Methodology of determining the level of living

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Abstract: This article provides the methodology of determining the living standard of the population of a country. By using this methodology one can make a comparative analysis of the standard of living in the territorial scale, i.e., comparing the standards of living in different countries. A comparative analysis of the standard of living in a time interval can also be made, i.e., comparing the standards of living in different times. The methodology of determining the population living standard examines 110 component indices and the 14 derivative indices reached on the basis of indicators characterizing the comprehensive situation of the population. On this basis the generalizing index is determined by the index of the standard of living of the population. Furthermore, in the methodology composed of the values of the final index, the standard of living of the population is divided into the categories of rich, sustainable, poor, and pauper levels.

1. Introduction

The wealth of each country is formed by its indigenous population, e.g., its citizens. For instance, Article 1 of the Constitution of the Republic of Kazakhstan states: "The Republic of Kazakhstan proclaims itself a democratic, secular, legal and social state whose highest values are an individual, his life, rights and freedoms." [1]. In addition, according to Article 25 of the Universal Declaration of Human Rights of the UN General Assembly, everyone has the right to appropriate living standards, including the food, clothing, housing, medical care, and social services that is necessary for the health and well-being of the individual and his/her family, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other cases of loss of livelihood in circumstances beyond his control" [2]. Therefore the life of each citizen and the entire population is as important to the government as to the individual.

The main factor influencing the development of human personality is the life of the society in which the individual lives, his/her associates, and the person themself. The life of such a social entity depends on the living standard of the population, citizens, and social castes. In the case of a high level of living standard, the social entity will develop as well. Hence one of the national goals of each country is the

creation and development of the relevant factors for raising living standards.

Such scholars as A. Smith [3], W. Jevons [4], A. Pigou [5], D. J. Rawls [6], A. Sen [7] and others have dedicated works and publications to topics such as social welfare. The first attempts to measure the population living standard at the global level appeared in the middle of the last century appeared. A number of international organizations have investigated this area to date. In their research they use different methods aimed at determining the living standard conditions on the basis of integral indicators. Among such techniques the following can be highlighted:

1) *The index of human development potential* (HDP). This index was developed in 1990, led by Mahbub-ul-Haq in the framework of the United Nations Development Programme, in order to measure and compare living standards around the world. The HDP is calculated by the index of longevity, education index, index of national income, and human development index produced by socioeconomic inequalities [8].

2) *Assessment of life quality in the European Union.* The methodology for this assessment was developed by the European Foundation for the Improvement of Living and Working Conditions (Eurofound). Research has been conducted since 2003 using this methodology. This investigation considered

economic conditions, housing and environment matters, employment, education and competency, structure of the household and family relationships, the balance between work and private life, health and protection, and individual health—all measures of quality that determine life quality in European countries [9].

3) *The Happy Planet Index.* This index describes the well-being of people and the environment around the world. This method was presented by the British research center New Economics Foundation in 2006. In calculating the index, measures of people's subjective satisfaction with their lives, life expectancy, and the human impact on nature ("ecological footprint") were used. The main conclusion is the more important indices, the less resources the government spends on the welfare of its citizens [10].

4) *The Legatum Prosperity Index.* The methodology of this index assesses the progress of the world in terms of prosperity and development. It was used by the British research center The Legatum Institute in 2006. The purpose of the research was studying the social welfare and global development. The index is divided into eight categories and consists of seventy-nine indicators that describe different aspects of life and social welfare settings [11].

5) *Quality of Life Index, International Living magazine.* On the basis of this methodology from 2009 the magazine "International Living" assesed the quality of life around the world. The index includes nine subindices of the cost of living, culture and leisure, the economy, environment, the level of freedom, health care, infrastructure, risk and safety, and climate [12].

6) *Quality of Life Index, "The Economist" magazine.* This index was developed in 2005 by the Economist Intelligence Unit. It is based on a comparative determination of the results of subjective evaluation of the country and the objective determinants of life quality. The study used nine indicators, such as, health, family life, the public life, essential prosperity, political stability and safety, climate and geography, an employment guarantee, a political freedom and gender equality. The research results were published in "The Economist" magazine [13].

7) *Mercer's Quality of Living survey.* The international consulting company Mercer compared cities that are divided into groups based on life quality. The method of research is based on thirty-nine indicators divided into ten categories such as sociopolitical environment, economic indicators, the availability of any of the restrictions, the quality of health care areas, the quality of education, affordable housing, the cost of cultural life, climate and forecasts of natural disasters [14].

Despite the existence of many techniques of determining living standards, certain problems are left unsolved. The standard of living is a socioeconomic category that is defined by physiological, material, moral, social, and other factors of satisfaction. Hence its definition should cover the living conditions of the people as much as possible. To this end, in order to achieve a scientific result this research will develop and offer the technique of comprehensively describing people's living conditions and include different types of indicators. This will be carried out through the following:

- Group indicators describing the condition of the population by their nature;

- On the basis of these indicators indices will be created that assess the level of living of the population; these indices are then synthesized into the group indices;

- Conduct testing of the developed technique in temporal and territorial space.

Theoretical basis

The methodology analyzes the definition of the standard of living based on a particular generalizing index. As shown in Figure 1, this generalizing index (I_{LL}) is determined on the basis of derivative indices of living (I_n). Each derivative index consists of its component indices (I_{n-i}). The component indexes are calculated on the basis of the final evaluation – generalizing indicators (R). Generalizing indicators are defined on the basis of the main indicators of the standard of living (r). The main indicator is calculated on the basis of indicators that characterize the state of life of the population (d).
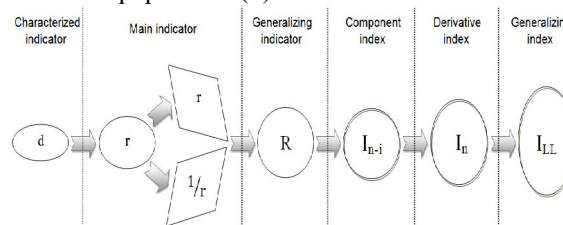
Figure 1. The sequence of definitions of indicators and indices of standard of living

Main indicators are divided into positive and negative, depending on the impact on living standards. The generalizing indicator is equal to the main indicator when the main indicator is positive. In the case of a negative main indicator, the generalizing indicator is calculated on the basis of the positive values of the main indicator. Positive values of the negative main indicator are defined as the ratio unit to a specific value of the main indicator.

Each component index is calculated by means of the generalizing indicator with regard to the object under study and of the large and small values defined in the research process. These very large and small values for the study of living standards should be defined at the global level on the basis of international practice.

As a boundary study it takes the subject under consideration and compares the set of all subjects.

The generalizing, derivatives, component index values range from zero to one $(0 < I_{LL} \leq 1)$ and are specified to the ten-thousandth fraction. The high value of the standard of living index (the index of any of the generalizing, derivative, component values) indicates a high level of life.

For research within each country the currency of the studied area is the currency of the country, but in cross-country research the currency of the studied area is the common currency, which takes into account the purchasing power parity of the national currencies of the studied countries.

In studies in the country, being held in a time warp is calculated by correcting the exact dimensions of levels of the inflation rate in the country, comparing the performance measures of value in different years.

In the research process within the country the main indicators of the country are replaced with basic indicators of regions.

Supplying people with land is considered to be collective orchards and vegetable gardens, plots (country houses), and plots of land by household.

Position indicator of political parties in parliament (W_{PP}) is defined on the basis of the data given in Table 1. Up to 5 parties that have the greatest number of allowances in the parliament ($A \geq B \geq C \geq D \geq I$) are placed in descending order in Table 1. If the number of such parties is less than five, then 0 is entered.

Table 1. Determining the position indicator of political parties in the parliament

Equity ratios	5	4	3	2	1
Share of the parties in parliament, %	A	B	C	D	I
Position of political parties in parliament	$W_{PP} = 5 \times A + 4 \times B + 3 \times C + 2 \times D + 1 \times I$				

Duration period indicator of the main authorities of the country is defined by Formula 1.

$$D_P = \left| 1 - \frac{D_{cp}}{5} \right| \qquad (1)$$

where, D_p = duration period of power and
D_{cp} = total rate of the ruling period of the person ruling the country.

2. Results

The final evaluating indicator of the living standard of the population – the *living level index* (I_{LL}) – is defined by the geometric value of the derived indices of living standards, as shown in Table 2. Fourteen such derivative indices are utilized.

1. *Index of income level* (I_{LI}). This is divided into four component indices based on GDP per capita, GNI per capita, cash income of households, and income inequality indicators that describe income and participation of the population in national production.

2. *Index of consumption level* (I_{LCt}). This is divided into eight component indices based on indicators that describe the state of the basic consumer expenses of the population, such as provisions, nonfood products, use of paid services and general consumer expenses, cost of living and basket of goods, as well as the debts of individuals per capita cost of daily food consumption per person.

3. *Index of savings level* (I_{LS}). This is divided into three component indices based on indicators that describe the savings of individuals per capita and the national savings (public savings fund), and the ratio of money income to household savings.

4. *Index of level of property supply* (I_{LP}). This is divided into five component indices based on indicators that describe property that ensures the well-being of the indigenous population, such as providing them with land for their household, housing, private cars, and general security through real estate, as well as indicators describing the household income of the property.

5. *Index of level of accessibility of education* (I_{LE}). This is divided into nine component indices based on indicators that describe the state of the population's access to education, such as preschool education, secondary education, the average expense of the state for one person in these stages, private and government expense per capita, as well as wages in the education sector.

6. *Index of level of health care* (I_{LH}). This is divided into eight components based on indicators that describe the state of public health care, such as providing the population with doctors, medical personnel, hospitals, hospital beds, medical outpatient facilities, and emergency services, as well as expenses of the population and government for public health.

7. *Index of level of demography* (I_{LD}). This is divided into thirteen components of the index based on indicators that describe the state, such as the expected life span of people grouped by sex and relationship, the death rate by class, natural growth, marriage and divorce, and emigration.

8. *Index of level of a healthy lifestyle* (I_{LHL}). This is divided into five components based on indicators that describe the level of the population's healthy lifestyle, including indicators such as tobacco

smoking, expenses for alcohol products, fitness services, mobilization, and measurement of daily calories.

9. *Index of level of culture-creativity-rest* (I_{LC}). This is divided into four components based on indicators that describe the state of the provision of services of culture, creativity, and rest, including indicators such as household and government expenses in this field.

10. *Index of level of ecological convenience* (I_{LEC}). This is divided into four components based on indicators that describe the state of ecological convenience for people, such as government expenses for protecting the environment, forested areas of the country, fresh water supply, domestic consumption of fresh water, harmful residues, permanent sources of polluting substances, storage and use, and treatment of contaminated wastewater.

11. *Index of level of social protection* (I_{LSP}). This is divided into thirteen components based on indicators that describe the state of the social security of social classes of the population, consisting of parts of the different groups and their incomes and consumption possibilities.

12. *Index of level of safety* (I_{LSf}). This is divided into thirteen components based on indicators that describe the population's level of safety of life by type of crime, the criminal and natural state of the country, as well as government expenses for security and protection of the people.

13. *Index of level of economic opportunities* (I_{LEO}). This is divided into thirteen components based on indicators that describe the economic opportunities share of the business sector, the ratio of unemployed to the number of working-age population, industrial deaths and injuries, taxes paid by households, ratio of the sum of payments to cash income, the share of the shadow economy in the national economy, investment in fixed assets, and the value of fixed assets in the economy.

14. *Index of level of political opportunities* (I_{LPO}). This is divided into thirteen components based on indicators of participating in demonstrations, strikes, human rights and freedom, public safety and discipline, crimes against journalists and media organizations, the number of deaths of citizens in conflicts, weight of political parties in the parliament, the longevity of a major power, the population's faith in the judicial system, and corruption of the state.

$$I_{LL} = \sqrt[14]{I_{LI} \times I_{LCt} \times I_{LS} \times I_{LP} \times I_{LE} \times I_{LH} \times I_{LD} \times I_{LHL} \times I_{LC} \times I_{LEC} \times I_{LSP} \times I_{LSf} \times I_{LEO} \times I_{LPO}}$$
(2)

Each derivative index of living standards is calculated separately by the component index. More precisely, each derived index is calculated by the arithmetic mean of the values of the components of the index, as shown in Formula 3:

$$I_{Ln} = \frac{I_{Ln-1} + I_{Ln2} + I_{Ln-3} + \ldots + I_{Ln-i}}{i} \quad (3)$$

where, I_{Ln} = value of n-derivative index and I_{Ln-i} = value of i-component index.

Each component index is determined by the method according to Formula 4 through the true value of the object of research and the most determined or established large and small values at the bound of the research.

$$I_{Ln-i} = \frac{R_i - R_i^{min}}{R_i^{max} - R_i^{min}} \quad (4)$$

where, R_i = the exact value of I to the object of research;

R_i^{max} = a certain (fixed) maximum value of i-measure in the bound of research;

R_i^{min} = a certain (fixed) minimum value of i-measure in the bound of research.

Let us now discuss each derived index of living standards and its component indices.

Index of the level of income (I_{LI}):

- *Index of the level of GDP* (I_{L1-1}). This index is calculated by Formula 4 on the basis of the amount of per capita GDP in the territory of the surveyed country, calculated by definite currency in the bound of research.

- *Index of the level of GNI* (I_{L1-2}). This index is calculated by Formula 4 on the basis of the amount of per capita GNI in the territory of the surveyed country, calculated by definite currency in the bound of research.

- *Index of the level of income* (I_{L1-3}). This index is calculated by Formula 4 on the basis of the amount of money of household income per capita in the territory of the surveyed country calculated by definite currency in the bound of research.

- *Index of the level of equitable benefit sharing* (I_{L1-4}). This index is calculated by Formula 4 on the basis of the positive value of the fund ratio that calculates the ratio of average income of the first and tenth decile groups of revenue sharing in the country.

In conclusion, assessing the index of the standard of living of the people by income level is determined by Formula 5 by the *Index of the level of income.*

$$I_{LI} = \sum_{i=1}^{4} (I_{L1-i}) / 4 \quad (5)$$

Index of the level of consumption (I_{LCt}):

- *Index of the cost of consumption of food* (I_{L2-1}). This index is calculated by Formula 4 using expenditures on household food in the territory

of the surveyed country, calculated by definite currency in the bound of research.

- *Index of the cost of consumption of nonfood goods* (I_{L2-2}). This index is calculated by Formula 4 using expenditures on household nonfood goods in the territory of the surveyed country, calculated by definite currency in the bound of research.

- *Index of the level of paid services* (I_{L2-3}). This index is calculated by Formula 4 using expenditures on household paid services in the territory of the surveyed country, calculated by definite currency in the bound of research.

- *Index of the level of consumption expenditures* (I_{L2-4}). This index is calculated by Formula 4 using a positive value of the ratio of expenditure on household consumption to the amount of their cash income.

- *Index of the level of individuals' debts* (I_{L2-5}). This index is calculated by Formula 4 using a positive value of the ratio of individuals' unpaid loans to the amount of the household's cash income.

- *Index of the level of the consumer basket* (I_{L2-6}). This index is calculated by Formula 4 on the basis of the cost of the food basket of the household, calculated by a particular currency in the boundary of the study.

- *Index of the level of the food basket* (I_{L2-7}). This index is calculated by Formula 4 on the basis of the value of the household consumption basket, calculated by a particular currency in the boundary of the study.

- *Index of the level of daily nutrition* (I_{L2-8}). This index is calculated by Formula 4 using an average cost ratio for 1000 calories daily consumption of food for one person on the basis of the amount calculated in the currency of a certain boundary of study.

In summary, the *Index of the level of consumption* is calculated by Formula 6:

$$I_{LCt} = \sum_{i=1}^{8}(I_{L2-i}) / 8 \qquad (6)$$

Index of the level of savings (I_{LS}):

- *Index of the level of individuals' contributions* (I_{L3-1}). This index is calculated by Formula 4 on the basis of the amount specified in the boundary of the study of individuals' personal contributions per capita.

- *Index of the level of government savings* (I_{L3-2}). This index is calculated by Formula 4 on

the basis of the amount specified in the boundary of the study of national savings.

- *Index of the level of income and savings of individuals* (I_{L3-3}). This index is calculated by Formula 4 on the basis of the ratio of contributions of the household per capita to their cash income.

The *Index of the level of savings* that assesses the level of public and private contributions is determined by Formula 7.

$$I_{LS} = \sum_{i=1}^{3}(I_{L3-i}) / 3 \qquad (7)$$

Index of level of property supply (I_{LP}):

- *Index of the level of supplying people with land* (I_{L4-1}). This index is calculated based on Formula 4 on the basis of areas of public land used by the household per capita.

- *Index of the level of supplying people with dwelling* (I_{L4-2}). This index is calculated based on Formula 4 on the basis of the indicator of square meters of total area per person (regardless of ownership) that describes the average supply of housing for the population.

- *Index of the level of supplying the population with private cars* (I_{L4-3}). This index is calculated by Formula 4 on the basis of digit ratio to the number of vehicles per 1,000 individuals.

- *Index of the level of providing the population with household property* (I_{L4-4}). This index is calculated by Formula 4 on the basis of the value per person of a particular currency in the boundary study of total value of property owned by individuals.

- *Index of the level of property income* (I_{L4-5}). This index is calculated by Formula 4 on the basis of the calculated amount of a particular currency in the boundary study per capita of individuals' earned income.

In summary, the *Index of the level of property supply* is determined by Formula 8:

$$I_{LP} = \sum_{i=1}^{5}(I_{L4-i}) / 5 \qquad (8)$$

Index of the level of accessibility of education (I_{LE}):

- *Index of the level of accessibility of education* (I_{L5-1}). This index is calculated by Formula 4 on the basis of the ratio of the total amount of GNI to government expenditures on education.

- *Index of the level of providing preschool education* (I_{L5-2}). This index is calculated by Formula 4 on the basis of the percentage of children attending preschool institutions (regardless of ownership) in the preschoolers' country.

- *Index of providing secondary education* (I_{L5-3}). This index is calculated by Formula 4 on the basis of the share of children receiving education in secondary institutions (regardless of ownership) in the school-age childrens' country.

- *Index of level of state spending per pupil* (I_{L5-4}). This index is calculated by Formula 4 on the basis of the indicator calculated by specific currency in the boundary of the study determined by a ratio of total state spending on preschool education to children attending preschool education institutions (regardless of ownership).

- *Index of government expenditures per student* (I_{L5-5}). This index is calculated by Formula 4 on the basis of the currency determined in the boundary of the study by a ratio of total state spending on secondary education to the number of children in secondary institutions (regardless of ownership).

- *Index of level of expenditures on technical and vocational education* (I_{L5-6}). This index is calculated by Formula 4 on the basis of the indicator of calculated currency defined in the boundary of the study by the ratio of total government expenditures on technical and vocational education to the number of students receiving education in technical and vocational education institutions (regardless of ownership).

- *Index of level of state spending on higher professional education* (I_{L5-7}). This index is calculated by Formula 4 on the basis of the rate calculated by currency determined in the boundary of the study by the ratio of total state spending on higher professional education to the number of students in higher education institutions (regardless of ownership).

- *Index of the average wage in education* (I_{L5-8}). This index is calculated by Formula 4 on the basis of the amount calculated in the currency determined in the boundary of the study of the average monthly wage in the field of education.

- *Index of the level of population spending on education* (I_{L5-9}). This index is calculated by Formula 4 on the basis of the positive values of the ratio of common household expenditures on educational services to the overall cost.

In summary, the *Index of the level of accessibility of education* that evaluates living standards of education opportunities is defined by Formula 9.

$$I_{LE} = \sum_{i=1}^{9}(I_{L5-i}) / 9 \qquad (9)$$

Index of level of health care (I_{LH}):

- *Index level of providing population with physicians* (I_{L6-1}). This index is calculated by Formula 4 on the basis of the number of physicians divided by 10,000 people.

- *Index level of providing population with public medical staff of operating level* (I_{L6-2}). This index is calculated by Formula 4 on the basis of the number of medical workers of operating level divided by 10,000 people.

- *Index level of providing population with public hospitals* (I_{L6-3}). This index is calculated by Formula 4 on the basis of the number of hospitals (regardless of ownership) divided by 10,000 people.

- The i*ndex level of providing people with public hospital beds* (I_{L6-4}). This index is calculated by Formula 4 on the basis of the number of beds in hospitals in the country (regardless of ownership) divided by 10,000 people.

- The i*ndex of level of providing people with outpatient treatment facilities* (I_{L6-5}). This index is calculated by Formula 4 on the basis of number of outpatient treatment facilities (regardless of ownership) divided by 10,000 people.

- The i*ndex level of providing people with medical ambulances* (I_{L6-6}). This index is calculated by Formula 4 on the basis of the number of stations providing emergency medical services (regardless of ownership) divided by 10,000 people.

- *Index level of spending on healthcare* (I_{L6-7}). This index is calculated by Formula 4 on the basis of a positive value of share of the cost of average monthly consumption expenditures on health care services of the household.

- *Index level of government expenditures on health care* (I_{L6-8}). This index is calculated by Formula 4 on the basis of the amount calculated in the currency determined in the boundary of study of total government spending on public health per capita.

In summary, the *Index of level of health care* in the country is calculated by Formula 10:

$$I_{LH} = \sum_{i=1}^{8}(I_{L6-i}) / 8 \qquad (10)$$

Index of level of demography (I_{LD}):

- *Index of life expectancy of the population* (I_{L7-1}). This index is calculated by Formula 4 on the basis of the population's life expectancy from birth.

- *Index of male life expectancy* (I_{L7-2}). This index is calculated by Formula 4 on the basis of life expectancy from birth of the country's men.

- *Index of female life expectancy* (I_{L7-3}). This index is calculated by Formula 4 on the basis of life expectancy from birth of the country's women.

- *Index of mortality rate* (I_{L7-4}). This index is calculated by Formula 4 on the basis of the positive values of the mortality rate divided by 1,000 people.

- *Index of male mortality rate* (I_{L7-5}). This index is calculated by Formula 4 on the basis of the positive value of the mortality rate divided by 1,000 men.

- *Index of female mortality* (I_{L7-6}). This index is calculated by Formula 4 on the basis of the positive value of the mortality rate divided by 1,000 women.

- *Index of children's mortality* (I_{L7-7}). This index is calculated by Formula 4 on the basis of the positive value of the infant mortality rate divided by 1,000 children.

- *Index of level of natural population growth* (I_{L7-8}). This index is calculated by Formula 4 on the basis of the ratio of births to deaths in the country.

- *Index of level of marriages/divorces* (I_{L7-9}). This index is calculated by Formula 4 on the basis of the ratio of married individuals to the divorced individuals.

- *Index of level of immigration* (I_{L7-10}). This index is calculated by Formula 4 on the basis of the positive values of the indicator shares of moving from the country in the principal amount of the population.

- *Index of level of emigration* (I_{L7-11}). This index is calculated by Formula 4 on the basis of the positive value of the indicator shares of entering the country in the principal amount of the population.

- *Index of ratio of men to women* (I_{L7-12}). This index is calculated by Formula 4 on the basis of the positive value of the ratio of the absolute value of the difference between men and women among the population.

- *Index of level of abortions* (I_{L7-13}). This index is calculated by Formula 4 on the basis of the positive values of the ratio of abortions in the country to the population of the country.

In summary, the *Index of level of demography* in the country is determined by Formula 11:

$$I_{LD} = \sum_{i=1}^{13}(I_{L7-i}) / 13 \qquad (11)$$

Index of level of healthy lifestyle (I_{LHL}):

- *Index of level of consumption of tobacco products* (I_{L8-1}). This index is calculated by Formula 4 on the basis of the positive value of the share indicator of tobacco use in general household consumption expenditures.

- *Index of drinking of alcoholic products* (I_{L8-2}). This index is calculated by Formula 4 on the basis of the positive value of the share indicator of household consumption of alcoholic products in the overall consumer spending.

- *Index of mobilization of population to sports and physical culture* (I_{L8-3}). This index is calculated by Formula 4 on the basis of a share for sports and physical activity in the population.

- *Index of level of providing the population with sports and physical culture centers* (I_{L8-4}). This index is calculated by Formula 4 on the basis of the number of places providing sports and physical education services to the population divided by 10,000.

- *Index of level of daily consumption of calories* (I_{L8-5}). This index is calculated by Formula 4 on the basis of the average of daily calories of food intake.

The *Index of the level of a healthy lifestyle* is defined by Formula 12:

$$I_{LHL} = \sum_{i=1}^{5}(I_{L8-i}) / 5 \qquad (12)$$

Index of the level of culture-creativity-rest (I_{LC}):

- *Index of household spending on culture-creativity-rest* (I_{L9-1}). This index is calculated by Formula 4 on the basis of the share of expenditures on the consumption of services, cultural arts, recreation in household consumer spending.

- *Index of government expenditures on culture-creativity-rest* (I_{L9-2}). This index is calculated by Formula 4 on the basis of the amount calculated in the currency determined in the boundary of study of public spending on culture, arts, and recreation per capita.

- *Index of providing the population with places for culture-creativity-rest* (I_{L9-3}). This index is calculated by Formula 4 on the basis of the ratio of institutions that provide cultural services, art, and recreation to 10,000 people.

- *Index of providing the population with culture-creativity-rest* (I_{L9-4}). This index is calculated by Formula 4 on the basis of the ratio of consumers of culture, arts, and recreation to the general population.

The *Index of the level of culture-creativity-rest* is determined by Formula 13:

$$I_{LC} = \sum_{i=1}^{4}(I_{L9-i}) / 4 \quad (13)$$

Index of level of ecological conveniences (I_{LEC}):

- *Index of state expenditures on the environmental protection* (I_{L10-1}). This index is defined by Formula 4 on the basis of the ratio of state spending on protecting the environment to the GNI.

- *Index of level of forest strips* (I_{L10-2}). This index is calculated by Formula 4 on the basis of forest strips in the country per capita.

- *Index of level of fresh water* (I_{L10-3}). This index is calculated by Formula 4 on the basis of fresh water volume in the country per capita.

- *Index of household consumption of fresh water* (I_{L10-4}). This index is calculated by Formula 4 on the basis of the annual volume of domestic consumption of fresh water per capita.

- *Index of the level of hazardous waste* (I_{L10-5}). This index is calculated by Formula 4 on the basis of the positive value of annual amount of hazardous waste per capita.

- *Air pollution index of constant sources* (I_{L10-6}). This index is calculated by Formula 4 on the basis of positive values of the volume of polluting substances from permanent sources of income per capita.

- *Index of containment level of polluting substances and cleaning* (I_{L10-7}). This index is calculated by Formula 4 on the basis of the share holding and use of full air-polluting substances from permanent sources.

- *Index of level of cleaning washable polluted wastewater* (I_{L10-8}). This index is calculated by Formula 4 on the basis of a positive ratio of not completely cleaned and treated water in the country to the annual supply of water derived from natural sources.

The *Index of the level of ecological conveniences,* which describes the environmental friendliness in the lives of the population of the region, is determined by Formula 14:

$$I_{LEC} = \sum_{i=1}^{8}(I_{L10-i}) / 8 \quad (14)$$

Index of level of social protection (I_{LSP}):

- *Index of level of protection of pensioners* (I_{L11-1}). This index is calculated by Formula 4 on the basis of the ratio of the average pension to the subsistence level in the country.

- *Index of level of protection of the unemployed* (I_{L11-2}). This index is calculated by Formula 4 on the basis of the ratio of the state average rate of unemployment (benefits) to the cost of living in the country.

- *Index of level of protection of the disabled* (I_{L11-3}). This index is calculated by Formula 4 on the basis of the average ratio of state disability benefits to a living wage in the country.

- *Index of the level of protection of the poor* (I_{L11-4}). This index is calculated by Formula 4 on the basis of the ratio of nominal state social assistance to the cost of living in the country.

- *Index of level of social protection* (I_{L11-5}). This index is calculated by Formula 4 on the basis of the ratio of average wage in the country to the cost of the consumer basket of the country.

- *Index of level of pensions* (I_{L11-6}). This index is calculated by Formula 4 on the basis of the amount of the average pension in the country, calculated in currency defined in the boundary of study.

- *Index of level of unemployment benefits* (I_{L11-7}). This index is calculated by Formula 4 on the basis of average unemployment benefits by the calculated currency.

- *Index of level of benefits for the disabled* (I_{L11-8}). This index is calculated by Formula 4 on the basis of the average disability allowance, calculated in currency defined in the boundary of study.

- *Index of level of of poverty relief* (I_{L11-9}). This index is calculated by Formula 4 on the basis of the average amount of the nominal state social assistance calculated in currency defined in the boundary of study.

- *Index of level of average monthly salary* (I_{L11-10}). This index is calculated by Formula 4 on the basis of the amount of the average salary calculated in currency defined in the boundary of study.

- *Index of disability* (I_{L11-11}). This index is calculated by Formula 4 on the basis of the positive values of the ratio of people with disabilities in the country to the workforce.

- *Poverty index* (I_{L11-12}). This index is calculated by Formula 4 on the basis of the positive value of the indicator of the proportion of the total

population whose income lies below the subsistence minimum in the total population.

- *Index of Child Welfare* (I_{L11-13}). This index is calculated by Formula 4 on the basis of the amount of the average state child welfare calculated in currency specified in the boundary of study.

The *Index of level of social protection* of the indigenous population is defined by Formula 15:

$$I_{LSP} = \sum_{i=1}^{13}(I_{L11-i}) / 13 \quad (15)$$

Index of the level of security (I_{LSf}):

- *Index of level of reported crimes* (I_{L12-1}). This index is calculated by Formula 4 on the basis of the positive values of the ratio of reported crimes per 10,000 people.

- *Index of level of crimes such as murder/attempted murder* (I_{L12-2}). This index is calculated by Formula 4 on the basis of the positive values of the ratio of murders and attempted murders per 10,000 people.

- *Index of level of suicides* (I_{L12-3}). This index is calculated by Formula 4 on the basis of positive values of the ratio of suicides per 10,000 people.

- *Index of level of intentional harm to human health* (I_{L12-4}). This index is calculated by Formula 4 on the basis of positive values of the ratio of crimes as intentional harm to human health per 10,000 people.

- *Index of level of crimes such as rape/attempted rape* (I_{L12-5}). This index is calculated by Formula 4 on the basis of positive values of the ratio of rapes and attempted rapes per 10,000 people.

- *Index of level of drug offenses* (I_{L12-6}). This index is calculated by Formula 4 on the basis of positive values of the ratio of drug offenses per 10,000 people.

- *Index of level of robberies and burglaries* (I_{L12-7}). This index is calculated by Formula 4 on the basis of positive values of the ratio of robberies and burglaries per 10,000 people.

- *Index of level of crime associated with theft* (I_{L12-8}). This index is calculated by Formula 4 on the basis of positive values of the ratio of burglaries per 10,000 people.

- *Index of level of sudden death* (I_{L12-9}). This index is calculated by Formula 4 on the basis of

positive values of the ratio of random accidents, poisoning, and injuries per 10,000 people.

- *Index of level of deaths from road traffic incidents* (I_{L12-10}). This index is calculated by Formula 4 on the basis of positive values of the ratio of deaths from road accidents per 10,000 people.

- *Index of level of deprivation of liberty* (I_{L12-11}). This index is calculated by Formula 4 on the basis of positive values of the ratio of prisoners per 10,000 people.

- *Index of level of state spending on national security* (I_{L12-12}). This index is calculated by Formula 4 on the basis of the ratio of the country expenditures on security to GNI.

- *Index of level of expenditures on services for national security and protection of rights* (I_{L12-13}). This index is calculated by Formula 4 on the basis of the ratio of the cost of services for national security and protection of rights to GNI.

The *Index of the level of security* in the country is calculated by Formula 16:

$$I_{LSL} = \sum_{i=1}^{13}(I_{L12-i}) / 13 \quad (16)$$

Index of the level of economic opportunities (I_{LEO}):

- *Index of level of entrepreneurship* (I_{L13-1}). This index is calculated by Formula 4 on the basis of the share of the output indicator of the business sector in the country's GDP.

- *Index of unemployment* (I_{L13-2}). This index is calculated by Formula 4 on the basis of the ratio of the positive value indicator of the number of unemployed in the country to the able-bodied population of the country.

- *Index of industrial deaths and injuries* (I_{L13-3}). This index is calculated by Formula 4 on the basis of the addition of positive values of the number of wounded and 2 (double-ply) number of positive value of mortality.

- *Index of level of household payments* (I_{L13-4}). This index is calculated by Formula 4 on the basis of the positive value of the ratio indicator of taxes, charges, fees, and amounts to the average annual incomes in the country.

- *Index of the shadow economy* (I_{L13-5}). The index is calculated by Formula 4 on the basis of the positive value of the indicator of the shadow economy in the national economy.

- *Index of level of investment in fixed assets* (I_{L13-6}). This index is calculated by Formula 4 on the basis of the amount of capital

investments per capita calculated in currency defined in the boundary of study.

- *Index of level of fixed assets in the economy* (I_{L13-7}). The index is calculated by Formula 4 on the basis of the amount of balanced cost of fixed assets in the economy per capita.

The *Index of the level of economic opportunities* of the indigenous population is determined by Formula 17:

$$I_{LEO} = \sum_{i=1}^{7}(I_{L13-i}) / 7 \qquad (17)$$

Index of the level of political opportunities (I_{LPO}):

- *Index of the level of assembly freedom* (I_{L14-1}). This index is calculated by Formula 4 on the basis of the positive value of the annual number of participants in rallies, demonstrations, marches, or picket lines per 100,000 people.

- *Index of the level of freedom strikes* (I_{L14-2}). The index is calculated by Formula 4 on the basis of the positive value of the annual number of freedom strikes.

- *Index of level of crime associated with violation of human rights* (I_{L14-3}). The index is calculated by Formula 4 on the basis of the positive value of crimes committed against the constitutional rights and freedoms of citizens per 100,000 people.

- *Index of the level of crime committed against the public order and security* (I_{L14-4}). This index is calculated by Formula 4 on the basis of the positive value of the number of crimes committed against public safety and order per 100,000.

- *Index of mortality in conflicts* (I_{L14-5}). This index is calculated by Formula 4 on the basis of the positive value of the number of deaths of citizens in internal and international conflicts per 100,000 people.

- *Index of the level of parliamentary parties* (I_{L14-6}). This index is calculated by Formula 4 on the basis of the positive value of weights of the political parties in the parliament.

- *Index of the highest power level* (I_{L14-7}). This index is calculated by Formula 4 on the basis of the positive value of the longevity of the main power indicator in the country.

- *Index of the level of trust in the courts* (I_{L14-8}). This index is calculated by Formula 4 on the basis of the value of people's trust in the judicial system.

- *Index of freedom of speech* (I_{L14-9}). This index is calculated by Formula 4 on the basis of

the positive value of the number of crimes committed against journalists and media organizations.

- *Index of the level of corruption* (I_{L14-10}). This index is calculated by Formula 4 on the basis of the positive value of corruption crimes per 100,000 people.

The *Index of the level of political opportunities* in a country is determined by Formula 18:

$$I_{LPO} = \sum_{i=1}^{10}(I_{L14-i}) / 10 \qquad (18)$$

In conclusion, the standard of living index is divided into four levels that depend on the value of the standard of living index [15]. Table 2 divides the index according to these levels.

Table 2. Stages of the standard of living of the population and meanings of indices

Steps of living standards	Indices of living standards
Rich level	$0 < I_{LL} \leq 0,25$
Sustainable level	$0,25 < I_{LL} \leq 0,5$
Poor level	$0,5 < I_{LL} \leq 0,75$
Pauper level	$0,75 < I_{LL} \leq 1,0$

The rich level –the ability to fully acquire the types and quantities of goods that can provide all-round development of the population of the country.

The sustainable level –the ability of the population to achieve sustainable physical and intellectual opportunities.

The poor level –the ability to use wealth continuously kept at a low level of production for the working population of the country.

The pauper level –the ability to use minimum benefits, only allowing the public (citizens) the capacity for mere existence.

3. Conclusions

As a result of this research study, a method of measuring the quality of life was developed.

1. *This technique offers*:

- Methods of calculating the 110 derivative indices from statistics that describe the different facets of the population's situation.

- Grouping the index data according to the characteristic parameters used in their definitions; calculation methods of fourteen derivative indices.

The method of calculating the index of living standards on the basis of derivative indices finally assesses the population's standard of living.

2. *This technique allows one to*:

- Evaluate the final level of the population with an index of living standards;

- Evaluate the levels of individual boundaries of life by using derivatives or components of the index of living standards;

- At the international level, determine the standard of living in different countries;

- At the state level, evaluate the standard of living of the population;

- At the national level, determine the standard of living in regions;

- Compare the standard of living in territorial spaces;

- Compare the standard of living in time space.

3. *Advantages of this technique*:

- Covers most of the sectors of people's lives;

- Objectively evaluates the standard of living using only statistical indicators.

4. *Disadvantages of this technique*:

- In the methodology the study of living standards do not take into account the views of the population, that is, they do not carry out a subjective assessment of the level of life.

5. *In order to validate this technique*:

- At the international level, actions were carried out to identify and compare the standard of living of the population of the Russian Federation and the Republic of Kazakhstan as of 2011;

- At the national level, actions were carried out to identify and compare the standard of living in Kazakhstan in 2003–2011;

- At the national level, actions were carried out to identify and compare the standard of living in fourteen states and two cities of Kazakhstan in 2011.

Articles have been published in scientific publications on the interim results of the scientific work [16], [17], [18].

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