Human capital for sustainable development: a comparative analysis of regions of the Republic of Kazakhstan

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Abstract. Human capital is the primary base for sustainable development at both macro, middle, and micro levels. The purpose of this study is the preliminary clustering of the regions of Kazakhstan according to human capital factors as public health and environmental issues. The results are intermediate and are subject to further study.

1. Introduction

Today one of the most topical subjects in the social sciences is human capital and its role in socio-economic development. For example, T. Shtertser proved that the growth of human capital accumulation rate has a positive effect on the GDP and GRP using mathematical models [1], and Y. Koutsina showed the importance of human capital for the long-term sustainable development of regions of the Russian Federation [2]. Latvian researchers E. Lonska and I. Mietule empirically proved the relationship between human capital development and economic development across the world countries [3]. T. Schulz proved that the income from investments in human capital is greater than from investments in physical capital on the example of the US economy [4]. There are many factors affecting the quality of human capital: the quality of education, the level and quality of life, the regulatory framework, the quality of the environment, the quality of health care, etc. [5]. Effective investment in these human capital factors is critical for development, providing significant economic benefits in the long run. Human capital is the central driving force for sustainable growth of the country [6]. It follows from this that countries with weak human capabilities and low incomes are especially important to invest in health care, education, and science [7].

However, despite significant progress in economic development, it is sometimes difficult for authorities to substantiate the need for investment in human capital since the materialization of the benefits from these investments can take a long time. So, if the construction of roads and bridges can bring quick economic and political benefits, then the economic benefits from investment in health, for example, of young children will not be obvious until these children grow up and fall into the category of the labor force [6], by producing an additional gross product.
To understand these benefits, international supranational organizations initiate various projects. One such initiative is the World Bank’s Human Capital Project (HCP). The project aims to raise awareness of the costs of inaction and justify the need to invest in people. The first version of the Human Capital Index was published in October 2018. This simple cross-country metric is expected to attract the political attention needed to catalyze action around the world. The human capital index allows us to quantify the contribution of health and education to productivity and the level of income of the next generation of citizens. Countries will be able to use it to determine how much income they lose because of a shortage of human capital, and how quickly they can turn these losses into benefits if they take action without delay [6].

The Human Development Index (HDI) is another project, developed by UNDP, embodies the progress of humanity, combining information on people's health, education, and income in one indicator. For many years, the HDI has been a perfect comparison tool and a solid base for active public debate on national priorities [7]. If the Human Capital Index is relatively freshly developed and the countries of Central Asia are not represented in it yet, then the Human Development Index is calculated since 1990 and serves as an indicator of the level of human development in more than 130 countries, including countries of the Central Asian region.

As you can see from the Figure 1 the Human Development Index of the countries of Central Asia and the Russian Federation is growing steadily from year to year.

![Figure 1. The Human Development Index of Central Asia countries and the Russian Federation, 2010–2017](image)

Kazakhstan is leading the Central Asia countries by the HDI in 2017 (Figure 1), but Uzbekistan has a higher average annual growth rate of HDI among these countries (Figure 2)

![Figure 2. The average annual growth rate of the Human Development Index, 2010–2017](image)
Human development indicators are directly taken into account when calculating the Sustainable Development Index. Sustainable Development Solutions Network publishes the Sustainable Development Goals Index (SDG Index). The index is calculated for 157 countries of the world based on 100 indicators related to 17 sustainable development goals until 2030, adopted at the UN Summit in 2015. The index takes into account the achievements of countries in combating poverty, observance of gender equality, providing the population with high-quality education and health services, etc.

Among the countries of Central Asia by the Sustainable Development Goals Index in 2018. The Kyrgyz Republic and Uzbekistan lead (Figure 3).

Figure 3. The Central Asian countries ranking by the Sustainable Development Goals Index, 2018

It is assumed that the existing theoretical and methodological concepts of measuring human capital are limited as they mainly include quantitative estimates of human capital at the macro level, and do not take into account the whole system of factors determining its quantitative and qualitative parameters at the middle and micro levels [7]. In this regard, it is necessary to study the quality of human capital and the factors directly affecting it to understand the dynamics of regional economic development.

2. Methodology

In this paper, we consider the factors of human capital related to the health of the population, directly or indirectly, in the context of the regions of the Republic of Kazakhstan over a ten-year period from 2008 to 2017. These factors are divided into two groups: the first group includes factors directly reflecting the state of public health, the second – environmental indicators:

1. Public health: life expectancy at birth, the overall incidence of the population.
2. Environment: emissions of harmful substances per capita (solid, liquid and gaseous)

Regions are conditionally divided into four groups depending on whether it is higher or lower to the national average indicator. In regions where the indicator exceeds the national average, the status “high” is assigned, where the indicator is lower than the national average, the “low” status is assigned. It should be noted that this method ranks the regions among themselves, and it does not relative to any benchmark indicators. This means we can talk about high Life Expectancy level relative to other regions, but we can not judge the quality of health relative to the world standards.

3. Results

Life Expectancy (LE). In 2017, the life expectancy was 72.95 years in the Republic. It should be noted that by this sub-indicator of the HDI, Kazakhstan lagged behind all the countries of the Central Asian region until 2013, and only since 2014 a significant leap allowed to lead in the region. From 2005 to 2013 Uzbekistan was the leader in this Index. At the meso-level, in 2017 the greatest Life Expectancy is observed in Astana, Almaty and Mangystau Oblast, and the lowest – in Akmola Oblast, North Kazakhstan Oblast and East Kazakhstan Oblast.

The overall morbidity. In 2017 the morbidity in Kazakhstan amounted to 30,409. The highest morbidity in the regions was registered in Pavlodar and Almaty Oblasts, as well as in Almaty city. The
lowest incidence is in the Kyzylorda, South Kazakhstan (now Turkestan and Shymkent) and Atyrau oblasts [8].

On average, in Kazakhstan, the morbidity increased by 3473 new cases per 100 thousand of population. The average annual increase in Kazakhstan was by 0.7%, in the regions this figure varies from 0.1 to 2.6% per year, and in Almaty, Kyzylorda, Karaganda, West Kazakhstan and Aktobe oblasts, the morbidity has decreased. The largest increase in morbidity was registered in Kostanay, Pavlodar and Akmola oblasts. The morbidity was most severe in Kyzylorda, West Kazakhstan and Karaganda oblasts.

In order to compile a regional ranking based on population health indicators, a distribution diagram was constructed based on regional data (Figure 4.)

![Figure 4. Distribution of regions of Kazakhstan by life expectancy and morbidity](image)

The conditional division of regions into four groups depending on the attitude to the average indicator for the Republic of Kazakhstan gave the following situation (Table 1).

| High morbidity - low life expectancy | Low morbidity - high life expectancy |
|-------------------------------------|-------------------------------------|
| Pavlodar                            | Atyrau                               |
| Almaty (obl)                        | Astana                               |
| Zhambyl                             |                                      |
| Kostanai                            |                                      |
| East-Kazakhstan                     |                                      |
| Akmola                              |                                      |

| Low morbidity - low life expectancy | Low morbidity - high life expectancy |
|-------------------------------------|-------------------------------------|
| Kyzylorda                           | Mangystau                           |
| West-Kazakhstan                     | Aktobe                              |
| Karaganda                           | Atyrau                              |
| North Kazakhstan                    | South-Kazakhstan                    |

Regions of Group 1 are the least prosperous in terms of public health. They combine high morbidity and low life expectancy relative to the average through the Republic of Kazakhstan. In these regions, systemic measures are needed to improve public health. In Groups 2 and 3 one of the
parameters is in the unfavorable zone, and the other is in the safe zone. For example, in Group 2 (with high life expectancy and high morbidity) measures taken to reduce the morbidity will improve the quality of public health. Group 3 refers to low life expectancy and also low morbidity regions, where the finding out the reasons for low life expectancy will improve the quality of public health. In Group 4 (the regions with high LE and low morbidity) includes the most prosperous relative to other regions.

Emissions of solid, liquid and gaseous wastes. The quantitative indicator of emissions per capita is calculated for comparison. In 2017 the average level of emissions of solid waste per capita amounted to 31.9 kg, emissions of liquid and gaseous substances – 129.5 kg. These values are taken as averages for further comparison.

The highest indicators of solid emissions per capita in Kazakhstan are registered in Pavlodar, Karaganda, Kostanay regions, the least solid waste emissions per capita are in Almaty (city), South Kazakhstan and West Kazakhstan [9].

The average annual increase in emissions per capita in Kazakhstan was -4.4%, demonstrating that in general emissions are reduced. If we look at the regional level, there is an increase in the volume of emissions of solid substances in 7 regions with an average annual rate fluctuating from 0.9% (in Kostanay) to 8.7% (in Atyrau) per year. In the rest of the regions, the volumes fall at an average annual rate of -0.7% (in Akmola) to -9.4% (in Almaty). The largest overall increase in per capita emissions of solids was registered in the Atyrau oblast, the city of Almaty and the Zhambyl oblast. The strongest reduction in emissions are in Almaty, Pavlodar oblasts and Astana.

The highest indicators of emissions of liquid and gaseous waste per capita fall on the Pavlodar, Karaganda and Atyrau oblasts, the smallest volumes are recorded in Almaty, South Kazakhstan oblasts and Almaty city [10].

The average annual increase in the volume of emissions of liquid and gaseous pollutants per capita is -0.5%. In 8 regions, there is an average annual growth rate range from 1.2% (in Kostanay) to 10.2% (in Almaty city). In other regions, emissions fall at an average annual rate of 0.3% (Astana) to -5.8% (Almaty oblast). Over the entire period, the largest increase in the volume of emissions of liquid and gaseous substances are observed in the Almaty city, Zhambyl and North Kazakhstan oblasts, and emissions per capita in the Karaganda, Almaty and Aktobe oblasts are most severely reduced.

The scattered diagram was constructed to compare the regions for these indicators, including the volumes of solid, liquid and gaseous pollutants per capita (Figure 5).

![Figure 5](image-url)

**Figure 5.** Distribution of regions in terms of pollutant emissions per capita

Figure 4 shows that most of the regions are located in an area where the values are lower than the national average (31.9 for solid waste and 129.5 for liquid and gaseous wastes). Also, some regions are experiencing difficulties with emissions of solid or, conversely, liquid and gaseous wastes. Only a
small number of regions experience problems in both aspects. They were also divided into four groups according to the principle that was used in the formation of Table 1.

**Table 2.** Distribution of regions by groups of environmental pollution

| 1. High pollution by all types of waste | 2. High solid pollution, low liquid and gaseous |
|----------------------------------------|-----------------------------------------------|
| Karaganda                              | Akmola                                        |
| Pavlodar                               | Kostanay                                      |
|                                        | North-Kazakhstan                              |

| 3. Low pollution by solid, high – by liquid and gaseous. | 4. Low pollution by all types of waste |
|---------------------------------------------------------|---------------------------------------|
| Aktobe                                                  | Almaty                                |
| Atyrau                                                  | West-Kazakhstan                       |
|                                                         | Zhambyl                               |
|                                                         | Kyzylorda                             |
|                                                         | Mangystau                             |
|                                                         | South-Kazakhstan                      |
|                                                         | East-Kazakhstan                       |
|                                                         | Almaty city                           |
|                                                         | Astana                                |

Group 1 contains regions in which the level of pollution with all types of waste is higher than the national average. To improve the quality of life will require significant systemic measures for the collection and recycling of waste. Regions of Groups 2 and 3 have difficulty in one of the two groups of pollutants, regions of Group 4 have the least difficulties compared to the others. At the same time, less than 1/8 of all waste of the country is captured and disposed of. The conclusions of this table are suitable for use – if there is a large number of emissions in the region, then this volume pollutes the environment and only a small part of it is disposed of.

It should be noted that this grouping does not fully reflect the current quality of the environment and the degree of its impact on public health, and it cannot be said that the population of Group 1 is currently experiencing more health problems due to environmental pollution than the Group 4. However, these indicators suggest possible long-term problems that are much more likely to be experienced by regions where per capita emissions are above average for the Republic of Kazakhstan. The nature of these problems is the subject of a separate study.

For the final conclusions, a summary table was formed, where the region received an assessment for each indicator – the “bad” status was received by the regions from Groups 1 of Tables 1 and 2, the “satisfactory” – by the regions from Groups 2 and 3, and “good” is by the regions from Group 4. Each assessment awards the region a score: “bad” = 1, “satisfactory” = 2, “good” = 3. The sum of points shows the general level of development of factors of human capital. It must be remembered that this is an estimate of the level relative to the average for the Republic of Kazakhstan, and it is limited by the ratios between regional indicators, but is not related to any benchmarks or standards for health quality indicators (Table 3).

**Table 3.** Integral assessment of the human capital development factors related to health and environmental issues in the regions of Kazakhstan

| Region          | Assessment for the “Public Health” factors | Assessment for the “Environmental issues” factors | Total score |
|-----------------|--------------------------------------------|--------------------------------------------------|-------------|
| Mangystau       | good                                       | good                                             | 6           |
| South-Kazakhstan| good                                       | good                                             | 6           |
| Aktobe          | good                                       | satisfactory                                     | 5           |
| Atyrau          | good                                       | satisfactory                                     | 5           |
| West-Kazakhstan | satisfactory                                | good                                             | 5           |
| Kyzylorda       | satisfactory                                | good                                             | 5           |
| Astana city     | satisfactory                                | good                                             | 5           |
| Almaty city     | satisfactory                                | good                                             | 5           |
### Region Assessment for the “Public Health” factors Assessment for the “Environmental issues” factors Total score

| Region          | Assessment for “Public Health” factors | Assessment for “Environmental issues” factors | Total score |
|-----------------|----------------------------------------|-----------------------------------------------|-------------|
| Almaty          | bad                                    | good                                          | 4           |
| Zhambyl         | good                                   | good                                          | 4           |
| North-Kazakhstan| satisfactory                           | satisfactory                                  | 4           |
| East-Kazakhstan | bad                                    | good                                          | 4           |
| Akmola          | bad                                    | satisfactory                                  | 3           |
| Karaganda       | satisfactory                           | bad                                           | 3           |
| Kostanay        | bad                                    | satisfactory                                  | 3           |
| Pavlodar        | bad                                    | bad                                           | 2           |

#### 4. Conclusions

According to the results of the study, the following conclusions can be drawn:

- Factors with a poor level of development signal destructive trends in the region, and require further detailed analysis of the reasons, as well as systemic measures to improve the situation.
- Factors with a satisfactory level of development signal problems in a certain sphere of life, while ignoring the consequences will be as devastating as ignoring factors with a “poor” score, but solving them will require smaller measures.
- Factors with a good level of development are less prone to risks and are most favorable for the development of human capital in the region. However it is necessary to realize that further improvement of the relevant field is necessary and to compare with world standards to achieve development of human capital in the region.

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