of the average monthly wages in the republic's agriculture. As a result, part of the rural population lives below the subsistence level.

The situation concerning the personnel of mass working professions, especially machine operators and livestock breeders, needs to be improved. The number of graduates from initial vocational education institutions of agriculture declined from 513 to 108 people in 1991–2010. The majority of livestock breeding personnel received on-site training rather than gained knowledge and skills at educational institutions. That is why it is difficult for them to use the machinery and equipment efficiently as well as the genetic potential of animals. They can't organize rational animal care and create optimal housing conditions for them.

A survey of household budgets shows the profound differences in well-being of urban and rural population. According to the sample household budget survey, carried out by the bodies of state statistics of the Komi Republic, the level of incomes and expenditures of households on average per person per month in rural households compared to the same indicator in urban households in 2012 was as follows: by disposable resources – 85.8%, by final consumption expenditures – 80.8%, by consumer spending – 76.9%, by cash expenditures – 77.9%, by the purchase of products for domestic supply – 72.2%, by the purchase of non-food goods – 84.1%, by the payment for services – 72.5%. Food and energy value of nutrition in rural households on average per person per day is just 2344 kcal against 2646 kcal in urban households.

The average consumption of foodstuffs per person per month in rural households was less than that in urban households: grain products – by 6.4%, potato – by 13.6%, vegetables and melons – by 14.3%, fruit and berries – by 19.5%, meat and meat products – by 26.8%, milk and dairy products – by 16.1%, eggs – by 11%. Consumption level was the same only with regard to fish and fish products, vegetable oil, fats, sugar and confectionery.

Work in the agricultural sector may be attractive, if the village has a developed social sphere, and a person has a tangible opportunity to get decent housing, decent wages and career prospects. According to our calculations, the state of socio-labour sphere in the village is 1.6 times worse than in town.

For years of reforms, the situation in the social sphere of village has aggravated due to the reduction in residential construction, health care, education, culture, public services and reduction in the funding of these institutions. Many schools and kindergartens, shops, public catering enterprises, clubs, comprehensive reception stations have been closed. Provision of the village with necessary facilities has slowed down. In the pre-reform years (1981–1990), an average of 115 thousand square metres of housing was annually commissioned in the villages of the Komi Republic; as for 2000–2010, this figure decreased to 42 thousand square metres, or by 62%. Over the past two years, the average of 37.5 thousand square metres of housing per year has been commissioned.

The number of young specialists and rural citizens, who received subsidies for improving their housing conditions, decreased from 223 people in 2008 to 73 people in 2009, to 51 people in 2010; in 2011 their number was 60 people and in 2012 – 52 people, the number of young specialists changed accordingly to 86, 38, 25, 29 and 19 people. The amount of subsidies granted in 2012, was 1065 thousand rubles per young specialist, 860 thousand rubles per rural resident.

Individual housing fund of the village, constituting 74% of the total housing fund, is characterized by poor quality and lack of amenities. Rural housing stock is largely deprived of basic conveniences: by the end of 2011 23% of housing had water supply, 33% had central heating, 19% had sewerage and 11% had hot water supply. (For the end of 2010 the rural housing fund of Russia as a whole was better provided with amenities: 48%, 60%, 38%, 25%, respectively.) The gasification issue is also acute in the villages of the Komi Republic: only 26% of housing have gas, while in Russia as a whole – 75%.

At the end of 2011, the provision of rural housing fund lagged behind that of urban housing fund: water supply system – four times, sewerage – five times, central heating – three times, hot water supply – nine times and bathrooms – eight times. Proportion of dilapidated and rundown housing fund in the total area was 22.6% (for comparison: in urban areas – 4.9%).

Unfortunately, the State programme "Development of agriculture and regulation of markets of agricultural products, raw materials and food, development of fishing industry in the Komi Republic in 2013–2020" stipulates the reduction in the amount of state support to the improvement of housing conditions of citizens, young families and young specialists living in rural areas, and to the assistance in the development of gasification and water supply of rural settlements – from 78.0 million rubles in 2013 to 49.5 million rubles in 2015.

During the years of agrarian reforms the core of rural life has been broken. Community relations have weakened. Agricultural organizations have lost their positions in the village, they no longer fulfil environment-forming function. The village faces deterioration of cultural values, and transformation of norms of public morality.

The problem of ensuring innovation development of agriculture through its staffing with highly qualified personnel can be solved by the radical improvement of living conditions in the village, including the increase in the income of agricultural workers, and their provision with comfortable housing, development of the system of socio-cultural and public services.

At present, small agricultural enterprises, farms and other enterprises with small production output, low profitability or unprofitability of production, low labour remuneration and labour productivity, poor facilities and technology base, along with underdeveloped rural social sphere do not attract specialists with higher education and even with vocational secondary education. University and technical school graduates will not seek employment in the agricultural sector unless the standard of living in the village is substantially improved in the near future.

**Main areas of personnel potential development**

In order to provide modernization and innovation development of agriculture with qualified personnel, it is necessary to carry out a complex of the following main measures:

- development of target programmes for providing agriculture with personnel at the level of agricultural enterprises, municipalities and the Republic;
- expansion of the system of qualified personnel training under leading agricultural universities of Russia, the Komi Republic and Komi Republican agricultural college; training of workers of mass professions, should be carried out at district and inter-district vocational schools, the training of workers of highly demanded professions that are in short supply should be carried out using contracts between agricultural organizations, employment agencies and educational institutions;

• upgrading of facilities, educational and technological base for practical training of future specialists at educational institutions and agricultural enterprises;

• restoration of advanced training at agricultural enterprises, organization of agricultural training courses in winter with the subsequent certification of students;

• introduction of probation of newly appointed managers and chief specialists at the leading farms;

• organisation of on-the-job training for agricultural managers, specialists and farmers, not less than once in three – five years at the Komi Republic Institute for Retraining and Advanced Training of Agricultural Specialists and at other universities;

• switch to the target training, retraining and advanced training of workers and specialists for enterprises on the basis of permanent monitoring of demand, analysis of their qualitative and quantitative composition, compilation of balances of qualified personnel; use of state order for training, retraining and improvement of their professional skills, introduction of a quota system for jobs and preferential admission of the rural youth to universities for obtaining the specialties that are in demand in the village;

• restoration of the work on vocational guidance in rural science at rural schools, creation of groups of professional education;

• gradual transition to the system of continuous agricultural education for the rural youth, consisting of several educational levels: the first – school education, the second – initial professional, the third – secondary vocational agricultural, the fourth – higher professional education, the fifth – institute for retraining and advanced training of agricultural specialists;

• preference to students of rural schools in the selection and training of applicants for secondary vocational and higher educational institutions of agriculture;

• development of training of specialists on a contractual-target basis, on the terms of a tripartite agreement: student – agricultural organization – university (technical school);

• expansion of the search for new forms and methods of training, aimed at the creation of a new employee, implementation of distance learning when necessary and possible;

• constant analysis and assessment of staffing of agricultural organizations with mangers, specialists and personnel of mass working professions; organization of monitoring for the study of professional and qualification structure of personnel; creation of data banks on the staffing needs; strengthening of HR management service;

• assessment (once every 3–5 years) of the activities of agricultural managers and specialists for evaluating their professional competence, the ability to handle production issues efficiently, identification of promising management employees to form the reserve of agricultural managerial personnel, for additional material and moral incentives;

• approval of the annual statements on the "Young specialist" database, so as to keep a record of newly employed young specialists, to control their provision with housing and reasons for quitting the industry;

• establishment of lump sum payments to graduates, directed to work in the village in the agrarian sector, from the Komi Republic budget (to university graduates – up to 500 thousand roubles, to technical school graduates – 300 thousand rubles), the payments in the peripheral regions will be 1.5 times higher and in the Arctic regions – 2 times higher; in turn, a young specialist must work at the enterprise not less than five years;

• forecasting of professional and qualification structure of personnel for the future on the basis of the state programme "Development of agriculture and regulation of markets of agricultural products, raw materials and food, development of fishery

complex of the Komi Republic for 2013–2020" (the forecast outlines the ways to form a contingent of qualified personnel required for innovation development of agriculture, to identify the needs for the training of specialists and qualified workers for new professions and occupations, to switch to the new educational standards and enhance the quality of education at all levels);

• formation of district, inter-district information and advisory services and enhancement of their role in innovation process;

• increase in the incomes of agricultural workers; establishment of a socially just system of labour remuneration that could ensure the reproduction of qualified personnel, satisfaction of their material and moral demands on the basis of enhancing state support to agriculture, increasing labour productivity, personnel skills development, efficient use of material resources (taking into account the conditions of the North, challenges of agricultural production and difficulty of labour, technological re-equipment of the industry, we emphasize that the wages in the agricultural sector should not be lower than the average level in the Komi Republic economy in general);

• cardinal improvement of social environment, provision of people with comfortable housing, provision of access to socio-cultural, trade and household services, medical care, improvement of road conditions, etc., through the development and implementation of the republican programme for sustainable development of rural areas and programmes of municipal entities up to 2020.

Citizens, young families and young specialists in rural areas should be given the opportunity to receive long-term housing loans for the purchase or construction of housing at a discounted rate (up to 3%) up to 20–25 years based on the market value and the social norm of living space. At the birth of children, it would be appropriate to write off a portion of debt for fiscal mortgage. It is necessary to allow families to repay the monthly payment in kind, by agricultural goods, produced in their households. Construction of new modern housing in rural areas should be financed by the federal, republican and local budgets, it should be carried out by specialized construction organizations and made available to the public through the long-term rent with the right of subsequent purchase [5].

Thus, one of the main tasks and a necessary condition for staffing of agriculture with qualified personnel consist in the enlargement of agricultural enterprises, their technological re-equipment, enhancement of the standard of living of rural residents. The latter can be achieved by increasing incomes, providing people with comfortable housing, developing a network of preschool institutions, secondary schools, objects of culture, health care, sports, trade, public catering and consumer services, road construction and transportation.

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# Economic evaluation of the market potential of fruit and berry production in the regions of the European North of the Russian Federation

*The article examines regional peculiarities of the local market formation of fruit and berry production in the Russian North from the theoretic perspective of new economic geography. It examines modern market development trends, presents the economic estimation of the market development potential of fruit and berry production in the regions of the European North of the Russian Federation.*

*Region, new economic geography, local market, berry products, the European North of the Russian Federation.*

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Vast areas, different duration and efficiency of economic development, uneven use of the territory's resources is one of the main reasons for Russian territorial differences in the development and distribution of productive forces. Liberalization of economic activities in the 1990s aroused interest in studying the peculiarities of the regional development, in analyzing natural resource potential and the contemporary geopolitical, economic and geographical situation in the territories. In that aspect the understanding of cause-and-effect relations of the country's socio-economic development is of fundamental nature [2] and takes into account different scientific views on the problem of regional development. In general, the main approaches to defining 'region' are territorial-spatial, economic and geographical, reproductive and territorial-administrative[13], moreover, these approaches complement each other in terms of spatial Economics (A.G. Granberg, A.I. Tatarkin, P.A. Minakir, etc.) and the theory of new economic geography (P. Krugman, J. Harris, A. Pred, etc.). Both of these scientific beliefs were formed not long ago (in the past 20–25 years), and has got scientific recognition only in recent years [5].

Paul Krugman's theory of the new economic geography is essentially based on two imperatives – J. Harris' "market potential" and A. Pred's "base-multiplier" model of regional income. It should be highlighted that the market potential concept includes access to all stages of goods flow – production, distribution, exchange and consumption [5].

The models within new economic geography describe the effects of "overjumping", "outstripping". This mechanism explains the phenomenon of leaders change in the periods of radical technological changes, when "the last ones become the first". Technologically and economically underdeveloped countries can take advantage of lower wages in order to reach the market. Moreover, because of their poverty these countries venture to introduce new technology, to take risks. Therefore, it often happens that the very factors enabling the country to become leader at one stage of technological and economic development, impede and hamper its dynamic development at the next stage [10].

Paul Krugman marked out two groups of factors contributing to the realization of the territories' competitive advantages. The "first-order" factors include the availability of natural resources (mineral, land resources, etc.) that are in demand in the market, as well as geographical location, including the position at global trade routes, reducing transport costs and facilitating innovation broadcasting. These advantages exist regardless of people's activity.

The "second order" factors comprise the advantages generated by the activities of an individual and society: agglomeration effect (high population density in cities, which allows for economies of scale); human capital (education, health, labour motivation, population mobility and adaptability); institutions, which contribute to the improvement of the business climate, population mobility, innovation diffusion, etc.; infrastructure, reducing economic distances [7].

Territorial-spatial approach to management, a number of provisions of Paul Krugman's "new economic geography" can be applied the regions of the European North of the Russian Federation as well, particularly the Northern, Northwestern and Arctic territories [5].

The territory of the North of Russia's European part is limited from the South, by parallel $60^0$N on average and practically coincides with southern administrative boundaries of the Pskov ($56^0$N), Novgorod ($58^0$N), Vologda ($59^0$N) oblasts and the Komi Republic ($61^0$N).

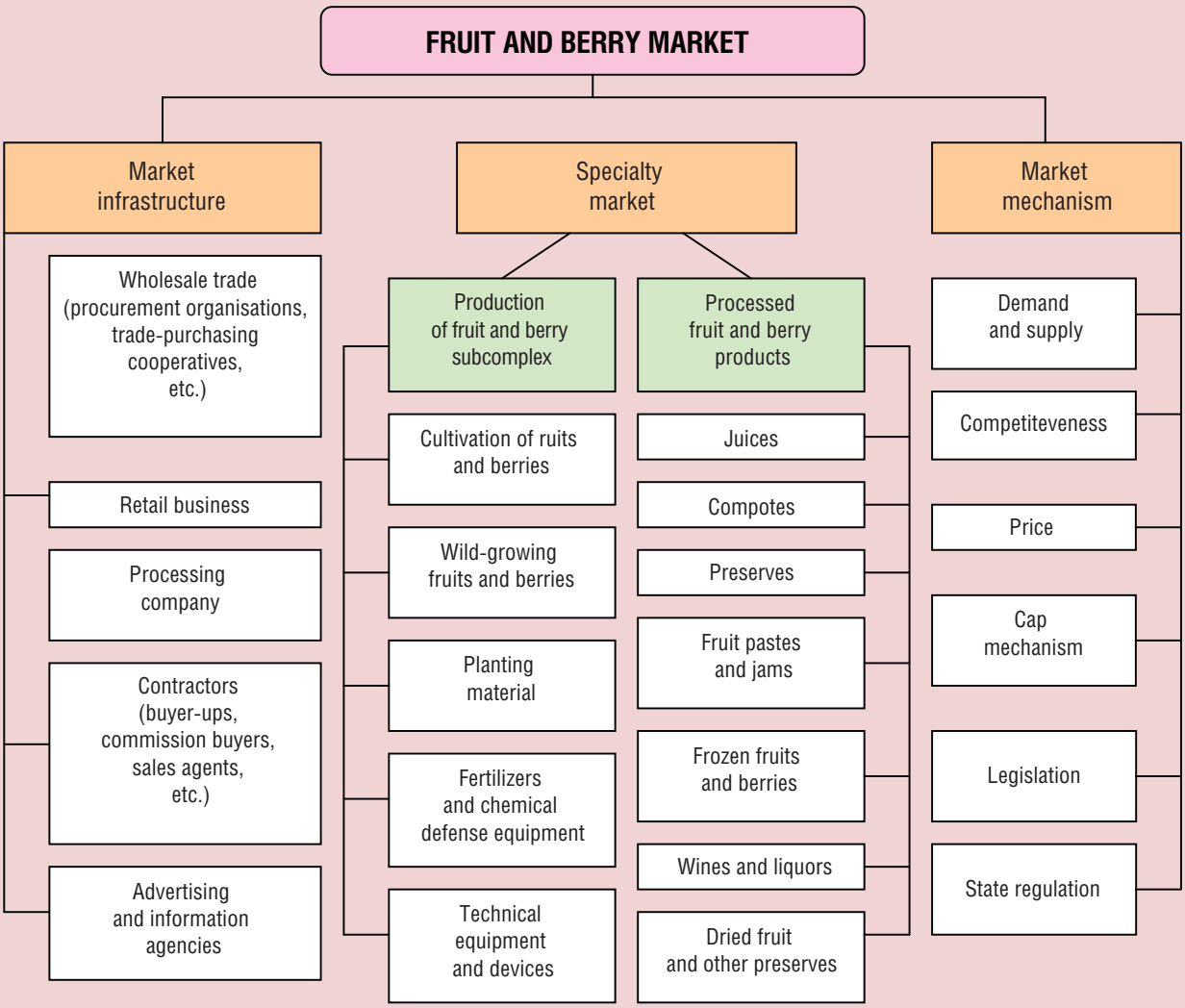
Important factors promoting the territory's economic development from the theoretic perspective of new economic geography and spatial approach include a unique geographical position and climate conditions, determining the regional (local) market development of fruit and berry products.

Research into theoretical and methodological approaches to the market development, including the works [1, 16], suggest that the market of fruit and berry products should be considered as a type of the common food market of multicommodity character, which is explained by a variety of independent markets of certain types of fruit and berry existing within it. According to the authors, fully functioning market of fruit and berry products of the Northern region consists of several components: market infrastructure, specialized markets, market mechanism *(fig. 1)*.

The local berry market is a system of economic relations concerning the implementation of berry products in the merchandise turnover. The object's specifics is that it is presented by two groups: cultivated and wild-growing. The first group of cultivated berries goes through production stage, while the second group of wild-growing berries immediately gets into circulation [9].

Natural-climatic factor directly affects berry growth and cultivation conditions. The variability of the weather regime throughout

Figure 1. Structure of developed market of fruit and berry products (compiled by the authors)




the year, except for the summer period; the prevalence of non-chernozem, low-fertility soils; swampiness of the territory (especially in the North) are the distinctive features of the Northern territories. Biological reserve of major varieties of wild berries alone in the regions of Russia's European North is rather large-scale: 3260 thousand tons of cowberries per year, 1800 thousand tons of blueberries, 640 thousand of bilberries, 1100 thousand tons of cranberries per year. This is a rather substantial and extensive activity field for personal subsidiary plots (PSP) in the field of gathering and processing of wild-growing berries.

Moreover, the territory of Russia's European North, particularly the Vologda Oblast, has significant potential for the distribution and economic turnover organization of cultivated berries

Modern horticulture began to develop in the oblast in 1927 with the creation of a centre of All-Union Institute of Applied Botanics and New Crops that was reorganised in 1932 into the Nikolsky fruit-berry centre within I.V. Michurin Research Institute, and later (December, 1956) became subordinate to Vologda State Agricultural Experimental Station. A number of new types of apple trees,

currant, gooseberry, etc. were produced at the Nickolsky centre (that existed until 1974).

In 1972, Vologda horticulture centre was opened at the Vologda District village Maisky. The works with regard to studying apple trees assortment were conducted here, in order to identify the most productive, winterproof, scab resistant types. The research into the use of polyethylene film for growing black currant seedlings was carried out, various ways and terms of propagation of berry plants, methods of queen cells accelerated reproduction and creation were examined. During functioning of the centre the assortment had been (and is) changing, more productive and yielding cultivars were introduced, the system of cultivating cane fruit mother plantations and commodity plantations at households was created and tested [13].

At present, the enterprise, which is the largest fruit tree nursery in the North-West, introduces new advanced technologies, actively cooperates with the Research Institute of Horticulture of the Nonchernozem Zone. Vologda state variety test plot of fruit and berry crops and Vologda horticulture centre of the All-Russian Selection and Technological Institute of Horticulture and Nursery (SSI ASTIHN) have been operating at the premises of the enterprise. The new cultivars are reproduced and introduced based on long-term cultivar investigation results. Over 1000 varieties of berry and other crops is cultivated in the enterprise.

Such berries as strawberry and black currant are produced predominantly at the integrated agricultural production centre Plemzavod Maisky. In certain years the plemzavod was engaged in the production of raspberry, sea buckthorn, honeysuckle, black chokeberry, and gooseberry. At the same time, their share in the total berry production volume made up 0.1%.

When considering berry sales of the integrated agricultural production centre Plemzavod Maisky, it can be concluded that during the 2005–2011 period the strawberry sales insignificantly decreased, while black currant sales, on the contrary, increased by 36%. In 2011 the enterprise sold 86.7 tons of strawberries and 90.1 tons of black currants. Sales of other berry crops are extremely low *(tab. 1)*.

The indicators of berry profitability, the level of which, except for the black currant profitability, is rather high, allow the economic efficiency of berry crops cultivation to be assessed. In certain years the production profitability of strawberries exceeded 200%, and the production profitability of raspberries reached 150% *(tab. 2)*.

Table 1. Berry sales of APC Plemzavod Maisky, kg

| Berry | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2011 to 2005, % |
|---|---|---|---|---|---|---|---|---|
| Strawberry | 91504 | 64094 | 85126 | 78933 | 125195 | 63526 | 86737 | 94.8 |
| Black currant | 66499 | 12631 | 86091 | 37442 | 56447 | 38294 | 90112 | 135.5 |
| Raspberry | 77 | 44 | 32 | 111 | 236 | 27 | 49 | 63.6 |

Table 2. Profitability level of berries produced at APC Plemzavod Maisky, %

| Berry | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Strawberry | 141,7 | 45,8 | 207,4 | 62,4 | 204,2 | 76,5 | 154,3 |
| Black currant | -1,3 | -61,9 | 86,3 | -1,5 | 144,1 | -28,7 | 6,3 |
| Raspberry | 129,7 | 163,1 | 144,2 | 84,6 | 118,6 | 156,4 | 84,7 |

However, natural low fertility of lands, short vegetation period make for rather low fruit and berry crop yields, and high costs ensuring their economic turnover hinder the extensive development of large horticultural farms. At present only 0.2% of the total fruit and berry production falls on agricultural organizations of Russian European North. Fruit and berry production in the Northern regions of the country is practically focused in dachas and subsidiary plots *(tab. 3)*. Thus, personal subsidiary plots are the main producer of fruit and berry products in Russia's European North.

At the same time, individual subsidiary agricultural production is inhomogenous and includes two forms. The first form is the production at subsidiary or field plots owned by rural residents. The second form is the production at truck patches and dachas by urban residents.

The role of personal subsidiary plots in providing the population with fruit and berry products has significantly increased, due to the transition to market relations and lowering living standard, although the potential of personal subsidiary plots in this field is not used to the full. Their involvement in the sphere of fruit and berry products exchange and in the food market system remains very low. The work of personal subsidiary plots is still considered only as a source of food self-sufficiency. In fact, this category of farms has significant surplus of agricultural products, including fruit and berries. According to the budget surveys of the Vologda Oblast PSPs, personal subsidiary farms currently produce about 20 kg of berry products. Overall production of fruit such as apples is rather significant – in certain years up to 1-1.5 tons per one PSP. Therefore, under favourable conditions of market infrastructure (proximity to the market, transport availability, etc.) the surplus of fruit and berry products could go to the local market.

As follows from the results of the Vologda Oblast population survey, each family can produce on average 1.2 tons of berry products (including wild-growing berries). A total of 200 people participated in the survey. The respondents were distributed by the following expert groups: the population of districts make up 40% of respondents, small and medium-sized enterprises – 50%, financial and credit institutions, organizations of the infrastructure of small and medium-sized enterprises support – 5%, experts in the sphere of small and medium enterprises support and development amount to 5%.

Table 3. Production structure of fruit and berry production in the regions of the European North of the Russian Federation (% of total production volume in households of all categories)

| Territory | Agricultural organizations | | Population households | | Farm households | |
|---|---|---|---|---|---|---|
| | 2005 | 2010 | 2005 | 2010 | 2005 | 2010 |
| Republic of Karelia | 1.2 | 0.3 | 96.7 | 99.4 | 2.1 | 0.3 |
| Komi Republic | 0.0 | 0.0 | 100 | 100 | - | 0.0 |
| Arkhangelsk Oblast | - | 0.0 | 100 | 100 | - | - |
| Vologda Oblast | 1.4 | 1.5 | 98.6 | 98.5 | - | - |
| Kaliningrad Oblast | 0.1 | 0.0 | 99.9 | 100 | - | 0.0 |
| Leningrad Oblast | 0.4 | 0.1 | 99.6 | 99.9 | 0.0 | 0.0 |
| Murmansk Oblast | 0.0 | 0.5 | 100 | 99.5 | 0.0 | - |
| Novgorod Oblast | - | - | 100 | 100 | - | - |
| Pskov Oblast | 3.1 | 1.0 | 96.3 | 99.0 | 0.7 | - |
| NWFD on average | 0.8 | 0.2 | 99.1 | 99.8 | 0.1 | 0.0 |
| For reference: Russia | 20.7 | 15.0 | 78.4 | 82.8 | 0.9 | 2.2 |
| Source: Agriculture, hunting and forestry in Russia. 2011: statistical digest. Rosstat. Moscow, 2011. | | | | | | |

Thus, the potential berry market of Russia's European North is rather well-marked, however, the realization of this potential is largely constrained by underdeveloped market infrastructure at the local level. As a result, the import from other Russian regions and from abroad remains, as before, the main source of fruit and berries on the consumer market of the RF NWFD subjects. Trade liberalization in recent years allowed the import of fruit and berry products to be considerably increased.

Such situation is characteristic throughout the country as well. In the 2000–2011 period the import of fresh apples in Russia increased from 218 thousand tons to 1191 thousand tons respectively, of fresh grapes from 72 thousand tons to 400 thousand tons, of citrus fruits from 473 thousand tons to 1661 thousand tons, and of bananas from 506 thousand to 1308 thousand tons *(tab. 4)*.

State statistics data show that import covers personal consumption of these products by 90–95% in the majority of the RF NWFD subjects. In the Kaliningrad Oblast alone this percentage is lower than in other regions of the district, amounting to 62%. According to our estimations, the population of NWFD consumed more than 1.2 million tons of imported fruits and berries in 2010.

Due to growing import, average per capita fruit and berry consumption in the Northwestern Federal District increased by 25% and amounted to 61 kg per person over the 2006–2011 period *(tab. 5),* which is somewhat higher than the national average.

Table 4. Import of fruit and berry products by the Russian Federation

| Production | 2000 | 2005 | 2008 | 2009 | 2010 | 2011 | 2011 to 2000, % |
|---|---|---|---|---|---|---|---|
| Bananas, thousand tons | 506 | 865 | 1007 | 981 | 1069 | 1308 | 258.5 |
| Citrus fruits, thousand tons | 473 | 953 | 1288 | 1280 | 1491 | 1661 | 351.2 |
| Including: oranges | 250 | 391 | 502 | 444 | 499 | 568 | 227.2 |
| lemons | | | 183 | 206 | 212 | 223 | 121.9* |
| Fresh grapes, thousand tons | 71.7 | 291 | 407 | 375 | 409 | 400 | 557.9 |
| Fresh apples, thousand tons | 218 | 730 | 1064 | 851 | 1206 | 1191 | 546.3 |

* 2011 to 2008, %.
Source: Russian statistical yearbook. 2012: statistical digest. Rosstat. Moscow, 2012.

Table 5. Fruit and berry consumption in NWFD regions (kg per capita annually)

| Territory | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2011 to 2006, % | Ratio | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | To the minimum rate (80 kg/person) | To the optimal rate (120 kg/person) |
| Kaliningrad Oblast | 54 | 58 | 65 | 64 | 70 | 71 | 131.5 | 88.8 | 59.2 |
| Vologda Oblast | 57 | 59 | 65 | 61 | 66 | 68 | 119.3 | 85.0 | 56.7 |
| Murmansk Oblast | 51 | 55 | 60 | 60 | 65 | 65 | 127.5 | 81.3 | 54.2 |
| Saint Petersburg | 48 | 53 | 59 | 59 | 61 | 64 | 133.3 | 80.0 | 53.3 |
| Arkhangelsk Oblast | 50 | 54 | 59 | 59 | 61 | 62 | 124.0 | 77.5 | 51.7 |
| Novgorod Oblast | 44 | 43 | 53 | 54 | 57 | 58 | 131.8 | 72.5 | 48.3 |
| Leningrad Oblast | 45 | 50 | 53 | 52 | 57 | 57 | 126.7 | 71.3 | 47.5 |
| Komi Republic | 37 | 39 | 47 | 49 | 50 | 53 | 143.2 | 66.3 | 44.2 |
| Republic of Karelia | 39 | 42 | 42 | 44 | 47 | 49 | 125.6 | 61.3 | 40.8 |
| Pskov Oblast | 41 | 44 | 46 | 45 | 45 | 48 | 117.1 | 60.0 | 40.0 |
| NWFD on average | 47 | 51 | 57 | 56 | 59 | 61 | 129.8 | 76.3 | 50.8 |
| RF on average | 48 | 51 | 54 | 56 | 58 | 60 | 125.0 | 75.0 | 50.0 |

Source: Consumption of main food products. Available at: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1286360627828

However, per capita fruit and berry consumption in the NWFD make up only 76% of the minimum rate (80 kg) and 51% of the recommended rate (120 kg), adopted by the Russian Academy of Medical Sciences. The value of this indicator substantially differs among the subjects of the Russian Federation. So, in the Komi Republic, the Republic of Karelia, the Novgorod, Leningrad and Pskov oblasts, per capita fruit and berry con sumption falls short of the half of the optimal rate (120 kg).

Wild-growing berries are an important reserve for the development of fruit and berry subcomplex and providing the population with berry products. For example, the Vologda Oblast has a huge potential for the development of berry procurement and processing. According to the forest management, the biological reserve of wild-growing berries in the area makes up 56 thousand tons, including cranberries – 37 thousand tons, cowberries – 11.2 thousand tons, blueberries – 7.8 thousand tons. The resources of blueberry, bilberry, strawberry, raspberry, currant and other wild-growing berries have not been nearly examined [19].

According to the Forestry plan, the volume of wild-growing berries procured by forest sector companies is planned to reach 514.3 tons by 2017 *(fig. 2)*. This will make it possible to attract extra 25–30 million rubles to the oblast budget as payment for berries gathering. However, in fact, budget loses significant sums due to poor market infrastructure development.

Over a long period of time, consumer cooperatives with the extensive network of offices in all districts, have been the main regional organization, procuring this type of production. In 1991 the Vologda Oblast consumer's association bought 3.8 thousand tons of cranberries and blueberries, the significant part of which was sold on the country's domestic market and abroad. However, this system has been destroyed. In 2010 the cooperatives purchased only 11 tons of forest berries. Insufficient attention of the state to such activities is one of the reasons for the under-utilization of the reserve increase [19].

Figure 2. Procurement volume of wild-growing berries in the Vologda Oblast, tons

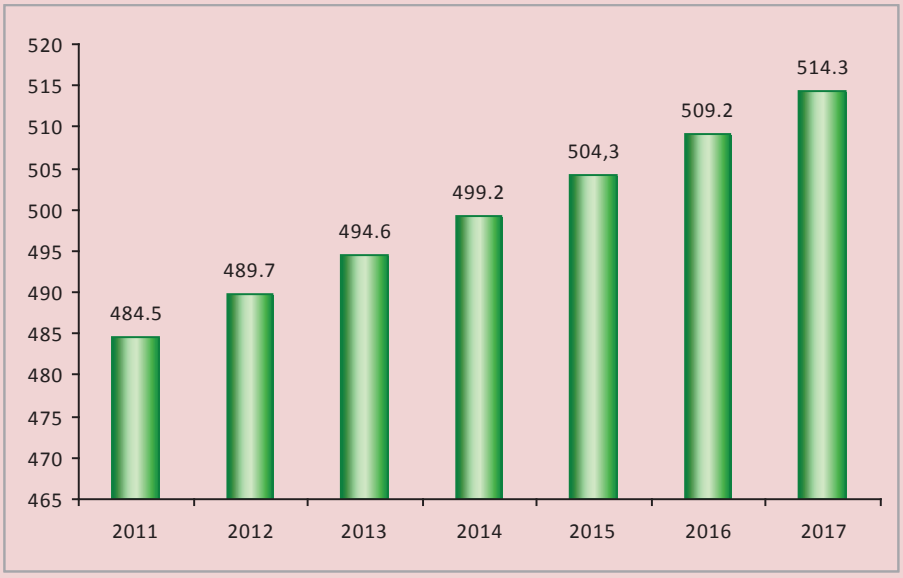
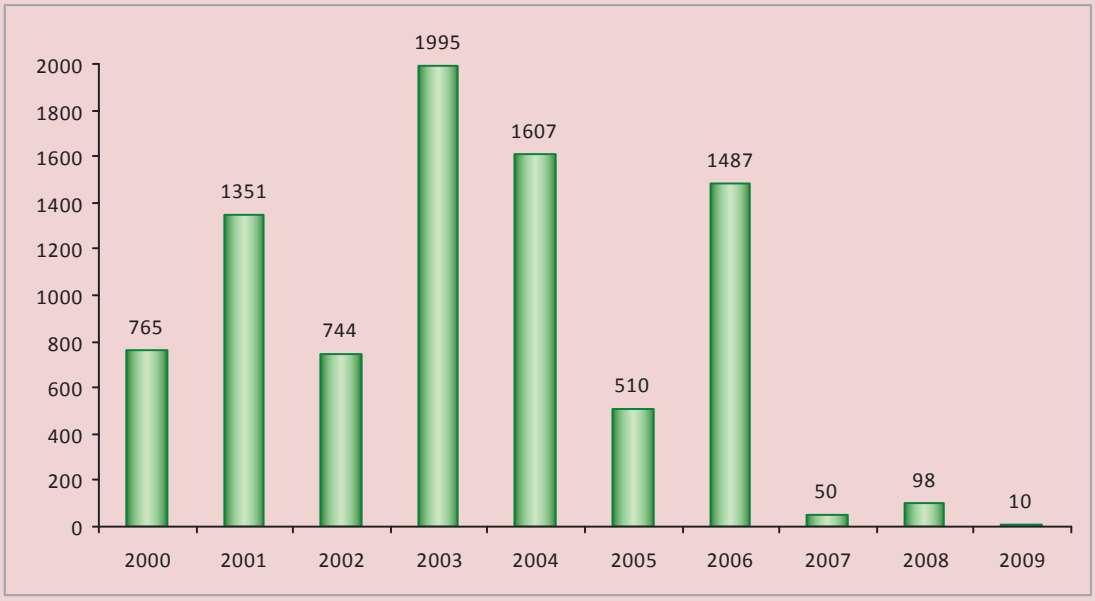


Figure 3. Export dynamics of wild-growing berries in the Vologda Oblast, tons




However, foreign demand for wild-growing berries is characterized by the tendency of steady increase, and regions that supply berry products for export, receive quite sufficient income. Thus, the Vologda Oblast exported 8617 tons of berry products for the 2000–2009 period *(fig. 3)*. Unfortunately, state statistical authorities do not provide any information about the export volume of wild-growing berries in the Vologda Oblast in recent years. However, as follows from print materials, the effectiveness of this activity has been increasing. Thus, 464 tons of berries (blueberry, cowberry, cranberry) with the total cost of 1.3 million US dollars were exported for the nine months of 2012[1].

At the same time, as a result of the state's withdrawal from the sector and the emergence of new channels of production flow, the role of which has been rapidly increasing, the tendency of decreasing export volume can be observed. Thus, along with forestry enterprises, the yields of which have significantly reduced, a lot of entrepreneurs and commercial companies, i.e. contractors (buyer-ups) became the suppliers of wild-growing forest food products.

At the same time, a great number of private companies and buyer-ups, cooperating with exporters and the capital's retailer, emerged in the market of wild-growing berries in the region.

The experience in using the resources of wild-growing berries in other NWFD regions has been accumulating as well; marketing activities on expanding the presence in the domestic and foreign markets constitute an important part of this business. Direct investments from the concerned Swedish, Finnish and Norwegian companies have become to a significant extent the stimulus to procurement development in the Republic of Karelia, the Pskov, Arkhangelsk and other oblasts. The sources of foreigners' interest are clear: this Russian region is in close proximity

[1] Vologda Oblast exports berries and mushrooms for millions of US dollars. Available at: http://www.krassever.ru/articles/economics/monitoring/38400/

to the borders of the countries, in which the consumption of wild crops (primarily berries) is at a very high level. In fact, the companies traditionally engaged in the processing of wild-growing berries, seriously took up relatively cheap Russian commodity market. At present, up to 40 companies in Karelia are involved in harvesting and supplying wild crops to the countries of Northern Europe. They are fully financed by Western partners. But processing of wild-growing primary products was not developed in the region: the vast majority of the market operators gather and supply berries for export "as is".

Note, that the effective functioning of the local berry market largely depends on the state regulation. However, as follows from the study, the priorities of state support for the industry are not clearly defined at both country and regional levels; the state regulation mechanism of prices for fruit and berry products and goods necessary for its production remains imperfect and is practically not regulated by imported fruit and berry volume; there is no information on the status and changes of the world fruit market. The development potential of fruit and berry subcomplex by means of wild crops remains unrealized. Up to now, government institutions have failed to organise gathering of wild-growing berries.

According to the authors, an increase in the efficiency of berry resources use is an important reserve for socio-economic development of the regions of Russia's European North and for the improvement in the population life quality. The use of this reserve depends directly on the development of the local market of fruit and berry products.

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# Decoupling effect in the industrial region (the case of the Kemerovo Oblast)

*The article considers the possibility of eco-economic decoupling in the industrial region (in the case of the Kemerovo Oblast). The analysis of the trends of economic development and production output volumes (in particular, in the coal industry) has proved that there are no decoupling effects in the region. The increase in production volumes has a direct negative impact on the environment. In order to change the situation, a substantial increase of investment in environmental protection is required, otherwise the ecological situation in the Kemerovo Oblast will deteriorate even more significantly.*

*Decoupling, industry, Kemerovo Oblast, modernization, environment, air pollution, water pollution, surface disturbance.*

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Economic development of the majority of Russia's regions during their post-crisis recovery and modernization will be connected in many respects with the key branches of heavy industry. The transition to the innovation model of economic growth does not reduce the importance of modern industry in the economy. Substantial evidence can be found in the U.S. experience; being a global innovation and technology leader, the country extracted 997 million tons of coal, 275 million tons of oil, produced 80 million tons of steel, 4361 billion kW*h of electric power, 64.4 million tons of cement in 2010 [14]. Economy modernization and technological breakthrough enhance, rather than reduce, the significance of present-day industry that provides enterprises and citizens with fuel, energy, modern construction materials.

It should be also noted that the actual branch-wise structure of Russia's economy, as V.A. Ilyin points out, is changing by no means toward high-tech manufacturing industries. On the contrary, in practice, there has been a shift in favour of raw material sectors, extractive industries, in particular, the fuel and energy complex [6]. This problem is especially acute in a number of Russia's old industrial regions

dominated by fuel, metallurgical and chemical industries, and metal-intensive engineering. Such regions comprise the Vologda, Kemerovo and Chelyabinsk oblasts, Krasnoyarsk Krai, the Republic of Khakassia, etc. Their economic growth pattern in the 1999 – 2008 period was based on the recovery of industries connected with the exploitation of natural resources, energy and fuel. Thus, in the Kemerovo Oblast, the rise of the economy was to a great extent reduced to the recovery of mining industry [10].

The problems, difficulties and disadvantages of this economic growth alternative are well-known, and they have been analysed by Russian scientists [1, 2, 3, 5, 6]. A most acute problem lies in the environmental impact of heavy industry that damages biodiversity, environment, human health, agricultural land, and deteriorates the quality of life. However, economic growth in most of Russia's regions is still based on raw materials and exploitation of natural resources. Moreover, such state of affairs is reflected in official strategies and programmes of many constituent entities of Russia. For instance, the "Socio-economic development strategy of the Kemerovo Oblast up to 2025" envisages the increase in coal mining up to 270 million tons [16].

At the same time, industrial growth, the increase in the volumes of natural resources extraction and processing do not always have to result in grave or disastrous environmental damage, since there exist certain technological solutions, organizational and economic methods of management, which help to reduce the damage inflicted or compensate for it [4, 8, 17, 18, 19]. In this regard, the concept of decoupling has become very popular for the last 10–15 years. The concept implies that economic growth (in raw material industries as well) is possible without the increase of natural resource intensity and environmental damage [11]. There have been speculations concerning the presence of decoupling in the Kemerovo Oblast economy, in its coal industry in particular [10]. However, the feasibility of decoupling is doubted by many specialists [20]. D. Meadows, the author of a widely known work *The Limits to Growth*, speaking at the lecture in SKOLKOVO, declared: "Decoupling does not work. There are some examples of minor changes of the dependence coefficient, for example in Denmark, but there are no long-term examples" [12].

Taking into account the high attractiveness of development in the framework of decoupling for industrial regions, the article is aimed at identifying the presence or absence of decoupling in the primary industrial sectors of the old industrial region (in the case of the Kemerovo Oblast).

However, to identify the presence or absence of decoupling, it is necessary to define this very concept. The English word *decoupling* means "splitting; separation; breakdown of connection" (in Russian: "развязывание, развязка, расщепление, разъединение, отделение, нарушение связи"). It follows that the concept of decoupling is applicable to the situations when two processes or a set of indicators that should have a correlation or other dependence actually move in different directions. The term *decoupling* indicates, in particular, the violation of synchronism in the economic growth and recession of developed and developing countries – instead of the expected synchronisation of economic cycles, there is a mismatch in economic dynamics of these countries [13, 15].

In eco-economic sphere, the term *decoupling* initially characterized the splitting of the trends of GDP growth and primary energy consumption in the OECD countries: while GDP was growing, the primary energy consumption remained stable or even slightly reduced [9]. At present, decoupling is regarded as the mismatch between the pace of population's welfare improvement on the one hand, and the consumption of resources and environmental impact – on the other.

Decoupling implies that the achievement of economic progress is based on lower rates of resources consumption and the reduction of environmental damage [11].

In view of the above, the author proposes to define the term *decoupling* (as applied to environmental economics) as the discrepancy and divergence between economic growth rates at the level of countries, regions and economic branches and the rate of changes in environmental damage indicators. In other words, an economy is said to be decoupled, when the indicators of negative impact on the environment remain stable or even show a decreasing trend along with a positive dynamics of economic growth rates.

Having defined the notion of decoupling, we can proceed to the methodology of its identification in the industrial region. The presence of decoupling is characterized by the divergence between the dynamics of economic indicators and indicators of environmental damage; thus, it is necessary, in the first place, to determine the structure (list) of indicators, which characterize the pace of economic development of a branch or region, as well as environmental damage indicators. Consequently, the links between them are examined at the second stage of the study, which helps to determine the presence or absence of decoupling effect.

It has been proposed to reveal the presence or absence of decoupling effects in the old industrial region in the case of the Kemerovo Oblast and the region's coal industry. Firstly, the Kemerovo Oblast is a typical representative of a group of historically old industrial regions, where economic growth was and, apparently, will be conditioned in the long term by the development of mining industry. Secondly, coal industry, as a branch of the region's specialisation, clearly reflects its economic performance, as well as an approach to the solution of environmental problems.

The volume of coal mining in natural units (in tons) was accepted as an indicator reflecting growth rates in the coal industry. Cost indicators of the volumes of coal production and sales weren't used, since they largely depend on fluctuations of coal prices and the situation in the sphere of rail transport. In order to determine the composition of indicators, reflecting negative industrial impact on the environment, the author proceeds from the fact, that coal industry affects the environment in the following ways:

1) withdrawal of land, its pollution by wastes from coal mining and enrichment are characterized by the indicator of the area of damaged land (in hectares);

2) change of hydrological behaviour of underground and surface waters, and depletion of water resources are characterized by the indicator of water intake from water bodies (cubic metres) and the use of fresh water (cubic metres);

3) pollution of groundwater and surface water bodies by industrial and household wastewater is characterized by the indicator of the discharge of sewage, transit, mine water into water bodies (cubic metres), as well as the discharge of polluted water (cubic metres);

4) pollution of air by solid and gaseous harmful substances is characterized by the indicator of the total emission of polluting substances into the air (tons).

The analysis covers the 2005 – 2011 period, which, in the author's viewpoint, is the most significant one for studying the decoupling effect in the Kemerovo Oblast. Generally, the years 2004–2005 witness the expansion of production capacities of coal-mining enterprises, while earlier, the growth in extraction volumes had been achieved mainly by using idle facilities and without conducting large-scale technological renovation. The data on environmental pollution in the Kemerovo Oblast in 2012, have not yet been published.

Table 1. Indicators used to identify the decoupling effect in the coal industry of the Kemerovo Oblast

| Indicator | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Coal mining, million tons | 164.3 | 174.8 | 181.4 | 182.8 | 179.2 | 181.8 | 188.3 |
| Area of disturbed land, hectares | 62783 | 62386 | 62361 | 62511 | 62700 | 63700 | 63531 |
| Intake of water from water bodies, million cubic metres | 274.2 | 298.4 | 316.2 | 323.9 | 327.5 | 328.9 | 329.1 |
| Use of fresh water, total, million cubic metres | 57.8 | 69.2 | 69.0 | 64.0 | 59.9 | 60.3 | 60.1 |
| Discharge of sewage, transit, mine water into water bodies, million cubic metres | 240.9 | 260.2 | 283.5 | 291.2 | 293.6 | 295.3 | 297.1 |
| Including polluted water, million cubic metres | 202.0 | 217.0 | 233.6 | 251.8 | 245.7 | 249.7 | 248.6 |
| Overall air pollution, thousand tons | 590.9 | 625.2 | 798.2 | 852.1 | 851.4 | 826.9 | 804.3 |
| Indicator | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Coal mining, million tons | 164.3 | 174.8 | 181.4 | 182.8 | 179.2 | 181.8 | 188.3 |
| Area of damaged land, hectares | 62783 | 62386 | 62361 | 62511 | 62700 | 63700 | 63531 |
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| Overall air pollution, thousand tons | 590.9 | 625.2 | 798.2 | 852.1 | 851.4 | 826.9 | 804.3 |

The empirical data used in the research are presented in *table 1.*

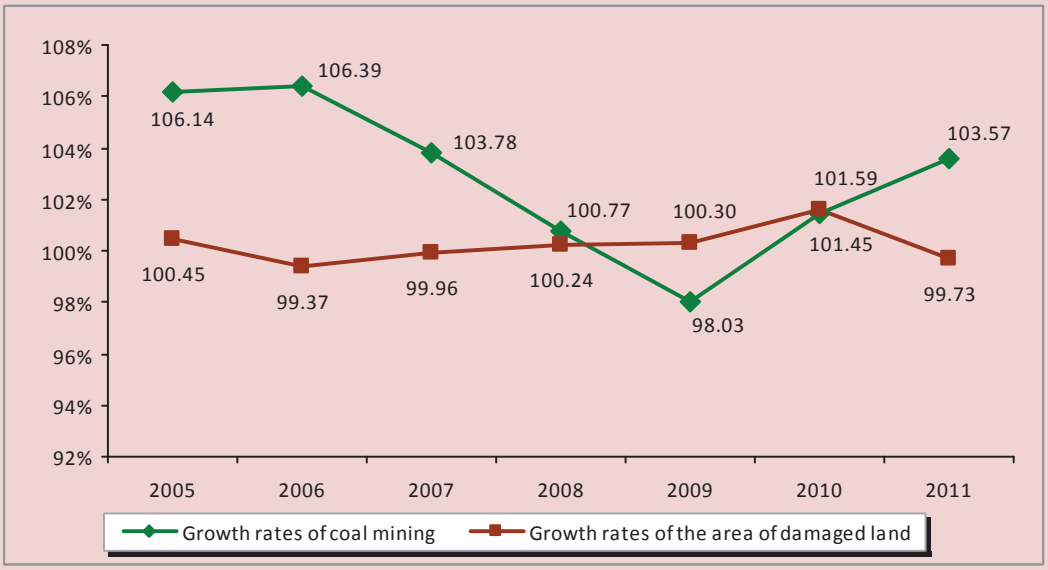
Coal production indicators have been obtained from official statistical reference book *Kuzbass in Figures*, published by the territorial body of the Federal State Statistics Service in the Kemerovo Oblast. Other indicators have been taken from the annual state reports on the condition and protection of environment in the Kemerovo Oblast, published by the Natural Resources and Ecology Department of the Kemerovo Oblast Administration on its official website (available at: http://kuzbasseco.ru/doklady/).

Let us first consider the dependence between the growth rates of coal industry and the increase in the area of disturbed land. For this purpose, let us calculate the chain rates of growth of coal mining and the change in the area of disturbed land. The results in *fig. 1* prove that there is no definite connection between the changes in the area of disturbed land and the volume of coal output.

While the pace of coal mining volumes increase was slowing down, the rate of damaged land areas increase remained stable; in 2006 – 2007 it was reducing alongside increasing extraction. Rapid increase of extraction in 2010 – 2011 didn't result in acceleration of land damage. The Pearson correlation coefficient between the variables *coal mining* and *area of damaged land* is 0.37, which indicates the absence of a statistically significant relationship.

Therefore, the increase of coal mining in Kuzbass doesn't necessarily imply the increase in the area of damaged land, which creates certain prerequisites for the implementation of decoupling effect. Since the damaged land area is reduced due to land rehabilitation and due to the change of a category of previously disturbed and exhausted land, we can conclude that the land, which is no longer in use, undergoes a relatively timely and full rehabilitation. The Kemerovo Oblast proves an argument of V.I. Danilov-Danilyan, who stated that "coal industry (unlike oil industry) pays off its land rehabilitation debts" [7]. However, it should be taken into account, that in the case of surface disturbance, it is easier to get the decoupling effect, because disturbed land is still possible to restore with the due quality and timing of rehabilitation.

Figure 1. Correlation between the growth rates of the area of damaged land and the growth rates of coal mining in the Kemerovo Oblast in 2005–2011, %




Let us consider the correlation between coal mining and water pollution. *Table 2* shows the Pearson correlation coefficients between the rates of coal mining volumes increase and the indicators of water consumption and pollution.

The data show that three out of the four indicators of water consumption and pollution have a strong positive correlation with coal mining increase rates. The increase in coal mining correlates closely with the volume of fresh water intake, total water discharge in water bodies and the discharge of polluted water – correlation coefficients exceed 0.9000 while the critical value is more than 0.7545.

The increase in coal production volumes leads directly to the increased intake of fresh water, which is explained by objective technological peculiarities of coal mining, an underground mining in the first place. The peculiarity of water consumption in coal industry consists in the prevalence of water intake from underground sources while draining mine workings. Only a small amount of water is taken from surface water bodies. It is not possible to reduce the volume of mine workings draining when using the present extraction technologies. At the same time, the main volume of consumed water still returns to natural environment, because the water, used in coal industry, doesn't become part of the finished product. This is expressed in the absence of statistical correlation between the increase of coal mining and the use of fresh water (the correlation coefficient is 0.1584, which is significantly lower than the critical value).

Discharge of waste water in general and the discharge of polluted sewage water, as can be seen in *table 2*, are directly connected with the change in the volumes of coal mining. The discharge of waste water is explained by the return of the previously taken water when draining mine workings, and it will objectively have the same dynamics as the volume of coal mining, tunnelling and second working.

A more serious problem lies in the closest connection between the overall production volume and the discharge of polluted waste water, which can be described by the regression equation explaining 87% of the variance:

Table 2. Correlation coefficients between the growth rates of coal production and indicators of water consumption and pollution*

| Water consumption and pollution indicator | Value of correlation coefficient between this indicator and the growth rates of coal production | Number of degrees of freedom | Critical value of correlation coefficient at the level of significance = 0.05 |
|---|---|---|---|
| Intake of fresh water, cubic metres | 0.9298 | 5 | 0.7545 |
| Use of fresh water, total, million cubic metres | 0.1584 | 5 | 0.7545 |
| Discharge of residuary, transit, mine water into water bodies, million cubic metres | 0.9302 | 5 | 0.7545 |
| Discharge of polluted sewage, transit, mine water, million cubic metres | 0.9016 | 5 | 0.7545 |
| * author's calculations. | | | |

$$C = 2.6231D - 189.14,$$

where $C$ is the discharge volume of waste, transit and mine waters into water bodies, million cubic metres;

$D$ is the volume of coal mining, million tons.

It turns out that every million tons of coal in the current situation will increase the discharge of polluted water by approximately 2.6 million cubic metres. The increase in extraction causes the pollution of aquatic environment, and any decoupling effect in this case is definitely out of the question.

The main reason consists in the fact that the share of partially clean water in the drains of coal industry is small due to certain technological peculiarities, and the number of treatment facilities is not enough. Less than half of wastewater discharges at coal enterprises have treatment facilities. Moreover, most of these structures use technologies that have been obsolete for decades.

Consequently, at present, coal enterprises are not able to treat waste water to a standard quality. Therefore, the increase in coal extraction will inevitably cause the increase in the amount of waste water. The problem lies not only in the lack of treatment facilities, but also in the obsolete technologies of mechanical water treatment at the enterprises that have treatment facilities. Their performance does not reach even 60%; therefore, without the large-scale construction of new sewage treatment facilities, it will be impossible to achieve decoupling effect.

Thus, land rehabilitation in general makes up for land damage in the Kemerovo Oblast; however, at present it is impossible to overcome the tendency of simultaneous increase in the amount of waste water.

Further on, let us consider the relationship between the volumes of coal production and the level of air pollution. The calculated correlation coefficient is 0.8249, which exceeds the critical level at the value of $\alpha = 0.05$. Therefore, in the period under review, air pollution intensity was in close correlation with the total volume of coal mining, so there was no decoupling effect in this aspect, either.

A connection between the increase in the amount of pollutants in the air and the change in the coal mining volume is illustrated by the following regression equation, which explains 68% of the variance:

$$E = 11.809M - 1349,$$

where $E$ is the amount of emissions into the air, thousand tons;

$M$ is the volume of coal mining, million tons.

The increase in coal production by one million tons can lead to additional emissions of pollutants in the air amounting to 11809 tons. However, the data for 2010–2011 give rise to certain optimism due to the fact that while the volume of coal mining output increased, air pollution in absolute terms reduced by

47.1 thousand tons or 5.53%, even though the volume of coal extraction over that period increased by 9.1 million tons or 5.08%. There is also a tendency toward the reduction of specific emissions of pollutants in the air per tonne of coal produced *(fig. 2)*. But, of course, the positive dynamics observed in such a short time-span doesn't confirm the existence of decoupling effect.

Studying the environmental impact of coal industry, one should point out that the absolute amount of its water and air pollution is greater than that of metallurgical and chemical industries. However, it should be emphasized that emissions from coal industry are less harmful regarding the content of 'heavy' pollutants. Coal industry pollutes the environment with a greater volume of less hazardous waste substances, while metallurgy and chemicals produce a smaller amount of waste, but it is more harmful.

The influence of coal industry on the environment has another peculiarity that is manifested in such phenomena that can not always be measured by quantitative indicators. These phenomena include changes of the landscape, hydrological behaviour of surface and ground water, and tectonic processes; indirect impact on wildlife; destruction of natural ecosystems. They are the consequences of large-scale displacement of soil, rock and minerals, industrial explosions, dramatically changing the environment. Such impact is not typical of other industries, their activities are 'restricted' mainly to the discharge of polluting substances and to the heat pollution. This should be also taken into account when evaluating the possibility to implement decoupling effect in this industry.

The analysis carried out in the article shows that it is at least premature to speak about the presence of decoupling in the coal industry, which is the key industry in the Kemerovo Oblast. 2005–2011 witnessed a positive correlation rather than divergence between the indicators of coal mining volumes increase and the negative impact on the environment. The increase in coal extraction leads directly to the increase of water and air pollution in the region.

Certain prerequisites for the emergence of decoupling effect exist only with regard to the divergence between the dynamics of coal extraction volumes and the rates of increase of disturbed land area. We can assume as a hypothesis that a certain tendency toward the

Figure 2. Specific emissions of pollutants in the air per ton of coal produced in the Kemerovo Oblast, kg

divergence between the growth rates of coal production and the intensity of air pollution could be observed in 2010 – 2011, but this period is too short for making grounded conclusions. In general, there was no decoupling effect in the Kemerovo Oblast coal industry in 2005– 2011. Therefore, under the circumstances, the increase of air and water pollution intensity in the region that is already suffering from environmental problems is the price, which has to be paid for the increase in the coal mining volumes.

The experience of other Russia's regions, for instance, the Republic of Karelia, proves that negative environmental impact caused by industrial growth can be actually reduced through ecological modernization and investments in environmental conservation [4]. That's why the implementation of decoupling effect in practice will be connected with the promotion of environmental investments based on a set of administrative and economic methods of the government.

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# Ecological protection of underdeveloped regions in China: a case study of Jiangxi Province

*The article presented scientific approaches to ecological protection in the underdeveloped regions of China. It describes its organization in the periods of economic recovery and rapid economic development. The article also covers acute issues concerning the enhancement of ecological protection at present.*

*Concept of ecological protection, environmental protection, underdeveloped regions, ecological problems, ecological safety.*

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The topic of "ecological protection of underdeveloped regions in China" is closely related to the following two key words.

The first key word is *underdeveloped regions*. *Developed regions* and *underdeveloped regions* (i.e. undeveloped regions) can be at least divided in accordance with the level of economic and social development in various regions within a country.

Most of the *developed regions* are located at the coastal regions; however, most of the *underdeveloped regions* are located in the inland regions, such as Jiangxi, Hunan, Hubei and other provinces located at the middle and lower reaches of the Yangtze River.

The second key word is *ecological protection*. In fact, most people confuse *ecological protection* with *environmental protection* except for those scientists specializing in the ecological study, and they do not understand the difference between the two, which is directly related to their lack of knowledge in the study objects of ecology and environmental science (the term *ecology* was coined in 1866 by the German zoologist E. Haeckel, and it is a scientific study of the habitats of living organisms. The English plant ecologist A.G. Tansley put forward the concept *ecosystem* in 1935 and the concept *ecological balance* in 1939.).

There is a link and difference between the study objects of ecology and environmental science. Ecology takes ordinary living organisms as the object, focusing on the study of the correlations between the natural environmental factors and living organisms, which is a part of natural science; and environmental science takes human beings as the main object, to study the interactions of the environment and human life as a whole, and thus making a close connection with social sciences.

Due to people's lack of knowledge in ecology and environmental science, they would confuse *ecological protection* with *environmental protection*. Although *ecology* has become a common vocabulary of social concern due to people's discussion on the series of major issues such as environmental pollution, resource shortage, population explosion and natural protection since the 1970s, *ecological protection* has lost its rightful place under the cover of *environmental protection*, making *ecological protection* become a mere formality, and the worrying *ecological protection* effect, which is extremely detrimental to the survival of human beings.

The geographical characteristics of the developed regions determine that the development of these regions is closely linked with the underdeveloped regions, because the clean air of developed costal regions shall be protected by forests in underdeveloped regions, and their fresh water sources depend on the rivers flowing from underdeveloped regions; the rivers establish the life chains between the developed and underdeveloped regions as the important carrier of biological diversity, making the developed regions obtain broader ecological barriers and greater environmental capacities.

In this sense, the ecological protection of underdeveloped regions is directly related to the ecological safety of developed regions, and is also directly related to the sustainable development of developed regions. Therefore, only when the underdeveloped regions are well protected ecologically, the ecological protection and environmental protection of the developed regions will have a solid basis, and the ecological safety of the developed regions will be guaranteed.

Next, I will take Jiangxi Province as an instance of an underdeveloped region to explain the current situation of ecological protection and our efforts required to be made in the field of ecological protection.

Land reclamation, deforestation, mineral mining, dam construction, road construction, house building and other activities are bound to be conducted in the process of human development. These human activities certainly have some impacts on ecology and environment. If the relations between the economic and social development and ecological protection cannot be well handled, ecological damage will be more serious with the development of the economy and the faster pace of urbanization. The return of nature must be the retaliation for the improper development of human behaviour, and, thus, it adversely affects the survival of man, which has been proved in the long-term development practice of human beings. Therefore, how to properly coordinate the relations between economic and social development and ecological protection is of great importance in the survival and development of human beings.

Since the founding of new China, the economic and social development of Jiangxi Province can be divided into two periods, they are: the 1949–1978 economic redevelopment period and the 1979–2005 rapid economic development period. Due to the different levels of ecological awareness and attention and different production conditions and modes during these two periods, the impacts of the economic and social development on the ecology will be different.

**The ecology of Jiangxi Province during the economic redevelopment period (1949–1978)**

The impacts of economic and social development on the ecology have experienced two stages from the environmental pollution problem to the heavy pollution period.

During the previous stage of economic redevelopment period (1949–1957), the characteristic of environmental pollution problems was the emerging of water pollution, but the damage to the environment was localized due to the small amount of industrial pollutant emissions, so this stage belonged to the light environmental pollution period.

During the later stage of economic redevelopment period (1958–1978), with the occurrence of a number of serious environmental pollution accidents due to the pollution caused by massive deforestation, serious soil erosion, disordered industrial development and other reasons, especially the continuous emerging of new provincial industrial pollution problems during the Great Proletarian Cultural Revolution, and the excessive application of chemical fertilizers and pesticides in agricultural production, the characteristics of environmental pollution were that the surface water of some rivers and the groundwater of some cities had been seriously polluted, the air quality of some cities had seriously deteriorated, environmental pollution accidents had increased greatly, and the serious recession of aquatic resources had occurred in the Province, so this stage belonged to the severe environmental pollution period.

**The economic construction and ecology of Jiangxi Province during the rapid economic development period (1979–2005)**

After the reform and opening-up, the economic construction boom has risen, industry, agriculture, mining, transportation, urban construction and other activities have been fully launched, with the rapid development of national economy, economic construction achievements are remarkable, and ecological protection is also on the rise.

However, due to people's lack of knowledge on ecological problems, there is still the concept of "pollution first and treatment second", and there are a lot of phenomena related to the reconstruction regardless of the ecology and environment; ecological protection often cannot keep up with the pace of economic construction, and environmental pollution develops from a localized problem to a global problem, resulting in a serious adverse impact on economic and social development and the people's livelihood all over the province.

The previous stage of this period (1979–1991) was the seriously damaged period of ecology. Its characteristics include: [1] although the development and utilization of natural resources in Jiangxi Province had promoted economic development during this development stage, this unrestricted practice of developing and utilizing the resources had a serious adverse impact on the natural resources all over the province. Ancient and rare tree species were in the danger of becoming extinct; animal resources declined significantly; the use of agricultural chemical industrial products in abundance had a large impact on the ecology and environment; soil erosion problems were getting worse; heavy metal pollution caused by mine development resulted in the serious environmental pollution of the rivers [2].

Industrialization and urbanization is the development sphere of human society, environmental pollution is often accompanied by industrialization and urbanization, and the environmental quality of the overall situation in Jiangxi Province was worse than that of before.

During the Seventh Five-Year Plan period (1986–1990), water pollution accidents in Jiangxi Province accounted for 62% of the total pollution accidents, water pollution had become a more prominent environmental issue. The accidents happened due to the following reasons: ground waters were endangered to some extent by the municipal solid waste without sanitization; bad pollution prevention measures of industrial wastewater in rural areas severely polluted the rural water environment; the industrial and mining enterprises along the river directly discharged large amount of untreated industrial wastewater into the rivers; urban sewage was untreated.

During the later stage of this period (after 1992), the government has increased the investment in ecological protection and built many pollutant treatment facilities due to the strengthening of the awareness of ecological protection; the whole Province has made great

progress in ecological protection, but ecological protection has not kept up with the pace of economic construction; ecological destruction and environmental pollution are still serious in some regions, and some environmental problems have new development.

Its characteristics include: [1] there is little change for a better ecological environmental situation. The ecological function of the forest system deteriorates continuously due to the serious damage to the natural broad-leaved forest all over the Province; soil erosion areas are reduced, but the strength erosion areas have been increasing. As Jiangxi is one of the regions with the most serious soil erosion in the south, and its ecological destruction caused by soil erosion and mining activities is still on the rise; the agricultural product pollution caused by agricultural chemical industrial products has affected the safety of agricultural products [2]. The overall environmental quality remains stable, but pollution is still serious in some regions. All the major rivers are polluted, and the urban section pollution of the rivers has posed a threat to the drinking water safety; the air quality in some cities is poor, and the acid rain pollution is more serious all over the Province; the control of total pollutant indicators and the sewage treatment rate are near the bottom of the national ranking (in 2002, the sewage treatment rate of Jiangxi Province was 3.9%, and the national average sewage treatment rate was 22%, in which Jiangxi occupied the last place; in the recent years, the construction of the provincial and prefectural primary sewage treatment plants has made great progress, which significantly changes this kind of situation); the newly-built environmental protection projects do not reach the standard, which poses a threat to the ecology and environment all over the Province.

In the face of ecological protection problems that exist in an underdeveloped region such as Jiangxi Province, guided by the scientific view of development, we must focus on the goal of the construction of Ecological Economic Zone of Poyang Lake, accelerate the adjustment of the unreasonable economic structure, change the extensive mode of economic growth, build a resource-saving and environmental-friendly society, and protect the terrestrial ecosystem and the freshwater ecosystem as well as the safety of water environment in the middle and lower reaches of the Yangtze River as to create a superior living environment for people, explore a way with the coordination of economic society and ecological protection, and make a contribution to the sustainable development of man.

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# Crowdfunding– social technology of collective financing: foreign experience of application

*The article dwells on the foreign experience of crowdfunding in the case study of a crowdfunding platform. It presents the results of the platform operation by categories of declared projects and the total amount of funding. Analysis of the popularity of the proposed projects, as well as their efficiency is performed in the article.*

*Kickstarter, crowdfunding, social technologies, public funding.*

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Crowdfunding (derived from English words: *crowd*, *funding*) is a social technology of collective financing, based on voluntary contributions, donations. The nearest Russian equivalent is national or public funding.

Crowdfunding is one of the branches of crowdsourcing, which is understood as voluntary participation of people in public decision-making. In the case of crowdfunding such participation is reduced to the transfer of monetary funds for launching and/or supporting a certain project.

Although the term is relatively new, the idea of national, collective financing is not modern: since the beginning of time people collected money for socially significant projects.

However, in recent years the development of the Internet and the comprehensive integration of information technologies in public life, their increasing availability and technological maturity, led to the emergence of new, unique forms of socio-technological systems, including crowdfunding platforms – specialized web sites to promote the projects and to raise funds. The given article considers one of the most successful and currently in-demand platforms, called 'Kickstarter'.

As follows from Wikipedia, Kickstarter is an American-based private for-profit company founded in 2009 that provides tools to raise funds for creative projects via crowd funding through its website (Kickstarter.com) [6].

The project can be initiated by any person, with certain reservations (mentioned further). The donator himself/herself assesses the project's potential, its risks, as well as takes the decision regarding the sum paid.

Crowdfunding can be based on both voluntary donations, and donations with subsequent reward. In the first case, the donator does not pursue any material/financial gain, his/her interest in the successful completion of the project is the main motive for financing. For example, when it comes to the project on the making of a film or a computer game, the donator is interested in the film to be made, and the game to be written. As a rule, the main donors are a group of fans, admirers of the ideas, underlying the project.

The donation with subsequent reward does not negate the above-formulated motive, but supplements it with specific financial gain that the donator may come after. This is the kind of crowdfunding implemented on the Kickstarter. The project initiator offers several types of remuneration depending on the amount invested. For example, those, who contribute 5 dollars, get their name on credits; contributors of get their name on credits and a licensed copy of the film, etc. Therefore the reward acts as an additional incentive.

The article analyzes the platform performance in 2012. *Table 1* presents the basic data of the research, taken from the web site Kickstarter.com [7] (ranked by column "Collected funds" with the totals presented).

Let us clarify the notions used in the table.

**Launched projects**– the total amount of projects suggested for financing.

**Successfully completed** – the number of projects, the set goal of which has been met and that has been financed. The set goal is defined in the context as a minimum funding goal, specified in advance by the initiator and needed for the successful implementation of the project. The 'all or nothing' rule stands for this case: if the initiator of the project fails to collect the specified sum within 1 month, he receives nothing, and all the funds are returned to contributors. The collected, but subsequently returned funds are not considered in the table.

**Raised funds** – the total amount of donations collected for successfully completed projects.

**Raised funds on average –** average amount of collected funds for one successfully completed project.

**Number of participants** here is equivalent to the number of donations, collected funds $= \sum_{i=1}^{n} x_i$, where $x_i$ – payment of a participant,

Table 1. Statistics of the Kickstarter performance for 2012

| Project category | Launched projects, units | Successfully completed, units | **Raised funds , dollars** | Raised funds on average, dollars | Number of participants |
|---|---|---|---|---|---|
| Games | 2 796 | 911 | **83 144 565** | 91 267 | 1 378 143 |
| Film and Video | 9 600 | 3 891 | **57 951 876** | 14 894 | 647 361 |
| Design | 1 882 | 759 | **50 124 041** | 66 040 | 536 469 |
| Music | 9 086 | 5 067 | **34 953 600** | 6 898 | 522 441 |
| Technology | 831 | 312 | **29 003 932** | 92 961 | 270 912 |
| Publishing | 5 634 | 1 666 | **15 311 251** | 9 190 | 262 738 |
| Food | 1 828 | 688 | **11 117 486** | 16 159 | 138 204 |
| Art | 3 783 | 1 837 | **10 477 939** | 5 704 | 155 782 |
| Comics | 1 170 | 542 | **9 242 233** | 17 052 | 177 070 |
| Theatre | 1 787 | 1 194 | **7 084 968** | 5 934 | 95 225 |
| Fashion | 1 659 | 434 | **6 317 799** | 14 557 | 83 067 |
| Photography | 1 197 | 427 | **3 283 635** | 7 690 | 46 550 |
| Dance | 512 | 381 | **1 773 304** | 4 654 | 23 807 |
| Total | 41 765 | 18 109 | **319 786 629** | 17 659 | 4 337 769 |

*n* – number of participants. Note that the word 'pledges' was originally used instead of 'participants', and understood in the context as 'people who have assumed the obligation[1] to carry a certain amount to the account of the project' (for brevity, defined as participants in the table).

Let us consider some of the values. The total amount of funds collected in 2012 is 319.786.629 US dollars or 10.66 billion rubles (at the exchange rate of 1 US dollar per 30 rubles). Certainly, the parity of these amounts is quite relative, nevertheless let us make some comparisons: the subsidies for the development of national cinematography in 2013 are expected to make up 5.34 billion rubles [3]; the volume of Vologda budget revenues in 2013 is predicted at 6.7 billion rubles [1]. Thus, the funds collected on Kickstarter are rather substantial for a regional and, in some cases, federal budget.

The distinctive feature of the raised funds is that 1) they are invested by individuals, 2) it is the funds of target financing. If the initiator asks for money, for example, to shoot a film, he/she gets money for the film. Contrary to 5.34 billion rubles, planned 'on the development of national cinematography', all funds collected on Kickstarter, are allocated to certain people (initiators) for certain projects.

There are all reasons to believe that such target-oriented financing scheme is more effective from the viewpoint of funds distribution: it is faster, more transparent, less likely to be hampered by bureaucratic hurdles and corruption costs. In fact, the crowdfunding scheme assumes direct popular voting for this or that project, the vote in which is the sum allocated. In this case the competition exists between the projects, as well as jostling for funding. As a result, the most popular and well-grounded projects win.

The dropout of potentially strong projects with weak marketing and advertising component is an obvious drawback of the scheme, i.e. the project might be useful and have all chances of success, but without proper coverage, good presentation its chances to get the funds needed are little.

Among other data Kickstarter specifies the total number of those, who participated in the work of the platform (2.241.475 people). The discrepancy with the table total value (4.337.769) is explained by the fact that many of these people have participated in several projects. Therefore, the number of unique participants most likely amounts to 2.241.475 people. The share of the initiators and donors among them is not specified.

Information on the participation of the same people in several projects:

- 570.672 people financed two or more projects;
- 50.047 people financed ten or more projects;
- 452 people financed a hundred or more projects.

The total number of countries, the residents of which participated in Kickstarter activities amounts to 177, share structure of participants by countries is not represented.

Let us consider the processed information in *table 2*.

In the context the categories are ranked with regard to the number of launched projects. Success rate = (Successfully completed / Launched projects) ·100.

As one can see, film and video projects were the most popular among the initiators, music and publishing were next most important categories. Films, video and music imply respectively filming, video and music recording. Publishing is understood here as the production of graphic and printed products. In spite of most of the funds being raised for the projects, associated with the development of computer games, (table 1, row 'Games'), they take only the 5th place by the number of launched

[1] Kickstarter has a deferred scheme of funding. The actual payment is effected only after the project has been successfully completed (this peculiarity will be discussed further on in more detail).

Table 2. Number of launched and successfully completed projects

| Project category | **Launched projects, units** | Successfully completed projects, units | Success rate, % |
|---|---|---|---|
| Film and Video | **9 600** | 3 891 | 41 |
| Music | **9 086** | 5 067 | 56 |
| Publishing | **5 634** | 1 666 | 30 |
| Art | **3 783** | 1 837 | 49 |
| Games | **2 796** | 911 | 33 |
| Design | **1 882** | 759 | 40 |
| Food | **1 828** | 688 | 38 |
| Theatre | **1 787** | 1 194 | 67 |
| Fashion | **1 659** | 434 | 26 |
| Photography | **1 197** | 427 | 36 |
| Comics | **1 170** | 542 | 46 |
| Technology | **831** | 312 | 38 |
| Dance | **512** | 381 | 74 |

projects. This is explained by the fact that the development of games requires larger seed funding. The team of highly qualified specialists is needed, including programmers, artists, designers, writers, the project manager, etc. Even if larger part of such experts is engaged only after the funding has been obtained, at the initial stage, it is still necessary to have a team of like-minded enthusiasts, who can prepare the demonstration part of the game for presentation. Thus, less popularity of game projects among the initiators is conditioned by higher entry price of the game projects.

Less popularity of other categories, according to the authors, is explained by a combination of factors, one of which, as have been already mentioned, is high barrier of entry, while others can be the following:

- other funding schemes, which allow attracting more or easier funds, as compared with crowdfunding;
- low demand for the company's projects according by the categories;
- crowdfunding financing scheme not corresponding to such projects.

Of special interest is the indicator of 'success rate', which is the ratio of the number of completed (funded) projects to the number of launched projects. Ranking by this indicator results in a rather different pattern *(tab. 3)*.

The analysis of the popularity of the projects, submitted to Kickstarter from the donors' viewpoint is presented in *table 4*.

The projects on the development of computer games are the absolute leaders.

Let us enumerate some peculiarities of Kickstarter platform, exerting a significant impact on its operation.

**1. 'All or nothing' principle.** As have been already mentioned, the project financing is carried out only if the funding goal has been achieved, partial financing is not provided. Even if 99% of the set amount has been received, the project gets no financing. Obviously, this stimulates the initiators to refinance the project themselves.

In general, the statistics is the following [8]:

- Of the projects that have reached 20% of their funding goal, 82% were successfully funded.
- Of the projects that have reached 60% of their funding goal, 98% were successfully funded.
- To date, 44% of projects have reached their funding goals.

**2. Payment system 'Amazon Payments'.** One of the most important conditions for effective functioning of a crowdfunding project is that the contribution of funds should be simple and convenient for donors. Amazon

Table 3. Statistics of the success of launched projects

| Project category | Launched projects, units | Successfully completed, units | **Success rate, %** |
|---|---|---|---|
| Dance | 512 | 381 | **74** |
| Theatre | 1 787 | 1 194 | **67** |
| Music | 9 086 | 5 067 | **56** |
| Art | 3 783 | 1 837 | **49** |
| Comics | 1 170 | 542 | **46** |
| Film and Video | 9 600 | 3 891 | **41** |
| Design | 1 882 | 759 | **40** |
| Food | 1 828 | 688 | **38** |
| Technology | 831 | 312 | **38** |
| Photography | 1 197 | 427 | **36** |
| Games | 2 796 | 911 | **33** |
| Publishing | 5 634 | 1 666 | **30** |
| Fashion | 1 659 | 434 | **26** |

Table 4. The number of people, engaged in financing per one project on average

| Project category | Launched projects, units | The number of people, who provided financing | **Number of people, engaged in financing per one project on average** |
|---|---|---|---|
| Games | 2 796 | 1 378 143 | **493** |
| Technology | 831 | 270 912 | **326** |
| Design | 1 882 | 536 469 | **285** |
| Comics | 1 170 | 177 070 | **151** |
| Food | 1 828 | 138 204 | **76** |
| Film and Video | 9 600 | 647 361 | **67** |
| Music | 9 086 | 522 441 | **57** |
| Theatre | 1 787 | 95 225 | **53** |
| Fashion | 1 659 | 83 067 | **50** |
| Publishing | 5 634 | 262 738 | **47** |
| Dance | 512 | 23 807 | **46** |
| Art | 3 783 | 155 782 | **41** |
| Photography | 1 197 | 46 550 | **39** |

Payments provides such an ease. Although it is not widely known in the post-Soviet space, it is quite popular in Western countries (primarily in the US, the UK, and a number of countries in Western Europe).

The possibility of deffered payments is a distinctive feature of the system. Under Kickstarter terms the donor transfers the funds to the account of the project, he/she likes. The money transfer is counted towards the project, therefore, bringing it closer to the goal (funding goal). The money is not transferred immediately, however: the funds are 'frozen' on the donator's account. In case the project goal is not achieved (i.e. the set amount has not been collected) the funds simply remain on the account, becoming fully available for further use.

Amazon Payments charges 3–5%, Kickstarter takes an additional 5% of the funds raised, which forms the company's profit. It is easy to calculate that in 2012 the company received 15.989.331 US dollars, having collected 319.786.629 US dollars.

**3. Pre-moderation.** The projects submitted to Kickstarter are pre-checked, after being approved by the company's employees, the project becomes available for donors.

Launched projects are to meet the following requirements [9]:

- Kickstarter cannot be used to raise money for charities or scoolarships;
- Kickstarter cannot be used to sell equity or solicit loans;
- Kickstarter cannot be used to fund e-commerce, social networking websites or apps;
- Kickstarter cannot be used to buy real estate;
- projects can not offer financial or medical advice;
- projects cannot offer alcohol as a reward;
- no projects endorsing or opposing a political candidate are allowed;
- no offensive material (hate speech, etc.); pornographic material is allowed;
- projects cannot offer tobacco, drugs; beauty products; eyewear (sunglasses, prescription glasses, and others); firearms, knives; personal care and medical products.

Creating projects is currently open to US and UK creators over the age of 18. Businesses, nonprofits, and other organizations can also use Kickstarter to fund their creative projects [9].

**Conclusion**

By the example of Kickstarter platform, it may be concluded that crowdfunding is a promising social technology that has a significant potential in terms of the stimulation of private business activities and the development of innovative projects.

At the same time, the Russian experience [4] leaves much to be desired. As of today, examples of successful funding under the crowdfunding scheme in Russia are the exception rather than the rule. Crowdfunding platforms existing in Russia are greatly exceeded on the number of the submitted projects and the volume of financing to Kickstarter due to objective reasons: technology novelty, lack of simple and convenient financial mechanisms, lack of legislative framework, financial and information and technological incompetence of society, low level of the Internet integration, etc. Relatively recent negative experience of large-scale financial fraud (MMM and others) should be also taken into account.

Thus, it is yet early to speak about crowdfunding as a ready to use social technology with regard to today's realities of Russia. Nevertheless, it is entirely possible to study foreign experience and use crowdfunding for the financing of certain pilot projects.

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# Distance learning for gifted schoolchildren: problems and prospects

*The article dwells on the problems concerning the formation of a regional system of distance education for gifted schoolchildren. It presents the experience in distance learning of the gifted schoolchildren of the Vologda Oblast at the Centre for distance education of the Vologda Multi-Discipline Lyceum. The most promising directions of the e-learning development are considered.*

*Distance education, e-earning, gifted schoolchildren.*

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At present, the issue concerning the system work with gifted children is addressed at the state level due to the changes in the country's socio-economic development. Economic modernization considerably increases the significance of intellectual and creative potential, hence, the problem of selecting and supporting talented youth becomes a priority in modern education [9].

In this regard, the organization of a system for searching, supporting and guiding talented children is necessary. Schools of advanced educational level with developed system of competitions and Olympiads, scientific conferences, supplementary and distance education, are established. The creation of such specialized schools for gifted children in regions requires tangible financial costs due to the relatively small number of students, as well as logistical and staffing difficulties.

Thus, only a few number of schoolchildren is involved in the learning process, whereas the need to acquire new knowledge is very important for a wide group of students. The creation and development of the regional system of distance education (DE) for schoolchildren is one of the solutions to this problem. Providing schoolchildren with equal opportunities

for in-depth education regardless of social conditions, may become a critical component of both the activities of educational institutions and the development of Russian education system in general.

Various definitions of "distance education" and "distance learning" are given in [2, 8], technologies and model of distance education are considered in [3, 5]. In this paper distance education (e-learning) is understood as the system, in which educational forms are implemented on the basis of traditional, new information and telecommunication technologies, creating the conditions for students' free choice of academic disciplines, and the learning process does not depend on the student's location in time and space [1, p. 6].

Distance model is especially effective for training and developing gifted schoolchildren with high level of motivation to learn, cognitive activities and intellectual abilities. More than forty years of experience of distance physical and mathematical schools indicate their significant influence on the training of future scientific personnel and form a research style of thinking. The use of distance learning system, when working with gifted children in the context of the region allows providing a brand new level of learning and development that is achieved through forming an appropriate information and education environment, the characteristic features of which are: the possibility of target audience accumulation, the realisation of personality-centered education principle, the consideration of schoolchildren's needs and interests, the development of creative activities in schoolchildren; learner-centered character of education combined with cognitive independence of schholchildren [4].

According to the authors, the most efficient component of working with gifted children is the establishment of a regional Centre for training gifted children with the purpose of integrating full-time, supplementary and distance education. The Centre can be assigned the following functions: interaction with the structures, involved in the organization of gifted children's training at the local level (in the Vologda Oblast districts); development of educational programmes for gifted schoolchildren; coordination of the Olympiad movement and research activities; distance assistance in the process of training gifted children; training workshops for teachers and management education specialists; the development of distance educational resources, etc.

At present, distance learning programmes for gifted schoolchildren are quite obscure in Russia and are implemented at the regional level, primarily on the basis of experimental platforms at universities or centres for gifted children's training.

The authors assume that the experience of foreign countries, particularly the USA with its system of distance education being one of the most developed in the world, can be used in such situation. The centres for talent development, implementing distance learning programmes as well, have been established in many universities of the country. For example, the education programme for gifted youth (EPGY) has been operating at Stanford University since 1992, comprising multimedia courses in Mathematics, Physics, Computer Science. The distance programme LearningLinks has been operating at the Centre for Talent Development at the Northwestern University, USA for over 20 years. Several thousands of gifted students of 6th–12th grades took part in the Programme that comprises many e-learning courses, including a course for excellent students (Honours level), and advanced programmes (Advanced Placement) [6].

Let us consider the experience of distance learning in the Vologda Oblast. The Centre for distance education (CDE) at the Vologda Multi-

Discipline Lyceum (VML) carries out training in the majority of subjects since 1994 [7].

The main CDE objectives are the following:

– to detect gifted schoolchildren in Mathematical and Natural Sciences, Humanities and to create conditions for improving their intellectual abilities;

– to assist schoolchildren in deeper and more advanced study of various academic disciplines and in the preparation for the Unified state examination;

– to use modern information technologies for providing students with opportunities for further education.

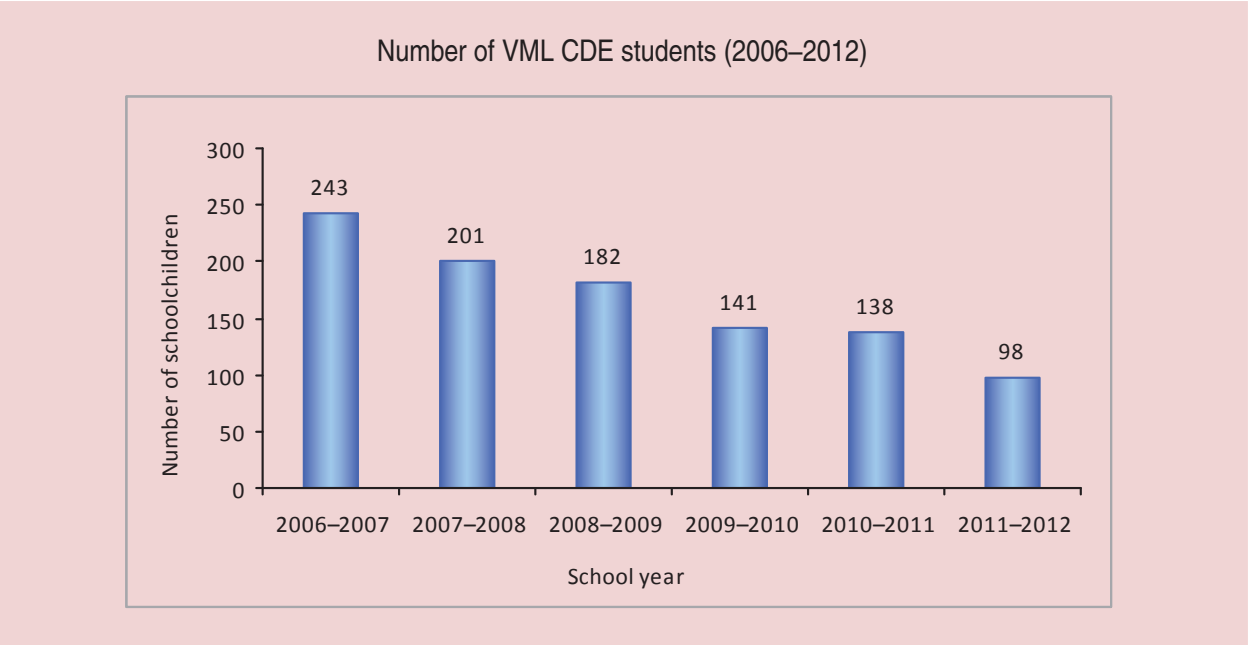
The VML CDE activities are developed in the following directions: implementation of distance education (forms 5-11 of the Vologda Oblast schools), organization of e-Olympiads, open Olympiads for students of 4th-8th forms of the Vologda Oblast schools).

**Distance learning.** At present, network and case-technologies of distance learning are used in the Lyceum, with a gradual transition from the case-technologies to networking technology by "Student-Internet-Teacher" model. For this purpose the freely distributed system of distance education "Moodle" was put on the Lyceum's web-site. This software product is constructed in compliance with the standards of information education systems. Due to the wide range of resources and interactive elements, the system allows creating wide variety of courses and implementing an interactive communication mechanism.

This model is especially effective for supplementary schoolchildren education, as it is aimed at the in-depth study of any subject or topic, pre-entry training, participation in competitions of different levels, etc.

CDE teachers have created methodological manuals, not duplicating the school curriculum and designed for advanced and in-depth study of subjects: for example, Dirichlet principle (Mathematics, 5th form); discrete continuity (Mathematics, 7th form); the application of the mass center and inertia moment concept to the solution of geometrical problems (Mathematics, 5th form); problem-solving on kinematic relations (Physics, 9th form), etc.

About 1000 students from almost all districts of the oblast have been trained in VML CDE for the past six years, 14 of the students were admitted to the Lyceum for full-time studies *(figure)*.



Overall decrease in the number of students was caused by the decline in the number of high school students (9th, 10th, 11th forms) mainly because of the fact that the methodological developments for senior forms, compiled on the basis of programmes for in-depth study of Mathematics, Physics and Chemistry, contain a large number of materials and activities of Olympiad level that are very difficult for students. Moreover, as a result of greater Internet access, schoolchildren of the oblast districts are now able to find educational materials independently. In order to increase the number of CDE, it is necessary to review the level of control tasks in methodological developments on the subjects and to simplify them, to elaborate methodological manuals, covering more thoroughly the tasks of the Unified state examination and of the State final attestation levels. More attention should be paid to e-courses with the use of web technologies.

**E-Olympiads.** The Centre for distance education annually conducts distance Olympiads that are aimed at finding students interested in studying particular disciplines, and preparing students to city and district Olympiads. The texts of Olympiads are placed every September on the Lyceum's web-site (http://www.vml-vologda.ru/).

It should be noted that the interest of the Vologda Oblast high school students in participating in the Olympiad has somewhat decreased, while the number of works from other Russian regions *(tab. 1)* has increased. 1151 schoolchildren from 26 Russian regions and the Republic of Belarus took part in the XI e-Olympiad. The largest number works was submitted by schoolchildren of the Vologda Oblast, the Republic of Belarus, the Chuvash Republic, and the Samara Oblast *(tab. 2)*.

Schoolchildren from 19 districts of the oblast took part in VML e-Olympiad; the best performance results is observed in Totemsky, Gryazovetsky, Sokolsky districts and in Cherepovets *(tab. 3)*.

Table 1. Main indicators of VML distance Olympiad (2007–2012)

| Indicator | 2008/09 school year | 2009/10 school year | 2010/11 school year | 2011/12 school year | 2012/13 school year |
|---|---|---|---|---|---|
| Number of subjects | 9 | 11 | 12 | 10 | 10 |
| Number of participants, people | 590 | 923 | 1170 | 1232 | 1151 |
| Number of RF regions, represented by participants | 16 | 20 | 45 | 20 | 26 |
| Number of participants from RF regions, people | 160 | 196 | 571 | 501 | 534 |
| Number of participants from Russian regions,% from total number | 27 | 21 | 48 | 40 | 46 |

Table 2. Regions of the Russian Federation and CIS countries with the largest number of VML e-Olympiad participants in 2012/2013 school year

| Region | Number of participants | % from total number of participants |
|---|---|---|
| Vologda Oblast | 617 | 53.6 |
| Republic of Belarus | 70 | 6.1 |
| Chuvash Republic | 67 | 5.8 |
| Samara Oblast | 56 | 4.9 |
| Moscow Oblast | 40 | 3.5 |
| Irkutsk Oblast | 37 | 3.2 |
| Republic of Tatarstan | 37 | 3.2 |
| Saint Petersburg | 35 | 3.0 |
| Rostov Oblast | 32 | 2.8 |

Table 3. Vologda Oblast municipal districts with the largest number of VML e-Olympiad participants in 2012/2013 school year

| Municipal districts and cities of oblast subordination | Number of participants | % from total number of participants |
|---|---|---|
| Totemsky District | 118 | 19.1 |
| Gryazovetsky District | 103 | 16.7 |
| Cherepovets | 87 | 14.1 |
| Sokolsky District | 74 | 11.8 |
| Vologda | 49 | 7.9 |
| Sheksninsky District | 40 | 6.5 |
| Chagodoshchensky District | 27 | 4.4 |
| Vologodsky District | 20 | 3.2 |
| Nyuksensky District | 18 | 2.9 |
| Kaduysky District | 17 | 2.8 |
| Vozhegodsky District | 14 | 2.2 |
| Velikoustyugsky District | 14 | 2.2 |
| Babushkinsky District | 12 | 1.9 |

As VML e-Olympiad has become traditional, the authors consider it expedient to introduce it in the event list of the Vologda Oblast Department of Education.

The development problems of VML Centre for distance education are the following:

- material and technical: lack of resources (server, computers for teachers, web-cameras, high-speed Internet) for online classes and e-courses; low-speed Internet in some areas;
- personnel: insufficient competence of teachers in the field of information technologies and distance education;
- scientific and methodological: insufficient development of approaches to the formation of education resources for distance education for the gifted schoolchildren based on personality-oriented approach, depending on the individual educational needs of a schoolchild;
- economic: lack of funds to pay teachers for the course development on the basis of distance education programmes.

The analysis of foreign and national experience reveals common problems in implementing distance education of gifted schoolchildren in school practice [5, 6, 11, 12]:

- lack of fundamental and large-scale practical research in distance education theory and practice in the system of general education;
- lack of efficient methods of distance education of gifted schoolchildren;
- low level of teachers' commitment to realise the process of distance education or to use information technologies;
- poorly developed quality control facilities and systems of distance education;
- insufficient financial support to the development of the given direction.

According to the authors, the most promising and rapidly developing online learning technologies are crowdsourcing, video lectures and webinars.

Crowdsourcing, which is a popular socially oriented technologies development trend at present, implies the involvement in problem-solving of many people on the basis of their voluntary and frequently gratuitous participation [10, P. 158]. Internet forums and communities in social networks are the most popular for training to the USE and Olympiads.

For example, more than 40 thousands of various training modules from lesson plans to interactive tests are collected on the website *Curriki.org*, and some *vkontakte* social network groups comprise hundreds of thousands of participants. All materials are freely distributed and are available to anyone.

Growing popularity of online education is another significant factor of virtual learning. High-speed Internet has become really widespread over the last decade, information development and transfer have sharply fallen in price, the number of mobile devices has rapidly increased, making the widespread use of web-technologies possible.

The Khan Academy is one of the most famous innovation projects in online education. More than three thousand lessons in various subjects (hosted via YouTube) are available through Khan Academy and have been viewed over 200 million times. Interaction tests, statistical instruments and instruments for observing schoolchildren performance, including teachers' extended functionality, have been actively developing. Note, that the project is non-commercial and has been operating under the crowdfunding scheme, sponsored among others by Bill Gates, Netflix CEO Reed Hastings, Google, etc.

Considering modern trends of distance education in Russia and abroad, the authors suggest basic directions of the process implementation for VML CDE as a regional center for distance education of gifted students:

- to develop courses for students of 5th–8th forms based on the existing methodological manuals on the ground of distance learning Moodle shell;
- to organise and to hold real-time online Olympiad;
- to establish forum on the CDE website for discussing issues, related to organising and conducting various Olympiads;
- to organise work with schoolchildren, who are participants of the oblast Olympiads or winners of district and city Olympiads in terms of training to the next Olympiad stages (including webinars, online consultations);
- to initiate the development and the implementation of elective courses (including the use of video lessons) for schoolchildren of 9th–11th forms in the profile distance learning programme.

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The article should generally include the following aspects: the purpose of research; method and methodology of work, its results and the field of their application; conclusions. The findings may be accompanied by recommendations, suggestions and hypotheses, resulting from the contents of the article. When presenting the results of sociological research in the article, it is necessary to state the following information: methods and methodology; the date, place (territory) and organization which carried out the study; the structure of total population; the type, volume and sampling error; the description of methods of data collection and analysis. This information should be arranged according to one of the following options: in the special section (paragraph) of the article; directly in the text; in the footnote. When creating tables, it is necessary to specify, whether the percentage of persons is calculated out of the number of those who answered the question, or out of the total amount of respondents. References should demonstrate the author's professional outlook and the quality of the research.

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