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RESEARCH ARTICLE

# Socioeconomic Development in Uzbekistan (1990-2023)

# Özbekistan'ın Sosyoekonomik Gelişimi (1990-2023)

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## Öz

*Bu çalışma, Özbekistan'ın 1990–2023 dönemindeki insan gelişimi seyrini diğer Türk Cumhuriyetleri, bölgesel komşular ve Batılı kıstaslarla karşılaştırmalı olarak analiz etmiştir. İnsan Gelişme Endeksi (HDI) ve Küresel Açlık Endeksi (GHI) verilerinin yanı sıra üç farklı Veri Zarflama Analizi (DEA) modelinin kullanıldığı araştırmada, gelişim sonuçlarında hem ilerleme hem de etkinlik düzeyleri değerlendirilmiştir. Bulgular, Özbekistan'ın özellikle 2016 sonrası reformlar sonrasında, artan kaynak mobilizasyonu ve verimlilik artışı sayesinde önemli gelişmeler kaydettiğini ortaya koymuştur. Başlangıçtaki dalgalanmalar ve süregelen bölgesel eşitsizliklere rağmen, yaşam süresi, eğitim, gelir ve gıda güvenliği alanlarındaki sonuçlar istikrarlı şekilde iyileşmiştir. Etkinlik analizi, Özbekistan'ın yalnızca kaynaklarını artırmakla kalmayıp, aynı zamanda bu kaynakları birçok emsaline kıyasla daha verimli kullanmaya başladığını göstermiştir. Bununla birlikte, 2023 yılında gözlenen ılımlı etkinlik gerilemesi, politika alanında yeniden müdahale gerektiren zayıf noktaları işaret etmektedir. Çalışma, Özbekistan'ın insan gelişimi hedeflerini sistemik reformlarla bütünleştirme konusunda yükselen bir bölgesel model olma potansiyelini vurgulamakta ve bu başarıların sürdürülebilmesi için politika önerileri sunmaktadır.*

**Anahtar Kelimeler:** *Sosyoekonomik Kalkınma, İktisadi Etkinlik Analizi, Veri Zarflama Analizi, İnsani Gelişim İndeksi, Küresel Açlık İndeksi*

## Abstract

*This study analyzed Uzbekistan's human development trajectory compared to other Turkic republics, regional neighbors, and Western benchmarks from 1990 to 2023. Employing the Human Development Index (HDI) and Global Hunger Index (GHI) datasets, alongside three variations of Data Envelopment Analysis (DEA), the research assessed both progress and efficiency in achieving development outcomes. The findings demonstrated that Uzbekistan achieved significant improvements, particularly following 2016 reforms, driven by both increased resource mobilization and enhanced productivity. Despite initial volatility and persistent regional disparities, Uzbekistan's outcomes in life expectancy, education, income, and food security have steadily improved. Efficiency analysis revealed that Uzbekistan not only expanded its resources but also increasingly utilized them more effectively than many of its peers. Nevertheless, a moderate resurgence of inefficiencies in 2023 signals areas requiring renewed policy attention. The study highlights Uzbekistan's emerging role as a regional model in integrating human development goals with systemic reforms and offers policy recommendations to sustain these achievements.*

**Keywords:** *Socioeconomic Development, Economic Efficiency Analysis, Data Envelopment Analysis, Human Development Index, Global Hunger Index.*

## 1. Introduction

Following the collapse of the Soviet Union on December 26, 1991 (Marples, 2016), fifteen independent states emerged (Smith, 2024), five of which are Turkic republics: Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Turkmenistan. Together with Turkey, these nations form a culturally and linguistically connected bloc, which by 2023 had a combined population of approximately 170 million (World Population Review, 2024) and a total land area of 4.73 million km² (Worldometer, 2024a). This grouping of states, increasingly visible on the global economic stage (see Table 1), reached a total nominal Gross National Product (GNP) of $1.34 trillion by the end of 2022. When adjusted for purchasing power parity (PPP), this figure increases to $4.32 trillion, approaching the economic scale of Germany (Worldometer, 2024b; Central Intelligence Agency, 2024). Economically dynamic and institutionally integrated through the formation of the Organization of Turkic States (Özer, 2023), these countries have advanced rapidly since the 1990s.

Uzbekistan stands out among these countries for its ambitious and multidimensional reform agenda launched after 2016 under President Shavkat Mirziyoyev. The country has pursued extensive liberalization policies, targeting key areas such as governance, economic modernization, education, and healthcare (Pomfret, 2019; IMF, 2023). These reforms have had significant effects on human development outcomes, including gradual improvements in the Human Development Index (HDI) and reductions in food insecurity, as captured by the Global Hunger Index (GHI). Scholars have also pointed to notable regional disparities in HDI indicators within Uzbekistan, with rural regions often lagging behind urban centers like Tashkent and Samarkand (ADB, 2011).

This study seeks to summarize, through an analytical and graphical approach, the trajectory of human development in Uzbekistan in comparison with the other Turkic republics from the 1990s to the present day, in addition to five regional neighbors, Russia, Iran, Tajikistan, Armenia, and Georgia, as well as two Western countries, the United States and Germany, to provide a comparative framework grounded in both geographical and historical relevance.

To represent human development, this study employs two major indices. The first is the Human Development Index (HDI), a composite metric developed by the United Nations Development Programme (UNDP, 2023) to assess countries' overall progress beyond mere economic growth. The HDI integrates three key dimensions (Smith & Todaro, 2020):

**1)** Life Expectancy at Birth (LE0): Reflects the average lifespan of a country's citizens and indicates overall public health conditions.
**2)** Education: A composite dimension composed of two factors:
   a. Mean Years of Schooling (mYoS): The average number of years of education received by individuals aged 25 and older.
   b. Expected Years of Schooling (eYoS): The number of years of schooling a child entering the education system can expect to receive.
**3)** Standard of Living (gNIpCpp): Measured by Gross National Income (GNI) per capita, adjusted for purchasing power parity (PPP).

The second index is the Global Hunger Index (GHI), a tool designed to monitor and measure hunger globally. Calculated on a 100-point scale, where lower scores signify better performance, the GHI comprises four dimensions: undernourishment, child wasting, child stunting, and child mortality. Beyond its function as a hunger metric, it also reflects broader challenges such as conflict, inequality, and climate change (Welthungerhilfe & Concern Worldwide, 2024).

This study is organized into four main sections following the introduction. The first section presents a concise literature review on human development in Uzbekistan, focusing on key debates, gaps, and recent findings. The second section explains the methodology and data sources, detailing the construction of the analytical framework and the application of Data Envelopment Analysis (DEA). The third section, divided into three subsections, provides an empirical analysis of trends in the Human Development Index (HDI) and Global Hunger Index (GHI) for Uzbekistan and its comparators, alongside a thorough evaluation of Uzbekistan's outcome efficiency using DEA-based models. Finally, the conclusion synthesizes the key findings, discusses their alignment with the broader literature, offers policy recommendations, and outlines directions for future research.

**Table 1.**
*Main Demographic Indicators for Turkic States (2022)*

| Country | Population | Area | nGNP | pGNP |
|---|---|---|---|---|
| Azerbaijan | 10.336.600 | 86.600 | 79 | 216 |
| Kazakhstan | 20.592.600 | 2.724.900 | 221 | 705 |
| Kyrgyzstan | 7.186.010 | 199.951 | 11 | 45 |
| Uzbekistan | 36.361.900 | 447.400 | 81 | 319 |
| Turkmenistan | 7.494.500 | 488.100 | 46 | 95 |
| Türkiye | 87.473.800 | 783.562 | 906 | 2936 |
| Toplam | 169.445.410 | 4.730.513 | 1.344 | 4.316 |

** World Population Review, Worldometer ve Central Intelligence Agency*

### 1.1 Objectives and Contributions to the Literature

The objectives of this article are fourfold. First, it seeks to evaluate the evolution of human development in Uzbekistan from the 1990s to 2023 by employing Human Development Index (HDI) and Global Hunger Index (GHI) indicators. Second, it aims to compare Uzbekistan's development trajectory with that of other Turkic republics, regional neighbors, and Western benchmarks to contextualize its progress. Third, the study assesses the efficiency of resource utilization in improving human development outcomes through the application of Data Envelopment Analysis (DEA) methodologies. Finally, the article endeavors to offer evidence-based policy recommendations designed to sustain and further enhance Uzbekistan's development performance in the coming years.

This research contributes to the existing literature in several important ways. It provides one of the first comprehensive and comparative assessments of Uzbekistan's human development trajectory in the post-reform era, addressing a significant gap in scholarship. By integrating HDI and GHI data with advanced efficiency modeling through DEA, the study presents a novel analytical framework that evaluates both outcome achievements and resource utilization. Furthermore, it highlights the crucial role of efficiency dynamics in human development, an aspect often overlooked in studies that primarily focus on aggregate outcomes. Lastly, the article offers nuanced, empirically grounded policy recommendations derived from efficiency analysis and comparative regional insights, thereby enhancing its relevance for both academic and policymaking audiences.

### 1.2 Literature Review: Human Development in Uzbekistan

Recent scholarship on human development in Uzbekistan reveals a multifaceted landscape shaped by historical legacies, regional disparities, institutional reforms, and demographic shifts. The literature collectively underscores the significance of human capital, governance, and equitable economic growth as central components of the country's development agenda. In Uzbekistan's case, progress in reducing stunting and undernutrition, once widespread in the early 1990s, has been notable. Governmental and international interventions, including nutrition-specific programs and rural development projects, have played a key role in improving GHI scores (UNICEF, 2022; FAO, 2022). However, seasonal food insecurity and regional variations remain significant challenges, particularly in the autonomous Republic of Karakalpakstan and remote rural provinces (World Bank, 2022).

#### *1.2.1 Regional Disparities and Governance Models*

Regional inequality is a recurring theme across multiple studies. Surkova (2012) highlights stark imbalances between urban and rural areas, attributing these to uneven investment patterns and calling for balanced policy interventions. Echoing this, Nurdinova (2014) identifies persistent disparities in education and healthcare access, particularly disadvantaging rural populations. Similarly, Davletova (2025) emphasizes the underfunding of rural schools and hospitals, proposing performance-based funding and targeted rural investment to close these gaps.

Uzbekistan's post-Soviet development trajectory has diverged from other regional transitions, adopting a cautious, state-led approach often termed the "Uzbek Model." Abdurakhmanov et al. (2016) frame this path as the "Uzbek Puzzle," wherein traditional institutions like mahalla continue to play a vital role in informal social support. The World Bank (2022) critiques the limited dynamism of the private sector and slow productivity growth, advocating for stronger institutions and targeted social spending to address poverty and inequality.

### *1.2.2 Labor Market Dynamics, Education, and Employment Reform*

The transformation of the labor market is a critical aspect of Uzbekistan's human development. The International Labour Organization (ILO, 2021) stresses the importance of formalization and vocational training, especially for women and youth. Mee and Alimdjanova (2001) further illuminate the gendered dimension of labor inequality, revealing that women face higher unemployment and are concentrated in low-paid sectors. Gender disparities in employment are also analyzed by Nurdinova (2013), who compares Uzbekistan with Latvia and stresses the need for targeted policy responses.

Education emerges as a cornerstone of sustainable development in Uzbekistan. Nazarova, Saidkarimova, and Obloqulova (2015) document the evolution of the education system, including curricular reforms and expanded vocational training. Disman and Goyibnazarov (2024) establish a positive correlation between education, health indicators, and economic growth. Medlin and Cave (1964) provide historical context, showing how Soviet-era educational policies transformed Uzbekistan's social fabric. Recent challenges in aligning education with labor market demands are detailed by Davletova (2025), who advocates for integrating vocational training with industry needs.

### *1.2.3 Health, Demographics and Child-Centered Development*

Healthcare improvements, particularly in maternal and child health, are highlighted by Olimov and Fayzullaev (2011), who assess the country's progress toward the Millennium Development Goals. However, they also point out persistent rural-urban disparities. Mee and Alimdjanova (2001) expose health-related gender inequalities, such as high rates of anemia among women. Public funding gaps in healthcare infrastructure are reiterated in Davletova (2025), suggesting increased rural investment and digital upgrades.

UNICEF (2022) foregrounds generational concerns, emphasizing child health, education, and employment opportunities. Their findings call for child-centered policies as a foundation for long-term socioeconomic sustainability. These insights are reinforced by the ILO (2021), which prioritizes youth employment and vocational training, and by Davletova (2025), who highlights the mismatch between training programs and market demands.

### *1.2.4 Human Development Indicators and Policy Integration*

Multiple studies underscore the utility of the Human Development Index (HDI) in assessing progress. Nurdinova (2014) and Disman and Goyibnazarov (2024) use HDI components to empirically demonstrate development trends and propose strategic investments in human capital. Sobirovich (2020) elevates HDI to a philosophical principle, arguing that human well-being is the core of all reforms under President Mirziyoyev's agenda. Pomfret (2019) and Zhunussova et al. (2021) analyze long-term trends and regional convergence, finding slow but steady progress.

Though focused on Kazakhstan, Kozhabaeva, Mukan, and Yelshibayev (2021) offer a methodological template for HDI analysis that reveals structural disparities similar to those in Uzbekistan. Their findings suggest the value of cross-country comparisons in refining policy design for human development across Central Asia.

### *1.2.5 Literature Review Conclusion*

The literature paints a comprehensive picture of human development in Uzbekistan, marked by meaningful progress and persistent challenges. Key policy recommendations include enhancing rural investment, promoting gender equality, aligning education with labor market needs, and integrating traditional institutions into modern governance frameworks. As Uzbekistan continues its reform journey, leveraging HDI, and to a lesser extent, GHI, as both a metric and a guiding principle remains crucial for building a more inclusive and equitable society. Comparative Perspectives, especially with other Turkic and neighboring states appear as particularly useful for comparison and guidance.

## 2. Methodology

As briefly discussed in the introduction, this study utilizes two sets of data: the Human Development Index (HDI) and the Global Hunger Index (GHI). The HDI data spans the period from 1990 to 2022 and covers 13 countries, comprising the 6 Turkic states, 5 regional neighbors, and 2 major Western countries, namely the United States

and Germany. Uzbekistan's HDI performance is assessed comparatively across five subsections: life expectancy at birth (LE0), mean years of schooling (mYoS), expected years of schooling (eYoS), gross national income per capita adjusted for purchasing power (gNIpCpp), and a concluding synthesis. Similarly, the GHI data spans 2000 to 2023 and includes 11 countries (excluding the two Western countries). Uzbekistan's GHI performance is likewise examined across five subsections: undernourishment, wasting, stunting, infant mortality, and a conclusion.

Beyond these comparative and descriptive analyses, the study also includes an efficiency analysis focused on Uzbekistan's GHI performance. We apply three variations of Data Envelopment Analysis (DEA) to evaluate the output-oriented efficiency of Uzbekistan relative to the 10 other countries (excluding the US and Germany) in the GHI dataset from 2000 to 2023. DEA is a non-parametric method that uses mathematical programming to construct a hypothetical production frontier and estimate the relative efficiency of decision-making units (Ray et al., 2015, p. 118). Importantly, undesirable outputs, such as the GHI indicators, can be seamlessly incorporated into the analysis (Färe et al., 1989).

In our model, the four undesirable outputs are the GHI components (undernourishment, wasting, stunting, and infant mortality), while the input is the gross national income per capita adjusted for purchasing power (gNIpCpp). The first and simplest model employed is the radial CCR (Constant Returns to Scale) method, originally proposed by Charnes et al. (1978), which evaluates efficiency by proportionally scaling all inputs. However, our analysis uses the VRS (Variable Returns to Scale) version developed by Banker et al. (1984), to better account for scale inefficiencies. The second model is the slack-based measure (SBM) developed by Tone (2001), which incorporates slacks, output reductions, into the efficiency calculation, thereby providing a more nuanced assessment. The third variation is the non-radial DEA model proposed by Färe et al. (1985), which minimizes each undesirable output independently, without assuming proportionality.

### 2.1. Model Specification

The model evaluates the efficiency of Decision Making Units (DMUs) using one input and four undesirable outputs. It assumes Variable Returns to Scale (VRS), which include convexity, free disposability of inputs and outputs, and feasibility of observations (Banker et al, 1984). The model variables and parameter are given as:

$x_i$: input for DMU i
$y_{ij}$: undesirable output $j \in \{1,2,3,4\}$ for DMU i
$\lambda_k$: intensity variable for peer DMUs k = 1, 2, ..., n
$\beta_{ij}$: proportional reduction in all output j for DMU i

Objective: Maximize $\sum_j \beta_{ij} + \alpha \sum_j (1 - \sum_k \lambda_k y_{kj} / y_{ij})$
Subject to:

$\sum_k \lambda_k x_k \leq x_i$ (input constraint)
$\sum_k \lambda_k y_{kj} \leq (1 - \beta_{ij}) y_{ij}$ for j = 1, 2, 3, 4 (undesirable outputs)
$\sum_k \lambda_k = 1 \ \wedge \ \lambda_k \geq 0$ for all k (VRS convexity constraint)
$\beta_{ij} \geq 0$
$\beta_{ij} = \beta_i \forall j = 1,2,3,4$ (for radial VRS and SBM models)
$\alpha = 0.0001$ for SBM model, $\alpha = 0$ otherwise

### 2.2. Model Interpretation

Our model setup consists of a composite framework that integrates three distinct variations of Data Envelopment Analysis (DEA), all based on a common structure of constraints. Specifically, all three models adopt the first four constraints, while constraints 5 and 6 vary depending on the model employed.

#### *2.2.1 Model 1: Standard VRS (Radial) Model*

This model assumes a constant $\alpha = 0$ and enforces a common efficiency factor across all undesirable outputs, such that $\beta_{ij} = \beta_i \forall j \in \{1,2,3,4\}$. This radial structure implies proportional reductions in all undesirable outputs. A positive $\beta_i$ indicates that each of the four outputs can be reduced by at least $\beta_i$ proportionally. Conversely, $\beta_i = 0$ signifies that the decision-making unit (DMU) is efficient, i.e., at least one of its outputs cannot be reduced further under the VRS assumptions.

#### *2.2.2 Model 2: Slack-Based Measure (SBM) Model*

The SBM model retains the core structure of the radial VRS model, aiming to maximize a common efficiency factor ($\beta_i$), but introduces an added layer of nuance by incorporating proportional output slacks. These slacks are accounted for by adding them to the objective function with a very small positive weight $\alpha$ (e.g., $\alpha = 0.0001$), ensuring that the main focus remains on maximizing $\beta_i$, while encouraging solutions with smaller normalized slacks.

This incorporation of proportional slack terms does not override the primary optimization goal but refines the efficiency estimation. The model therefore still yields the same primary efficiency factor $\beta_i$ as the radial VRS model but evaluates overall efficiency based on the average normalized slack, which captures the average relative reduction potential across all four outputs. The result is an efficiency score that retains the structure of the radial VRS model while also providing a richer diagnostic understanding of individual output inefficiencies.

### *2.2.3 Model 3: Non-Radial VRS Model*

In this version, the assumption of a common efficiency factor is relaxed. Instead, the model introduces output-specific efficiency factors ($\beta_j$) for $j \in \{1,2,3,4\}$, and seeks to maximize their arithmetic average. By doing so, this model implicitly assigns equal weight to each output, unless otherwise specified. Unlike the radial model, which ensures uniform output reduction, the non-radial structure permits differentiated scaling of each undesirable output, enabling greater flexibility in modeling.

One key advantage of this approach is that it allows the incorporation of output-specific preferences or prior knowledge by adjusting the weights of individual $\beta_j$ terms. While we use equal weighting in our application, alternative weighting schemes could reflect varying importance across outputs, leading to different target output levels and efficiency scores. This makes the non-radial model particularly well-suited for contexts where uniform treatment of outputs is not ideal or justifiable.

### *2.2.4 Efficiency Measurement*

A concise summary of the three models is provided in Table 2, which outlines their objective functions, inefficiency metrics, and resulting efficiency scores. While all models share the same underlying structure, they differ in how they treat proportional reductions in undesirable outputs and how they define and measure inefficiency.

**Table 2.**
*Measures of Efficiency by Model*

| Model | Efficiency Factor(s) | Maximization Objective | Inefficiency | Efficiency |
|---|---|---|---|---|
| 1. Radial VRS | $\beta_i$ | $\beta_i$ | $\beta_i$ | $1-\beta_i$ |
| 2. SBM VRS | $\beta_i$ (with slacks) | $\beta_i + \alpha \cdot \sum_j$ (norm. slacks) | $\sum_j\beta_{ij}/4$ | $1-\sum_j\beta_{ij}/4$ |
| 3. Non-Radial VRS | $\beta_{ij}$ for j= 1,…,4 | $\sum_j\beta_{ij}/4$ | $\sum_j\beta_{ij}/4$ | $1-\sum_j\beta_{ij}/4$ |

## 3. Results

This section is organized into three sub-sections. The first sub-section analyzes the evolution of the Human Development Index (HDI) in Uzbekistan between 1990 and 2022. It presents a comparative perspective by examining Uzbekistan's progress alongside other Turkic states, five regional countries (including Iran and Russia), as well as two Western benchmarks: the United States and Germany. The second sub-section explores the trends in the Global Hunger Index (GHI) in Uzbekistan from 2000 to 2023. This part also includes comparative analysis with selected Turkic and regional countries to contextualize Uzbekistan's performance in addressing food insecurity and malnutrition. The final sub-section evaluates the efficiency of Uzbekistan's GHI outcomes using three variations of the Data Envelopment Analysis (DEA) methodology. This methodological approach allows for a nuanced assessment of the country's relative performance, highlighting strengths and weaknesses both across time and in comparison to peer countries.

### 3.1 Evolution of Human Development Index in Uzbekistan, 1990-2022

As shown on Table 3 and Graph 1, Uzbekistan's Human Development Index (HDI) has followed a steady and sustained upward trajectory, rising from approximately 0.62 in 1990 to over 0.72 by 2022. Despite a notable dip around 2000, likely linked to regional economic shocks or internal challenges, Uzbekistan recovered swiftly and has since maintained consistent progress. Compared to Türkiye, Uzbekistan's HDI remains about 0.13 points lower, reflecting a slower pace of development; however, the gap has narrowed somewhat, particularly after 2010.

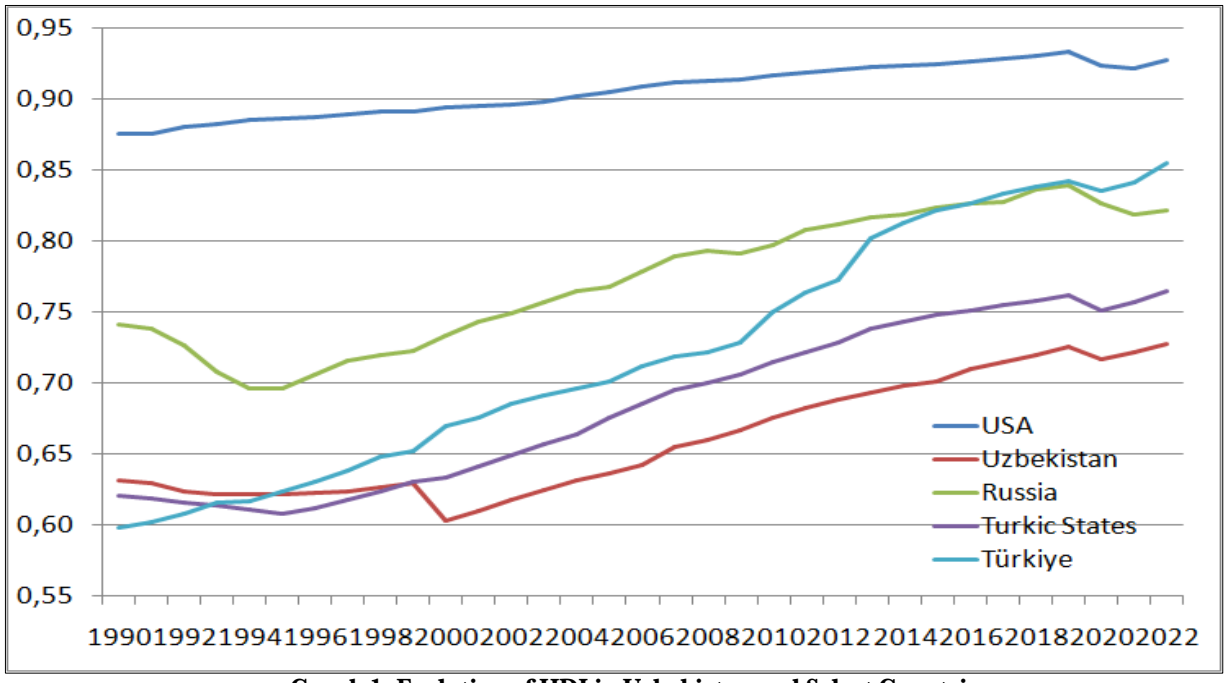
While Uzbekistan lagged behind Russia by around 0.12 points in the early 1990s, it has demonstrated more stable and less volatile growth over time, especially during Russia's period of early transition turbulence. Although still trailing the average of Turkic states, Uzbekistan's HDI trend closely parallels and gradually converges with it, suggesting shared regional dynamics possibly rooted in similar cultural, institutional, or economic structures. While comparisons with the United States are less direct due to differing development baselines, Uzbekistan has nonetheless made meaningful progress in reducing the absolute HDI gap, especially since 2005. The effects of the COVID-19 pandemic are visible across all countries around 2020–2021, yet Uzbekistan's upward trajectory shows only a minor disruption.

**Table 3.**

*Evolution of HDI in Uzbekistan and Select Countries*

| **Country** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** | **2022** |
|---|---|---|---|---|---|---|---|---|
| Armenia | 0,66 | 0,62 | 0,66 | 0,70 | 0,74 | 0,77 | 0,77 | 0,79 |
| Azerbaijan | 0,63 | 0,60 | 0,64 | 0,68 | 0,73 | 0,75 | 0,72 | 0,76 |
| Georgia | 0,71 | 0,67 | 0,69 | 0,74 | 0,76 | 0,80 | 0,81 | 0,81 |
| Germany | 0,83 | 0,86 | 0,89 | 0,92 | 0,93 | 0,94 | 0,95 | 0,95 |
| Iran | 0,61 | 0,66 | 0,69 | 0,73 | 0,76 | 0,78 | 0,78 | 0,78 |
| Kazakhstan | 0,67 | 0,65 | 0,68 | 0,74 | 0,77 | 0,80 | 0,81 | 0,80 |
| Kyrgyzistan | 0,64 | 0,58 | 0,62 | 0,64 | 0,66 | 0,69 | 0,69 | 0,70 |
| Russia | 0,74 | 0,70 | 0,73 | 0,77 | 0,80 | 0,82 | 0,83 | 0,82 |
| Tajikistan | 0,62 | 0,53 | 0,55 | 0,61 | 0,63 | 0,65 | 0,66 | 0,68 |
| Turkic States | 0,62 | 0,61 | 0,63 | 0,68 | 0,71 | 0,75 | 0,75 | 0,76 |
| Turkmenistan | 0,55 | 0,56 | 0,59 | 0,65 | 0,70 | 0,73 | 0,73 | 0,74 |
| Türkiye | 0,60 | 0,62 | 0,67 | 0,70 | 0,75 | 0,82 | 0,84 | 0,86 |
| USA | 0,88 | 0,89 | 0,89 | 0,90 | 0,92 | 0,92 | 0,92 | 0,93 |
| Uzbekistan | 0,63 | 0,62 | 0,60 | 0,64 | 0,68 | 0,70 | 0,72 | 0,73 |

** Data is acquired from "https://hdr.undp.org ".*




**Graph 1. Evolution of HDI in Uzbekistan and Select Countries**

### *3.1.1 Evolution of Life Expectancy at Birth in Uzbekistan, 1990-2022*

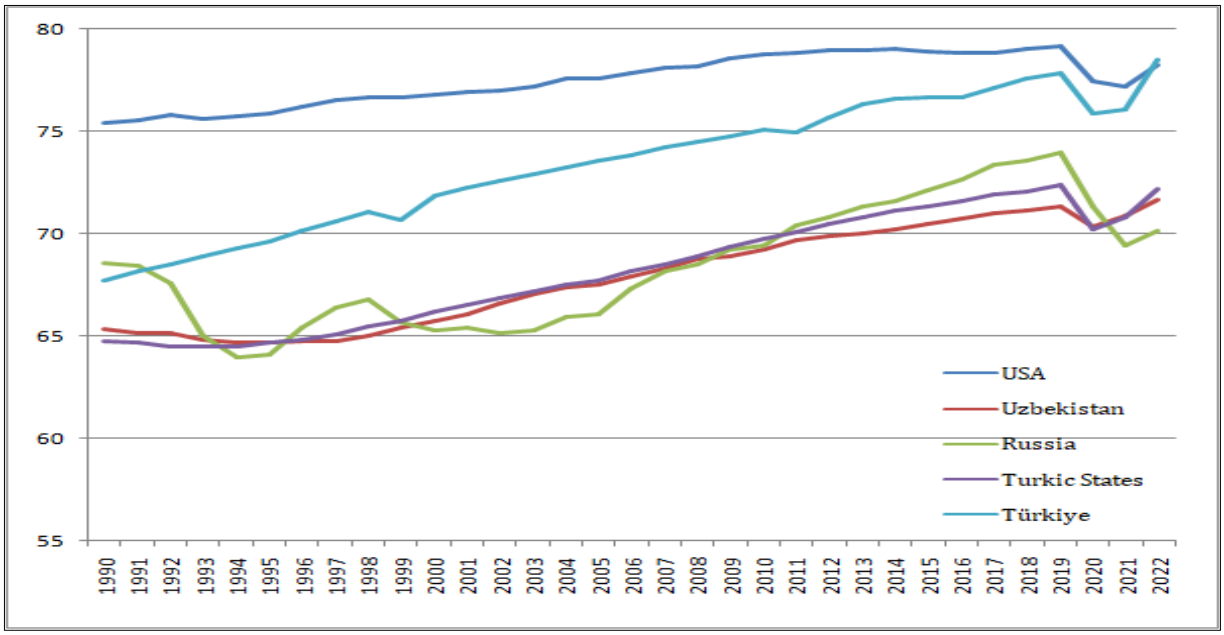
Uzbekistan has experienced a steady and gradual rise in life expectancy over the past three decades. Beginning at approximately 65.3 years in 1990, the country's trajectory has been marked by minimal volatility, reaching around 71.7 years by 2022 (Table 4 and Graph 2). While this progress is notable, Uzbekistan still lags behind Türkiye by about 3 years and the USA by roughly 6 years, highlighting the need for continued investments in preventive healthcare, rural health services, and elderly care.

**Table 4.**

*Evolution of Life Expectancy in Uzbekistan and Select Countries*

| **Country** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** | **2022** |
|---|---|---|---|---|---|---|---|---|
| Armenia | 68,8 | 69,3 | 70,6 | 71,8 | 73,2 | 74,4 | 72,2 | 73,4 |
| Azerbaijan | 62,4 | 62,3 | 64,9 | 67,6 | 69,5 | 71,5 | 66,9 | 73,5 |
| Georgia | 68,4 | 68,9 | 69,6 | 71,1 | 72,1 | 73,3 | 72,8 | 71,6 |
| Germany | 75,4 | 76,6 | 78,1 | 79,3 | 80,1 | 80,6 | 81,1 | 81,0 |
| Iran | 64,4 | 67,8 | 69,7 | 71,8 | 73,1 | 75,1 | 74,8 | 74,6 |
| Kazakhstan | 64,9 | 63,7 | 64,2 | 65,1 | 68,1 | 70,7 | 70,0 | 69,5 |
| Kyrgyzistan | 64,3 | 63,9 | 65,4 | 66,4 | 68,3 | 70,0 | 69,6 | 70,5 |
| Russia | 68,5 | 64,1 | 65,3 | 66,1 | 69,4 | 72,1 | 71,3 | 70,1 |
| Tajikistan | 61,9 | 59,3 | 63,3 | 66,5 | 67,7 | 69,3 | 68,0 | 71,3 |
| Turkic States | 64,7 | 64,6 | 66,2 | 67,7 | 69,7 | 71,3 | 70,2 | 72,2 |
| Turkmenistan | 63,9 | 63,7 | 65,0 | 66,1 | 68,3 | 68,8 | 68,7 | 69,4 |
| Türkiye | 67,7 | 69,6 | 71,9 | 73,5 | 75,1 | 76,6 | 75,9 | 78,5 |
| USA | 75,4 | 75,9 | 76,8 | 77,6 | 78,8 | 78,9 | 77,4 | 78,2 |
| Uzbekistan | 65,3 | 64,6 | 65,7 | 67,5 | 69,2 | 70,5 | 70,3 | 71,7 |

** Data is acquired from "https://hdr.undp.org ".*




**Graph 2. Evolution of Life Expectancy at Birth in Uzbekistan and Select Countries**

In comparative terms, Uzbekistan has either outperformed or remained closely aligned with the average of other Turkic States, following a similar upward trend. This suggests the influence of shared socio-economic and demographic factors. Unlike Russia, which experienced more erratic developments, Uzbekistan's consistent gains reflect policy continuity, a resilient public health infrastructure, and gradual socio-economic improvements. Overall, although Uzbekistan trails more developed nations like Türkiye and the USA, its relatively stable and upward path, especially post-2000, distinguishes it within the region and indicates a solid foundation for future health-related progress.

### *3.1.2 Evolution of Education in Uzbekistan, 1990-2022*

The educational landscape in Uzbekistan has undergone substantial transformation since 1990, as reflected in two key indicators: Expected Years of Schooling (EYoS) for newly born children, and Mean Years of Schooling (MYoS) among the adult population. Together, these metrics provide a dual lens to assess both the aspirational reach of the education system and the realized accumulation of human capital across generations.

As shown on Tables 5, 6 and Graph 3, Uzbekistan's EYoS increased steadily from approximately 11.5 years in 1990 to about 13 years by 2022. This upward trajectory signals expanded access to formal education for school-age cohorts and reflects sustained policy efforts to strengthen basic and secondary education, uphold near-universal enrollment, and gradually widen access to tertiary education. In comparative terms, Uzbekistan holds a slightly stronger position than the average for Turkic states. However, Russia and the United States consistently outperform Uzbekistan in this domain, with the U.S. reaching nearly 19 years by 2022, driven largely by widespread post-secondary enrollment.

In contrast, the trend in MYoS, which captures the actual average years of schooling completed by adults aged 25 and older, has been more gradual. From a baseline of 9.5 years in 1990, MYoS reached approximately 12.5 years by 2022. This slower pace highlights the enduring effects of under-enrollment in earlier decades and suggests that, while the system has expanded, its full impact will take time to manifest across the adult population.

The narrowing gap between EYoS and MYoS, from about 2 years in 1990 to just 0.5 years in 2022, is particularly telling. It points to a more gradual, sustained, and well-grounded expansion of education, in contrast to hastily implemented or uneven reforms. It also suggests improvements not only in enrollment but in retention and completion rates. However, the relatively smaller increase in MYoS compared to EYoS highlights persistent challenges such as adult illiteracy, early school leaving in previous decades, and limited access to higher education among older cohorts. Bridging this gap further will require targeted adult education initiatives, skills upgrading programs, and continued investment in inclusive lifelong learning strategies.

**Table 5.**

*Expected Years of Schooling in Uzbekistan and Select Countries*

| Country | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 |
|---|---|---|---|---|---|---|---|---|
| Armenia | 11,2 | 10,2 | 10,7 | 10,9 | 12,4 | 13,1 | 14,1 | 14,4 |
| Azerbaijan | 11,1 | 11,5 | 11,9 | 12,3 | 12,7 | 13,1 | 12,6 | 12,7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Georgia | 13,0 | 11,3 | 12,6 | 13,8 | 14,1 | 15,4 | 16,3 | 16,7 |
| Germany | 14,4 | 15,8 | 16,2 | 16,5 | 16,9 | 17,1 | 17,2 | 17,3 |
| Iran | 10,8 | 11,3 | 11,8 | 12,0 | 13,5 | 14,9 | 14,1 | 14,1 |
| Kazakhstan | 12,2 | 11,6 | 12,2 | 14,2 | 14,5 | 14,2 | 14,8 | 14,8 |
| Kyrgyzistan | 11,9 | 10,3 | 11,4 | 12,0 | 12,2 | 12,6 | 12,6 | 13,0 |
| Russia | 12,7 | 11,6 | 12,8 | 14,1 | 14,3 | 15,2 | 15,7 | 15,7 |
| Tajikistan | 11,8 | 10,1 | 9,6 | 10,6 | 11,0 | 10,9 | 10,9 | 10,9 |
| Turkic States | 10,0 | 10,0 | 10,8 | 11,8 | 12,5 | 13,5 | 14,0 | 14,2 |
| Turkmenistan | 5,0 | 6,3 | 7,6 | 8,7 | 10,2 | 11,6 | 12,4 | 13,2 |
| Türkiye | 8,9 | 9,6 | 11,1 | 12,0 | 14,0 | 17,8 | 19,3 | 19,7 |
| USA | 15,6 | 15,9 | 15,7 | 16,1 | 16,4 | 16,6 | 16,6 | 16,4 |
| Uzbekistan | 11,1 | 10,6 | 10,8 | 11,5 | 11,6 | 11,7 | 12,1 | 12,0 |

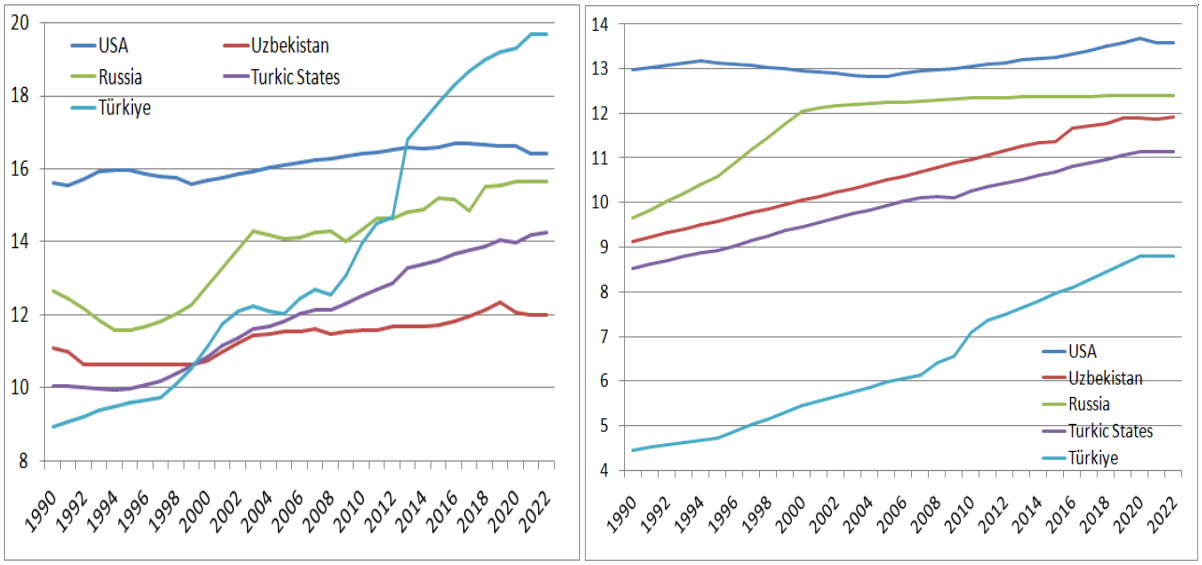
** Data is acquired from "https://hdr.undp.org ".*

**Table 6.**

*Mean Years of Schooling in Uzbekistan and Select Countries*

| **Country** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** | **2022** |
|---|---|---|---|---|---|---|---|---|
| Armenia | 9,8 | 10,1 | 10,5 | 10,8 | 11,1 | 11,6 | 11,3 | 11,3 |
| Azerbaijan | 10,1 | 9,9 | 10,2 | 10,6 | 10,5 | 10,5 | 10,6 | 10,6 |
| Georgia | 11,3 | 11,6 | 11,8 | 12,1 | 12,4 | 12,7 | 12,8 | 12,7 |
| Germany | 10,4 | 11,4 | 12,4 | 13,7 | 13,9 | 14,1 | 14,3 | 14,3 |
| Iran | 5,7 | 7,2 | 8,5 | 9,6 | 9,7 | 10,2 | 10,7 | 10,7 |
| Kazakhstan | 7,5 | 8,6 | 9,8 | 11,0 | 11,2 | 12,0 | 12,4 | 12,4 |
| Kyrgyzistan | 9,2 | 9,7 | 10,3 | 10,6 | 11,0 | 11,5 | 12,0 | 12,0 |
| Russia | 9,7 | 10,6 | 12,1 | 12,2 | 12,3 | 12,4 | 12,4 | 12,4 |
| Tajikistan | 9,3 | 10,3 | 10,8 | 11,0 | 11,2 | 11,3 | 11,3 | 11,3 |
| Turkic States | 8,5 | 8,9 | 9,5 | 9,9 | 10,3 | 10,7 | 11,1 | 11,1 |
| Turkmenistan | 10,8 | 11,0 | 10,9 | 10,9 | 10,9 | 10,8 | 11,1 | 11,1 |
| Türkiye | 4,5 | 4,7 | 5,4 | 6,0 | 7,1 | 8,0 | 8,8 | 8,8 |
| USA | 13,0 | 13,1 | 13,0 | 12,8 | 13,1 | 13,3 | 13,7 | 13,6 |
| Uzbekistan | 9,1 | 9,6 | 10,0 | 10,5 | 11,0 | 11,4 | 11,9 | 11,9 |

** Data is acquired from "https://hdr.undp.org ".*




**Graph 3. Expected (left) and Mean (right) Years of Schooling in Uzbekistan and Select Countries**

### *3.1.3 Evolution of Income per capita in Uzbekistan, 1990-2022*

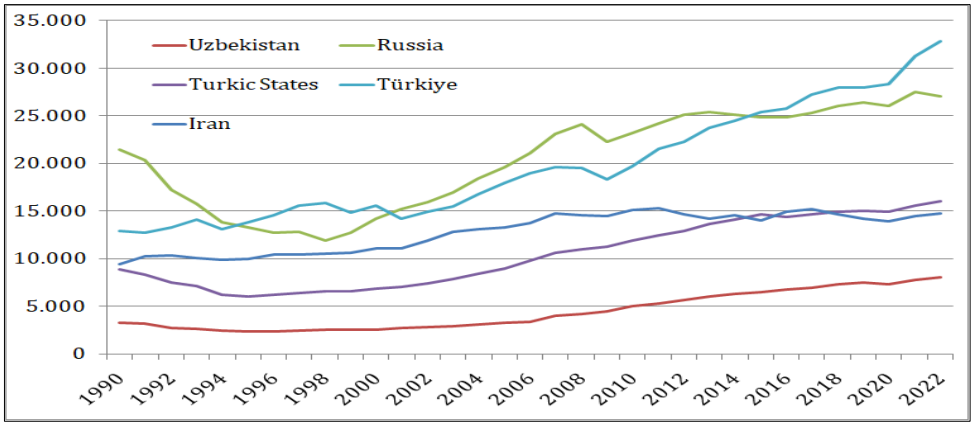
From 1990 to 2022, Uzbekistan experienced a gradual yet steady increase in gross national income (GNI) per capita, measured in purchasing power parity (PPP) terms. This trajectory reflects the country's long-term efforts

toward economic stabilization, structural reforms, and cautious integration into global markets following its independence from the Soviet Union.

In 1990, Uzbekistan's GNI per capita stood just above $3,000 (PPP). For much of the 1990s and early 2000s, it remained relatively stagnant, reflecting the transitional shock and limited foreign investment. However, from around 2005 onwards, Uzbekistan's income levels began a steady upward trend, surpassing $8,000 by 2022 (see Table 7 and Graph 4). This growth reflects improvements in macroeconomic management, the expansion of the private sector, and increased remittances, particularly from labor migrants.

Uzbekistan followed a trend similar to the average of Turkic states (excluding Türkiye), starting slightly higher and maintaining a modest advantage throughout. While other countries, such as Türkiye and Russia, demonstrated periods of rapid income growth, Uzbekistan's approach has been characterized by caution and gradualism, consistent with its broader economic strategy. However, the income gap with these regional peers has narrowed since 2015, suggesting that Uzbekistan is gradually catching up.

Though Uzbekistan remains the lowest in terms of income per capita among the countries compared, and the gap with Türkiye and Russia is still substantial, its growth has been steady and resilient, particularly since 2005. While the country has not yet closed the income gap with regional leaders, the foundation for sustained growth is increasingly solid. With strategic reforms and improved governance, Uzbekistan could narrow these disparities and elevate living standards in the coming decade.




**Graph 4. Gross National Income per Capita (PP) in Uzbekistan and Select Countries**

**Table 7.**

*GNI per capita (pp) in Uzbekistan and Select Countries*

| Country | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 |
|---|---|---|---|---|---|---|---|---|
| Armenia | 5.183 | 2.999 | 4.048 | 7.580 | 9.517 | 11.966 | 13.182 | 15.388 |
| Azerbaijan | 7.427 | 2.924 | 3.894 | 6.251 | 13.285 | 14.398 | 13.684 | 15.018 |
| Georgia | 10.016 | 3.076 | 4.957 | 7.424 | 9.582 | 12.335 | 13.298 | 15.952 |
| Germany | 37.293 | 39.310 | 42.685 | 44.309 | 47.934 | 52.322 | 53.375 | 55.340 |
| Iran | 9.439 | 9.958 | 11.046 | 13.301 | 15.103 | 14.021 | 13.925 | 14.770 |
| Kazakhstan | 13.968 | 8.763 | 9.994 | 15.396 | 17.976 | 23.137 | 23.304 | 22.587 |
| Kyrgyzistan | 5.159 | 2.453 | 2.888 | 3.394 | 3.890 | 4.633 | 4.566 | 4.782 |
| Russia | 21.448 | 13.207 | 14.185 | 19.542 | 23.185 | 24.771 | 25.974 | 26.992 |
| Tajikistan | 4.337 | 1.435 | 1.355 | 2.234 | 2.838 | 3.439 | 4.205 | 4.807 |
| Turkic States | 8.806 | 6.001 | 6.853 | 8.908 | 11.870 | 14.622 | 14.958 | 16.023 |
| Turkmenistan | 10.092 | 5.614 | 6.131 | 7.156 | 11.395 | 13.657 | 12.449 | 12.860 |
| Türkiye | 12.910 | 13.870 | 15.619 | 17.991 | 19.681 | 25.416 | 28.381 | 32.834 |
| USA | 40.920 | 43.448 | 50.648 | 54.956 | 55.568 | 59.470 | 61.077 | 65.565 |
| Uzbekistan | 3.278 | 2.384 | 2.594 | 3.258 | 4.994 | 6.490 | 7.366 | 8.056 |

** Data is acquired from "https://hdr.undp.org ".*

### 3.2 Evolution of Global Hunger Index in Uzbekistan, 2000-2023

Between 2000 and 2023, Uzbekistan achieved one of the most significant improvements in food security and nutrition outcomes across the broader Eurasian region, as reflected in the Global Hunger Index (GHI). The GHI measures undernourishment, child mortality, child wasting, and child stunting , key indicators of a population's vulnerability to hunger (Welthungerhilfe & Concern Worldwide, 2023a).

According to Table 8 and Graph 5, Uzbekistan's GHI stood at 24.2, placing it in the "serious" hunger category in 2000. Over the next two decades, consistent reductions were observed, reaching 14.9 in 2008, 5.9 in 2015, and 5.1 in 2023, thereby transitioning Uzbekistan into the "low" hunger category. This marks a 79% reduction in hunger over the period, the second-highest among all countries listed, after Azerbaijan (72%), and well above the Turkic States average, which saw a 63% drop from 18.1 to 6.7. This stands in contrast to the relatively modest gains made by Russia and Iran, which achieved reductions of 43% and 44% in their GHI, respectively (Welthungerhilfe & Concern Worldwide, 2023b).

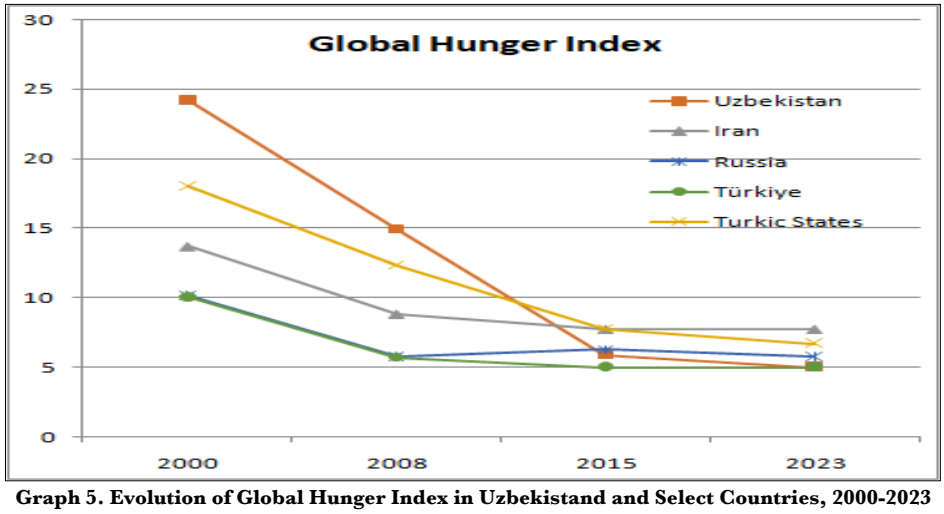
These gains reflect substantial progress in agricultural development, improved rural healthcare access, maternal and child nutrition programs, and school feeding initiatives. The implementation of the "Iron Book" social registry and a heightened focus on poverty alleviation in recent years likely helped maintain downward momentum in hunger levels. Despite this progress, the persistence of a GHI above 5 suggests that certain segments of the population , particularly in remote or low-income areas , still face nutritional vulnerability. Addressing this residual hunger will require targeted social safety nets, nutrition-specific interventions, and continued investment in rural infrastructure.

**Table 8.**

*Global Hunger Index in Uzbekistan and Select Countries*

| Country | 2000 | 2008 | 2015 | 2023 | Δ% |
|---|---|---|---|---|---|
| Azerbaijan | 24,9 | 15 | 9,3 | 6,9 | 72 |
| Armenia | 19,2 | 11,7 | 6,3 | 5,6 | 71 |
| Georgia | 12,1 | 6,6 | 5 | 5 | 59 |
| Iran | 13,7 | 8,8 | 7,7 | 7,7 | 44 |
| Kazakhstan | 11,3 | 11 | 5,7 | 5,5 | 51 |
| Kyrgyzistan | 17,5 | 12,9 | 9,1 | 7,5 | 57 |
| Russia | 10,2 | 5,8 | 6,3 | 5,8 | 43 |
| Tajikistan | 40,1 | 29,9 | 16,9 | 13,7 | 66 |
| Turkic States | 19,1 | 12,6 | 8,4 | 7,6 | 60 |
| Turkmenistan | 20,3 | 14,5 | 11,4 | 10,3 | 49 |
| Türkiye | 10,1 | 5,7 | 5 | 5 | 50 |
| Uzbekistan | 24,2 | 14,9 | 5,9 | 5 | 79 |

** Data is acquired from "www.globalhungerindex.org "*




**Graph 5. Evolution of Global Hunger Index in Uzbekistand and Select Countries, 2000-2023**

### *3.2.1 Evolution of Infant Mortality in Uzbekistan, 2000-2023*

According to Table 9 and Graph 6, Uzbekistan achieved a substantial reduction in infant mortality between 2000 and 2023, reflecting significant progress in healthcare access, maternal and child health, and public health infrastructure. The infant mortality rate declined from 6.1 deaths per 1,000 live births in 2000 to 1.4 in 2023, a

77% decrease over the period (Worldbank, 2024). This trajectory aligns with Uzbekistan's broader human development gains, particularly in healthcare modernization and early childhood interventions.

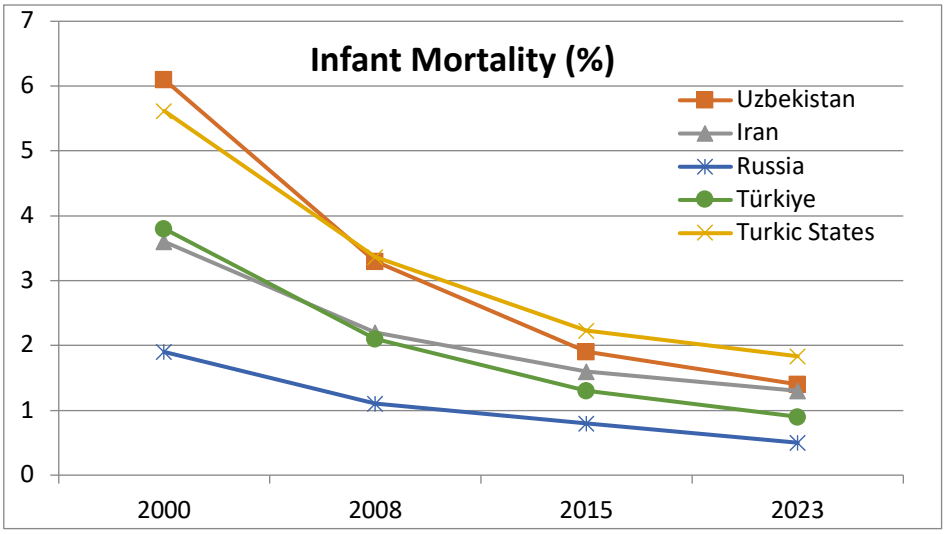
Uzbekistan's progress is notable both in absolute terms and relative to regional peers. Its 2023 rate of 1.4 places ahead of Azerbaijan (1.9) and approaching Türkiye (0.9). It is also comparable to Kazakhstan (1.0) and Kyrgyzstan (1.7), countries with similar post-Soviet healthcare legacies. However, Uzbekistan still trails the best-performing countries in the region, such as Georgia (0.9) and Russia (0.5). The average reduction among Turkic states was 67%, placing Uzbekistan slightly above the regional average. This reinforces its image as a steady and consistent improver, even if it has not yet caught up with the most advanced countries in terms of outcomes.

Uzbekistan's progress can be attributed to the expansion of maternal and neonatal care services, especially in rural areas, increased investment in perinatal care units, professional training for midwives and nurses, and national initiatives such as the "Healthy Mother, Healthy Child" program. With over 75% decline in infant mortality, Uzbekistan has joined the ranks of countries making significant strides in early childhood survival. While countries like Russia and Türkiye report lower final mortality rates, Uzbekistan's rapid improvement from a higher baseline highlights the effectiveness of its health policies. Continued focus on quality care, health equity, and maternal health will be essential to reaching parity with global best performers and securing further long-term gains.

**Table 9.**
Infant Mortality (‰) in Uzbekistan and Select Countries, 2000-2023

| Country | 2000 | 2008 | 2015 | 2023 | Δ% |
|---|---|---|---|---|---|
| Azerbaijan | 7,5 | 4,3 | 2,6 | 1,9 | 75 |
| Armenia | 3,1 | 2,1 | 1,4 | 1,1 | 65 |
| Georgia | 3,7 | 1,7 | 1 | 0,9 | 76 |
| Iran | 3,6 | 2,2 | 1,6 | 1,3 | 64 |
| Kazakhstan | 4,3 | 2,5 | 1,2 | 1 | 77 |
| Kyrgyzistan | 5,0 | 3,4 | 2,2 | 1,7 | 66 |
| Russia | 1,9 | 1,1 | 0,8 | 0,5 | 74 |
| Tajikistan | 8,4 | 4,6 | 3,7 | 3,1 | 63 |
| Turkic States | 4,1 | 2,3 | 1,7 | 1,4 | 67 |
| Turkmenistan | 7,0 | 4,6 | 4,2 | 4,1 | 41 |
| Türkiye | 3,8 | 2,1 | 1,3 | 0,9 | 76 |
| Uzbekistan | 6,1 | 3,3 | 1,9 | 1,4 | 77 |

** Data is acquired from "www.globalhungerindex.org"*




**Graph 6. Evolution of Infant Mortality (‰) in Uzbekistand and Select Countries, 2000-2023**

### *3.2.2 Evolution of Undernourishment in Uzbekistan, 2000-2023*

Table 10 and Graph 7 show that Uzbekistan experienced a dramatic reduction in undernourishment between 2000 and 2023, reflecting broad improvements in food availability, agricultural productivity, rural development, and nutrition policy. In 2000, an estimated 18.0% of the population was undernourished. By 2023, this figure had dropped to just 2.5%, an 86% reduction, positioning Uzbekistan among the top performers in the region (Welthungerhilfe & Concern Worldwide, 2023b).

This decline is one of the most significant in Eurasia, second only to Armenia, which achieved a 90% reduction. By 2023, Uzbekistan had reached parity with Türkiye, Kazakhstan, and Russia, all reporting undernourishment rates of 2.5% or lower, despite Uzbekistan starting from a considerably higher baseline. This success reflects a combination of expanding domestic food production, rural poverty reduction programs, strategic food import policies, and investments in child nutrition and maternal health. In contrast, Iran experienced a worsening trend, with undernourishment rising from 5.0% in 2000 to 6.1% in 2023, likely due to economic sanctions, inflation, and structural constraints in its food system.

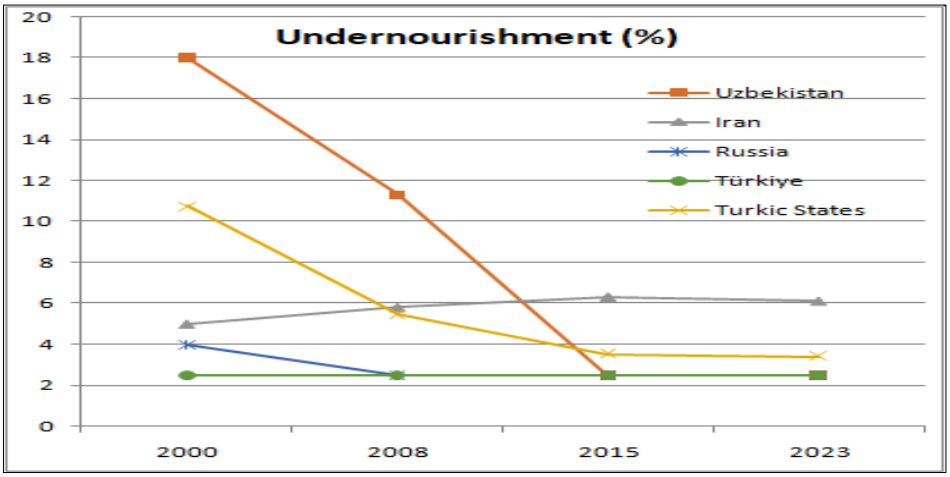
Uzbekistan's gains in nourishment are not solely the result of economic growth, but also the outcome of deliberate policy choices aimed at food security. These include support for smallholder farmers, stabilization of staple food prices, and nutritional programs in schools and maternal care settings. Moreover, Uzbekistan's ability to outperform the average reduction among Turkic states , from 10.8% to 3.4% , highlights its leadership in advancing regional food and nutrition outcomes. With an 86% reduction in undernourishment, Uzbekistan stands as a regional success story in combating food insecurity. It has closed the nourishment gap with wealthier or more urbanized neighbors and now ranks among the top performers in the region.

**Table 10.**

*Undernourishment (%) in Uzbekistan and Select Countries, 2000-2023*

| Country | 2000 | 2008 | 2015 | 2023 | Δ% |
|---|---|---|---|---|---|
| Azerbaijan | 16,8 | 2,5 | 2,5 | 2,5 | 85 |
| Armenia | 25,7 | 5,8 | 2,5 | 2,5 | 90 |
| Georgia | 7,2 | 3,5 | 3,6 | 2,9 | 60 |
| Iran | 5,0 | 5,8 | 6,3 | 6,1 | -22 |
| Kazakhstan | 6,3 | 4,2 | 2,5 | 2,5 | 60 |
| Kyrgyzistan | 14,6 | 8,5 | 5,8 | 4,8 | 67 |
| Russia | 4,0 | 2,5 | 2,5 | 2,5 | 38 |
| Tajikistan | 40,4 | 34,4 | 16,3 | 9,3 | 77 |
| Turkic States | 16,5 | 10,4 | 6,2 | 4,7 | 72 |
| Turkmenistan | 6,4 | 3,9 | 5,5 | 5,7 | 11 |
| Türkiye | 2,5 | 2,5 | 2,5 | 2,5 | 0 |
| Uzbekistan | 18,0 | 11,3 | 2,5 | 2,5 | 86 |

** Data is acquired from "www.globalhungerindex.org "*




**Graph 7. Evolution of Undernourishment(%) in Uzbekistand and Select Countries, 2000-2023**

### *3.2.3 Evolution of Wasting in Uzbekistan, 2000-2023*

As shown in Table 11 and Graph 8, Uzbekistan achieved a significant reduction in child wasting between 2000 and 2023, the share of children under five with low weight for their height, an indicator of acute undernutrition. In 2000, Uzbekistan's wasting rate stood at 9.1%, the highest among the countries compared. By 2023, this figure had dropped sharply to 2.5%, marking a 73% reduction over the period. (Welthungerhilfe & Concern Worldwide, 2023b)

The most substantial improvement occurred between 2000 and 2008, during which the rate fell by more than half. Progress continued steadily thereafter, with Uzbekistan maintaining one of the lowest wasting rates among its regional peers by 2015 and 2023. Comparatively, Uzbekistan's decline outpaced that of Iran and Russia, both of which saw more modest reductions and even slight reversals after 2008. Türkiye achieved a consistently low wasting rate, reaching 1.4% in 2023, slightly outperforming Uzbekistan. The average among Turkic states mirrored Uzbekistan's trajectory but at a slower pace, ending at 2.9% in 2023.

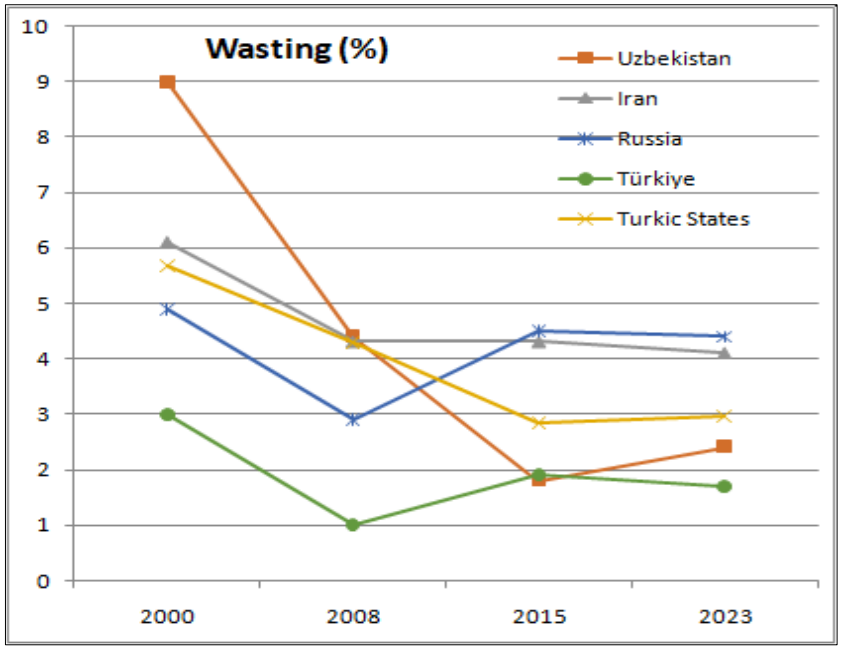
Uzbekistan's success reflects broad improvements in child nutrition programs, rural healthcare access, and targeted interventions against acute malnutrition. While there is still room for further progress to match the very lowest rates in the region, Uzbekistan's achievements position it among the stronger performers in reducing child wasting over the past two decades.

**Table 11.**

*Wasting (%) in Uzbekistan and Select Countries, 2000-2023*

| Country | 2000 | 2008 | 2015 | 2023 | Δ% |
|---|---|---|---|---|---|
| Azerbaijan | 9,0 | 6,8 | 3,2 | 3,6 | 60 |
| Armenia | 2,5 | 4,1 | 4,4 | 3,3 | -32 |
| Georgia | 3,1 | 1,3 | 0,6 | 0,6 | 81 |
| Iran | 6,1 | 4,3 | 4,3 | 4,1 | 33 |
| Kazakhstan | 2,5 | 4,9 | 3,1 | 3,9 | -56 |
| Kyrgyzistan | 2,6 | 1,4 | 2,8 | 2 | 23 |
| Russia | 4,9 | 2,9 | 4,5 | 4,4 | 10 |
| Tajikistan | 9,4 | 5,6 | 3,5 | 5 | 47 |
| Turkic States | 5,2 | 3,6 | 3,5 | 3,5 | 33 |
| Turkmenistan | 8,0 | 7,2 | 4,2 | 4,1 | 49 |
| Türkiye | 3,0 | 1 | 1,9 | 1,7 | 43 |
| Uzbekistan | 9,0 | 4,4 | 1,8 | 2,4 | 73 |

** Data is acquired from "www.globalhungerindex.org "*




**Graph 8. Evolution of Wasting (%) in Uzbekistand and Select Countries, 2000-2023**

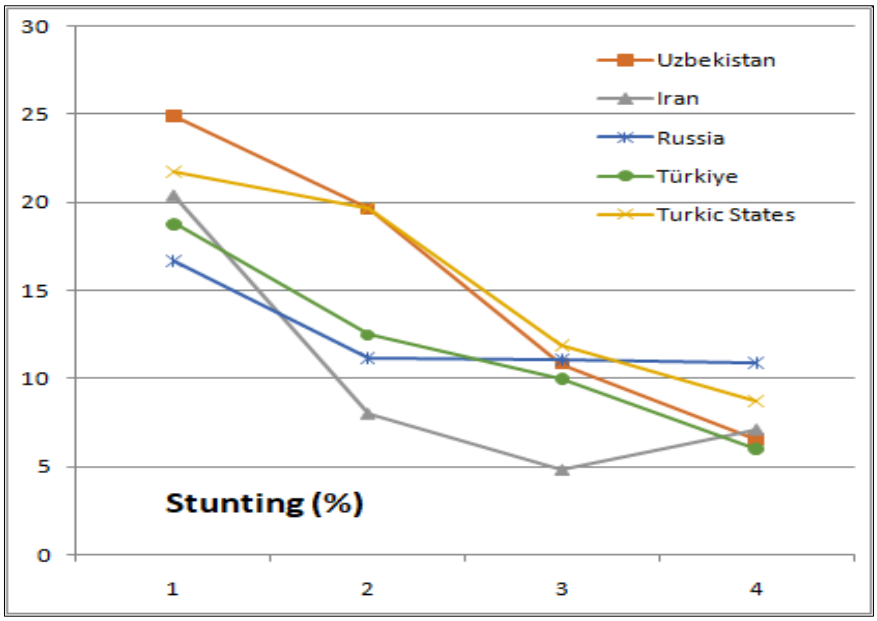
### *3.2.4 Evolution of Stunting in Uzbekistan, 2000-2023*

Table 12 and Graph 9 show that Uzbekistan achieved a remarkable reduction in child stunting, between 2000 and 2023, which is defined as the share of children under five with low height for their age, reflecting chronic undernutrition (Welthungerhilfe, & Concern Worldwide, 2023a). In 2000, stunting affected around 25% of children in Uzbekistan, a level among the highest in the broader region. Over the next two decades, Uzbekistan recorded consistent and sharp declines. By 2008, stunting had fallen to approximately 19%, and by 2015 it was halved again to near 10%. By 2023, Uzbekistan reached a stunting rate of about 6%, representing a reduction of more than 75% from 2000 levels. (Welthungerhilfe, & Concern Worldwide, 2023b)

**Table 12.**
*Stunting (%) in Uzbekistan and Select Countries, 2000-2023*

| Country | 2000 | 2008 | 2015 | 2023 | Δ% |
|---|---|---|---|---|---|
| Azerbaijan | 9,0 | 6,8 | 3,2 | 3,6 | 60 |
| Armenia | 2,5 | 4,1 | 4,4 | 3,3 | -32 |
| Georgia | 3,1 | 1,3 | 0,6 | 0,6 | 81 |
| Iran | 6,1 | 4,3 | 4,3 | 4,1 | 33 |
| Kazakhstan | 2,5 | 4,9 | 3,1 | 3,9 | -56 |
| Kyrgyzistan | 2,6 | 1,4 | 2,8 | 2 | 23 |
| Russia | 4,9 | 2,9 | 4,5 | 4,4 | 10 |
| Tajikistan | 9,4 | 5,6 | 3,5 | 5 | 47 |
| Turkic States | 5,2 | 3,6 | 3,5 | 3,5 | 33 |
| Turkmenistan | 8,0 | 7,2 | 4,2 | 4,1 | 49 |
| Türkiye | 3,0 | 1 | 1,9 | 1,7 | 43 |
| Uzbekistan | 9,0 | 4,4 | 1,8 | 2,4 | 73 |

** Data is acquired from "www.globalhungerindex.org "*




**Graph 9. Evolution of Wasting (%) in Uzbekistand and Select Countries, 2000-2023**

Comparatively, Uzbekistan's progress has been among the most substantial in the region. While Türkiye and Kazakhstan started from lower baselines and maintained steady improvements, Uzbekistan managed to close the gap significantly. By 2023, Uzbekistan's stunting rate was comparable to or slightly better than the Turkic States' average and notably lower than Russia's, where progress plateaued in the last decade and while Iran achieved faster early reductions, it has seen less steady improvements in recent years.

Uzbekistan's success reflects broader efforts in improving rural healthcare, expanding maternal and child nutrition programs, strengthening food security, and investing in early childhood interventions. The sharp decline in stunting highlights the country's ability to address deep-rooted public health challenges through targeted and sustained policy measures. Even though further progress is needed to reach rates comparable with the best global performers, Uzbekistan's achievements in reducing chronic undernutrition mark it as a regional success story in child health and nutrition.

## 3.3 GHI Efficiency Results for Uzbekistan and Select Countries, 2000-2023

An output-oriented efficiency analysis assesses whether resources are fully and effectively utilized to achieve optimal outcomes. The figures presented herein represent inefficiency rates, denoting the percentage by which each undesirable outcome could be reduced under conditions of maximal resource efficiency. A zero inefficiency rate indicates that the best possible outcome, given existing resources, has been attained. As efficiency

measurements are inherently susceptible to measurement errors and data limitations, the results should be interpreted cautiously—as indicative rather than definitive—until more comprehensive data or improved methodologies become available.

As Table 13 reveals, Uzbekistan's inefficiency has generally followed a declining trend across all three models applied, with only a slight uptick observed in 2008. Inefficiency levels decreased from approximately 50% to a range between 0% and 15% by 2023, indicating that resources have been increasingly better utilized over time. In other words, Uzbekistan's improvements are attributable not only to greater resource allocation but also to enhanced productivity in the use of these inputs, achieving better outcomes with more efficient resource utilization, as outlined in the previous sections.

An assessment of the overall results for the other Turkic countries reveals two distinct patterns. Azerbaijan, Kazakhstan, and Türkiye exhibit moderate volatility around relatively stable inefficiency rates of approximately 55%, 55%, and 45%, respectively. This suggests that these countries could have effectively halved their undesirable outcomes had they achieved full resource efficiency. In contrast, Kyrgyzstan and Turkmenistan display clearly deteriorating inefficiency trends. Kyrgyzstan's inefficiency, which was near zero in 2000, has risen into the 20–35% range, while Turkmenistan's inefficiency worsened further, increasing from 45–55% to 55–70%. These patterns indicate that both countries have struggled to translate increased resource allocations into improved outcomes, a contrast that further underscores Uzbekistan's exemplary efficiency gains achieved alongside expanding resources.

A similar trajectory is observed among other regional countries. Russia's inefficiency rates hover around 50%, gradually worsening from approximately 46% in 2000 to 53% in 2023, indicating a persistent decline in resource utilization efficiency. Iran's results remain relatively stable, although a noticeable improvement is evident in 2015. Tajikistan exhibits a deteriorating trend similar to that of Kyrgyzstan, albeit at consistently worse levels, approaching those observed in Iran. Both Armenia and Georgia demonstrate declining efficiency over time, with Armenia displaying more pronounced volatility compared to Georgia's comparatively steadier trajectory.

A closer examination of the slack values provides a more detailed assessment of Uzbekistan's performance (see Table 14). Regardless of the outcome and model considered, 2015 emerges as the most efficient year, while 2000 ranks as the least efficient. Overall, efficiency has improved across all indicators between 2000 and 2023, with notable improvements in wasting, undernourishment, stunting, and infant mortality. However, mixed results are observed between 2000 and 2008, which is unsurprising given the time required for macroeconomic policies and social transformations to take full effect. All efficiency metrics and outcome-specific slacks demonstrate dramatic improvements by 2015, indicating the success of reforms implemented during the preceding period.

Nevertheless, a moderate resurgence of inefficiencies is observed in 2023, particularly regarding wasting, stunting, and infant mortality rates. Although undernourishment levels have remained fully controlled, the reappearance of slacks in these areas suggests that the sustainability of prior efficiency gains may now depend on renewed policy initiatives targeting child health outcomes. It also signals the beginning of a possible policy readjustment period, which should be closely monitored and proactively managed. Overall, Uzbekistan demonstrates the most promising trajectory of outcome improvements among the Turkic countries, coupled with robust long-term gains in efficiency, setting a regional benchmark for integrating resource expansion with measurable outcome enhancements.

**Table 13.**
*GHI Efficiency Results for Uzbekistan and Select Countries, 2000-2023*

| | **2000** | | | **2008** | | | **2015** | | | **2023** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Model** | | | | | | | | | | | |
| **Country** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** |
| Armenia | 0,000 | 0,000 | 0,000 | 0,489 | 0,539 | 0,601 | 0,000 | 0,314 | 0,314 | 0,000 | 0,529 | 0,529 |
| Azerbaijan | 0,430 | 0,543 | 0,608 | 0,000 | 0,592 | 0,592 | 0,000 | 0,497 | 0,497 | 0,000 | 0,589 | 0,589 |
| Georgia | 0,071 | 0,130 | 0,156 | 0,000 | 0,000 | 0,000 | 0,021 | 0,154 | 0,187 | 0,068 | 0,211 | 0,300 |
| Iran | 0,500 | 0,664 | 0,702 | 0,569 | 0,653 | 0,690 | 0,520 | 0,539 | 0,589 | 0,582 | 0,592 | 0,636 |
| Kazakhstan | 0,492 | 0,534 | 0,583 | 0,405 | 0,679 | 0,694 | 0,000 | 0,527 | 0,527 | 0,000 | 0,563 | 0,563 |
| Kyrgyzstan | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,056 | 0,069 | 0,105 | 0,218 | 0,275 | 0,345 |
| Russia | 0,375 | 0,457 | 0,486 | 0,000 | 0,477 | 0,477 | 0,000 | 0,515 | 0,515 | 0,000 | 0,533 | 0,533 |
| Tajikistan | 0,063 | 0,160 | 0,241 | 0,363 | 0,454 | 0,509 | 0,208 | 0,237 | 0,324 | 0,476 | 0,519 | 0,521 |
| Turkmenistan | 0,425 | 0,463 | 0,559 | 0,359 | 0,627 | 0,640 | 0,545 | 0,651 | 0,712 | | | |
| Türkiye | 0,000 | 0,435 | 0,435 | 0,000 | 0,000 | 0,000 | 0,000 | 0,497 | 0,497 | 0,000 | 0,447 | 0,447 |
| Uzbekistan | 0,357 | 0,465 | 0,545 | 0,450 | 0,455 | 0,515 | 0,000 | 0,000 | 0,000 | 0,000 | 0,143 | 0,143 |
| Turkic States | 0,284 | 0,407 | 0,455 | 0,202 | 0,392 | 0,407 | 0,100 | 0,373 | 0,390 | 0,044 | 0,404 | 0,417 |

**Table 14.**
*Output Slacks in Uzbekistan by Variable, 2000-2023*

| | Wasting | Undernourishment | Stunting | Infant Mortality |
|---|---|---|---|---|
| Year | Model 2 / 3 | Model 2 / 3 | Model 2 / 3 | Model 2 / 3 |
| 2000 | 0.628 / 0.667 | 0.357 / 0.636 | 0.357 / 0.336 | 0.519 / 0.541 |
| 2008 | 0.450 / 0.413 | 0.470 / 0.668 | 0.450 / 0.514 | 0.450 / 0.466 |
| 2015 | 0.000 / 0.000 | 0.000 / 0.000 | 0.000 / 0.000 | 0.000 / 0.000 |
| 2023 | 0.139 / 0.139 | 0.000 / 0.000 | 0.233 / 0.233 | 0.200 / 0.200 |

## 4. Conclusion

This study examined the trajectory of human development in Uzbekistan relative to other Turkic states, regional neighbors, and Western benchmarks, focusing on two critical indicators: the Human Development Index (HDI) and the Global Hunger Index (GHI). The results reveal that Uzbekistan has made substantial and sustained progress, particularly after 2016, in both dimensions. Human development improvements have been achieved not only through resource expansion but also through increased efficiency in translating these resources into better outcomes. Uzbekistan's experience contrasts with the more volatile or stagnant trajectories observed in countries like Kyrgyzstan, Turkmenistan, and Tajikistan.

These findings are largely consistent with previous literature. Studies such as those by Pomfret (2019), World Bank (2022), and Abdurakhmanov et al. (2016) had noted Uzbekistan's gradual shift toward a more open and developmental governance model. Moreover, evidence from Surkova (2012) and Davletova (2025) regarding regional disparities and the importance of targeted investments remains highly relevant, especially considering the minor resurgence of inefficiencies in 2023 in outcomes like stunting and wasting.

### 4.1. Limitations of the Study and Future Research

While this study provides a comprehensive assessment of Uzbekistan's human development progress and efficiency relative to its regional and global peers from 1990 to 2023, several limitations should be acknowledged. First, the analysis relies primarily on aggregate indicators such as the Human Development Index (HDI) and the Global Hunger Index (GHI), which, although widely accepted, may obscure important intranational disparities (e.g., between provinces or rural-urban divides) and sector-specific dynamics. Second, the efficiency analysis, conducted through different specifications of Data Envelopment Analysis (DEA), depends heavily on the quality and consistency of available secondary data. Potential inaccuracies or gaps, particularly for earlier periods and outcomes such as stunting or wasting, could introduce biases into the results. Third, the literature review was constrained by limited access to Russian-language sources, which may have excluded important regional insights and analyses.

Future research could address these limitations by incorporating regionally disaggregated datasets to better capture internal disparities and variations in development outcomes. Additionally, employing broader socio-economic indicators such as the Multidimensional Poverty Index (MPI) (Alkire & Foster, 2011) and the Inequality-adjusted Human Development Index (IHDI) (UNDP, 2010) would enrich the analysis by providing a more nuanced understanding of poverty and inequality dynamics. Utilizing micro-level data, expanding the set of input and output variables, and applying complementary efficiency assessment methods would also strengthen the robustness of findings. Finally, future studies should strive for a more comprehensive literature comparison by integrating sources from Russian and other regional academic databases to ensure a fuller representation of the research landscape.

### 4.2. Discussion and Policy Recommendations

Based on the findings of this study, several policy recommendations are proposed to sustain and enhance Uzbekistan's human development trajectory. First, it is essential to sustain and deepen reforms by maintaining a strong emphasis on inclusive economic modernization, rural development, and human capital investment, all of which are necessary to consolidate the gains achieved thus far. Second, policy efforts should prioritize rural and vulnerable regions, particularly in light of lingering inefficiencies observed in child nutrition and mortality indicators. Targeted social spending and healthcare interventions are critical to addressing disparities in remote and underserved areas. Third, the development of more robust and real-time monitoring mechanisms is recommended to detect early signs of regression in human development outcomes, thereby enabling swift and adaptive policy responses. Additionally, strengthening vocational and adult education initiatives should be

prioritized, as targeted programs could help close the gap between expected and mean years of schooling, thereby accelerating human capital accumulation. Finally, Uzbekistan would benefit from fostering regional learning and cooperation by engaging with similarly successful countries and systematically avoiding the policy pitfalls evident in neighboring states experiencing efficiency declines.

## Conflict Declaration

There is no conflict of interest in this article.

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