Original Paper
doi 10.15826/recon.2024.10.4.024
UDC 338.2
JEL I31, R11, R58

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National adaptive social well-being index for measuring regional disparities in Kazakhstan

ABSTRACT
Relevance. The well-being of citizens is a key focus of national policies worldwide. Kazakhstan, however, is characterized by significant regional disparities in social well-being, which necessitates targeted programs and investments to improve conditions in less developed areas.
Research Objective. This study aims to develop a national adaptive social well-being index to evaluate and spatially map the regions of Kazakhstan.
Data and Methods. The methodology included identifying indicators through a literature review and regional data, conducting an expert survey to weight them, and creating a social well-being index. A spatial analysis was then used to calculate the index for each region.
Results. The social well-being index shows significant disparities across regions. Astana, Almaty, and Atyrau demonstrate strong social welfare, driven by economic growth and advanced social infrastructure. In contrast, Karaganda, Pavlodar, and Shymkent show lower social welfare, highlighting the need for targeted interventions and investments.
Conclusion. The findings offer valuable insights for policymakers to design strategies for sustainable socioeconomic growth in Kazakhstan. The proposed index can help national and regional authorities monitor social well-being.

KEYWORDS
social well-being; regional disparities; adaptive index; well-being index, measuring well-being, spatial development, socio-economic development

ACKNOWLEDGEMENTS
This research was supported by the project AP14869686 "Development of a national index of social well-being in the regions of Kazakhstan and its adaptation to the conditions of the global geopolitical and economic crisis", funded by the "Institute of Economics" Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan.

FOR CITATION
Satybaldin, A. A., Moldabekova, A., Alibekova, G. Zh., Azatbek, T. A. (2024). National adaptive social well-being index for measuring regional disparities in Kazakhstan. *R-Economy*, 10(4), 391–409. doi: 10.15826/recon.2024.10.4.024

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Национальный адаптивный индекс социального благополучия для измерения региональных различий в Казахстане

Online ISSN 2412-0731

АННОТАЦИЯ
Актуальность. Благосостояние наций является краеугольным камнем национальной политики во всем мире. Признание различий в социальном благосостоянии среди регионов Казахстана требует внедрения целевых программ и инвестиций для улучшения социального благосостояния в менее развитых областях.
Цель исследования. Данное исследование направлено на разработку национального адаптивного индекса социального благосостояния для оценки и пространственного картирования регионов Казахстана.
Данные и метод. Методология исследования включала определение индикаторов на основе литературного обзора и доступных региональных статистических данных, а также проведение экспертного опроса для выбора индикаторов и определения их весовых коэффициентов. Затем был построен интегральный индекс социального благосостояния для оценки регионов. В заключение был проведен пространственный анализ с расчетом индекса для каждого региона.
Результаты. Разработанный индекс социального благосостояния эффективно выявил значительные различия в социальном благосостоянии между регионами. Результаты показали, что города Нур-Султан и Алматы, а также Атырауская область демонстрируют высокий уровень социального благосостояния, характеризующийся сильным экономическим ростом и развитой социальной инфраструктурой. В то же время Карагандинская, Павлодарская и Шымкентская области показывают более низкий уровень социального благосостояния, что подчеркивает необходимость целевых вмешательств и инвестиций.
Выводы. Результаты исследования предоставляют политикам важные данные для разработки стратегий, способствующих устойчивому социально-экономическому росту по всему Казахстану, что может изменить политическую ситуацию в стране. Государственным и региональным властям рекомендуется использовать этот индекс для мониторинга ситуации.

КЛЮЧЕВЫЕ СЛОВА
социальное благосостояние; региональные различия; адаптивный индекс; индекс благосостояния; измерение благосостояния; пространственное развитие; социально-экономическое развитие.

БЛАГОДАРНОСТИ
Данное исследование профинансировано Комитетом науки Министерства науки и высшего образования Республики Казахстан (Грант № AP14869686 «Разработка национального индекса социального благополучия в регионах Казахстана и его адаптация к условиям мирового геополитического и экономического кризиса»)

ДЛЯ ЦИТИРОВАНИЯ
Satybaldin, A. A., Moldabekova, A., Alibekova, G. Zh., Azatbek, T. A. (2024). National adaptive social well-being index for measuring regional disparities in Kazakhstan. *R-Economy*, 10(4), 391–409. doi: 10.15826/recon.2024.10.4.024

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衡量哈萨克斯坦地区差距的国家适应性社会福利指数

摘要
现实性：国家福祉是全世界国家政策的基石。认识到哈萨克斯坦各地区在社会福祉方面的差异，就需要引入有针对性的方案和投资，以改善欠发达地区的社会福祉。
研究目标：本研究旨在制定国家社会福利适应性指数，用于哈萨克斯坦各地区的评估和空间绘图。
数据与方法：研究方法包括根据文献综述和现有的地区统计数据确定指标，以及进行专家调查，以选择指标并确定其加权系数。然后，构建社会福利综合指数，对各地区进行评估。最后，通过计算各地区的指数进行空间分析。
研究结果：发达的社会福利指数有效揭示了不同地区之间社会福利的显著差异。结果显示，努尔苏丹市和阿拉木图市以及阿特劳州以强劲的经济增长和发达的社会基础设施为特征，社会福利水平较高。与此同时，卡拉干达州、巴甫洛达尔州和什姆肯特州的社会福利水平较低，这表明有必要进行有针对性的干预和投资。
结论：研究结果为政策制定者提供了重要数据，有助于他们制定促进哈萨克斯坦全境的社会经济可持续增长战略，从而改变该国的政治局势。鼓励国家和地区当局利用该指数来监测局势。

关键词
社会福祉；地区差异；适应指数；福祉指数；福祉测量；空间发展；社会经济发展。

供引用
Satybaldin, A. A., Moldabekova, A., Alibekova, G. Zh., Azatbek, T. A. (2024). National adaptive social well-being index for measuring regional disparities in Kazakhstan. *R-Economy*, 10(4), 391–409. doi: 10.15826/recon.2024.10.4.024

Online ISSN 2412-0731

Introduction

The study of social well-being is crucial for shaping public policy in Kazakhstan, especially in light of global challenges. The socio-economic development of Kazakhstan's regions is influenced by a variety of external and internal factors. External challenges include the ongoing geopolitical and economic crisis, environmental issues, and the shift towards a digital and circular economy. Meanwhile, internal problems—such as the degradation of social, industrial, and transport infrastructure, declining living standards, rising unemployment, migration, and growing social tension—further complicate the socio-economic landscape. Given these complex dynamics, understanding the social consequences of economic policy has become a key focus for both scholars and policymakers. In this context, developing a national adaptive index of social well-being in Kazakhstan's regions is of significant theoretical, methodological, and practical importance.

In recent years, the concept of "social well-being" has emerged as an alternative to the traditional macroeconomic indicator of Gross Domestic Product (GDP). Researchers argue that while GDP has long been used to assess a nation's economic performance, it increasingly falls short in measuring overall well-being and development. GDP focuses solely on economic output without accounting for factors such as income distribution, environmental sustainability, or the quality of life of citizens (Fioramonti et al., 2019). Also, scholars note that GDP is insufficient to guide national development strategies, particularly at the regional level (Charles & D'Alessio, 2020). Other researchers pointed out conceptual issues regarding the use of GDP in measuring social welfare (Slesnick, 2019). They concluded that GDP, while useful for measuring overall production, cannot accurately reflect the social well-being of a society. The authors argue that qualitative factors, particularly those related to human development, play a crucial role in driving economic growth and influencing exports (Lukman et al., 2023). From a financial standpoint, evaluating social well-being is of significant scientific and practical importance to both researchers and policymakers. By using well-being indicators in policymaking, it becomes possible to establish a connection between social capital and well-being at the regional level (Calcagnini & Perugini, 2019).

In the international arena, social well-being is measured using the Social Progress Index (SPI), Genuine Progress Indicator (GPI), Global Liveability Index (GLI), Better Life Index (BLI), and Quality of Life Index (QoL). The Social Progress Index is one of the world's largest curated social and environmental data collections. It concentrates on the non-economic aspects of global social performance. The Genuine Progress Indicator considers a nation's well-being by incorporating environmental and social factors. The Global Liveability Index quantifies the challenges presented to an individual's lifestyle and standard of living in 173 cities worldwide. The Better Life Index is constructed with the OECD data on housing, income, jobs, community, education, environment, civic engagement, health, life satisfaction, safety, and work-life balance indicators. The Quality of Life Index measures the overall well-being of individuals by evaluating factors such as purchasing power, safety, healthcare, cost of living, property price to income ratio, and pollution levels across different countries.

Existing indices for measuring social well-being provide valuable insights but face significant challenges when applied across different regions, particularly in terms of data availability, complexity, and scalability. Many of these indices place considerable emphasis on non-economic or subjective factors, such as life satisfaction or cultural elements, which can undermine their consistency and hinder cross-country comparisons. Moreover, the data requirements for these indices often exceed what is available in certain regions, particularly in developing or rural areas. Additionally, most of these indices are designed for country-level analysis, making them difficult to apply in regional assessments within a single country. Many regions lack the detailed data on social and environmental indicators that these frameworks typically rely on. As a result, such indices are better suited for national rather than subnational assessments, limiting their utility for regional policymaking and local well-being evaluations. This highlights the need for a new index that integrates economic, living standards, education, healthcare, environmental, and infrastructural indicators. Such an index would offer a more balanced and objective approach to measuring well-being at both the national and regional levels, making it more adaptable and widely applicable.

Online ISSN 2412-0731

This study aims to develop a national adaptive social well-being index for evaluating, comparing, and spatially mapping the social well-being of Kazakhstan's regions. The index will be based on a range of indicators, including economic, living standards, education, health, migration, and environmental and infrastructural factors, using both statistical and survey data.

The research hypothesis is that regions with a significant share of the mining industry in their gross regional product (GRP) tend to have a higher social well-being index. The mining industry may be a key factor influencing social well-being in these regions, as Kazakhstan remains a resource-based country, with mineral resources (58%) and metals and ores (18%) comprising the majority of its exports in 2022, according to national statistics.

The study is structured as follows: The first section provides a literature review of the concept of social well-being. The second section outlines the methodology, including the derivation of the formula, the indicator system, data sources, weighting method, and research process. The third section presents the primary empirical results, followed by a discussion in the fourth section. The study concludes with insights and recommendations for further research.

Theoretical framework

Social well-being is a multidimensional concept analysed within the social welfare and social well-being framework, intersecting with economics, sociology, and psychology. Researchers use mathematical, econometric, statistical, and empirical data to examine various aspects of social well-being. As Zahra et al. (2014) noted, social well-being encompasses economic and financial factors as well as social and environmental issues.

The concept of social well-being encompasses various aspects that reflect both individual and collective quality of life in society. Iacus et al. (2022) introduced social well-being as a daily measure, examining multiple dimensions of personal and social life, and comparing it to other well-being and health indicators. This approach suggests that environmental and health conditions can influence the perception of well-being, as captured by social well-being metrics. Contradictions or interesting insights arise when considering these measures within the broader context of sustainable human development indices (Iacus et al., 2022). Strezov et al. (2017) analyzed various indices for measuring sustainable development and noted that only a few integrated all three dimensions—economic, environmental, and social—highlighting the complexity and multifaceted nature of such measurements.

Income, social spending, and grants positively influence regional well-being through various mechanisms. Increased income enables individuals to access better healthcare, education, and living conditions, contributing to higher life satisfaction and well-being (Boyce et al., 2013). Social spending on welfare programs, healthcare, and education reduces poverty and inequality, fostering a more inclusive society with higher levels of happiness and stability (Livingston et al., 2022).

Local indices of well-being have been developed for individual countries. One such example is the QUARS index, created by Segre et al. (2011), which stands for "Regional Quality of Development" in Italian. The QUARS index uses 41 indicators across seven categories: environment, economy and labor, law and citizenship, education and culture, participation in the school system and quality of structures, public education, cultural activities, health, gender equality, and democratic participation.

Charles and D'Alessio adapted the Social Progress Index (SPI) to evaluate and rank Peru's regions using Data Envelopment Analysis (DEA). Their regional SPI highlights the importance of addressing critical gaps and leveraging strengths to help individuals achieve their full potential. The study assessed social progress across three dimensions: 1) basic human needs (nutrition, primary health care, safe drinking water, adequate housing, and community safety); 2) well-being essentials (access to primary education, information, healthy living conditions, and environmental quality); and 3) opportunities (individual rights, personal freedom, tolerance, and access to higher education for skill development) (Charles & D'Alessio, 2020).

Long and Ji applied the Genuine Progress Indicator (GPI) to evaluate social well-being across 31 Chinese provinces, emphasizing the need to assess economic growth quality for sustainable development planning. The study incorporated diverse indicators: economic factors like personal consumption expenditure, durable consumer services, and net capital gains; environmental dimensions such as changes in wetlands and forests; and

Online ISSN 2412-0731

social factors including volunteer work, non-defense public spending on education and health, and public infrastructure services. Other indicators included income inequality, water pollution, resource depletion, crime and divorce rates, and health and education spending (Long & Ji, 2019).

Quantitative methods play a crucial role in measuring social well-being. Glazyrina et al. (2021) applied simulation modeling and experimental planning theory to assess a region's social well-being using indicators such as gross regional product (GRP), population size, average monthly income, and consumer goods costs. Additionally, Data Envelopment Analysis (DEA) was used to evaluate social well-being in rural areas, incorporating inputs like wage, material, and administrative costs, and outputs such as the number of households and total employment days (Singh, 2016).

The literature includes many studies on factors affecting social well-being. Torres and Augusto (2020) explored the effects of digitalization and social entrepreneurship on national well-being, concluding that digitalization can improve well-being if supported by an effective education system, good governance, and a philanthropy-oriented financial system. Hassad de Andrade et al. (2022) studied the impact of the COVID-19 pandemic on food consumption habits, finding that individuals in countries with low levels of social welfare consumed more fast food during the pandemic compared to those in countries with higher levels of social welfare. These findings underscore the value of incorporating such factors into a social well-being index, as they reflect dynamic changes in well-being. Additionally, wealth inequality remains a critical measure, particularly in developing countries (Čižo et al., 2023).

While social well-being is often assessed at the macro level in international studies, the question as to how its practical utility can be enhanced at the local level requires regional analyses with tailored indicators and sub-indicators. Developing relevant tools for measuring social well-being at the regional level is essential for supporting timely and effective policy decisions. Existing approaches to regional social well-being measurement must also adapt to address challenges arising from digitalization.

Assessing social well-being requires a multidimensional approach, combining economic and social indicators such as income, health, education, relationships, employment, and neighborhood conditions (Livingston et al., 2022).

Seabela et al. (2024) investigate the determinants of income inequality in South Africa using the Vector Error Correction Model (VECM) and show a significant negative correlation between government spending on social grants and income inequality, suggesting that increased social grants improve social well-being by reducing income disparity. This study also highlights that population growth positively correlates with income inequality, indicating potential challenges for social well-being as the population expands without corresponding increases in resources and social services (Seabela et al., 2024).

Dermatis et al. (2024) assessed the quality of life (QoL) and mapped it for 27 EU countries, utilising composite criteria and the Geographical Information Systems (GIS) technology. Their research highlighted the complex and multidimensional nature of QoL, encompassing factors such as socio-economic environment, employment conditions, economic conditions, and health services (Dermatis et al., 2024).

These studies illustrate the complex interplay between economic policies, income inequality, and social well-being. Public policies that prioritize equitable income distribution, inclusive economic growth, and adequate social spending are essential for improving social well-being. Effective public policies that promote equitable income distribution, inclusive economic growth, and adequate social spending are crucial for enhancing social well-being.

Malkina (2015) applied simulation modeling and experimental design methods to assess social well-being at the regional level using indicators such as Gross Regional Product (GRP), population size, average monthly income, and consumer goods prices. In her later study of Russian regions, social well-being was evaluated using economic indicators like per capita nominal income and the distribution of actual income levels within regions, measured against the intra-regional Gini coefficient (Malkina, 2016). Bagstad & Shammin (2012) employed cluster analysis to examine regional well-being, incorporating factors such as economic conditions, labor markets, neighborhood relations, and environmental quality.

Social well-being can also be evaluated at the individual level across three dimensions: material well-being, which includes factors such as food,

Online ISSN 2412-0731

income, assets, housing, employment, access to services, natural resources, and environmental quality; relational well-being, which involves interactions with others, care and love relationships, relations with the state and social institutions, collective action, conflict and security, law, and cultural and political identity; and subjective well-being, which reflects personal perceptions of living conditions and quality of life (Britton & Coulthard, 2013).

The BBC well-being scale encompasses 24 questions covering quality of life, physical health, psychological health, and social relationships (Pontin et al., 2013).

In assessing regional subjective well-being at the individual level, Lawless and Lucas (2011) examined how life satisfaction levels correlate with economic factors (income, poverty level, employment, household expenses, home cost, mortgage/loans, rent), education level and occupational field, family status, and inclusion factors (types of illnesses, physical health, disability, obesity, causes of death, accidents, suicide).

The assessment of social well-being in relation to environmental and infrastructure parameters explores how elements of the built and natural environment affect human quality of life. Environmental factors such as air quality, green spaces, and climate change significantly influence social well-being. Green infrastructure (GI) is increasingly recognized as a key factor in promoting urban sustainability and enhancing well-being. Ko and Lee (2021) examined GI's effectiveness in improving social welfare through a Social Well-being Index. Using a random forest regressor, they identified significant links between GI types and variables such as population, employment rate, and air pollution, highlighting regional differences in GI's impact on social well-being. Similarly, Venkataramanan et al. (2019) reviewed the health and social well-being outcomes of GI in stormwater and flood management. While direct links between GI and physical or mental health outcomes remain limited, they found positive economic effects, such as higher property values, and noted mixed public perceptions of GI. Their findings stress the need for interdisciplinary research to better connect infrastructure design with tangible human outcomes. Both studies highlight the role of environmental quality in urban planning. For instance, poor air quality is linked to respiratory diseases and reduced life expectancy, negatively impacting social well-being. Well-planned infrastructure addressing these environmental challenges can play a crucial role in improving urban residents' quality of life.

Infrastructure plays a critical role in shaping social well-being by influencing various aspects of daily life, health, and overall quality of life. The built environment, which includes transportation systems, utilities, housing, and public spaces, directly affects individuals' physical and mental health, social interactions, and economic opportunities. Infrastructure development also influences economic opportunities and equity. Efficient transportation systems, for example, provide better access to jobs, education, and services, which can reduce socioeconomic disparities. However, inequitable infrastructure investment can exacerbate social inequalities, as marginalised communities may have less access to high-quality infrastructure and services (Ewing & Hamidi, 2015).

Infrastructure resilience to environmental challenges like climate change and natural disasters is another crucial aspect of social well-being. Resilient infrastructure can protect communities from the adverse effects of these challenges, ensuring continuity in essential services and enhancing community stability (Ahern, 2011).

In Kazakhstan, social well-being is analyzed to assess the population's quality of life by region (Kireyeva et al., 2023). The relationship between economic growth and income inequality remains a key issue in economic research, with significant implications for policy and regional development. Temerbulatova et al. (2024) provide a comprehensive analysis of this relationship, examining both the effects of economic growth on income inequality and vice versa across Kazakhstan's regions. Notably, Kazakhstan has not previously conducted integrated studies on its population's social well-being.

While various approaches to assessing social well-being provide valuable insights, they share critical limitations. Models that focus on income, social spending, and individual well-being often overlook environmental factors essential for long-term sustainability. Regional models and experimental forecasting methods rely on accurate data, which can lead to inaccuracies or gaps. Furthermore, many methods struggle with scalability when applying individual-level findings to broader or international contexts. To enhance their ef-

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Table 1

Indices of assessing social well-being: methods, indicators, and features

Index and disciplines	Method and indicators	Critique and features
Social Progress Index (SPI) Sociology, economics, healthcare, ecology	Measures social development across three categories: basic human needs, foundations of well-being, and opportunity. Utilizes 54 indicators categorized accordingly from statistical data and surveys. Indicators include basic needs (nutrition, water, housing, safety), well-being (education, health, environment), and opportunities (rights, freedom, tolerance).	egional adaptation helps identify strengths and weaknesses of regions, but measuring all parameters is labor-intensive (Charles & D'Alessio, 2020)
Genuine Progress Indicator (GPI) Economics, ecology, social sciences	Expands GDP by incorporating environmental and social costs and benefits. Calculated by subtracting negative factors (environmental and social) from growth indicators. Metrics include consumer spending, income inequality, water pollution, resource depletion, crime rates, volunteer work, healthcare, and education.	Including environmental and social costs makes the GPI more comprehensive, but it can be complex for international comparisons (Long & Ji, 2019)
Global Liveability Index (GLI) Urban studies, economics, sociology	Measures city livability using criteria like stability, healthcare, culture, environment, and education. Scores cities based on quantitative and qualitative data. Metrics include healthcare access, crime rates, education quality, and infrastructure.	Focuses primarily on urban centers, underrepresenting rural or smaller regions, which limits global applicability (EIU, 2024)
Better Life Index (BLI) Economics, sociology, public health	Developed by the OECD, it assesses well-being based on factors like housing, income, jobs, community, education, environment, civic engagement, and health. Data is drawn from a mix of survey responses and economic statistics.	Offers a user-driven approach to well-being measurement, but subjective weights complicate cross-country comparisons (OECD, 2021)
Quality of Life Index (QoL) Sociology, economics, ecology	Assesses well-being through multiple dimensions such as health, working conditions, and socio-economic environment. Based on survey data and statistical indicators. Metrics include socio-economic conditions, labor environment, economic status, and healthcare.	Provides a comprehensive analysis with multiple factors, though cross-country comparisons may remain challenging (Dermatis et al., 2024)

Source: compiled by the authors

fectiveness, future indices should tackle these issues by integrating environmental factors, enhancing data reliability, and creating scalable frameworks.

Indices for assessing social well-being focus on dimensions such as basic needs, economic growth, environmental sustainability, and subjective life satisfaction. The Social Progress Index (SPI)[1] and Quality of Life Index (QoL)[2] measure well-being through health, economic, and social indicators, though they can be resource-intensive and difficult to compare across regions. The Genuine Progress Indicator (GPI) emphasizes the inclusion of environmental and social costs, but face challenges in data availability and international applicability[3]. The Global Liveability Index (GLI) focuses on urban factors like healthcare, stability, and infrastructure, but its focus on cities limits its broader application[4]. The Better Life Index (BLI) emphasizes subjective life satisfaction and well-being across various dimensions like income and housing but can be difficult to standardize for global comparison due to user-driven customization[5]. While these indices offer valuable insights, they are constrained by data limitations, complexity, and scalability issues. A comparative assessment of these indices, including their disciplines, methods, indicators, and limitations, is presented in Table 1.

[1] Social Progress Imperative. Available at: https://www.socialprogress.org/ (Date of access: November 3, 2024)

[2] Numbeo. Available at: https://www.numbeo.com/quality-of-life/rankings_by_country.jsp (Date of access: November 3, 2024)

[3] Recipes for Wellbeing. Available at: https://www.recipes-forwellbeing.org/genuine-progress-indicator/ (Date of access: November 3, 2024)

[4] Economist Intelligence Unit. Available at: https://www.eiu.com/n/campaigns/global-liveability-index-2023/ (Date of access: November 3, 2024)

[5] OECD Better Life Index. Available at: https://www.oecdbetterlifeindex.org/ (Date of access: November 3, 2024)

Online ISSN 2412-0731

A comparison of various indices shows that, while some of these indices incorporate environmental and social costs, their practical utility is limited by a lack of standardization and challenges in comparing data across regions and countries. Many indices are region-specific, which makes generalization or international application challenging. The absence of comprehensive data on critical factors, such as environmental sustainability, further restricts our understanding of the relationship between social well-being, economic growth, and infrastructure development.

Additionally, subjective well-being measures, while useful for capturing individual perceptions, often overlook broader societal issues, like income inequality or environmental degradation, reducing the scope of some indices. To enhance their effectiveness, these indices need to address challenges related to data availability, simplify complex calculations, and integrate more comprehensive metrics that account for the interconnection between social, economic, and environmental factors.

In summary, social well-being is a multifaceted concept that encompasses personal, social, and work-related dimensions. It is part of a broader shift toward including diverse factors in measuring well-being and sustainable development. When selecting an approach for measuring social well-being, it's important to consider the economy's maturity (developed or developing) and local community conditions.

Social well-being reflects the efficiency and quality of the social system, as well as the competency of authorities in managing socio-economic processes. As our literature review has shown, assessment of social well-being at the regional level should include not only macroeconomic indicators but also social, infrastructural, and environmental factors.

Methods and data

Data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of Kazakhstan were used to analyze the social well-being across the country's regions. These data were analyzed using descriptive statistics and index methods. As shown in Figure 1, constructing the National Social Well-Being Index (NSWI) involved five stages of research.

1. The following indicators proposed by experts were included in the NSWI: Investments in Fixed Assets, Fund Coefficient (the ratio of the wealthiest 10% to the poorest 10%), Life Expectancy at Birth, and Length of Public Paved Roads. However, statistical data for the following indicators over the past five years could not be found: population indebtedness, levels of alcoholism and drug addiction, corruption (registered criminal corruption offenses), and suicidality (mortality from suicides).

2. To determine the significance level of each indicator, assessments were conducted by 45 experts using the Likert scale (June-July 2023). The experts were academics specializing in socio-economic development issues in Kazakhstan's regions. Consistency of responses was checked using Cronbach's Alpha coefficient in SPSS 25, revealing an average score of 0.88. This indicates a high level of agreement among experts regarding the significance of these factors, with environmental and social aspects receiving the most emphasis. The weighting coefficients of the indicators were calculated using formula (1):

$$m_i = \frac{1}{n}\sum_{i=1}^{n}\frac{h_{ix}}{\sum_{x=1}^{k} h_{ix}}, \quad (1)$$

where m_i is the weight coefficient of the i-th indicator; n is the number of indicators; h is the assessment of the expert on indicator i.

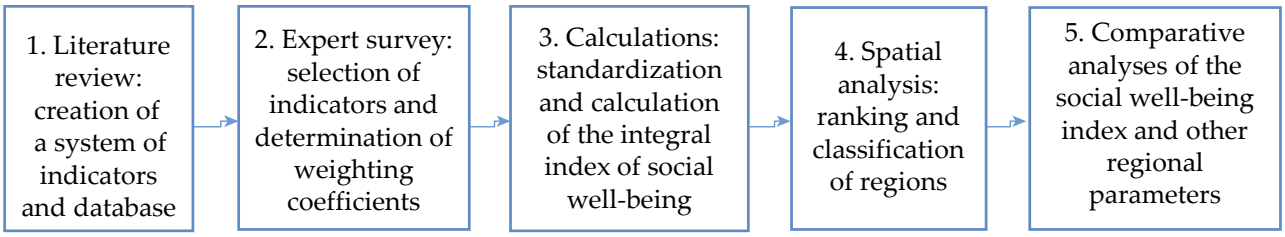

Figure 1. *Methodology for constructing the National Social Well-Being Index*

Source: compiled by the authors.

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Drawing on expert evaluations, we assigned weighting coefficients to each parameter. The highest coefficient (0.039) was given to Gross Regional Product per Capita and Maternal Mortality Rate (per 100,000 births), indicating their perceived significance by the experts. In contrast, the lowest coefficient (0.030) was assigned to the Overall Divorce Rate in Kazakhstan, suggesting it was considered less important or exhibited more variability in expert assessments. Other indicators, such as Investments in Fixed Capital, Enrollment Rates in Education (preschool and secondary), Infant Mortality, and Satisfaction with the Quality of Drinking Water, received a coefficient of 0.037, reflecting a consistent level of importance. Additionally, key parameters like Poverty Depth, Emissions of Pollutants (air, liquid, solid), and Life Expectancy showed coefficients around 0.036, demonstrating a stable evaluation across these areas. Detailed coefficients for each indicator are provided in Annex 1.

3. Furthermore, the collected statistical data were standardized using linear scaling, a method commonly employed in international practice, such as in the calculation of the UN Human Development Index. Data standardization was carried out using formulas (2) and (3), depending on whether the indicator positively or negatively impacts social well-being:

$$I_k = \frac{x - x_{\min}}{x_{\max} - x_{\min}} \quad I_k = 1 - \frac{x - x_{\min}}{x_{\max} - x_{\min}}, \qquad (2)$$

where I_k is value of the private index of the region's well-being, x is the estimated indicator, $x_{\max}$, $x_{\min}$ are the reference points (maximum and minimum values of the indicator for the period under study).

The same standardisation techniques were used to investigate and evaluate the status of sustainable development of selected Chinese provinces (Cai et al., 2023).

The weighting coefficients of the parameters were considered to determine the final index of social well-being for the regions. The calculated indices for each indicator are multiplied by their respective weighting coefficients, and the sum of the values for the economy, standard of living, education, health care, migration, environment, and infrastructure are used to determine the final index according to formula:

$$ISW = \sum_{i=7}^{n} I_i \cdot m_i, \qquad (3)$$

where ISW is the integral index of social well-being, I is the index for the i-parameter, m is the weight coefficient for parameter i.

4. After calculating the regional indices of social well-being, the regions were ranked based on the average index value using the following scale: 0.42–0.46 (low index), 0.47–0.49 (medium index), and 0.50–0.55 (high index). This scale was developed by dividing the range between the highest and lowest index values into three groups.

5. Finally, the regional values of the NSWI were analyzed in relation to regional parameters, such as population and economic structure, particularly the share of the mining industry in GRP, to test the hypothesis.

Results

Building on our literature review, we propose an Adaptive National Social Well-Being Index. Indicators from the National Statistics Bureau, along with those recommended by experts in the survey, were categorized into economic, living standards, education, healthcare, migration, environmental, and infrastructure factors (Table 2).

The final indicators of the National Social Well-Being Index (NSWI) consist of 28 metrics, organized into seven categories. The key parameters and indicators for Kazakhstan's regions are listed in Table 2. Data for these indicators, covering the period from 2018 to 2022, were sourced from the Bureau of National Statistics of Kazakhstan.

To provide an objective measure of social well-being and track regional development, calculations were conducted for 2018–2022 (see Table 3 below). The analysis of the social well-being index reveals significant regional disparities. On average, the highest index values were found in Atyrau region (0.54) and Astana city (0.55), reflecting a high level of social well-being. In contrast, Karaganda (0.42) and Pavlodar regions (0.43) recorded the lowest values, indicating lower levels of well-being. Notably, some regions, such as Aktobe, experienced sharp fluctuations in the index, with a significant drop to 0.30 in 2020, suggesting potential temporary economic or social challenges.

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Table 2

Main parameters and indicators of the National Index of Social Well-Being of Regions

Parameter	Indicator and Scale
Economic	Gross Regional Product per Capita, million tenge; Investments in Fixed Assets*, million tenge; Growth Rate of Average Per Capita Nominal Cash Income, %; Self-Employed in Unproductive Activities, number of people; Employees, number of people
Living Standard	Index of Real Cash Income (as a percentage of the corresponding period of the previous year); Share of Population with Income Below Subsistence Minimum, %; Fund Coefficient (ratio of the wealthiest 10% to the poorest 10%), times*; Poverty Depth, Life Expectancy at Birth, years*
Education	Gross Enrollment Ratio in Preschool Education; Gross Enrollment Ratio in Secondary Education; Gross Enrollment Ratio in Higher Education
Healthcare	Maternal Mortality Ratio (per 100,000 live births); General Mortality Rate (per 1000 people); Infant Mortality Rate (per 1,000 live births)
Migration	Crime Rate per 10,000 population; General Divorce Rate in Kazakhstan; Net Internal/External Migration Balance in Kazakhstan
Ecology	Emissions of Atmospheric Pollutants from Stationary Sources per Capita (without treatment); Emissions of Liquid and Gaseous Pollutants per Capita (without treatment); Emissions of Solid Pollutants per Capita (without treatment); Utilized Pollutants; Respondents' Satisfaction with Air Cleanliness (absence of emissions, smoke, dust, and dirt), based on a survey of the Bureau of National Statistics of Kazakhstan
Infrastructure	Length of Public Paved Roads per 1,000 square kilometres*; Respondents' Satisfaction with Drinking Water Quality, based on a survey of the Bureau of National Statistics of Kazakhstan; Level of Digital Literacy, %; Number of Fixed Internet Subscribers, thousand units

* These indicators were chosen following expert evaluation.

Source: compiled by the authors

Table 3

National Social Well-being Index of Kazakhstan's regions and its average value, 2018–2022

Region/year	2018	2019	2020	2021	2022	Average Index
Akmola	0,46	0,45	0,41	0,46	0,45	0,44
Aktobe	0,52	0,52	0,30	0,51	0,45	0,46
Almaty	0,49	0,50	0,38	0,55	0,51	0,49
Atyrau	0,59	0,57	0,37	0,57	0,61	0,54
West Kazakhstan	0,58	0,56	0,31	0,48	0,55	0,50
Zhambyl	0,52	0,48	0,37	0,44	0,49	0,46
Karaganda	0,42	0,37	0,49	0,43	0,39	0,42
Kostanay	0,44	0,43	0,39	0,49	0,49	0,45
Kyzylorda	0,48	0,51	0,30	0,48	0,60	0,47
Mangystau	0,46	0,51	0,30	0,35	0,53	0,43
Pavlodar	0,41	0,41	0,53	0,42	0,38	0,43
North Kazakhstan	0,46	0,47	0,34	0,49	0,58	0,47
Turkestan	0,48	0,57	0,43	0,42	0,47	0,47
East Kazakhstan	0,54	0,48	0,42	0,60	0,56	0,52
Astana city	0,57	0,61	0,44	0,56	0,57	0,55
Almaty city	0,57	0,57	0,46	0,58	0,52	0,54
Shymkent city	0,56	0,59	0,34	0,39	0,36	0,45
Mean	0,50	0,51	0,39	0,48	0,50	0,48

Source: Authors' calculations.

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Table 4

Grouping of regions by average values of the National Social Well-Being Index for 2018–2022

Group of Regions	Regions (Indices)
Regions with high NSWI	Astana City (0.55); Almaty City (0.54); Atyrau (0.54); East Kazakhstan (0.52); West Kazakhstan (0.50)
Regions with medium NSWI	Almaty (0.49); North Kazakhstan (0.47); Turkestan (0.47); Kyzylorda (0.47)
Regions with low NSWI	Aktobe (0.46); Zhambyl (0.46); Shymkent City (0.45); Kostanay (0.45); Akmola (0.44), Pavlodar (0.43); Mangystau (0.43); Karaganda (0.42)

Source: Compiled by the authors

Excluding the decline in the index during the 2020–2021 COVID-19 pandemic, regions such as Atyrau, Mangystau, North Kazakhstan, Kostanay, Almaty, and East Kazakhstan have shown stable growth in the NSWI. In contrast, regions like Shymkent, Almaty city, Aktobe, Pavlodar, and Akmola have experienced negative trends in their indicators, highlighting the need for additional measures to improve social and economic stability. It was observed that all regions saw a drop in the NSWI in 2020, primarily due to the global impact of the COVID-19 pandemic, which halted economic activity. However, by 2021, most regions had recovered quickly, with the only exception of Turkestan region, which showed a slow recovery compared to the others, possibly due to its larger population and higher population density.

This study categorizes regions into three groups based on their average NSWI scores: high (0.50–0.55), average (0.46–0.49), and low (0.42–0.46). The scaling of the National Social Well-Being Index (Table 3) shows that, apart from Astana and Almaty, only three regions—Atyrau, East Kazakhstan, and West Kazakhstan—achieve high NSWI values. Table 4 presents the grouping of regions by the average NSWI for 2018–2022. High social well-being regions, such as Astana, Almaty, Atyrau, East Kazakhstan, and West Kazakhstan, demonstrate strong economic activity and investment potential. Regions with average social well-being, including Almaty, North Kazakhstan, Turkestan, and Kyzylorda, have shown stable growth and investment in social sectors. Conversely, regions with low social well-being, such

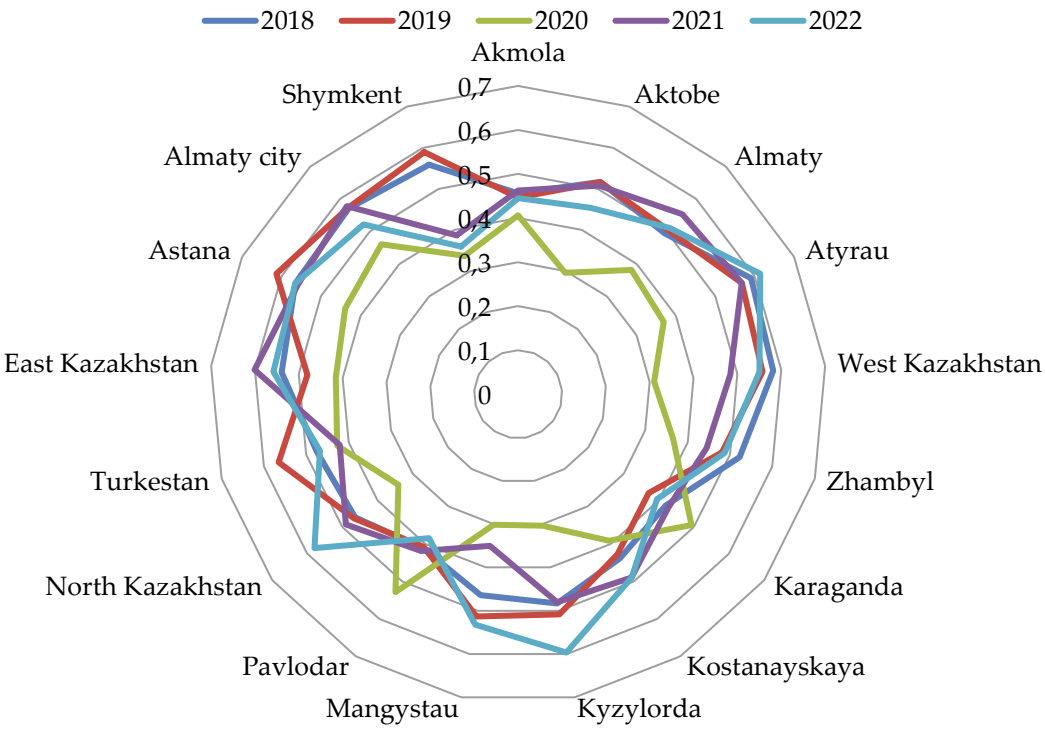

Figure 2. *Regions of Kazakhstan by the Social Well-Being Index in 2018–2022.*
Source: Authors' calculations.

Online ISSN 2412-0731

as Aktobe, Kostanay, Akmola, Zhambyl, Pavlodar, Mangistau, Karaganda, and Shymkent, require targeted interventions to improve their socio-economic conditions.

The situation remained largely unchanged in several regions throughout the whole given period (2018–2022) (Figure 2). It is important to note that the NSWI reached its lowest point in 2020 across nearly all regions due to the COVID-19 pandemic.

Values of the NSWI subindicators for 2022 are essential for analyses of the current situation in the regions of Kazakhstan (Annex 2). They reflect key socio-economic dimensions through the following subindicators:

Economic Indicators: The highest economic score is in Atyrau (0.74), reflecting its strong economic base due to oil production. Mangistau (0.49) and Pavlodar (0.44) also rank high, likely due to their industrial bases. The lowest economic score is in Almaty region (0.22), suggesting challenges despite its importance as a financial hub.

Life Quality Indicators: Atyrau (0.89) and Zhambyl (0.72) rank highest in life quality, indicating better access to services, social stability, and living conditions. Karaganda (0.53) and Turkestan (0.53) are in the middle, while Akmola (0.40) and Astana (0.42) show lower scores.

Education Indicators: North-Kazakhstan (0.96) stands out with a remarkably high score in education, which may indicate a focus on educational resources and infrastructure. Regions like Karaganda (0.20) and Turkestan (0.10) score quite low, highlighting challenges in educational access and quality.

Healthcare Indicators: Almaty city (0.87) and East-Kazakhstan (0.75) demonstrate strong healthcare systems, while North-Kazakhstan (0.12) and Astana (0.27) lag significantly behind, suggesting healthcare access and quality concerns.

Migration: Shymkent city (0.72) and West-Kazakhstan (0.58) have high migration scores, which may be tied to economic opportunities and living conditions attracting more residents. Kostanai (0.25) and Pavlodar (0.23) show lower migration rates, indicating less population movement or attractiveness.

Environmental Indicators: Kyzylorda (0.99) and Atyrau (0.83) have the highest scores for environmental indicators, possibly due to effective environmental policies or lower industrial pollution. Pavlodar (0.31) and Karaganda (0.38) have some of the lowest scores, likely reflecting environmental challenges related to heavy industries.

Infrastructure Indicators: Astana city (0.72) and Karaganda (0.68) lead in infrastructure, demonstrating strong transportation, energy, and urban infrastructure. Turkestan (0.33) and Pavlodar (0.29) score lower, indicating weaker infrastructure development.

This analysis highlights regional disparities in Kazakhstan, with some regions excelling in specific areas but facing significant challenges in others. Atyrau leads in economic strength and quality of life but struggles with infrastructure; Pavlodar performs well in education but faces environmental and infrastructure issues; North Kazakhstan excels in education but underperforms in healthcare and migration; and the cities of Astana, Almaty, and Shymkent show mixed results, excelling in infrastructure and healthcare but needing improvements in economic and environmental areas.

The specialization of regions and their contributions to the national economy are closely linked to the socio-economic development of these areas, influencing the social well-being of their residents. While the mining sector plays a crucial role in regional economic indicators, its impact on social well-being remains unclear. To test this hypothesis, we compare the regions' NSWI with the share of the mining industry in their GRP (Table 5).

This table provides an overview of various regions in Kazakhstan, comparing their economic indicators and NSWI across different sectors. Atyrau (0.55) is dominated by mining (38.4%), with small contributions from agriculture (1%) and moderate manufacturing (5.3%). The region's high NSWI is driven by wealth from the oil and gas industry, despite limited diversification. East Kazakhstan (0.52) has a more balanced economy, with mining (15.1%), agriculture (8.9%), and significant manufacturing (23%), supporting a stable and high NSWI. West Kazakhstan (0.50), another resource-rich area, relies heavily on mining (38.9%) but has smaller agricultural and manufacturing sectors, contributing to relatively high social well-being.

Almaty region is largely dependent on agriculture (15.8%) and manufacturing (24.3%), with little mining activity, resulting in moderate social well-being. Kyzylorda (0.47) also depends on mining (21.3%), agriculture (6%), and manufacturing (6.1%), but its focus on primary sectors limits higher NSWI scores. In North Kazakhstan

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Table 5

Economic profile of regions of Kazakhstan in 2022

Regions	Primary sector, 2022		Secondary sector, 2022	Average NSWI for 2018-2022
	Mining industry, % in GRP	Agricultural industry, % in GRP	Manufacturing industry, % in GRP	
NSWI – 0,5–0.55 (high)				
1. Astana City	–	–	16,8	0,55
2. Atyrau	38,4	1	5,3	0,54
3. Almaty City	–	–	7,9	0,54
4. East Kazakhstan	15,1	8,9	23	0,52
5. West Kazakhstan	38,9	4,2	4,9	0,5
NSWI – 0.47–0.49 (medium)				
6. Almaty	0,3	15,8	24,3	0,49
7. Kyzylorda	21,3	6	6,1	0,47
8. North Kazakhstan	7,5	18,7	8	0,47
9. Turkestan	8,8	6	29	0,47
NSWI – 0.42–0.46 (low)				
11. Aktobe	19,9	6,2	11,8	0,46
10. Zhambyl	2,9	11,2	15,1	0,46
12. Kostanay	12,5	12,5	19,5	0,45
13. Shymkent City	0,04	–	25,7%	0,45
14. Akmola	3,9	16,5	24,3	0,44
15. Pavlodar	0,2	27,9	10,6	0,43
16. Mangystau	44,5	0,8	4,4	0,43
17. Karaganda	13,1	3,8	31,4	0,42

Source: Compiled by the authors

(0.47), agriculture (18.7%) dominates, while mining (7.5%) and manufacturing (8%) contribute less, leading to moderate social well-being. Turkestan (0.48) benefits from strong manufacturing (29%) but faces challenges in other areas, giving it a medium NSWI.

Aktobe (0.46) relies on mining (19.9%), agriculture (6.2%), and manufacturing (11.8%), but its lower NSWI reflects challenges in economic or social infrastructure. Zhambyl (0.46) has a balanced industrial base with agriculture (11.2%) and manufacturing (15.1%) as key sectors, while mining plays a minor role (2.9%), contributing to moderate social well-being. Kostanay (0.45) is fairly diversified with agriculture (12.5%) and manufacturing (19.5%) but faces socio-economic challenges, resulting in a lower NSWI.

Akmola (0.45) benefits from developed agriculture (16.5%) and manufacturing (24.3%), but struggles with low social well-being, possibly due to infrastructure or public service issues. Pavlodar (0.43) is heavily focused on agriculture (27.9%) with limited manufacturing (10.6%) and minimal mining, which affects its NSWI. Mangystau (0.43), dominated by mining (44.5%), has low diversification into agriculture (0.8%) and manufacturing (4.4%), keeping its NSWI low despite mining's economic output. Karaganda (0.42), reliant on manufacturing (31.4%) and mining (13.1%), faces socio-economic challenges linked to an over-reliance on these industries, leading to a lower NSWI.

Thus, our analysis has refuted the initial hypothesis, which suggested that regions with a large share of mining in their GRP would have a higher NSWI. While resource-rich regions like Atyrau and West Kazakhstan score higher due to the economic strength derived from mining, despite limited diversification, regions with a more balanced industrial structure, such as East Kazakhstan and Almaty, tend to have higher NSWI. This highlights the benefits of industrial diversification. In conclusion, regions with strong industrial bases and economic diversification sup-

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port higher social well-being, while areas overly reliant on a single sector, such as mining or agriculture, tend to have lower NSWI scores. For instance, agriculture-dependent regions like Pavlodar and North Kazakhstan exhibit lower NSWI, reflecting the limitations of economies dominated by agriculture with less industrial or mining activity.

Discussion

The findings of this study, along with previous research, contribute to the understanding of regional social well-being by emphasizing the role of various factors in improving community welfare. Assessing social well-being is complex, highlighting the need for a systematic approach to understand its dynamic nature and impact on quality of life (Greblikaitė et al., 2018). Our study revealed significant regional variations in Kazakhstan's social well-being, with NSWI ranging from 0.42 in Karaganda (lowest) to 0.55 in Astana city (highest). These disparities are linked to differing economic activities, investment policies, and socioeconomic conditions. The results support the need for targeted economic and social programs to address regional inequalities in well-being. Additionally, the relevance of monetary policy strategy for human resource development is affirmed by earlier research (Kurniasih, 2023). The research by Pérez et al. (2024) provides valuable insights into the interplay between social programs, socioeconomic variables, and poverty. While social programs offer temporary relief, their long-term impact on poverty reduction is limited. Investments in education, infrastructure, and economic stability are essential for creating sustainable solutions to poverty. Access to education and healthcare services emerged as critical factors in improving social well-being and reducing poverty. Higher education correlates with better job opportunities and income levels, reducing poverty risk. Comprehensive policies focused on improving educational outcomes and healthcare access can significantly reduce poverty in the regions (Pérez et al., 2024).

Economic growth does not necessarily lead to high social welfare, as exemplified by regions with high GRP but low social well-being indices, such as Pavlodar and Karaganda regions. This underscores the necessity for more equitable resource distribution and improved social services.

Conclusions

The adapted National Social Well-Being Index (NSWI) for Kazakhstan serves as a comprehensive tool for evaluating regional disparities in social and economic conditions. This index is constructed using 28 indicators across seven parameters, including economic performance, living standards, education, healthcare, migration, environmental quality, and infrastructure. The findings from 2018 to 2022 highlight significant regional differences: Atyrau and Astana consistently rank highest in NSWI values due to robust economic activity and investment appeal, whereas regions like Karaganda and Pavlodar exhibit lower scores, indicative of persistent economic and social challenges.

Our analysis brings to light a clear trend: regions with diversified economies, like East Kazakhstan and Almaty, tend to have higher social well-being, while those dependent on a single sector, particularly mining or agriculture, show lower scores. Resource-rich regions, such as Atyrau and West Kazakhstan, achieve high NSWI scores due to strong oil and gas industries, but their lack of diversification limits broader social progress. In contrast, regions like Aktobe and Pavlodar, with lower NSWI scores, face challenges from reliance on a narrow economic base, impacting infrastructure, social services, and environmental quality.

Economic diversification, especially in the industrial sector, is key to improving social well-being. Regions in Kazakhstan affected by the COVID-19 pandemic saw significant drops in their NSWI scores in 2020, but most recovered quickly by 2021. The NSWI framework serves as a valuable policy tool to identify areas needing targeted interventions for greater social and economic stability. The study highlights the importance of equitable resource distribution and investment in social infrastructure, healthcare, and environmental protection, particularly in industrial or remote areas. Addressing social well-being disparities requires tailored policies to promote balanced and inclusive growth across Kazakhstan.

Nonetheless, the study has certain limitations, including data availability and quality, reporting inconsistencies, and subjective expert weighting, all of which could influence the accuracy of the index. A static index may also fall short of capturing the dynamic aspects of social well-being, and there might be a delay between policy implemen-

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tation and observable outcomes. Future research should strive to refine indicators, integrate more comprehensive data, and investigate the complex interactions shaping social well-being.

In summary, while some regions have made progress in social well-being, significant disparities remain. Policymakers must address these challenges with targeted interventions to promote equitable development, ensuring all regions contribute to Kazakhstan's prosperity and resilience. To reduce regional disparities, focused programs and investments are needed to improve living standards in less developed areas. High-performing regions can serve as models for balanced socioeconomic growth, guiding improvements in lower-performing regions.

Appendix 1

Weighting coefficients of the indicators of the National Index of Social Well-Being

№	Indicators	Weighting coefficients
1	Gross regional product per capita	0,039
2	Investments in fixed capital	0,037
3	Growth rate of average per capita nominal monetary income of the population	0,037
4	Self-employed workers, number of people (productively/unproductively employed)	0,036
5	Employees, number of people	0,033
6	Real monetary income index (in % of the corresponding period of the previous year)	0,037
7	Share of population with incomes below the subsistence minimum	0,038
8	Ratio of funds between the top 10% and bottom 10% of the population, times	0,032
9	Poverty depth	0,036
10	Gross enrollment rate of children in preschool education and training	0,037
11	Gross enrollment rate of secondary education	0,037
12	Gross enrollment rate of higher education	0,036
13	Maternal mortality rate (per 100,000 births)	0,039
14	Overall mortality rate (per 1,000 people)	0,037
15	Infant mortality rate (per 1,000 births)	0,037
16	Life expectancy at birth	0,036
17	Crime rate*per 10,000 population	0,036
18	Overall divorce rate in Kazakhstan	0,030
19	Balance of internal/external migration of the population in Kazakhstan	0,033
20	Emissions of air pollutants from stationary sources, per capita (without purification)	0,036
21	Emissions of liquid and gaseous pollutants, per capita (without purification)	0,035
22	Emissions of solid pollutants, per capita (without purification)	0,036
23	Disposed of pollutants	0,034
24	Respondents' opinions on satisfaction with air purity (absence of emissions, smoke, dust and dirt)	0,035
25	Length of public paved roads, kilometers per 1000 square kilometers	0,036
26	Respondents' satisfaction with the quality of drinking water	0,037
27	Proportion of housing with water supply, %	0,036
28	Number of fixed-line Internet subscribers, thousand units	0,034
	Total	1,000

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Appendix 2

Sub-indices of the National Index of Social Well-Being in the regions of Kazakhstan for 2022

Region	1.Economy	2.Life quality	3.Education	4.Healthcare	5.Migration	6.Environment	7.Infrastructure
Akmola	0,34	0,40	0,40	0,52	0,38	0,65	0,37
Aktobe	0,38	0,57	0,28	0,53	0,41	0,59	0,50
Almaty	0,22	0,65	0,41	0,39	0,42	0,74	0,56
Atyrau	0,74	0,89	0,37	0,56	0,48	0,83	0,35
West-Kazakhstan	0,40	0,68	0,39	0,48	0,58	0,70	0,48
Zhambyl	0,38	0,72	0,34	0,61	0,45	0,77	0,35
Karaganda	0,35	0,53	0,20	0,32	0,38	0,38	0,68
Kostanai	0,41	0,68	0,48	0,21	0,25	0,55	0,35
Kyzylorda	0,40	0,76	0,45	0,62	0,36	0,99	0,35
Mangistau	0,49	0,55	0,53	0,73	0,34	0,69	0,30
Pavlodar	0,44	0,69	0,63	0,44	0,23	0,31	0,29
North-Kazakhstan	0,43	0,52	0,96	0,12	0,48	0,62	0,38
East-Kazakhstan	0,41	0,44	0,62	0,75	0,42	0,75	0,34
Astana city	0,40	0,42	0,33	0,27	0,42	0,66	0,72
Almaty city	0,37	0,67	0,40	0,87	0,55	0,73	0,45
Shymkent city	0,40	0,44	0,34	0,74	0,72	0,59	0,60
Turkestan	0,38	0,53	0,10	0,59	0,27	0,74	0,33
Mean	0,41	0,59	0,43	0,51	0,42	0,66	0,44

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Online ISSN 2412-0731

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ARTICLE INFO: received August 18, 2024; accepted November 8, 2024.

ИНФОРМАЦИЯ О СТАТЬЕ: дата поступления 18 августа 2024 г.; дата принятия к печати 8 ноября 2024.

Online ISSN 2412-0731