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Assessing the Consistency of National Projects: How Target Achievement Could Transform Russia's Quality of Life Ranking

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Abstract: This study assesses the potential impact of Russia's National Projects on the country's global standing by integrating S.A. Aivazyan's Quality of Life Index (QLI) with State-Space dynamic modelling. Using a panel of 14 socioeconomic indicators (2000–2022), we simulate Russia's quality of life trajectory through 2036 under baseline and target-achievement scenarios. The analysis demonstrates that achieving government targets for life expectancy, fertility, infant mortality, and income inequality is statistically consistent with structural trends and would raise Russia's global rank by 11 positions. These findings validate the internal consistency of Russia's strategic planning goals and confirm the QLI's utility as a tool for public administration effectiveness.

Keywords: National Projects, Quality of Life Index, State Space Model, Demographic Indicators

1. INTRODUCTION

National development strategies increasingly rely on quantitative targets spanning multiple decades. Russia's Presidential Decree No. 309 of May 7, 2024[†] sets ambitious goals for 2036, including significant increases in life expectancy and fertility, and reduction in inequality. Such commitments raise critical questions about their internal consistency when aggregated into composite well-being measures such as quality-of-life indices [2, 12], their projected impact on Russia's international position in cross-country quality-of-life rankings, and how inertial demographic and economic trends constrain the magnitude and timing of achievable gains [6].

Answering these questions requires a forecasting framework that simultaneously transforms heterogeneous socioeconomic and demographic indicators into comparable, directionally consistent scales [1, 2], captures latent structural dynamics while smoothing short-term volatility and preserving long-run trends [3, 7, 18], and accounts for simultaneous progress in peer countries, reflecting the competitive nature of international quality-of-life rankings [19].

Forecasting socioeconomic indicators such as income per capita, life expectancy, education indices, poverty measures, or composite development indicators is a central task in empirical economics, public administration, development monitoring, and strategic planning. These indicators evolve slowly over time, may display structural breaks, and are observed across heterogeneous units such as countries or regions [19]. Any forecasting framework

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must therefore balance strict methodological transparency and interpretability with the ability to capture latent dynamic patterns and persistent trends.

This study combines the static normalization and aggregation procedures of Aivazyan's methodology with the dynamic forecasting power of State-Space models to assess Russia's National Projects. The primary contribution is a transparent, step-by-step blueprint – from indicator transformation to dynamic scenario modeling – that is replicable and adaptable for evaluating strategic targets in various policy contexts.

2. LITERATURE REVIEW

Quality-of-life indices have evolved from single-dimension measures to multidimensional frameworks. The UNDP Human Development Index (HDI) [20] pioneered this approach, followed by refinements such as the OECD Better Life Index [13], the Sustainable Development Goals index[‡], and Aivazyan's hierarchical system [1, 2]. Within Russia, Aivazyan's framework has been successfully operationalized for cross-regional and cross-country comparisons [4, 9, 12]. However, most existing indices remain static cross-sections. A critical gap persists in the development of dynamic forecasting frameworks that explicitly link indicator-level targets to projected international rankings; current approaches often rely on static "what-if" substitutions rather than modeling joint dynamics over time [16].

State-Space models offer a robust framework for decomposing time series into persistent trends and transitory shocks [7,18]. While widely used in macroeconomics for policy analysis and nowcasting [18], and in systems science for signal extraction in short time series [3], their application to composite social indices remains limited. Subspace identification techniques, which estimate parameters directly from trajectory matrices without parametric likelihood functions [7], are particularly suitable for socioeconomic panels with limited temporal depth. Despite these advantages, State-Space models are rarely integrated with the specific normalization and directionality-correction frameworks required for composite indices, leaving a methodological disconnect between dynamic modeling and index construction.

Strategic target evaluation typically relies on CGE models, microsimulation and agent-based dynamics [6, 10, 11], or institutional analysis [15]. For Russia, substantial research has addressed demographic potential [6], population quality [17], and institutional traps [15]. However, these approaches often assess targets via individual indicators or aggregate macroeconomic outcomes rather than their joint effect on composite quality-of-life rankings. A key challenge remains: linking specific targets (e.g., fertility, mortality) to aggregate indices in a dynamic, multi-country framework that accounts for external competitive pressures. This study addresses this gap by integrating Aivazyan's methodology with State-Space forecasting.

3. CONCEPTUAL FRAMEWORK

3.1. Hierarchical Structure of Well-Being Indicators

Traditionally, quality of life is treated as a multidimensional, latent construct operationalized through a hierarchy of observable indicators [1, 2]. Aivazyan proposes a four-level pyramid starting from raw **Primary indicators** (Level I), which are aggregated into semantically coherent **Thematic blocks** (Level II), such as *Quality of the Population*, *Welfare of the Population*, *Quality of the Social Sphere*, *Natural Environment*, and *Natural climatic conditions*. These are then transformed into normalized **Block indices** (Level III) and finally aggregated into a single **Composite QLI** (Level IV). A critical feature of this hierarchy is the

[‡] SUSTAINABLE DEVELOPMENT REPORT 2024. https://sdgtransformationcenter.org/sdgindex

preliminary directionality correction and normalization to a common scale $[0;1]$, ensuring that aggregation across heterogeneous indicators remains conceptually consistent.

Within this framework, national development goals can be mapped directly onto block indicators. The Presidential Decree No. 309 and associated strategic documents define targets corresponding closely to Aivazyan's blocks. For instance, the goal "Preservation of the population" and the national project "Demography" align with the *Quality of the Population* block, targeting fertility rates, life expectancy, and infant mortality. Similarly, the goal "Comfortable and Safe Living Environment" corresponds to the *Welfare of the Population* block through housing and infrastructure indicators. Goals related to poverty reduction and talent development resonate with the *Quality of the Social Sphere*, where strengthening social connections is known to positively impact economic performance [5,8]. Figure 3.1 illustrates this correspondence between Aivazyan's blocks and Russia's 2036 development goals.

Fig. 3.1. Correspondence of block indicators proposed by S. A. Aivazyan (rectangular boxes) and national development goals until 2036 (rounded frames).

3.2. Latent Dynamics and Unified Analytical Pipeline

While Aivazyan's framework provides a robust static description of quality of life, analyzing long-term trajectories requires explicitly modeling the dynamics of these indicators. We employ a State-Space model to decompose the normalized indicator into latent and noise components. This representation allows for smoothing short-term noise and extracting persistent development trends, which is crucial for medium-term forecasting [7, 18].

To operationalize this, we propose a unified analytical pipeline. First, raw indicators undergo **Aivazyan normalization** to obtain directionally aligned variables [1, 2]. Second, we apply **Subspace identification** using singular value decomposition on Hankel trajectory matrices to estimate matrices A and C without specifying parametric likelihoods [3, 7]. Third, **filtering** generates smoothed state estimates and multi-step forecasts. Finally, we perform **Scenario injection** by substituting Russia's target values for 2024, 2030, and 2036 (e.g., life expectancy, fertility) into the model as exogenous constraints. The robustness of these rank improvements is verified via **Bootstrap validation**. This integration unifies the interpretability of Aivazyan's static indices with the structural forecasting power of dynamic State-Space models.

4. METHODOLOGY

4.1. Data Sources and Measurement

The empirical analysis utilizes a panel of 14 socioeconomic indicators for 63 countries over the period 2000–2022. Data are drawn from the World Bank Development Indicators[§] and the UNDP Human Development Index database[¶]. The variable set (Table 4.1) aligns with global frameworks (HDI, SDGs, BLI) and prior studies on quality-of-life assessment in Russia [2, 4, 9, 14]. Due to data constraints, the fund coefficient is calculated as the income ratio of the top 20% to the bottom 20%.

Table 4.1. Description of variables used in the analysis

No.	Variable	Description
1	`gdp_pc`	GDP per capita, PPP (current international $)
2	`lab_effect`	Labour productivity (GDP per person employed, 2021 PPP $)
3	`consumption`	Final consumption expenditure per capita (constant 2015 US$)
4	`literacy`	Adult literacy rate (% ages 15+)
5	`funds`	Income share ratio (highest 20% / lowest 20%)
6	`inflation`	GDP deflator (annual %)
7	`expectancy`	Life expectancy at birth (years)
8	`mortality`	Infant mortality rate (per 1,000 live births)
9	`carbon`	CO_2 emissions (% change from 1990)
10	`resdev`	R&D expenditure (% of GDP)
11	`fertility`	Total fertility rate (births per woman)
12	`gini`	Gini index
13	`gni`	GNI per capita, PPP (current international $)
14	`hdi`	Human Development Index

4.2. Indicator Transformation and Normalization

Following Aivazyan's framework, heterogeneous indicators $y_{i,t}$ are transformed into dimensionless scores $z_{i,t} \in [0, 1]$ to ensure comparability and consistent directionality ("higher is better"). Indicators are classified as *direct* (e.g., income, life expectancy) or *inverse* (e.g., mortality, inequality). For each year t, transformations are applied cross-sectionally:

$$z_{i,t} = \begin{cases} \frac{y_{i,t} - \min_j y_{j,t}}{\max_j y_{j,t} - \min_j y_{j,t}}, & \text{for direct indicators,} \\ \frac{\max_j y_{j,t} - y_{i,t}}{\max_j y_{j,t} - \min_j y_{j,t}}, & \text{for inverse indicators.} \end{cases} \quad (4.1)$$

The resulting $z_{i,t}$ values serve as the basis for both composite index aggregation and dynamic forecasting.

[§] https://data.worldbank.org
[¶] https://hdr.undp.org/data-center/human-development-index

4.3. Forecasting Strategy

We define the forecasting target as $\hat{z}_{i,t+h}$ for horizon $h \geq 1$. A rolling window approach is used to generate forecasts, estimating models on $\{z_{i,1}, \dots, z_{i,t}\}$ to predict $t + h$. Two modeling approaches are compared.

4.3.1. Baseline Model A transparent benchmark $f(\cdot)$ using only observable lags:

$$\hat{z}_{i,t+h}^{(base)} = f(z_{i,t}, z_{i,t-1}, \dots, z_{i,t-L}). \tag{4.2}$$

This specification (typically AR or exponential smoothing) captures inertia but lacks structural depth.

4.3.2. State-Space Model To capture latent structural trends, we employ a State-Space representation [3]:

$$x_{t+1} = Ax_t + w_t, \quad w_t \sim \mathcal{N}(0, Q), \tag{4.3}$$

$$z_t = Cx_t + v_t, \quad v_t \sim \mathcal{N}(0, R), \tag{4.4}$$

where $x_t \in \mathbb{R}^k$ is the latent socioeconomic state, and A, C are system matrices.

Estimation. Following [3], we employ subspace identification based on the Singular Value Decomposition (SVD) of the block Hankel matrix H. The matrix is factorized as the product of observability ($\mathcal{O}_k$) and controllability ($\mathcal{C}_k$) matrices:

$$H = U\Sigma V^\top \approx \mathcal{O}_k \mathcal{C}_k. \tag{4.5}$$

The state dimension k corresponds to the dominant singular values in Σ. $\mathcal{O}_k$ (stacking $C, CA, \dots$) and $\mathcal{C}_k$ (stacking $x_1, Ax_1, \dots$) are estimated from the signal subspaces of U and V. System matrices A and C are then recovered via the shift-invariance property of $\mathcal{O}_k$, enabling robust estimation on short time series without parametric assumptions.

Forecasting. Multi-step forecasts are generated by propagating the filtered state x_t forward:

$$\hat{z}_{t+h} = CA^h x_t. \tag{4.6}$$

This formulation filters out short-term measurement noise (v_t) while capturing persistent structural dynamics (x_t), making it appropriate for medium-term analysis ($h \geq 2$).

5. EMPIRICAL RESULTS

The empirical analysis proceeds along two distinct methodological lines based on the framework established in Sections 2 and 3. While these approaches function autonomously, their comparative results yield consistent conclusions: achieving strategic targets drives an improvement in Russia's rank position.

5.1. Static Rank of Russia by Aivazyan's Methodology

We use 2022 as the base year due to data availability. All ranks "before correction" and "after target value substitution" refer specifically to 2022. Figure 5.2 provides a comparison between the QLI and HDI. As shown in the plots, the QLI exhibits greater volatility compared to the relatively smooth trajectory of the HDI, indicating that Aivazyan's index is significantly more sensitive to fluctuations in socioeconomic indicators and shifts in the global context.

The static ranking of countries by Aivazyan's composite quality of life index for 2022 was constructed using the hierarchical system described in Section 2 and the normalization rules in Section 3.2. For Russia in the baseline (factual) configuration, the following was obtained:

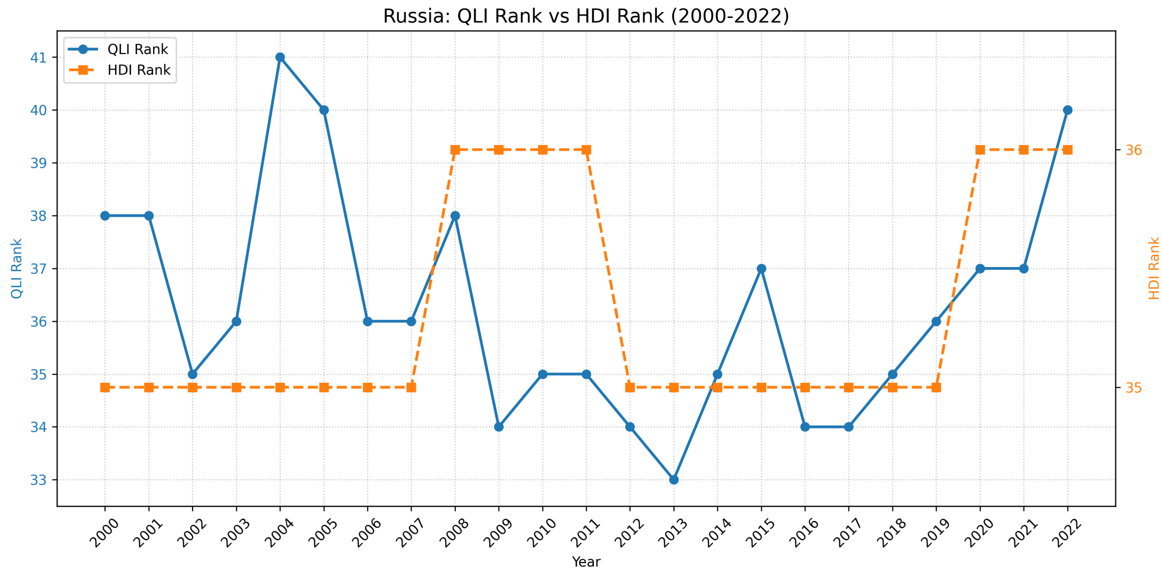

Fig. 5.2. Russia's rank: (left) QLI, (right) HDI. These dual-axis plots show Russia's Aivazyan rank (left axis, inverted so that upward movement indicates improvement) alongside the underlying indicator values (right axis).

- Composite index: $I^{\text{Aiv}}_{\text{RUS},2022} = 0.627$;
- Russia's rank in 2022: **36th place among 63 countries**.

This serves as a reference point for comparison with alternative scenarios.

Table 5.2. Baseline static rank of Russia by Aivazyan index (2022) and bootstrap estimates

Indicator	Estimate	Lower 95% CI	Upper 95% CI
$I^{\text{Aiv}}_{\text{RUS},2022}$	0.627	0.440	0.639
$\text{Rank}^{\text{Aiv}}_{\text{RUS},2022}$	36	36	36

The bootstrap procedure was conducted over 10000 replications to assess the statistical stability of Russia's rank. Results are presented in Table 5.2. The resulting confidence interval for Russia's rank in 2022 had a width of less than three positions, indicating high stability of the rank estimate: none of the replications moved Russia beyond its cluster of countries with similar development levels. After substituting target values, a narrowing of the confidence interval and a shift of the median rank toward improvement are also observed.

To understand the context of Russia's position, Table 5.3 presents the top ten leading countries by Aivazyan index in 2022. The top positions are consistently occupied by highly developed countries with high quality of life indicator values. Russia is substantially below the top ten.

5.2. Scenario Forecast with Target Values (2024–2036)

Official target values for four key quality of life indicators for Russia were specified for years 2024, 2030, and 2036 according to Presidential Decrees No. 204 (2024 targets) and No. 309 (2030 and 2036 targets). These target indicators are:

- Life expectancy at birth (years)
- Total fertility rate (births per woman)
- Gini coefficient (inequality index)

Table 5.3. Top-10 countries by Aivazyan index (2022)

Rank	Country	$I^{\mathrm{Aiv}}_{i,2022}$
1	Austria	1.000
2	Switzerland	0.991
3	Australia	0.991
4	Sweden	0.975
5	Luxembourg	0.969
6	Finland	0.967
7	United States	0.952
8	Norway	0.929
9	Italy	0.928
10	Iceland	0.915
	…	
36	Russian Federation	0.627

- Infant mortality rate (per 1,000 live births)

Table 5.4 presents the target values for each horizon.

Table 5.4. Target indicators for Russia (Presidential Decrees No. 204 and No. 309)

Indicator	2024 Target	2030 Target	2036 Target
Life expectancy (years)	78	78	81
Total fertility rate	1.7	1.6	1.8
Gini coefficient	—	0.37	0.33
Infant mortality (per 1,000)	4.5	3.9	3.7

These target values were substituted into the Aivazyan index calculation formula, while keeping other indicators and index structure unchanged. The scenario trajectory for Russia shows substantial improvement in both index values and rankings, as presented in Table 5.5.

Table 5.5. Russia's forecast index and rank: baseline and scenario (2022–2036)

Year	Scenario Index	Scenario Rank	Improvement (places)
2022	0.627	36	—
2024	0.564	35	0
2030	0.571	32	+3
2036	0.616	23	+11

Note: Baseline and scenario values are computed using the Subspace dynamic model defined in Eq. (3.3)–(3.6). Improvements reflect changes relative to Russia's baseline forecast, not a fixed reference as in static substitutions.

The scenario analysis based on the Subspace model shows a moderate but statistically meaningful improvement rather than dramatic jumps. According to the dynamic forecast, if Russia achieves the four target indicators, its ranking improves from **36th place** in 2022 to **35th place** in 2024, **32nd place** in 2030, and **23rd place** in 2036. Thus, the maximum improvement relative to the baseline trajectory is **+11 positions**, reflecting long-term structural changes captured by the latent dynamics of the State-Space model.

This scenario should be interpreted as a realistic assessment rather than an upper bound. Unlike static substitutions, the Subspace model incorporates simultaneous development of all countries, meaning that Russia's improvement occurs in a competitive environment where other countries also progress. Consequently, estimated gains are more conservative but more suitable for policy interpretation.

Bootstrap validation confirms that the observed improvements are statistically stable, with narrow confidence intervals and consistent movement of Russia's trajectory upward relative to the baseline.

6. DISCUSSION AND CONCLUSION

The empirical analysis yields several key findings that confirm the utility of the integrated Aivazyan–Subspace framework for strategic policy assessment.

First, the current assessment places Russia 36th among 63 countries in the 2022 composite quality of life index. Bootstrap validation confirms this estimate is statistically stable, with rank variation constrained to a narrow band.

Second, the dynamic modeling reveals that achieving the four national development targets – life expectancy, fertility, infant mortality, and income inequality – leads to a measurable but moderate improvement in Russia's quality-of-life ranking. Within the Subspace model Russia's trajectory improves from 36th place (2022) to 35th (2024), 32nd (2030), and 23rd (2036). These results indicate a gradual but structurally consistent upward shift driven by improvements in the four key indicators, consistent with competitive international dynamics.

Third, the comparison of methodological approaches highlights that the static Aivazyan substitution method provides an upper-bound estimate for a single year, whereas the Subspace model generates a realistic multi-country dynamic trajectory. The two approaches agree on the direction of the effect (achievement of national targets improves the quality-of-life index) but differ in magnitude due to fundamentally different assumptions about international competition and dynamic adjustment. The forecasted improvement reflects competitive international dynamics rather than idealized conditions.

Overall, the study demonstrates that the official targets embedded in Russia's National Projects form a statistically coherent system. Simultaneous progress on the four key dimensions would generate a measurable upward shift in Russia's composite quality-of-life position.

While the methodology successfully links indicator-level dynamics to aggregate outcomes, several limitations should be acknowledged.

The scenario gains in Russia's ranking require changes that go far beyond inertial baseline trends. They presuppose sustained improvements in demographic behavior, health outcomes, and distributional equity in a challenging context of demographic ageing and fiscal constraints. As noted in the institutional literature, structural constraints and "institutional traps" may impede the full realization of these ambitious goals.

Furthermore, the international ranking demonstrates strong persistence. The structural stability of leading nations underscores that relative improvements are difficult to achieve. The model assumes that the declared targets are fully met; however, in practice, they represent a demanding upper bound rather than an automatic trajectory. Active competition from other countries that are also upgrading their social and economic policies means that even successful domestic policy implementation may yield smaller relative gains if peer nations accelerate their own development.

The empirical results support the following recommendations for strategic planning:

1. **Prioritization of key indicators.** The four target indicators (life expectancy, fertility, inequality, infant mortality) represent dimensions with strong explanatory power for composite index outcomes. Their prioritization within national strategic planning is empirically justified, as improvements in these specific dimensions produce measurable upward shifts in Russia's ranking.
2. **Use of QLI for ex ante assessment.** The integrated Aivazyan–Subspace methodology provides a transparent and policy-relevant tool for testing the consistency of long-term

objectives. It can serve as an ex ante criterion for assessing whether proposed policy goals are aligned with realistic constraints and observable indicator dynamics.

3. **Focus on structural transformation.** Since baseline dynamics show only gradual incremental improvement, achieving the targeted gain requires structural policy interventions that break inertial trends. Policymakers should treat the National Project targets not merely as forecasts but as active benchmarks requiring sustained effort to overcome demographic and institutional headwinds.

In conclusion, this study established an integrated framework that combines Aivazyan's indicator transformation methodology with a dynamic State-Space forecasting model, estimated via subspace identification. This approach effectively unifies interpretability with structural time-series modeling and demonstrates broad applicability across a wide range of socio-economic indicators.

The empirical findings confirm that the integrated Aivazyan–Subspace methodology provides a transparent, reproducible, and policy-relevant tool for medium- and long-term socio-economic forecasting. Future research may extend the framework by incorporating multivariate latent structures, exogenous policy shocks, or refined composite index methodologies.

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