Improved Techniques for Estimating Living Standards of the Population: A Case Study of the Siberian Federal District

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Abstract
The purpose of this paper is to study the population's standard of living and to improve the methods of its measurement. Mathematical and statistical analysis methods were used to process the results. The study of the standard of living and the introduction of new approaches to its measurement is an important prerequisite for obtaining complete, accurate and relevant information necessary for the regional public authorities to analyze the real social and economic processes, to monitor the implementation of the active social policy, and to design public programs of social and economic development. The proposed model of subjective indicators is based on the assertion that the real sense of the standard of living is reflected in subjective feelings of individuals, which are based on the level of their intellectual development, life experience, emotional state, etc. Thus, the authors prove that the measurement of living standards should take into account both objective and subjective indicators, one of which is the human development index.

Keywords: economic development, standard of living, standard of living indicator, human development index, income

INTRODUCTION
One of the main directions of the analysis of social and economic development is the study of living standards. Advancing human welfare and improving living conditions for the various segments of the population are among the most important long-term priorities of the social and economic development of the country.

The term "standard of living" is multifaceted and it refers to the level of wealth and financial possibilities of the population. Quantitative characterization of these social sides of society's life through socio-economic indicators is the subject of the study of social development and living standards statistics [1, 2, 3, 4, 5].

Infrastructure is an integral part of the market, therefore, the analysis of its essence is necessary for the formation, sustainable development and functioning of market mechanisms and for the optimization of various laws of the market, providing the goods movement process, satisfying the needs of the population and regulating the social sphere of society.

The transition to a market economy is not yet finished, and it order to complete this process and to come to a stable and regulated market it is necessary to study the existing market institutions, to identify their strengths and weaknesses, and to develop recommendations to improve their functioning.

The aim of this study is to measure the standard of living of the population of Krasnoyarsk Krai. To do this, the following objectives have been pursued: to develop a methodology for calculating the human development index and to determine the human development index of Krasnoyarsk Krai.

The study of the essence of a market infrastructure is the foundation of the effective device of the region's economy.

One of the most common methods of measuring the quality of life is the human capital index developed by the United Nations Development Program. This indicator is far ahead of such approaches to the measurement of the quality of life as: Human Development Index (HDI), Gross National Happiness, Happy Planet Index (HPI), Quality-of-life, Physical quality-of-life index, Quality of Living, Life satisfaction, Genuine Progress Indicator (GPI), Vanderford-Rley-well-being schedule [6, 7, 8].

The proposed method of the measurement of the human development index was elaborated by doctor of economic sciences, professor Y. Y. Suslova. Its peculiarity is that the human development index allows to analyze the received information at the international level and to compare different regions of the world under a single methodology. HDI is relatively easy to calculate and at the same time it characterizes the standard of living within structural assumptions. Research in this area started in 2005 and included a number of articles and monographs [9, 10, 11].

The disadvantage of the HDI is that the average values for the country may conceal large disparities. The best solution would be to build separate HDIs for the most significant groups: for example, by sex, income group or by geographical region. Disaggregated HDIs can reveal a more detailed picture of human deprivation in each region.

The question of infrastructure, namely infrastructure outsourcing, is also studied by L. V. Ivanova. Its use could allow many companies to achieve very high efficiency, reduce their costs and maintain high profitability in today's difficult economic period [12].

The current social and economic situation in the country makes it necessary to improve the technology of the implementation of social policy, and to provide the appropriate infrastructure for the institutions of the economy, in particular. Unfortunately, at present, the methodological framework for infrastructure development is not perfect. Regional standards and indicators of the development of the service sector are not calculated to the full extent and in their entirety which deprives regional planning of the objective criteria that could contribute to its activities [13].

MATERIALS AND METHODS

The theoretical partof this study used a number of works of Russian and foreign economists: Agnes Claus, Iori Sato, Akiko Higuchi, Takaaki Yanagisawa, AkitakeMukasa, Kohmei Ida, Yutaka Sawamura, Kazuhiko Sugiyama, Nobuhito Saito, Toshihiro Kumabe, MizuhikoTerasaki, Ryo Nishikawa, Yasushi Ishida, Kiyoko Kamibeppu, A. G. Aganbegian, Y. L. Alexandrov, S. D. Amirov, A. R. Bernwald, I. K. Bielawski, A. G. Granberg, Y. Zharavin. The research is also based on the legislation of the Russian Federation; recent data of the Russian Federal State Statistics Service, including that on Krasnoyarsk Krai; official instructional and teaching materials; publications of periodicals and reports on the results of scientific and practical conferences; results of the author's own research.

The methodical basis of the study was a combination of different methods of analysis and synthesis, grouping and comparison, and economic-statistical, expert and regulatory methods.

Using the example of the capital cities of the Siberian Federal District (SFD), the research presentsa complex characteristic of the factors that shape the development of market infrastructure in modern conditions. Regions and cities act as relatively independent integrated systems, but at the same time they are subsystems of the economy, performing the functions assigned to them in the social division of labor.

The SFD is one of the most sparsely populated regions of Russia. The average population density is four persons per square kilometer. The share of urban population is 71%, which is slightly below the national average. The ethnic composition of Siberia is diverse: besides the Russians and Ukrainians, who comprise the majority of the population, such titular ethnic groups as the Tuvans, Evenks, Dolgans, Buryats and others live on the territories of the Tuva, Buryatia, Khakassia republics and autonomous regions. The total number of inhabitants of three cities – Krasnoyarsk, Novosibirsk and Omsk –is over 1 million. Therefore, calculations were carried out on the example of the Siberian Federal District [14, 15, 16].

The following regions of the Siberian Federal District were taken for the research: the Republic of Altai, Buryatia, Tuva, Khakassia, Altai Krai, Zabaykalsky Krai, Krasnoyarsk Krai, Irkutsk region, Kemerovo region, Novosibirsk region, Omsk region, and Tomsk region.

The analysis was conducted on the basis of statistical data that have been taken from Krasnoyarsk Regional Statistical Yearbook [17] and Russia in Figures [18].

To calculate the human development index the authors used such indicators as life expectancy, the level of education and the level of per capita income.

The following methods were used in the measurement of the human development index: the ranking of regions in terms of the level of social infrastructure development; Bennett's integrated assessment of infrastructure development; an integrated assessment of the market infrastructure with regard to the weighting factors; an integrated indicator of the adaptive type; the Engel coefficient; an assessment of infrastructural maintenance of the territories on the basis of the Uspensky coefficient.

The human development index (HDI) is a composite index measuring the standard of living and welfare of the population by such indicators as life expectancy, the level of education and the level of per capita income [19].

In general, the human development index is calculated as a simple average of the three indices [19]:

$$HDI = \frac{J_{x1} + J_{x2} + J_{x3}}{3}$$

where J_{x1} -income index; J_{x2} –education index; J_{x3} -life expectancy index.

Income index(J_{x1})is calculated by the formula [19]:

$$J_{x1} = \frac{\ln x - \ln x_{min}}{\ln \overline{x} - \ln x_{min}}$$

where x is the real GDP (at purchasing power parity (PPP) per capita, expressed in terms of the actual value, US dollars; x_{min} is the minimum value of GDP (PPP) per capita, 100 US dollars; $\overline{x}$is the global average level of GDP (PPP) per capita, 40, 000 US dollars.

Education index (J_{x2}) covers the sub-indices: adult literacy index and gross enrollment index and is calculated by the following formula [19]:

$$J_{x2} = \frac{2 \times I_{ALI} + I_{GEI}}{3}$$

where I_{ALI} is the adult literacy index; I_{GEI} is the gross enrollment index.

Adult literacy index is measured as follows [19]:

$$I_{ALI} = \frac{L_{ALR} - L_{ALR\,min}}{L_{ALR\,max} - L_{ALR\,min}}$$

where L_{ALR} is the actual level of literacy of the population, defined by the ratio of the number of literates aged 15 years and over per 1, 000 people; L_{ALRmin} is the minimum level of literacy of the population, equal to 0. 0%; L_{ALRmax} is the maximum level of literacy of the population, equal to 100. 0%.

Gross enrollment index, an index covering the number of students enrolled in educational institutions of the I, II, III levels of education (general, primary, secondary, higher, vocational education) [19] is calculated as follows:

$$I_{GEI} = \frac{L_E - L_{Emin}}{L_{Emax} - L_{Emin}}$$

where L_E is the actual number of students enrolled in educational institutions (I, II and III levels) to the population aged 6-23 years, %;

L_{Emin} is the minimum number of students enrolled in educational institutions (I, II and III levels) to the population aged 6-23 years, 0%;

L_{Emax} is the maximum number of students enrolled in educational institutions (I, II and III levels) to the population aged 6-23 years, 100%.

Life expectancy index (J_{x3}) is calculated according to the formula [19]:

$$J_{x3} = \frac{x_i - x_{min}}{x_{max} - x_{min}}$$

where x_i is life expectancy at birth, years; x_{min} is the minimum value of life expectancy at birth, equal to 25 years; x_{max} is the maximum value of life expectancy at birth, equal to 85 years.

The standard of living of the population of Krasnoyarsk Krai was considered according to the objective assessment based on official statistics. It was proved that in the period of 2011-

2015, the basic social indicators of living standards in Krasnoyarsk Krai were improved.

The present research also analyzed the subjective assessment of the standard of living based on the perception by the population of Krasnoyarsk Krai of the economic situation in the country and personal financial situation [20, 21].

A sample survey of consumer expectations held by the state statistics bodies can serve as an example of the implementation of the subjective approach. A household survey allows to generate data on consumer sentiment and expectations of the population. Evaluating the economic prospects (of the country or one's own), people both absorb the external information and rely on their own experience and feelings related to changes in income, prices, conditions of employment [22, 23].

An analysis of the growth of prices for goods and services during the year shows that 100% of the surveyed in the IV quarter of 2015 suggest that the prices for goods and services will increase throughout the year (compared to 97. 1%-in the IV quarter of 2014).

The IV quarter of 2015 saw an increase in the number of respondents who have started to invest their savings primarily in education (including that of children) (12. 5% in the IV quarter of 2015 against 9. 4% in the IV quarter of 2014); in construction and repair (11. 4%-in the IV quarter of 2015, 10. 9%-in the IV quarter of 2014); in help for their relatives and friends, taking into account the contribution to the estate (9. 5%-in the IV quarter of 2015, 7. 4%-in the IV quarter of 2014) [19, 24].

An analysis of the subjective assessment of living standards shows that it does not always coincide with the official one. The model of subjective indicators is based on the assertion that the real sense of the standard of life is reflected in subjective feelings of individuals, which are based on the level of their intellectual development, life experience, emotional state, etc. [25, 26].

Results and Discussion

The evaluation of the standard of living must take into account both objective and subjective indicators, one of which is the human development index. Table 1 shows the value of the HDI by the subjects of the Siberian Federal District obtained using the adjusted GDP per capita as an indicator of the per capita income [19, 27, 28].

In the year 2015, 8 of the 12 subjects of the SFD were considered to be regions with a very high level of human development (HDI values were no less than 0. 800). The highest values of the HDI were observed in Krasnoyarsk Krai (0. 854), Tomsk region (0. 852), Omsk and Novosibirsk regions (0. 840 and 0. 830 respectively) [29].

In general, there was an increase in the HDI values in all regions of the SFD during the reporting period, due to the increased values of composite indicators of the index (Table 2). It should be noted that this is one of the main specificities of the HDI. According to international experience, the HDI values of the vast majority of the world regions from year to year show an increase and only in some countries in the most difficult economic situation, the index decreases. Despite the increased HDI values common to all regions of the SFD, its

growth rates in each region are different. In 2015, compared to2012, the most intensive growth rate was observed in Krasnoyarsk Krai (113. 3%). The lowest growth rate of the index was observed in the Novosibirsk and Tomsk regions (110. 8%) [30].

Table 1: Human development index by the subjects of the Siberian Federal District in the Russian Federation

Federal subjects of the Siberian Federal District (Russian Federation)	2012	2015
Altai Republic	0,695	0,777
Republic of Buryatia	0,717	0,796
Tuva Republic	0,665	0,750
Republic of Khakassia	0,730	0,814
Altai Krai	0,717	0,805
Zabaykalsky Krai	0,704	0,790
Krasnoyarsk Krai	0,754	0,854
Irkutsk region	0,732	0,822
Kemerovo region	0,737	0,825
Novosibirsk region	0,749	0,830
Omsk region	0,751	0,840
Tomsk region	0,769	0,852

Note. Compiled by the authors

Table 2: Growth rates of the HDI of the federal subjects of the Siberian Federal District in 2015 (per cent by 2012)

Federal subjects of the Siberian Federal District (Russian Federation)	2012	2015
Altai Republic	103,5	111,8
Republic of Buryatia	102,4	111,0
Tuva Republic	102,1	112,8
Republic of Khakassia	101,4	111,5
Altai Krai	101,6	112,3
Zabaykalsky Krai	101,6	112,2
Krasnoyarsk Krai	103,1	113,3
Irkutsk region	102,1	112,3
Kemerovo region	102,3	111,9
Novosibirsk region	102,1	110,8
Omsk region	102,0	111,9
Tomsk region	102,3	110,8
The average annual growth rate for the entire population of regions	102,2	111,9

Note. Compiled by the authors

According to international tendencies, the HDI growth in the regions with a relatively high index value (or in the regions ranking highest) means that there is potential for further growth. At the same time, the moderate growth of the HDI values in the regions with low index values (or in the regions ranking lowest) indicates that the population has difficulty in discovering their potential, or that their capabilities are constrained [31, 32, 33].

Throughout the reporting period, the HDI value for the SFD has not been changed in eight federal subjects: the Republic of Buryatia, Republic of Khakassia, Altai Krai, Zabaykalsky

Krai, Irkutsk region, Kemerovo region, Novosibirsk region, Omsk region (Table 3).

Table 3: Ranking of the federal subjects of the Siberian Federal District by the values of the HDI

Federal subjects of the Siberian Federal District (Russian Federation)	2012	2015	Rating changes in 2015 and 2012
Republic of Buryatia	9	9	0
Tuva Republic	12	11	1
Republic of Khakassia	7	7	0
Altai Krai	8	8	0
Zabaykalsky Krai	10	10	0
Krasnoyarsk Krai	2	1	1
Irkutsk region	6	6	0
Kemerovo region	5	5	0
Novosibirsk region	4	4	0
Omsk region	3	3	0
Tomsk region	1	2	-1

Note. Compiled by the authors

With regard to Krasnoyarsk Krai, this region took first place in the ranking of the HDI values, advanced by one position in comparison with the year 2012 [34, 35].

Such multidirectional influence of the values of the same indicators prove that the HDI characterizes the level of human development in terms of the optimal distribution of the tangible and intangible factors. For example, income may be used in various ways. On the one hand, higher income offers greater access to the factors that improve the life expectancy of the population, as well as the level of education. On the other hand, income may be directed to the consumption of goods and services, having a negative or at best neutral impact on these indicators.

CONCLUSION

This study suggested the method of calculating the human development index and its measuring on the example of Krasnoyarsk Krai. The research showed that the values in the dynamics of the HDI calculated using the basic indicators remained unchanged as compared to those in the dynamics of the HDI calculated on the basis of per capita income: all regions throughout the reporting period saw an increase in the index values. The changes affected the position of regions in the ranking by the HDI, as well as in the classification of the level of human development.

Thus, in the year 2015, 8 out of 12 subjects of the SFD were considered to be regions with a very high level of human development (HDI values were no less than 0. 800). The highest values of the HDI were observed in Krasnoyarsk Krai (0. 854), Tomsk region (0. 852), Omsk and Novosibirsk regions (0. 840 and 0. 830 respectively).

The analysis of the dynamics of the HDI showed that the majority of federal subjects of the Siberian Federal District, including Krasnoyarsk Krai, falls into the category of regions with a very high level of human development. HDI values increased in all regions during the reporting period, while its growth rate vary from region to region. The HDI value of the

resource-producing regions is mainly influenced by income indicators, and that of the regions that do not exploit their natural resources so actively – by the factors not related to income.

Nevertheless, the HDI is not universal. It cannot be regarded as a comprehensive index: the data obtained with the use of this index need to have a higher level of detail on the basis of additional official statistical information about the regions, their characteristics and problems. Despite the fact that the HDI sufficiently characterizes the welfare of the population within structural assumptions, these assumptions are its main limitation.

For example, the HDI in the Russian conditions does not give a complete picture of regional differences in the standard of living, since it ignores significant territorial, geographical, climatic and other differences. The research of the HDI is continuing to this day.

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