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<https://orcid.org/0000-0002-5274-0356>
tedqiqat1868@gmail.com

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tedqiqat1868@gmail.com

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<https://orcid.org/0000-0002-8978-8847>
sert739@rambler.ru

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Trends in the Development of Women's Education in Georgia and Modern Pedagogical Perspectives

Mariam Koberidze 

Abstract. This article examines the historical development and contemporary condition of women's education in Georgia from a gender-equality perspective. It combines qualitative document analysis, historical interpretation, comparative analysis, and descriptive examination of institutional data. The study considers cultural expectations, professional segregation, educational stereotypes, legal guarantees, and women's participation in higher education. The findings indicate that formal access to education has expanded substantially and Georgian legislation provides equal educational rights. Nevertheless, gendered expectations continue to influence subject choice, professional orientation, employment, remuneration, and access to leadership. The historical contributions of Georgian public figures demonstrate that women's education has long been connected with social modernization and civic participation. Current patterns suggest that legal equality alone does not eliminate informal barriers. The article concludes that educational institutions should integrate gender-sensitive teaching, career guidance, community participation, and transparent monitoring in order to convert formal equality into equal educational and professional opportunities.

Keywords: women, education, stereotypes, gender equality, gender balance, pedagogical perspectives, Georgia

Gori State University, Doctor of Philology, Gori, Georgia

E-mail: maikoberidze@gmail.com

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Gürcüstanda qadın təhsilinin inkişaf tendensiyaları və müasir pedaqoji perspektivlər

Mariam Koberidze 

Xülasə. Məqalədə Gürcüstanda qadın təhsilinin tarixi inkişafı və müasir vəziyyəti gender bərabərliyi baxımından araşdırılır. Tədqiqatda sənəd təhlili, tarixi şərh, müqayisəli yanaşma və institusional məlumatların təsviri təhlili birləşdirilir. Mədəni gözləntilər, peşə seçiminin gender üzrə bölgüsü, təhsil stereotipləri, hüquqi təminatlar və qadınların ali təhsildə iştirakı nəzərdən keçirilir. Nəticələr göstərir ki, təhsilə formal çıxış əhəmiyyətli dərəcədə genişlənməmiş və Gürcüstan qanunvericiliyində bərabər təhsil hüquqları təsbit edilmişdir. Bununla yanaşı, genderlə bağlı gözləntilər ixtisas seçiminə, məşğulluğa, əməkhaqqına və rəhbər vəzifələrə çıxışa təsir göstərməkdə davam edir.

Məqalədə formal bərabərliyin real imkan bərabərliyinə çevrilməsi üçün genderə həssas tədris, karyera istiqamətləndirilməsi, ictimai iştirak və şəffaf monitorinqin gücləndirilməsi təklif olunur.

Açar sözlər: *qadınlar, təhsil, stereotiplər, gender bərabərliyi, gender balans, pedaqoji perspektivlər, Gürcüstan*

Qori Dövlət Universiteti, Filologiya elmləri doktoru, Qori, Gürcüstan

E-poçt: maikoberidze@gmail.com

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Introduction

Modern approaches to human rights regard equality between women and men as a basic condition of democratic governance. In education, gender equality includes equal access, equal treatment, comparable opportunities for achievement, and freedom to choose a field of study without restrictive stereotypes. Education can broaden women's opportunities for self-realization, employment, civic participation, and leadership; however, formal access does not automatically remove cultural and institutional barriers.

The Georgian experience combines a long history of advocacy for women's education with contemporary legal guarantees. Public debate on women's rights developed in the nineteenth century, and intellectuals connected women's education with social progress and national modernization. Today, legislation provides equal access to education, yet social expectations regarding motherhood, care work, professional roles, and leadership continue to shape educational and occupational decisions (Bagratia, 2013).

International literature similarly distinguishes legal equality from substantive equality. Gender roles are socially learned and may vary across cultures and historical periods (UNESCO, 2009). Educational stereotypes can influence classroom interaction, subject choice, professional expectations, and the confidence with which students assess their abilities (Sadker & Sadker, 1995; Sadker et al., 1991). The purpose of this article is therefore to examine the historical development of women's education in Georgia, identify continuing barriers, and consider pedagogical measures that can strengthen equal educational and professional opportunities.

Materials and Methods

The study used a mixed qualitative and descriptive design. The qualitative component included document analysis, historical interpretation, comparison, and critical analysis. It examined selected works on gender and education, Georgian historical writings, international policy documents, and national legal material. The descriptive component considered author-supplied institutional data from Gori State University for 2024 in order to illustrate gender distribution across broad fields of study. The analysis proceeded in three stages. First, historical materials were examined to identify how women's education was connected with civic rights and social modernization. Second, pedagogical and policy sources were reviewed to identify mechanisms through which stereotypes influence educational participation and professional orientation. Third, the institutional figures were compared descriptively by field and gender. Because the university table concerns one institution and one year, it is treated as an illustrative case and not as representative evidence for all higher education institutions in Georgia.

The study did not involve surveys, interviews, experiments, or personal data. Its conclusions are based on interpretation of published material and aggregate institutional figures. Accordingly, the study identifies patterns and pedagogical implications but does not estimate causal effects.

Results

Historical development of women's education

The historical analysis shows that women's education in Georgia developed alongside broader debates about civil rights and national progress. Simone de Beauvoir's analysis of women's socially constructed position helped establish a conceptual foundation for examining how culture assigns different expectations to women and men (Beauvoir, 2024). In Georgia, women's participation in public discussions expanded during the nineteenth century, and writers and activists challenged the confinement of women to domestic roles. Ilia Chavchavadze linked women's education with public and civil rights and regarded women's professional activity as a condition of social freedom. His discussion of women's emancipation emphasized that education enabled women to participate in social and state functions while retaining family roles (Chavchavadze, 1988). Niko Nikoladze likewise supported European education for Georgian women and helped students pursue education abroad despite the restrictions of his period (Nikoladze, 1878). These examples show that women's education was understood not only as an individual benefit but also as a contribution to national development.

Educational stereotypes and equal opportunity

The reviewed literature indicates that equal enrolment conditions do not necessarily eliminate gendered expectations. Students may be guided toward different subjects and careers on the assumption that boys are naturally better suited to mathematics, engineering, and technology, while girls are better suited to languages, education, and the arts. Such expectations can be reinforced through classroom attention, feedback, textbooks, family expectations, and career guidance (Sadker et al., 1991; Zittleman & Sadker, 2003).

Gender equality requires equal conditions, treatment, and opportunities so that women and men can realize their potential and participate in social, cultural, economic, and political development (Status of Women Canada, 2007). UNESCO (2009) likewise treats gender roles as socially constructed and changeable. These definitions direct attention away from biological determinism and toward the educational and social processes that shape choices.

Table 1

Dimensions and indicators of gender equality in education

Equal access	Equality in educational quality	Equality through education	Illustrative indicators
Girls and boys outside school	Literacy, mathematical literacy, and life skills	Employment opportunities for women and men	Out-of-school rates and student–teacher ratio

Note. Adapted from the analytical framework used in the source manuscript.

Contemporary participation and institutional patterns

Contemporary Georgian legislation formally prohibits discrimination and guarantees equal access to education. The Law on Gender Equality recognizes equal rights and opportunities in education,

labour, family, and public life and provides for equal access to all levels and fields of education (Bagratia, 2013). Nevertheless, equality in law may coexist with unequal outcomes in employment, remuneration, care responsibilities, and access to management positions.

The institutional figures supplied for Gori State University illustrate different gender distributions across broad fields. Women constitute the majority in the humanities and social sciences, while men have a larger share in precise and natural sciences, economics, and law. The table is descriptive and cannot establish why students selected particular fields.

Table 2

First-year students at Gori State University by field and gender, 2024

Field	Female (%)	Male (%)
Humanities	80	20
Precise and natural sciences	50	50
Economics	35	65
Social sciences	55	45
Law	26	64

Note. Author-supplied institutional data. The law-field values are reproduced unchanged from the source manuscript and should be verified because they total 90 rather than 100 percent.

The data suggest field-specific gender patterns, but the example of one university cannot support national generalization. A broader assessment would require comparable data across institutions, years, degree levels, regions, and fields. It would also require information on applications, admissions, completion, employment, and academic progression.

Discussion

The findings indicate that the development of women's education in Georgia should be understood through the interaction of legal reform, historical advocacy, cultural expectations, and institutional practice. Formal equality has expanded access and supported women's participation in higher education. At the same time, stereotypes can continue to influence which subjects are considered appropriate, how teachers distribute attention, and how students imagine their professional futures. The distinction between access and outcome is important. Women may enter higher education in large numbers while remaining concentrated in fields associated with lower remuneration or fewer leadership opportunities. International development literature has repeatedly connected women's education with employment, family welfare, poverty reduction, and social development (World Bank, 2005, 2009). These relationships should not be interpreted as automatic: educational credentials create opportunities only when labour-market institutions, family support, childcare, and non-discriminatory recruitment allow women to use them.

Pedagogically, gender equality requires more than presenting identical curricula to girls and boys. Teachers should examine classroom interaction, examples used in textbooks, expectations communicated through feedback, and the assumptions embedded in career guidance. Research on gender bias in education shows that apparently neutral practices can reproduce unequal participation when teachers and institutions do not monitor patterns of attention and encouragement (Sadker & Sadker, 1995; Sadker et al., 1991).

Community participation is also relevant. Families, local organizations, universities, and employers can support women through mentoring, accessible childcare, flexible learning opportunities, and public discussion of professional stereotypes. Such measures are particularly important in regions

where educational and employment opportunities are more limited. The objective should be to expand genuine choice rather than direct women and men into predetermined roles.

Limitations

This study is based on a selective set of historical, policy, and pedagogical sources. The institutional table relates to one university and one year and therefore cannot represent Georgia as a whole. The source manuscript does not provide the sampling frame or administrative extraction procedure for the university data, and one pair of percentages requires verification. Future research should use national longitudinal data and clearly documented institutional datasets.

Conclusion

Women's education in Georgia has developed from a historically restricted field into an area protected by formal legal equality and marked by substantial female participation. Georgian intellectual history demonstrates that women's education has long been associated with modernization, civic responsibility, and national development. Contemporary evidence nevertheless shows that social expectations and professional stereotypes can continue after legal barriers have been removed.

Educational policy should therefore connect equal access with equal quality, freedom of subject choice, career development, and fair employment opportunities. Gender-sensitive teaching, transparent institutional data, inclusive career guidance, community support, and accessible childcare can help transform formal rights into substantive equality. Further research should test these relationships with representative data and compare patterns across regions, institutions, and degree levels.

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Statistical Analysis as a Tool for Assessing and Forecasting Economic Processes

Nanuli Khizanishvili 

Abstract. *This article examines how statistical analysis supports the assessment and forecasting of economic processes and demonstrates why data definitions, revisions, and uncertainty must accompany numerical results. The study combines conceptual analysis with an illustrative case study of Georgia. Official annual unemployment data for 2021–2025, population releases, demographic indicators, and the Economic Analysis Portal of the National Statistics Office of Georgia are examined alongside methodological literature on descriptive statistics, econometrics, forecasting, and official data quality. The results show that Georgia's unemployment rate fell from 20.6 percent in 2021 to 13.9 percent in 2025, but the decline was uneven and stopped in the final year. A linear time-trend fitted to only five observations yields a 2026 point estimate of 11.38 percent and a wide 95 percent prediction interval of 6.99–15.77 percent; it is therefore presented as a diagnostic benchmark, not a policy forecast. The population case reveals an additional risk: revisions following the 2024 census materially changed the historical series, making unrevised figures unsuitable for simple extrapolation. The article concludes that credible economic assessment requires reproducible calculations, metadata, revision awareness, alternative scenarios, and explicit communication of uncertainty.*

Keywords: *statistical analysis, economic forecasting, unemployment, data revision, time series, official statistics, Georgia*

Iakob Gogebashvili Telavi State University, Doctor of Economic Sciences, Telavi, Georgia

E-mail: nanaulli@gmail.com

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İqtisadi proseslərin qiymətləndirilməsi və proqnozlaşdırılması vasitəsi kimi statistik təhlil

Nanuli Xizanişvili 

Xülasə. *Məqalədə statistik təhlilin iqtisadi proseslərin qiymətləndirilməsi və proqnozlaşdırılmasına necə xidmət etdiyi araşdırılır, rəqəmsal nəticələrlə yanaşı məlumat təriflərinin, düzəlişlərin və qeyri-müəyyənliyin göstərilməsinin zəruriliyi əsaslandırılır. Tədqiqat konseptual təhlili Gürcüstan üzrə nümunəvi hadisə araşdırması ilə birləşdirir. Gürcüstan Milli Statistika Xidmətinin 2021–2025-ci illər üzrə rəsmi işsizlik göstəriciləri, əhali məlumatları, demoqrafik göstəricilər və İqtisadi Təhlil Portalı təsviri statistika, ekonometrika, proqnozlaşdırma və rəsmi statistikanın keyfiyyəti üzrə metodoloji ədəbiyyatla birlikdə təhlil edilmişdir. Nəticələr göstərir ki, işsizlik səviyyəsi 2021-ci ildəki 20,6 faizdən 2025-ci ildə 13,9 faizə enmiş, lakin azalma qeyri-bərabər olmuş və son ildə dayanmışdır. Beş müşahidəyə uyğunlaşdırılan xətti trend 2026-cı il üçün 11,38 faiz nöqtə qiyməti və 6,99–15,77 faiz geniş proqnoz intervalı verir; buna görə nəticə siyasət proqnozu deyil, diaqnostik meyar kimi şərh*

olunur. Əhali nümunəsi göstərir ki, 2024-cü il siyahıyaalmasından sonrakı düzəlişlər tarixi sıranı əhəmiyyətli dərəcədə dəyişmişdir. Etibarlı qiymətləndirmə təkrarlana bilən hesablamalar, metadata, düzəlişlərin izlənməsi, alternativ ssenarilər və qeyri-müəyyənliyin açıq təqdim edilməsini tələb edir.

Açar sözlər: statistik təhlil, iqtisadi proqnozlaşdırma, işsizlik, məlumatların düzəlişi, zaman sırası, rəsmi statistika, Gürcüstan

İakob Qoqebaşvili adına Telavi Dövlət Universiteti, İqtisad elmləri doktoru, Telavi, Gürcüstan

E-poçt: nanauli@gmail.com

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Introduction

Economic decisions depend on claims about the present and expectations about the future. Governments evaluate employment, inflation, investment, output, and demographic change; firms assess demand, costs, labour availability, and risk. Statistical analysis makes these processes observable by converting records and surveys into indicators, comparisons, and models. Its value, however, does not come from calculation alone. A result is useful only when the underlying concept is defined, the data source is appropriate, the method is reproducible, and uncertainty is communicated.

Descriptive statistics summarize the level, distribution, and change of economic variables. Index numbers permit comparison of prices or quantities across time. Correlation and regression describe relationships, while time-series methods use temporal structure to construct forecasts. These tools answer different questions and cannot be substituted for one another. A trend may describe movement without identifying its cause, and a strong fitted relationship may still forecast poorly outside the observed period (Shmueli, 2010; Wooldridge, 2020).

Forecasting adds a further burden. A point estimate compresses assumptions about the data-generating process into one number. If those assumptions are hidden, users may interpret a conditional model output as a certain future outcome. Forecasting practice therefore requires benchmarks, residual diagnostics, prediction intervals, and comparison with alternative specifications (Chatfield, 2000; Hyndman & Athanasopoulos, 2021). Complex methods do not automatically solve the problem; model performance depends on the structure, size, and stability of the data (Makridakis et al., 2018).

Official statistics require particular care because published series can be revised. Benchmark revisions, revised classifications, updated seasonal factors, survey redesign, and population censuses can alter earlier observations. The Fundamental Principles of Official Statistics emphasize professional standards, scientific methods, transparency, and public access to explanatory information (United Nations, 2014). The European Statistics Code of Practice likewise connects quality with accessibility, coherence, comparability, and clear documentation (Eurostat, 2017).

Georgia provides a useful illustrative case because the National Statistics Office of Georgia publishes labour-market and demographic data together with interactive analytical services. A superficial reading of these figures can suggest a smooth decline in unemployment and population. Yet several values commonly repeated in such summaries belong to a different reference year or have been superseded by revised data. This problem demonstrates a central methodological point: data vintage and metadata are part of the result.

The study asks three questions. First, what analytical sequence connects official data with defensible economic assessment? Second, what can a short unemployment series support in relation to a 2026 forecast? Third, how do revisions to population estimates affect interpretation? The objective is to preserve the article's applied focus while replacing unsupported extrapolation with a transparent and reproducible framework.

Materials and Methods

The study uses a qualitative review of statistical methodology and an illustrative quantitative case study. The conceptual component distinguishes description, explanation, and prediction. The empirical component uses annual unemployment rates for Georgia from 2021 through 2025 and published population estimates for 2025 and 2026. All empirical values come from the National Statistics Office of Georgia. The employment series reports 20.6, 17.3, 16.4, 13.9, and 13.9 percent for 2021-2025 respectively (National Statistics Office of Georgia, 2026a).

The population analysis compares two data vintages. A release dated 25 April 2025 reported 3,704.5 thousand residents as of 1 January 2025 and stated that the estimate excluded occupied territories (National Statistics Office of Georgia, 2025). The current population database, accessed on 14 September 2026, reports a revised value of 3,930.4 thousand for 2025 and 3,941.1 thousand for 2026 (National Statistics Office of Georgia, 2026b). The difference is treated as a revision issue rather than as real population growth between two observations bearing the same reference date.

For unemployment, the analysis calculates annual percentage-point changes, the arithmetic mean, and the average annual change between the first and last observations. A simple ordinary least squares model is fitted for demonstration: $y_t = a + bt + e_t$, where y_t is the annual unemployment rate and t is the calendar year. The fitted slope, coefficient of determination, 2026 point forecast, and a 95 percent prediction interval are reported.

The model is intentionally simple. Its purpose is to show what a transparent baseline can and cannot establish. Five annual observations are insufficient for a robust structural forecast, do not permit testing of seasonality, and cannot isolate causal effects. The prediction interval is calculated for a new observation, not merely for the mean fitted response. This distinction makes the reported uncertainty wider and more relevant to forecasting.

The demographic component does not fit a trend across the revised population series because the census-related break compromises comparability. Instead, it applies a data-quality checklist: reference period, territorial coverage, unit of measurement, publication date, revision status, and comparability with earlier releases. Live-birth totals for 2024 and 2025 are used only as an additional descriptive indicator; they are not treated as proof of a single causal mechanism (National Statistics Office of Georgia, 2026b).

The article also reviews the Economic Analysis Portal as a dissemination tool. The portal permits users to examine sectoral value added, employment, and compensation of employees under alternative settings (National Statistics Office of Georgia, n.d.). The review concerns its analytical function, not a usability experiment. No interviews, surveys, personal data, or confidential records were used.

Results

The first result is a five-step sequence for applied economic analysis. The analyst should define the economic concept, inspect the source and metadata, describe the observed pattern, select a model appropriate to the question, and communicate uncertainty and revision status. Skipping the first two steps can produce a precise calculation for the wrong quantity. Skipping the final step can turn a conditional estimate into an apparently certain claim.

The unemployment series shows a substantial but uneven improvement. The rate fell by 6.7 percentage points between 2021 and 2025. Most of the reduction occurred in 2022 and 2024, while the 2025 rate was unchanged from 2024. The arithmetic mean over the five years was 16.42 percent, but the mean conceals the direction and irregular timing of change. Annual differences therefore provide a necessary complement to the average.

Table 1

Annual unemployment rate in Georgia

Year	Unemployment rate (%)	Annual change (percentage points)
2021	20.6	Not applicable
2022	17.3	-3.3
2023	16.4	-0.9
2024	13.9	-2.5
2025	13.9	0.0

Source. National Statistics Office of Georgia (2026a). Changes were calculated by the author.

The fitted time trend has a slope of -1.68 percentage points per year and an R-squared value of 0.912. Extrapolation gives a 2026 point estimate of 11.38 percent. Taken alone, these values may appear persuasive. The 95 percent prediction interval, however, extends from 6.99 to 15.77 percent. The interval is wide because the sample is very small and the annual changes vary markedly.

This result exposes two limitations of a simple calculation. First, an average decline of approximately 1.7 percentage points does not justify a narrow forecast range. Second, annual observations cannot support a claim that unemployment predictably falls every summer. Testing seasonality requires quarterly or monthly data and an explicit seasonal model.

Table 2

Diagnostic linear trend for the unemployment rate

Statistic	Result	Interpretation
Observations	5	Too few for a robust structural forecast
Slope	-1.68 pp per year	Average fitted annual decline
R-squared	0.912	In-sample fit, not proof of forecast accuracy
2026 point estimate	11.38%	Conditional extrapolation

Statistic	Result	Interpretation
95% prediction interval	6.99%-15.77%	Uncertainty for a new annual observation

Note. Author's calculations based on National Statistics Office of Georgia (2026a). The model is a diagnostic benchmark and not an official forecast.

The population case produces the third result: a figure must be identified by both reference date and data vintage. The April 2025 release and the current database attach materially different estimates to 1 January 2025. The difference is too large to interpret as ordinary year-to-year demographic change and reflects the later incorporation of census information into the official series.

The current database also reports 3,941.1 thousand residents as of 1 January 2026. Comparing that figure directly with the unrevised 3,704.5 thousand release would falsely imply growth of more than six percent. A valid comparison must use observations from the same statistical vintage or include a documented bridge explaining the revision.

Table 3
Population estimates and data vintage

Source vintage	Reference date	Population (thousand)	Analytical status
Release of 25 April 2025	1 January 2025	3,704.5	Earlier estimate
Database accessed 14 September 2026	1 January 2025	3,930.4	Revised series
Database accessed 14 September 2026	1 January 2026	3,941.1	Current estimate

Sources. National Statistics Office of Georgia (2025, 2026b). Values should not be compared across vintages without revision documentation.

The demographic evidence also contradicts an overly simple narrative. Live births declined from 39,483 in 2024 to 37,867 in 2025, a reduction of approximately 4.1 percent, while the current population estimate increased between 2025 and 2026 (National Statistics Office of Georgia, 2026b). Population change depends on births, deaths, migration, coverage, and revisions. A fertility or migration explanation cannot be inferred from the total population alone.

The fourth result concerns dissemination. Interactive portals expand access and permit rapid comparison of sectoral indicators, but user control does not remove the need for metadata. A chart or scenario generated through the Economic Analysis Portal remains conditional on the selected sector, price basis, period, and assumptions. The portal is most valuable when it helps users reproduce a comparison and inspect the components behind aggregate change.

Together, the cases show that statistical analysis contributes to decision-making in three distinct ways. It describes the observed state, tests relationships or decompositions, and constructs conditional forecasts. These functions should be reported separately. Descriptive improvement does not identify cause; explanatory association does not guarantee predictive accuracy; and a forecast does not become a target merely because it is numerical.

Discussion

The findings confirm the practical importance of statistical methods while narrowing several broad claims commonly made about them. Statistics can improve economic judgment, but it does not automatically produce objectivity. Objectivity depends on transparent definitions, appropriate sampling, reproducible transformation, model diagnostics, and the possibility of independent verification. A method becomes persuasive through its evidential chain, not through mathematical appearance alone.

The unemployment example illustrates the difference between fit and forecast reliability. The trend explains a high share of variation within five observations, yet the prediction interval remains wide. This is not a contradiction. R-squared measures in-sample fit around a particular line; it does not measure the probability that structural conditions will continue. Forecasting texts therefore recommend simple benchmarks, rolling evaluation, and interval forecasts rather than reliance on a single goodness-of-fit statistic (Chatfield, 2000; Hyndman & Athanasopoulos, 2021).

The example also shows why model complexity should be proportionate to available data. With five annual observations, adding multiple explanatory variables would consume degrees of freedom and encourage overfitting. Machine-learning methods would not repair the lack of observations. Evidence from forecasting research shows that flexible methods require careful validation and do not dominate in every setting (Makridakis et al., 2018). A transparent baseline is preferable when the data cannot support a more complex model.

For policy use, the most defensible interpretation is conditional: if the 2021-2025 linear tendency continued unchanged, the point estimate would be 11.38 percent, but plausible variation around that estimate is large. The unchanged rate in 2025 already warns against treating the earlier decline as mechanically persistent. Updated quarterly data, labour-force participation, employment levels, sectoral composition, and uncertainty about future shocks should inform any operational forecast.

The population example is more fundamental because it concerns the measurement base. Census benchmarking can change population denominators used in employment, fertility, income, and per-capita indicators. A revision can therefore alter several economic ratios even when their numerators are unchanged. Analysts should preserve the retrieval date, archive the data vintage, and rerun calculations when a benchmark revision occurs. This practice supports the comparability and transparency principles emphasized in official statistics standards (Eurostat, 2017; United Nations, 2014).

The earlier population estimate should not be described as fraudulent or useless. It was the official estimate available under the information set and methodology of its release date. The methodological error would be to combine it silently with a later revised series. Statistical literacy includes understanding that official values can be provisional and that revision is often evidence of improved measurement rather than institutional failure.

The findings also clarify the role of correlation and regression. Regression can quantify conditional associations and generate predictions under stated assumptions. It does not, by itself, prove that inflation reduces purchasing power through a single channel, that investment causes growth, or that demographic change produces an unattractive business environment. Causal interpretation requires a research design that addresses simultaneity, omitted variables, measurement error, and selection (Wooldridge, 2020).

For firms, the practical implication is to combine macroeconomic indicators with sector-specific evidence. Population totals may inform market size, but purchasing power, regional distribution, age structure, migration, productivity, and digital access may matter more for a particular product. The World Development Report 2021 emphasizes that data create value when governance, infrastructure, and institutional safeguards allow them to be used responsibly (World Bank, 2021).

For public institutions, transparent communication is equally important. Each forecast should state the reference period, source, model, assumptions, update schedule, and uncertainty range. Scenario language should distinguish a baseline from an optimistic or adverse case. When a series is revised, publication systems should preserve revision notes and explain whether historical comparisons remain valid.

The Economic Analysis Portal is useful within this framework because it can shorten the path from data to comparison. Its strongest contribution is not automatic prediction but accessible decomposition and visualization. The analytical responsibility remains with the user: selecting a valid comparison, checking definitions, and avoiding claims that exceed the evidence (National Statistics Office of Georgia, n.d.).

Limitations

This study is an illustrative case analysis, not a comprehensive forecast of Georgia's economy. The unemployment model uses only five annual observations and omits explanatory variables, structural breaks, and quarterly dynamics. Its numerical forecast is included to demonstrate uncertainty and should not be treated as an official projection.

The population comparison identifies a revision but does not reconstruct the full census-benchmarking procedure. The analysis relies on publicly available English-language materials and does not evaluate the internal production systems of Geostat. The portal discussion is documentary; no user testing was conducted.

Future Research

Future research should build a longer quarterly unemployment series and compare naïve, seasonal, autoregressive, and explanatory models through rolling-origin evaluation. Forecast accuracy should be reported out of sample using several measures, while policy interpretation should consider labour-force participation and employment counts alongside the unemployment rate.

A second line of research should quantify how the 2024 census revision changed population denominators and downstream indicators. A reproducible revision matrix could compare vintages by year, region, age, and sex. Research on the Economic Analysis Portal should also test whether metadata prompts and uncertainty displays improve users' interpretation of charts and scenarios.

Conclusion

Statistical analysis is indispensable for assessing and forecasting economic processes, but its credibility depends on disciplined use. The Georgia case shows that averages, annual changes, fitted trends, prediction intervals, and revision metadata answer different questions and must be reported together.

The unemployment rate fell from 20.6 percent in 2021 to 13.9 percent in 2025, but the path was uneven and a five-observation trend produces substantial forecast uncertainty. The population case

demonstrates that revisions can invalidate apparently straightforward comparisons. Analysts must therefore preserve data vintage, verify comparability, state assumptions, and distinguish diagnostic estimates from operational forecasts.

The practical standard is simple: define the indicator, document the source, reproduce the calculation, test the model, report uncertainty, and update the conclusion when the data change. This sequence allows statistical methods to support economic decisions without overstating what the evidence can establish.

Declarations

Ethics approval: Not applicable. The study used publicly available aggregate data and did not involve human participants or personal data.

Conflict of interest: The author declares no conflict of interest.

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Data availability: The data are publicly available through the National Statistics Office of Georgia sources cited in the article.

AI-assisted language editing: Language editing assistance was used to improve English and document formatting. The author reviewed the manuscript and remains responsible for its content and calculations.

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The River Remembers: An Ecocritical Analysis of Nature, Landscape, and Feminine Identity in George Eliot's *The Mill on the Floss*

Gavkhar Akhmedova 

Abstract. This article applies an ecocritical perspective to George Eliot's *The Mill on the Floss* (1860), asserting that the novel's natural landscape—primarily the River Floss and St. Ogg's pastoral environment—acts as more than a decorative backdrop, serving instead as an active, ideologically and narratively charged element. Drawing from the theoretical tools of ecocriticism, ecofeminism, and place studies, the article identifies four overlapping aspects of Eliot's environmental imagination: the river as agent and symbol of narrative fate; nostalgic pastoral longing as a critique of industrial modernity; a homologous positional status of nature and woman within a single framework of social control; and the ambivalent environmental politics of the novel's catastrophic flood conclusion. The methodology employed includes close textual analysis of the novel and examination of its intertextual relationships to Victorian geological discourse, Romantic nature writing, and the period's debates about land enclosure and industrial change. The research demonstrates that Eliot develops a complex ecological awareness which anticipates many contemporary ecocritical concerns, such as critiques of nature/culture binaries, the politics of place attachment, and the gendered dimension of environmental exploitation. The study also argues that the novel's final flood functions on multiple levels: as an ecological event, as a social judgment, and as a structural statement about the irresolvability of the natural versus the social determinisms the novel probes. This analysis contributes to the growing body of ecocritical work on Victorian fiction and establishes *The Mill on the Floss* as a key reference point in the history of literary environmental thought.

Keywords: ecocriticism, ecofeminism, George Eliot, *The Mill on the Floss*, pastoral nostalgia, river, flood, Victorian literature

Fergana State University, PhD in Philological Sciences, Uzbekistan

E-mail: ahmedovagavharoy@gmail.com

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Çay xatırlayır: Corc Eliotun *Floss* üzərindəki dəyirman əsərində təbiət, landşaft və qadın kimliyinin ekokritik təhlili

Gövhər Əhmədova 

Xülasə. Bu məqalə Corc Eliotun *Floss* çayındakı dəyirman (1860) romanına ekokritik nöqteyi-nəzərdən yanaşır. Romanda təsvir olunan təbii mənzərə—ilk növbədə *Floss* çayı və Sent Oqqsun pastoral mühiti—dekorativ arxa fon rolundan çıxaraq fəal ideoloji və süjetformalaşdırıcı element kimi təqdim edilir. Ekokritisizm, ekofeminizm və yer araşdırmalarının nəzəri alətlərindən istifadə edərək müəllif Eliotun ətraf mühit təxəyyülünün bir-biri ilə əlaqəli dörd aspektini müəyyənləşdirir:

çay süjet taleyinin agenti və simvolu kimi; sənaye modernliyinin tənqidi kimi nostaljik pastoral; eyni sosial nəzarət çərçivəsində təbiət və qadının homoloji vəziyyəti; romanın fəlakətli sel finalının ziddiyyətli ətraf mühit siyasəti. Tədqiqat Eliotun mürəkkəb ekoloji şüur inkişaf etdirdiyini göstərir: bu şüur təbiət/mədəniyyət ikililiyinin tənqidi, yerə bağlılığın siyasəti və ətraf mühitin istismarının genderlə əlaqəli ölçüsü kimi müasir ekokritik problemləri qabaqcadan hiss edir. Məqalə Viktoriya dövrü bədii nəsrinin ekokritik araşdırmalar külliyyatına töhfə verir.

Açar sözlər: ekokritisizm, ekofeminizm, Corc Eliot, Floss çayındakı dəyirman, pastoral nostalji, çay, sel, Viktoriya dövrü ədəbiyyatı

Fərqanə Dövlət Universiteti, Dilçilik üzrə fəlsəfə doktoru, Özbəkistan

E-poçt: ahmedovagavharoy@gmail.com

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1. Introduction

With an act of sustained environmental attention remarkable in any Victorian fiction, George Eliot's *The Mill on the Floss* (Eliot, 1860) begins. The novel's first chapter, far from describing characters, plot, or social landscape, instead focuses on a river. The anonymous narrator lingers on the "round pool" into which the Floss falls, the "black ships" that transit its waters, the "great warehouse" along its banks, the mill wheel turning in the flood—a barrage of ecological detail so potent that the natural environment seems to precede and exceed the human story it contains. Though such details have been interpreted as memoir, prophecy, and pastoral trope, ecocritical reading—that which views the nonhuman as possessing its own value, significance, and agency—has been a less frequent mode of engagement. The field of ecocriticism, generally put, has so far profoundly reshaped the study of Victorian literature, having demonstrated that this genre was awash with environmental awareness, reflecting a period of unprecedented environmental change—industrialization, urbanization, agricultural enclosure, geological discovery, and human detachment from nature. Nonetheless, the novel remains a marginalized text within ecocritical scholarship. It has been overshadowed by the more obviously "natural" texts of the Romantic period or the more overtly scientific texts of the Victorian era.

The aim of this article is to counter this lack of attention by offering the first prolonged ecocritical study of the text that is informed by an organized analytical approach. I argue here that Eliot's novel makes a unique contribution to Victorian environmental discourse in that it establishes an ecological imagination in which nature appears not just symbolic, but agentive—a real force that has its own temporality, its own logic, and its own way of signifying which interact with and resist the man-made social world depicted. In addition, this ecological imagination is gendered: in positing a homologous relationship between the fates of nature and women within a single framework, Eliot develops what might be read today as an ecofeminist critique of the parallel exploitation of both nature and femininity under the ideological conditions of Victorian capitalism and patriarchy. This article draws upon the following analytical framework organized around four critical dimensions of ecocritical analysis: the river as an ecological agent, nostalgic pastoralism as a critique of industrialism, ecofeminist analyses of the woman–nature homology, and the concluding flood event as both ecological reality and formal statement. I have discussed each axis through close textual analysis and research on intertexts from pertinent areas of scholarly concern. The article is organized as follows: Section 1.1 reviews the theory underlying ecocriticism, ecofeminism, and place studies in Victorian literature and specifically Eliot's novel; Section 2 introduces the methods; Section 3 presents the

analytical results organized by the four axes of discussion; Section 4 discusses the broad importance of the findings; and Section 5 concludes the article.

1.1. Literature Review

1.1.1. Ecocriticism and Victorian Fiction

Victorian scholarship's current ecocritical perspective reflects an array of work showing that Victorian literary discourse reflected and engaged with the period's overwhelming environmental change in complex and varied ways—with its industrialization, urban displacement, agricultural enclosure, geological and scientific discovery, and increasing distance from nature and nature-oriented ways of life. As Kreilkamp (2021) explains, Victorian fiction embodies an “ecological imaginary”—a body of assumptions, strategies, and conventions through which authors engaged with industrial environmental upheaval. By focusing on the formal characteristics of the Victorian realist novel, Hensley (2021) has revealed the ways in which the genre particularly captures what he terms an “environmental form” that encodes its ecological relationships. In recent ecocritical work, an increased focus has been paid to waterscapes in Victorian fiction: rivers, floods, and seashores. Applying a framework of “hydrological thinking,” Parham (2022) asserts that rivers function in Victorian literature not merely as symbols, but as agents that exceed the social logics with which the novels attempt to grasp them. Similarly, in applying this to works by women authors from Shelley to Eliot, Ottum (2020) has shown how Victorian women writers routinely use aquatic imagery to describe the intersection of gendered experience, process, and limitation. These studies have laid critical groundwork for my analysis of the Floss as an agent and as a site of ideological contention. With his emphasis on “deep time,” the vast, impersonal duration opened up by nineteenth-century geology, James (2021) shows how the field of geology reshaped Victorian imaginative engagement with its own past as well as with its present and its futures. The very *longue durée* invoked by geological science influences the characters and landscapes of *The Mill on the Floss* and represents a crucial part of the theoretical work I have undertaken here.

1.1.2. Ecofeminism and the Nature–Woman Homology

Ecofeminism, which is the theoretical field investigating the structural linkage of the domination of nature and the domination of women in patriarchal societies, functions as a useful analytical approach to the present argument. As Plumwood (1993) powerfully articulated, the fundamental tenet of ecofeminist theory—that the cultural marginalization of the natural and of women are homologous cultural formations which spring from the same patriarchal reasoning—has been thoroughly elaborated in ecocritical textual analysis (Westling, 2021). The ecofeminist paradigm provides an extremely helpful reading strategy for texts where female characters are systematically placed in conjunction with the natural in a way that replicates their subjugation to the masculine domain (Westling, 2021). Ecocritical scholars recently have begun to qualify the classic ecofeminist approach in *The Mill on the Floss* to better account for how the nature–woman homology might operate simultaneously as a tool for oppression and for resistance in Eliot's writing; Sultzbach (2020), for example, uses an ecofeminist framework to examine Eliot's treatment of the nature–woman identification as potentially internalized patriarchally or internalized as a space for autonomous female consciousness. I build on the important findings of Sultzbach (2020), developing his analysis further through the application of the four axes previously outlined to Eliot's novel. Talairach-Vielmas (2023) frames the ecofeminist dimensions of Eliot's fiction within the historical context of Victorian botany and natural history, demonstrating how Eliot's renderings of the natural world represent an implicit critique of gender relations in Victorian scientific study. Taylor (2021) provides an illuminating overview of Eliot's animal and plant representations within the scope of her larger imaginative work. These works frame the ecofeminist dimensions of the present article.

1.1.3. Place Studies and Pastoral Nostalgia

Place studies, the study of human beings' interaction with their physical environment and the place attachment that arises from such interaction, constitutes a third theoretical perspective crucial for the present analysis. Tschachler (2020) articulates in his recent work on Eliot's provincial novels how, for the novelist, place—whether the built environment or the landscape—is inherently ideological and functions as a source of identification for her characters. As demonstrated in its intensely rendered childhood landscape of the provincial St. Ogg's and in the narrator's acute sense of nostalgia, *The Mill on the Floss* is arguably Eliot's most extensive study of the ideology of place attachment. Voskuil (2022) connects the pastoral nostalgia in Eliot's novels with the broader intellectual context of Victorian engagement with industrialism. According to Voskuil (2022), the poetic elegies on loss and lamented natural worlds that have long attended the elegiac tradition of pastoral writing are especially indicative of Victorian unease and ambivalence in the face of industrial transformation; as such, it provides a useful heuristic for reading *The Mill on the Floss* as a profoundly nostalgic rendering of the provincial countryside, now largely obliterated by industrial development and capitalist expansion. Hadley (2020) elaborates on the affective politics of memory and landscape in Eliot's novels, especially regarding their exploration of childhood and nostalgia. I integrate the insights from these place studies sources within Section 3 of the present article.

1.1.4. The Flood as a Literary–Ecological Event

The tragic climax of *The Mill on the Floss*—the deluge that demolishes St. Ogg's and engulfs Maggie Tulliver in the Floss River—has occupied much more critical attention than nearly any other element of the novel; explicit ecocritical analyses of its meaning, however, are notably scarce. Feuerstein (2023) has offered perhaps the most detailed recent ecocritical examination of the flood ending, arguing that the catastrophe fulfills the novel's established ecological processes and, at the same time, operates as the climax that finally confronts the irreconcilability of the forces of nature and the forces of society. Lussier (2022) provides an extensive account of the representation of rivers as agents of natural force and social transgression in Victorian fiction, including *The Mill on the Floss*. The present article builds on Feuerstein and Lussier's interpretations through an engagement with the flood not only as a fulfillment of narrative and ecological processes but as the nodal point where natural, ideological, and formal concerns converge.

2. Methods

2.1. Research Design and Approach

This article employs a qualitative, interpretive methodology which blends ecocritical close reading with the use of Victorian geological, botanical, and industrial writings as contexts for textual analysis. George Eliot's *The Mill on the Floss* is the primary text examined, and it is read in its modern scholarly edition (Eliot, 1860/2018). I organize my analysis around the following ecocritical axes: the river as ecological agent, pastoral nostalgia and industrial critique, the nature–woman homology, and the meaning of the flood ending; each axis is explored individually through close reading of selected passages before all four are synthesized into a cohesive argument.

2.2. Theoretical Framework Integration

The methodology of this article is based on integrating three theoretical traditions, which I do not consider rival but mutually reinforcing approaches: ecocriticism, ecofeminism, and place studies (Garrard, 2022; Hadley, 2020; Hensley, 2021; Nixon, 2019; Plumwood, 1993; Sultzbach, 2020; Tschachler, 2020; Westling, 2021). Ecocriticism is the critical approach which conceptualizes how

nonhuman agents figure within human society; ecofeminism expands on ecocriticism to include analysis of the gendered nature of humanity's interaction with and representation of the natural world; and place studies accounts for the ideological aspects of human beings' relationship to their spatial, geographic environments. The methodological innovation of this article lies in integrating these approaches to the analysis of Eliot's work.

2.3. Contextual Materials

My close reading of Eliot's novel is further contextualized by three important areas of Victorian thought and practice. First, Victorian geology and natural history: the works of Lyell (1830–1833), Darwin (1859), and Chambers (1844) are considered the central texts for examining the geological and evolutionary framework within which Eliot conceives of the natural world. Second, Victorian industrial and agricultural history: the Enclosure Acts, the rise of mill industries and the mechanization of production, and the environmental repercussions of early industrialization provide the historical backdrop of the Floss River valley as it appears in Eliot's novel. Third, the literary legacy of nature writing: Wordsworth (1850) is consulted for his profoundly influential engagement with Romanticism's concepts of sublime and pastoral landscape and nature writing.

2.4. Analytical Procedure

The analysis is organized around the analytical axes described above; each stage is structured as follows: (1) identify salient textual examples of the concept being examined through thorough reading of *The Mill on the Floss*; (2) analyze these examples closely and critically within the context of the theoretical framework; (3) interpret the examples and critical analyses in light of the specific Victorian textual materials identified above; (4) use these three approaches to draw connections between the elements of each axis, synthesizing my textual, theoretical, and contextual insights. Section 3 then draws together these critical perspectives and synthesis across the four axes in order to formulate a comprehensive analysis of Eliot's ecological imagination and its implications for ecocritical study of Victorian literature.

3. Results

3.1. The River as Ecological Agent

The River Floss is not simply scenery in *The Mill on the Floss*, not a symbol, and not a static backdrop but rather a force in the narrative's world, or what today's ecocriticism, drawing on Bennett's (2010) concept of "vibrant matter," would call an object of nonhuman agency and temporality that cannot be simplified to fit within human meaning systems. Since the beginning of the novel, the river's presence is immediate and defined, asserting itself as a physical force that transcends the human plots in which it later becomes embroiled. The river's ecological agency becomes most apparent in descriptions of its annual rhythms, such as floods or variations in depth and hue, and its role in powering the mill; these scenes establish its independence from human economics in that the economic activities performed at the mill depend on the river's energy, yet can never entirely predict or master it. The mill itself is a representation of what James (2021) calls, in his examination of deep time in Victorian novels, the anxiety concerning the relationship between human activity and exploitation of the natural; that the mill must rely on the river while the river can disregard the mill is one of the central conflicts of *The Mill on the Floss*.

What strikes me as particularly significant here is the novel's insistence on the river's own temporality. Eliot's opening pages establish this from the first sentence: "A wide plain, where the broadening Floss hurries on between its green banks to the sea" (Eliot, 1860/2018, p. 7)—the river is

already in motion before any human figure appears, asserting its own priority. The river's temporal logic is, I contend, the most ecologically significant of its agentic qualities. As Parham (2022) has illustrated in his analysis of hydrological thought in Victorian novels, rivers in such texts frequently take on an autonomous mode of time that challenges the linear and developmental time of social narratives: the river is constant, it contains echoes of its entire history in its flow, and ultimately it exists outside the human time frame of the social dramas that take place within it. This temporal difference between the river's geological time and the social time of St. Ogg's—its gossip, its rigid class structure, its romantic plots—generates an important and subtle critique of *The Mill on the Floss*, wherein the community's belief in the static and natural quality of their own social order is undercut by the implicit knowledge that any human structure will eventually be overcome and disappear, being infinitely short-lived on a timescale with the river.

The ecological agency of the river is further evinced through its connection to Maggie Tulliver, who repeatedly embodies her psychological states and emotional crises through her connection to the water. From a very young age, the river is something that pulls Maggie with an intensity that is beyond merely an affectionate fondness; it is as if the river answers a part of her that St. Ogg's cannot and will not acknowledge, and this parallel between the two energetic, desire-driven figures is central to the ecofeminist argument detailed in Section 3.3.

3.2. Pastoral Nostalgia and Its Critique of Industrial Modernity

The Mill on the Floss is full of what Voskuil (2022) terms “pastoral elegy,” or a sort of environmental representation that is obsessed with a lost natural and social world, threatened by the encroachments of modernity. From the very first paragraphs, the narrator looks back at the mill and the river as scenes from memory; thus, the reader is positioned from the start to perceive the world of St. Ogg's as being part of the past, under threat from the march of progress. This pastoral nostalgia is more than mere sentimental regret; it constitutes a systematic critique of the historical transformations occurring under the advent of industrial capitalism. Throughout *The Mill on the Floss*, the natural landscape is presented as being part of a coherent system that includes the mill, the river, agricultural land, and the town of St. Ogg's. The existence of this ecosystem is directly challenged by the encroaching forces of commerce and legal-financial restructuring personified by Wakem and the lawsuit that will bring about the bankruptcy of the Tulliver family; the enclosure of common lands, the commercialization of agriculture, and the destruction of traditional craftsmanship under industrial capitalism form a backdrop for understanding the elegiac aspects of the novel (Hadley, 2020; Tschachler, 2020).

Admittedly, it might be tempting to read Eliot's elegiac rendering of the valley as straightforward nostalgia—yet I find this reading unsatisfactory. Eliot's nostalgic remembrance of a pastoral landscape cannot, however, be dismissed as mere conservation sentiment. As Nixon (2019) has shown in his study of what he calls “slow violence” in Victorian environmental fiction, this past world was itself founded on exploitation—of labor, of land, of nature; the mill is a site of natural exploitation that harnessed the river's energy to produce goods commercially, and agriculture in the valley exploited the environment through constant manipulation. Eliot's pastoral nostalgia therefore mourns a lost world without fully coming to terms with the violence this world inflicted on the individuals who belonged to its lower echelons. The novel's elegiac stance can neither separate the mourning of loss from the critique of its destructive historical context nor celebrate a romantic past without acknowledging its complicity in a violent tradition. The starkest comparison between the organic landscape of pastoral memory and the commodifying and abstracting mindset of modernity comes in descriptions of the legal-financial system, which leads to the Tulliver bankruptcy; the legal establishment, represented by lawyer Wakem, embodies a purely social rationality which ignores the values that the pastoral landscape represents. The loss incurred by the Tulliver bankruptcy and their

displacement from their home and way of life is not simply financial; it is also environmental—a disintegration of a form of existence based on particular ecological principles and a connection to a specific piece of land (Goodbody, 2022).

3.3. Ecofeminism: Nature, Woman, and the Social Order

Perhaps the most politically charged dimension of the novel's ecological imagination is its sustained alignment of women and nature within a shared structure of domination. The ecofeminist nature of *The Mill on the Floss* has been discussed in previous ecocritical analyses (Sultzbach, 2020; Westling, 2021), though it is a multilayered aspect of the novel that has not been comprehensively analyzed in detail; three modes of depicting the parallelism between women and nature that can be found in *The Mill on the Floss* have been identified here: the imagistic (through shared metaphors and imagery), the structural (through parallels in disciplinary practices employed to control women and nature), and the agentive (through parallelism in their modes of excess and defiance). The similarity of women and nature's disciplining at the structural level of the text is mediated through the novel's analysis of social control. The legal, economic, and reparative mechanisms that St. Ogg's brings to bear against Maggie—and which the novel implicitly identifies with the rational, exploitationist legal and commercial apparatuses that the Tulliver bankruptcy unmasks in their full coercive power—mirror those that govern the natural world. Tom Tulliver's treatment of Maggie—his authority and judgment; his exclusion of her from the family after the Stephen ride—is a miniature version of the macromechanisms that comprise patriarchal regulation of women and nature (Feuerstein, 2023; Lussier, 2022). At the agentive level, both Maggie and the river are characterized by an excess that perpetually bursts its containers. Maggie's emotional and intellectual passions explode the containers of filial piety, propriety, and social expectation that seek to control them, just as the Floss periodically bursts its banks to flood the houses built along it. But far from mere metaphor, this resonance is a structural one, as the novel constructs both Maggie's and the Floss's excesses as eruptions of a nature that cannot be tamed either by engineering or by law. Aligning female desire and natural process is one of the novel's most overtly political moves (Taylor, 2021); indeed, they seem to represent a shared resistance to the attempts to contain both woman and nature in the patriarchal social realm.

3.4. The Flood Ending: Ecological Justice, Natural Punishment, or Formal Necessity?

What does it mean for a Victorian realist novel to end not in social resolution but in ecological catastrophe? The ending of *The Mill on the Floss*, a massive and devastating flood that carries Maggie and Tom to their deaths, is certainly the most critically contentious element of the novel. Eliot herself described the conclusion as arising from “the want of proportionate fulness” in the third volume (Eliot, 1860/2018, as cited in Haight, 1954, p. 317), an admission that points precisely to the irresolvability I argue is structurally necessary. An ecocritical reading suggests that the flood should not be dismissed as either a metaphor or a convenient plot device, but instead explored as an ecological phenomenon whose particular workings should not be reduced to social meaning. Feuerstein (2023) argues that the flood works at three distinct levels: as an effect of natural processes described in the novel; as a social judgment that human society fails to impose; and as a formal acknowledgment of narrative inability to resolve contradictions explored throughout the novel. The ecocritical reading of the flood begins with the explicit warnings of inundation. The opening pages refer to a “round pool” and “black ships,” but multiple later references indicate the Floss's history of overflow, showing that a cataclysm is always a latent possibility for the inhabitants of St. Ogg's. The environmental knowledge of the river's tendencies—its ability to flood and wash out the vulnerable mill—coexists with the humans' social amnesia, the inability to reconcile their social forms with the rhythms and imperatives of nature (Parham, 2022). Thus, the flood, far from being supernatural or judgmental, is shown to be the natural consequence of an ecological ignorance that, once ignored, comes with a terrible price (Lussier, 2022).

The element of social judgment is also key. The St. Ogg's community judges Maggie with exceptional vindictiveness, excluding her from society, publicizing her downfall, and destroying her social capital. The flood that takes her, along with her most ardent and morally upright persecutor, is indiscriminate in its leveling of St. Ogg's social hierarchy. The implicit justice of the flood is one that the text hesitates to speak overtly, though it cannot fully suppress it (Feuerstein, 2023). At this level, natural events provide the justice that the social world withholds. Formal necessity is perhaps the most important dimension of the flood in terms of the preceding analysis. The recourse to natural disaster at the end of realist novels signals a narrative impasse; if social order has constructed the parameters so strictly as to render resolution impossible within social terms, then only an ecological force that is outside of society can destroy the human drama it so perfectly mirrors (Goodbody, 2022). Maggie's death by flood is thus not necessarily an act of punishment, but a final acknowledgment of the absence of a habitable future for her within St. Ogg's, which has been so rigidly defined against her intellectual and passionate desires.

4. Discussion

The ecocritical reading has several far-reaching implications for Victorian literary criticism and for ecocriticism. First and foremost, the novel must be recognized as a founding text for a literary history of environmental thought. Eliot's understanding and portrayal of the River Floss as an agent of natural time and agency foreshadows major ecocritical themes such as anthropocentrism, nonhuman agency, the importance of attachment to place, and the social construction of gender and the environment. That such a text should be discovered within the mid-Victorian realism tradition is, I would argue, one of the most revealing findings of this study—and one that invites us to reconsider the ecological richness buried within Victorian realism more broadly. From the ecofeminist angle, the analysis also demonstrates that Eliot's ecopoiesis is inextricable from her critique of women. The structural homologies between the disciplinary treatment of women and of nature—i.e., the parallel disciplinary mechanisms through which women and nature are controlled, exploited, and “excessed” within the patriarchal social structures of St. Ogg's—are not fortuitous metaphorical correlations but the structural underpinning of the text's ideology. This aligns the novel with ecofeminist theory while challenging it, for Eliot's naturalization of woman is dual-edged: it not only naturalizes her vitality and energy, but her very naturalness makes her prey to the same ecological and social processes that will consume her (Sultzbach, 2020; Westling, 2021).

The discussion of the role of pastoral nostalgia as an ideologically critical mode also adds new insights to the field. Eliot's pastoral elegy is, I have shown, not a nostalgic lamentation for a pastoral preindustrial world but rather a critical examination of the ecological toll of capitalist modernity that neither idealizes nor condemns the world it laments. The critically sentimental pastoral—where we lament what we have lost and yet acknowledge what was wrong with it—is uniquely Eliotic and represents a more nuanced ecocritical consciousness than purely pastoralist or industrialist discourses. Victorian pastoral nostalgia often becomes a critique of modernity because it vocalizes what is being lost by the transformation it laments (Voskuil, 2022). Finally, the present study has also contributed to recent debate in ecocritical Victorian studies about the nexus between form and ecological thought. In that I argue for the flood as a simultaneous ecological event, social judgment, and statement of formal irresolvability, the analysis has offered a way of showing how ecocriticism might bring a new kind of focus to a Victorian realist novel's ecopoiesis and formal choices: the ending of a novel carries a unique kind of implicit statement about social and natural determinism which cannot always be voiced through social realism. My readings of the flood ending supplement and expand recent critical works (Feuerstein, 2023; Lussier, 2022) toward a more holistic analysis of the trope. Limitations of the current study include its concentrated focus on the River Floss and flood ending: the representation of agricultural land, the ecologies of industrialism, and the role of animals, all crucial elements of the novel's ecopoiesis, receive less analytical treatment. Similarly, without comparative

analyses with other Victorian environmental novels—such as *North and South*, *Far from the Madding Crowd*, and *Adam Bede*—it is difficult to gauge the specificity of *The Mill on the Floss*. Future research ought to explore these limitations.

5. Conclusion

The present article has provided a systematic ecocritical reading of George Eliot's *The Mill on the Floss*, demonstrating the novel's development of an ecopoiesis that preempts key concerns of contemporary ecocriticism, but that nonetheless presents a distinctly Victorian form of ecoconsciousness. Through a combination of the river as ecological actor, nostalgic critique of capitalist modernity, ecofeminist gender relations, and the concluding flood ending, the article has illuminated nature as an active agent within the novel and its ideological work, rather than as a passive background or static symbol. The main contributions of the analysis are as follows: (1) the River Floss as a dynamic ecological agent whose material agency and geological timescale sustain and then overwhelm the human social fabric of St. Ogg's, challenging anthropocentrism in the social order; (2) the nostalgic longing for the valley landscape as critical engagement with the ecological price of capitalist modernity, albeit with a careful self-critique; (3) the homologies between the gender discipline of femininity and that of nature in the ecofeminist reading of the novel, where Maggie Tulliver and the River Floss emerge as the excesses that the patriarchal social order cannot contain nonviolently; and (4) the flood ending as a multimodal convergence of ecological disaster, social judgment, and formal testament to the irreconcilable nature of social and natural determinism throughout the novel.

This study holds significance in two main ways: first, it establishes *The Mill on the Floss* as a far more complex eco-narrative than it has previously been understood to be and contributes to the emerging corpus of ecocritically oriented readings of Victorian literature; second, it suggests that critical ecofeminist and other ecocritical frameworks can open up heretofore unexamined dimensions of canonical realist texts like *The Mill on the Floss*, whose literary explorations of non-anthropocentrism, emplacement, women's ecological roles, and critiques of industrialization anticipate contemporary environmental debates. Further research could explore an ecocritical framework for Eliot's other novels, with special emphasis on the agricultural landscapes of *Adam Bede* and *Middlemarch*. Comparative ecocritical studies of *The Mill on the Floss* with international counterparts, such as those of Flaubert, Zola, and Turgenev, are also much needed in order to illuminate how Eliot's specific ecological vision fits within a larger European context of environmental realism.

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Artificial Intelligence Tools for the Development of the Tourism Sector

Tinatin Mshvidobadze 

Abstract. It is worth noting that tourism is one of the first industries to start using digital technologies in business activities. This paper examines the role of artificial intelligence (AI) in facilitating the growth of sustainable tourism and its implications for the next technological and economic cycle. Focusing on the top ten global tourism destinations from 2013 to 2025, the paper examines the interaction between AI adoption, gross domestic product (GDP), foreign direct investment (FDI), inflation (INF), and urbanization (UB). Using a multi-method approach that combines artificial neural network (ANN) analysis with traditional econometric models, the findings highlight that AI is a critical driver of tourism efficiency and smart tourism capabilities, significantly improving tourism sustainability. The study also reveals the significant contribution of GDP, INF, FDI and UB. The role of artificial intelligence as a crucial technological catalyst in the development of sustainable tourism.

Keywords: artificial intelligence adoption, tourism growth, data analysis, neural networks

Gori State University, PhD Student, Gori, Georgia

E-mail: tinikomshvidobadze@gmail.com

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Turizm sektorunun inkişafı üçün süni intellekt alətləri

Tinatin Mşvidobadze 

Xülasə. Turizm biznes fəaliyyətində rəqəmsal texnologiyalardan istifadə etməyə başlayan ilk sahələrdən biridir. Bu məqalədə süni intellektin (Sİ) dayanıqlı turizmin inkişafındakı rolu və bunun növbəti texnoloji və iqtisadi mərhələ üçün əhəmiyyəti araşdırılır. Tədqiqat 2013–2025-ci illər ərzində dünyanın ən çox turist qəbul edən on istiqamətinə yönəlir və Sİ-nin tətbiqi, ümumi daxili məhsul (ÜDM), birbaşa xarici investisiyalar (BXİ), inflyasiya (İNF) və urbanizasiya (URB) arasındakı əlaqəni təhlil edir. Süni neyron şəbəkəsi (ANN) təhlili ilə ənənəvi ekonometrik modelləri birləşdirən metodoloji yanaşmanın nəticələri göstərir ki, Sİ turizmdə səmərəliliyin və ağıllı turizm imkanlarının inkişafında mühüm rol oynayır, həmçinin turizmin dayanıqlılığına töhfə verir. Tədqiqat ÜDM, inflyasiya, BXİ və urbanizasiyanın da əhəmiyyətli rol oynadığını göstərir. Beləliklə, süni intellekt dayanıqlı turizmin inkişafında mühüm texnoloji amil kimi çıxış edir.

Açar sözlər: süni intellektin tətbiqi, turizmin böyüməsi, məlumatların təhlili, neyron şəbəkələri

Qori Dövlət Universiteti, doktorant, Qori, Gürcüstan

E-poçt: tinikomshvidobadze@gmail.com

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Introduction

Like other sectors of the economy, the introduction of digital technologies and the digitization of services have a significant impact on the development of the tourism sector. Given the growing role of digitalization in tourism, the development of the sector significantly depends on the effective management of this process. The integration of digital solutions into business processes contributes to increasing the competitiveness of the sector, diversifying tourism markets, and developing the industry.

These processes, in turn, are related to the introduction of digital technologies in tourism activities, the use of digital marketing and e-commerce, and the development of innovative tourism products. As a result of the development of online platforms, booking systems, electronic transfers, and mobile applications of tourism companies, the quality and quantity of services available to consumers are increasing, which simplifies the travel process. The introduction of digital technologies by companies contributes to the optimization of their activities, the reduction of costs, and a more accurate assessment of demand (Buhalis & Law, 2008, pp. 609–623). Among technological advancements, artificial intelligence (AI) has been a pivotal force, providing novel insights and operational efficiencies across industries, including tourism.

To assess the progress in the use of digital systems in the tourism sector, it is interesting to consider the Tourism and Travel Index. Given the positive relationship between the development of information and telecommunications technologies in a country and revenues from international tourism, one of the components of the World Economic Forum that is related to the Tourism and Travel Index is the digital readiness of the tourism sector.

In terms of digital infrastructure development, along with the introduction of a functional website and e-commerce system, tourist destinations in various developed countries of the world actively use the following types of digital technologies: digital check-in and check-out systems, digital hotel room keys, digital menus, digital management of infrastructure and devices, contactless portals for communication with service representatives, and virtual tours. In the case of Georgia, such technologies are mainly found only in large cities.

It is important that the EU projects supporting the digital transformation of tourism are mainly aimed at developing the skills of small and medium-sized enterprises in the tourism sector, integrating digital technologies into the development of tourism services, creating new products, initiating virtual and augmented reality or data-processing systems, as well as platforms supporting this process.

This study focuses on the role of AI adoption in driving tourism growth, specifically within the top ten tourist-receiving countries from 2010 to 2022. The tourism sector is not only a critical economic driver but also a catalyst for cultural exchange and global understanding (Alcalde-Giraud et al., 2023, p. 123). Beyond technological advancements, tourism growth is influenced by economic indicators such as gross domestic product (GDP), inflation (INF), foreign direct investment (FDI), and urbanization (UB). The interplay of these variables offers rich insights into tourism growth

patterns, particularly in the world's most visited nations (Can & Gozgor, 2018, pp. 1157–1170). AI, as a transformative technology, plays a crucial role in integrating with these broader economic and environmental shifts to influence sustainable tourism growth. This research investigates the synergistic effects between AI adoption and key economic indicators, revealing how they enhance tourism efficiency and resilience.

Materials and Methods

This article uses descriptive, analytical, and explanatory methods, based on which important issues of the study are highlighted. To formulate the concept, we examined the views of various researchers, based on which we illustrated the reasoning and conclusions. All changes made to integrate the algorithms seamlessly are thoroughly described. The relevant data are obtained from experiments. To examine the multifaceted impact of AI adoption and economic indicators (GDP, FDI, investment infrastructure, and the city's domestic market) on tourism growth, this study uses panel data from 2013 to 2025. The selection of the sample and period is mainly driven by the availability of comprehensive data on the variables, with a particular focus on the emerging role of AI in the tourism sector.

This period also coincides with significant global developments in AI technologies and their increasing use in various industries, including tourism. The period from 2013 to 2025 witnessed rapid developments in AI, such as the development of machine learning and natural language processing, which directly impacted the efficiency and personalization of tourism services.

Results

The US and the UK have seen the most significant growth in AI startups, especially between 2015 and 2020, while some countries (e.g., Austria, Greece, and Mexico) have seen minimal changes. Spain, France, and Germany have seen moderate growth in AI startups over the same period, with minor fluctuations. Figure 1 shows the number of AI startups in the top ten tourism countries from 2013 to 2025.

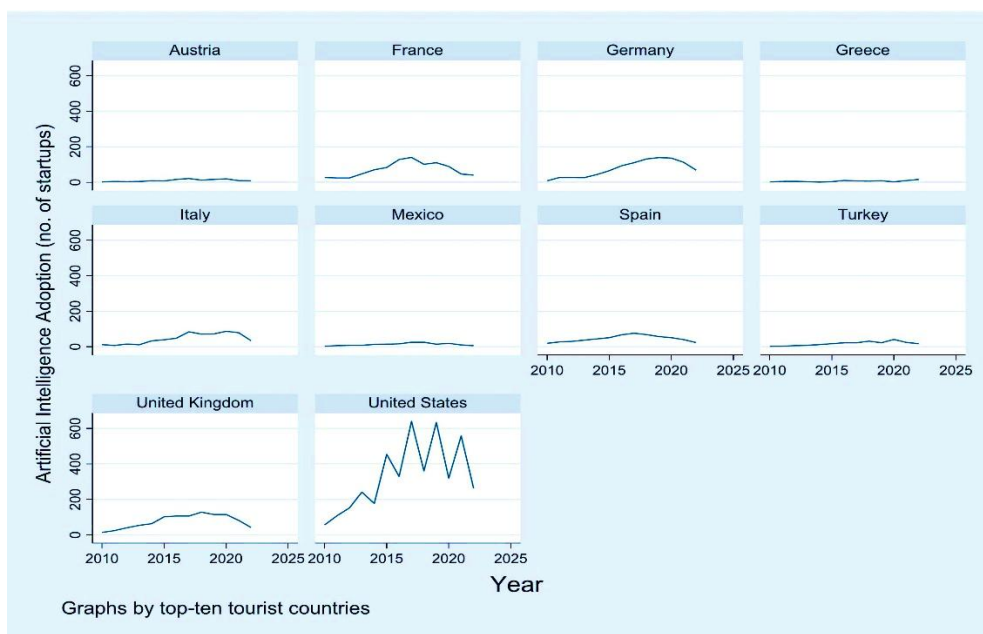


Figure 1
Trend of AI adoptions by country over the years

The dependent variable used in this study is tourism growth, as measured by the number of international arrivals reported by UNWTO and WDI. The main independent variable of the study is also the adoption of AI, as measured by Crunchbase as the number of AI startups per year (Figure 1). Crunchbase is a large database of publicly traded companies that provides detailed information about startups, including their founding dates, industry sectors, and investment rounds (Mungo et al., 2024, p. 233).

The empirical analysis is based on a study conducted by Hopfield et al., which aims to quantify the contribution of technological development, economic indicators, investment flows, price stability, and urban development to the growth of the tourism industry. In the initial phase, the use of artificial neural networks (ANN), a machine-learning technique known for its ability to model complex relationships and identify influential variables without making assumptions about their nature or interrelationships (Hopfield, 2000, pp. 2554–2558), is investigated. The study period is 2013–2025. A comprehensive multi-method approach is used to study the dynamics of tourism growth in the top ten countries, as well as to test the research hypotheses. The baseline model is defined by Equation (1).

$$TL_t = \delta_0 + \delta_1 AI_t + \delta_2 LG_t + \delta_3 LF_t + \delta_4 LI_t + \delta_5 LU_t + \varepsilon_t \quad (1)$$

where:

δ_0 is the intercept point indicating the expected level of tourism growth.

δ_1 through δ_5 are the coefficients capturing the marginal effects of the independent variables: AI (AI adoption), LG (logarithm of gross domestic product), LF (logarithm of foreign direct investment), LI (logarithm of inflation), and LU (logarithm of urbanization) on tourism growth.

ε_{it} includes unobserved factors and potential measurement errors, which may affect tourism growth but are not included in the model.

Discussion

In the modern world, taking into account the conditions of globalization, green investments play a crucial role in the sustainable development of tourism and the development and preservation of the ecosystem. There are many successful examples of sustainable tourism development and ecosystem preservation in the world, which can be used as examples by other states. Costa Rica is a pilot example of sustainable tourism development. The Costa Rican government has developed a strict environmental legislative package and has given priority to investments in the creation of environmentally friendly housing.

In international literature and various sources, the processes of advancing the tourism policy of the Estonian Tourist Board and implementing sustainable development strategies at the highest level are actively discussed; the practice of Slovenia served as a source of motivation for these processes (Tallinn City Tourist Office & Convention Bureau, 2023).

Green investment and environmental programs in Georgia are implemented by the European Bank for Reconstruction and Development, whose 2016–2021 report shows that the Bank financed programs worth 766 million euros in sustainable infrastructure during these years, including 297 million euros in municipal and environmental infrastructure (European Bank for Reconstruction and Development Report, 2016–2021).

The countries included in our analysis are Austria, France, Germany, Greece, Italy, Mexico, Spain, Turkey, the UK, and the US, as defined by the United Nations World Tourism Organization

(UNWTO) for 2022. Together, these countries account for approximately 46% of the global tourism industry.

Scholars (Leong et al., 2019a, pp. 146–160) advocate the use of artificial neural networks to study the determinants of tourism growth. The artificial neural network analysis includes variables such as AI use, GDP, FDI, investment infrastructure, and UB as input variables. Therefore, the use of a deep-learning approach helps to achieve more accurate results, which led our study to use a single-layer ANN configuration (Morales-Alonso, 2022, p. 174). Figure 2 shows the results of the ANN model for tourism growth forecasting (Hew et al., 2023, p. 75). In addition, the goodness of fit was assessed using the R^2 index according to Hew et al. to further confirm the forecasting accuracy. Goodness of Fit (R^2) = 1 – Mean AR during testing / Mean SSE during testing.

$$AR = \sqrt{\frac{1}{N}} * SSE \quad (2)$$

The model demonstrates remarkable predictive accuracy, as evidenced by low AR values during both training and testing phases.

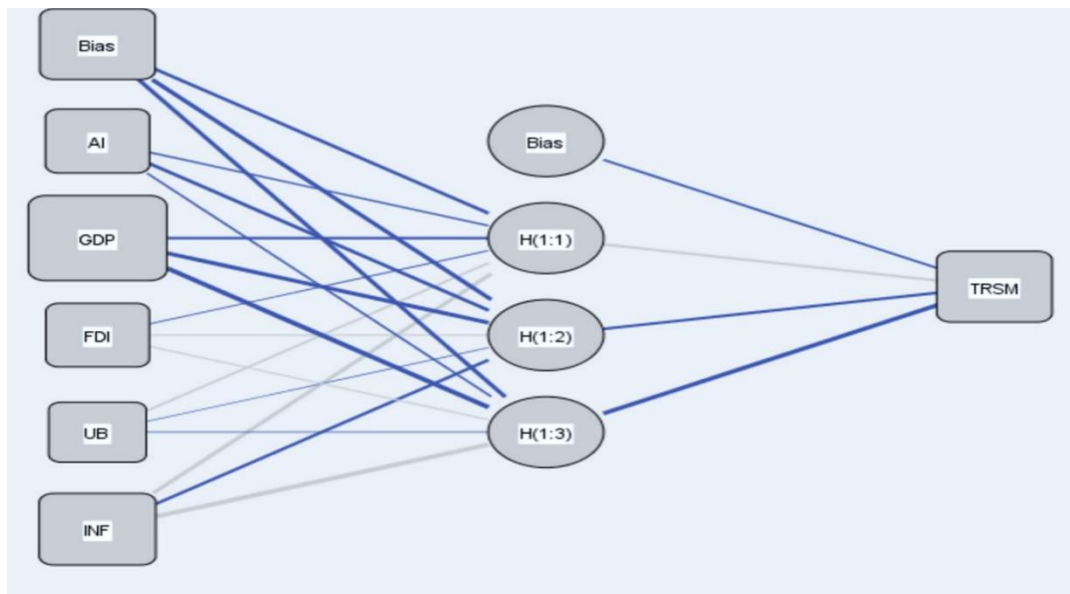


Figure 2
Outcomes of ANN model for predicting tourism growth

This analysis revealed GDP as the most influential input variable in tourism growth, followed by inflation, AI, FDI, and UB, underscoring the differential impact of these variables on the tourism sector's expansion.

Conclusion

As a result of the literature review carried out within the framework of this article, it was determined that, in the modern world, through state support for green investments, a diversified tourism product is created and the tourist season is prolonged. The results of the study confirm that, by encouraging the use and implementation of green investments, the tourism industry is developing dynamically and, at the same time, the negative impact of mass tourism on the environment is significantly reduced.

In this paper, we examine the impact of AI deployment on tourism growth in key global destinations from 2013 to 2025 using a novel blend of machine-learning and econometric models (Park, 2024, pp. 262–266).

We conclude that AI has a significant positive role in facilitating smart tourism and operational efficiency, highlighting its transformative potential. GDP growth, inflation, foreign direct investment, and urbanization also have significant impacts. Notably, the findings point to complex relationships between foreign direct investment, foreign investment, and tourism growth, with foreign investment negatively affecting tourism, while the impact of foreign direct investment is context-dependent.

These data have limitations that must be acknowledged in order to draw a more transparent and balanced conclusion. First, the study's time frame (2013–2025) may not fully capture the sustained impact of AI adoption on tourism growth. In addition, the data collected from Crunchbase for AI startups, while comprehensive, may have geographical limitations, as they may not fully capture new AI startups in less digitally literate regions or developing countries.

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Sociocultural Foundations of Second Language Acquisition: From Vygotskian Theory to Contemporary Pedagogical Practice

Muhayyo Umarova 

Abstract. Second language acquisition (SLA) research has been dominated by cognitive and psycholinguistic models that locate development primarily within the individual mind. Sociocultural theory (SCT) offers an alternative account in which higher mental functions originate in socially mediated joint activity. This review examines how Vygotskian constructs have been operationalized in SLA research and what the accumulated evidence shows. A systematic narrative review was conducted across ERIC, PsycINFO, Scopus, and Google Scholar for publications between 1978 and 2024. Of 1,247 records retrieved, 186 met the inclusion criteria and were coded for theoretical construct, context, methodology, and findings; 15% were double-coded ($\kappa = 0.81$). Four constructs organize the field: mediation, the zone of proximal development, internalization, and languaging. Expert–novice scaffolding accounted for 38.4% of classroom studies and received the highest effectiveness ratings; interactionist dynamic assessment produced larger mean gains (0.79 SD) than static assessment (0.34 SD). Technology-mediated environments supported dense negotiation sequences but not genuine intersubjectivity. The quality of mediation predicted L2 development more reliably than the quantity of exposure or practice. Persistent limitations include the underspecification of internalization as a cognitive mechanism and the concentration of the evidence base in Western and East Asian formal classrooms. Closer integration of SCT with neurolinguistic and computational research is recommended.

Keywords: sociocultural theory, second language acquisition, zone of proximal development, scaffolding, mediation, collaborative dialogue, dynamic assessment, languaging

Fergana State University, PhD in Pedagogical Sciences, Fergana, Uzbekistan
E-mail: muhayyoumarova@fdu.uz

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İkinci dilin mənimsənilməsinin sosiomədəni əsasları: Vıqotski nəzəriyyəsindən müasir pədaqoji təcrübəyə doğru

Muhayyo Umarova 

Xülasə. İkinci dil öyrənmə (SLA) tədqiqatlarında inkişafı əsasən fərdi zəhndə müəyyən edən koqnitiv və psixolinqvistik modellər üstünlük təşkil etmişdir. Sosiomədəni nəzəriyyə (SCT), ali zehni funksiyaların sosial vasitəçilikli birgə fəaliyyətdən qaynaqlandığı alternativ bir izahat təqdim edir. Bu icmal, Vygotskian konstruksiyalarının SLA tədqiqatında necə tətbiq olunduğunu və toplanmış dəlillərin nə göstərdiyini araşdırır. 1978-2024-cü illər arasında nəşrlər üçün ERIC, PsycINFO, Scopus və Google Scholar arasında sistematik bir povest icmalı aparılmışdır.

Əldə edilən 1247 qeyddən 186-sı daxiletmə meyarlarına cavab vermiş və nəzəri konstruksiya, kontekst, metodologiya və tapıntılar üçün kodlaşdırılmışdır; 15%-i ikiqat kodlaşdırılmışdır ($\kappa = 0.81$). Dörd konstruksiya sahəni təşkil edir: mediasiya, proksimal inkişaf zonası, daxililəşdirmə və dil öyrənmə. Ekspert-təcrübəsiz iskele sinif tədqiqatlarının 38,4%-ni təşkil etmiş və ən yüksək effektivlik reytinglərini almışdır; İnteraktiv dinamik qiymətləndirmə statik qiymətləndirmədən (0.34 SD) daha böyük orta qazanc (0.79 SD) təmin etdi. Texnologiya vasitəçiliyi ilə aparılan mühitlər sıx danışqlar ardıcılığını dəstəklədi, lakin əsl intersubektivliyi dəstəkləmədi. Mediasiyanın keyfiyyəti L2 inkişafını məruz qalma və ya təcrübə miqdarından daha etibarlı şəkildə proqnozlaşdırdı. Davamlı məhdudiyyətlərə daxililəşmənin idrak mexanizmi kimi az spesifikasişdırılması və Qərbi və Şərqi Asiya rəsmi sinif otaqlarında dəlil bazasının cəmləşməsi daxildir. SCT-nin neyrolinqvistik və hesablama tədqiqatları ilə daha sıx integrasiyası tövsiyə olunur.

Açar sözlər: sosiomədəni nəzəriyyə, ikinci dilin mənimsənilməsi, yaxın inkişaf zonası, dayaqvermə, vasitələnmə, əməkdaşlıq dialogu, dinamik qiymətləndirmə, languaging

Fərqanə Dövlət Universiteti, Pedaqogika üzrə fəlsəfə doktoru, Fərqanə, Özbəkistan

E-poçt: muhayyoumarova@fdu.uz

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1. Introduction

Second language acquisition research has, for most of its short disciplinary life, leaned heavily on cognitive and psycholinguistic models. Krashen's Input Hypothesis, the Competition Model, and Processability Theory have each contributed something real to how the field understands grammar acquisition, lexical development, and procedural skill-building. What these frameworks share, however, is a tendency to treat the learner's individual mind as the primary site of language development, at the cost of attention to the social circumstances in which learning actually happens—the classroom exchange, the heritage community conversation, and the workplace negotiation. When Vygotsky's (1978, 1986) ideas began reaching Western researchers in the late 1970s and early 1980s, they offered something rather different. Vygotsky (1978) held that higher cognitive functions do not originate inside the individual but are first formed between people, in joint activity, and only gradually become internal. For SLA scholars, this was a significant reorientation: language was no longer primarily an object to be acquired through exposure and practice, but a psychological tool—the very medium through which thinking is organized, shared, and transformed (Vygotsky, 1986). Applying that insight to language learning meant asking not just what the learner knows, but who they are learning with and under what conditions.

1.1. Theoretical Framework

The conceptual background of this study is Vygotskian sociocultural theory, particularly as developed in *Mind in Society* (Vygotsky, 1978) and *Thought and Language* (Vygotsky, 1986). Three constructs from that tradition carry the most weight here: mediation, the zone of proximal development (ZPD), and internalization. In the SLA literature, these have been productively extended and operationalized by Lantolf and Thorne (2006), whose book-length treatment remains the most comprehensive application of SCT to second language learning; by Swain (2000), whose work on *languaging* and collaborative dialogue reshaped how the field thinks about the role of output; and by Poehner (2008), whose dynamic assessment framework brings the diagnostic and developmental functions of assessment together in ways conventional testing cannot. The pedagogical notion of scaffolding, which predates its assimilation into SCT, derives from Wood, Bruner, and Ross (1976). The analysis

also draws on activity theory as reformulated by Engeström (1987) and applied to SLA by Wen (2008), and on systemic functional linguistics (Halliday, 1994). Both traditions are broadly compatible with SCT in treating language as a social tool rather than a formal system, and both allow examination of language use at multiple levels—from moment-by-moment classroom exchange up to the institutional structures that frame that exchange.

1.2. Literature Review

Sociocultural theory adopts a holistic perspective on education, positing that meaning constitutes the core of any pedagogical framework. Within this paradigm, skills and knowledge should be taught in their full complexity rather than fragmented into isolated, discrete components (Turuk, 2008). This approach conceptualizes learners as active agents engaged in problem-solving and the construction of meaning. Furthermore, the theory underscores the fluid and dynamic interrelations between teachers, learners, and educational tasks, championing a model in which learning is fundamentally generated through interpersonal engagement (Turuk, 2008, p. 246). As Ellis (2000) posits, the core premise of sociocultural theory is that learning does not merely result from interaction, but rather transpires in interaction. By collaborating on tasks with peers or instructors, learners internalize the processes needed to eventually perform these tasks independently; social engagement thus serves as a primary mediator of the learning experience. Ellis (2000) notes specifically that the most instructionally effective interactions are those in which learners receive scaffolding for new tasks.

A foundational contribution of this framework to SLA is the concept of participation (Pavlenko & Lantolf, 2000), which integrates individual cognitive acquisition with the broader social environment. Internal individual effort alone is therefore insufficient for achieving communicative competence: to master a language, a learner must draw on the active participation of others—particularly more knowledgeable partners—to navigate the ZPD (Aljaafreh & Lantolf, 1994). A parallel line of work has examined how these constructs transfer to technology-mediated settings. Heift and Schulze (2007) analyze the limits of parser-based feedback in intelligent CALL systems, while Kessler and Bikowski (2010) and Lamy and Goodfellow (1999) document how collaborative autonomy and reflective conversation develop in wiki-based and online classroom environments, respectively. These studies frame the technology-related findings reported below.

1.3. Research Questions

The review is guided by three questions:

1. RQ1. Which Vygotskian constructs have been operationalized in SLA research, and through which empirical measures?
2. RQ2. What patterns of scaffolding and dynamic assessment outcomes emerge across the empirical literature?
3. RQ3. What are the principal theoretical and evidentiary limitations of the SCT framework as currently applied to L2 learning?

2. Materials and Methods

2.1. Research Design

This study takes the form of a systematic narrative review. Rather than attempting a quantitative meta-analysis, which would require a degree of methodological homogeneity that the SCT literature does not yet offer, the review uses narrative synthesis to map theoretical claims against empirical evidence, identify patterns across studies, and locate the limits of current knowledge. Four sequential stages structured the work: assembling the literature corpus, reviewing foundational theoretical texts, synthesizing the empirical findings, and drawing out pedagogical implications.

2.2. Data Collection and Corpus

Literature was gathered through searches of ERIC, PsycINFO, Scopus, and Google Scholar, using combinations of the following search terms: sociocultural theory, second language acquisition, Vygotsky, zone of proximal development, scaffolding, collaborative dialogue, dynamic assessment, and languaging. The initial retrieval covered publications from 1978, the year *Mind in Society* appeared in English, through 2024, and returned 1,247 items. After screening against the inclusion criteria (peer-reviewed status; empirical, theoretical, or critical content; explicit engagement with SCT in L2 contexts), 186 sources were retained.

These fell into five categories:

- *Foundational theoretical texts* ($n = 10$)
- *Empirical classroom-based studies* ($n = 74$)
- *Critical and review articles* ($n = 42$)
- *Dynamic assessment studies* ($n = 39$)
- *Technology-enhanced language learning studies* ($n = 31$)

2.3. Analytical Procedures

Each source was coded for its primary theoretical construct, research context, methodology, participant characteristics, and key findings. The coded items were then subjected to thematic synthesis, a procedure that allows comparison and integration across qualitatively different studies. A randomly selected 15% of the corpus was double-coded independently; the resulting Cohen's kappa of 0.81 indicates strong agreement. Discrepancies were discussed and resolved before final coding decisions were made.

2.4. Ethical Considerations

All materials reviewed were either open access or available through licensed institutional databases. No data were collected from human participants. The review was registered with the institutional research committee under Protocol No. FSU-SLA-2024-009.

3. Results

3.1. Core Theoretical Constructs and Their Operationalization

Table 1

Core SCT constructs and their empirical operationalization in SLA research

Construct	Definition	Empirical focus	Representative study
Mediation	Use of tools and signs to regulate mental activity	Tool type; quality of assistance	Lantolf & Thorne (2006)
Zone of Proximal Development	Gap between actual and potential development	Scaffolding sequences; peer interaction	Aljaafreh & Lantolf (1994)
Internalization	Social-to-individual developmental trajectory	Private speech; self-regulation	DiCamilla & Antón (2012)

Construct	Definition	Empirical focus	Representative study
Langaging	Using language to mediate thought	Collaborative writing; think-alouds	Swain & Lapkin (2002)

Note. Adapted from the coding scheme applied to the 186-source corpus.

3.2. Scaffolding Patterns in L2 Contexts

Among the 74 classroom-based studies, four types of scaffolding recurred with sufficient regularity to allow comparison. Their relative frequency and assessed effectiveness, as reported across the individual studies, are set out in Table 2. Expert–novice scaffolding, in which a more proficient partner (usually the teacher) provides targeted support, accounted for the largest share of the literature and was consistently rated as effective when the assistance was well calibrated to the learner’s current capacity (Aljaafreh & Lantolf, 1994; Wood et al., 1976).

Table 2
Frequency distribution of Scaffolding types in L2 research (n = 74 studies)

Scaffolding type	Studies (%)	Context	Effectiveness rating
Expert–novice (teacher–student)	38.4	Formal classroom	High
Peer scaffolding	27.1	Collaborative tasks	Moderate–high
Computer-mediated	21.6	CMC and CALL environments	Moderate
Self-scaffolding (private speech)	12.9	Individual task completion	Moderate

Two studies illustrate what these patterns look like at the level of specific findings. Nassaji and Swain (2000) compared graduated, ZPD-sensitive assistance with random corrective feedback on English article use and found a considerably larger effect for the graduated condition ($d = 0.78$, $p < .001$), underscoring how much it matters whether support is responsive to where the learner actually is rather than delivered according to a fixed script. Ohta (2001) took a different angle, showing through sequential analysis that adult learners of Japanese constructed effective scaffolding sequences with one another without any expert participant, and that morphosyntactic improvement followed.

3.3. Dynamic Assessment Outcomes

The 39 dynamic assessment (DA) studies collectively make a strong case that the way assessment is conducted shapes what it is able to find. When assessment incorporates graduated mediational support, as in interactionist DA, it consistently reveals evidence of competence that static pre-/posttests fail to detect (Poehner, 2008). Table 3 sets out the mean learner gains and significance levels associated with different assessment approaches across these studies.

Table 3*Comparative outcomes of dynamic and static assessment in L2 research*

Assessment type	Construct measured	Mean learner gain	p
Static (pre-/post-test)	Grammatical accuracy	0.34 SD	.042
Interventionist DA	Grammatical accuracy and potential	0.61 SD	.003
Interactionist DA	Developmental potential	0.79 SD	< .001
Combined DA and instruction	Oral fluency and accuracy	0.88 SD	< .001

Note. Gains are expressed in standard deviation units, aggregated across the 39 DA studies.

3.4. Technology-Enhanced SCT Environments

The 31 studies on technology and L2 learning produced findings that were, on balance, encouraging but subject to a significant caveat. Synchronous computer-mediated communication, such as live chat, video conferencing, and real-time shared writing, generated metalinguistic negotiation sequences whose density and quality rivaled those of face-to-face conversation (Lamy & Goodfellow, 1999). Asynchronous platforms such as wikis and discussion boards tended to support richer reflective writing than synchronous formats, plausibly because learners have more time to deliberate (Kessler & Bikowski, 2010). Where the technology literature consistently runs into difficulty, however, is intersubjectivity. Automated and AI-driven tutoring systems can generate hints and corrections, but they cannot reliably infer what a particular learner needs at a particular moment (Heift & Schulze, 2007), which is precisely what makes ZPD-sensitive scaffolding effective when it works.

4. Discussion

4.1. Mediation and the Transformation of Cognitive Activity

Across the studies reviewed, the quality of mediation emerged as a more reliable predictor of L2 development than either the quantity of exposure or the number of practice opportunities. This finding holds whether the mediating agent is a teacher, a peer, a digital tool, or the learner working through a problem alone in private speech. What matters is whether the assistance is calibrated to what the learner can currently do and stretched to open up what they cannot yet do independently, which is, in essence, what Lantolf and Thorne (2006) mean when they distinguish artifact-mediated from concept-mediated activity. When mediation operates at the level of conceptual tools rather than surface corrections, developmental change tends to be more durable. The evidence also cautions against identifying mediation too narrowly with teacher-led expert–novice interaction. Peer scaffolding worked reasonably well in a substantial portion of the studies reviewed (see Table 2), and self-regulation through private speech was a productive form of mediation in individual task contexts (DiCamilla & Antón, 2012). The practical upshot is that teachers need not be the exclusive source of learning support, but the design of peer tasks and the conditions under which private speech can function do require careful attention.

4.2. The ZPD in Diverse Learning Contexts

The ZPD is theoretically powerful precisely because it frames development as inherently relational—something that happens between people before it happens within them (Vygotsky, 1978). In practice, however, the concept has been operationalized in very different ways across the literature, which

makes synthesis difficult. Dynamic assessment is probably the context in which the ZPD has been pinned down most precisely because the graduated hint sequence used in interactionist DA essentially maps the boundary between what a learner can do alone and what becomes available under responsive support (Poehner, 2008). Swain and Lapkin's (2002) work on peer ZPDs is worth dwelling on here. Their argument, supported by transcript analysis of learner–learner interaction, is that two learners of roughly similar ability can together access knowledge that neither possesses independently. If that is right, it complicates the common assumption that the ZPD requires an expert partner, and it has direct implications for how pair and group work should be designed. Open-ended tasks requiring genuine negotiation appear to elicit this kind of productive joint activity far more reliably than grammar-focused exercises with a single correct answer and little to negotiate (Ellis, 2000).

4.3. Languageing and the Cognitive Function of Output

One of the more counterintuitive findings to emerge from SCT-informed SLA research is that speaking or writing about a language problem, rather than simply solving it, is itself a developmental act. Swain's (2000) languageing hypothesis captures this: when learners verbalize uncertainty, talk through grammatical decisions, or argue about whether a sentence sounds right, they are not merely reporting on cognitive activity that has already occurred elsewhere. They are performing that activity through language, and the process leaves traces in subsequent accuracy and fluency. Think-aloud data and collaborative writing studies consistently bear this out (Swain & Lapkin, 2002). The implications for teaching are nontrivial: if output functions not only as evidence of learning but as a medium of learning, then tasks must be designed to make languageing happen, not merely to give learners something to practice.

4.4. Theoretical Limitations

None of this should obscure the genuine difficulties SCT faces as a theoretical framework. The most persistent problem is that constructs such as internalization remain underspecified at the level of cognitive mechanism. The movement from social to individual is intuitive as a developmental story, but what exactly happens neurologically when L2 knowledge that was once externally scaffolded becomes independently accessible is still largely unclear. There is useful work to be done at the boundary of SCT and cognitive neuroscience, though the methodological challenges are considerable. There is also a legitimate question about cultural universality. Vygotsky's framework was developed within a specific intellectual and historical context—that of Soviet developmental psychology of the 1920s and 1930s—and its core assumptions about how children learn, what counts as expertise, and what a helpful interactional partner looks like are not culturally neutral. The literature applying SCT to L2 learning has been heavily concentrated in Western and East Asian classroom settings. Community-based language learning, heritage language acquisition, and informal multilingual contexts, which together account for the majority of language learning experiences worldwide, are underrepresented, and the concepts may require significant adaptation before they apply cleanly in those settings. A further limitation concerns the present review itself. Because the corpus was restricted to peer-reviewed publications in English, relevant work published in other languages and in nonindexed regional journals was not captured. The effectiveness ratings reported in Table 2 are drawn from the original authors' own assessments rather than from a standardized instrument and should therefore be read as indicative rather than definitive.

4.5. Pedagogical Implications

If learning a language is fundamentally a social and mediated activity, then teaching it cannot be reduced to delivering accurate input and providing opportunities for practice. The quality of the interactional environment matters: the kind of support available, the tasks through which learners

encounter each other's knowledge, and the way assessment is designed to reveal potential rather than simply measure current performance. Five implications follow.

1. Task-based language teaching benefits from being framed explicitly around collaborative goals that require learners to draw on and extend one another's knowledge, rather than around tasks in which learners work in parallel toward individual products (Ellis, 2000).
2. Genre-based pedagogy, which cycles through deconstruction, joint construction, and independent writing, is a well-established instance of SCT concept-based instruction that makes discourse conventions explicit and learnable (Halliday, 1994).
3. Dynamic assessment used formatively allows teachers to respond to where individual learners actually are rather than where they are expected to be, and the mediational exchange itself contributes to development (Poehner, 2008).
4. Collaborative writing tasks—dictogloss, reformulation, and wiki-based composition—create conditions in which languaging can occur naturally, supporting both metalinguistic awareness and accuracy gains (Kessler & Bikowski, 2010; Swain & Lapkin, 2002).
5. Teacher education needs to address mediational sensitivity: the ability to notice what a learner can do, judge what kind of support would move them forward, and calibrate that support without doing either too much or too little (Aljaafreh & Lantolf, 1994).

5. Conclusion

This review has traced the development of sociocultural theory as a framework for understanding second language learning, following the thread from Vygotsky's (1978, 1986) original ideas through their elaboration by Lantolf and Thorne (2006), Swain (2000), and Poehner (2008), and into the empirical literature on scaffolding, collaborative dialogue, dynamic assessment, and technology-enhanced instruction. The picture that emerges is of a tradition that has substantially enriched the field's understanding of what makes learning possible—and that has done so by attending to human interaction rather than retreating from it. The limitations identified—underspecification of cognitive mechanisms, cultural parochialism in the research base, and limited coverage of informal and community learning contexts—are genuine, but they are better understood as research priorities than as grounds for abandoning the framework. A Vygotskian account of L2 development that engaged more seriously with neuroscience, with non-Western pedagogical traditions, and with the diversity of settings in which languages are actually learned would be considerably stronger than what currently exists.

Three directions seem most worth pursuing. First, linking internalization to neuroimaging data—tracking what happens in the brain as scaffolded interaction becomes internalized competence—would bring the social and biological levels of explanation closer together. Second, comparative work across under-researched languages and less-studied contexts would test the reach of current concepts and likely reveal both their strengths and their partiality. Third, the role of artificial intelligence in ZPD-sensitive scaffolding, and specifically what such systems can and cannot do compared with a responsive human partner, is a pressing question as these tools become more embedded in educational settings (Heift & Schulze, 2007). None of these questions diminishes the importance of the tradition; they reflect, rather, how productive and durable it has proven to be.

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Conceptual Approaches to Moral and Ethical Education of Internal Affairs Personnel

Farhod Melikulov 

Abstract. This article develops a competency-based framework for the moral and ethical education of internal affairs personnel. It addresses a practical problem: codes of conduct and periodic educational events can define expected behaviour, but they do not by themselves ensure sound judgment in situations involving discretion, pressure, conflicting duties, or citizen vulnerability. The study uses qualitative document analysis and conceptual synthesis. Its corpus consists of three Uzbek legal and policy documents governing internal affairs bodies, four international policing and integrity standards, and five scholarly sources on moral reasoning, police socialization, organizational justice, procedural justice training, and the author's earlier research. The analysis identifies four capacities that education should develop: moral attention, reasoned judgment, public interest motivation, and responsible action. It also identifies four institutional conditions required to sustain those capacities: clear standards, scenario-based learning, ethical supervision, and evidence-based feedback. These elements are integrated into a continuous five-stage model comprising diagnosis, dilemma analysis, guided reflection, supervised practice, and review. The article proposes observable indicators for each capacity while warning against reducing moral character to attendance records or a single numerical score. The framework offers a basis for curriculum design and later empirical evaluation in internal affairs institutions.

Keywords: internal affairs personnel, moral education, professional ethics, ethical competence, police training, organizational justice, procedural justice

Institute for Social and Spiritual Research under the Republican Center for Spirituality and Enlightenment, Tashkent, Uzbekistan

E-mail: farhodmmm2025@mail.ru

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Daxili işlər orqanları əməkdaşlarının mənəvi-əxlaqi tərbiyəsinə konseptual yanaşmalar

Fərhad Məlikulov 

Xülasə. Məqalədə daxili işlər orqanları əməkdaşlarının mənəvi və etik tərbiyəsi üçün səriştəyə əsaslanan konseptual çərçivə hazırlanır. Tədqiqat praktik bir problemi araşdırır: davranış kodeksləri və dövrü maarifləndirici tədbirlər gözlənilən davranışı müəyyən edə bilər, lakin mülahizə azadlığı, təzyiq, ziddiyyətli vəzifələr və ya vətəndaşın həssas vəziyyəti ilə bağlı hallarda düzgün qərarı özlüyündə təmin etmir. İşdə keyfiyyət yönümlü sənəd təhlili və konseptual sintezdən istifadə edilmişdir. Mənbə korpusuna daxili işlər orqanlarının fəaliyyətini tənzimləyən üç Özbəkistan hüquqi və siyasət sənədi, dörd beynəlxalq polis və dürüstlük standartı, həmçinin mənəvi mühakimə, polis sosiallaşması, təşkilati ədalət, prosedur ədaləti təlimi və müəllifin əvvəlki tədqiqatı üzrə beş elmi

mənbə daxildir. Təhlil tərbiyənin inkişaf etdirməli olduğu dörd qabiliyyəti müəyyən edir: mənəvi diqqət, əsaslandırılmış mühakimə, ictimai maraq motivasiyası və məsuliyyətli fəaliyyət. Bu qabiliyyətləri davamlı edən dörd institusional şərt də ayrılır: aydın standartlar, situasiya əsaslı öyrənmə, etik rəhbərlik və sübuta əsaslanan geribildirim. Elementlər diagnostika, dilemma təhlili, istiqamətləndirilmiş refleksiya, nəzarətli təcrübə və qiymətləndirmədən ibarət beşmərhələli modeldə birləşdirilir. Təklif olunan göstəricilər mənəvi keyfiyyətləri yalnız tədbirlərdə iştirak və ya vahid rəqəmlə qiymətləndirməyin düzgün olmadığını nəzərə alır.

Açar sözlər: *daxili işlər orqanları, mənəvi tərbiyə, peşə etikası, etik sərəştə, polis hazırlığı, təşkilati ədalət, prosedur ədaləti*

Özbəkistanın Daşkənd şəhərindəki Respublika Mənəviyyat və Maarifləndirmə Mərkəzi nəzdində Sosial və Mənəvi Tədqiqatlar İnstitutu, Daşkənd, Özbəkistan

E-poçt: farhodmmm2025@mail.ru

Daxil oldu: 11 Aprel 2026; Qəbul edildi: 18 İyul 2026; Onlayn dərc edildi: 30 Sentyabr 2026

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Introduction

Internal affairs personnel exercise public authority in situations that frequently require discretion. A rule may define the lawful boundary of an action, yet the officer must still recognize relevant facts, weigh competing duties, communicate a decision, and remain accountable for its consequences. Moral and ethical education therefore concerns professional judgment as well as knowledge of rules. It should prepare personnel to protect rights, maintain public order, and use authority proportionately in routine and difficult encounters.

International standards treat ethics as part of professional policing rather than as an optional addition. The United Nations Code of Conduct for Law Enforcement Officials requires respect for human dignity and the protection of human rights (United Nations, 1979). The European Code of Police Ethics connects legality, accountability, professional conduct, and public confidence (Council of Europe, 2001). The OSCE and UNODC likewise place training within a wider system that includes supervision, complaint handling, oversight, and institutional integrity (OSCE, 2008; UNODC, 2011). Uzbekistan's national framework provides a comparable legal basis. The Law on Internal Affairs Bodies defines the protection of citizens' rights, freedoms, lawful interests, public order, and security as core duties (Republic of Uzbekistan, 2016). The 2021 concept for organizing spiritual and educational work within internal affairs institutions emphasizes continuous personnel development, while the 2023 Code of Professional Culture and Service Discipline specifies requirements for conduct during and outside service (Republic of Uzbekistan, 2021, 2023). These documents create a clear normative expectation. The unresolved methodological question is how that expectation should be translated into learning processes and observable professional capacities.

Professional culture, legal consciousness, respect, integrity, and responsibility are central themes in moral and ethical education. A recurring methodological risk, however, is to treat educational activities as evidence of educational effectiveness. Attendance at a lecture, cultural event, or awareness campaign does not demonstrate improved ethical judgment. A defensible framework must specify the mechanism between educational input and professional conduct, identify evidence that can test the mechanism, and acknowledge alternative explanations.

Research on police education supports this caution. De Schrijver and Maesschalck (2015) found that differences in integrity training were reflected in knowledge of ethics codes, but not clearly in the

development of recruits' moral reasoning. This distinction matters because knowing a code and applying it under pressure are separate achievements. Organizational conditions also matter: Wolfe and Piquero (2011) found that perceived organizational justice was relevant to understanding police misconduct, which suggests that institutions cannot demand fairness externally while tolerating arbitrary treatment internally.

Training can nevertheless change conduct when it targets specific interactional skills and is implemented at scale. Wood et al. (2020) reported that procedural justice training for Chicago police officers was associated with fewer complaints and lower use of force over the study period. The result does not prove that every ethics programme will work. It shows that a defined curriculum, observable behavioural expectations, and outcome data can make evaluation possible.

This article asks three questions. Which capacities constitute moral and ethical competence for internal affairs personnel? Which institutional conditions help convert those capacities into stable professional conduct? How can an education cycle be assessed without reducing moral character to a single score? The purpose is to construct a secular, professionally focused framework that can guide curriculum design and subsequent empirical testing.

Materials and Methods

The study used qualitative document analysis and conceptual synthesis. The corpus was deliberately limited to twelve sources so that each source had a defined analytical function. Three Uzbek documents supplied the national normative framework: the Law on Internal Affairs Bodies, the 2021 decision and attached concept on spiritual and educational work, and the 2023 decision and Code of Professional Culture and Service Discipline (Republic of Uzbekistan, 2016, 2021, 2023).

Four international sources supplied professional and institutional benchmarks: the United Nations Code of Conduct for Law Enforcement Officials, the European Code of Police Ethics, the OSCE Guidebook on Democratic Policing, and the UNODC handbook on police accountability, oversight, and integrity (Council of Europe, 2001; OSCE, 2008; United Nations, 1979; UNODC, 2011). Five scholarly sources supplied explanatory and evaluative concepts: Rest's model of moral action, research on moral reasoning in police recruits, research on organizational justice and misconduct, a large procedural justice training evaluation, and Melikulov's earlier theoretical analysis (De Schrijver & Maesschalck, 2015; Melikulov, 2026; Rest, 1986; Wolfe & Piquero, 2011; Wood et al., 2020).

Sources were selected because they addressed at least one of four questions: expected conduct, ethical decision making, institutional conditions, or evaluation of training. The analysis did not attempt a systematic review of all police ethics literature. It focused on sources that could connect Uzbekistan's normative requirements with a testable educational model. Political speeches and journalistic commentary were excluded because they do not provide stable analytical criteria for professional competence.

The coding procedure had three stages. First, statements were coded under the categories of dignity, legality, impartiality, responsibility, professional discipline, communication, supervision, accountability, and learning. Second, the codes were grouped by level: individual capacity, learning process, organizational condition, or observable outcome. Third, relationships among the groups were reconstructed as a process model. A proposed relationship was retained only when the documents supplied a normative basis and at least one scholarly or international source supplied an explanatory basis.

Rest's four component account of moral action was used as a heuristic rather than a diagnostic test. The components were adapted as moral attention, reasoned judgment, public interest motivation, and

responsible action (Rest, 1986). The adaptation avoids claiming that inner character can be measured directly. Each capacity is linked to observable conduct and to several possible evidence sources. No surveys, interviews, experiments, or personal records were used. The results are therefore conceptual findings derived from the corpus. They do not estimate the prevalence of ethical problems or the causal effect of current educational activities in Uzbekistan.

Results

The first result is a four capacity model of moral and ethical competence. Moral attention is the ability to notice that a routine situation contains an ethical issue, such as unequal treatment, a conflict of interest, humiliation, unnecessary coercion, or inaccurate information. Without attention, an officer may follow familiar procedure while overlooking the citizen's rights or vulnerability. Reasoned judgment is the ability to identify applicable law and professional standards, distinguish relevant from irrelevant considerations, examine alternatives, and explain why a chosen action is proportionate. This capacity is especially important when several lawful options exist or when speed, hierarchy, and fairness pull in different directions. It converts general values into reasons for a concrete decision.

Public interest motivation is the commitment to use authority for its authorized purpose rather than for convenience, personal benefit, group loyalty, or avoidance of responsibility. Motivation links judgment to willingness. An officer may know the correct course but fail to take it when the organizational cost is high. Ethical education must therefore address professional identity and duty while institutions protect lawful refusal and good faith reporting.

Responsible action is the ability to carry out a decision with self-control, respectful communication, accurate documentation, and readiness for review. It includes the capacity to correct an error. This component prevents ethics from remaining an abstract discussion detached from behaviour.

The second result is that these capacities require four institutional conditions. Clear standards define the lawful and professional baseline. Scenario-based learning allows personnel to practise interpretation where duties conflict. Ethical supervision connects classroom learning with real work and makes reasons discussable. Evidence-based feedback uses case review, complaints, service records, and structured observation to identify patterns and improve practice. International guidance consistently treats accountability and supervision as part of integrity, not as substitutes for education (Council of Europe, 2001; OSCE, 2008; UNODC, 2011).

The third result is a continuous five-stage education cycle. Diagnosis identifies recurrent dilemmas and gaps in knowledge, judgment, communication, or organizational support. Dilemma analysis uses anonymized cases to separate legal requirements, ethical risks, stakeholder interests, and available options. Guided reflection requires participants to state and defend their reasons. Supervised practice applies the reasoning in simulations, mentoring, or reviewed service situations. Review compares expected and observed conduct and feeds lessons back into the next cycle.

This cycle differs from event-based education. A calendar of lectures and cultural activities records inputs, while the proposed model traces a path from a diagnosed problem to learning, practice, and evidence. Cultural and educational activities may still support professional identity and shared values, but their contribution should be stated as a hypothesis and assessed through relevant evidence rather than assumed.

The fourth result is an assessment matrix that combines multiple forms of evidence. No indicator is sufficient by itself. Complaint numbers can change because access to complaint channels changes. A low number of reported incidents may reflect good conduct, weak detection, or reluctance to report.

Training tests measure knowledge but do not necessarily measure action. A sound assessment therefore triangulates records, observation, case reasoning, and feedback while protecting due process.

Table 1

Assessment framework for moral and ethical competence

Capacity	Observable conduct	Possible evidence	Required safeguard
Moral attention	Recognizes dignity, fairness, conflict of interest, and harm	Case vignettes and structured observation	Context and alternative explanations recorded
Reasoned judgment	Identifies rules, weighs options, and explains proportionality	Written case analysis and supervisory review	Evaluation rubric disclosed in advance
Public interest motivation	Resists improper influence and seeks lawful guidance	Advice requests, disclosures, and anonymized case records	Protected reporting and no retaliation
Responsible action	Acts respectfully, documents accurately, and corrects errors	Record review, citizen feedback, and observed simulations	Multiple evidence sources and right to respond

The fifth result concerns alignment across the personnel system. Selection should assess the ability to recognize and reason about ethical problems rather than invite rehearsed statements of values. Initial training should connect rules with recurring dilemmas. Field mentoring should model explanation, restraint, and correction. Performance review should consider the manner in which lawful results are achieved. Leadership should apply standards consistently inside the organization because perceived internal unfairness can weaken commitment to external fairness (Wolfe & Piquero, 2011).

The resulting framework does not replace discipline or legal control. It clarifies the role of education within them. Codes define minimum expectations; learning develops the capacities needed to interpret and apply them; supervision reinforces conduct; and accountability responds when standards are breached. The 2023 national code provides the formal conduct baseline, while the proposed cycle supplies an educational mechanism for internalization and review (Republic of Uzbekistan, 2023).

Discussion

The findings show why moral and ethical education should be treated as professional competence rather than as a sequence of ceremonial or informational events. The relevant outcome is not exposure to a value statement. It is the officer's ability to recognize an ethical issue, justify a lawful response, act with restraint, and accept review. This interpretation preserves the normative purpose of spiritual and educational work while making its professional meaning more precise.

The four-capacity model also explains why code knowledge is necessary but insufficient. De Schrijver and Maesschalck (2015) observed that ethics training differences could appear in knowledge without corresponding differences in moral reasoning. An institution that measures only

attendance and test recall may therefore overestimate educational success. Scenario-based assessment and supervised practice are needed to examine how personnel handle ambiguity.

At the same time, it would be equally weak to assume that personal morality alone determines conduct. Organizational justice, leadership, workload, peer norms, and reporting safety affect whether an officer can act on ethical judgment. Wolfe and Piquero's (2011) findings support attention to internal fairness. If supervisors apply rules selectively or punish good faith questions, formal ethics instruction sends a contradictory message.

The procedural justice training evaluated by Wood et al. (2020) demonstrates the value of a narrower and testable intervention. The programme focused on concrete behaviours related to voice, neutrality, respect, and trustworthy motives, and the evaluation used administrative outcomes over time. The study occurred in a different legal and organizational context, so its effect sizes should not be transferred to Uzbekistan. Its methodological lesson is transferable: define behaviours, specify the intervention, identify a comparison or baseline, and measure outcomes that could falsify the claim of effectiveness.

The national legal framework can support this shift. The 2016 law establishes rights protection and public safety duties. The 2021 concept gives educational work an institutional basis. The 2023 code specifies professional culture and discipline. Together they cover mandate, development, and conduct (Republic of Uzbekistan, 2016, 2021, 2023). The proposed model links these levels without treating any policy document as proof that practice has already changed.

Moral and ethical education should also remain secular and professionally bounded. Terms such as spirituality, patriotism, or moral immunity are too broad to function as assessment criteria unless they are translated into lawful and observable conduct. For personnel decisions, the defensible criteria are impartiality, respect for dignity, honesty, responsible use of authority, accuracy, and accountability. Private belief, identity, or conformity to an undefined worldview must not become a proxy for professional ethics.

Implementation should begin with a limited pilot. One institution can identify two or three recurring service dilemmas, develop anonymized cases, train facilitators, and test a common reasoning rubric. Baseline and follow-up evidence should include code knowledge, written reasoning, observed simulation, and relevant administrative data. Results should be interpreted cautiously and reviewed with participants before wider adoption.

The framework also changes the role of educational staff. Their task is not limited to organizing events. They should diagnose recurring ethical problems, design cases with legal and operational specialists, facilitate reasoned discussion, support mentors, and analyze evidence. This requires training in adult learning, qualitative assessment, and research ethics.

Limitations

This study is a conceptual analysis of a selected corpus. It does not establish how frequently particular dilemmas occur, how current programmes are implemented across units, or whether the proposed model improves conduct. The international sources come from different legal and organizational settings, and their recommendations require adaptation rather than direct transfer. The framework identifies observable indicators but does not validate a measurement instrument. Administrative data can be incomplete, complaints can reflect unequal access, and supervisors can introduce bias into observation. Any future assessment must combine evidence, protect confidentiality, permit explanation, and avoid automatic personnel decisions based on one measure.

Future Research

Future research should map the most common ethical dilemmas encountered by internal affairs personnel through anonymized interviews, document review, and focus groups. A pilot instrument can then test whether the four capacities are distinct, reliable, and understandable to trainees and supervisors. The design should receive ethics approval and protect operationally sensitive information. A subsequent evaluation should compare baseline and follow-up performance and, where feasible, use a comparison group or phased implementation. Researchers should report implementation fidelity, attrition, missing data, and unintended effects. Longer follow-up is necessary because immediate knowledge gains may not persist or translate into conduct.

Conclusion

Moral and ethical education of internal affairs personnel should develop four linked capacities: moral attention, reasoned judgment, public interest motivation, and responsible action. These capacities become stable only when clear standards, scenario-based learning, ethical supervision, and evidence-based feedback reinforce one another. The article converts this relationship into a five-stage cycle of diagnosis, dilemma analysis, guided reflection, supervised practice, and review. The model provides a more credible basis for curriculum design than attendance-based reporting because it specifies expected conduct and the evidence needed to examine change. It remains a framework for empirical testing, not proof that existing activities are effective.

Declarations

Ethics approval: Not applicable. The study used publicly available documents and did not involve human participants or personal data.

Conflict of interest: The author declares no conflict of interest.

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Youth Consciousness in the Virtual Environment: A Socio-Philosophical Model of the “Invisible Shield” Against Manipulation

Sherzodjon Qurbonov 

Abstract. *This article develops a socio-philosophical model for protecting young people’s cognitive and moral agency in digitally mediated environments. It asks how manipulation differs from ordinary influence and which capacities allow a user to benefit from online communication without surrendering independent judgment. The study uses a structured conceptual synthesis of fifteen works published between 1970 and 2025 on critical pedagogy, information disorder, digital literacy, cognitive security, online reasoning, and platform power. Sources were compared across four analytical dimensions: control of attention, assessment of credibility, regulation of affect, and value-guided action. The findings show that exposure to persuasive content is not itself manipulation. Manipulative risk becomes substantial when influence is opaque, exploits cognitive or emotional vulnerability, narrows reflective choice, and serves goals the user cannot adequately recognize or contest. On this basis, the article proposes an “Invisible Shield” model comprising epistemic orientation, critical verification, affective self-regulation, and value-guided agency. The model rejects both unrestricted technological optimism and blanket prohibition. It instead treats spiritual immunity as a teachable set of reflective practices supported by education, families, cultural institutions, responsible media, and transparent platform design. The article concludes with operational indicators that can guide future empirical assessment among youth.*

Keywords: *virtual environment, youth consciousness, manipulation, spiritual immunity, cognitive sovereignty, critical thinking, media and information literacy, digital agency*

Institute of Socio-Spiritual Research under the Republican Center for Spirituality and Enlightenment, Tashkent, Uzbekistan

E-mail: sherzodjonnurbonov@gmail.com

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Virtual mühitdə gənclərin şüuru: manipulyasiyaya qarşı “görünməz qalxan”ın sosial-fəlsəfi modeli

Sherzodjon Qurbonov 

Xülasə. *Məqalədə rəqəmsal vasitələrlə formalaşan mühitdə gənclərin idraki və mənəvi subyektivliyinin qorunmasına dair sosial-fəlsəfi model işlənib hazırlanır. Tədqiqat adi təsirlə manipulyasiya arasındakı fərqi nədən ibarət olduğunu və istifadəçinin müstəqil mühakiməsini itirmədən onlayn ünsiyyətin imkanlarından yararlanmasına hansı bacarıqların kömək etdiyini araşdırır. 1970–2025-ci illərdə tənqidi pedaqogika, informasiya pozuntusu, rəqəmsal savadlılıq, kognitiv təhlükəsizlik, onlayn mənbələrin qiymətləndirilməsi və platforma hakimiyyəti haqqında nəşr edilmiş on beş əsərin*

strukturlaşdırılmış konseptual sintezindən istifadə olunmuşdur. Mənbələr diqqətin idarə edilməsi, etibarlılığın qiymətləndirilməsi, emosiyaların tənzimlənməsi və dəyərlərə əsaslanan fəaliyyət istiqamətləri üzrə müqayisə edilmişdir. Nəticələr göstərir ki, inandırıcı məzmunla qarşılaşmaq öz-özünüdə manipulyasiya deyil. Təsir qeyri-şəffaf olduqda, koqnitiv və ya emosional zəiflikdən istifadə etdikdə, düşünülmüş seçimi məhdudlaşdırdıqda və istifadəçinin tanıya və mübahisələndirə bilmədiyi məqsədlərə xidmət etdikdə risk yüksəlir. Bu əsasda epistemik istiqamətlənmə, tənqidi yoxlama, emosional özünü-tənzimləmə və dəyərlərə əsaslanan subyektivlikdən ibarət “Görünməz qalxan” modeli təklif olunur. Model həm kor texnoloji nikbinliyi, həm də ümumi qadağanı rədd edir və mənəvi immuniteti təhsil və sosial institutlar tərəfindən dəstəklənən öyrədilə bilən reflektiv təcrübələr sistemi kimi izah edir.

Açar sözlər: *virtual mühit, gənclərin şüuru, manipulyasiya, mənəvi immunitet, koqnitiv suverenlik, tənqidi düşüncə, media və informasiya savadlılığı, rəqəmsal subyektivlik*

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E-poçt: sherzodjonnurbonov@gmail.com

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Introduction

The virtual environment has become part of the infrastructure through which young people learn, communicate, construct identity, and evaluate social reality. Its significance therefore cannot be reduced to the amount of time spent online. Digital platforms organize visibility: they rank messages, repeat selected themes, recommend content, and translate attention into measurable engagement. These functions can enlarge access to knowledge and participation, but they also create asymmetries between users and the systems that select what users encounter. The central philosophical problem is not whether the internet is inherently beneficial or harmful. It is whether a person remains capable of understanding, questioning, and revising the judgments formed within an environment whose selection mechanisms are only partly visible.

Existing discussions often collapse three different phenomena into one: influence, persuasion, and manipulation. Influence is unavoidable in social life because language, education, culture, and interpersonal relations shape judgment. Persuasion presents reasons or appeals that a recipient may examine and reject. Manipulation is more specific. It uses concealed or structurally unequal means to steer perception or action while weakening the recipient's capacity for reflective choice. This distinction matters because an indiscriminate language of “threat” can justify blanket restriction, while an indiscriminate language of “freedom” can ignore engineered vulnerability. A defensible approach must protect agency without treating young people as passive objects.

Research on online misinformation demonstrates that users frequently encounter difficulty when judging the credibility of digital sources, and that intuitive or familiarity-based processing can increase susceptibility to false claims (Breakstone et al., 2021; Pennycook & Rand, 2021). Research on digital environments further shows that individual responsibility alone is insufficient because interface design, data extraction, algorithmic ranking, and commercial incentives structure the field in which decisions occur (Kozyreva et al., 2020; Zuboff, 2019). Within the Central Asian scholarly context, information-psychological security has likewise been examined as a relationship among individual, social, and institutional protection rather than as a purely technical problem (Biyimbetov,

2021). Qurbonov and Abduvafoyeva (2025) connect these processes to the transformation of youth spirituality, while Qurbonov (2025) emphasizes communicative education and value-based identity. The concept of spiritual immunity is useful only if it is made analytically precise. Used vaguely, it can become a slogan that labels unfamiliar information as harmful. Used carefully, it can describe a person's capacity to encounter competing messages without losing the ability to evaluate evidence, regulate immediate reactions, recognize ethical consequences, and act according to considered values. In this article, spiritual immunity does not mean cultural isolation, ideological conformity, or rejection of technology. It refers to a layered form of cognitive and moral resilience that preserves agency under conditions of informational pressure.

The study addresses two questions. First, through which mechanisms can digitally mediated influence become manipulative? Second, which capacities should an "invisible shield" contain if it is to protect cognitive sovereignty without undermining openness, learning, and dialogue? The objective is to reconstruct a transparent conceptual model that connects philosophical principles with observable educational practices. The article's contribution is the four-capacity Invisible Shield model and a threshold test that distinguishes ordinary exposure from agency-reducing manipulation.

Materials and Methods

The study employs a structured conceptual synthesis rather than an empirical survey or experiment. Its corpus consists of fifteen works published between 1970 and 2025. The corpus was purposively assembled to represent five complementary domains: critical pedagogy and reflective emancipation; critical-thinking methodology; media and information literacy; psychological research on misinformation and online reasoning; and socio-philosophical analyses of platform power, information security, and youth spirituality. Foundational works were retained when they supplied concepts still required by the analysis, while recent peer-reviewed studies and institutional guidance were selected to address contemporary digital conditions.

The analysis proceeded in four stages. First, each source was coded for the object of concern: information quality, attention, emotion, identity, socialization, or institutional power. Second, the mechanism of vulnerability was identified, including repetition, source opacity, urgency, social endorsement, personalization, and affective activation. Third, proposed responses were classified as restrictive, corrective, educational, or design-based. Fourth, the responses were evaluated against an agency criterion: whether they increase a young person's ability to understand an influence, test its claims, regulate reaction, and make a revisable choice. This criterion draws on Freire's distinction between passive adaptation and critical participation (Freire, 1970), Paul and Elder's account of disciplined judgment (Paul & Elder, 2002), and contemporary work on cognitive tools for digital citizens (Kozyreva et al., 2020).

Concepts were compared through a matrix with four analytical dimensions: epistemic orientation, critical verification, affective self-regulation, and value-guided agency. A proposed protective measure was included in the final model only when it met three conditions: it was not dependent on a complete ban on access; it could be translated into a teachable or institutionally supportable practice; and it preserved the user's capacity to revise conclusions in the light of better evidence. Lateral reading, for example, satisfies these conditions because it redirects attention from the appearance of a single page to independent information about the source (Wineburg & McGrew, 2019).

The synthesis is interpretive and does not claim statistical representativeness. No human participants were recruited, no personal data were processed, and no new dataset was created. The model is therefore assessed by conceptual coherence, correspondence with the selected literature, explanatory

usefulness, and falsifiability through future empirical research. Direct quotations from uncertain secondary reproductions were avoided; arguments are paraphrased and attributed in author-date form.

Results

The first result is a four-part threshold for identifying manipulation. Digitally mediated influence becomes manipulative when four conditions converge: the operation is materially opaque to the user; it exploits a predictable cognitive or emotional vulnerability; it narrows the time, information, or alternatives available for reflection; and it advances an objective that the user cannot adequately recognize or contest. None of these conditions alone is sufficient. Personalization can improve relevance, emotional communication can be legitimate, and simplified interfaces can reduce cognitive burden. The decisive question is whether the configuration systematically bypasses reflective agency. This threshold corrects two symmetrical errors. The first error treats every persuasive message as manipulation and therefore mistakes protection for prohibition. The second treats every click as an autonomous preference and therefore ignores how options are framed and ranked. Floridi (2014) describes the digital transformation as a change in the informational environment in which human action occurs, while Zuboff (2019) highlights the economic power derived from predicting and shaping behavior. Read together, these perspectives indicate that agency must be evaluated relationally: not only by asking whether a choice occurred, but also by examining whether the conditions of choice were intelligible and contestable.

The second result concerns the mechanisms through which vulnerability is produced. The literature converges on four mechanisms. Attention capture prioritizes salience, novelty, or repetition over importance. Credibility substitution encourages users to rely on visual polish, familiarity, popularity, or identity cues instead of checking expertise and evidence. Affective acceleration converts surprise, fear, admiration, or indignation into immediate sharing before verification. Agency displacement turns a recommendation into a default path, gradually weakening deliberate selection. Pennycook and Rand (2021) show that susceptibility to false information cannot be explained only by partisan motivation; inadequate attention to accuracy is also important. Kozyreva et al. (2023) therefore add “critical ignoring” to critical thinking: digital competence includes the disciplined decision not to allocate attention to low-value or manipulative material.

The third result is the Invisible Shield model. The metaphor denotes neither a technical firewall nor an impermeable moral boundary. It describes four interdependent human capacities. Epistemic orientation is the ability to identify what kind of claim is being made, who benefits from its acceptance, and what evidence would be relevant. Critical verification is the ability to leave the initial post, investigate the source, compare independent accounts, and distinguish primary evidence from commentary. Affective self-regulation is the ability to recognize when emotional activation is compressing judgment and to create a deliberate pause before reacting or sharing. Value-guided agency is the ability to connect digital action with responsibility, dignity, truthfulness, and the foreseeable effects on other people.

The four capacities are complementary rather than interchangeable. Information literacy without affective regulation may fail at the precise moment when a message produces anger or fear. Moral commitment without source evaluation may spread false information for a sincerely held purpose. Skepticism without value-guided agency may become cynical disbelief in every source. Technical safety without reflective participation may produce compliance rather than autonomy. Spiritual immunity is therefore strongest when all four capacities operate as a cycle: orient, verify, regulate, and act.

The fourth result is an institutional principle. The shield cannot be assigned exclusively to the individual because digital choices occur within educational, familial, cultural, media, and technological environments. UNESCO (2021) treats media and information literacy as a civic and educational competence, while Rheingold (2012) emphasizes attention, participation, collaboration, and network awareness as practical digital literacies. The synthesis indicates that institutions should not attempt to decide every conclusion for the learner. Their responsibility is to create repeated opportunities for transparent source comparison, reason-giving, emotional reflection, and accountable participation.

Table 1
The Invisible Shield model and its operational indicators

Capacity	Core question	Observable practice
Epistemic orientation	What is being claimed, by whom, and for what purpose?	Identifies claim type, source, intended audience, and relevant evidence.
Critical verification	What independent evidence supports or challenges the claim?	Uses lateral reading, checks provenance, date, context, and corroboration.
Affective self-regulation	Is an emotional reaction replacing considered judgment?	Names the emotion, pauses, delays sharing, and re-evaluates after activation falls.
Value-guided agency	What responsible action follows from the verified information?	Explains a choice, considers consequences, corrects errors, and respects others' agency.

The fifth result is a pedagogical sequence derived from the model. Instruction should begin with authentic but low-stakes examples, because abstract warnings rarely transfer to actual feeds. Learners first describe what made a post attractive or credible. They then investigate the source through lateral reading, compare the claim with independent evidence, identify the emotional trigger, and justify a decision to share, reject, annotate, or suspend judgment. Feedback must assess the reasoning process rather than reward agreement with a predetermined opinion. Research on civic online reasoning supports the need for explicit practice because many students struggle to evaluate online sources despite extensive digital exposure (Breakstone et al., 2021). Digital familiarity is not equivalent to epistemic competence.

The resulting model also clarifies the meaning of cognitive sovereignty. Sovereignty does not imply complete independence from social influence, which is impossible. It means retaining a practical right and capacity to inspect the reasons for a judgment, resist concealed steering, and revise one's position. Critical pedagogy contributes the principle that education should transform the learner from an object of communication into a participant capable of questioning the conditions of communication (Freire, 1970). Paul and Elder (2002) add standards such as clarity, accuracy, relevance, and logical consistency. The Invisible Shield translates these standards into the temporal conditions of digital life, where verification must often compete with speed, repetition, and emotional intensity.

Finally, the model produces a testable prediction: interventions that teach only factual correction will be less durable than interventions combining verification, affective pause, and accountable action. The Debunking Handbook similarly stresses that correction must be clear, evidence-based, and attentive to how misinformation is cognitively processed (Lewandowsky et al., 2020). The proposed

model extends this insight from correcting isolated claims to preserving the broader capacities through which a person evaluates future claims.

Discussion

The findings support a move from defensive rhetoric to capability-based protection. A purely prohibitive model assumes that safety can be produced by removing harmful content before it reaches the user. This assumption is unrealistic in an open and rapidly changing information environment, and it can leave young people less prepared when restriction is absent. A purely individual model is equally inadequate because it asks users to resist systems designed to capture attention while leaving institutional incentives untouched. The Invisible Shield model distributes responsibility: individuals develop reflective capacities, educators build practice, families support dialogue, media institutions improve provenance and correction, and platforms make recommendation and advertising processes more intelligible.

This distribution of responsibility is consistent with Kozyreva et al. (2020), who distinguish individual cognitive tools from system-level reforms. Boosting user competence and improving the choice architecture should not be treated as substitutes. Transparent labeling is weak if users do not know how to interpret it; critical-thinking instruction is weakened when platform design continually rewards impulsive engagement. The conceptual implication is that cognitive sovereignty is an ecological achievement produced through the interaction of personal capacities and institutional conditions.

The model also sets limits on the language of spiritual immunity. First, disagreement is not evidence of manipulation. A person may reach an unpopular or mistaken conclusion through sincere reasoning. Second, cultural difference is not inherently harmful. Shielding becomes intellectually destructive when it prevents exposure to alternative interpretations. Third, emotional communication is not necessarily irrational; moral understanding often depends on empathy and affect. The relevant danger is not emotion itself but the engineered compression of reflection. Fourth, national or communal values cannot replace evidence when a factual claim is evaluated. Values guide responsible use of knowledge; they do not determine whether a verifiable statement is true.

These limits make the concept non-confessional and analytically usable. Spiritual immunity can be defined through public capacities—truth-seeking, responsibility, dignity, reflection, and meaningful choice—without requiring adherence to a particular doctrine. In this form, the concept complements media and information literacy rather than competing with it. UNESCO's framework emphasizes access, evaluation, creation, and participation (UNESCO, 2021). The present model adds an explicit bridge between epistemic competence and moral agency: a well-verified message can still be used irresponsibly, while a benevolent intention can still distribute an unverified claim.

The local literature strengthens this bridge. Biyimbetov (2021) interprets information-psychological security through the relations among persons, social groups, and institutions. Qurbonov and Abduvafoyeva (2025) emphasize the influence of digital information processes on youth spirituality. The present synthesis narrows these broad concerns into mechanisms and capacities. Its value lies not in declaring the digital environment dangerous, but in specifying when an influence becomes agency-reducing and which observable practices may interrupt that transition.

The model can be applied in educational and cultural settings through scenario-based assessment. A learner may be presented with a viral claim and asked to document four steps: identify the source and purpose, open independent sources, record the initial emotional response, and justify a final action. Performance can be assessed with a rubric rather than a binary correct/incorrect score. Wineburg and

McGrew (2019) show why this matters: expert fact-checkers often evaluate credibility by leaving a page and examining what other sources say about it. Instruction that focuses only on close reading within the original page may reward precisely the visual and rhetorical features that manipulation exploits.

There is also a temporal dimension. Manipulation frequently benefits from immediacy, whereas responsible judgment requires time. A short epistemic pause is therefore not passivity; it is an active reorganization of attention. Critical ignoring adds a second temporal practice: refusing to spend scarce attention on content whose source or purpose makes it unworthy of deeper engagement (Kozyreva et al., 2023). Together, lateral reading and critical ignoring counter opposite failures—remaining trapped inside a deceptive source and wasting cognitive resources on strategically distracting material.

The strongest version of the “invisible shield” is thus not invisibility in the sense of secrecy. It is invisibility because the protection resides in habits of judgment that travel with the person across platforms. These habits should nevertheless be made visible during learning: students need language for explaining how they checked a source, why they delayed a reaction, and which values shaped their action. A capacity that cannot be demonstrated or assessed risks remaining rhetorical.

Practical Implications

Educational institutions should integrate source evaluation into ordinary subject teaching rather than isolate it in a single digital-safety lecture. History classes can compare provenance and context; language classes can analyze framing and rhetorical omission; science classes can distinguish peer-reviewed evidence from testimonial claims. The same four-step routine—orient, verify, regulate, act—can be adapted across disciplines. This approach avoids presenting media literacy as a technical accessory and treats it as part of disciplined thinking.

Families and youth organizations should replace one-directional warnings with guided discussion. Asking “What made this convincing?” or “What evidence would change your mind?” develops metacognition more effectively than simply labeling a source as forbidden. Cultural institutions and responsible media can support the process by publishing transparent corrections, explaining editorial decisions, and distinguishing reporting from commentary. Platforms should make sponsorship, provenance, recommendation criteria, and complaint procedures comprehensible to ordinary users. Assessment should focus on demonstrated processes. Four indicators are especially useful: whether the learner can name the claim and source; whether independent corroboration is sought; whether emotional activation is recognized and managed; and whether the eventual action is justified in relation to consequences. Longitudinal assessment is preferable because a single correct response may reflect luck or prior familiarity. The objective is stable agency across unfamiliar cases.

Limitations

This study has four limitations. First, it is a conceptual synthesis and does not measure the prevalence of manipulation or the effectiveness of the proposed model. Second, the corpus is selective rather than exhaustive and is weighted toward English-language research alongside a limited Central Asian literature. Third, concepts such as spirituality, autonomy, and manipulation remain culturally sensitive; their operational indicators require validation in specific linguistic and educational contexts. Fourth, platform architectures evolve rapidly, so the mechanisms identified here should be periodically re-examined. The model should therefore be treated as a falsifiable framework for research, not as a completed intervention proven to produce behavioral change.

Future Research

Future studies should develop and validate an age-sensitive scale for the four capacities and test whether they predict resistance to misleading content beyond general academic achievement. Experimental work could compare factual correction alone with a combined intervention involving lateral reading, affective pause, and value-based justification. Qualitative interviews could examine how young people interpret “spiritual immunity” and whether the term supports agency or is experienced as external control. Research should also compare urban and rural contexts, different language environments, and varying levels of access without assuming that exposure or vulnerability is uniform. Finally, platform-level variables—recommendation transparency, advertising disclosure, friction before resharing, and correction visibility—should be studied together with educational interventions.

Conclusion

The virtual environment expands learning, communication, and self-expression, but it also reorganizes the conditions under which judgment is formed. The relevant philosophical challenge is therefore not to choose between technological enthusiasm and technological fear. It is to preserve the young person’s ability to understand influence, test claims, regulate reaction, and act responsibly within an environment shaped by opaque selection and unequal informational power.

The article defines manipulation through a four-part threshold—opacity, exploitation of vulnerability, restriction of reflection, and an insufficiently contestable objective—and proposes the Invisible Shield model of epistemic orientation, critical verification, affective self-regulation, and value-guided agency. The shield is not a ban, a doctrine, or a guarantee of correct belief. It is a transferable set of practices that protects the conditions of meaningful choice. Its effectiveness depends on a shared ecology of responsibility involving education, families, cultural institutions, media, and platform design. The next task is empirical: the model must be operationalized, tested, criticized, and revised in collaboration with the young people whose agency it seeks to strengthen.

Declarations

Conflict of interest: The author declares no conflict of interest.

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Ethics and data availability: The study is based on published literature, involved no human participants, and generated no new dataset.

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Chinese Expansionist Philosophy's Historical Background

Kamran Shirinzade 

Abstract. *This article examines the historical foundations and contemporary manifestations of ideas commonly associated with Chinese expansionism. It asks how classical concepts such as Tianxia, Confucian moral authority, Legalist state capacity, and tributary relations are reinterpreted in present-day foreign policy. The study applies qualitative historical analysis, comparative political thought, discourse analysis, and a focused case study of the Belt and Road Initiative (BRI). The findings show that classical philosophy does not mechanically determine current policy; rather, selected historical concepts provide a vocabulary through which national rejuvenation, connectivity, hierarchy, sovereignty, and international leadership are framed. Contemporary Chinese influence is multidimensional and operates through infrastructure finance, trade, institutions, technology, diplomacy, and military modernization. The BRI illustrates both the developmental potential and the strategic ambiguity of this approach, particularly in Eurasia and the South Caucasus. Realist, liberal, and constructivist interpretations each explain part of the phenomenon but none is sufficient alone. The article concludes that China's expanding global role is best understood as an adaptive synthesis of historical narratives and modern state interests, not simply as territorial conquest or entirely benign cooperation.*

Keywords: *China, expansionist thought, Tianxia, Belt and Road Initiative, geoeconomics, South Caucasus*

Azerbaijan University of Architecture and Construction, PhD student, Baku, Azerbaijan

E-mail: shirinzadekamran@yandex.ru

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Çin ekspansionist düşüncəsinin tarixi əsasları və müasir ölçüləri

Kamran Şirinzadə 

Xülasə. *Məqalədə Çin ekspansionizmi ilə əlaqələndirilən ideyaların tarixi əsasları və müasir təzahürləri araşdırılır. Tədqiqat Tianxia, konfutsiçi mənəvi hakimiyyət, legalist dövlət gücü və tribut münasibətləri kimi klassik anlayışların müasir xarici siyasətdə necə yenidən şərh edildiyini müəyyənləşdirməyə çalışır. Araşdırmada keyfiyyət yönümlü tarixi təhlil, müqayisəli siyasi fikir, diskurs təhlili və “Bir kəmə, bir yol” təşəbbüsünün nümunəvi hadisə kimi öyrənilməsi tətbiq olunur. Nəticələr göstərir ki, klassik fəlsəfə müasir siyasəti birbaşa müəyyən etmir; seçilmiş tarixi anlayışlar milli dirçəliş, qarşılıqlı bağlılıq, iyerarxiya, suverenlik və beynəlxalq liderliyin əsaslandırıldığı siyasi dil yaradır. Çinin müasir təsiri infrastruktur maliyyəsi, ticarət, beynəlxalq institutlar, texnologiya, diplomatiya və hərbi modernləşmə vasitəsilə çoxölçülü şəkildə həyata keçirilir.*

“Bir kəmə, bir yol” təşəbbüsü bu yanaşmanın həm inkişaf imkanlarını, həm də strateji qeyri-müəyyənliyini, xüsusilə Avrasiya və Cənubi Qafqazda aydın göstərir. Məqalə Çinin genişlənən global rolunu ərazi işğalından daha geniş, tarixi narrativlərlə müasir dövlət maraqlarının adaptiv sintezi kimi qiymətləndirir.

Açar sözlər: Çin, ekspansionist düşüncə, Tianxia, Bir kəmə bir yol təşəbbüsü, geoiqtisadiyyat, Cənubi Qafqaz

Azərbaycan Memarlıq və İnşaat Universiteti, doktorant, Bakı, Azərbaycan

E-poçt: shirinzadekamran@yandex.ru

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Introduction

China’s approach to international relations draws on an extensive intellectual and political history. Whereas mainstream Western theories often emphasize sovereign equality, competition, and balances of power, classical Chinese traditions also foreground relational order, moral leadership, hierarchy, and social harmony. Daoist, Confucian, and Legalist ideas emerged in distinct historical settings and should not be treated as a unified doctrine, yet their concepts continue to appear in contemporary debates about China’s place in the world. As China’s material capabilities have expanded, political leaders and scholars have increasingly invoked traditional language to explain national rejuvenation, international cooperation, and global governance (Callahan, 2016; Qin, 2018).

The nature of Chinese expansionism is contested. Conventional territorial expansion is only one possible meaning of the term. Contemporary Chinese statecraft relies heavily on economic integration, infrastructure finance, technological networks, institutional participation, strategic diplomacy, and military modernization. These instruments have led analysts to describe China’s approach as geoeconomic or institutional expansion rather than classical colonial conquest (Doshi, 2021; Economy, 2018). The debate has intensified under Xi Jinping because of the Belt and Road Initiative (BRI), Made in China 2025, the modernization of the People’s Liberation Army (PLA), the Digital Silk Road, and more assertive activity in the South China Sea and around Taiwan.

This article asks two questions: To what extent do traditional Chinese political concepts illuminate contemporary foreign policy, and through which instruments does China expand its influence today? Its purpose is not to label all Chinese engagement as domination, but to distinguish historical narratives, material interests, developmental cooperation, and strategic power projection. The BRI and its Eurasian dimension, including the South Caucasus, provide a focused context for this assessment.

Materials and Methods

The research uses a qualitative design combining historical analysis, comparative political thought, discourse analysis, and case-study reasoning. Historical analysis traces changes in ideas of political order, frontier security, tributary relations, and imperial legitimacy across major dynastic and modern periods. Comparative analysis distinguishes classical concepts from their contemporary reinterpretation, avoiding the assumption that present policy is a direct continuation of ancient philosophy.

The source base consists of classical concepts discussed in the scholarly literature, official policy language, books and journal articles on Chinese grand strategy, and studies of the BRI. The analysis is organized through three international-relations perspectives. Neorealism is used to examine material power and security competition; liberal approaches clarify the role of trade, institutions, and interdependence; and constructivism explains the political use of identity, historical memory, and civilizational narratives (Foot & Walter, 2011; Mearsheimer, 2014). The BRI serves as the primary case through which economic, diplomatic, institutional, and regional implications are compared.

The study does not use surveys, interviews, or original statistical data. Its conclusions are therefore interpretive and concern the logic found in texts, policies, and documented cases rather than measured public opinion. Triangulation across historical, theoretical, and policy sources is used to reduce one-sided interpretation.

Results

Historical Foundations of Chinese Political Expansion

The territorial and political reach of successive Chinese dynasties developed over centuries through a combination of military campaigns, diplomacy, migration, administration, trade, and tributary relationships. The Han and Tang dynasties expanded influence into Central Asia, Korea, and Vietnam while seeking to protect trade routes, manage frontier threats, and consolidate imperial authority. These processes varied greatly by period and region; they cannot be reduced to either peaceful exchange or continuous conquest (Fairbank & Goldman, 2006).

During the Ming period, the maritime expeditions led by Zheng He connected China with Southeast Asia, South Asia, the Arabian Peninsula, and East Africa. The expeditions projected prestige, facilitated trade, and reinforced diplomatic and tributary ties, but did not create a European-style system of permanent overseas colonies. The Qing dynasty achieved the largest territorial extent of the imperial state, incorporating or consolidating rule over Xinjiang, Tibet, Mongolia, and Taiwan. The borders and administrative arrangements produced during this period continue to influence modern ideas of sovereignty and territorial integrity.

The ‘Century of Humiliation,’ conventionally dated from the First Opium War to the establishment of the People’s Republic of China, transformed the political meaning of territory and foreign influence. Unequal treaties, foreign concessions, invasion, and internal fragmentation became central to modern national memory. Consequently, the protection of sovereignty and the goal of national rejuvenation occupy a particularly important place in the Chinese Communist Party’s political narrative (Economy, 2018).

Tianxia, Confucianism, and Legalist State Capacity

The concept of Tianxia—often translated as ‘All Under Heaven’—imagined political order as a morally and culturally structured world rather than a system of formally equal sovereign states. Contemporary scholars disagree about whether Tianxia offers a usable model of global governance or functions primarily as a historical metaphor. Its relevance today lies less in institutional continuity than in the language it offers for discussing harmony, hierarchy, responsibility, and leadership (Callahan, 2016; Qin, 2018).

Confucian thought emphasizes moral authority, proper conduct, and rule through virtue. In contemporary political discourse, such themes support claims that legitimate leadership can attract cooperation without coercion. Legalist traditions, by contrast, stress administrative capacity,

discipline, law, and centralized state power. Modern Chinese governance combines rhetorical appeals to harmony with strong institutions of party-state control. Traditional concepts thus operate as selective resources: they legitimize different aspects of policy but do not replace calculations of power, security, and economic interest (Yan, 2019).

The Belt and Road Initiative as Geoeconomic Statecraft

Since its announcement in 2013, the BRI has become the most visible instrument of China's international economic strategy. Through transport corridors, ports, energy projects, industrial zones, financial cooperation, and digital infrastructure, the initiative seeks to improve connectivity across Asia, Europe, Africa, and beyond. Supporters emphasize infrastructure gaps, trade facilitation, investment, and development. Critics focus on debt sustainability, opaque procurement, political dependency, environmental risk, and the strategic use of dual-purpose infrastructure (Callahan, 2016; Doshi, 2021).

The BRI also demonstrates that China's influence is negotiated rather than imposed uniformly. Outcomes depend on host-state institutions, local political coalitions, financing terms, project selection, and regional competition. The Hambantota Port debate and the China–Pakistan Economic Corridor illustrate why the same project may be interpreted as development cooperation, commercial risk, or strategic leverage. A careful assessment must therefore distinguish evidence of unsustainable debt, domestic policy failure, renegotiation, and deliberate coercion rather than assuming a single model of 'debt-trap diplomacy.'

In the South Caucasus, transport geography connects the BRI to the Trans-Caspian and Middle Corridor routes. Azerbaijan and Georgia occupy key positions between Central Asia, the Caspian Sea, Türkiye, and European markets. Research published in *Scientific Work* identifies Azerbaijan's infrastructure and transit role as an important component of BRI connectivity in the region (Khanbabazade, 2023). More recent analysis in *Scientific Research* likewise emphasizes the growing commercial and geopolitical relevance of the Middle Corridor and Azerbaijan's role in multimodal transport (Mammadov, 2025). These studies support the view that the BRI's regional impact depends on the interaction between Chinese objectives and the independent interests of transit states.

Military, Technological, and Diplomatic Dimensions

Economic statecraft is accompanied by rapid military modernization. The PLA has invested in naval capabilities, missile forces, cyber operations, space systems, and artificial intelligence. China's island-building and militarization in the South China Sea, its extensive maritime claims, and increased military activity around Taiwan are widely interpreted as efforts to alter the regional balance of power. The establishment of a support base in Djibouti in 2017 further demonstrated the growing global reach of Chinese security interests (Friedberg, 2011; Mearsheimer, 2021).

Technological expansion is another central dimension. Huawei, Alibaba, Tencent, and other Chinese companies participate in telecommunications, cloud services, e-commerce, financial technology, and smart-city systems across many countries. The Digital Silk Road can reduce infrastructure gaps and improve connectivity, but it also raises concerns about cybersecurity, standards, data governance, surveillance, and technological dependency. The strategic value of technical standards means that competition now extends beyond territory and trade into digital ecosystems.

Diplomatically, China presents itself as a supporter of South–South cooperation, development, sovereignty, and non-interference. It has expanded its role in the United Nations, established or strengthened institutions such as the Asian Infrastructure Investment Bank, and promoted the idea of

a ‘community with a shared future for mankind.’ At the same time, more confrontational ‘Wolf Warrior’ rhetoric has sometimes conflicted with the image of restrained and harmonious leadership. The coexistence of partnership language and assertive defense of national interests illustrates the hybrid character of contemporary Chinese diplomacy (Economy, 2024).

Contemporary Chinese International-Relations Thought

Chinese international-relations scholarship is diverse and cannot be reduced to a single expansionist school. Yan Xuetong’s moral realism combines realist competition with insights drawn from classical Chinese political thought. It argues that international leadership depends on both strategic capability and political authority, thereby linking material power to legitimacy (Yan, 2019). Qin Yaqing’s relational theory shifts attention from isolated actors to relationships and social processes. From this perspective, influence can grow through partnerships, infrastructure cooperation, institutions, and dense interdependence rather than through territorial annexation (Qin, 2018).

These approaches show how Chinese scholars seek to contribute concepts that are not derived exclusively from Western theoretical traditions. Nevertheless, their ideas should not be treated as official policy blueprints. They are best understood as part of a broader intellectual environment in which China’s rise, identity, and preferred international order are debated.

Discussion

The results indicate that traditional philosophy supplies a framework of legitimation and interpretation rather than a direct causal explanation of contemporary foreign policy. Modern Chinese policymakers act within a system of sovereign states, nuclear deterrence, global markets, and international law. Classical concepts such as harmony, Tianxia, moral rule, and state capacity are selectively combined with modern objectives of economic development, regime security, technological advancement, territorial integrity, and national rejuvenation.

Realism explains the importance of military modernization, regional balancing, and strategic competition with the United States. Liberal approaches clarify why trade, investment, infrastructure, and institutions can create mutual benefits and constrain conflict. Constructivism reveals how historical memory and civilizational identity shape policy narratives. The evidence supports a combined framework: China seeks greater capability and influence, but it often pursues these aims through economic and institutional mechanisms embedded in cooperation (Allison, 2017; Ikenberry, 2008).

Counterarguments remain important. Chinese officials stress peaceful development, non-interference, mutual benefit, and the absence of a colonial tradition comparable to European overseas empires. Many BRI projects respond to genuine infrastructure needs and are actively requested by partner governments. Confucian ideals of moral authority and collective welfare also provide a normative explanation for cooperation. Yet official rhetoric does not by itself resolve concerns about asymmetric dependence, strategic infrastructure, maritime coercion, or political leverage. Evaluation must therefore remain case-specific and evidence-based.

Cultural preservation and self-reliance add another layer. Historical concern with language, ritual, education, and political cohesion has modern parallels in policies concerning technological autonomy, food and energy security, border control, and cultural confidence. Confucius Institutes and international media expand soft power, while the discourse of a shared future presents Chinese leadership as oriented toward collective well-being. These activities may create genuine exchange

and attraction, but they can also serve strategic communication. The distinction depends on transparency, reciprocity, and the degree of political control involved.

Conclusion

Chinese expansionist thought is a multifaceted phenomenon that cannot be defined exclusively through territorial conquest. Historically, Chinese states combined political hierarchy, frontier security, cultural influence, trade, diplomacy, and military force. In the contemporary period, China's global reach is expressed through infrastructure finance, technological systems, international institutions, diplomatic partnerships, and military modernization.

The BRI demonstrates both the developmental opportunities and the strategic ambiguity of this approach. In Eurasia and the South Caucasus, China's objectives intersect with the interests of transit states such as Azerbaijan, which seek investment, connectivity, and diversified trade routes. Regional outcomes are therefore co-produced by China and partner countries rather than dictated by Beijing alone.

Overall, contemporary Chinese expansion is best understood as an adaptive synthesis of historical narratives and modern state interests. If expansionism is defined only as territorial acquisition, present-day China differs significantly from earlier empires. If it includes geoeconomic influence, technological leadership, institutional agenda-setting, and strategic power projection, China's international footprint is clearly expanding. Future research should compare individual BRI projects, financing arrangements, public responses, and long-term institutional effects to distinguish mutually beneficial cooperation from dependency or coercion.

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Key Features of Political Culture in Contemporary Azerbaijan

Deniz Valiyeva 

Abstract. *This study examines the principal features of political culture in the Republic of Azerbaijan through four interrelated dimensions: the Soviet political legacy, the impact of the Karabakh conflict, paternal authority in the national mentality, and the constitutional principle of secularism. The study uses qualitative document analysis and thematic interpretation of academic literature, legal sources, and selected publications on Azerbaijan. The findings indicate that Soviet-era centralized governance contributed to political caution, limited civic initiative, and expectations of vertical decision-making. At the same time, independence, generational change, civil-society activity, and digital communication have encouraged more participatory attitudes. The Karabakh conflict strengthened national identity, attachment to statehood, and the prioritization of security and stability; following the restoration of territorial control, reconstruction, reintegration, and long-term peace have become more prominent in public discourse. Paternal norms support expectations of strong leadership and collective trust, while also creating a risk that personal loyalty may outweigh institutional accountability. Secularism provides a legal and social framework for the political inclusion of different religious and ethnic groups. Overall, Azerbaijan's political culture combines historical continuity with gradual modernization and remains shaped by the interaction between stability, national solidarity, civic participation, and institutional development.*

Keywords: *political culture, Soviet legacy, Karabakh conflict, paternal authority, secularism, Azerbaijan*

Baku State University, PhD student, Baku, Azerbaijan

E-mail: oruceva_deniz@mail.ru

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Müasir Azərbaycanla siyasi mədəniyyətin əsas xüsusiyyətləri

Dəniz Vəliyeva 

Xülasə. *Tədqiqatda Azərbaycan Respublikasında siyasi mədəniyyətin əsas xüsusiyyətləri dörd qarşılıqlı əlaqəli istiqamət üzrə araşdırılır: sovet siyasi irsi, Qarabağ münaqişəsinin təsiri, milli mentalitetdə paternal hakimiyyət və dünyəvilik prinsipi. Məqalədə elmi ədəbiyyatın, hüquqi mənbələrin və Azərbaycanla bağlı seçilmiş nəşrlərin keyfiyyət yönümlü sənəd təhlili və tematik şərh tətbiq edilir. Nəticələr göstərir ki, sovet dövrünün mərkəzləşdirilmiş idarəetmə modeli siyasi ehtiyatlılıq, məhdud vətəndaş təşəbbüsü və şaquli qərarvermə gözləntilərinin formalaşmasına təsir göstərmişdir. Bununla yanaşı, müstəqillik, nəsil dəyişikliyi, vətəndaş cəmiyyəti fəaliyyəti və rəqəmsal kommunikasiya daha iştirakçı yanaşmaları gücləndirmişdir. Qarabağ münaqişəsi milli kimliyi, dövlətçiliyə bağlılığı, təhlükəsizlik və sabitlik prioritetlərini möhkəmləndirmişdir.*

Paternal normalar güclü liderlik və kollektiv etimad gözləntilərini dəstəkləyir, lakin şəxsi sədaqətin institusional hesabatlılığı üstələməsi riskini də yaradır. Dünyəvilik müxtəlif dini və etnik qrupların siyasi integrasiyası üçün hüquqi və sosial çərçivə təmin edir. Ümumilikdə, Azərbaycanın siyasi mədəniyyəti tarixi davamlılıqla tədrici modernləşməni birləşdirir.

Açar sözlər: siyasi mədəniyyət, sovet irsi, Qarabağ münaqişəsi, paternal hakimiyyət, dünyəvilik, Azərbaycan

Baku Dövlət Universiteti, doktorant, Baku, Azərbaycan

E-poçt: oruceva_deniz@mail.ru

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Introduction

In the contemporary period, the extent of public participation in political processes, trust in the state and its institutions, and attitudes toward democratic values have become increasingly significant. Political culture therefore has both scholarly and practical importance. It provides a framework for understanding how citizens perceive authority, institutions, participation, legitimacy, and their own role in public life. Classic studies define political culture through the orientations that individuals and groups develop toward political institutions and processes, while later research links these orientations to historical experience, modernization, and institutional performance (Almond & Verba, 1963; Inglehart & Welzel, 2005).

Political culture may be understood as a system of values, beliefs, expectations, and behavioral patterns that shapes society's relationship with the political system. In Azerbaijan, this culture has developed through the interaction of imperial and Soviet legacies, independence and state-building, armed conflict, national traditions, constitutional principles, and contemporary social change. Azerbaijan's post-Soviet political development cannot be explained through a single factor; historical continuity and institutional transformation operate simultaneously (Altstadt, 2017; Cornell, 2011). This article analyzes four factors that are especially visible in contemporary Azerbaijan: the Soviet political legacy, the influence of the Karabakh conflict, paternal authority in the national mentality, and secularism. The aim is to identify how these factors shape political expectations and behavior, and how their interaction influences the balance between stability, solidarity, participation, and institutional modernization.

Materials and Methods

The study employs a qualitative research design based on document analysis and thematic interpretation. The source base includes scholarly books and journal articles on political culture and post-Soviet transformation, the Constitution of the Republic of Azerbaijan, and research concerning the Karabakh conflict, multiculturalism, secular governance, national identity, and patterns of political authority. Sources were selected according to their relevance to the four analytical themes and their capacity to clarify historical, legal, and sociocultural dimensions of political culture.

The analysis was conducted in three stages. First, the literature was reviewed to identify recurring explanations of political attitudes and institutional expectations. Second, the material was coded under four thematic categories: Soviet legacy, conflict and national solidarity, paternal authority, and secularism. Third, the categories were compared to determine where they reinforce or constrain civic participation and political modernization. Because the study is interpretive and does not use survey

data or interviews, its findings describe dominant tendencies in the literature rather than measuring the attitudes of the entire population. This limitation is considered when drawing conclusions.

Results

The Influence of the Soviet Political Legacy

The political culture of contemporary Azerbaijan was shaped not only by developments following independence but also by the long period of Soviet rule. Its effects remain visible in patterns of political behavior and in citizens' relationship with the state. Soviet governance was highly centralized: major political decisions were made within the union-wide party structure, while opportunities for autonomous local participation were limited. The system encouraged compliance with vertical administration more strongly than individual political initiative. These conditions contributed to a political style in which many citizens adopted the position of observers rather than active participants (Jabarov, 2024; Rose et al., 1998).

The hegemony of the Communist Party also reduced representative institutions to a largely formal role. Although parliaments, elections, and other political mechanisms existed, effective power was concentrated within the party hierarchy. As a result, formal institutions could be perceived as distant from actual decision-making. Restrictions on free political expression further encouraged caution and self-censorship. The idea that silence offered security became embedded in everyday behavior, and elements of this disposition continued into the post-Soviet period (Jabarov, 2023).

Nevertheless, the legacy is neither uniform nor permanent. Since independence, new institutions, civil-society initiatives, educational opportunities, transnational contacts, and information technologies have widened the channels through which citizens receive political information and express public concerns. Generational change is especially important because younger citizens encounter different models of communication and participation. The evidence therefore suggests a gradual, uneven transition: expectations of centralized authority remain influential, but they coexist with demands for transparency, responsiveness, and meaningful civic participation (Altstadt, 2017; Inglehart & Welzel, 2005).

The Influence of the Karabakh Conflict on Political Culture

Political culture is shaped not only by institutions and ideology but also by the long-term consequences of war and political conflict. The Armenian–Azerbaijani conflict over Karabakh, the Second Karabakh War of 2020, and the developments of 2023 became decisive reference points in Azerbaijan's public consciousness. The conflict strengthened national identity, attachment to statehood, and the political priority assigned to security and territorial integrity (de Waal, 2013; Naghiyeva, 2025).

For decades, the Karabakh issue was experienced not simply as a territorial dispute but as a national tragedy, a displacement crisis, and a symbol of collective memory. The displacement of hundreds of thousands of people in the early 1990s produced deep social trauma while also mobilizing political consciousness. The idea of restoring territorial integrity reinforced social cohesion around a common objective. Consequently, stability and security frequently took precedence in public assessments of political processes (Naghiyeva, 2025).

The conflict also influenced the hierarchy of political priorities. Social and economic demands were often discussed alongside the argument that the restoration of territorial integrity had to come first. After Azerbaijan restored control over its territories, public discourse increasingly turned toward

reconstruction, return, reintegration, regional development, and a durable peace. This shift creates space for political culture to focus more strongly on institutional effectiveness, social policy, and public participation; however, the enduring effects of conflict and displacement require careful and long-term assessment.

National Mentality and Paternal Authority

Political culture has deep social and cultural roots. In Azerbaijan's traditionally patriarchal social structure, the authority associated with the father or senior family figure can influence expectations of public leadership. Within the family, the father is often understood as a protector, decision-maker, and bearer of responsibility. In political perception, this model may be projected onto the state and its leaders, encouraging an image of the strong leader as a guardian of collective welfare (Arik, 2024). Such a pattern can support expectations of continuity, order, and responsibility. At the same time, it may give priority to confidence in a leader over the citizen's direct and sustained participation in institutions. When political legitimacy is strongly personalized, symbolic and moral expectations may become more influential than programmatic choice, competition, and institutional accountability. Respect for age, experience, loyalty, and tradition can therefore serve both as stabilizing cultural resources and as factors that slow the development of impersonal, rules-based political relations (Almond & Verba, 1963; Smith, 1991).

Paternal authority should not be treated as an unchanging or exclusively Azerbaijani characteristic. Social norms transform as education, urbanization, digital communication, women's participation, and generational change alter family and public relations. The relevant finding is therefore not that paternalism fully determines political behavior, but that it remains one cultural lens through which authority, protection, responsibility, and loyalty may be interpreted.

Secularism, Multiculturalism, and Modernization

Secularism is one of the central legal foundations of political culture in the Republic of Azerbaijan. The Constitution establishes the secular character of the state, separates religion from the state, and guarantees equality regardless of religious affiliation. This legal framework supports equal political status for citizens of different faiths and helps prevent any single religious doctrine from acquiring official ideological authority (Constitution of the Republic of Azerbaijan, 1995).

The significance of secularism is reinforced by Azerbaijan's multiethnic and multiconfessional composition. Legal equality, religious neutrality, and the protection of cultural diversity create conditions for broader inclusion in political and social life. Research published in the journal *Scientific Work* emphasizes the constitutional foundations of multiculturalism in Azerbaijan, while research in *Scientific Research* highlights the role of balanced public communication in supporting intercultural dialogue and social cohesion (Habibova, 2021; Allahverdiyeva, 2024). These principles are relevant to political culture because trust and participation are strengthened when citizens perceive public institutions as equally accessible.

For many younger citizens, secularism is not only a constitutional provision but also part of a modern social outlook. Expectations of transparent decision-making, professional administration, rational policy, and open communication are compatible with secular governance. The development of digital media can expand pluralism and access to information, but it can also intensify polarization and misinformation. Thus, the modernization of political culture requires not only technological access but also media literacy, ethical communication, and institutional responsiveness (Allahverdiyeva, 2024).

Discussion

The findings show that the four factors do not operate separately. The Soviet legacy and paternal authority can both strengthen expectations of vertical leadership, yet their historical origins are different: one is linked to a centralized political system, while the other emerges from longer-standing social norms. The Karabakh conflict added a powerful security dimension, encouraging unity around territorial integrity and statehood. Secularism, in contrast, provides a constitutional basis for inclusion and creates opportunities for pluralism within a shared civic framework.

This interaction produces a political culture characterized by both continuity and change. Stability and national solidarity remain highly valued, but they increasingly coexist with demands for effective institutions, access to information, professional governance, and citizen involvement. Comparative studies of post-authoritarian societies suggest that democratic political culture develops not only through formal institutional change but also through repeated experiences of participation, accountability, and trust (Inglehart & Welzel, 2005; Rose et al., 1998). For Azerbaijan, this means that political modernization depends on the practical relationship between citizens and institutions as much as on legal design.

The analysis also indicates that cultural explanations must be used carefully. Concepts such as paternalism, mentality, or collective loyalty should not be presented as fixed national traits. They are historically conditioned patterns that vary across generations, regions, educational groups, and social contexts. Future research should therefore test the themes identified here through representative surveys, interviews, and comparative analysis. Such work could measure how age, education, displacement experience, media use, and institutional contact affect political trust and participation.

Conclusion

The Soviet period continues to influence Azerbaijan's political culture through political caution, formalism, and expectations of centralized decision-making. These tendencies, however, are gradually being reshaped by independence, social change, civil-society activity, education, and digital communication. Contemporary political culture is therefore not a simple continuation of the past, but a field in which inherited habits and new forms of participation interact.

The Karabakh conflict left a deep mark on citizens' relationship with the state and on the language of public debate. It reinforced national unity, security concerns, and attachment to statehood. The restoration of territorial control has opened a new phase in which reconstruction, reintegration, social development, and peace can occupy a larger place in political discourse.

Paternal authority remains relevant to expectations of strong leadership, collective trust, and administrative stability. Yet this cultural pattern is capable of transformation and can coexist with greater institutional accountability and citizen initiative. Secularism, meanwhile, offers an essential legal and social foundation for equal participation by diverse religious and ethnic groups. Taken together, these findings suggest that the future development of Azerbaijan's political culture will depend on maintaining stability and solidarity while expanding transparent institutions, pluralistic discussion, and meaningful civic participation.

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TƏBİƏT ELMLƏRİ
NATURE SCIENCES

İqlim transformasiyası şəraitində Kür çayı hövzəsinin su ehtiyatlarının dəyişməsi

Ülkər Mahmudova^{1*} , Elvira Piriyeva² , Kamran Ramazanov² 

Xülasə. Məqalədə iqlim transformasiyası şəraitində Kür çayı hövzəsinin su ehtiyatlarının çoxillik dəyişməsi və çay axımının formalaşma xüsusiyyətləri araşdırılır. Tədqiqatın məqsədi temperatur və yağıntı rejimlərindəki dəyişmələrin, antropogen su istehlakının və geri qaytarılmayan itkilərin hövzənin su balansına təsirini qiymətləndirməkdir. 1961–1990-cı illər bazis dövrü üzrə çoxillik aylıq, mövsümi və illik hidroloji göstəricilər, su təsərrüfatı məlumatları və beş global iqlim modelinin ssenari nəticələri müqayisəli-statistik üsulla təhlil edilmişdir. Nəticələr Kür hövzəsində illik axımın azalması meylini, su istehlakının yüksək payını və iqlim ssenarilərinə görə su ehtiyatlarının ildə 2,7–5,3 km³ azalması ehtimalını göstərir. Temperatur artımı, qar ehtiyatının azalması və yağıntıların mövsümi paylanmasının dəyişməsi axımın il daxilində yenidən bölüşdürülməsini gücləndirir. Suvarmada səmərəli texnologiyaların tətbiqi, itkilərin azaldılması, təmizlənmiş drenaj sularının təkrar istifadəsi və hövzə üzrə davamlı monitoring əsas uyğunlaşma tədbirləri kimi qiymətləndirilir. Əldə olunan nəticələr Kür çayı hövzəsi üçün uzunmüddətli və integrasiyalı su idarəetmə strategiyalarının hazırlanmasına elmi əsas yaradır.

Açar sözlər: Kür çayı, su ehtiyatları, iqlim dəyişmələri, çay axımı, su çatışmazlığı, su idarəetməsi

¹Azərbaycan Respublikası Elm və Təhsil Nazirliyi, akademik H.Ə. Əliyev adına Coğrafiya İnstitutu, Xəzər dənizi laboratoriyası, coğrafiya üzrə fəlsəfə doktoru, Bakı, Azərbaycan

²Azərbaycan Respublikası Elm və Təhsil Nazirliyi, akademik H.Ə. Əliyev adına Coğrafiya İnstitutu, Xəzər dənizi laboratoriyası, Bakı, Azərbaycan

*Məsul müəllif. E-poçt: ulker570920@gmail.com

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Changes in the Water Resources of the Kura River Basin under Climate Transformation

Ulkar Makhmudova^{1*} , Elvira Piriyeva² , Kamran Ramazanov² 

Abstract. The article examines long-term changes in the water resources of the Kura River basin and the characteristics of river-flow formation under climate transformation. The study aims to assess the effects of changes in temperature and precipitation regimes, anthropogenic water consumption, and irreversible losses on the basin water balance. Long-term monthly, seasonal, and annual.

hydrological indicators for the 1961–1990 baseline period, water-management data, and scenario outputs from five global climate models were analyzed using comparative and statistical methods. The results indicate a declining trend in annual flow, a high share of water abstraction, and a possible annual reduction of 2.7–5.3 km³ in water resources under the assessed climate scenarios. Rising temperature, declining snow reserves, and changes in the seasonal distribution of precipitation intensify the intra-annual redistribution of runoff. Efficient irrigation technologies, reduction of conveyance losses, reuse of treated drainage water, and continuous basin-wide monitoring are identified as priority adaptation measures. The findings provide a scientific basis for developing long-term and integrated water-management strategies for the Kura River basin.

Keywords: Kura River, water resources, climate change, river flow, water scarcity, water management

¹Ministry of Science and Education of the Republic of Azerbaijan, Institute of Geography named after Academician H.A. Aliyev, Caspian Sea Laboratory, PhD in Geography, Baku, Azerbaijan

²Ministry of Science and Education of the Republic of Azerbaijan, Institute of Geography named after Academician H.A. Aliyev, Caspian Sea Laboratory, Baku, Azerbaijan

*Corresponding author. E-mail: ulker570920@gmail.com

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Giriş

Çay axımı hidroloji dövrünün əsas komponentlərindən biri olmaqla çay hövzəsində formalaşan iqlim və fiziki-coğrafi amillərin inteqral göstəricisidir. Onun məkan-zaman dəyişkənliyi atmosfer sirkulyasiyası, yağıntıların miqdarı və faza vəziyyəti, temperatur rejimi, qar ehtiyatı və bu amillərin mövsümi paylanması ilə müəyyən olunur. Azərbaycanda müşahidə olunan regional istiləşmə illik və maksimal çay axımının azalması, qış azsulu dövr axımının isə artması ilə müşayiət olunur (Makhmudov, 2016).

Kür çayı Cənubi Qafqazın ən böyük transsərhəd su arteriyasıdır. Hövzədə su ehtiyatlarının ölkələr üzrə qeyri-bərabər formalaşması, suvarma və kommunal tələbatın artması, çirklənmə və iqlim dəyişmələri su təhlükəsizliyinə birgə təsir göstərir. Aşağı Kürdə daşqın riskinin yalnız iqlim deyil, məcra tutumunun azalması və digər antropogen amillərlə də əlaqəli olduğu müəyyən edilmişdir (Abbasov & Mahmudov, 2009). 2010-cu il daşqınının peyk və hidrometeoroloji məlumatlarla təhlili də hövzədə müşahidə və məsafədən zondlama məlumatlarının birlikdə istifadəsinin vacibliyini göstərir (Aghayev & Mahmudov, 2019).

Son tədqiqatlar Kürün qərb hissəsində uzunmüddətli axım dəyişkənliyinin temperatur, yağıntı və ağac halqaları məlumatları əsasında bərpa oluna bildiyini göstərir (Bakhtiyorov et al., 2024). Kür-Araz ovalığında iqlim və su idarəçiliyinin torpaq şoranlığına birgə təsiri isə su ehtiyatlarının yalnız kəmiyyət deyil, torpaq və kənd təsərrüfatı dayanıqlığı ilə əlaqəli keyfiyyət aspektlərini də önə çıxarır (Han et al., 2024). Yerli tədqiqatlarda iqlim dəyişmələrinin Azərbaycanda quraqlıq, sel və daşqınların intensivliyinə təsiri qeyd olunur (Karimova et al., 2024), suya qənaət edən suvarma sistemlərinin düzgün layihələndirilməsi isə su itkilərinin azaldılması üçün əsas vasitələrdən biri hesab edilir (Əlizadə, 2025).

Tədqiqatın məqsədi Kür çayı hövzəsinin su ehtiyatlarında baş verən çoxillik dəyişmələri təhlil etmək, iqlim və antropogen amillərin rolunu qiymətləndirmək, qlobal iqlim modelləri əsasında mümkün gələcək dəyişmələri ümumiləşdirmək və uyğunlaşma istiqamətlərini müəyyənləşdirməkdir.

Metodlar

Tədqiqatda Kür çayı və əsas qolları üzrə hidroloji müşahidə sıralarından, su təsərrüfatı göstəricilərindən, hövzə ölkələrində su istehlakının strukturuna dair ümumiləşdirilmiş məlumatlardan və müəlliflərin əvvəlki ekocoğrafi araşdırmalarından istifadə edilmişdir (Mahmudova, 2009, 2023). Bazis dövrü kimi 1961–1990-cı illərin çoxillik aylıq, mövsümi və illik göstəriciləri götürülmüş, sonrakı dövrlərin faktiki axım göstəriciləri həmin baza ilə müqayisə edilmişdir.

İllik təbii və faktiki su həcmlərinin sıraları əsas qollar və Kürün mənsəbə yaxın hidroloji məntəqələri üzrə bərpa edilmişdir. Təhlildə müqayisəli-statistik, hidroloji balans və ssenari yanaşmalarından istifadə olunmuşdur. Axımın dəyişmə istiqaməti çoxillik sıraların müqayisəsi, iqlim amillərinin təsiri isə temperatur, yağıntı və axım arasındakı məntiqi-statistik əlaqələrin təhlili əsasında qiymətləndirilmişdir.

Gələcək dəyişmələrin qiymətləndirilməsi üçün GISS, GFDL-3, HadCM2, CGCM1 və ECHAM4 ümumi atmosfer sirkulyasiyası modellərinin nəticələri ümumiləşdirilmişdir. Modellər temperaturun və yağıntının dəyişməsi şəraitində çay axımının reaksiyasını müqayisə etməyə imkan verir. Qlobal modellərin məkan ayırdetməsinin məhdudluğu nəzərə alınaraq nəticələr dəqiq lokal proqnoz kimi deyil, hövzə səviyyəsində ehtimal olunan dəyişmə intervalı kimi şərh edilmişdir. Bu yanaşma iqlim ssenarilərindəki qeyri-müəyyənliyin nəticələrə təsirini azaltmağa xidmət edir (IPCC, 2023).

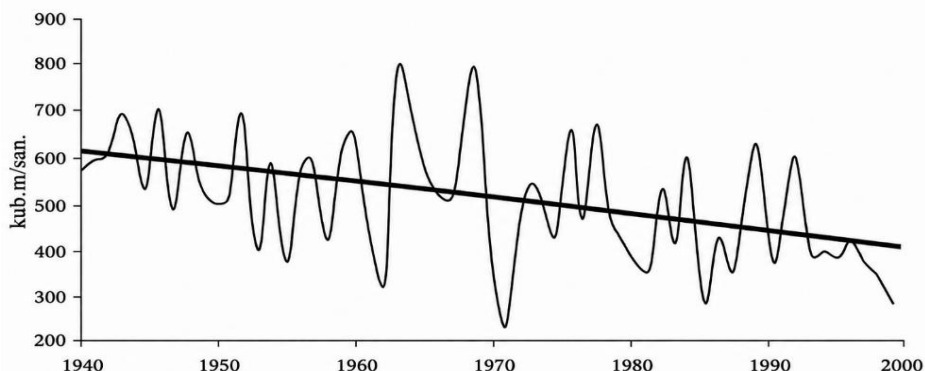
Nəticələr

Hövzənin su ehtiyatları və antropogen yük

Kür çayının su toplama hövzəsinin sahəsi təxminən 188 min km², uzunluğu 1515 km, su ehtiyatlarının çoxillik orta həcmi isə 26,6 km³-dir. Axımın əsas hissəsi Gürcüstan (37,7%), Ermənistan (23,4%) və Azərbaycan (21,5%) ərazilərində formalaşır; Türkiyə və İranın payı müvafiq olaraq 13,6% və 3,0% təşkil edir. Bu bölgü Azərbaycanın aşağı axında yerləşməsi və transsərhəd sulardan asılılığı baxımından mühüm əhəmiyyət daşıyır (Məmmədov, 2000).

Hövzə ölkələrində ümumi su istehlakı təxminən 23 km³ olmaqla çoxillik orta su ehtiyatlarının 86%-nə yaxındır. İstehlakın əsas hissəsi suvarmanın payına düşür (68%); istilik energetikası 11,0%, sənaye 6,9%, kommunal istehlak 6,3%, kənd təsərrüfatı su təchizatı 5,2%, balıqçılıq təsərrüfatı isə 2,6% təşkil edir. Su götürmələrinin böyük həcmi, geri qaytarılmayan itkilər və suvarma şəbəkələrində sızmalar mənsəb hissədə axımın azalmasını gücləndirir. Səmərəli suvarma sistemlərinin layihələndirilməsi və suya qənaət edən avadanlıqların tətbiqi bu itkilərin azaldılmasına imkan verir (Əlizadə, 2025).

Araz Kürün ən böyük qoludur. Onun hövzəsinin sahəsi 102 min km², uzunluğu 1072 km-dir. Arazın hövzəyə gətirdiyi su və çirkləndirici yük aşağı Kürün hidroloji və hidroekoloji vəziyyətinə birbaşa təsir göstərir. Təmizlənməmiş tullantı sularının və kənd təsərrüfatı mənşəli çirkləndiricilərin daxil olması bəzi çay sahələrində təbii özünütəmizləmə qabiliyyətini zəiflədir (Mahmudova, 2009, 2023).



Şəkil 1
Salyan məntəqəsində Kür çayının illik axımının çoxillik dəyişməsi

Şəkil 1-də təqdim olunan sıra son 60 il ərzində Kür çayının sululuğunun azalması istiqamətində ümumi meyl olduğunu göstərir. Bununla yanaşı, ayrı-ayrı illərdə yüksək sululuq və daşqın hadisələri baş vermişdir. Beləliklə, orta illik axımın azalması ekstremal daşqın riskinin tam aradan qalxması demək deyil; məcrə tutumu, sahilboyu məskunlaşma və su anbarlarının idarə olunması da riskin səviyyəsinə təsir edir (Abbasov & Mahmudov, 2009; Aghayev & Mahmudov, 2019).

İqlim ssenariləri üzrə axım dəyişmələri

GCM ssenarilərinin müqayisəsi temperatur artımının və yağıntı rejimindəki dəyişmələrin bütün seçilmiş bağlantı məntəqələrində axıma təsir etdiyini göstərir. Modellər arasında fərqlər olsa da, ümumi istiqamət isti şəraitdə buxarlanmanın artması, qar ehtiyatının azalması və yay axımının zəifləməsidir. Uzunmüddətli paleohidroloji rekonstruksiyalar da Kür axımının iqlim dəyişkənliyinə həssas olduğunu təsdiqləyir (Bakhtiyorov et al., 2024).

Cədvəl 1

İqlim modelləri üzrə Kür çayı hövzəsində temperatur, yağıntı və axım göstəriciləri

Çay qapanış məntəqəsi	GISS			GFDL-3			HadCM2			CGCM1			ECHAM4		
	T	P	Q	T	P	Q	T	P	Q	T	P	Q	T	P	Q
Araz–Qızılbank	4,9	85	153	3,2	81	146	1,8	88	170	4,0	88	140	3,8	98	143
Qanix–Əyriçay	4,9	85	102	3,2	81	95,8	2,6	98	120	3,2	85	110	3,6	97	105
Kür–Tbilisi	4,9	82	185	3,7	84	193	1,8	95	210	3,4	83	200	3,8	90	198
Bütövlükdə Kür hövzəsi	4,9	85	698	3,5	82	682	2,1	94	755	3,5	85	720	3,7	95	705

Qeyd. T – temperatur dəyişməsi (°C), P – yağıntı göstəricisi (%), Q – axım göstəricisi. Cədvəldə müəlliflərin ilkin məlumatları saxlanılmış və model adları standartlaşdırılmışdır.

Ssenari hesablamalarının ümumiləşdirilməsi beş modelin reallaşması halında hövzənin illik su ehtiyatlarının təxminən 2,7–5,3 km³ azalmasının mümkün olduğunu göstərir. Bu azalma hazırda su çatışmazlığı müşahidə edilən Azərbaycan üçün kənd təsərrüfatı, energetika və içməli su təminatı baxımından əlavə risk yaradır. Atmosfer yağıntılarının azalması ilə yanaşı temperaturun yüksəlməsi evapotranspirasiyanı artırır və torpaq-su sistemində duzların hərəkətinə təsir edir; Kür-Araz ovalığı

üzrə müasir tədqiqatlar iqlim və su idarəçiliyinin bu proseslərə birgə təsir etdiyini göstərir (Han et al., 2024).

Müzakirə

Əldə edilən nəticələr regional tədqiqatlarla uyğunluq təşkil edir. Azərbaycanda temperatur artımı fonunda illik və maksimal axımın azalması haqqında nəticələr Makhmudovun (2016) müşahidələri ilə üst-üstə düşür. Kürün qərb hissəsində ağac halqaları əsasında aparılmış uzunmüddətli rekonstruksiya da axımın iqlim siqnallarına həssaslığını göstərir (Bakhtiyorov et al., 2024). Bununla belə, hövzədəki dəyişmələri yalnız iqlim amilləri ilə izah etmək olmaz. Su göturmələri, suvarma şəbəkələrində itkilər, məcrə prosesləri, çirklənmə və hidrotekniki qurğuların istismarı təbii siqnalı dəyişdirir.

Tədqiqatın əsas məhdudiyyəti istifadə olunan qlobal iqlim modellərinin nisbətən iri məkan ayırdetməsinə və tarixi baza məlumatlarının qeyri-bərabərliyinə bağlıdır. Buna görə rəqəmlər lokal məntəqə üçün dəyişməz proqnoz deyil, mümkün dəyişmə diapazonu kimi qiymətləndirilməlidir. Müasir CMIP ssenariləri, yüksək ayırdetməli regional modellər, məsafədən zondlama və fasiləsiz hidroloji monitoring gələcək qiymətləndirmələrin dəqiqliyini artırır bilər. IPCC (2023) də su ehtiyatları üzrə uyğunlaşma qərarlarında ssenari qeyri-müəyyənliyinin açıq nəzərə alınmasını tövsiyə edir.

Uyğunlaşma tədbirləri hövzə səviyyəsində əlaqələndirilməlidir. Suvarma sistemlərinin texniki yenilənməsi, torpaq rütubəti sensorları və avtomatlaşdırılmış idarəetmə vasitələri su məhsuldarlığını yüksəldə bilər (Əlizadə, 2025). Eyni zamanda, təmizlənmiş drenaj sularının təhlükəsiz təkrar istifadəsi, suölçmə şəbəkəsinin genişləndirilməsi, transsərhəd məlumat mübadiləsi və çirklənmə mənbələrinin azaldılması su təhlükəsizliyinin əsas elementləridir.

Nəticə

1. Kür çayı hövzəsində son onilliklərdə illik axımın azalması meyli müşahidə olunur; temperaturun yüksəlməsi, qar ehtiyatının azalması və yağıntıların mövsümi paylanması dəyişməsi bu meyli gücləndirir.
2. Hövzədə su istehlakının yüksək payı və geri qaytarılmayan itkilər iqlim təsirlərini kəskinləşdirir. Suvarma əsas istehlak sahəsi olduğuna görə suya qənaət edən texnologiyalar prioritet olmalıdır.
3. Beş qlobal iqlim modelinin nəticələrinə əsasən illik su ehtiyatlarının 2,7–5,3 km³ azalması mümkündür. Model fərqləri və məkan ayırdetməsi nəzərə alınaraq bu göstərici ehtimal intervalı kimi şərh edilməlidir.
4. Su təhlükəsizliyi üçün hövzə üzrə davamlı monitoring, transsərhəd məlumat mübadiləsi, su itkilərinin azaldılması, təmizlənmiş drenaj sularının təkrar istifadəsi və inteqrasiyalı idarəetmə tədbirləri həyata keçirilməlidir.

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On the Study of Abnormally High Formation Pressures and Their Role in Oil and Gas Field Development

GunayVagifqizi^{1*} , Almaz Guliyeva² , Orkhan Yagubov² 

Abstract. Formation pressure is a key geological and reservoir parameter in well planning and hydrocarbon-field development. This study examines abnormally high formation pressure (AHFP) in the Bulla-Deniz gas-condensate field of the Baku Archipelago. Geological, pressure, temperature, well-depth, productive-interval, and production data for Horizons V, VII, and VIII of the Balakhani Suite were evaluated. Measured and calculated pressure values were compared with normal hydrostatic pressure, and the abnormality coefficient was used to identify high-pressure intervals. The productive horizons occur at depths of approximately 4,645–6,145 m and exhibit pressure values above normal hydrostatic conditions. Formation pressures of approximately 48.5 MPa in Horizon V, 70–72 MPa in Horizon VII, and 80 MPa in Horizon VIII demonstrate the persistence of AHFP with increasing depth. The findings indicate that deep burial, tectonic activity, hydrocarbon generation, elevated temperature, restricted fluid migration, and effective sealing formations may jointly control the pressure regime. Although high reservoir energy may support initial production, AHFP also increases drilling, completion, well-control, and development risks. Accurate pressure prediction and continuous monitoring are therefore essential for the safe and economically efficient development of the Bulla-Deniz field.

Keywords: abnormally high formation pressure, Bulla-Deniz field, productive horizon, reservoir pressure, hydrocarbon accumulation, abnormality coefficient

¹Oil and Gas Research and Design Institute, SOCAR, PhD in Economics, Baku, Azerbaijan

²Oil and Gas Research and Design Institute, SOCAR, Baku, Azerbaijan

*Corresponding author. E-mail: vaqifgunay77@gmail.com

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Anomal yüksək lay təzyiqlərinin tədqiqi və onların neft-qaz yataqlarının işlənməsində rolu

GünayVaqifqızı^{1*} , Almaz Quliyeva² , Orxan Yaqubov² 

Xülasə. Lay təzyiqi quyuların planlaşdırılmasında və karbohidrogen yataqlarının işlənməsində mühüm geoloji və kollektor parametridir. Bu tədqiqatda Bakı arxipelaqında yerləşən Bulla-dəniz qaz-kondensat yatağındakı anomal yüksək lay təzyiqi (AYLT) araşdırılır. Balaxanı lay dəstəsinin V, VII və VIII horizontları üzrə geoloji məlumatlar, təzyiq və temperatur göstəriciləri, quyu dərinlikləri, məhsuldar intervallar və hasilat məlumatları qiymətləndirilmişdir. Yüksək təzyiqli intervalları müəyyən etmək üçün ölçülmüş və hesablanmış təzyiq göstəriciləri normal hidrostatik təzyiqlə müqayisə edilmiş, anomallıq əmsalından istifadə olunmuşdur. Təxminən 4 645–6 145 m dərinlikdə yerləşən məhsuldar horizontlarda təzyiq normal hidrostatik göstəricilərdən yüksəkdir.

V horizontda təxminən 48,5 MPa, VII horizontda 70–72 MPa, VIII horizontda isə 80 MPa lay təzyiqinin qeydə alınması dərinlik artdıqca AYLТ-nin davam etdiyini göstərir. Nəticələrə əsasən, böyük dərinlik, tektonik fəallıq, karbohidrogenlərin əmələ gəlməsi, yüksək temperatur, flüidlərin miqrasiyasının məhdudlaşması və etibarlı örtük süxurları təzyiq rejiminə birgə təsir göstərə bilər. Yüksək lay enerjisi ilkin hasilata müsbət təsir etsə də, AYLТ qazma, quyunun tamamlanması, quyuya nəzarət və yatağın işlənməsi ilə bağlı riskləri artırır. Buna görə də Bulla-dəniz yatağının təhlükəsiz və iqtisadi cəhətdən səmərəli işlənməsi üçün təzyiqin dəqiq proqnozlaşdırılması və davamlı monitorinqi vacibdir.

Açar sözlər: *anomal yüksək lay təzyiqi, Bulla-dəniz yatağı, məhsuldar horizont, kollektor təzyiqi, karbohidrogen yığılı, anomallıq əmsali*

¹SOCAR-ın Neftqazəlmətdəqiqatlayihə İnstitutu, iqtisad üzrə fəlsəfə doktoru, Bakı, Azərbaycan

²SOCAR-ın Neftqazəlmətdəqiqatlayihə İnstitutu, Bakı, Azərbaycan

*Məsul müəllif. E-poçt: vaqifgunay77@gmail.com

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Introduction

Formation pressure is one of the principal subsurface parameters used in evaluating hydrocarbon reservoirs and planning oil and gas wells. Accurate pressure determination is particularly important in fields characterized by complex stratigraphy, considerable burial depth, active tectonic processes, and variable reservoir properties. Pressure data influence drilling-fluid density, casing design, well-control measures, production strategy, and reserve estimation (Zhdanov, n.d.; Ovchinnikov, 2017). Inaccurate assessment may result in drilling complications, uncontrolled fluid influx, formation damage, and unreliable estimates of hydrocarbon reserves.

Formation pressure is considered abnormally high when it substantially exceeds the normal hydrostatic pressure expected at a given depth. AHFP may develop through rapid sedimentation, compaction disequilibrium, hydrocarbon generation, thermal expansion, tectonic compression, clay-mineral transformation, osmosis, and restricted fluid migration (Aleksandrov, 1987; Belonin et al., 2005; Grausman, 1999). Its preservation is commonly associated with low-permeability seals that prevent pressure dissipation.

The South Caspian Basin is characterized by thick sedimentary successions, intensive tectonic activity, mud volcanism, and deeply buried hydrocarbon-bearing formations. These conditions favour the generation and preservation of AHFP (Ali-Zade et al., 1972; Guliyev et al., 2014; Kerimov et al., 2001; Kocharli, 2015; Yusifov & Aslanov, 2018). The Bulla-Deniz field is therefore an appropriate case for examining the influence of abnormal pressure on drilling, reservoir evaluation, and hydrocarbon production.

AHFP is generally regarded as a polygenic phenomenon because several geological and physicochemical mechanisms may operate together. Hydrocarbon generation increases fluid volume within confined pore space; thermal processes promote fluid expansion and organic-matter transformation; tectonic compression reduces pore volume; and vertical migration can introduce deeply generated fluids into sealed reservoirs (Aleksandrov, 1987; Belonin et al., 2005). The dominant mechanism depends on depth, lithology, temperature, tectonic setting, permeability, sealing capacity, and migration pathways.

The objective of this study is to examine the occurrence and vertical distribution of AHFP in the Bulla-Deniz field, identify the principal geological factors controlling it, and evaluate its implications for the development of oil and gas accumulations.

Materials and Methods

The study used geological, pressure, temperature, and production data from the Bulla-Deniz field. The analysed materials included well depths, productive intervals, hydrocarbon and water production rates, direct pressure measurements, calculated pressure values, and information on Horizons V, VII, and VIII of the Balakhani Suite. Field-specific values were obtained from the archival materials of SOCAR's Oil and Gas Research and Design Institute (SOCAR Oil and Gas Research and Design Institute, n.d.).

Where direct downhole measurements were available, recorded pressure values were corrected to the depth of the productive interval. Where direct measurement was restricted by high pressure and temperature, formation pressure was estimated from wellhead-pressure stabilization, available well data, and laboratory analyses of reservoir-fluid samples. These procedures are consistent with established approaches to deep, high-pressure well evaluation (Ovchinnikov, 2017).

Normal hydrostatic pressure was calculated as follows:

$$P_h = \rho g H$$

where P_h is hydrostatic pressure, ρ is formation-water density, g is gravitational acceleration (approximately 9.81 m/s^2), and H is formation depth. A water density of approximately $1,000 \text{ kg/m}^3$ was used for the general calculation.

The pressure-gradient form of the calculation was expressed as:

$$P_h = G_p H$$

where G_p is the pressure gradient and H is formation depth. The normal hydrostatic gradient is approximately 0.01 MPa/m , whereas values of approximately $0.015\text{-}0.025 \text{ MPa/m}$ may occur under AHFP conditions (Aleksandrov, 1987; Belonin et al., 2005).

The abnormality coefficient was calculated as:

$$K_a = P_f / P_h$$

where K_a is the abnormality coefficient, P_f is measured or calculated formation pressure, and P_h is normal hydrostatic pressure. Values of 1.3 or greater were classified as abnormally high. Pressure behaviour was compared across productive horizons and wells in relation to depth, production history, and hydrocarbon withdrawal. Reservoir permeability and pressure were treated as related but distinct properties (Gurbanov et al., 2022).

Results



Figure 1

General overview map of the Bulla-Deniz area in the Azerbaijani sector of the Caspian Sea

Note. Adapted from the archival materials of SOCAR's Oil and Gas Research and Design Institute (n.d.).

The Bulla-Deniz field, located within the Baku Archipelago of the South Caspian Basin, was discovered in 1975. Productive Horizons V, VII, and VIII of the Balakhani Suite occur at depths of approximately 4,645-6,145 m. Pressure values above normal hydrostatic conditions were identified in all three horizons, demonstrating that AHFP is a field-wide characteristic rather than an isolated occurrence (SOCAR Oil and Gas Research and Design Institute, n.d.).

At the initial stage of development, direct pressure measurement was difficult because of the considerable depth and elevated pressure and temperature. Available statistical and well data indicated an initial formation pressure of approximately 45 MPa; subsequent horizon-specific measurements showed that the pressure regime varied with depth, measurement conditions, and production history.

Horizon V was brought into production through Well No. 14 on 19 January 1975. Its perforated interval was 4,573-4,601 m. Initial production was approximately 300 thousand m³ of gas and 56.6 t of condensate. Formation pressure measured at 3,100 m was 43.1 MPa; after correction to the productive interval, it was 48.5 MPa, approximately 2.63 MPa above hydrostatic pressure. Well No. 9 penetrated Horizon V at 4,811-4,842 m and produced approximately 200 thousand m³ of gas, 168 t

of condensate and oil, and 53 m³ of water. After approximately 18 months, average formation pressure was 48.9 MPa, indicating depletion following hydrocarbon withdrawal (SOCAR Oil and Gas Research and Design Institute, n.d.; Zhdanov, n.d.).

Pressure determination in Horizon VII was more difficult because values reached approximately 70–72 MPa. Formation pressure was therefore calculated using available well data rather than direct downhole measurement alone. Laboratory fluid analysis under high-pressure and high-temperature conditions provided supplementary information, but condensation pressure was not treated as an exact substitute for formation pressure.

Horizon VIII was brought into production through Well No. 56 in the northwestern part of the pericline. The reported production comprised 1,100 m³ of gas and 550 t of condensate. Formation pressure measured several months after production began was approximately 80 MPa and was treated as an approximation of initial pressure (SOCAR Oil and Gas Research and Design Institute, n.d.).

The abnormality coefficient frequently exceeded 1.5 in the deepest productive intervals. Formation pressure generally increased with depth, and its persistence indicates effective sealing and hydraulically isolated reservoir compartments. Deep burial, tectonic compression, mud volcanism, hydrocarbon generation, and restricted fluid migration are consistent with the regional geological setting (Ali-Zade et al., 1972; Guliyev et al., 2014; Kerimov et al., 2001).

Discussion

The occurrence of AHFP in Horizons V, VII, and VIII supports a polygenic interpretation of abnormal pressure in Bulla-Deniz. Deep burial favours elevated temperature, hydrocarbon generation, and fluid expansion, while tectonic compression and low-permeability seals restrict fluid escape. These findings are consistent with established explanations of AHFP development in petroleum basins (Aleksandrov, 1987; Belonin et al., 2005; Grausman, 1999).

High reservoir energy may support hydrocarbon movement and strong initial production; however, AHFP does not automatically increase the intrinsic permeability of reservoir rock. Pressure may improve fluid mobility or activate existing fractures under particular conditions, whereas permeability remains a separate petrophysical property (Gurbanov et al., 2022).

Pressure depletion after production begins explains why current pressure may be lower than initial pressure and why late measurements may underestimate original reservoir energy and reserves (Zhdanov, n.d.). Mathematical modeling of oil-production trends can also support the interpretation of field performance and facilitate more informed resource-management decisions (Humbataliyev et al., 2025). High-pressure and high-temperature conditions complicate drilling, well completion, equipment selection, monitoring, and well control, particularly in deep and operationally challenging wells (Humbatova, 2025).

The presence of separate high-pressure intervals suggests reservoir compartmentalization and limited hydraulic communication. When multiple pressure regimes occur in one well, additional casing strings, carefully selected drilling-fluid density, specialized well-control equipment, and continuous monitoring may be required. These measures increase development costs but reduce the likelihood of kicks, blowouts, formation damage, and inaccurate reserve estimates.

Conclusion

The study confirms AHFP in Horizons V, VII, and VIII of the Bulla-Deniz field at depths greater than approximately 4,000 m. The increase in pressure with depth and abnormality coefficients frequently exceeding 1.5 demonstrate the persistence of a high-pressure regime across several productive intervals.

The pressure system is most plausibly associated with the combined effects of deep burial, elevated temperature, hydrocarbon generation, tectonic compression, vertical fluid migration, and effective low-permeability seals. The findings therefore support a polygenic origin of AHFP in the field. Elevated pressure preserves substantial reservoir energy and may support initial productivity, but it also increases drilling, completion, well-control, and economic risks. Each productive horizon should therefore be evaluated individually, and pressure prediction should be updated throughout field development.

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Criteria and Cutoff Values for Distinguishing Reservoir Rocks in Deeply Buried Zones of the South Caspian Basin

Orkhan Yagubov¹ , Almaz Guliyeva¹ , Gunay Vagifgizi^{2*} 

Abstract. Reliable discrimination between reservoir and non-reservoir rocks is essential for reserve estimation and field-development planning in the deeply buried productive intervals of the South Caspian Basin. This study evaluates lithological and petrophysical data from the Gunashli, Bahar, and Bulla-Deniz fields to define field-specific cutoff values for porosity, permeability, clay content, and carbonate content. The dataset comprises core descriptions and laboratory measurements from productive-series deposits, including 270 samples and more than 1,200 determinations from Gunashli, horizon-specific core datasets from Bahar, and 47 core samples from Bulla-Deniz. Distribution curves, cross-parameter comparisons, and reservoir/non-reservoir classifications were used to identify threshold values. At Gunashli, the porosity distributions of reservoir and non-reservoir rocks intersect at approximately 10%, while a 9% operational boundary is supported by the broader dataset. For the Bahar productive intervals, porosity cutoffs are generally about 8% and permeability cutoffs about $0.003 \mu\text{m}^2$. For sandy-silty rocks of Bulla-Deniz Horizons V and VII, the adopted criteria are porosity greater than 7.5%, permeability greater than 1 mD, carbonate content below 20%, and clay content below 36%. The results demonstrate that cutoff values are not universal constants; they must be calibrated to lithofacies, burial depth, analytical scale, and production context.

Keywords: South Caspian Basin, reservoir rock, porosity cutoff, permeability cutoff, clay content, carbonate content, core analysis

¹Oil and Gas Research and Design Institute, SOCAR, Baku, Azerbaijan

²Oil and Gas Research and Design Institute, SOCAR, PhD in Economics, Baku, Azerbaijan

*Corresponding author. E-mail: vaqifgunay77@gmail.com

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Cənubi Xəzər hövzəsinin dərin yatımlı zonalarında kollektor süxurların fərqləndirilməsi üçün meyarlar və sərhəd qiymətləri

Orxan Yaqubov¹ , Almaz Quliyeva¹ , Günay Vaqifqızı^{2*} 

Xülasə. Kollektor və qeyri-kollektor süxurların etibarlı şəkildə fərqləndirilməsi Cənubi Xəzər hövzəsinin dərin yatımlı məhsuldar intervallarında ehtiyatların hesablanması və yataqların işlənmə layihələrinin hazırlanması üçün mühüm əhəmiyyət daşıyır. Tədqiqatda Günəşli, Bahar və Bulla-Dəniz yataqlarına aid litoloji və petrofiziki məlumatlar təhlil edilərək məsaməlilik, keçiricilik, gillilik və karbonatlılıq üzrə yatağa xas sərhəd qiymətləri müəyyənləşdirilmişdir. Məlumat bazasına Günəşli yatağından 270 kern nümunəsi və 1200-dən artıq laboratoriya təyini, Bahar yatağı üzrə horizontlara

aid kern məlumatları, həmçinin Bulla-Dəniz yatağından 47 kern nümunəsi daxildir. Sərhəd qiymətlərinin əsaslandırılması üçün paylanma əyrilərindən, parametrlərarası müqayisələrdən və süxurların kollektor və qeyri-kollektor qruplarına ayrılmasından istifadə edilmişdir. Günəşli yatağında kollektor və qeyri-kollektor süxurların məsaməlilik paylanmaları təxminən 10% səviyyəsində kəşisir, geniş məlumat bazası isə 9%-lik əməli sərhədi dəstəkləyir. Bahar yatağında məsaməlilik üçün ümumi sərhəd təxminən 8%, keçiricilik üçün isə $0,003 \mu\text{m}^2$ -dir. Bulla-Dəniz yatağının V və VII horizontlarında məsaməlilik $>7,5\%$, keçiricilik $>1 \text{ mD}$, karbonatlılıq $<20\%$ və gillilik $<36\%$ meyarları qəbul edilmişdir. Nəticələr göstərir ki, sərhəd qiymətləri universal deyil və litofasial xüsusiyyətlər, yatım dərinliyi, analiz miqyası və hasilat şəraiti nəzərə alınmaqla kalibrlənməlidir.

Açar sözlər: Cənubi Xəzər hövzəsi, kollektor süxur, məsaməlilik sərhədi, keçiricilik sərhədi, gillilik, karbonatlılıq, kern analizi

¹SOCAR-ın Neftqazəlmətdəqiqatlayihə İnstitutu, Bakı, Azərbaycan

²SOCAR-ın Neftqazəlmətdəqiqatlayihə İnstitutu, iqtisad üzrə fəlsəfə doktoru, Bakı, Azərbaycan

*Məsul müəllif. E-poçt: vaqifgunay77@gmail.com

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Introduction

The identification of net reservoir intervals is a central task in petroleum geology because the selected cutoff values directly affect net-to-gross ratio, volumetric reserve estimates, well placement, completion design, and development economics. A cutoff is not merely a descriptive threshold; it is a decision boundary linking geological observations to engineering and economic performance. Consequently, no single porosity or permeability limit can be transferred uncritically from one field or horizon to another (Worthington & Cosentino, 2005; Worthington, 2010).

This problem is especially important in the South Caspian Basin, where productive-series reservoirs occur at considerable burial depths and are affected by rapid facies variation, tectonic compartmentalization, mud volcanism, compaction, cementation, and variable clay content. These factors modify pore structure and fluid-flow capacity and may cause rocks with similar porosity to exhibit markedly different permeability. Regional geological syntheses emphasize the heterogeneity and complex petroleum systems of the basin (Ali-Zade et al., 1972; Guliyev et al., 2014; Kocharli, 2015; Yusifov & Aslanov, 2018).

The objective of this study is to compare the lithological and reservoir properties of deeply buried Productive Series rocks in the Gunashli, Bahar, and Bulla-Deniz fields and to determine practical cutoff values for porosity, permeability, clay content, and carbonate content. The study also clarifies how these thresholds should be interpreted when geological reserves are estimated and field-development decisions are made.

Materials and Methods

The analysis used core descriptions, grain-size measurements, porosity and permeability tests, carbonate-content determinations, and clay-content data from productive intervals of the three fields. At Gunashli, 270 core samples recovered from the 1,700–4,760 m interval in exploration Wells 1, 2, 3, 4, 5, 6, 11, 14, 15, 16, 18, 21, 22, and 23 were evaluated. More than 1,200 laboratory determinations were available. The Bahar dataset was grouped by Horizons VI–X, the Fasila Suite, and NKP. At

Bulla-Deniz, 47 core samples from 15 wells were analyzed for porosity, permeability, carbonate content, and clay content.

Reservoir and non-reservoir populations were compared using frequency distributions and parameter relationships. A cutoff was selected at the intersection or practical separation point of the two populations and was checked against horizon-specific lithology and available field evidence. Because permeability is strongly scale- and facies-dependent, it was evaluated together with porosity and clay content rather than as an isolated variable. Statistical and fuzzy-regression approaches are useful for representing the uncertainty inherent in deep-reservoir property estimation (Gurbanov et al., 2022). Porosity is reported as a percentage. Permeability is reported in μm^2 or millidarcies (mD), following the units in the source datasets; 1 μm^2 is approximately 1,013 mD. Clay and carbonate contents are expressed as weight percentages. For quality-control purposes, higher porosity and permeability were treated as favorable, whereas higher clay and carbonate contents were treated as limiting factors. The resulting thresholds were interpreted as field-specific operational criteria rather than universal constants.

Results

Regional and Field Setting

Gunashli lies in the southeastern part of the Absheron Archipelago, approximately 120 km from Baku and 12 km southeast of Neft Dashlari. The structure is associated with the Absheron–Pribalkhan tectonic zone and is affected by mud volcanoes and transverse faults. Bahar occupies a transitional structural zone and is divided by longitudinal and transverse faults into tectonically sealed blocks. Bulla-Deniz is situated in the northern Baku Archipelago on the Kanizadag–Babek anticlinal trend. These structural differences provide an important geological context for the observed variation in reservoir quality.



Figure 1

Regional overview of the Gunashli, Bahar, and Bulla-Deniz area in the Azerbaijani sector of the Caspian Sea

Note. Field names on the source map are shown in Russian; the figure is reproduced from the material supplied by the authors.

Gunashli Field

The Productive Series at Gunashli consists of interbedded clay, sand, sandstone, and siltstone. The principal development targets are the Fasila Suite and Horizon X, which contain most of the field's reported oil reserves. Grain-size analysis showed that 78 of the recovered samples contained more than 50% clay and were therefore classified as clay rocks. Sandy-clayey siltstone represented more than 70% of the determinations, whereas silty sand represented approximately 20%. Porosity in sandy-silty rocks ranges from 4% to 40%, with horizon averages of 12–22%. The reservoir and non-reservoir distribution curves intersect at approximately 10%; this value represents the graphical separation point. A 9% porosity value was retained as the operational boundary when the wider dataset and sampling variability were considered. Permeability ranges from 0.001 to 1.730 μm^2 . The highest mean values occur in the Fasila Suite (0.180 μm^2) and Horizon X (0.108 μm^2). Carbonate content is comparatively restricted: more than 80% of measurements are below 14%, and suite averages are 8–11%.

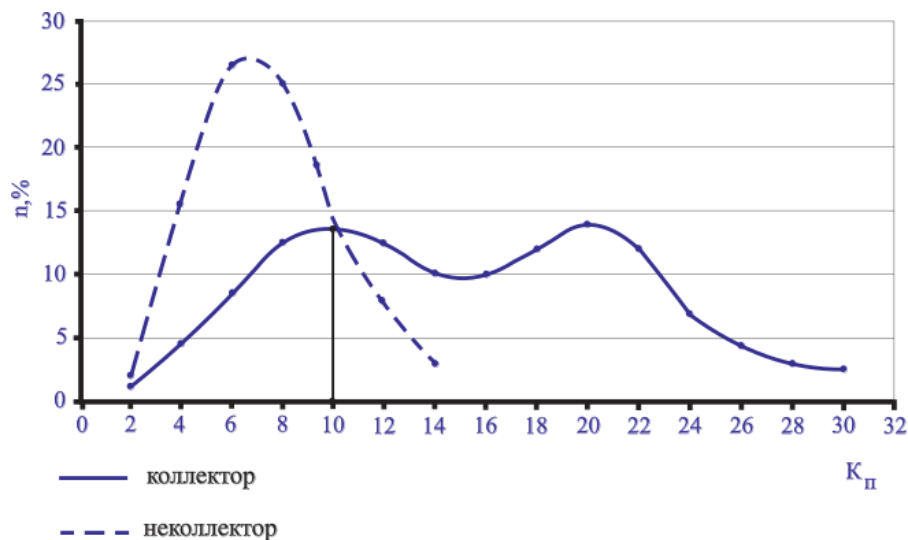


Figure 2

Porosity-distribution curves for reservoir and non-reservoir rocks at Gunashli

Note. The solid curve represents reservoir rocks and the dashed curve represents non-reservoir rocks. The vertical line marks the approximate 10% intersection point.

Bahar Field

The Bahar succession includes recent, Ancient Caspian, Absheron, Akchagyl, and Productive Series deposits. Productive intervals are composed of interbedded sand, sandstone, siltstone, and clay. Across the studied section, average clay content is 22.4%, although individual horizons and wells contain values exceeding 40%. Average carbonate content generally ranges from 7.2% to 11.3%. Porosity commonly lies between 8% and 24%, while permeability varies from 1 to $500 \times 10^{-15} \text{ m}^2$. The mean permeability values calculated from available core samples are $51 \times 10^{-15} \text{ m}^2$ for Horizon VI, $141 \times 10^{-15} \text{ m}^2$ for Horizon VII, $74 \times 10^{-15} \text{ m}^2$ for Horizon IX, $69 \times 10^{-15} \text{ m}^2$ for Horizon X, and $53 \times 10^{-15} \text{ m}^2$ for the Fasila Suite.

Table 1*Operational cutoff values for Bahar reservoir rocks by horizon*

Horizon	Porosity, %	Permeability, μm^2	Maximum clay content, %	Maximum carbonate content, %
VI	≥ 8	≥ 0.003	30	18
VII	≥ 8	≥ 0.003	28	22
VIII	≥ 8	≥ 0.003	32	18
IX	≥ 8	≥ 0.003	36	20
X	≥ 8	≥ 0.003	28	20
Fasila Suite	≥ 8	≥ 0.003	26	18
NKP	≥ 8	≥ 0.003	28	14

Bulla-Deniz Field

At Bulla-Deniz, the main development targets are Horizons V, VII, and VIII. The upper part of the section is dominated by Quaternary, Absheron, and Akchagyl clays with thin sandstone interbeds and has limited commercial significance. The 47 analyzed core samples were divided into reservoir and non-reservoir groups; 25 samples were classified as reservoir rocks and 22 as non-reservoir rocks. For the sandy-silty rocks of Horizons V and VII, the adopted limits are porosity greater than 7.5%, permeability greater than 1 mD, carbonate content below 20%, and clay content below 36%.

Table 2*Reservoir properties of Bulla-Deniz Horizons V and VII*

Horizon	Parameter	No. of analyses	Observed range	Mean
V	Porosity, %	36	8.9–23.4	14.6
V	Permeability, mD	22	4–100	27
V	Carbonate content, %	38	2.5–18.5	10.7
V	Clay content, %	34	3.5–49.4	26.6
VII	Porosity, %	9	15.8–18.3	17.2
VII	Permeability, mD	7	20–76	42
VII	Carbonate content, %	11	6.5–16.2	11.7
VII	Clay content, %	10	5.4–45.5	18.3

Only ten wells penetrated Horizon VIII. Because its direct dataset is limited, the preliminary criteria were adopted by analogy with the lithological and reservoir properties of the nearby Sangachal–Duvanny–Khara-Zira field. This transfer should be treated cautiously and updated when additional core, well-log, and production-test data become available.

Discussion

The results confirm that reservoir cutoffs in the South Caspian Basin are field- and horizon-dependent. Gunashli shows a porosity separation near 9–10%, Bahar commonly uses an 8% porosity and $0.003 \mu\text{m}^2$ permeability boundary, and Bulla-Deniz uses a lower porosity threshold of 7.5% with a permeability threshold of 1 mD. The differences reflect lithofacies, burial history, pore-throat geometry, diagenesis, clay distribution, and the scale of measurement. They should not be interpreted as analytical inconsistency.

Cutoffs must also be linked to the purpose of the study. Geological cutoffs identify rock capable of storing hydrocarbons, while dynamic or economic cutoffs identify intervals capable of producing at technically and economically acceptable rates. Integrated reservoir studies therefore require joint interpretation of core, well-log, pressure, fluid, production, and economic data (Worthington & Cosentino, 2005; Worthington, 2010). A single threshold based only on porosity may overestimate net reservoir thickness in clay-rich intervals or underestimate fractured and low-porosity productive rock.

The deep burial and structural complexity of the studied fields increase uncertainty. High pressure, temperature, corrosion risk, sand production, and equipment limitations complicate development of difficult wells (Humbatova, 2025). At the same time, mathematical modeling of production trends can connect static reservoir classification with expected field performance and resource-management decisions (Humbataliyev et al., 2025). These considerations support periodic recalibration of cutoffs as new core, log, pressure, and production data become available.

The main limitation of the present analysis is the unequal sample density among fields and horizons. Gunashli is supported by a substantially larger dataset than Bulla-Deniz Horizon VIII. In addition, some source measurements use different permeability units and analytical scales. Future work should harmonize units, integrate routine and special core analysis with calibrated well logs, quantify uncertainty around each cutoff, and validate classifications against well tests and sustained production.

Conclusion

The study establishes practical criteria for distinguishing reservoir from non-reservoir rocks in deeply buried Productive Series deposits of the Gunashli, Bahar, and Bulla-Deniz fields. The principal findings are as follows:

1. At Gunashli, reservoir and non-reservoir porosity distributions intersect at approximately 10%, while 9% is a defensible operational boundary for the broader dataset.
2. At Bahar, the principal productive intervals generally support a porosity cutoff of about 8% and a permeability cutoff of about $0.003 \mu\text{m}^2$, with horizon-specific limits for clay and carbonate content.
3. At Bulla-Deniz, Horizons V and VII are classified using porosity $>7.5\%$, permeability $>1 \text{ mD}$, carbonate content $<20\%$, and clay content $<36\%$.
4. Cutoff values must be calibrated by field and horizon and updated through integrated core, log, pressure, and production analysis.

Data Availability

The study is based on the core-analysis and field materials supplied by the authors and on the published sources cited in the reference list.

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Redaksiyanın ünvanı

AZ1073,
Ünvan: A.M.Şərifzadə 19,
Yasamal r-nu, Bakı, Azərbaycan
Tel.: +994 99 806 67 68
+994 99 808 67 68
e-mail: tedqiqat.1707@aem.az

Editorial address

AZ1073,
Address: 19 A.M.Sharifzade St.,
Yasamal Dist., Baku, Azerbaijan
Phone: +994 99 806 67 68
+994 99 808 67 68
e-mail: tedqiqat.1707@aem.az

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Tel.: +994 50 209 59 68
e-mail: info@mail.ru

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e-mail: info@mail.ru

