Journal of Economics and Management Advances

Editorial Board

FOREWORD

Azerbaijan State University of Economics (UNEC) with great pleasure announces the publication of the inaugural issue (Vol.1, No.2) of the Journal of Economics and Management Advances (JEMA). JEMA is established with the aim of contributing to the advancement of knowledge in economics, business, finance, and management sciences by creating a platform for high-quality academic exchange.

The journal welcomes original research articles, review papers, and short communications written in English that address contemporary theoretical and practical issues in the economic and managerial fields. Our focus is to publish work that is not only methodologically sound but also relevant to current global and regional economic realities.

JEMA operates on the principles of academic integrity, transparency, and open science. Manuscripts submitted for consideration must be original, not previously published or under review elsewhere, and must be approved by all contributing authors. In line with our commitment to open access, all articles published in JEMA are freely available to read, download, distribute, and cite without subscription barriers. We believe that the dissemination of knowledge should be unrestricted and accessible to all.

Beyond article publications, the journal also aims to inform and engage the academic community by highlighting significant scholarly events such as conferences, workshops, and research initiatives that shape the future of the disciplines we represent.

We warmly invite researchers, practitioners, and scholars to contribute their work to JEMA and to take part in this new academic endeavor. Manuscripts can be submitted through our official portal at 100, and further information about the journal, including editorial policies and current issues, is available at journals.unec.edu.az.

We extend our sincere gratitude to all authors, reviewers, and editorial board members for their valuable contributions and dedication. We look forward to growing this platform together and making a meaningful impact in the field of economics and management studies.

Sincerely,
Editorial Board

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The Role of Budgetary Regulation in the Management of Macroeconomic Processes and Macroeconomic Problems of Increasing Tax Revenues of Regions

Abstract

The article examines the development of the national economy and the mechanisms of its effective regulation by the state. Particular attention is paid to the study of the role of budgetary regulation of macroeconomic processes. The article notes that effective budgetary regulation is, in general, the most priority issue in the system of economic management mechanism.

The normal development of the national economy largely depends on its orderly regulation by the state. Thus, even at the maximum level, liberalization of the economy does not deny the participation of the state in the management of economic processes. The presence of each state's own interests and priorities makes it necessary for the state to intervene in all spheres of public life. Modern trends in the development of the tax system, in addition to the well-known positive components, are characterized by an extremely uneven distribution of tax potential across the country and, as a consequence, by different contributions of individual territorial entities to the formation of budget revenues. As a rule, tax relations "unfold" within a specific regional economic space that has attributive features that are essential for the dynamics of fiscal efficiency: socio-economic and institutional heterogeneity, multi-vector trajectories and different rates of economic development. The current situation generates additional risks that reduce the efficiency of the tax system due to the disproportionate distribution of the tax burden, which, in turn, not only violates the principle of justice in the territorial context, but also contributes to a decrease in the stability of tax revenue formation.

Keywords. budget, state, management, taxes, economic development, region, macroeconomic process.

Introduction

The system of state regulation of the national economy, in general, should determine the level of influence of the state on economic life. Without such a regulatory system, it is impossible to effectively coordinate the areas of activity for the formation of market relations. With the formation of the economy of the republic in accordance with the principles of the market economy, the development of a diversified economy in our society, the creation of conditions for the activities of various forms of ownership on an equal basis, the privatization process has accelerated. In order to increase the effectiveness of the measures taken related to the development of the economy of the republic, the state pays special attention to the regulation of the economy and its main component. In the conditions of the transition to a market economy, the role of the state in the economic revival of

the republic, in the establishment of international relations, in the total volume of imports and exports, in the development of free enterprise is undeniable. In the modern world, in the conditions of the market orientation of the economy of the republic, a radical change in the demand for a management mechanism is necessary. The transition to market relations with a mixed economy transforms state regulation of the economy into a specific means of management. In our conditions, that is, in the period of formation of market relations by state administration bodies, mechanisms of influence on the development of the national economy must be used to the fullest extent by programming.

Methodological and practical features of budget regulation

Economic theory does not know purely financial laws that would allow forecasting the financial and economic situation for a quarter of a century. But this does not mean that there is no scientific basis and objective need for long-term forecasting. Forecasts in the budget sphere are essentially based on the connection of the budget strategy with the laws of general reproduction and economic growth. The dependence of the dynamics of budget revenues on the general dynamics of GDP and on business activity reflects the determination of the sphere on general economic patterns, which are the first methodological principle. As noted, there is an objective connection between the level of GDP, which reflects the scale of the reproduction process, and the volume of financial resources of the state that serve this process.

The second methodological principle is the dependence of economic dynamics on the typology of budget strategy and on real budget proportions. This principle is essentially of decisive importance for long-term budget forecasting. Budget strategy should not only passively reflect market processes, but on the contrary should form general economic limits. The third methodological principle is forecasting based on the internal intensity of budget relations and internal factors of the budget-tax system of budget dynamics. This means that the forecasted budget-tax potential and proportions depend on the use of internal resources of the existing budget system. The fourth methodological principle provides for socio-political accounting of forecasting. In our opinion, the following principles should form the basis of the financial system and the restructuring of budget regulation:

- creation of a stable system of financial relations;
- structuring should be comprehensive and should ensure close links between all elements (financial infrastructure, public finances, insurance organizations, pension funds and other financial institutions) of the financial system:
- limited resources make it necessary to use the principle of centralization of financial resources;
- restructuring of the financial system should be carried out mainly at the expense of internal sources. External loans and investments should play a supporting role. (*Elena A. Fedchenko, Lyubov V. Gusarova, , Margarita L. Vasyunina, Alexander S. Lozhechko and Anastasia A. Lysenko, 2022*)

In our opinion, in the context of integration, the systemic renewal of the tax mechanism in improving budgetary relations is one of the factors creating conditions for ensuring economic growth. For these purposes, it is advisable to take the following measures:

- by covering the "shadow" sector of the economy, expanding the tax base;
- reducing the tax burden for the real sector of the economy;
- standardization of tax legislation and tax reports;
- gradual reduction and differentiation of profit and VAT rates;
- differentiation of profit tax by individual sectors of the economy.

Problems of state regulation of the national economy with the help of the state budget

Budget regulation, in general, is the most priority issue in the system of economic management mechanism of the economy. As we know, the budget system, being an important management mechanism in the conditions of a market economy, is formed on the basis of state principles. Budget regulation is generally used to organize the activities of the economic system, stimulate production

and improve the principles of division. Scientific substantiation of its limits, analysis and management of factors and results should be based on a number of methodological and practical features. Budget regulation has features inherent in each country. In the conditions of a market economy, the tasks of managing the state budget, income and expenditure have become even more complicated, and as a result have encountered serious socio-economic problems. And therefore, the strategy of revenue and expenditure management should be developed and assessed from the prism of the most important economic and production problems. It is this approach that can provide an opportunity to create an even clearer idea of the complex nature and content of revenues and expenditures of the state budget, the state budget as a whole. The budget system is formed in accordance with the economic system and political organization of each country. In general, traditional, implemented and program budget systems are distinguished. Traditional budget systems mainly ensure control over the implementation of expenditures provided for by law. In other words, the control function plays a leading role in this system. Support of economic activity is one of the pressing issues in the transition period. And from this point of view, it is advisable to study the implemented budget system. It is also called the implemented budget system. This budget system is compiled as a work program.

The program or planned-program budget system, in contrast to the previously noted budget systems, also ensures the use of the budget as a strategic program. Here, it is possible to analyze alternative service programs and select the best ones from a macroeconomic point of view. The basis of this budget system is system analysis. In other words, if the feasibility of services for achieving certain goals in the public sector is known, if attention is paid to alternatives to help achieve goals, if the goals are long-term and if the activities of existing service programs are adequately assessed, decisions related to the distribution of sources of funds will be made in a more optimal form. In general, the budget system expresses the totality of all types of budgets, united in the budget of each country. The creation of a budget system and the organization of relationships between its individual links expresses budget construction. Budget construction reflects the mechanism by which the budget system is built.

With traditional budget policy, it is very important to constantly maintain the budget balance of the state. If the state wants to influence national income, it must bring the demand and supply of labor to a level capable of changing aggregate production. Due to the fact that it is impossible to achieve technical progress that affects the growth of aggregate production and population growth through budget policy that fulfills traditional tasks and provides for the financing of these services in taxes at a level that does not affect economic activity, a small but balanced budget policy meets the requirements of traditional budget policy and theory. The issues of improving budget planning should be implemented in conjunction with issues of public administration. The main condition for the successful implementation of the program-target approach is the implementation of financial discipline in the implementation of adopted budgets. The main problem for the successful application of budgeting based on results is the difficulty of determining the socio-economic results of the activities of state enterprises, the lack of development of a unified system of goals and indicators, and the imperfection of the accounting system and information support. As we know, fiscal policy is a system of regulation associated with government spending and taxes. Speaking about government spending, we mean spending on maintaining the institution of statehood, as well as on purchasing certain goods and services by the state. These can be different types of orders, for example, construction of schools, healthcare facilities and cultural facilities at the expense of the state budget, and the purchase of imported goods and military equipment. The main distinguishing feature of all these orders is that the state itself is their consumer.

Budget regulation is one of the main tools influencing macroeconomic processes. Stability of budget revenues, increasing regional tax potential and ensuring fiscal sustainability are strategic goals of state policy. The data in the diagram show that both revenues and expenditures have growth dynamics. Since expenditures are higher than revenues, the budget deficit is persistent.

Based on the table below, a macroeconomic analysis of GDP growth, inflation, budget revenues and budget expenditures for the period 2020–2024 is presented.

Year	GDP growth rate (%)	Annual inflation (%)	State budget revenues (billion AZN)	State expenditures (billion AZN)
2020	–4.3	2.8	24.7	26.4
2021	5.6	6.7	26.4	28.0
2022	4.9	13.9	30.6	32.1
2023	1.5	5.4	33.2	36.3
2024	2.1	3.2	35.0	37.8

Table 1. Selected macroeconomic indicators for Azerbaijan (2020–2024)
Sources: Presentation of the Draft Consolidated and State Budgets of the Republic of Azerbaijan for 2025, Baku 2024

When analyzing the GDP growth rate, 3 main stages can be distinguished: the first stage, the 2020 pandemic shock - characterized by negative growth. Thus, GDP decreased by -4.3%. The reasons can be cited as quarantine restrictions, a decline in the service sector, and instability in the energy market. The second stage, 2021–2022, was accompanied by rapid recovery and economic revival, which can be attributed to rising oil prices, expanding exports, increasing public investments, and strengthening post-pandemic recovery policies. In the third stage, i.e., 2023–2024, a weakening of the growth rate is observed, which is due to the global economic slowdown, restrictions on oil production and gas exports, and the longer-term nature of public investment projects. When analyzing budget revenues, it is seen that the growth trend continues throughout the period. The reasons for this increase are: increased revenues from the oil sector, high energy prices in 2021–2022, and transfers from the state oil fund. At the same time, the reasons for the increase include the strengthening of non-oil revenues, the digitalization of tax administration, and the reduction of the shadow economy.

In turn, budget expenditures are also growing faster than revenues. The main reasons for the increase are social projects, pension and salary increases, the restoration of Karabakh and regional investments, increased defense and security expenditures, and infrastructure - road, water, energy, and urban development projects (Muradov & Hajiyeva, 2024)

The budget deficit remains structural, that is, each year expenditures exceed revenues → persistent deficit. Government spending plays an important role in the socio-economic development of society. Therefore, the issues of increasing the efficiency of government spending, their regulatory role in ensuring socio-economic development, and the formation of a new quality of economic growth are very relevant. Much has been said about the need to carry out systemic transformations in the budget process. However, due to various reasons, this problem remains unresolved. At the same time, it can be said that certain steps have been taken in the area of restructuring the budget sector. The essence of the new approach to the budget process is simple and clear: spending not for the sake of spending, but spending to achieve specific results. In order to achieve this goal, we consider it necessary to solve the following problems:

- optimization of the network of budgetary organizations. This is the restructuring and implementation of new forms of financing budgetary organizations. The solution to this problem is certainly more complex and requires the implementation of certain innovations in the current budget legislation.

- development and use of result-oriented financing methods. The decline in GDP in the economy of newly independent states, the breakdown of the national reproduction process, the breakdown of ties between production and financial systems, the deterioration of the socio-economic situation of the population are explained by these reasons.

Year	Budget deficit (billion AZN)	Public debt (billion AZN)	Debt to GDP ratio (%)
2020	1.7	17.8	20.7
2021	1.6	17.3	18.0
2022	1.5	16.9	14.9
2023	3.1	17.4	15.2
2024	2.8	18.1	15.0

Table 2. Budget deficit and debt dynamics
Sources: Presentation of the Draft Consolidated and State Budgets of the Republic of Azerbaijan for 2025, Baku 2024

The table data shows that the dynamics of the budget deficit has shown a downward trend (2020–2022). Thus, in 2020–2022, the budget deficit decreased from 1.7 billion AZN to 1.5 billion AZN. This decrease can be explained by the following factors: restoration of economic activity after the pandemic, stabilization of oil prices, fiscal discipline and control over state expenditures, increase in tax revenues, etc. In 2023, the deficit increased to 3.1 billion AZN. The increase was mainly due to the expansion of social packages, pension and salary increases, increased defense and security expenditures, and the activation of infrastructure projects. The relative decrease, i.e., in 2024, the deficit decreased to 2.8 billion AZN. This is due to the strengthening of fiscal collection and optimization of expenditures.

Looking at the dynamics of public debt, a period of slight decline covers the years (2020–2022) (17.8 billion AZN → 16.9 billion AZN). The reasons for this decline include timely execution of external debt payments, limitation of new borrowing, and reduction of budget pressure by transfers from the State Oil Fund. An increase in debt is observed in 2023 and 2024, the reasons for which include financing of infrastructure projects, partial coverage of the budget deficit with borrowing, and expansion of regional development programs.

The most important macro indicator, the debt-to-GDP ratio, decreased significantly in 2020–2022 (20.7% → 14.9%), which indicates that the debt is easing due to real economic growth. Although the debt increased slightly in 2023–2024, the ratio stabilized around 15% as a result of GDP expansion. This indicates that Azerbaijan's debt burden is at a low-risk level (below 30% is considered safe by international organizations), that the increase in debt does not pose a risk to macroeconomic stability, and that the conservative strategy in public debt management continues.

Sometimes the regulatory role of the state in the economy is associated with its role in production and the level of the share of state property. Such an assessment from the point of view of the role of the state in the monetary system and the effective use of public finances is incorrect. Because the role of the state in the economy is not adequate to the level of state ownership of the means of production. The main thing here is the level of nationalization of national income in the form of public finances. Analysis shows that in developed countries the share of public expenditures in GDP does not decrease, but develops at an increasing rate. This indicator is 30% in the USA, 60% in Denmark, 54.6% in France, 53.7% in Belgium.

In developing market economies there is no alternative to reducing government spending in GDP and a savings strategy. The policy of reducing those same government spending should turn into a general reduction in all spending, including vital items of spending. It is clear that a reduction in government capital investment in high-tech projects, budget allocations for the maintenance of

infrastructure providing fixed assets will lead to a deterioration in the prospects for economic development. At the same time, a reduction in real wages of those working in the public sector will cause a decrease in labor productivity of workers in this sector and the emergence of social conflicts. It should be taken into account that it is difficult to assess and measure most budget expenditures at market prices. Manufactured products cannot be sold quickly. In general, non-production government spending can be expensive for the country's economy. In modern conditions, new elements are constantly being added to the state financial mechanism, requiring corresponding instruments of regulation and control. At this stage, state finances must again be transformed from the category of division into the category of reproduction. State finances do not simply perform the function of state provision. They are also an effective element of the reproduction processes.

Integration into the global financial market requires the development of both an adaptation mechanism and mechanisms for protecting national interests in the area of public finance. Long-term definition of the concept of budget strategy is a very complex issue. Long-term financial forecasts are not found in world practice. There are a number of objective reasons related to the nature of financial and budgetary processes.

Macroeconomic problems of increasing tax revenues of regions

As is known, the foundation of the functioning of the tax system is made up of factors of macroeconomic dynamics, aggregated identified through GDP volumes, which are the object of secondary redistribution through tax mechanisms legitimized by society in the form of laws, which, in turn, are determined by the "quality" of the institutional environment. The study of the regional projection of the above-mentioned determinants gives grounds to state their multi-vector movement. Thus, the relative unification of tax legislation and the limitation of the powers of subnational entities in the sphere of taxation are accompanied by an unprecedented differentiation of macroeconomic indicators, initiating, among other things, institutional differences between regions. In this case, the requirement to ensure the unity of tax policy on the territory of the state comes into conflict with the objective resource-reproductive diversity of the regional economy.

It is obvious that the reasons for such a situation were laid much earlier than the period of building market relations, and, in fact, the differentiation of fiscal performance at the meso level is only one of the consequences of the specifics of the distribution of productive forces on the territory of the country during the period of the administrative-command economy. However, these negative trends were especially evident during the period of market transformation, when the intensive development of the resource-extracting sector was accompanied by the deindustrialization of a number of regions based on the replacement of industries with the service sector and trade, as well as the expansion of the sphere of shadow entrepreneurship. As a result, macroeconomic inequality acquired a new quality in the fiscal sphere, consolidating the tendency of territorial "stratification" in terms of tax burden and revenues. In most cases, the above-mentioned problems are identified through the phenomenon of vertical imbalance of the tax system, describing the situation of dominance of the interests of the center as the "recipient" of tax revenues, which leads to fiscal "bleeding" of the regions and reduces incentives for the development of their own tax base.

Thus, the vertical imbalance of the tax system is caused not so much by the unfair redistribution of financial flows, but by the narrowness of the tax base of most regions of the country, which, in a situation where more than 70% of tax revenues of the consolidated budget are formed by several well-known "locomotive" cities, automatically distorts the vertical and horizontal proportions of the budget system and determines the feasibility of using macroeconomic determinants to increase tax revenues.

The reasons for the differentiation of the sectoral tax burden have been repeatedly discussed in special studies, and the main components of an objective nature include the heterogeneity of the cost structure and different levels of profitability of activities, as well as the presence of unequal opportunities for legal minimization and illegal tax evasion. Thus, the heterogeneous distribution of sectors of the national economy in the territory of individual regions, together with sectoral

differences in the actual tax burden, initiates the multiplication of inequality in the fiscal productivity of regions.

The most classic form of the fiscal multiplier is as follows:

$$Multiplier = 1/(1 - MPC)$$

Where,

MPC is the marginal propensity to consume.

Example: if MPC = 0.75, then multiplier = 1/(1 − 0.75) = 4. This indicates that a 1 azn increase in government spending (or a reduction in taxes → an increase in spending) results in a 4 azn increase in national income. This formula is fundamental in assessing the macroeconomic impact of government spending and taxes — it allows us to analyze the effectiveness of budget policy.

Before building simple macro model formulas for tax revenues, let's define the variables used:

Variable Explanation:

T_{ri} - Tax revenues of region i

GDP_I - GDP of region i

t_I - Effective tax rate of region i

C_i - Consumption level by region

I_i - Investments by region

U_I - Unemployment rate (%)

$\alpha, \beta, \gamma, \delta$ - Model coefficients

B_i - Regional budget balance

R_I - Regional real tax potential

We can express regional tax revenues in a generalized way as follows:

$$TR_i = t_i * GDP_i * (1 - \theta * U_i) + \phi * I_i \, iTR\_$$

Here,

θ — coefficient indicating the negative effect of unemployment on tax revenues;

ϕ — coefficient indicating the additional effect of investments on tax revenues.

This formula shows that the tax revenues of the region depend on GDP, but unemployment reduces it, and investments increase it. For a descriptive characteristic of the above trends, which are already taking the form of a short-term trend, the following economic and institutional determinants should be taken into account:

- production growth, as a rule, leads to a change in its structural components, which, in turn, directly contributes to an increase in the potential for fiscal deductions for profit tax and personal income tax, and indirectly initiates an increase in spending on current consumption and, therefore, expands the potential for indirect taxation; - higher values of production per capita contribute to the reduction of contradictions in tax relations due to more complete collection of taxes and loyalty of economic entities in the area of enforcement of tax legislation.

Indirect confirmation of the significant impact of labor on the fiscal performance of socio-economic regions is the fact that measures to stimulate employment have ensured stable revenues from personal income tax. At the same time, the state policy of stimulating "self-employment" by providing financial assistance and subsidizing loans to individuals starting small business also has a predominantly tactical fiscal effect, due to the lower burden of special tax regimes, as well as the presence of significant opportunities for "shadow" entrepreneurship.

In general, the results of modeling allow us to scientifically substantiate the priorities of economic policy to increase the tax "return" of regions. It is obvious that increasing investment activity in depressed regions is a very complex independent task of economic policy, the effective implementation of which should involve taking into account the factor and potential of the fiscal productivity of territories.

Modeling of tax revenues of regions

Crisis phenomena in the economy, accompanied by sporadic fiscal imbalances in the budget system, actualize the problem of adequate planning of tax revenues in order to form realistic budget projections. A study of literary sources allows us to identify several conceptual approaches to planning tax revenues based on programs for the socio-economic development of the territory, forecasts of macroeconomic indicators, changes in tax and budget legislation, and a long-term financial plan developed within the framework of the previous budget cycle. At the same time, these approaches are practically not used in the practice of tax authorities as an instrumental and methodological basis for analyzing and planning tax revenues.

Characterizing the current state of the tax planning system at the macro level, it is necessary to highlight a number of methodological shortcomings that lead to a decrease in the accuracy and validity of forecasts and planned calculations:

- the use of predominantly deterministic models that characterize the processes of forming tax revenues exclusively taking into account the positions of tax legislation;

- widespread use of methods for indexing tax revenues using planned macroeconomic deflator indices of socio-economic development, which are, in fact, planning methods "from what has been achieved";

- overly optimistic nature of planning, which does not take into account the probability of a bifurcation change in the inertial time trend of macroeconomic indicators *(Rui Cao, 2023)*.

Taking into account the relative stability of the economy and tax legislation since the 2000s, and the accumulation of a sufficient array of empirical data on the functioning of the tax system in the specified period, we consider it possible to actively implicate the methods of economic and statistical modeling in the tools of state tax planning. (*Ulloa-Suarez, C*., 2022) This will not only improve the quality of the budget process, but also form a scientific basis for the modernization of the regional economy, including taking into account the target guidelines for increasing its tax capacity. The following formula can be used to express the budget balance by region:

$$B_i = TR_i - G_i$$

• G_i — the region's expenditures (for example, social programs, infrastructure expenditures).
• If $B_i > 0$, it indicates a budget surplus;
 if $B_i < 0$, it indicates a budget deficit.

As for institutional factors, which have recently been actively included by researchers in the field of economic analysis, their effective implication is not yet possible due to the lack of adequate and statistically accessible indicators of the development of the institutional environment in the regions. It is also worth noting the negative experience of foreign scientists in the field of econometric modeling of the influence of institutional factors on the dynamics of tax revenues. In particular, in the works of economists at the World Bank, attempts have been made to use indicators of the shadow economy, corruption, and the level of government regulation as explanatory variables. However, any combination of the above factors with traditional indicators of the tax base resulted in statistical insignificance of institutional variables, which is associated with the weak effect of the latter on the processes of tax revenue formation or with the inadequacy of the information base. Modern conditions of the need to preserve and strengthen the territorial integrity of the country, overcome the economic crisis dictate the need to create a tax system that would allow for effective management of the economy, take into account the interests of the state, economic entities, and the population. When developing tax policy, it is necessary to take into account international experience, as well as national characteristics of the country's development. One of the main elements of the tax system is taxes. Through the redistribution of financial resources, the development of priority areas of the economy is stimulated, social support is provided to certain categories of the population. By implementing a competent tax policy of the state, it is possible to achieve positive results in the financial and socio-economic sphere.

Tax policy as a set of scientifically substantiated and economically feasible legal actions of government and management bodies is capable of ensuring the needs of reproduction and the growth of public welfare. (*Yossinomita, Y., 2025*)When implementing an effective tax policy, not only the legal order is ensured, i.e. taxpayers pay taxes and financial sanctions, but also a comprehensive assessment of economic relations that develop under the influence of taxation.

Consequently, tax policy is not an automatic implementation of the provisions of tax legislation, but their constant improvement in accordance with the development of society and the state.

When forming a tax policy during an unstable economic and political situation, it is necessary to take into account the following factors:
- political relations of the state,
- international economic relations,
- internal factors.

Internal factors include: priority areas of economic development of the state and the formation of society, determined by the Government of the country, the tax culture of society and economic entities, the legal implementation of tax relations, the need to support and develop business entities, create jobs and other factors.

Recently, special attention has been paid to the harmonization of tax relations. When considering issues of harmonizing tax relations between taxpayers and tax authorities, the starting point is the very essence of taxes, their purpose. On the one hand, state policy in the field of taxation and finance should be aimed at fulfilling their main fiscal function, that is, timely and full receipt of tax payments in the revenue part of budgets at all levels.

Since one of the goals of doing business is to make a profit, economic entities try to optimize the taxation of organizations. Optimization often borders on tax evasion. Attempts by taxpayers to avoid paying taxes are one of the serious problems in the taxation system. Tax evasion is a method of reducing tax payments, in which the taxpayer deliberately avoids paying taxes or reduces the amount of their tax liabilities in violation of current legislation. Tax evasion should be distinguished from tax optimization, tax planning, which are activities to reduce the amount of tax liabilities through targeted systematic actions of the taxpayer, which include the use of all benefits, techniques and mechanisms provided by law, as well as actions aimed at legally evading taxes.(*Zárate C.V., 2025*) Such actions do not constitute a crime, do not entail adverse consequences in the form of criminal and administrative liability and are allowed in the implementation of financial and economic activities of an economic entity.

The relationship between taxpayers and fee payers with tax authorities is currently enshrined in the first part of the Tax Code in the form of rights and obligations of both parties. It should be noted that within the framework of harmonization of tax relations, harmonization of the rights and obligations of taxpayers and tax authorities is carried out. Harmonization of tax relations will contribute to the improvement of tax culture and the setting of "correct" priorities in doing business, the desire to comply with the criteria for optimizing the taxation of the subject established by law. With the help of tax policy, tax harmonization is carried out in all its directions. First of all, in order to build an effective tax system, a balanced tax policy of the state is carried out, which in the long term should orient the tax system to establish an optimal level of the real tax burden on economic entities while simultaneously observing the fiscal interests of the state. In addition, tax policy in this direction of harmonization of tax relations should be focused on eliminating the heterogeneity of the economic development of individual industries and types of economic activity in terms of the income they receive. Ensuring equality of rights, obligations and responsibilities of taxpayers and the state is achieved by pursuing a tax policy aimed at observing the mandatory relationship between the legislatively established powers and obligations of tax parties, as well as generally accepted principles of taxation. Also, one of the areas of the tax policy activities is to reduce the tax burden in order to stimulate the development of the real sector of the economy. Tax classification is of great importance in the implementation of these tasks, since it allows us to predict situations with changes introduced

in a particular group of tax payments.

When establishing the ratio of direct and indirect taxes in the tax system, a scientific approach should be used, and the principle of fairness should be implemented to a greater extent. As the practice of foreign taxation experience and research in this area shows, the value of this indicator in different countries depends on their level of economic development. In highly developed countries, tax systems have been formed in which direct taxes are of the greatest importance. In countries with an unstable economy, indirect taxes occupy a leading position. One of the areas of support for economic entities within the framework of tax policy may be the provision of benefits or the removal of real estate from taxation. These measures will reduce the tax burden and direct the released financial resources to reinvest in the development of production and the competitiveness of goods.

Changes in the tax system directly affect the financial resources of the state, namely the formation of tax revenues of budgets at all levels. In order to plan state revenues and expenditures, budgets for the planning period are approved at all levels of the budget system.

Activities in the field of tax policy include both direct reduction of the tax burden and the use of indirect mechanisms of the regulatory function of taxation. The main areas of tax policy can be identified:

- implementation of measures to ensure the growth of tax returns from economic entities of the region and the completeness of accounting of taxable items;
- continuation of the practice of coordinated actions of state authorities of the region with federal government bodies in terms of monitoring compliance with tax legislation, strengthening payment discipline and reducing arrears in payments to the budget;
- improvement of tax administration, updating of databases, reduction of arrears in regional and local taxes.

Effective implementation of the state tax policy should take into account all factors of the political and socio-economic sphere. The main areas of tax policy for the planning period are the priority area is further improving the efficiency of the tax system. All efforts should be made to generate revenues for the budget system in the context of falling prices for natural resources on the international market. In these conditions, a more detailed analysis of the formation of tax revenues for the country's budget system will contribute to solving the tasks set.

Increasing the efficiency of using the territory's tax potential

The level of the region's and municipalities' tax potential is influenced by many different factors. The article shows the need for a new approach to organizing budget expenditures, the inevitability of decentralization, the need for a radical reform of the tax system, without which a further increase in expenditures will lead to an increase in the tax burden and a decrease in economic activity. Interest in the problems of increasing the efficiency of using the tax potential by subjects and municipalities is due to the practical task of forecasting the receipt of financial resources, with the help of which the expenditure obligations of the budgets of the corresponding levels of administrative authority will be ensured. On the other hand, it is important to take into account that fiscal policy has a direct impact on the activity of the economic development process. In this regard, the problem of developing such solutions becomes obvious, which, on the one hand, will allow the budget to be filled as efficiently as possible, and on the other hand, will help stimulate economic activity.

We can express the modeling of tax potential by regions (real tax collection capacity) as follows:

$$R_i = \alpha \cdot GDP_i + \beta \cdot I_i + \gamma \cdot (1 - U_i) \cdot C_i$$

- α — GDP impact coefficient on tax potential
- β — impact of investments on tax potential
- γ — impact of employment and consumption on tax potential

Then, tax revenues can be predicted by adjusting the region's real tax rate (t_i):

$$TR_i = t_i \cdot R_i$$

This model shows that by adjusting tax rates, it is possible to both increase tax revenues and maintain socio-economic stability.

The level of tax potential of a region and municipal entities is influenced by many different factors. The most important is the production potential of the territory, expressed by the results of economic activity of business entities and prospects for their increase. (*Onofrei, M., Oprea, F.,2022*) It is this factor that ultimately directly and indirectly determines many other factors that influence the tax potential of the territory: the amount of taxable profit, the volume of income of individuals, the added value created in the production process, the value of property, the use of certain natural resources, etc. (*Kamasa, K., 2025*) The concentration of tax potential largely occurs at the municipal level - in the largest municipal entities (cities and urban districts). This is explained by the fact that it is in cities that the bulk of sources of taxes and fees are located. Consequently, the level of socio-economic development of the territory directly affects the level of tax potential, from which it can be concluded that at present we can expect a significant differentiation of various parts of the single economic space of the country in the level of tax potential. Meanwhile, it is important to note that the steps taken to change the tax policy must have a serious economic justification. They must pursue not only political aspects, but also simultaneously stimulate both the overall development of a single economic space of the country and the strengthening of the competitiveness of individual regions and municipalities, ensuring the implementation of a comprehensive policy of economic modernization. It is important to understand that different taxes have different effects on economic development. For example, taxes on wages, value added, and profit suppress economic activity to a much greater extent than taxes on natural resources, excess real estate, luxury goods, overconsumption, and consumption of harmful products.

The transfer of tax powers to the regional and local levels should contribute to the launch of real changes in state fiscal policy. In particular, these are changes in the principles of redistribution of state budget revenues in favor of lagging regions and the reduction of subsidies - an ineffective mechanism that does not have a real impact on stimulating the economic development of regions and municipalities. Thus, a number of facts are now becoming obvious:

- the inevitability of decentralization;
- the need for a radical reform of the tax system, without which a further increase in expenditure will lead to an increase in the tax burden and a decrease in economic activity;
- the need to implement new approaches to organizing budget expenditures.

Currently, there are no effective incentives for growth of regional budget revenues, which leads to the emergence of a large number of chronically subsidized territories. Budget equalization through subsidies and grants creates a dependent mood in regional authorities and does not contribute to the development of their economic initiative. In essence, the principle of functioning of financial circulations within the budget, their objective connection with the sphere of production of goods and services is ignored. Therefore, there is a need to study the mechanism of formation of tax revenues of regional budgets in order to identify opportunities to increase the level of own revenues of regions.

Conclusion

The implementation of the correct budget policy can lead to an increase in budget revenues and a decrease in budget expenditures. To achieve a positive balance, a number of reforms and programs should be prepared within the links of the budget system. Macroeconomic indicators guiding budget policy reflect the achievement of faster economic growth, the identification of additional sources of budget revenues, an increase in the direct participation and influence of the budget, strengthening financial discipline and ensuring transparency, reducing poverty, improving the use of targeted social assistance and creating financial conditions for the development of entrepreneurship and regions. One of the main goals in budget policy is to improve the material well-being of the population, increase income and employment, transform the state budget into the main financial source and economic instrument for managing the economy and stimulating its dynamic development.

One of the primary steps taken to increase the budget volume and improve the budget process

in general is to strengthen control over budget expenditures. Because the lack of proper control over budget expenditures can cause an increase in corruption opportunities, the legalization of a large volume of unearned income, and even greater monopolization. As a result, the revenues of the state budget will decrease, and in general the economic entity called the budget process will begin to have a formal character. Thus, in order to achieve progressive movements in the development of our economy, the development of effective mechanisms for the implementation of the listed tasks in the field of fiscal management is of strategic importance. Carrying out the specified control will lead to the concentration of state revenues in the state budget, and this in turn will lead to a reduction in poverty, continuation of structural reforms in the economy, an increase in budget revenues, ensuring the social and investment focus of budget expenditures, transparency and effective management of expenditures. And in the future, the implementation of a successful budget policy will ultimately have a significant positive effect on the development of the state from an economic point of view.

Finally, we have the following recommendations:
- Forecasting should be strengthened with regional tax capacity models.
- Strict limits on the budget deficit should be applied.
- Result-oriented measurement indicators for expenditures should be developed.
- Dynamic models should be applied to optimize tax rates

In conclusion, mathematical models show that fiscal multipliers have a significant impact on economic growth. Also, the application of multi-factor models is required to calculate regional tax potential. At the same time, international experience confirms that strict fiscal rules increase resilience.

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Analysis of Foreign Direct Investments in Azerbaijan and Directions for Improving the Legal Attraction Mechanism in Local Self-Government Bodies

Abstract

This paper provides a comprehensive analysis of foreign direct investment (FDI) in Azerbaijan and explores avenues for enhancing the legal mechanisms employed by local self-governance bodies to attract such investments. The study underscores the theoretical and practical significance of fostering a more developed investment climate and improving the efficiency of local governance systems. Given the critical role of investments in economic development, the creation of a favorable legal environment by local governance bodies is deemed essential for attracting and protecting foreign investments. The article examines the existing legal framework in Azerbaijan, identifies challenges hindering the development of the investment climate, and outlines actionable steps for local self-governance bodies in this domain. Additionally, it analyzes key economic indicators influencing the investment environment, including import volumes, export volumes to foreign countries, industrial output (goods, works, and services), GDP, and the consumer price index. The research methodology employs econometric techniques, including the Augmented Dickey-Fuller (ADF) test, Fully Modified Ordinary Least Squares (FMOLS) estimator, and Johansen Cointegration test, to investigate the interrelationships among these economic indicators.

Keywords: Foreign Direct Investment, Azerbaijani Economy, Local Self-Government, Legal Attraction Mechanism, Municipality.

Introduction

Azerbaijan stands out as a key factor in attracting direct foreign investments for the sustainable and rapid advancement of economic development. In this article, the important role played by local self-government bodies in improving the investment environment and their effective activities in terms of ensuring long-term economic perspectives are at the center of attention. Research indicates that local self-government bodies enhance the effectiveness of the investment environment by creating favorable conditions for businesses, such as simplifying administrative processes, reducing bureaucracy, and implementing initiatives like the "single window" system, which facilitate the start and management of businesses, potentially increasing import volumes and exports to foreign countries. Additionally, incentives such as tax breaks, grants, and infrastructure investments can

attract investments to key sectors, positively impacting the volume of industrial output (works, services), GDP, and overall economic activity. Maintaining the consumer price index stable and facilitating market access in the investment environment manifests as a significant component of economic performance. The growing role of local governments is of strategic importance for developing the investment environment and ensuring sustainable economic success. Their deep understanding of regional dynamics and resources facilitates the adaptation of policies to local needs for optimizing import and export volumes and increasing industrial output. Additionally, through community participation and the promotion of social cohesion, local governments can contribute to GDP growth and the stabilization of the consumer price index. This participatory approach can drive innovative solutions, enhancing both community well-being and economic indicators, including industrial output and GDP.

The primary objective of the article is to ensure the protection of investors' rights and the stabilization of the investment environment by improving legal attraction mechanisms. Alongside the analysis of the current state of direct foreign investments in Azerbaijan, changes in import and export volumes, industrial output, GDP, and the consumer price index, the directions for developing legal mechanisms within local self-government bodies are at the core of the research. Improving legal attraction mechanisms can create positive changes in import-export volumes and GDP by providing investors with a reliable environment, particularly when supported by addressing gaps in legislation.

Literature review

Kumari and others (2023), in their empirical analysis covering the Indian economy from 1980 to 2019, identified positive long-term relationships between FDI, trade openness, and economic growth using ARDL models. While FDI and trade openness are key drivers of economic growth, negative effects were observed among some variables in the short term, recommending that policymakers undertake structured reforms. The analysis results highlight that trade openness positively impacts FDI, economic growth creates a causal relationship toward FDI, and the synergy of these three factors strengthens the global integration of the Indian economy. The study provides practical policy recommendations to enhance FDI attraction through infrastructure development, the rule of law, and the improvement of international trade agreements. Consequently, the coordinated and planned development of these factors plays a key role in ensuring the sustainable and continuous growth of the Indian economy.

Hübner (2011) emphasizes that FDI is a key driver of economic development in South Caucasus countries, while geopolitical conflicts and economic dependencies in the region limit investment attractiveness. According to the 2011 economic analysis, FDI in Azerbaijan is primarily directed toward the oil sector (88%), which has led to high economic growth, but limited investment in non-oil sectors complicates economic diversification and creates long-term risks. In Georgia, FDI peaked in 2007 (2.15 billion USD) but sharply declined due to the global crisis and the 2008 war, with the government attempting to develop sectors like energy and agriculture through reforms. The region's investment climate is rated as average in international rankings (Georgia performs best, while Azerbaijan lags due to infrastructure issues), highlighting the need to improve FDI quality through reforms.

Qaracayev (2022) indicated in his research that municipalities in the Republic of Azerbaijan constitute the second level of public authority and represent a new form of governance established after independence. There are significant gaps in the national municipal legislation, particularly the lack of a balanced concept regarding the administrative oversight of the powers delegated to local self-government bodies. This gap can be addressed by adopting the draft law "On the Report of the Municipality," which is a short but crucial step toward developing local self-governance in line with European standards. The adoption of the law will also lead to other positive effects, such as improving the protection of social rights at the local level.

Huseynov (2023) emphasized in his research that local self-governance is a crucial political institution stemming from the people's authority, ensuring the state's political stability and democratic

development by connecting the state and society. Its powers and activities are shaped by the country's historical, geographical, demographic, and legal characteristics, while state authority serves as a framework for its functionality. The effectiveness of local self-governance is enhanced by the application of governance technologies and the preservation of autonomy between central and local levels. In the context of Azerbaijan, the reform and study of this institution offer significant perspectives for political science and practical governance.

Çütçü and Kan (2018) demonstrate through their empirical analyses that factors such as inflation and labor costs negatively impact foreign investment inflows, while a high level of per capita income has a positive effect. The existence of sustained long-term relationships underscores the necessity of formulating effective macroeconomic policies. For countries like Türkiye, prioritizing FDI over external debt or short-term financial inflows is crucial for sustainable capital accumulation and long-term economic growth.

Özdamar (2016) notes in his research that the analysis of Türkiye's economic data from 1981 to 2014 shows that both income levels and nominal exchange rates positively affect FDI, although the statistical significance of income variables is lacking. Using the Johansen cointegration methodology alongside the vector error correction model, the analysis confirms the existence of a long-term equilibrium relationship among the variables and demonstrates that any short-term deviations from this equilibrium are quickly corrected. The results indicate that foreign investments are primarily market-oriented and emphasize the importance of maintaining economic stability for sustained investment inflows. Additionally, the analyses show that currency compression policies can negatively impact investment levels.

Theoretical and conceptual framework

A local self-government body can be defined as an administrative entity tasked with managing state affairs and providing essential services to residents within its jurisdiction. These bodies may exhibit significant diversity in their functional duties and areas of authority, depending on the country's governance structure. The provision of relevant services by local self-government institutions implies the implementation of powers delegated to public service organizations through decentralization (Sambor, 2024, p.87). It can be considered that the changes observed in the functional activities of local self-governance in the modern era, resulting from the increasing demands and needs related to governance, lead to the integration of innovative technological applications into the management process. This process necessitates the use of technology to enhance the effectiveness of local self-governance bodies and to meet contemporary needs. As a result, this integration ensures transparency, acceleration, and accuracy of data in governance, facilitating the delivery of services tailored to the community's needs.

The functions of local self-government are classified into two main groups according to Lorenz Stein, considered the founder of the "Statehood" theory: natural functions and delegated functions. These arise from the independence of local self-government and encompass the implementation of locally significant services, as well as functions delegated by the state and bearing a public character. Representatives of this theory emphasize that natural functions embody the right of local communities to self-government, whereas functions delegated by the state play a crucial role in realizing public interests in accordance with the state's overall strategy. As a result, these two groups of functions reflect both the independent and the state-integrated level of activity of local self-government, thereby creating a balance between the community and the state (Fərman, 2024, p. 33). In our opinion, these functions should be further developed by taking a new direction in the modern era.

Local self-government delineates boundaries and responsibilities in matters such as delegation of authority, budget management, oversight, and mechanisms for citizen participation (KOLAY, 2024, p. 15). In this regard, a strong legal framework is essential for properly regulating the functions and relations between local self-government bodies and the central government. The legal mechanisms in the organization of local self-government encompass the following elements: the determination of the powers of local self-government bodies, the management of financial provision

and budget funds, as well as the promotion of local population participation and the protection of their rights. Through these mechanisms, the effectiveness of local governance is enhanced, and mutual relations with central authorities are appropriately regulated.

In Azerbaijan, local self-government constitutes an important part of the country's governance framework. Their activities are regulated by a comprehensive legal system encompassing specific powers, duties, and principles. The foundations of the legal regulation mechanism of local self-government in Azerbaijan are presented in the table below:

Legal basis	Content	Source
Constitution of the Republic of Azerbaijan	Chapter IV of the Constitution is titled "Local Self-Government" and, in Chapter IX, defines the status, formation principles, powers, and responsibilities of municipalities before the state. The independence of municipalities and their right to independently resolve matters of local importance are established.	https://president.az/az/pages/view/azerbaijan/constitution#section_4
Law of the Republic of Azerbaijan "On the Status of Municipalities"	Provisions regarding the formation and dissolution of municipalities, their powers, management structure, and the election processes for municipal representatives are reflected. This demonstrates that municipalities possess broad powers to resolve matters of local importance.	https://www.justice.gov.az/categories/640
Law of the Republic of Azerbaijan "On Management of Municipal Lands"	This regulates the management, use, and disposal of lands belonging to municipal bodies. This process is an important component of creating economic activities and revenues for municipalities.	https://abma.gov.az/az/qanunlar
Law of the Republic of Azerbaijan "On the Fundamentals of Financial Activities of Municipalities"	This regulates the formation and execution of municipal budgets, the imposition of local taxes and fees, transfers from the state budget, and other financial matters. It is one of the primary mechanisms ensuring the financial independence of municipalities.	https://www.justice.gov.az/categories/640
Other legislative acts	Laws regulating other areas related to the activities of municipalities (the Law "On Local Taxes and Payments," the Law "On Municipal Service"), presidential decrees, decisions of the Cabinet of Ministers, and other normative legal acts complement the legal mechanisms of municipalities.	https://taxes.gov.az/az/post/303 https://republic.preslib.az/az_d4-71.html

Table 1. Fundamentals of the legal regulatory mechanism of local self-government in Azerbaijan
Source: The table data has been prepared by the author with reference to the relevant official legal electronic databases.

By the authority mechanisms of municipalities, it is understood the legislative and organizational structures that ensure more active participation of municipalities in local governance and decision-making processes. Through these mechanisms, municipalities are able to provide more efficient and transparent services in accordance with the needs and priorities of the local population. As a result, the effectiveness of local governance increases and public satisfaction rises. The specific features of the main authority mechanisms of municipalities are presented as follows.

Local self-government bodies have the opportunity to take necessary steps to ensure the socio-economic development of their territory within the framework of their legal powers. These steps can be directed towards strengthening the local economy, improving infrastructure, and enhancing the welfare of the population. For this purpose, attracting investments is of great importance in increasing the capabilities of local self-government bodies. In particular, since foreign direct investments have a significant impact on regional development, creating more favorable conditions for their attraction is essential. Foreign Direct Investment (FDI) is an international investment form in which an economic entity recognized as a direct investor or parent company from one country acquires a significant and lasting interest in an enterprise located in another country (Cole, 2017, p. 467). In local self-governments,

this interest also aims to participate in the management of the enterprise or to exercise control over it.

- In accordance with the legislation, municipalities impose local taxes and fees, and this expands the sources of income for them..

Imposition of local taxes and fees

- Municipalities actively participate in the organization (for example, waste collection, water supply, road maintenance, landscaping) and management of social services of local importance.

Organization of social services

- The preparation, approval and management of budgets in their regions are among the main indicators of the financial independence of municipalities.

Preparation, approval and management of local budgets

- Municipalities make decisions on their own authority and areas of activity, and these decisions are binding on local issues and may require investment.

Decision-making mechanism

- They can manage, use and dispose of land, infrastructure facilities and other assets in their ownership; they need various resources for the attraction of investments.

Management of municipal property

- They direct and provide programs aimed at the socio-economic development of their regions, and these programs play a key role as a platform for investment planning and implementation.

Ensuring local socio-economic development programs

Figure 1. Main power mechanisms of municipalities
Source. Prepared by the author

FDI refers to the expenditures made by a corporation or individual from one country to create or acquire business assets and interests in a different country (Kanval et al., 2024, p. 51). This investment serves to expand economic ties by creating lasting interest and influence in the management of a business in a foreign country. FDI plays a crucial role in meeting capital requirements, promoting economic development, and facilitating technological progress in developing countries. This role is particularly linked to bolstering economic budgets and the innovative application of technology in developing countries, which helps sustain the local economy. FDI plays an important role in promoting economic development and eliminating capital shortages in developing countries. As a result, FDI contributes to increasing countries' financial resources and ensuring economic stability, thereby creating a positive impact for long-term economic growth and sustainable development.

Current status of FDI in Azerbaijan

From a strategic perspective, FDI plays a crucial role in the economic development of Azerbaijan, located at the crossroads of Eastern Europe and Western Asia. Over the past few decades, Azerbaijan has achieved significant success in attracting foreign investments, particularly in the oil and gas sector, which forms the backbone of its economy. The foundation of FDI in Azerbaijan was laid after the country gained independence from the Soviet Union in 1991. The government recognized the necessity of attracting foreign capital to stimulate economic growth and modernization. Between 1991 and 1994, major international companies such as BP, McDermott, LukOil, and Exxon became pivotal milestones in Azerbaijan's economic landscape and contributed to the development of the energy sector.

In 2023, Azerbaijan attracted a total of approximately 6.658 billion US dollars in Foreign Direct Investment (FDI), which rose to approximately 7.046 billion US dollars in 2024. This represents an approximate 6% increase in FDI inflows over the two years. Such an upward trend signals a positive trajectory in the country's economic development and underscores the sustained interest of foreign investors. The analysis of FDI distribution by country reveals the prominent participation of the United Kingdom, Türkiye, and other European countries dominating the investment landscape. Specifically, the

United Kingdom remained the leading investor by contributing 1.857 billion US dollars in 2023 (constituting 27.9% of total FDI) and slightly decreased to 1.749 billion US dollars (24.8%) in 2024, observing a 3.1 percentage point decline in market share. Türkiye invested 1.302 billion US dollars (19.5%) in 2023, dropping to 1.219 billion US dollars (17.3%) in 2024, reflecting a 2.2 percentage point reduction, yet maintaining its position among the top investing countries. In 2023, Hungary held third place with an investment volume of 197.452 million US dollars, but in 2024, it dropped to fourth position with 101.648 million US dollars (1.4%), constituting 3.0%. This change reflects a 1.6 percentage point decrease in market share and a significant reduction in investment volume. Cyprus, which was in fourth place in 2023 with 791.594 million US dollars (11.9%), rose to third place in 2024 with 746.789 million US dollars (10.6%). This transition indicates a marginal 1.3 percentage point decrease in market share alongside a relatively modest 5.7% reduction in investment volume. The United Arab Emirates maintained fifth place in both years with an investment volume of 318.967 million US dollars (4.8%) in 2023, increasing its market share by 2.2 percentage points to reach 490.156 million US dollars (7.0%) in 2024. Conversely, the Islamic Republic of Iran fell from sixth position in 2023 with 395.983 million US dollars (5.9%) in investments to seventh place in 2024 with 271.487 million US dollars (3.8%). This shift is characterized by a 2.1 percentage point decline in market share and a substantial 31.4% decrease in overall investment volume. In 2023, the Russian Federation rose from seventh to eighth place with an investment volume of approximately 677.24 million US dollars, accounting for 10.2% of total investments. However, by 2024, its share decreased significantly by 6.9 percentage points, dropping to approximately 234.48 million US dollars or 3.3%, marking one of the most notable declines during this period. The United States maintained its ninth position in 2023 with approximately 171.91 million US dollars (2.6%) in investments, decreasing to approximately 149.83 million US dollars (2.1%) in 2024, experiencing a 0.5 percentage point reduction. This represents a relative decrease of 12.7%. Norway, which was in tenth place in 2023 with approximately 152.22 million US dollars (2.3%), saw its share decrease by 0.4 percentage points in 2024, reaching approximately 136.74 million US dollars (1.9%), and reducing its investment volume by about 10.1%. Overall, although European countries such as the United Kingdom and Türkiye remained the primary sources of FDI inflows in 2023–2024, the decline in some shares despite the overall volume increase reflects changes in interregional investment dynamics and the potential influence of geopolitical factors.

Legal provisions for attracting investments in local self-government bodies

Local self-government is established with the aims of ensuring citizens' welfare, protecting their interests, upholding democratic principles, and implementing effective governance at the local level. The provisions of legal attraction, in particular, play a crucial role in fulfilling the administrative duties of local self-government and promoting citizen participation, thereby serving to make the activities of these bodies transparent and accountable. Within the framework of legal attraction provisions, mechanisms such as incentive programs and tax concessions developed by local self-government bodies play an important role. These initiatives offer potential investors efficient cooperation opportunities and make the business environment attractive. At the same time, initiatives such as strengthening local infrastructure and developing communication networks create essential conditions for attracting investments. These initiatives enhance the appeal for the concentration of entrepreneurial activities, thereby drawing the attention of foreign investors and contributing to the improvement of the investment environment. A key factor in local investment policy is the transparency and stability of the existing legislative system. Providing investors with a reliable and predictable legal environment creates conditions for reducing their risks and developing long-term strategies. The updating of laws, the support of the executive authority, and the protection of local property rights occupy one of the primary places in the process of attracting investments.

The table below summarizes the main elements of the legal attraction mechanism in local self-government bodies, their legal bases, implementing institutions, and outcomes.

Areas of application	Legal basis	Implementing party	Target achievement
Lease or sale of municipal property	Law on the Fundamentals of Municipal Finance	Municipalities	Increasing interest of local and foreign investors through transparent auctions
Public-private partnership (PPP)	Law of the Republic of Azerbaijan on Public-Private Partnership	Municipalities and various institutions	Infrastructure, utilities, and farm project implementation
Municipal bonds and financial instruments	Decision of the Cabinet of Ministers of the Republic of Azerbaijan on the Approval of the "Rules for the Issuance and Circulation of State and Municipal Securities"	Municipalities	Optimization of financial resources and financing of long-term investment projects
Property and land relations	Land Code, Civil Code	Municipalities	Protecting investors' rights and creating transparent ownership relationships
Investment contracts	Civil Code, Principles of contract law	Municipalities and various institutions	Facilitate and encourage investor activity
Tax benefits	Law of the Republic of Azerbaijan on Municipal Taxes and Payments	Municipalities	Attracting local and foreign investors and stimulating economic activity by reducing tax burdens

Table 2. Elements of the legal mechanism for attracting investments in municipalities
Source. Compiled from the Law of the Republic of Azerbaijan on the Fundamentals of Municipal Finance; Law on Public-Private Partnership; relevant Decisions of the Cabinet of Ministers; Civil Code of the Republic of Azerbaijan; Land Code of the Republic of Azerbaijan; and the Law on Local (Municipal) Taxes and Fees.

The areas of application of the legal attraction mechanism for investments by municipalities create an important platform for meeting the economic and social needs of the local community. This platform functions as a guarantor of the strategies of municipalities aimed at improving the living conditions and economic welfare of local residents. These areas ensure the creation of an attractive and legally secure environment for investors by effectively utilizing the powers granted to municipalities by the state. The effective use of these powers establishes a vital foundation for attracting the interests of foreign and local investors by enhancing the transparency and reliability of the investment environment. Areas such as the development of infrastructure and communal services enable municipalities to make extensive use of the PPP model when attracting investments. The PPP model ensures the sustainable development of infrastructure by synthesizing state resources of municipalities with the innovative technologies of the private sector. The optimization of financial resources and the accountable management of investments facilitate the implementation of long-term economic projects by strengthening cooperation between municipalities and investors. This optimization process enhances the financial management capabilities of municipalities by aligning investment resources with strategic planning. Furthermore, the improvement of legal safeguards in the investment attraction process by municipalities emerges as a crucial factor supporting citizens' participation in economic activities and the activation of the investment environment. The enhancement of legal safeguards serves to create a synergy effect between the community and municipalities by strengthening citizens' trust in investment processes.

Econometric analysis

Data set

This research analyzes data covering the years 2000–2024 within the framework of statistical information pertaining to the Republic of Azerbaijan. The examined data were obtained from the databases of the State Statistical Committee of Azerbaijan, the Central Bank of the Republic of Azerbaijan, and the World Bank. The test procedures specified in detail below were implemented for the econometric analysis.

Abbreviation	Description
İBC	Imports by country (mln.dollars)
EBC	Exports by country (mln.dollars)
FDİ	Foreign direct investment, net inflows (mln.dollars)
VIO	Volume of industrial output (works, services), at actual prices, million dollars
GPD	GPD (mln.dollars)
CPİ	Consumer price index

Table 3. Abbreviated description of variables
Source: Prepared by the author.

Econometric methodology

The main model used in the analytical part of the study was constructed to assess the dependence of FDI on various economic indicators. Analytical procedures were conducted using the EViews 10 software package. Specifically, the effect of the following variables on FDI (FDI_t) is examined: fixed component (β_0), imports by country (IBC_t), imports by country (EBC_t), industrial output (VIO_t), that is, the volume of works and services in real prices, GPD (GPD_t) and the consumer price index (CPI_t). This relationship is represented in the following form:

$$FDI_t = \beta_0 + \beta_1 IBC_t + \beta_2 EBC_t + \beta_3 VIO_t + \beta_4 GPD_t + \beta_5 CPI_t$$

Each β coefficient reflects the impact of the corresponding variable on FDI, which allows for a precise assessment of the role of each factor within the model's analytical framework. All statistical analyses conducted in this study were carried out using the EViews 10 software package.

ADF test

The Unit Root test was originally developed by D.A. Dickey and W.A. Fuller and is often referred to as the Dickey-Fuller unit root test. This test assumes that the residuals have a mean of zero and constant variance, and that the residuals are uncorrelated (no autocorrelation). However, in many cases, residuals are correlated with each other or contain elements of autocorrelation. For this reason, the unit root test is not suitable for data with autocorrelation in the residuals, and additional measures must be taken. To address this issue, the Augmented Dickey-Fuller (ADF) test was developed. This test more accurately determines the presence of a unit root in non-stationary time series by accounting for autocorrelation in the residuals (Roza, 2022, p. 108). The table below presents the results of the ADF test and is used to check the stationarity (stability) of the time series. The table provides the test results for the variables logFDI, logEBC, logIBC, logVIO, logGPD, and logCPI.

Level	Model	Variables	ADF t-Statistic	Prob	Level	Variables	ADF t-Statistic	Prob
At Level	With Constant	logFDI	-4.1617	0.0038	**At First Difference**	logFDI	-4.5625	0.0017
		logEBC	-2.2227	0.2049		logEBC	-2.3746	0.1607
		logIBC	-2.073	0.2564		logIBC	-7.1992	0.0000
		logVIO	-2.8024	0.0749		logVIO	-3.1958	0.0334
		logGPD	-1.7488	0.3953		logGPD	-3.4379	0.0200
		logCPI	-2.3049	0.1785		logCPI	-4.007	0.0056
	With Constant & Trend	logFDI	-3.8491	0.0312		logFDI	-4.3272	0.0126
		logEBC	-2.6835	0.2524		logEBC	-1.9599	0.5867
		logIBC	-2.4097	0.3657		logIBC	-7.2517	0.0000
		logVIO	-1.0527	0.9166		logVIO	-3.5061	0.0624
		logGPD	-1.2102	0.8853		logGPD	-3.6844	0.0443
		logCPI	-2.3857	0.3769		logCPI	-4.1586	0.0171

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant

*MacKinnon (1996) one-sided p-values.

Table 4. ADF test between variables

Source. *This Result is The Out-Put of Program Has Developed By: Dr. Imadeddin AlMosabbeh, College of Business and Economics, Qassim University-KSA*

This analysis covers the results of the ADF unit root tests conducted to assess the stationarity properties of the time series. The variables under study (logFDI, logEBC, logIBC, logVIO, logGPD, logCPI) were examined both in level form ("At Level") and in first difference form ("At First Difference"). The tests were performed under two models: a model with a constant term ("With Constant") and a model including both a constant and a trend term ("With Constant & Trend"). Stationarity assessment was based on t-statistics and probability values (Prob); typically, the null hypothesis (presence of a unit root, i.e., the

series is non-stationary) is rejected at Prob < 0.05. The results are presented below in a structured format.

1. **Stationarity Results at Level Form ("At Level"):**

The stationarity properties of the variables were examined in their level form. At this stage, the original values of the series were used.

Model: With Constant
logFDI: t-statistic = -4.1617, Prob = 0.0038 (stationary, since Prob < 0.05).
logEBC: Prob = 0.2049 (non-stationary).
logIBC: Prob = 0.2564 (non-stationary).
logVIO: Prob = 0.0749 (partially stationary; rejectable at 10% significance level, but not at 5%).
logGPD: Prob = 0.3953 (non-stationary).
logCPI: Prob = 0.1785 (non-stationary).

Model: With Constant & Trend
logFDI: Prob = 0.0312 (stationary).

Other variables (logEBC, logIBC, logVIO, logGPD, logCPI): Prob > 0.05 (non-stationary). As a result, in level form, only the logFDI variable demonstrates stationarity in both models. The remaining variables exhibit unit root characteristics and are non-stationary.

2. Stationarity Results at First Difference Form ("At First Difference")

The stationarity properties of the variables were examined in first difference form. At this stage, the first-order differences of the series (ΔlogX) were used.
Model: With Constant
logFDI: Prob = 0.0017 (stationary).
logEBC: Prob = 0.1607 (non-stationary).
logIBC: Prob = 0.0000 (stationary).
logVIO: Prob = 0.0350 (stationary).
logGPD: Prob = 0.0206 (stationary).
logCPI: Prob = 0.0171 (stationary).
Model: With Constant & Trend
logFDI: Prob = 0.0160 (stationary).
logEBC: Prob = 0.0867 (partially stationary; rejectable at 10% significance level).
logIBC: Prob = 0.0004 (stationary).
logVIO: Prob = 0.0024 (stationary).
logGPD: Prob = 0.0443 (stationary).
logCPI: Prob = 0.0171 (stationary).

At this stage, most variables exhibit stationarity, with the exception of logEBC (which shows only partial stationarity). Based on the ADF test results, the logFDI variable is not integrated in level form (I(0)), meaning it is already stationary in its original form. The remaining variables (logEBC, logIBC, logVIO, logGPD, logCPI) are non-stationary in level form but become stationary in first difference form, indicating that they are integrated of order one (I(1)). This level of integration is crucial for modeling the long-term dynamics of the series and lays the foundation for potential cointegration analyses.

The above results are significant in explaining the economic dynamics of the variables under study. Specifically, it can be noted that the influence of other variables on foreign direct investment may possess long-term equilibrium relationships, and long-term interconnections may exist among these factors.

Johansen Cointegration test
The Johansen cointegration analysis proposes estimators to determine cointegration coefficients

using two reduced-rank regressions for I(2) variables in Vector Autoregression (VAR) models (Johansen, 1995, p. 25). In other words, the Johansen cointegration test is an econometric method used to determine whether long-term equilibrium relationships (cointegration) exist among multiple time series. This test, particularly within the framework of VAR models, examines whether variables that are non-stationary can move together to form a stable relationship. The results of the cointegration test among the variables used in the study are as follows:

Sample (adjusted): 2002 2024							
Included observations: 23 after adjustments							
Trend assumption: Linear deterministic trend							
Series: LOGFDI LOGCPI LOGEBC LOGGPD LOGIBC LOGVIO							
Lags interval (in first differences): 1 to 1							
		Unrestricted Cointegration Rank Test (Trace)			Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
Hypothesized		Trace	0.05		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	Statistic	Critical Value	Prob.**
None *	0.980431	197.8898	95.75366	0.0000	90.47730	40.07757	0.0000
At most 1 *	0.855587	107.4125	69.81889	0.0000	44.50676	33.87687	0.0019
At most 2 *	0.705664	62.90569	47.85613	0.0011	28.12979	27.58434	0.0426
At most 3 *	0.641030	34.77590	29.79707	0.0123	23.56387	21.13162	0.0223
At most 4	0.292506	11.21203	15.49471	.1988	7.958593	14.26460	0.3829
At most 5	0.131905	3.253439	3.841466	.0713	3.253439	3.841466	0.0713
		Trace test indicates 4 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values			Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values		

Table 5. Johansen Cointegration test between variables
Source. *Prepared by the author using the EViews 10 software package*

The Johansen Cointegration test in the table shows that the LOGFDI, LOGCPI, LOGEBC, LOGGPD, LOGIBC, and LOGVIO series were analyzed based on 23 variables for the years 2002–2024. The test evaluates the probability of 4 cointegrating relations with a lag interval of 1 (in first differences). The results of the Unrestricted Cointegration Rank Test (Trace) and Maximum Eigenvalue tests confirm, based on the rejection of hypotheses (at the 0.05 level), the presence of 4 cointegration coefficients. This indicates the existence of a long-term equilibrium relationship among the selected economic indicators.

FMOLS test
Fully Modified Ordinary Least Squares (FMOLS), developed by Pedroni, is a residual-based estimation method that provides efficient results in small samples for the analysis of integrated variables while addressing issues such as endogeneity and serial correlation. Its primary objective is to estimate long-term relationships between variables, for example, identifying factors influencing electricity consumption in time series data (Merlin & Chen, 2021, p. 5–8). Overall, the FMOLS test is an advanced econometric methodology designed to assess the existence of long-term equilibrium relationships among non-stationary time series variables. The results of the FMOLS test among the variables are presented in Table 6.

Dependent Variable: LOGFDI				
Method: Fully Modified Least Squares (FMOLS)				
Sample (adjusted): 2001 2024				
Included observations: 24 after adjustments				
Cointegrating equation deterministics: C @TREND				
Long-run covariance estimate (Prewhitening with lags = 2 from AIC				
maxlags = 2, Tukey-Hamming kernel, Andrews bandwidth = 9.5017 (with offset=6))				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGPD	-0.605493	0.057272	-10.57218	0.0000
LOGCPI	0.784470	0.073317	10.69969	0.0000
LOGIBC	1.017791	0.099263	10.25344	0.0000
LOGEBC	-0.145743	0.041032	-3.551925	0.0023
C	9.426684	0.315478	29.88068	0.0000
@TREND	-0.040489	0.005480	-7.388514	0.0000
R-squared	0.575964	Mean dependent var		8.100863
Adjusted R-squared	0.458176	S.D. dependent var		0.715106
S.E. of regression	0.526380	Sum squared resid		4.987375
Long-run variance		0.004339		

Table 6. FMOLS test results

Source. *Prepared by the author using the EViews 10 software package.*

$$LOGFDIt = -0.6055 \cdot LOGGPDt + 0.7845 \cdot LOGCPIt + 1.0178 \cdot LOGIBCt - 0.1457 \cdot LOGEBCt + 9.4267 - 0.0405 \cdot TRENDt$$

The analysis described in Table 4 employs the FMOLS approach to assess the long-term cointegration relationship with the logarithmic foreign direct investment (LOGFDI) variable as the dependent variable. The model is based on 24 adjusted observations covering the years 2001–2024. The trend-input model was specified with two lagged terms selected according to the Akaike Information Criterion (AIC), using a Tukey-Hamming kernel with an Andrews bandwidth of 5.5017. The independent variables — LOGGPD, LOGCPI, LOGIBC,

LOGEBC, and trend were included in the analysis, demonstrating statistical significance (p-value = 0.000) as evidenced by their respective t-statistics. The model exhibits a moderate level of fit, as indicated by an adjusted R-squared value of 0.576964. The sum of squared residuals (0.004339) and standard error (0.715106) confirm the model's precision. These analysis results indicate the presence of stable and consistent relationships among the economic indicators under study.

Based on the model provided above, let us consider the relative change in LOGFDI with respect to LOGGPD. The coefficient of LOGGPD in the model is -0.605493341486, which indicates that a 1% increase in LOGGPD (with other variables held constant) results in an approximate -0.61% decrease in LOGFDI. This confirms that the relationship is negative (inverse) and calculated in accordance with elasticity. According to the model, when LOGIBC increases by 1% and other variables remain constant, the elasticity is approximately equal, meaning LOGFDI will increase by approximately 1.01779%. This suggests the presence of a directly proportional relationship.

In the given model, a 1 percentage point increase in LOGEBC, with other variables held constant, results in an approximate 0.1457% decrease in LOGFDI.

Conclusion

The following conclusions were obtained as a result of the research:

FDI is inversely proportional to GPD. In the case of an inverse proportionality between the volume of FDI and GDP, innovations such as financial support for local investors and strengthening education in local self-government can be proposed, which would ensure their adaptation to the external environment and the development of strategies supporting economic growth. Article 102 of the Tax Code of the Republic of Azerbaijan concerns exemptions and concessions from income tax. Subclause 123 of this article states that an individual entrepreneur who has received an investment

promotion document is exempt from taxes on 50% of the income obtained from the date of receiving the document for a period of 7 years. It can be proposed that the profitability period be reduced from 7 years to 5 years and the percentage rate be increased from 50% to 70%. These measures could significantly enhance the attractiveness of investments and the interest of investors.

FDI is directly proportional to the volume of products or services imported from foreign countries. Taking into account the direct proportionality between the activities of local self-government and the volume of products or services imported from foreign countries with FDI, municipalities can expand their economic policies in the direction of attracting foreign investments and encouraging the substitution of imported goods with local production. For this purpose, in addition to Article 15 of the Law of the Republic of Azerbaijan "On Public-Private Partnership" (on the economic development of municipalities), a mechanism for creating a special fund for joint projects with foreign investors within the PPP framework can be included, for example, subsidizing 10–15% of the municipal budget directed toward local infrastructure projects (road construction, communal services), which would facilitate the implementation of PPP models (e.g., BOT – Build-Operate-Transfer) with the participation of foreign companies and strengthen the integration of the local economy. Furthermore, by amending Article 22 (on municipal property and management), foreign investors could be granted the right to apply tax reductions for 5–10-year leases of municipal land and property; additionally, provisions on international cooperation could be added to Article 35, requiring the creation of an electronic platform for transparency in the process of municipalities concluding contracts with foreign investors.

FDI is inversely proportional to the volume of products or services exported to foreign countries. Local self-government bodies can balance this situation by directing their economic policies toward increasing local production and export potential. In this regard, providing subsidies to stimulate local production in various sectors, implementing modern technologies, and supporting innovative initiatives are of great importance. At the same time, creating appropriate infrastructure for the development of local production and improving education should be among the main priorities.

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The current state of Azerbaijan's financial security: threats and solutions

Abstract

This paper examines the financial security of the Republic of Azerbaijan, focusing on key indicators such as budgetary performance, banking sector stability, monetary policy, and external sector resilience. Using data from 2019 to 2025, the study evaluates fiscal sustainability, liquidity, capital adequacy, inflation, and external debt management. The analysis shows that Azerbaijan's financial system remains relatively stable, with manageable budget deficits, a resilient banking sector, and strong international reserves. Nonetheless, potential risks exist, including dependency on oil revenues, low foreign investment, and exposure to global economic fluctuations. The paper highlights policy measures aimed at enhancing fiscal sustainability, financial stability, and economic resilience, emphasizing the importance of strategic planning, monetary stability, and investment promotion to ensure long-term financial security.

Keywords: financial security, financial system, security criteria, budget deficit, monetization coefficient, inflation

Introduction

According to the Law of the Republic of Azerbaijan "On National Security" (as amended and supplemented on December 22, 2023), one of the main threats to ensuring the country's national security is the weakening of the state's financial system, that is, the emergence of threats to its financial security [1]. Financial security is an integral component of the country's economic security and ensures the protection of the financial system, which guarantees the state's integrity, independence, and sustainable development, against real and potential threats. Financial security is a complex system that encompasses a number of subsystems or segments, each of which has its own specific criteria and indicators (see Figure 1).
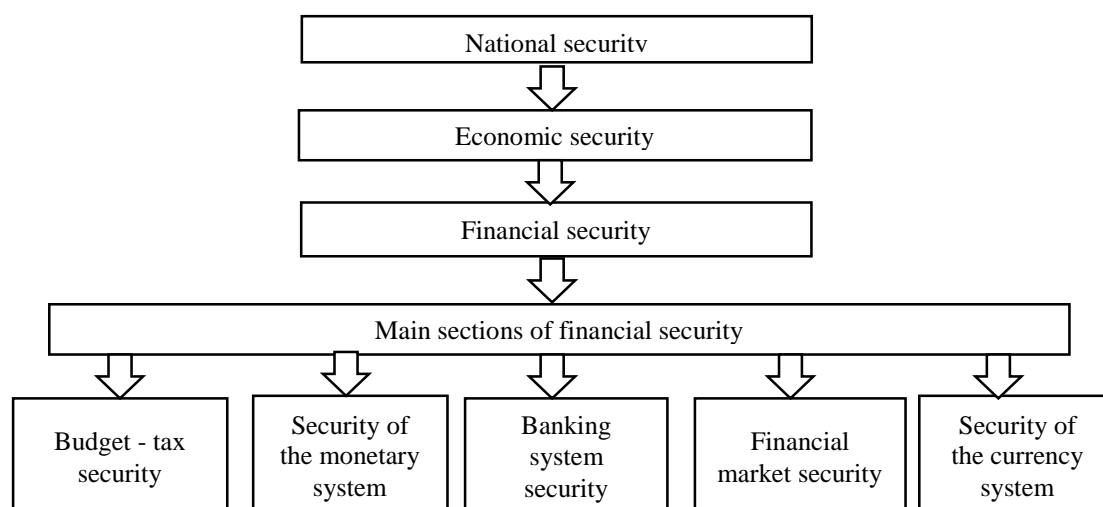

Figure 1. Main Components of the State's Financial Security

The contemporary policy framework for ensuring Azerbaijan's financial security must address multiple strategic dimensions, encompassing both structural stability and operational efficiency of the

financial system. A fundamental priority is to maintain the long-term balance and resilience of the national budget system, which serves as the cornerstone of fiscal stability. Equally important is ensuring the continuity and efficiency of the banking sector, which underpins the broader financial system and sustains public confidence. Other key objectives include preserving a positive balance of payments, safeguarding the stability of the national currency and monetary system, reducing external public debt, and maintaining the operational stability of financial markets. The primary instrument for assessing the state of a country's financial system is the system of financial security indicators. This framework allows policymakers to evaluate the level of existing and potential risks, identify areas in which these risks are likely to emerge, and implement preemptive measures aimed at enhancing the stability, resilience, and efficiency of the financial sector. By providing a quantitative basis for analysis, these indicators facilitate the development of targeted policies designed to mitigate threats and strengthen systemic robustness. Within the financial security system, the state budget plays a central role. It functions as the primary financial instrument through which the government executes its functions and responsibilities, representing a centralized monetary fund essential for national governance. Operational indicators of the budget, such as revenues, expenditures, deficits, and surpluses, are closely linked to macroeconomic variables that reflect the socio-economic development of the country.

Azerbaijan's current budgetary policy is framed by the Law on the State Budget for 2025, enacted on 16 December 2024. This legislation establishes strategic priorities aimed at enhancing fiscal sustainability. Among these priorities are the reduction of the overall budget deficit to below 2.4 percent of GDP in 2025 and the control of the non-oil primary deficit, which is projected not to exceed 20 percent of non-oil GDP in the medium term, with a further reduction to 15 percent by 2028. The policy also emphasizes a full transition to results-oriented budgeting characterized by transparency, efficiency, and accountability. Measures to reduce dependency on oil revenues are complemented by efforts to expand the tax base and enhance the financial autonomy of regional authorities, thereby strengthening the revenue side of the budget. From 2025 onwards, the policy also seeks to attract private investment through public-private partnerships and optimize capital expenditures through a service-oriented allocation model. To evaluate the level of financial security in the public sector, threshold indicators are employed. The budget deficit as a proportion of GDP in Azerbaijan is set at a maximum of 2.7 percent, comparable to the European Union ceiling of 3 percent. Similarly, the non-oil primary deficit relative to non-oil GDP is capped at 20 percent for the medium-term horizon of 2025. These metrics provide a systematic basis for monitoring fiscal sustainability and for guiding evidence-based interventions in policy and financial management. The dynamics of budget sector indicators and associated financial resources for the period 2021–2025 are summarized in Table 1. Analysis of these trends allows for a critical assessment of Azerbaijan's financial security, highlighting the country's progress in fiscal consolidation and resilience-building, while providing insights into potential vulnerabilities and areas for policy refinement.

Indicators	Actual Data				
	2021 il.	2022 il.	2023 il.	2024 il.	2025 il.
Revenues of the State Budget, million AZN	26396,3	30679,6	35236,4	36388,0	38316,0
Expenditures of the State Budget, million AZN	27422,4	32064,6	36458,0	39742,3	41367,6
Budget Deficit of the Republic, million AZN	-1026,1	-1384,9	-1221,6	-3354,3	-3051,6
Budget Deficit as a Percentage of GDP, %	1,1	1,0	1,0	2,7	2,4
Ratio of the Non-Oil Primary Deficit of the Consolidated Budget to Non-Oil GDP, %	-30,4%	-22,4	-22,5	-22,2	-22,9

Table 1. Dynamics of Financial Security Indicators in the Budget Sector of the Republic of Azerbaijan

Source. Based on the data from the State Statistical Committee of the Republic of Azerbaijan (https://www.stat.gov.az), the figures presented have been compiled by the author.

Note: The non-oil primary deficit of the consolidated budget is calculated as the consolidated budget revenues minus oil revenues (including transfers from the State Oil Fund and taxes from the oil sector) minus the consolidated budget primary expenditures. The consolidated budget primary expenditures are calculated as total consolidated budget expenditures minus interest payments on public debt.

Methodology and Discussion

During the period 2021–2025, the budget system of the Republic of Azerbaijan experienced a deficit, which increased in 2024 to -3,354.3 million manat compared to previous years. However, the budget for 2025 has been approved with a deficit corresponding to 2.4% of GDP. The growth in budget revenues in 2024 was largely driven by increased transfers from the State Oil Fund, while the efficiency of expenditures also improved.

The non-oil deficit as a percentage of GDP in 2024 decreased by 8.2% compared to 2021, reflecting a positive trend and a reduced dependency of budget expenditures on oil revenues. In the long term, the reduction of the non-oil deficit is expected to be achieved through the development of the non-oil sector. While a budget deficit persists, it has remained below the 5% threshold throughout the analyzed period, indicating that there is no significant threat to financial security.

The implementation of the 2025 state budget is progressing successfully. The projected budget deficit for the current year is -3,051.6 million manat, equivalent to 2.4% of GDP (129.2 billion manat), with an anticipated reduction by year-end. Maintaining fiscal balance will depend on several factors, including GDP growth, the stability of the tax system, the efficient use of budgetary resources by program administrators, oil prices, export volumes, and the optimization of budget expenditures.

Overall, Azerbaijan's budget system is relatively stable; however, maintaining its balance is crucial for enhancing financial security. Persistent long-term budget deficits undermine fiscal sustainability, reduce sovereign credit ratings, increase financing costs in international markets, elevate country risk, and indirectly affect overall financial stability. Another critical segment of the state's financial security is the stability of the monetary system, which is reflected in indicators such as the degree of monetization of the economy, inflation, and the exchange rate of the national currency. In this regard, the main authority responsible for ensuring financial security is the Central Bank of the Republic of Azerbaijan, which formulates and implements monetary and credit policy. The level of monetization indicates the extent to which an economy is supplied with money. The threshold of the monetization ratio, defined as the ratio of the money supply to GDP, is generally set at 50% for developing countries, while in advanced economies it is at least 80%. The dynamics of Azerbaijan's money supply, GDP, and monetization ratio are presented in

Indicators	2019	2020	2021	2022	2023	Growth Rate%
Money Supply (M3), million manat	28866,3	29185,8	34646,6	42824,9	45073,5	64,0
Gross Domestic Product (GDP), million manat	81896,2	72578,1	93203,2	133972,7	123005,5	66,6
Monetization Ratio in %	35,2	40,2	37.2	32,0	36,6	96,1

Table 2. Dynamics of the Monetization Ratio in Azerbaijan

Source. The data have been compiled by the author based on information from the Central Bank of the Republic of Azerbaijan (http://www.cbar.az).

In 2023, the monetization ratio of the Azerbaijani economy reached 36.6%, representing an increase of 1.4% over the period 2019–2023. This trend indicates that the current level of monetization does not pose a threat to the country's financial security. Low monetization reflects an economy that is insufficiently supplied with money, which can lead to higher credit costs, reduced investment activity, and a decline in aggregate demand.

The monetization ratio is inversely related to the velocity of money circulation; thus, the lower the monetization level, the higher the turnover of money in the economy. However, a high velocity of money is typically characteristic of economies focused on the production of consumer goods and resource-intensive activities. In contrast, developed economies exhibit substantially higher monetization levels. For example, France has a monetization ratio of 91%, Japan 184%, and China 200%, suggesting that these economies prioritize investments in high-tech products, industrial production, and research and development.

Another key indicator of financial security is inflation, defined as the general increase in the prices of goods and services. Maintaining inflation within a target range is crucial for economic stability. In the European Union, creeping inflation is generally considered to be 3–5% per year, whereas in Azerbaijan, annual price increases have historically remained below 20%. The Central Bank of the Republic of Azerbaijan implements an inflation-targeting policy, which aims to establish and achieve a medium-term target inflation rate. For 2023, the target inflation corridor was set at 2±4%. Inflation is measured using the **Consumer Price Index (CPI)**, which reflects changes in the overall price level of goods and services consumed by households.

The dynamics of the Consumer Price Index in Azerbaijan for the period 2019–2023 are presented in Figure 2 [5].
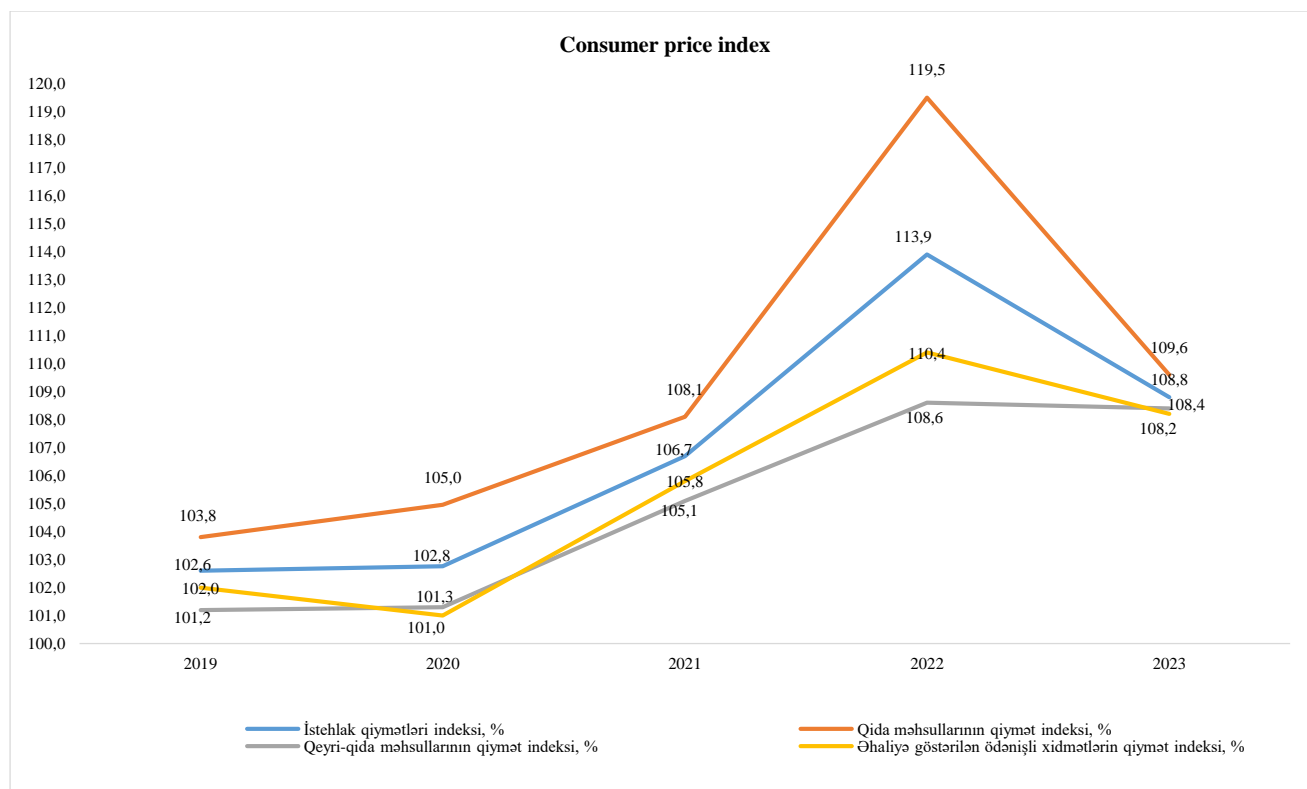

Consumer price index

İstehlak qiymətləri indeksi, %
Qida məhsullarının qiymət indeksi, %
Qeyri-qida məhsullarının qiymət indeksi, %
Əhaliyə göstərilən ödənişli xidmətlərin qiymət indeksi, %

Figure 2. Dynamics of Inflation Components in Azerbaijan

The data indicate that the annual rate of overall inflation in 2023 reached 8.8%, representing an increase of 6.2% compared to the base year of 2019. Specifically, the price index for food products increased by 9.6%, for non-food products by 8.4%, and for paid services provided to the population by 8.2%. Although the inflation rate in 2023 slightly exceeded the pace of creeping inflation, it is premature to regard this as a real threat to financial security. Within the framework of inflation-targeting monetary policy, the Central Bank ensured adherence to the established target corridor of 2±4% throughout the year. The favorable dynamics of inflation in 2023 were supported by several factors, including positive GDP growth, increased oil and gas condensate production, expansion of domestic output, positive trends in consumer credit in global commodity and raw material markets, and the growth of real household incomes, which collectively contributed to sustained consumption demand. The Central Bank of the Republic of Azerbaijan implements a managed exchange rate policy for the national currency, the manat. Its volatility is influenced by global oil prices and the exchange rates of key partner countries, primarily the United States and the European Union. The dynamics of the manat's exchange rate against the US dollar, euro, and Russian ruble are presented in Figure 3. In 2023, the manat exhibited a stable exchange rate, with one US dollar equivalent to 1.7 manat, one euro equivalent to 1.88 manat, and one Russian ruble equivalent to 0.0188 manat. Over the period 2019–2023, the Russian ruble depreciated by 31.4%.
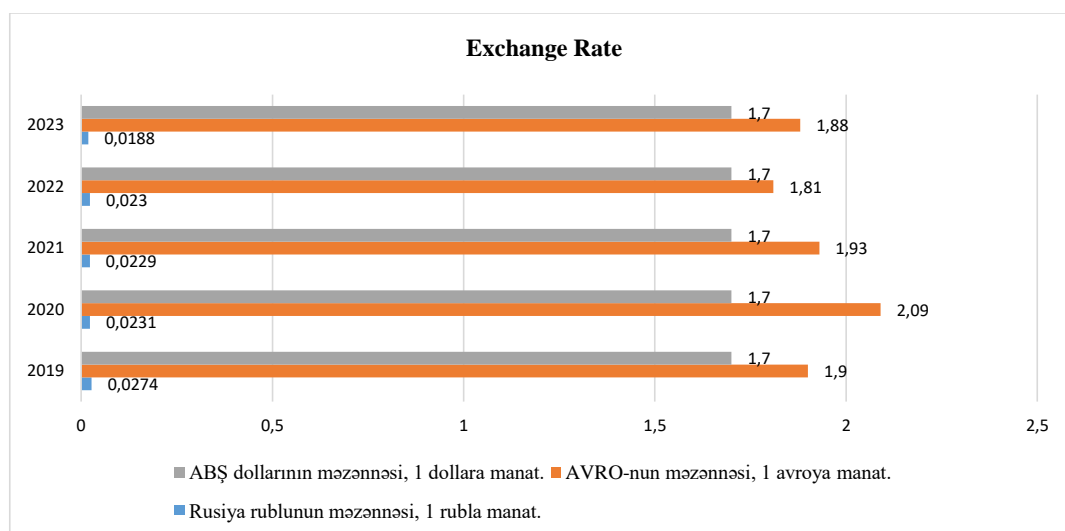
Figure 3. Dynamics of the Manat Exchange Rate Volatility

In response to this negative external environment, the depreciation of the ruble contributed to upward pressure on the manat's dynamics in 2023. During the first quarter of 2023, oil prices declined from $82.84 per barrel to a minimum of $76.83 per barrel by the end of the year, which also caused minor fluctuations in the manat's exchange rate against both the US dollar and the euro. Domestic factors affecting the manat's exchange rate include the timing of tax payments for exporting companies, the level of the policy base rate, and the state of the balance of payments. Instability of the national currency and its dependence on external factors can strengthen the population's expectations of devaluation, contribute to higher inflation, and pose a threat to the country's financial security. As previously noted, the financial security of the country depends on multiple factors, with foreign economic activity representing one of its most critical segments. This is reflected in indicators such as the state of the balance of payments, external debt, trade volume (imports and exports), and international reserves.

The dynamics of these foreign economic activity indicators are presented in Table 3.

Indicators	2019	2020	2021	2022	2023
Current account balance, mln USD	4,364.9	-227.6	8,291.6	23,478.1	8,329.4
As % of GDP	9.1	-0.5	15.1	29.8	11.5
Balance of payments, mln USD	8,533.0	2,511.5	11,273.6	28,697.5	12,805.6
Foreign trade balance (goods, works, services) – exports, mln USD	19,868.3	12,588.1	21,692.3	42,206.7	29,202.1
As % of GDP	41.2	29.5	39.6	53.5	40.3
Foreign trade balance (goods, works, services) – imports, mln USD	11,335.3	10,076.6	10,418.7	13,509.2	16,396.5
As % of GDP	23.5	23.6	19.0	17.1	22.7
Foreign direct investment inflows, mln USD	4,275.2	4,527.7	4,795.3	6,275.8	6,658.1
As % of GDP	8.9	10.6	8.7	8.0	9.2
Central Bank of the Republic of Azerbaijan – International reserves, mln USD	6,258.0	6,369.4	7,075.4	8,995.7	11,613.0
State Oil Fund of the Republic of Azerbaijan, mln USD (end of period)	43,300.0	43,600.0	45,025.1	49,033.6	56,069.7
External public debt of the Rep.of Azerbaijan, miln USD	8,320.0	8,100.4	7,393.4	6,693.2	6,461.2
As % of GDP	17.3	19.0	13.5	12.2	8.9
GDP at current prices, mln USD	48,174.2	42,693.0	54,825.4	78,807.5	72,356.2
Export of oil and gas condensate (mln tons)	37.5	34.5	34.6	32.6	30.2
Average world price of 'Azeri Light' Brent oil (spot USD/barrel)	66.9	43.7	71.6	103.6	86.1

Table 3. Key Indicators of the External Sector of the Republic of Azerbaijan

Source. Compiled by the author based on data from the Central Bank of the Republic of Azerbaijan (http://www.cbar.az).

Between 2019 and 2023, Azerbaijan maintained a positive balance of payments surplus. This outcome reflects, on one hand, the relatively favorable global oil price environment, and on the other, the stability of the national currency the manat against the U.S. dollar, despite adverse external conditions. Such macroeconomic resilience contributed to preserving the competitiveness of the domestic economy, expanding exports, and constraining import growth.

The current account balance remained positive throughout the analyzed period. A temporary deficit within the current account generally arises when current payments exceed current receipts. Nonetheless, Azerbaijan's trade balance (the ratio of exports to imports of goods, works, and services) consistently demonstrated a surplus, as export volumes fully covered import expenditures during the reviewed years.

The rise in Brent crude oil prices led to higher export revenues, which in turn increased income payments to foreign investors thereby contributing to the overall expansion of the balance of payments. A share of foreign investors' income from direct investments remained within the country, and inflows grew by approximately 382.3 million USD compared to 2022. The majority of these inflows were directed toward financing the operations of foreign-owned subsidiaries in Azerbaijan's oil and gas sector. However, the share of foreign direct investment (FDI) in GDP remained low 9.2% in 2023, below the indicative benchmark of 25% indicating limited investment activity and a potential vulnerability in terms of financial security due to insufficient capital inflows.

The international reserves of both the Central Bank of Azerbaijan and the State Oil Fund (SOFAZ) demonstrated an upward trend over the analyzed period. Despite rising current expenditures and capital outflows through financial operations, by the end of 2023 the country's official reserves, combined with SOFAZ assets, reached 67.7 billion USD, equivalent to 93.5% of GDP. This robust reserve position has a stabilizing effect on Azerbaijan's overall financial system and strengthens the country's resilience against external shocks.

The total external public debt of Azerbaijan amounted to 6.5 billion USD at the end of 2023, reflecting a modest decline compared to the previous year. The pace of debt reduction, however, remained slow: external debt as a share of GDP decreased slightly from 8.5% in 2022 to 8.9% in 2023.

According to international practice, a country's external debt sustainability is typically assessed based on three main indicators:

1. The ratio of external debt to exports should not exceed 200%.
2. The ratio of external debt to GDP should remain below 40%.
3. Total payments on external debt servicing should not exceed 5% of GDP.

Based on these parameters, Azerbaijan's external debt management can be considered efficient and sustainable. In 2023, external debt accounted for only 22.2% of exports, while debt servicing payments amounted to a mere 0.6% of GDP. These figures confirm that external borrowing is maintained at a prudent level and does not pose a threat to the country's financial security. It is also noteworthy that Azerbaijan's external debt is predominantly long-term, which constitutes a positive trend, as short-term foreign loans generally pose the greatest risk to financial stability. The critical threshold for this financial security indicator external debt to GDP should not exceed 50%, as recommended by the World Bank. Azerbaijan's current debt levels remain well below this benchmark, reinforcing the conclusion that the country's financial system is stable and its external position secure. The ratio of external debt, domestic debt, and total public debt to GDP is illustrated in Figure 4 [8].
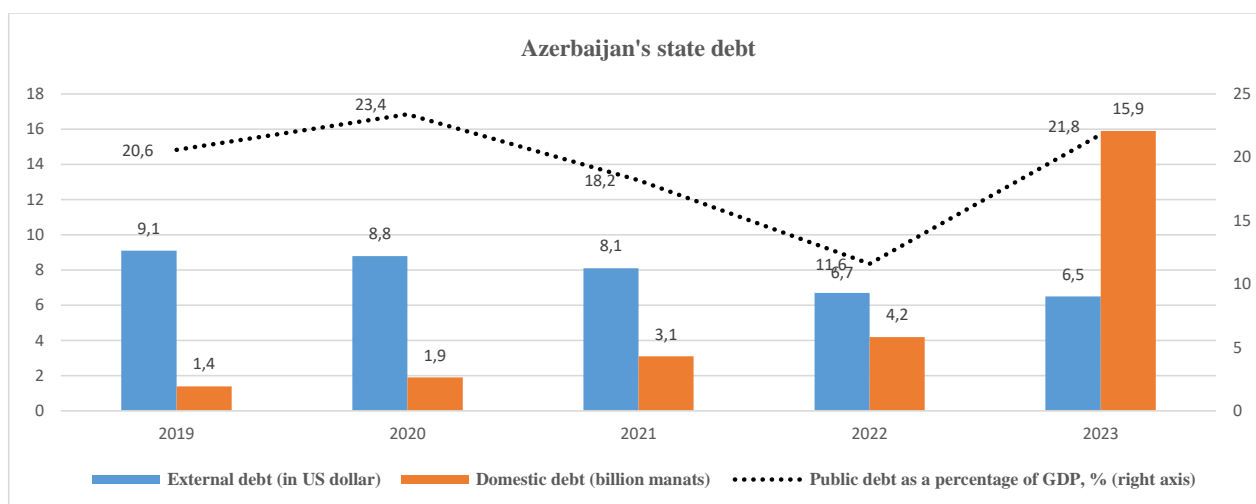
Figure 4. Azerbaijan's External Debt as a Percentage of GDP, %

By the end of 2023, Azerbaijan's total public debt, comprising both external and domestic components, amounted to USD 15.8 billion, representing 21.8% of the country's GDP for the year. This level remains within acceptable limits; however, any significant increase beyond this threshold could pose a risk to national financial stability. An increase in external debt may necessitate debt restructuring and raise the cost of servicing existing loans, thereby increasing the annual budgetary burden for debt repayment. In 2023, servicing the state debt required approximately USD 0.6 billion, including USD 150 million for principal repayments and USD 457 million for interest payments, which adds pressure to the state budget and increases the country's financial dependence on external creditors.

The maintenance of financial security in Azerbaijan also relies on the efficient and resilient functioning of the banking system, which reallocates resources from the financial sector to the real economy, mobilizes funds across industrial and other sectors, channels them into investment, and facilitates government operations, including servicing domestic and external debt obligations and supporting the state budget. The stability and security of the banking sector are assessed through a combination of quantitative and qualitative indicators. Key structural indicators include the composition of the banking system, the number of credit institutions, and the operational scale of banking organizations. Currently, Azerbaijan operates a two-tier banking system: the first tier is represented by the Central Bank of the Republic of Azerbaijan, while the second tier comprises commercial banks. At present, there are 23 second-tier credit institutions, including two state-owned banks, with a total of 475 operating branches. Additionally, nine banks with foreign capital operate in Azerbaijan, including one foreign bank branch. The financial soundness of the banking sector is evaluated based on key performance indicators, including return on assets (ROA), return on equity (ROE), compliance with the Central Bank's prudential capital adequacy standards, and asset liquidity. The dynamics of these indicators are presented in Table 4.

Indicators	Regulatory Value	2019	2020	2021	2022	2023
Capital Adequacy Ratio (CAR)	≥ 12	22.2	25.1	19.1	19.3	17.5
Instant Liquidity Ratio, %	≥ 30	59.0	61.0	62.0	60.0	52.0
Share of Liquid Assets in Total Assets, %	≥ 20	29.0	33.0	36.0	37.0	27.0
Return on Assets (ROA), %	$> 1–2\%$	1.71	1.75	1.8	2.2	2.4
Return on Equity (ROE), %	$> 15\%$	12.4	12.23	13.6	18.9	20.3

Table 4. Capital Adequacy, Liquidity, and Profitability Indicators of the Banking Sector in Azerbaijan
Source: Compiled by the author based on data from the Central Bank of the Republic of Azerbaijan (http://www.cbar.az).

The data in the table indicate that during 2019–2023, the banking sector complied with the prudential norms established by the Central Bank regarding capital adequacy and liquidity levels. The high share of highly liquid assets in total bank assets also remains at threshold levels, signaling that the banking sector is sufficiently solvent. Nevertheless, the profitability of the banking sector in 2023 was dynamic. Both return on assets (ROA) and return on equity (ROE) exceeded the levels observed during 2019–2022. In 2022, the banking sector's net profit reached AZN 914.0 million, representing an increase of AZN 305.0 million compared to 2021. In 2023, the sector recorded a net profit of AZN 1,076 million, with profitability indicators meeting the regulatory requirements. It is worth noting that Azerbaijan's banking system currently operates on a relatively stable basis: the system's structure remains stable, no significant reduction in credit institutions has been observed, and an upward trend in asset growth has been recorded in 2023. The banking sector's capital and net income reinforce its financial security. As of 2023, the capital adequacy ratio of the banking sector stood at 17.5%, significantly exceeding the minimum regulatory threshold of 12% set by the Central Bank. This indicates that banks possess a strong financial buffer to withstand potential risks.

Conclusion

By examining the main segments, criteria, and indicators of Azerbaijan's financial security, the following conclusions can be drawn: the country's financial system is relatively stable; however, potential and actual threats to its security exist, including:

- Long-term budget deficits that could undermine the stability of the financial system;
- High dependence of the manat exchange rate on global oil price fluctuations, which can increase inflation and strengthen public expectations of devaluation;
- Low investment activity and an excessively small volume of attracted foreign investment;
- High levels of public debt, which increase financial dependence on other countries and institutions;
- A raw-material-oriented economy, making budget revenues, the exchange rate, and the balance of payments strongly dependent on global oil price dynamics.

To ensure financial security, the Government of the Republic of Azerbaijan has identified priority directions for the development of the financial sector, as outlined in the *Strategic Development Plan of the Republic of Azerbaijan up to 2030*:

- Integration of the tax and customs systems, improvement of tax administration, expansion of regional financial autonomy, strengthening budget revenues through targeted sectoral tax incentives, and efficient management of budgetary resources;
- Expansion of the tax base and reduction of the burden of state expenditures to decrease dependence on oil revenues and enhance fiscal sustainability;
- Ensuring a stable price level through full implementation of inflation targeting under a freely floating manat exchange rate regime that neutralizes the impact of external shocks;
- Maintaining low inflation to positively influence domestic savings, credit activity, and investment, thereby contributing to financial stability and sustainable economic growth;
- Expanding investments in the economy through off-budget funds via the Azerbaijan Stock Exchange, simplifying initial public offerings (IPOs) for small and medium enterprises, and establishing simpler administrative procedures for listing companies.

In summary, ensuring Azerbaijan's financial security constitutes a cornerstone of the country's macroeconomic stability.

Limitations

This study on Azerbaijan's financial security has some limitations. The analysis is based mainly on official data from the State Statistical Committee, the Central Bank, and the State Oil Fund, which may have minor reporting delays or differences in methodology. While key financial indicators such as budget deficits, banking sector performance, monetary stability, and external debt are examined, the study does not include scenario analyses or stress tests to capture unexpected economic or geopolitical shocks. The

focus is largely on quantitative measures, with limited discussion of institutional capacities or policy implementation. In addition, subnational fiscal dynamics and private sector resilience are not explored in detail, though they can influence overall financial stability. Finally, because the global economic environment is constantly changing, the findings and projections for 2025 may need to be updated over time to remain fully relevant.

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Conflict of Interest
The author declares no conflicts of interest.

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Green Finance and Environmental Aspects of Modern Tax Policy

Abstract

This article examines the theoretical and practical aspects of developing green finance and greening tax policy. It demonstrates the role of the state and the financial sector in shaping a sustainable economic model that combines economic growth with environmental protection. Key challenges in implementing environmental taxes and ways to improve them are highlighted. The study focuses on government fiscal regulation tools aimed at encouraging organizations to reduce their negative environmental impact. The aim of this study is to identify opportunities for tax incentives to green the economy and develop recommendations for the further development of relevant tax instruments. The research was conducted using general scientific methods, such as systems and situational analysis, generalization, synthesis, and logical and descriptive methods. Based on the results of the study, tax measures aimed at addressing pressing environmental issues were proposed for the financial and economic activities of organizations. Allowing free depreciation of equipment operated using best available technologies will provide an additional incentive for their implementation and reduce the negative impact of production processes. Reducing the VAT rate on recycled goods will lead to increased demand, the popularity of such products, and the development of a circular economy. Preferential taxation of income for green bondholders will contribute to the increased investment attractiveness of environmental projects. An assessment of the proposed solutions demonstrated the feasibility of their implementation and made it possible to identify sources of compensation for lost revenues in the budget system, including an expansion of the tax base due to positive economic effects, improved tax administration, the development of environmental payments and carbon regulation, and a reduction in the need for government spending on certain social items.

Keywords: greening business, tax regulation, tax instruments, environmental taxation, recycled materials.

Introduction

The concept of green finance includes a set of financial institutions, instruments and mechanisms aimed at supporting environmentally sustainable projects. These include green bonds, environmental investment funds, loans for the introduction of clean technologies, and tax and subsidy incentives to support the transition to a low-carbon economy. Green finance is based on the principles of environmental efficiency, inclusiveness and long-term sustainability. Environmentalization of tax policy represents the process of adapting the taxation system for the purpose of stimulating rational consumption and reducing the level of environmental pollution. The basic idea is that the tax system should perform not only a fiscal but also a regulatory function.

Theoretical and practical foundations of green finance and the role of the state in shaping the institutional environment for green finance development

Despite the obvious advantages of *ecologicalization* of the fiscal system, its implementation faces a number of challenges: the lack of a unified methodology for calculating rates, the low willingness of enterprises to transition to new technologies, social costs energy resources and administrative difficulties of control for accountability *(Sitnik A. A., 2022)*. These factors require a combination of tax measures with state business support tools.
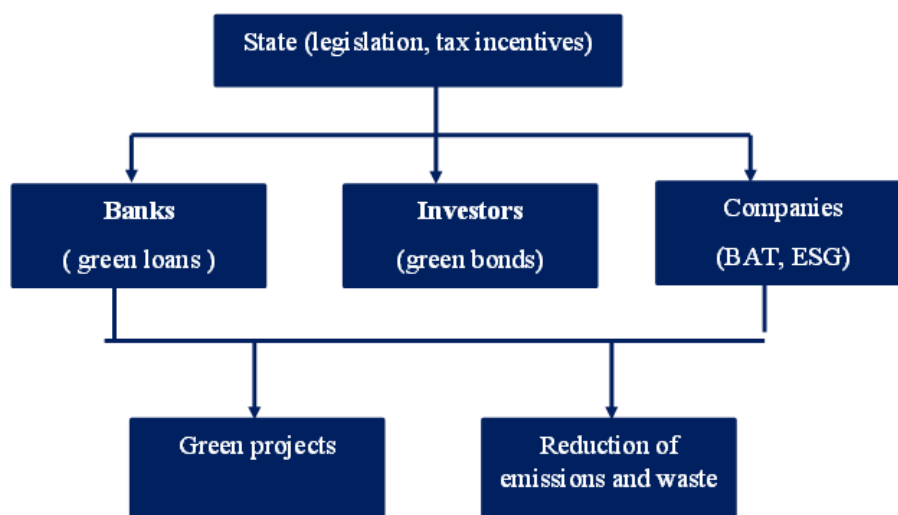

Diagram 1. Green finance ecosystem (scheme)
Source: *European Central Bank, (2020)*

The state plays a key role in shaping the institutional environment for green finance development. It should provide a regulatory framework, stimulate private investment, and develop environmental reporting and transparency of corporate practices. Commercial banks and investment funds, by implementing responsible finance principles, channel resources into environmentally significant industries. Currently, the legislation contains a number of taxes and other mandatory payments with an environmental component. According to the direction of impact, they are grouped into four groups:
- energy taxes and payments (excise taxes on motor and energy fuel, payment for electricity);
- transport taxes (excise taxes on gasoline, transport tax);
- pollution payments (payment for negative impact on the environment in the form of emissions of pollutants into the atmosphere, disposal of pollutants from water bodies environmental fee, disposal fee);
- resource taxes (tax on the extraction of mineral resources, tax on additional income from the extraction of hydrocarbon raw materials, payments for the use of nedras, fees for the use of wildlife and aquatic biological resources, water tax, water tax charges for the use of water resources, land tax).

Most of the listed payments are predominantly fiscal in nature and are essentially a fee for the use of natural resources. From the standpoint of regulating the environmentalization of businesses, third party payments represent the greatest interest, having the potential to affect the business activities of companies in terms of reducing waste and reducing environmental damage.

When calculating the fee for the negative impact on the environment, in addition to the rates differentiated by the types of pollutants and classes of waste, a number of coefficients are provided for the purposes of implementation of best available technologies. For example, during dewatering and subsequent placement of lower hazard classes of waste, reducing factors ranging from 0.33 to 0.67 are applied, and after the implementation of the best technologies accessible of pollutants within technological standards is nullified. In addition, the adverse environmental impact fee may be reduced

by the payer's costs of funding the mitigation measures included in the environmental measures plan environmental performance.

The ecological impact of food waste can be quantified using the following model:

$$GHG_{food} = Q_{waste} \times EF_{CH4}$$

Where:

- GHG_{food} – greenhouse gas emissions from food waste,
- Q_{waste} – quantity of food waste,
- EF_{CH4} – methane emission factor per unit of food waste.

Beyond regulatory and fiscal instruments, the efficiency of green investments can be evaluated using **mathematical models** that combine ecological and financial perspectives. The overall efficiency of a green project can be assessed as follows:

$$E = \frac{B_{eco} + B_{fin}}{C_{inv}}$$

Where:

- E – overall efficiency indicator of the green project,
- B_{eco} – ecological benefits, such as reductions in emissions and waste,
- B_{fin} – financial returns generated by the project,
- C_{inv} – total investment costs.

Ecological benefits measured in terms of carbon equivalent can be calculated as:

$$B_{eco} = \Delta CO_2 \times P_{CO_2}$$

Where:

- ΔCO_2 – reduction in CO₂ emissions attributable to the project,
- P_{CO_2} – market or social price per ton of CO₂ emissions saved.

This integrated approach allows decision-makers to prioritize projects that deliver the greatest combined environmental and financial benefits relative to their costs. By combining regulatory, fiscal, and quantitative assessment methods, governments and enterprises can effectively channel resources toward sustainable, environmentally significant investments.

The environmental fee is paid by manufacturers and importers of goods which do not dispose of the waste generated from their use. The collection amount for each commodity group is calculated as the product of the mass or quantity at the disposal cost-based rate and the approved disposal standard. If an entity undertook to dispose of waste but did not meet the standards, it pays a fee on the difference between the established and actually achieved quantity of waste disposed of. The ecological impact of food waste can be quantified using the following model:

$$GHG_{food} = Q_{waste} \times \times EF_{CH4}$$

where:

- GHG_{food} – greenhouse gas emissions from food waste,
- Q_{waste} – quantity of food waste,
- EF_{CH4} – methane emission factor per unit of food waste.

According to the United Nations Environment Programme (UNEP), food waste contributes approximately 8–10% of global greenhouse gas emissions. This highlights the significant environmental impact of food losses throughout the supply chain (*UNEP, 2024*).

At the core of the regulatory capabilities of fiscal instruments are the weightiness of their size for payers and the constraint with the extent of damage inflicted on the environment. Non-negligible factors include the obligation to pay and the irrevocability of liability for evasion. Recommendations to improve the system of environmental payments to improve the effectiveness of their incentive function have been voiced in the scientific literature. Within the framework of the topic under consideration, it is necessary to emphasize the expediency of tax codification of environmental, environmental and disposal fees for their improvement and administration. Also significant are the proposed measures for the development of environmental collection, including increasing rates by

1.5-5 times and their differentiation depending on the technological properties of pre-packaging standards, 70-100% and excluding them from the calculation of the collection amount, perfecting the listing of groups of goods.

Modern environmental incentives in taxation of profits of organizations

It is possible to incentivize business environmentalization not only through specialized taxes and levies, but also through changing elements of other taxes. So, current legislation entitles taxpayers to accelerated depreciation of major technological equipment operated in case of application of best available technologies, and major means of higher energy efficiency high class energy efficiency. Accounting for depreciation deductions at earlier periods enables a reduction in the tax base and amount of profit tax of organizations, which enhances the profitability of investments in such equipment. However, for large-scale technological reinvention of enterprises and encouragement of other environmental initiatives there are insufficient benefits existing at the moment. In order to more fully realize the regulatory potential of taxation, complementary tools are needed. One of the most important tools of environmental industrial policy are the best available technologies, the application of which aims at comprehensive prevention or minimization of negative impact on the environment. Technology is defined as the best available given the optimal combination of energy, environmental and economic performance. The experience of EU countries confirms the effectiveness of the best available technologies as an object of 'green' investment. Their introduction ensures a 'double win' – increasing farm efficiency and minimizing environmental damage.

Country	Types of Environmental Taxes	Green Subsidies	Carbon Pricing Mechanism	Outcomes
EU countries	CO$_2$ tax, energy tax, plastic tax	Renewable energy subsidies	ETS (EU Emissions Trading System)	Emissions decreased by 37% during 2005–2023
USA	Carbon fee, fuel tax	Federal credits for green technologies	Regional Trading Systems (RGGI)	Emissions in the RGGI region decreased by 50% between 2010–2023
Japan	Carbon tax, waste tax	Green innovation funds	J-Credit system	Energy efficiency increased by more than 15%

Table 1. Environmental Tax Practices in the European Union, USA, and Japan
Source. *The table was compiled by the author based on UNEP reports. (UNEP, 2021-2024)*

The wide list of industries that require technological upgrading and enterprise eco-friendliness for sustainable growth justifies the importance of public financial support for the introduction of the best available technologies. Considering the possibilities of tax instruments in this context it should be noted that among the investment benefits simultaneously beneficial to organizations and not too critical to the revenue base of state budgets is the amortication of the poly. (*Ilyakova, I. E. 2021*) By maneuvering the speed of write-off of the cost of fixed assets, taxpayers reduce tax liabilities in preferred periods at the expense of carrying costs over time.

An actionable incentive for companies to implement the best available technologies is represented by the introduction of free depreciation of equipment operated in case of their use. The right to write off cost for any approved period by the organization will help in corporate tax planning, one element of which is the optimal allocation of expenses for taxation purposes. As a result, the reduction in tax burden will accelerate the payback of investments in the best available technologies, which will become an additional argument in their favor when evaluating investment alternatives (Nuță et al., 2025) In considering the implications of free depreciation for budgets of the budgetary system, it is necessary to consider that the application of this allowance does not increase the total amount of written-off expenses, but merely transfers the moment of their recognition. Accordingly, the reduction in tax base and income tax receipts turns out to be temporary and is offset by the absence of depreciation deductions in subsequent periods. However, the state bears reluctance on providing depreciation benefits due to the non-uniform value of money in time. Moreover, since the best available technologies are characterized by economic efficiency of operation, application of resource-

and energy-saving methods, their implementation will have a positive impact not only on companies. Growth of endowment and profitability of production will lead to broadening of tax base and increase of tax receipts to state budgets. To the extent of widespread diffusion of technologies, in order to prevent significant falling revenues, it is permissible to set a limit with respect to expensive equipment,a minimum write-off period of 12 months-for example, 36 In doing so, it is advisable to differentiate limits on the cost of fixed assets, and also not to exceed the classifier-approved conventional useful lives per depreciation group.

4. **Reduced VAT rate on secondary raw materials and abolition of VAT refund on duty-free transfer of food products**.

A pressing problem of contemporary society remains the significant amount of food waste generated in the sphere of trade, public catering and households. Expired products are sent to landfills and landfills where they become a source of methane, ammonia and hydrogen sulfide emissions. According to estimates by the United Nations Environment Program (UNEP), about 8-10% of global greenhouse gas emissions are associated with unconsumed food products. Negative effects occur not only with environmental but also with socio-economic. An effective way to prevent irrational food consumption can become food sharing, for which the involvement of large retail chains is necessary to develop. At the moment, there are several barriers to transferring expired products for charitable purposes, and one of the significant ones is the current tax legislation. By purchasing a VAT-inclusive good from a manufacturer, the trading company takes tax towards the deduction and reduces the size of its tax liability. In case of further transfer of goods, non-profit organizations are required to reclaim VAT and pay to the budget in full. Thus, the additional tax burden on the seller amounts to up to 20% of the cost of production while the disposal of organic waste is circumvented significantly cheaper.

In order to eliminate this obstacle, it is advisable to cancel the obligation to refund the previously adopted VAT deduction for free transfer of food products, but at the same time to limit the amount of deduction and deduction of 1% of the amount organizations through which charity will be realized. Data restrictions will allow to prevent abuse of the norm and in addition are consistent with the terms of reduction of taxable gain on the value of property transferred to socially oriented non-profit organizations.

The sustainable development strategy of the country as one of the main vectors provides for a transition to a closed-loop economy, building among other things on the use of secondary resources and the recycling of products into. Production from secondary raw materials helps to alleviate the environmental and economic crisis, on the one hand, at the expense of saving resources and preventing environmental damage from the production of primary materials, and on the other hand, through rational recycling polluting the environment. Over the past decade, resource efficiency issues have attracted particular attention from G20 countries, many of which have undertaken the development and implementation of national strategies and roadmaps aimed at increasing resource productivity and productivity (Nuță et al., 2025)

Country	Overall Recycling Rate	Share of Waste-to-Product Conversion	Note
Germany	67%	35%	Leader in Europe
Netherlands	60%	40%	Circular economy model
Japan	50%	28%	"3R" strategy
USA	32%	15%	High regional differences

Table 2. International Indicators of Recycling
Source. *Eurostat (2023), "Recycling and Waste Statistics", European Commission*

In working out the mechanisms of encouraging companies to a particular behavior pattern, it is necessary to consider the characteristic features of the economic system in which they function. Under conditions of free pricing and competition for consumer demand the advantage is gained by those

firms that manage to offer a commodity with an optimal price-quality ratio. It is the demand for output that breeds production expansion and refocusing on the most demanded goods by buyers. At the same time, a significant impact on price competitiveness is provided by indirect taxation in the form of VAT, as the tax increases the final cost of the product. Hence, by revising the elements of VAT, the state can contribute to increasing the profitability and sales volume of certain commodities.

Based on the above, it is submitted advisable to stimulate the demand for products manufactured using secondary raw materials by reducing the VAT rate to 15% upon its implementation. Simultaneously with the introduction of privileges it is necessary to approve the list of goods indicating the threshold share of secondary raw materials, according to which they fall into the privileged category. Given the non-uniform recycling capabilities of different types of materials, classification requires a differentiated approach and comprehensive analysis. For example, glass, paper and metal products are relatively simple to reuse, while recycling rates for textiles are significantly lower. In the future, as technology develops and the recyclable waste listing expands, the classifier of favored goods should be revised and the threshold values adjusted.

From the standpoint of revenue shaping state budgets, the most obvious consequence of the proposed benefit is a reduction in VAT receipts. This tax possesses great fiscal importance both for the state budget and in the tax revenue structure of the state as a whole. *(Freire-González, 2022)* Therefore, special attention should be given to not only environmental but also economic justification when introducing a reduced rate. In this connection, it can be noted that the popularity of the closed-loop production and consumption idea is due to the realization of the integrity of sustainable development and economic growth from environmental well-being. Circular economy focuses on overcoming the dependency of economic growth on negative environmental impact and natural resource depletion. Improving resource efficiency, reusing raw materials and involving products in recycling can bring economic benefits while addressing environmental challenges. So, the transition to a closed-loop economy can result, by various estimates, in increasing GDP by 12-15%.

To achieve the effectiveness of the tax benefit an important detailed development of the previously mentioned classifier of the benefited goods is presented with the involvement of competent technologists possessing information about the production processes and technologies to be accessed. Timely updating of commodity listing and threshold values of specific gravity of secondary raw materials will provide flexibility to the state in managing the exemption application process. In addition, regular assessment and analysis of receivables based on data in quarterly VAT tax returns is essential.

It should be noted that the preliminary collection, sorting and processing of waste is a necessary condition of its production. Some trading companies are already engaged in the collection of secondary raw materials on their own initiative, and the introduction of the proposed benefit will become an additional motivation for them. In the rest, success will depend on reforming the waste management system using measures of a non-tax nature.

Tax incentives for companies towards environmental investment and preferential income taxation from 'green' financing

As is known, the implementation of any investment project requires financial resources, and business environmentalization is no exception. Introducing high-tech and energy efficient equipment, equipping processing production, decarbonising and developing alternative energy all require significant investment. *(Appelbaum E.,2021)* Without proper funding, no 'green' project can be realized. Along with public funding, corporate and private investors play a significant role, for attracting which favorable financial market conditions are important.

Investor Profitability Model

Profitability of green bonds:
$$R = C + \frac{(P_s - P_b)}{P_b} - \text{Tax}$$

If the investment income is tax-exempt ($\text{Tax}=0$), the investor's real profitability:
$$R_{\text{green}} > R_{\text{standard}}$$

The global 'green' bond market began to take shape early and has been characterized by accelerated growth since the early days. In 2024 issuance volume reached a record $481.8 billion. USA, doubling the figure of the previous year. Government support for corporate 'green' bonds is widespread abroad. The range of instruments includes reimbursement of project verification costs, subsidized coupon rate, preferential taxation of investor income, provision of guarantees and a number of others.
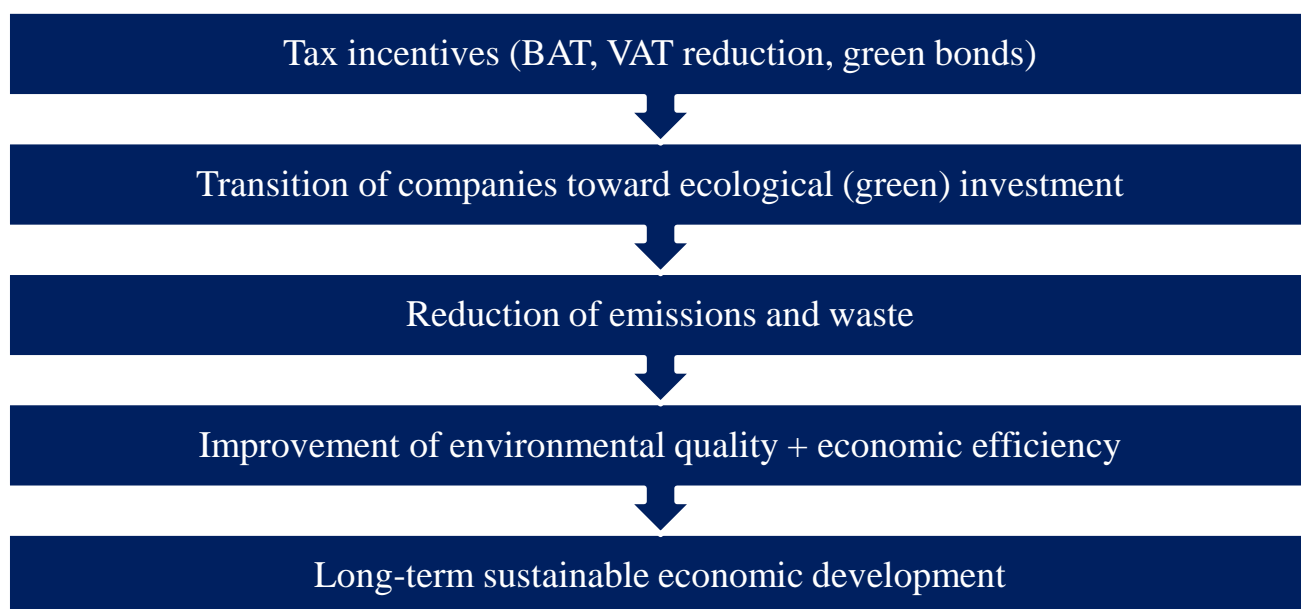
Tax incentives (BAT, VAT reduction, green bonds)

↓

Transition of companies toward ecological (green) investment

↓

Reduction of emissions and waste

↓

Improvement of environmental quality + economic efficiency

↓

Long-term sustainable economic development

Diagram 2. Macroeconomic impact mechanism of green tax policy
Source. *Gregor Boehl (2024), Bank for International Settlements (BIS)*

Within the framework of tax incentives of companies towards environmental investment, the following measures are advisable in relation to bonds from the sustainable development sector falling into the segments and "green" projects areas of ecology:
- lower the corporate profits tax rate to 10% with respect to interest income;
- lower to 0% the corporate profits tax rate with respect to a financial result from the realization or other issuance of bonds provided they have been owned continuously by the taxpayer for at least 1 year.

Introduction of specified tax benefits will contribute to increasing the investment attractiveness of "green" bonds and will allow issuers to attract additional financial resources for the implementation of environmental projects, while investing with investors – effectively time to feel your contribution to protecting the environment. Moreover, data measures will aid the development of sustainable finance tools.

Conclusion

Modern tax policy is increasingly guided by the principles of sustainable development. Green finance is becoming an effective mechanism that ensures the alignment of society's economic and environmental interests. Forming a balanced green tax policy model will enhance the effectiveness of environmental measures and create prerequisites for long-term sustainable economic growth.

The conducted study allows us to conclude that there is a significant potential of the tax system in addressing pressing environmental issues. The state positions opportunities to incentivize companies to comply with the principles of environmental protection, "green" modernization of production processes and auxiliary activities. The proposals for amendments tax legislation, justified in this paper, are aimed at reducing environmental damage by achieving the following results:
– dissemination of the best available technologies;

– popularization of goods from secondary raw materials;
– attraction of investments in "green" projects;
– food waste reduction due to foodsharing development;
– replacement of paper documentation with electronic.

On the basis of qualitative and quantitative assessment of the proposed solutions, the feasibility of their implementation to ensure environmental transformation and sustainable development of the Russian economy was established. The replenishment of revenue budgets is facilitated by the expansion of the tax base due to the improvement of business processes, saving of resources and reduction of non-production costs of companies, as well as pre-brewing analysis of measures. Along with this, sources of additional receipts to budgets will be improved in accordance with the indicated recommendations the environmental payments system and the evolving emissions quotation mechanism. In addition, the expansion of foodsharing activities will create a basis for reducing public expenditure, and improving the overall environmental environment will improve the quality of life and health of the population, which will ultimately of environmental diseases.

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Section ECONOMETRICS

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Analysis of the impact of high-tech exports and industrial scale on employers in Azerbaijan

Abstract

Modern technologies accelerate and change the economic activity of both developed and developing countries. The application of technologies in a wide range of fields, from production processes to the service sector, increases macroeconomic competitiveness. It is for this reason that employers' high technology export and connection with industry can be considered as one of the main components of economic success in the modern era.

The study mainly assesses the impact of employers on high-tech exports and changes in the size of industry. This assessment provides optimized data for the study of the relationship between employers and potential export and the impact of employers on growth in the industrial sphere.

The aim of the study is to examine the interaction between employers and the following variables: domestic loans provided by banks to the private sector (% of GDP), Industry (including construction) with value added (annual % growth), High-tech exports (% of manufactured exports), and GDP. The task of the study is to determine the role of employers in the development of high-tech exports and industries. High technology export is the sale of technological products and services to other countries. This is usually associated with innovative technology products. These products include more automated information technology, production technology, biotechnology, etc. High technology export represents a very important situation for the employer parties. Because these products can be sold at a higher price in the world market and earn more profit.

The statistical annual data used in the study are taken from the database of the World Bank and the State Statistics Committee of Azerbaijan. Technological exports and employers developed in Azerbaijan between 2007-2023 and other macroeconomic indicators were analyzed using the Granger causality analysis method. As a result of the analysis, it is concluded that employers are related to high-tech export technologies and industry.

Keywords: employer, high technology, industry, Granger Causality Tests.

Introduction

The high-tech export sector of Azerbaijan is more important in the development of the country's economy and its sustainability, in adapting to its aspirations for a technology-based future. It can be emphasized that employers create a complex ecosystem that both supports and challenges the development of high-tech industries. This analysis also assesses employers' impact on industry development, focusing on workforce development efforts and collaborative initiatives. In this study, the general characteristics of the influence of employers on economic growth in recent times are examined from a theoretical point of view. A key feature of modern employers is their adaptability. This adaptation a willingness to embrace change and manage uncertainty with flexibility and

innovation. Employers who can adapt to emerging technologies, evolving market trends and workforce needs are more likely to succeed in the fast-paced modern workplace.

Investment is at the center of the influence of employers on high-tech export and industry in Azerbaijan. High-tech industries require a workforce that is not only technically skilled but also adaptable to rapid technological change. This, in turn, increases the competitiveness of high-tech exports.

While previous studies have mainly focused on theoretically examining the role of entrepreneurs in employment and industrial development, this study's in-depth practical analysis clarifies the provisions that can contribute to economic growth.

Literature review

In their joint study, K. Lee and L. Wang emphasize the importance of intellectual capital management in the global high-tech export sector, as it provides companies with resilience to uncertainties (such as COVID-19) and competitive advantage through dynamic and risk management capabilitiesThe Chinese case suggests strategies for companies in emerging markets to combine intellectual capital with opportunity- and risk-oriented capabilities to compete with developed countries such as Europe and the United States. The results recommend that companies adopt a two-way mediation model for sustainable growth in rapidly changing global environments (Lee & Wang, 2023).

In an article coauthored by Navarro Zapata et al., they showed that strong export potential is essential for long-term economic growth and that technological advances improve export performance. Factors affecting international trade flows in the manufacturing sector in OECD countries are analyzed. Investments aimed at high-tech exports are important for industrial policy. The study concludes that high-tech export-oriented investments have significant implications for industrial policies (Navarro et al., 2024).

The article, jointly prepared by T.Suvalova, R.Ashurbekov, O.Zhuravleva and O.Suvalov, analyzes the special role of the labor market as a universal factor in the economy, discusses the dynamics of supply and demand, the impact of migration processes, and unemployment levels at both the macro and micro scales. This study proposes a macro-micro level analysis model for managing migration and unemployment in global labor markets, linking regional statistics (the case of Russia) with global trends (e.g., digitalization and pandemics), supporting sustainable economic development (Suvalova et al., 2023).

In his article, N. Abbasov examines the impact of innovation on economic growth in Azerbaijan, Türkiye, and Georgia, comparing statistical data (GDP), GDP per capita, labor productivity, R&D expenditures, patents, high-tech production and exports, and sources such as the World Bank, IMF, OECD, and the Global Innovation Index for 2015-2024. This study emphasizes economic diversification through innovation in developing countries, especially resource-dependent countries (e.g., the post-Soviet region), and shows that investments in R&D and human capital provide long-term growth (Abbasov, 2025).

In his article, X. Abbaszadeh evaluates the interplay between economic growth and the labor market in the Republic of Azerbaijan, analyzing data on GDP, unemployment rate, labor productivity, employment, and wage indicators for 2005–2023 using the Granger causality test, ordinary least squares (OLS) method, and ARDL models. The study finds that wages drive productivity, unemployment affects productivity, and employment influences economic outcomes, while GDP and productivity exhibit a bidirectional relationship. This research proposes an econometric framework for analyzing the economic growth-labor market nexus in resource-dependent countries (e.g., the post-Soviet region) (Abbaszadə, 2025).

The article by authors P. Budhwar, A. Malik, M. Thedushika De Silva and P. Thevisuthan analyzes the integration of artificial intelligence (AI) into human resource management (HRM) practices over the past 10 years, especially in international companies. The article synthesizes 70 scientific articles using a systematic literature review (SLR) method and examines the application of

AI in HRM functions (organizational planning, recruitment, training, performance appraisal) and its impact on employee and business outcomes (positive: productivity, job satisfaction; negative: job uncertainty, ethical issues) (Budhwar et al., 2022)

The study, written by authors Zhanna A. Ermakova, Natalia V. Speshilova and Vyacheslav N. Shepel, analyzes the impact of the digitalization of the economy on the labor market and justifies the formation of personnel supply in accordance with the specialization of regions (agriculture in the Orenburg region). Using statistical analysis, comparison and cause-and-effect analysis methods, the main determinants of personnel supply are identified: the management system, the availability and movement of labor resources, the vocational education

system (the role of local universities). The article also emphasizes the global importance of personnel strategies in accordance with the specialization of regions in the conditions of the digital economy (Ermakova et al., 2023).

Important aspects of employers in modern times

Nowadays, employers play a crucial role in forming the work environment and employee experience. Employers today are expected to have a unique set of characteristics that promote a positive and productive workplace. They are responsible for creating job opportunities, shaping workplace cultures and driving economic growth.

In order to achieve sustainable economic growth and reduce dependence on oil and gas exports, it is important to create and implement development mechanisms aimed at promoting innovative economic growth (Abbasov, 2022). In this regard, the impact of employers on economic growth cannot be overemphasized. The main goals of employers are programs aimed at strengthening local capitalism, focusing on job creation, income growth, poverty reduction, economic diversification and improvement of the quality of life (Besser et al., 2009). One of the main characteristics of employers in modern times is adaptability. In a rapidly changing business landscape, employers must be flexible and open to new ideas and approaches. It requires the ability to embrace change and approach uncertainty with tolerance and creativity. Employers who can adapt to new technologies, market trends and employee needs are better positioned to succeed in today's dynamic work environment.

The role of exporting high technologies today

Application of innovative technologies has the power to improve the macroeconomic situation and create new opportunities for production (Abbasov, 2022). High technology is becoming a more important field nowadays. The relevance of high technologies in countries is the main source of future development.

High-tech products are usually characterized by a combination of research and development (Sandu et al., 2014). High-tech refers to innovative products or services that are at the forefront of scientific and technological advances. These may include electronics, robotics, artificial intelligence, biotechnology, and others. High technology is characterized by complexity, rapid innovation, and the potential to significantly impact various industries and daily life. This includes helping businesses use these advances to grow and succeed.

The level of innovative and technological progress of the country can be determined by its ability to produce and export high-tech products (Usman, 2017). High technologies play a crucial role in driving economic growth and creating new opportunities for businesses and individuals. The development of high-tech products and services not only increases productivity and competitiveness, but also fosters innovation and entrepreneurship.

Moreover, high technologies have the potential to solve pressing global problems such as climate change, resource scarcity and public health crises. For example, the use of advanced renewable energy technologies and smart infrastructure can help mitigate the impact of climate change and build more sustainable societies.

In conclusion, high technology represents the pinnacle of human invention and creativity, offering endless possibilities for forming the future. As we continue to apply the power of high

technology, we can expect to see even greater advancements that will continue to change our world for the better.

Importance of exporting high technologies

In modern times, the development of technology plays an important role in the management of economic growth, in addition to strengthening the high-tech export capabilities of a country (Şahin et al., 2021). The concept of high-tech exports provides a foundation for the development of relations between regions and the improvement of technologies. This foundation helps to define the export strategy of high-tech products. In general, the concept of high-tech export refers to the strategy of a country or company to sell high-tech products abroad. This strategy is often based on factors such as innovation, quality and competitive advantage.

Exports play an important role in the economic growth of rapidly developing countries. In the global space, states try to increase the export of high-tech products in order to have superior opportunities (Usman, 2017). The export of high-tech products is generally aimed at increasing economic growth and competitiveness. This often requires a focus on producing and marketing products that require knowledge and skills.

The main goal of this concept is to ensure important development in the field of high technologies. In this context, the main principles of high technology export are as follows:

1. Innovation and research: Research should be invested in the continuous innovation and development of high-tech products. Innovation provides a competitive advantage and ensures that products are constantly updated.

2. Quality and standards: It is important that high-tech products comply with international quality standards and meet customer expectations. Quality products increase customer satisfaction and strengthen brand reputation.

3. Market research and customer demand: Detailed market research should be done to develop products that meet the needs of target markets. The design and features of products should be determined taking into account customer feedback.

4. Global networks and cooperation. It is important to expand market coverage by establishing international collaborations and partnerships. Strategic cooperation facilitates technology transfer and accelerates access to new markets.

5. Export incentives and supports. Governments should provide various supports and incentives to promote high-tech exports. Measures such as research funding and trade support encourage companies to increase their international competitiveness.

6. Continuous improvement and adaptation. Because market conditions and technological trends are constantly changing, high-tech export strategies should be constantly reviewed and improved. Flexibility and adaptability are key to successful competition.

The status of employer influence in relation to high-tech exports

In the post-industrial period, the importance of raw materials, materials, energy resources and labor force in production was replaced by the increasing importance of intellectual resources in the information society (Qurbanova, 2021). For this reason, high technological development can be associated with an intellectual product. Exporting high technology can increase business efficiency and speed up business processes. This allows employers to generate more profits and manage their workforce more efficiently. But this does not directly affect the employees to be more productive and successful in their work.

The productivity of the production process is related to the level of professionalism demonstrated by the employees, that results from their work experience, skills and motivation. Investments in labor force play an important role in ensuring the dynamically sustainable development. Improving the quality of personnel contributes to the growth of labor productivity and development of innovative activity. These innovations ensure continuous updating of the technical and technological base of production, development of new competitive products, effective penetration

of goods and services into world markets. It is fair to conclude that by creating an environment conducive to innovation and technological advancement, employers encourage the development of cutting-edge products and services that can be exported to the world markets. Employers play a key role in forming the high-tech export environment by investing in research and development and in their ability to attract and retain the best talent.

The competitive environment influences the potential productivity growth of employers. In other words, intense competition between employers forces them to increase production efficiency and hire highly productive workers, albeit at a higher cost. (İsmayilov et al., 2021). Consequently, employers may have opportunities to influence the export of high-tech products. Employers can also help create a more favorable environment for global trade and investment in the high-tech sector by advocating for trade agreements and policies that support the export of high-tech goods.

Research method and results
Research method
A Granger causality test is a statistical hypothesis test used to determine whether one time series can change another. The test was developed by Clive Granger (1969), a Nobel laureate in economics, and it has become a key tool for analyzing causal relationships between time series data (Altıntaş et al., 2008).
The research used data from 2007-2023.
Data:
➣ World Bank database (World Bank, 2025) (employers as a percentage of the employed population and high-tech exports (as a percentage of total exports))
➣ Data base of the Azerbaijan State Statistics Committee (Azerbaijan State Statistics Committee, 2025) (industry, additional volume and number of employed population).

Research results
Granger causality analysis

The variables used in the analysis are described in the table below with their abbreviations.

Variable name	Variable abbreviation
Number of employers	ISS
high technological demand	YTI
Domestic loans granted by banks to the private sector (% of GDP)	BOSVK
İndustry (with added value)	SED
Gross Domestic Product	UDM

Table 1. Variables used in the analysis
Source: Compiled by the author

Before conducting Granger causality analysis, it is important to test the stationarity of the variables. This was achieved by applying the Augmented Dickey-Fuller (ADF) test, with results presented in Table 2.

Null Hypothesis: the variable has a unit root						
		At Level				
		ISS	YTI	BOSVK	SED	UDM
With Constant	t-Statistic	-0.6763	-3.2543	-1.4741	-3.2975	-0.7634
	Prob.	***0.8258***	***0.3980***	***0.5165***	***0.3270***	***0.7982***
		n0	*	n0	*	n0
With Constant & Trend	t-Statistic	-4.6834	-2.2404	-1.2904	-3.1642	-2.7322
	Prob.	***0.1360***	***0.4386***	***0.8463***	***0.1261***	***0.2392***
		*	n0	n0	n0	n0
		At First Difference				
		d(ISS)	d(YTI)	d(BOSVK)	d(SED)	d(UDM)
With Constant	t-Statistic	-3.2236	-3.5840	-3.8147	-3.8208	-4.3012
	Prob.	***0.0440***	***0.0243***	***0.0141***	***0.0150***	***0.0059***
		**	**	**	**	***

Table 2. Unit Root Test Results (ADF)
Source. Compiled by the author using EViews 10 software based on World Bank (2025) and Azerbaijan State Statistics Committee (2025) data

As shown in Table 2, it presents the results of the ADF test and provides information about the unit root hypothesis tested for five variables (ISS, YTI, BOSVK, SED, UDM) at level and in first difference, considering constant and constant & trend. In the tests conducted with constant at level, the t-statistics of all variables have absolute values less than the critical values and the probability values (p-values) are greater than 0.05, therefore, it is not possible to reject the unit root hypothesis, i.e., the variables are not stationary. In the tests conducted with a constant in the first difference, the p-values for ISS (p=0.044), BOSVK (p=0.014), SED (p=0.015), and UDM (p=0.0059) are less than 0.05, indicating that the unit root hypothesis is rejected. However, for YTI, the p-value in the first difference is 0.20243, which is greater than 0.05, meaning the unit root hypothesis cannot be rejected at the 5% significance level, though it may suggest stationarity at the 10% significance level. Consequently, the table data indicate that most variables are non-stationary at level but become stationary in the first difference, suggesting that the time series are suitable for analysis.

VAR Granger Causality/Block Exogeneity Wald Tests			
Sample: 2007 2023			
Included observations: 14			
Dependent variable: ISS			
Excluded	Chi-sq	df	Prob.
YTI	20.55410	3	0.0001
All	20.55410	3	0.0001
Dependent variable: YTI			
Excluded	Chi-sq	df	Prob.
ISS	3.999107	3	0.2616
All	3.999107	3	0.2616

Table 3. Results of the granger causality estimation of the effect between employers and high-tech exports
Source. Compiled by the author using EViews 10 software based on World Bank (2025) data

Hypothesis 1 from Table 3 is as follows:
H_0 -The change in the number of employers is the reason for high-tech exports;
H_1 - The change in the number of employers is not the reason for high-tech exports.

In Table 3, to find out the reason for employers, H_0 is accepted and H_1 is rejected. The result obtained from here can be interpreted as follows:

As technology continues to advance rapidly, the demand for highly skilled workers in the high-tech sector has increased. This has led to an of new companies and startups entering the market. The existing hall shows the relationship influx with the number of employers.

As high-tech exports increase, companies may need to expand their workforce to keep up with production and meet the demands of international markets. Conversely, if there is a decline in high-tech exports, employers may have to decrease their operations and workforce. In general, fluctuations in high technology exports can directly affect the number of employers in the industry.

Hypothesis 2 from Table 3 is as follows:

H_0 - The change in the volume of high-tech exports is the reason for the number of employers;

H_1 - The change in the volume of high-tech exports is not the reason for the number of employers.

In Table 3, to study the reason for high-tech exports, H_0 is rejected and H_1 alternative is accepted. The result obtained from here can be interpreted as follows:

Regardless of the employers involved in the production process, the volume of high-tech exports remains constant. This shows that the demand for high-tech products is not significantly affected by changes in the companies responsible for their production.

Additionally, the consistent volume of high-tech exports, regardless of the employers involved, suggests that market forces such as technological advances and consumer preferences play a larger role in determining demand than individual company strategies. This means that the high-tech industry as a whole provides more demand for these products than individual companies competing for market share.

According to the results of the Granger causality test, it was concluded that employers do not influence technological exports. This may indicate that the company lacks potentially innovative technologies or lags behind in technology development. In this case, it may be compounded by some unwillingness of employers to invest in and develop high technology.

The export of high technology is closely related to the import of high technology raw materials from foreign countries (Ekananda, & Parlinggoman, 2017). In this regard, the effect between employers and the export of high technology is ambiguous. There may be several reasons why employers are not affected by high-tech exports:

1. Productive degradation in technology: Employers may choose to work with older technology and equipment because the use of new technology may cause employees to become interested and learn new mechanisms.

2. Financial issues: Buying and providing new technology and equipment is impossible for financial reasons. Employers or business owners may not be willing to spend much time and money to make these investments.

3. Business practices and existing business processes: Employers may struggle to understand how technology changes will affect business processes and employee actions. In such cases, technology change may seem risky and employers should properly analyze and plan before taking this risk.

Such reasons may also cause employers not to accept high-tech exports and, as a result, to face technological development constraints.

VAR Granger Causality/Block Exogeneity Wald Tests			
Sample: 2007 2023			
Included observations: 14			
Dependent variable: ISS			
Excluded	Chi-sq	df	Prob.
SED	4.009094	4	0.4048
All	4.009094	4	0.4048
Dependent variable: SED			
Excluded	Chi-sq	df	Prob.
ISS	22.42068	4	0.0002
All	22.42068	4	0.0002

Table 4. Results of the granger causality estimation
of the influence of employers on the industry
Source. *Compiled by the author using EViews 10 software based on World Bank (2025) and Azerbaijan State Statistics Committee (2025) data*

Hypothesis 1, taken from Table 4, is as follows:
H_0 - The change in the number of employers is caused by the industry (including value added).
H_1 - The change in the number of employers is not caused by the industry (including value added).

As shown in Table 4 for Hypothesis 1, H_0 was rejected, and H_1 was accepted, confirming the investigation into the factors influencing employers. The result obtained from this can be interpreted as follows:

The analysis in Table 4 shows that the size of the industry does not play a role in the change in the number of employers in this sector. The main reasons why the size of the industry does not directly affect the number of employers are related to technological development, economic cycles, and labor market dynamics. Modern technologies and automation allow for higher productivity with fewer human resources, which reduces or keeps the need for labor constant. Economic cycles, especially during economic downturns or crises, can lead to industrial layoffs to reduce costs even if industrial volume increases. Global trade dynamics, such as changes in the import-export balance or restricted access to foreign markets, affect the number of local employers by changing production strategies. In addition, structural changes in the labor market, such as shortages of skilled personnel or labor migration, can limit the number of employees regardless of the size of the industry.

Hypothesis 2, taken from Table 4, is as follows:

H_0 - The change in the industry's volume (including value added) is caused by the number of employers.

H_1 - The change in the industry's volume (including value added) is not caused by the number of employers.

Hypothesis 2 in Table 4 shows that H_0 is accepted and H_1 is rejected. In this case, the result obtained can be interpreted as follows:

According to the results of this analysis, changes in the number of employers significantly affect the size of the industry as a whole. Changes in the number of employers have both a direct and an indirect impact on the industry's size. First and foremost, the increase in the number of employers is associated with the emergence of new enterprises in the industry and the expansion of existing ones, which enhances overall production capacity. As new employers enter the market, competition intensifies, leading to increased productivity. This process contributes to diversification in the industry structure and the diffusion of innovations. At the same time, an increase in the number of employers leads to the creation of new jobs in the labor market and an increase in economic activity. This creates conditions for an increase in total turnover and added value in the industrial sector. On

the contrary, a decrease in the number of employers results in the closure or limitation of industrial enterprises, which reduces the overall size of the industry. Scientific studies show that the number of employers is one of the main indicators in the dynamics of the industrial sector, and its change leads to significant changes in the size of the industry. According to Keynes, the private sector alone cannot provide the optimal level of employment, and in order to maintain full employment, it is necessary to regulate aggregate demand through government policies (fiscal and monetary) (Ермакова et al., 2023). In this regard, government intervention in the economy and stimulation of demand are considered essential for increasing employment. In the Keynesian approach, an increase in the number of employers is associated with an increase in aggregate demand and economic activity.

VAR Granger Causality/Block Exogeneity Wald Tests			
Sample: 2007 2023			
Included observations: 14			
Dependent variable: ISS			
Excluded	Chi-sq	df	Prob.
UDM	12.54111	3	0.0057
All	12.54111	3	0.0057
Dependent variable: UDM			
Excluded	Chi-sq	df	Prob.
ISS	5.388014	3	0.1455
All	5.388014	3	0.1455

Table 5. Results of the Granger Causality Test Assessing the Relationship Between Employers and GDP
Source. *Compiled by the author using EViews 10 software based on World Bank (2025) and Azerbaijan State Statistics Committee (2025) data*

Hypothesis 1, taken from Table 5, is as follows:
H_0 - Changes in the number of employers cause changes in GDP.
H_1 - Changes in the number of employers do not cause changes in GDP.
Based on the results for Hypothesis 1 in Table 5, since the p-value ($p<0.05$) is statistically significant, the null hypothesis (H_0) is accepted, and the alternative hypothesis (H_1) is rejected. The result obtained from this can be interpreted as follows:

Changes in the number of employers have a direct impact on the economy, as their growth increases employment and consumption levels. Employers who hire more workers and invest in new projects stimulate economic activity. This, in turn, leads to an increase in GDP and improved social welfare. According to Schumpeter's theory, employers drive economic growth through innovations and new businesses. These innovations transform market dynamics, intensify competition, and expand consumer choice. Simultaneously, this process restructures the economy, leading to the elimination of outdated and inefficient business models. This results in more efficient resource utilization and an increase in the overall productivity of the economy. Consequently, innovation and entrepreneurship not only foster economic growth but also enhance social welfare, positively contributing to societal development.

Hypothesis 2, taken from Table 5, is as follows:
H_0 - Changes in the volume of GDP are caused by the number of employers.
H_1 - Changes in the volume of GDP are not caused by the number of employers.
Based on the results for Hypothesis 1 in Table 5, since the p-value ($p>0.05$) is not statistically significant, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. The obtained results can be interpreted as follows:

The change in GDP is a result of many factors, and this change is not a direct cause of the number of employers. On the contrary, economic growth is mainly due to factors such as

technological innovations, capital investments, productivity growth, and foreign trade. For example, GDP growth sometimes occurs as a result of automation and technological development, which can lead to a decrease in the number of employers, rather than an increase. At the same time, changes in the structure of the economy – for example, changes in industry sectors – can affect the creation of new jobs or the elimination of existing ones. In addition, the number of employers also depends on other factors, such as demand in the labor market, labor migration, and the availability of qualified personnel. Therefore, changes in GDP cannot be considered a direct cause of the number of employers, as the relationship is reciprocal and multifaceted.

Conclusion

Employers should have a reason to invest in the development of high-tech exports. There are a number of key measures that can be taken to encourage and support employers in this work. First of all, employers should create a favorable environment for the development of high-tech exports in management. This includes providing financial incentives such as tax benefits and grants to export-oriented companies investing in research and development. By reducing the financial burden on employers, they are more likely to take risks and invest in new technologies and products that can be brought to international markets.

In addition, it is important to increase the skilled workforce for the development of high-tech exports. Employers should be encouraged to invest in training and education programs to keep their employees ahead of technological advancements and global competition. Governments can also play a role in facilitating partnerships between industry and academia to ensure that the workforce is equipped with the necessary skills and knowledge to support high-tech exports.

Employers can drive positive change in the industry by investing in their employees, promoting diversity and inclusion, and prioritizing sustainability and social responsibility. Employers play a key role in developing industries through investment decisions, innovation and technological advancements, and strategic decisions about mergers and acquisitions. Employers should also focus on creating a positive work environment by attracting skilled personnel. Employers can influence industry growth by offering competitive salaries and opportunities for advancement. In addition, employers can invest in training and development programs to help upskill current employees and equip them to meet the evolving demands of the industry. By prioritizing employee satisfaction and professional growth, employers can not only increase the size of the industry, but also contribute to overall success and innovation.

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Trends in Education of the Fourth Industrial Revolution in Azerbaijan

Abstract

Innovations associated with the Fourth Industrial Revolution, particularly digitalization and artificial intelligence, are reshaping the substance and methodology of education in profound ways. In today's world, learning is no longer restricted to the physical boundaries of schools and universities, education is no longer restricted to the physical boundaries of schools and universities and has instead become accessible anywhere and at any time, thereby significantly broadening the educational environment. This evolving landscape is transforming the professional roles of teachers, enriching students' learning experiences, and redefining the principles of educational management. This article seeks to offer readers a comprehensive and systematic examination of the role that digitalization and innovative technologies play in contemporary education. It specifically explores the integration of digital tools and artificial intelligence applications into educational processes, considering both global trends and developments within Azerbaijan, and evaluates their influence on teaching, learning, and management practices. The overarching aim is to analyse the current situation within a scientific framework and to promote a deeper understanding of emerging directions and innovative transformations in the field of education. Through this analysis, readers will gain insight into how technological advancements shape teaching and management processes, facilitate the renewal of instructional methods, and support the effective use of digital resources in educational institutions.

Keywords: Education 4.0, digitalization, artificial intelligence, educational innovations, digital transformation

Introduction

The contemporary period signifies the onset of a new phase in human development - the Fourth Industrial Revolution. This revolution has introduced far-reaching changes across all sectors of society, including the field of education. Emerging approaches such as artificial intelligence, automation, robotics, and digital platforms have necessitated a reassessment of the effectiveness of traditional teaching models and have brought new conceptual perspectives into the educational process. Education today is no longer viewed simply as a mechanism for the transmission of knowledge; rather, it has evolved into a dynamic and adaptable ecosystem that nurtures creativity, innovation, and critical thinking. As the requirements of the global labor market continue to evolve, educational institutions are placing increasing emphasis on cultivating competencies such as problem-solving, digital literacy, and lifelong learning. This shift reflects a fundamental transformation of the educational paradigm - a movement toward the "Education 4.0" model.

The relevance of this topic stems from the growing necessity to maintain a balance between technological advancement and social adaptation, which has become a strategic priority in modern education policy. In this evolving landscape, the development of digital infrastructures within

educational institutions, the strengthening of teachers' technological competencies, and the deployment of AI-based management systems emerge as essential components of progress. Without these advancements, an education system that fails to keep pace with rapid technological change may become a significant barrier to broader social and economic development.

In the context of Azerbaijan, this issue carries particular importance. In recent years, notable initiatives have been undertaken to formulate digital education strategies, expand distance learning opportunities, and integrate online platforms into the teaching process. Despite these efforts, there remains a need for comprehensive scientific research to evaluate the actual impact of digitalization on teaching quality, teacher–student interaction, and educational management practices. In conclusion, examining the relationship between the Fourth Industrial Revolution and the Education 4.0 paradigm is of substantial theoretical and practical significance. Research in this area will help form a robust scientific foundation for shaping future education models and supporting the innovative development of teaching and learning processes.

Literature review

Today, the notion that 'education extends beyond the classroom and is accessible everywhere' has become an undeniable reality. Since the beginning of the 21st century, industry, the economy, and social life have undergone profound digital transformation. The Fourth Industrial Revolution - driven by artificial intelligence (AI), big data, the Internet of Things (IoT), and automation - is reshaping every sphere of society, including education. In this environment, adapting educational systems to the digital landscape is no longer optional; it has become an imperative. For this reason, examining the impact of the Fourth Industrial Revolution on education - particularly within the context of Azerbaijan holds strategic significance. Contemporary scholars refer to this transformative stage as 'Education 4.0', a concept that encompasses modern academic perspectives, theoretical approaches, and emerging trends associated with the digital transformation of learning.

UNEC Rector, Professor Adalat Muradov, in his reflections on *AI and the Future of Education'*, underscores the transformative role of AI in shaping the trajectory of future educational systems. He emphasizes that AI significantly expands the potential for personalized learning by analysing each student's strengths, weaknesses, and learning pace, thereby enabling the creation of genuinely individualised educational pathways. Professor Muradov also observes that the future of education will increasingly incorporate interactive learning tools, with Virtual Reality (VR) and Augmented Reality (AR) making lessons more immersive, engaging, and dynamic. In addition, he highlights the supportive function of AI in teachers' professional activities: by automating routine administrative tasks, AI allows educators to devote more time and attention to their core mission teaching. According to Muradov, AI also strengthens accessibility and inclusivity in education by enabling the delivery of learning materials in multiple languages, thus helping to eliminate linguistic and social barriers for students. Ultimately, he argues that the advancement of AI should facilitate the development of competencies aligned with future labor market demands, allowing education systems to teach not only traditional academic subjects but also the skills required to thrive in an AI-driven environment. In this regard, artificial intelligence emerges as a key factor enhancing the quality, efficiency, and accessibility of modern education (Muradov, et.al, 2025).

In his book *The Fourth Industrial Revolution*, Klaus Schwab argues that the rapid convergence of technologies - including artificial intelligence, automation, and the Internet of Things - is reshaping not only industries and economies but education itself. Schwab maintains that educational institutions must move beyond traditional knowledge transmission and instead cultivate a culture of lifelong learning. He further stresses that educators must continuously adapt their teaching methods and assessment practices to keep pace with ongoing technological innovation (Schwab, 2016).

According to Firudin T. Aghayev and his co-authors in the article *'Trends and Prospects for IT Education in Industry 4.0'*, the concept of 'Education 4.0' is designed to prepare flexible, creative, and technologically proficient professionals for the emerging industrial era. The contemporary education system is shifting from traditional theoretical knowledge delivery toward practical,

problem-oriented learning, with a strong emphasis on integrating AI, AR, IoT, and cloud technologies into the instructional process. Within this model, teachers function as facilitators, while students assume the role of active participants in their own learning. Ultimately, the core objective of 'Education 4.0' is to develop innovative and adaptive specialists capable of meeting the evolving demands of the modern labor market (Aghayev, Mammadova & Melikova, 2022).

In Azerbaijan, a range of initiatives illustrates the country's growing commitment to digital transformation and skills development in the context of the Fourth Industrial Revolution. Programs such as the "4IR Academy" and the National Digital Skills Program are designed to develop human capital that is better aligned with the demands of a rapidly changing labor market. Beyond improving technological literacy, these initiatives contribute to embedding lifelong learning into national education policy and practice. Taken together, these efforts signal a deliberate and forward-looking strategy to build an education system that is flexible, innovative, and sustainable in the era of the Fourth Industrial Revolution (4SIM, 2025).

According to the Asian Development Bank (ADB), the Fourth Industrial Revolution not only generates significant economic opportunities but also exacerbates the persistent challenge of skills mismatch in the labor market. Emerging technologies-particularly automation and artificial intelligence-are rapidly reducing the need for many traditional occupations while simultaneously giving rise to new roles that demand advanced technical and digital competencies. As a result, the disparity between workers' existing skills and the evolving requirements of employers continues to widen, underscoring the need for well-designed education, upskilling, and retraining initiatives. ADB specialists emphasize that vocational education and comprehensive reskilling programs should be prioritized, especially in regional and rural areas where access to such opportunities is often limited. Strengthening these pathways not only promotes social equity and economic inclusion but also fosters more adaptable, resilient, and lifelong learning-oriented education systems capable of meeting the demands of a rapidly transforming economy (Asian Development Bank, 2020). In a comparable way, Tikhonova and colleagues associates contend in "Education 4.0: Concept, Skills, and Research" that the skill set required in the Fourth Industrial Revolution is drastically changing. They contend that modern education systems must place greater emphasis on cultivating critical thinking, digital literacy, analytical competencies, and collaborative abilities. Embedding these skills into educational curricula helps nurture not only technologically proficient individuals but also creative, adaptable human capital capable of addressing complex, multidimensional challenges. The authors further observe that this shift fundamentally reconfigures the role of the teacher. Instead of functioning primarily as a transmitter of information, the teacher increasingly assumes the role of facilitator and mentor, guiding learners through personalized, interactive, and learner-centered educational experiences (Tikhonova et al., 2023). Regional research findings show that educational digitalization plays a vital role in achieving the Sustainable Development Goal on Quality Education (SDG 4). In the study "Digitalization and SDG4 in Azerbaijan," it is emphasized that although digital technologies improve inclusiveness and quality in education, structural barriers persist in some Azerbaijani regions. These challenges include unequal internet access, a shortage of modern educational equipment, and insufficient digital skills among teachers. The authors argue that to ensure digital inclusivity, national policy priorities must be clarified, and resources distributed equitably across regions (Rahmanov et al., 2025).

A review of the existing literature shows that Azerbaijan has achieved notable scientific and practical progress in integrating Fourth Industrial Revolution principles into its education system. Nevertheless, most available studies are confined to policy-level analyses and preliminary pilot outcomes. Robust empirical and comparative research capable of measuring the actual effects of digital transformation in education remains limited. Accordingly, future scholarship should focus on assessing how Education 4.0 initiatives influence teaching quality, teacher-student competencies, and social inclusivity, while also developing methodological frameworks that clearly define success criteria for technological integration. Sustained long-term monitoring and systematic data analysis would offer critical evidence to support national policy decisions and facilitate the sharing of best

practices across the region (Ahadov et al., 2019). In conclusion, the findings of these studies collectively underscore that the central mission of education in the era of the Fourth Industrial Revolution extends far beyond the simple integration of digital technologies. Rather, it involves a profound qualitative transformation of human capital. Aligning curricula with emerging skill demands, repositioning teachers as mentors and facilitators of learning, and ensuring equitable access to digital resources should therefore be considered strategic priorities within contemporary educational policy.

The role of digitalization in education

Reports from the U.S. Bureau of Economic Analysis show that technological progress boosts productivity largely through the substitution of human labor. In their widely cited study, Frey and Osborne evaluated 702 occupations based on their susceptibility to automation and concluded that approximately 47% of U.S. employment may be at risk over the next 10-20 years. This dynamic has intensified labor market polarization: high-income cognitive and creative occupations continue to grow, whereas middle-income routine jobs are steadily diminishing. These shifts highlight the need for strategic policy responses and robust social support mechanisms to help the workforce adapt to rapidly evolving technological realities.

Occupations with the Highest Risk of Automation		Occupations with the Lowest Risk of Automation	
Probability	Occupation	Probability	Occupation
0.99	Telemarketers	0.0031	Social workers specializing in mental health and substance abuse
0.99	Tax consultants	0.0040	Choreographers
0.98	Insurance underwriters (Automobile claims)	0.0042	Physicians and surgeons
0.98	Referees and other sprts officials	0.0043	Psychologists
0.98	Court clerks	0.0055	Human resources managers
0.97	Restaurant and café waitstaff	0.0065	Computer systems analysts
0.97	Real estate brokers	0.0077	Anthropologists and archaeologists
0.97	Agricultural labor contractors	0.0100	Marine engineers and naval architects
0.96	Legal, medical, and executive secretaries and adminstrative assistants	0.0130	Sales managers
0.94	Couriers and messengers	0.0150	Chief executives

Table 1. Examples of occupations most and least amenable to automation
Source. *Schwab, K. (2016). The Fourth Industrial Revolution. World Economic Forum: p.52*

Automation is shaped not only by the capabilities of robots and algorithms, but also by a range of complementary factors, including:

Simplifying and structuring work	Outsourcing and digital labor markets	Monitoring and data quality

Occupations that are comparatively less exposed to automation in the near term are those that rely heavily on social interaction and creative competencies, especially roles that involve making decisions under uncertainty and generating novel ideas. Yet this relative security is unlikely to be permanent. Even in fields such as writing-long considered a quintessentially creative profession-we

are already beginning to see the emergence of automated systems capable of generating stories, signalling that we may be only at the outset of a broader transformation (Schwab, 2016). The convergence of physical, digital, and biological domains-which lies at the heart of the Fourth Industrial Revolution-creates substantial global opportunities to use resources more efficiently. The World Economic Forum's "Project Main Stream," designed to accelerate the shift toward a circular economy, illustrates that these opportunities go beyond merely reducing the environmental footprint of individuals, organizations, and governments. They also encompass the use of technology and intelligent system design to restore and regenerate natural ecosystems. The central aim of this approach is to move firms and consumers away from the traditional linear "produce-consume-dispose" model and toward a new industrial paradigm in which resources are managed in a regenerative and sustainable way. Such a model promotes the development of a more productive and resilient economy by recognizing and optimizing the interconnected flows of materials, energy, labor, and information. Achieving this transformation depends on four fundamental mechanisms:

Internet of Things (IoT) and Resource Efficiency	*The Internet of Things (IoT) and smart assets enable the tracking of material and energy flows, thereby ensuring higher efficiency across value chains. According to Cisco's projections, IoT technologies are expected to generate an economic benefit of 14.4 trillion USD in the coming decade, while optimizing supply chain processes could reduce waste and save 2.7 trillion USD. In addition, IoT-based solutions have the potential to reduce greenhouse gas emissions by 9.1 billion tons by 2020, which represents approximately 16.5% of global emissions. These facts suggest that IoT not only creates economic value but also plays an important role in promoting environmentally sustainable development.*
Digital Assets, Blockchain, and Accountability	*The democratization of information resources and the transparency of digital assets encourage accountability among citizens, corporations, and government institutions. In this process, blockchain technologies play a critical role by ensuring the integrity and reliability of data. For example, blockchain-based systems can authenticate land titles, thereby enhancing the accountability of landowners. Overall, digital transparency and reliable data circulation create a new phase in ecological governance and public accountability.*
Behavioral Changes and Social Innovations	*The growth of new data sources and increased transparency can also drive behavioral changes and social norm transformations. These shifts influence how individuals make decisions, interact with institutions, and perceive the world. Moreover, behavioral economics and psychology research helps governments better understand human decision-making. Accordingly, many governments, companies, and social organizations have launched experimental initiatives to evaluate the effectiveness of behavioral interventions. For instance, the "OPower" program uses behavioral insights to encourage citizens to reduce household electricity consumption by comparing their usage with that of their neighbors.*
New Business and Organizational Models	*Digital technologies form the foundation for new business and organizational models, fostering innovation in value creation and sharing processes. Through advanced logistics tools, digital platforms enhance resource utilization efficiency, facilitate resource sharing and leasing mechanisms, and strengthen circular economy practices by increasing asset turnover. Furthermore, such models promote "upward scalability," making businesses more flexible while ensuring sustainable resource use. These models not only enhance economic efficiency but also contribute to long-term environmental sustainability.*

Table 2. Digital technologies and sustainable resource use
Source: Schwab, K. (2016). The Fourth Industrial Revolution. *World Economic Forum*

The evidence on how automation affects different professions demonstrates that renewing and adapting the education system is no longer optional but necessary. In recent years, artificial intelligence has emerged as a central pillar of digital education. Generative AI tools-such as ChatGPT, Duolingo Max, and Khanmigo-are increasingly being integrated into learning environments to support more personalized learning pathways and to assist educators in tasks such as assessment, feedback provision, and instructional planning (Carr, 2023; Google, 2022). Nevertheless, the integration of these technologies also brings a range of ethical, social, and legal challenges. Biased AI algorithms have the potential to reinforce existing social inequalities and may even erode the trust that underpins effective teacher-student relationships (Kolkman, 2020). Enhancing digital infrastructure in education-including ensuring high-speed internet connectivity in schools, reducing digital inequality, and expanding access to high-quality devices-has become a central priority in many countries' digital education strategies. In pursuit of these goals, the OECD launched a major initiative in 2023 titled "Resourcing School Education for the Digital Transformation of Teaching and Teachers' Readiness for the Future". The project aims to develop a comparative data framework for digital education, examine countries' experiences, and support the formulation of evidence-based policy decisions in this area (OECD, 2025). The expansion of digital education and its rising prominence in education policy have become increasingly evident in recent years. Although the COVID-19 pandemic accelerated the digitalization of teaching and learning processes, the rapid advancement of generative artificial intelligence has created a new imperative to reevaluate existing education strategies and adapt them to emerging technological realities (OECD, 2023, p. 42). In this context, many countries have introduced central-level strategies focused specifically on digital education to guide ongoing and future reforms. The diagram 1 offers a visual overview of the types of strategies adopted at the national level and their current stage of implementation.
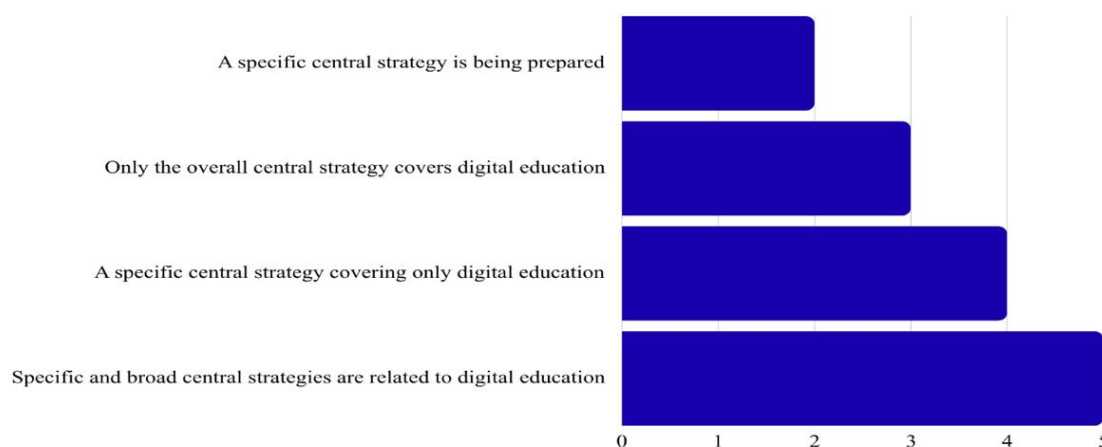

Diagram 1. Central-level strategies for digital education
Source. OECD. (2025). Policies for the digital transformation of school education: Evidence from the Policy Survey on School Education in the Digital Age (OECD Education Working Paper No. 328), p.12.

Diagram 1 illustrates that central-level digital education strategies vary considerably across countries. The colours in the chart indicate both the type and the stage of these strategies: "combined and broad central strategies" refer to national strategies that incorporate digital education as one component; "specialised strategies" denote those dedicated exclusively to digital education; "general strategies that partially address digital education" represent cases where digital education is embedded within broader policy frameworks; and an additional category captures specialised strategies that are currently under development. Overall, the chart presents data from 37 jurisdictions-that is, 37 distinct education governance systems. These jurisdictions are grouped as follows:

- Eighteen countries - Austria, Colombia, Finland, France, Ireland, Korea, Lithuania, Luxembourg, the Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, New South Wales (Australia), Wales (United Kingdom), Croatia, and Singapore have implemented both

specialised and broad central strategies for digital education.

- Ten countries - Chile, Denmark, Estonia, Greece, Iceland, Japan, Sweden, England (United Kingdom), Bulgaria, and Romania address digital education solely within the framework of their general central strategies.
- Five countries - Germany, Italy, New Zealand, the Flemish Community (Belgium), and the French Community (Belgium) maintain a dedicated central strategy exclusively focused on digital education.
- Four countries - Poland, Northern Ireland (United Kingdom), Scotland (United Kingdom), and Israel are in the process of developing specialised strategies for digital education.

Based on the results of the policy survey, all participating countries have accorded digital education a prominent role in strategic documents outlining the main directions of educational reform. In some countries, this is achieved through standalone strategies specifically dedicated to digital education, whereas in others, it is integrated within broader, general education strategies (OECD, 2025). In this context, one influential international model guiding the development of digital education is the World Bank's framework, Key Shifts Required in Digital Transitions in Education and Skills Development. The framework highlights that the digital transformation of education and skills systems depends not only on technological innovation but also on fundamental changes in governance, policy, and pedagogical practices. It emphasizes that success in digital transformation is not achieved solely through the provision of technological infrastructure, but through the implementation of a systematic and sustained reform approach. The table below organizes these changes according to key directions, illustrating the distinctions between previous and emerging paradigms.

Shift Mindsets and Actions	Previous approach ("FROM")	New direction ("TO")
Strategic management and policy formulation	Focus on short-term and ad hoc digital initiatives	Leading a systematic, purposeful and learning-skill development-centered approach
Investment and technology infrastructure	Investing in fragmented and disconnected digital "frills"	Investing in integrated digital "cores" that support teaching, learning and governance
Education and innovation orientation	Application of technology-centric approaches	Application of education, skills and learning-centric approaches

Table 3. Key trends in the digital transformation of education and skills
Source. *World Bank (2023). Digital Transformation in Education and Skills Development: Key Shifts for Systems Change. Washington, DC: World Bank.*

Previous approach ("FROM")	New direction ("TO")
Inequality and rent-seeking systems	Systems based on equality, transparency and accountability
Outdated and Outdated Learning Models	Modern, Flexible and Future-Oriented Learning Models
Weak and Fragile Education Systems	Resilient, Flexible and Emergency-Ready Education Systems

Table 4. Shift Outcomes
Source. *World Bank (2023). Digital Transformation in Education and Skills Development: Key Shifts for Systems Change. Washington, DC: World Bank.*

Digital transformation in education extends beyond the mere adoption of new technologies; it represents a comprehensive reform that interweaves policy, infrastructure, and pedagogy. Its central aim is to shift away from short-term, technology-driven approaches toward systematic, integrated, and learner-centered strategies. Within this framework, strategic planning emphasizes long-term, purpose-driven initiatives focused on skill development; investments target integrated digital infrastructures that support teaching, learning, and governance; and educational practices prioritize the cultivation of learning, skills, and innovation rather than the simple application of technology. Consequently, education systems become equitable, transparent, and resilient; outdated learning models are replaced with modern, flexible, and future-oriented approaches; and weak or fragile

systems are strengthened to be adaptable and resilient in emergency situations. This process ensures the development of inclusive, flexible, and skill-oriented education systems capable of addressing current and future challenges.

The Impact of Digitalization on Education in Azerbaijan

In Azerbaijan, the impact of digitalization on education has been primarily oriented toward enhancing the experiences of students and teachers, rather than focusing solely on technology, positioning it at the intersection of technological innovation and pedagogical development within the higher education sector. The Social-Economic Development Strategy of the Republic of Azerbaijan for 2022-2026 further highlights the development of innovative and digital skills in higher education as a strategic priority (E-qanun, 2022). The incorporation of technology into education has prompted educators to rethink how they teach and to adjust curricula to better suit the needs of today's learners. This shift has transformed the ways teaching, learning, and research are conducted, creating an increased emphasis on building the skills and capabilities of both students and teachers (Rampelt et al., 2019). The main objective of digital transformation in education is to improve the student experience. In this context, UNEC's EDUMAN-E-University model represents an important advancement. Through this initiative, electronic textbooks and grade books were introduced, a 24-hour e-library was made available, and the management of teaching and administrative processes was digitized to streamline operations.

During the period when schools in Azerbaijan were closed due to the pandemic, the Ministry of Education launched an online learning platform. According to Minister of Education Emin Əmrullayev, roughly one year after the start of the pandemic, 1,442,000 students had registered on the platform. Given that the total student population in the 2020 - 2021 academic year was 1,569,000, this means that around 92% of students were registered, leaving approximately 127,000 students who did not engage with the online platform. Although a large number of students and teachers registered on the platform, not all were active users. As reported by Minister Emin Amrullayev in 2021, around 1,170,000 students accessed the platform at least once per week. Overall, approximately 68% of students and teachers actively participated in online learning, while the remaining 550,000 were not regularly engaged in educational activities (Amrullayev, 2021). Participation in online education was notably lower among students residing outside major cities. In Baku, Ganja, and other large urban centers, 74–75% of students attended online lessons at least once per week. Given that the Absheron Peninsula is home to roughly 40% of the country's student population, about 470,000 of the 627,000 students there engaged in online learning. In contrast, in other regions, approximately one-third of students faced difficulties in consistently accessing online education (State Statistical Committee of the Republic of Azerbaijan, 2021).

One of the key challenges to online education was the limited availability of physical infrastructure. In 2020, 66% of households had internet access via a modem, increasing to 71% in 2021. Nevertheless, during the pandemic, roughly 30% of homes remained without internet connectivity. At the same time, only about 75% of households owned a computer, which meant that many students had to rely on mobile phones to participate in lessons. Furthermore, the speed and quality of internet connections significantly affected students' ability to engage with the online platform effectively (State Statistical Committee of the Republic of Azerbaijan, 2021). Overall, these data suggest that issues with internet quality and coverage posed a major barrier to students' participation in online education (Mehralizadeh, 2024). These challenges existed even prior to the pandemic, and despite ongoing government efforts to improve internet access - especially in rural areas substantial progress had yet to be achieved.

Indicator	Number	Explanation
Total number of students (2020–2021)	1.569.000	Nationwide
Students registered on the online platform	1.442.000	92% of students
Students not using the platform	127.000	8%
Total number of teachers	150.000	85% of teachers registered
Teachers not using the platform	22.000	15%
Students and teachers who are active users	1.719.000	Those who access the platform at least once a week
Students and teachers who are not active users	550.000	Those who do not participate in educational activities
Students participating in online classes (Baku and large cities)	74–75%	At least once a week
Percentage of students with internet access at home	66–71%	2020–2021
Percentage of students with computer access at home	75%	During the pandemic
Population connected to the 3G network	80%	Less in the regions, more in Baku

Table 5. Educational Coverage During the Pandemic

Source. *Mehralizadeh, F. (2024). The impact of the pandemic on educational outcomes in Azerbaijan. Baku Research Institute.*

The education sector is among the most innovative fields, playing a crucial role in fostering an innovative environment and enhancing the overall competitiveness of the economy. Modern education systems are increasingly built on technological innovations that leverage information, computer, and telecommunication technologies. A defining characteristic of contemporary global education is its ongoing process of modernization, aimed at ensuring high-quality learning within the context of mass education. In developed countries, education systems adapt to global trends, guided by national strategies designed to enhance educational quality. In Azerbaijan, the State Strategy on the Development of Education, approved by President Ilham Aliyev, fulfills a similar role by promoting the integration of innovative practices within the national education system. The trends that ensure the application of innovations in education are as follows:

- Humanization of education;
- High demands on children's education and the development quality of the younger generation;
- Attention to cultural and moral values;
- Competitive environment among educational institutions.

When developing an innovation program for an educational institution, it is important to forecast the expected outcomes. The administration, together with an initiative group, should then implement a goal-oriented, comprehensive program. This program should encompass both organizational measures and the sequential stages required for effective innovation implementation.

One of the earliest applications of artificial intelligence in education was developed by Sidney Pressey. His approach went beyond merely evaluating students' test results in real time; it also supported their acquisition of essential knowledge. Pressey highlighted that AI could benefit teachers by freeing them from the routine task of grading, allowing them to focus more on direct interaction with students. Another important contribution came from Burrhus Skinner, who, building on his research on operant behavior, introduced the concept of "operant learning." During World War II, Skinner worked on a project that employed pigeons to guide aircraft fire. His educational system enabled students to record their responses on a rotating mechanism, which could then be compared with correct answers, illustrating the potential of automated feedback in learning.

Although the integration of artificial intelligence (AI) into the educational process in Azerbaijan is still in its early stages, several initiatives are underway. Efforts include the establishment of digital schools, online learning platforms, and personalized learning systems. The Ministry of Education, along with other institutions, is developing projects that leverage AI to optimize curricula, analyze student performance, and create individualized learning programs. Platforms such as the Virtual

School provide students with tailored learning resources, track their progress, and recommend suitable content. AI-based educational systems in Azerbaijan also facilitate personalized learning, streamline the assessment process, and offer detailed insights into student development. Nonetheless, challenges remain, including limited technical infrastructure, insufficient funding, and the need to enhance teachers' competencies in using these technologies. Furthermore, issues concerning data privacy and ethical considerations require careful attention.

Overall, AI holds considerable potential to optimize the educational process, improve learning quality, and support more personalized approaches to education. Azerbaijan can harness international experiences, strengthen its digital infrastructure, and enhance teachers' technological competencies to make meaningful progress in realizing this potential (Hamidov, 2024). Globalization and rapid technological advancements are driving higher education systems to fundamentally rethink their traditional models. In particular, the emergence of AI technologies challenges universities to reconsider their operational frameworks. Integrating AI into the educational environment represents not merely a technical innovation but also a pedagogical and methodological transformation. These technologies enable education to adapt to the individual characteristics of learners, personalize the learning process, optimize knowledge acquisition, and alleviate teachers' workloads.

The traditional university model, largely shaped during the First Industrial Revolution, has remained relatively unchanged for a long time. However, within the context of the Fourth Industrial Revolution, this model struggles to meet contemporary demands. While higher education institutions must prepare graduates to meet current labor market needs, focusing exclusively on present requirements can hinder innovation, as the labor market reflects the current state rather than guiding future development. Consequently, the primary goal of education is not only to fulfill immediate market demands but also to cultivate leaders capable of adapting to future technological and social transformations. In this context, one of AI's most significant advantages is its capacity to enable personalized learning. Digital tools and intelligent platforms facilitate the creation of individualized learning paths tailored to each student's pace of knowledge acquisition, learning style, and areas of interest effectively reviving the historical mentor-student relationship in a modern technological form. AI provides students with 24/7 access to interactive learning environments, allowing them to review lessons and receive guidance outside the classroom. Experts emphasize that AI is intended not to replace teachers but to enhance their instructional practice. In other words, the most successful educators of the future will be those who can use AI creatively and effectively to enrich the learning experience

The Azerbaijan State University of Economics (UNEC) is widely recognized as the leading institution in the country in adopting innovative practices within higher education. Rector Adalat Muradov emphasizes that the current model of higher education has exhausted its potential, highlighting the necessity of a new university concept. He emphasizes the need for a new university paradigm that moves beyond the traditional, instructor-centred classroom, where lecturers primarily transmit information and students remain passive recipients. According to Muradov, the transformative dynamics of the Fourth Industrial Revolution necessitate a shift toward flexible, student-centred, and competency-oriented models of teaching and learning. He maintains that

the future of higher education lies in designing individualized learning pathways and constructing environments that actively support student agency and engagement. Although the educational system historically struggled to maintain personalized learning due to demographic pressures and limited resources, contemporary advances in artificial intelligence and digital technologies now make such approaches attainable once again. Professor Muradov views artificial intelligence as a pivotal component of this transformation. AI-enabled tools, functioning as "virtual academic assistants," can support learners outside the classroom by reinforcing subject knowledge, providing tailored feedback, and assisting with analytical tasks. Nevertheless, he stresses that technological adoption alone is insufficient; its effectiveness depends on the alignment with sound pedagogical principles and an overall rethinking of instructional design. He further cautions that universities should not confine themselves to training specialists merely for the current labour market.

Such a narrow orientation, he argues, may hinder long-term educational progress and suppress innovation capacity. Instead, higher education institutions must cultivate professionals capable of addressing emerging societal needs and contributing to the creation of new domains of knowledge. Within this broader mission, Muradov positions artificial intelligence as a strategic instrument that enhances teaching quality, fortifies the university's forward-looking role, and supports its capacity to lead national educational development. In his view, the future of higher education lies in constructing individualized educational pathways and cultivating environments that place the learner at the centre of the pedagogical process. Although the principles of personalized learning were historically constrained by population growth and limited educational resources, the expansion of AI and digital technologies now makes their restoration feasible. AI is envisioned as a form of "virtual assistant" capable of supporting students beyond the classroom by reinforcing learning, facilitating analytical tasks, and contributing to the consolidation of knowledge. Nevertheless, Muradov underscores that technological tools alone cannot guarantee educational progress; their impact depends on being embedded within sound pedagogical strategies. Furthermore, he cautions against a narrow focus on preparing graduates solely to satisfy current labor-market demands, noting that such an approach risk inhibiting innovation and stalling the long-term evolution of higher education. Instead, he asserts that universities bear a broader mission: to educate professionals who can anticipate emerging societal needs and contribute to the creation of new knowledge domains. Within this framework, AI is understood not only as a mechanism for improving instructional quality but also as a strategic asset for strengthening the university's capacity to shape future developments proactively (UNEC nəzdində Sosial-İqtisadi Kollec, 2025). Thus, improving the quality of education in Azerbaijan and integrating contemporary technologies into this sphere constitute key priorities within the state's long-term development agenda. The incorporation of digital transformation and innovative practices into the education system necessitates not only pedagogical and methodological modernization, but also a comprehensive and coherent normative-legal framework. In this context, the laws, national strategies, state programs, and conceptual documents adopted in recent years have established the fundamental regulatory basis for the effective deployment of modern technologies in the education sector (Muradov, et.al, 2025)

The legal foundations governing the use of digital technologies in education in Azerbaijan are primarily anchored in the Law of the Republic of Azerbaijan *on Education* (2009), which remains the central legislative instrument shaping this domain. The law establishes the fundamental principles for integrating modern and digital technologies into the teaching–learning process and outlines the state's responsibility to enhance the quality of educational services through technology-driven reforms. It formally recognizes the need to expand technology-supported instructional formats including distance, blended, and electronically mediated learning and sets normative requirements for their implementation. Furthermore, the law provides a regulatory framework for the deployment of digital platforms, the development and use of electronic educational resources, and the creation of an integrated information environment across higher, secondary, and general education institutions (Azərbaycan Respublikası Elm və Təhsil Nazirliyi, 2009). In addition, the "State Strategy on the Development of Education in the Republic of Azerbaijan" (2013-2025) and the State Program for its implementation specify the priority directions of digital transformation. The strategy identifies tasks such as creating an electronic educational environment, expanding the digital resource base, developing distance learning models, and preparing AI-based personalized learning tools Moreover, the *State Strategy for the Development of Education in the Republic of Azerbaijan* (2013-2025) and the corresponding State Program for its implementation articulate the strategic priorities guiding digital transformation within the national education system. These policy documents outline a set of long-term objectives aimed at modernizing educational infrastructure and strengthening technological capacity. Among their key provisions are the establishment of a comprehensive electronic educational environment, the expansion and systematic enrichment of digital learning resources, and the advancement of distance and blended learning models in line with international standards. In addition, the Strategy underscores the importance of developing personalized learning

instruments supported by artificial intelligence, thereby promoting learner-centered pedagogical practices and facilitating the transition toward data-driven and adaptive education (E-qanun, 2015). The "Digital Development Concept of the Republic of Azerbaijan" serves as another significant policy document reinforcing the country's commitment to educational digitalization. It outlines a vision for enhancing digital infrastructure within educational institutions, scaling e-government and e-education services, and deploying cloud-based and artificial intelligence-supported management systems. The concept further delineates the regulatory mechanisms necessary for integrating digital technologies into institutional practice, including the establishment of technical standards, cybersecurity requirements, and protocols for safeguarding educational data. Together, these legal and strategic documents illustrate a systematic and forward-looking approach to digital transformation in Azerbaijan's education system, ensuring that technological innovation is not only adopted but also governed through clear, consistent, and future-oriented policy instruments (E-qanun, 2025a).

The *Artificial Intelligence Strategy of the Republic of Azerbaijan for 2025-2028* outlines a comprehensive national agenda aimed at building a sustainable and competitive AI ecosystem. The document places particular emphasis on strengthening collaboration between governmental institutions and the private sector, enhancing the country's scientific and academic capacity, and stimulating a dynamic environment for startups and technological innovation. A central component of the strategy is the promotion of responsible and ethically grounded AI development. This includes safeguarding human rights, ensuring robust data-protection standards, and preparing a workforce equipped with the digital and analytical skills required in an AI-driven economy. The strategy also calls for expanding educational initiatives and deploying advanced computational and cloud-based infrastructures capable of supporting large-scale AI applications. In addition, the implementation of pilot projects, measures to encourage business activity and entrepreneurship, targeted support for scientific research, and broad public awareness campaigns are envisaged as key mechanisms for ensuring the effective and socially beneficial integration of AI technologies across the country (E-qanun, 2025b). Taken together, these legislative and strategic documents form a multilayered and coherent regulatory environment for advancing digitalization and AI adoption in Azerbaijan's education sector. The coordination of legal acts, strategic policies, and technical standards enables the continued modernization of the education system and supports its convergence with global best practices. Ultimately, this legal architecture strengthens the transformation of educational institutions through digital technologies and serves as a critical mechanism for enhancing educational quality nationwide.

Perspectives for the application of technologies in the field of education

Over the past five decades, technological developments have largely been shaped by human social and economic needs, reflecting a reciprocal relationship between society and innovation. Notably, the advent and rapid expansion of the Internet have had a transformative effect on education, mirroring its impact across other sectors. In this context, Gerstein (year) proposed a framework categorizing the evolution of educational practices into four stages: Education 1.0, 2.0, 3.0, and 4.0. These classifications are widely employed to describe the historical progression of educational systems, highlighting shifts in pedagogical approaches alongside technological advancement. Broadly, these stages encapsulate:

Education 1.0 - This stage corresponds to the traditional model of instruction, in which the classroom setting and conventional teaching methods form the core of the learning process. The primary

objective during this phase is the acquisition of foundational knowledge and the cultivation of essential skills.

Education 2.0 - This stage marks the initial integration of information and communication technologies (ICT) into the educational process. The use of computers, the Internet, and other digital tools introduces a more interactive and dynamic learning environment, enhancing student

engagement and participation.

Education 3.0 - This stage is characterized by the personalization of learning, in which students transition from passive recipients of knowledge to active participants and from their educational experiences. Technological tools facilitate learning pathways that are tailored to individual interests, abilities, and needs, promoting autonomy and engagement in the learning process.

Education 4.0 - This stage emerges alongside the principles of Industry 4.0 and embodies a comprehensive digital transformation within education. Advanced technologies, including artificial intelligence, big data analytics, and virtual and augmented reality, are increasingly integrated into the learning environment. This approach extends beyond the mere acquisition of knowledge, placing equal emphasis on cultivating higher-order competencies such as critical thinking, creative problem-solving, and collaborative skills.

Criteria	Education 1.0	Education 2.0	Education 3.0	Education 4.0
Teachers	Teachers who act as the main source of information.	Teachers who collaborate with students, parents, and other stakeholders to create a more effective learning environment.	Teachers who contribute to the formation of new knowledge through joint collaboration.	Teachers who share knowledge with portals and software that enable learning anywhere and anytime.
Students	Passive learners who acquire knowledge only through listening.	Students who take responsibility for their own learning and are more actively involved in the process.	Students who have an individual learning plan, creating new ideas and products.	Students who constantly improve their learning plans using virtual platforms and quickly adapt to updated technologies.
Educational institutions	Traditional educational institutions where teaching and learning are carried out and assessed by a single institution (school or university).	Educational institutions that expand student interaction opportunities and support exchange programs.	Institutions that are not limited to universities and schools, but also include courses, training centers and companies.	A global educational environment where there are no regional and international borders, all levels of education are supported
Learning method	The transfer of knowledge from teacher to student is carried out through presentations, assignments, written and oral tests.	Team-based learning based on teacher-student and student-student collaboration.	Personalized learning, where online resources become a core part of teaching.	Students' creative learning using any resources; the ability to teach at any time without interfering with daily life and work activities.
Alumni (graduates)	Employees who need retraining, with limited creativity.	Employees who have superior knowledge and skills compared to the previous stage, although they may have some shortcomings in the work process.	Professionals who focus on the creation of new knowledge, continuously proposing new business models.	Creative and agile professionals who focus on innovation and can continue to apply innovations.

Table 6. General description of educational periods
Source: *Yadigarova, Z., Mikayılov, M., Ahmadov, E., & Salehli, F. (2024)*
Research on cybersecurity issues of cloud-based e-learning system

In contemporary education, Education 3.0 is characterized by expansive, inter-organizational, and cross-cultural learning opportunities. Within this model, students move beyond the role of passive knowledge consumers to become active creators of shared knowledge products. Furthermore, the use of social networks and collaborative engagement across diverse disciplines significantly enhances the learning experience, fostering both creativity and collective problem-solving. In summary, the

Education 4.0 paradigm seeks to shift students from passive recipients of knowledge to active, creative agents within a technology-enhanced, learner-centered environment. This approach enables learners to explore, experiment, and direct their own educational pathways, cultivating professionals with adaptable and flexible thinking capable of responding to the rapidly evolving demands of the future. The introduction of Education 4.0 also brings both opportunities and challenges to the Azerbaijani education system. The integration of modern technologies, personalized learning strategies, and interactive pedagogical methods has the potential not only to improve the overall quality of education in schools and universities but also to foster the development of students' creative, analytical, and critical thinking skills (Yadigarova and et. al., 2024). In this context, the formulation and implementation of strategies aligned with the principles of Education 4.0 are expected to foster the development of digitally literate, innovative, and lifelong learning-oriented professionals in Azerbaijan. Drawing on the findings of my research, a set of recommendations has been developed to guide the effective integration of Education 4.0 within the national education system.

1.	Technology integration and digital learning environments	Artificial intelligence, VR/AR technologies, cloud-based platforms and interactive software should be applied in schools and universities, and distance and hybrid education opportunities should be expanded. This will create a flexible learning environment in line with the requirements of the Education 4.0 concept, creating the opportunity for students to learn at any time and place.
2.	Personalized learning and open educational resources	Learning plans should be developed in accordance with the individual interests and abilities of students, and the selection and management of learning content should be entrusted to them. The use of open educational resources (OER) and digital libraries should ensure the borderlessness of learning.
3.	Redefining the role of teachers	Teachers should act not only as knowledge transmitters, but also as facilitators, mentors and analytical decision-makers. For this, appropriate training and certification programs should be provided to teachers to increase their technological and pedagogical skills.
4.	Developing creative and critical thinking skills	Project-based, interactive and gamified methods should be applied in the learning process, and students should be given the opportunity to analyze problems, find creative solutions and operate with multidisciplinary approaches.
5.	Promoting global collaboration and teamwork	Students should gain a global perspective and teamwork skills through international exchange programs, online collaboration platforms, and interactive forums. This will strengthen students' knowledge sharing and collaborative skills with their peers.
6.	Digital literacy and lifelong learning	Students should be taught digital ethics, data security, and critical information analysis skills, and lifelong learning habits should be encouraged, and the ability to continuously improve and think flexibly should be developed.

Table 7. Proposals for the implementation of Education 4.0 in the Azerbaijani education system
Source. *Ministry of Science and Education of AR*

Conclusion

In conclusion, the Fourth Industrial Revolution, digitalization, and artificial intelligence are transforming both global and Azerbaijani education systems, shifting them from traditional knowledge delivery models toward flexible, learner-centered ecosystems. Education 4.0 prioritizes personalized learning, critical thinking, creativity, and digital literacy, enabling students to actively manage their educational trajectories and prepare for evolving labor market demands. In Azerbaijan, notable advancements have been achieved through initiatives such as digital schools, online learning platforms, and AI-driven educational tools; however, challenges persist, including limited infrastructure, unequal access to the Internet, and gaps in teachers' technological competencies. A robust legal framework, state strategies, and targeted programs provide the foundation for the integration of digital technologies, ensuring alignment with international standards. The deployment of AI not only enhances teaching quality and facilitates personalized learning but also streamlines

administrative processes, though effective implementation remains dependent on pedagogical adaptation. The transition toward Education 4.0 further underscores the importance of lifelong learning, inclusivity, and the cultivation of human capital capable of responding to rapid technological and social change. Overall, the integration of digital tools and innovative technologies in Azerbaijan offers significant opportunities to elevate educational quality, foster creativity, future-ready professionals. Sustained investment in infrastructure, teacher training, and equitable access will be essential to fully realizing the transformative potential of Education 4.0.

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A Comparative Analysis of Digital Entrepreneurship via Startups in the South Caucasus and Central Asian Countries

Abstract

This study investigates the impact of digital entrepreneurship on economic growth in the South Caucasus and Central Asian countries, with a particular focus on startup ecosystems. By conducting a comparative analysis, the research examines the current state of digital entrepreneurship, identifies existing challenges, and evaluates each country's position and advantages within the regional digital entrepreneurship landscape. The study employs an analysis-based approach to assess the effects of digital entrepreneurship on key economic indicators, including GDP, employment, and innovation. Findings reveal that intercountry collaboration is essential to foster regional development, and the establishment of platforms for knowledge exchange, startup promotion, and investment flow between the South Caucasus and Central Asian countries is recommended. The study provides evidence-based insights and strategic recommendations to guide policymakers, entrepreneurs, and academics in enhancing the effectiveness and efficiency of digital entrepreneurship across the region.

Keywords: innovation ecosystem; venture capital; startup ecosystem; digital transformation; innovation clusters; human capital.

Introduction

Digital entrepreneurship is characterized as a form of entrepreneurship that relies on the application of digital technologies, online platforms, data analytics, and innovative business models in managing economic activities. According to Satish Nambisan, a leading researcher in this field, "the question of who can engage in entrepreneurial activity on digital platforms and ecosystems is resolved by considering both platform-related and entrepreneurship-related factors" (Satish Nambisan (2017) vol. 41, issue 6, Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship, pg:16). From this perspective, entities engaging in entrepreneurial activities on digital platforms must be proficient both digitally and in terms of entrepreneurial management. In other words, they must possess adequate knowledge and skills. This implies that a modern digital entrepreneur should be capable of responding promptly and flexibly to the challenges of the digital society.

Another expert, Daniel J. Isenberg, emphasizes that "Governments alone cannot build ecosystems. Only the private sector has the motivation and perspective to create self-sustaining, profit-oriented markets. Therefore, governments should engage the private sector early and allow it to have or acquire a significant stake in the success of the ecosystem" (Daniel J. Isenberg (June 2010), How to Start an Entrepreneurial Revolution, pg:4).

Isenberg's argument highlights that entrepreneurial ecosystems are not artificially constructed solely through government programs. While the government can provide support through legislation, tax incentives, and infrastructure, the private sector is the primary force that sustains the ecosystem, introduces dynamism, and creates real markets. The private sector's motivation to generate profit and compete naturally drives ecosystem development. Therefore, the government must engage the private sector early and provide opportunities for decision-making, initiatives, and leadership. In short, "the government creates the conditions, but it is the private sector that truly builds and sustains the ecosystem."

Regarding the role of policy, Mason & Brown argue that "policy has a dual effect on the development of digital entrepreneurship. First, efforts to stimulate high-growth entrepreneurship cannot be limited to top-down initiatives aimed solely at framework conditions. Bottom-up efforts, including engagement with non-governmental actors, are also required. Second, a different set of policies is needed than those aimed at general business formation. Policies focused solely on increasing the number of new firms have limited impact, as only a very small number of firms achieve significant growth" (Prof. Colin Mason and Dr. Ross Brown (January 2014), Entrepreneurial ecosystems and growth-oriented entrepreneurship, pg:8).

Mason & Brown argue that the development of digital entrepreneurship cannot rely solely on top-down government decisions. Policy must simultaneously support both the framework conditions (infrastructure, legislation, financial environment) and bottom-up initiatives (startup communities, universities, accelerators, private sector). They also emphasize that a general "increase the number of startups" policy is ineffective; as real economic growth is generated by a small number of high-growth firms. Therefore, policy should focus specifically on fostering startups with high growth potential.

It is important to highlight that the theoretical foundation of the digital economy is based on Schumpeter's concept of innovation and "creative destruction." According to this theory, technological innovations and new business models are the primary drivers of economic growth. Schumpeter notes, "If we try to imagine how or how it will work in the process of creative destruction of perfect competition, we are confronted with an even more disappointing 'result.' This should not surprise us, since all the essential facts of this process are not included in the general scheme of economic life that provides traditional propositions about perfect competition" (Joseph A.Schumpeter Capitalism, Socialism and Democracy (1975), pg: 81).

Based on Schumpeter's perspective, digital entrepreneurship is a field where technological innovations and new business models emerge rapidly. The concept of creative destruction shows that old technologies and traditional business models are replaced by new digital solutions. This process not only stimulates economic growth but also creates market entry and rapid growth opportunities for startups. In other words, startups play the role of "creative destruction" in the digital entrepreneurship environment by transforming old systems, implementing innovations, and enhancing economic dynamism. Schumpeter's theory thus provides an important theoretical foundation for understanding the development of the digital economy and startup ecosystems.

According to another group of researchers, Brynjolfsson & Mcafee, "The success of technological entrepreneurs demonstrates how technology and the use of personal talents can create significant wealth" (Erik Brynjolfsson & Andrew McAfee, *The Second Machine Age*, 2014, p. 49). They argue that digital technologies increase labor productivity and create new economic opportunities, but they can also lead to structural changes in the labor market.

The demand for digital skills varies across sectors. Overall, responding SMEs identified the most urgent training needs in digital marketing and SEO (42%), digitization of daily operations (36%), and data analytics (33%) (Figure1) (SME digitalization for competitiveness The 2025 OECD D4SME Survey, pg:12).

Demand for skills related to energy consumption optimization or fintech services was low, with less than 10% of respondents prioritizing these areas, and there were minimal sectoral differences (Marco Bianchini and Marta Lasheras Sancho (10 April,2025), SME digitalization for competitiveness The 2025 OECD D4SME Survey,12).

Figure 2.2. Areas in which businesses would like more training

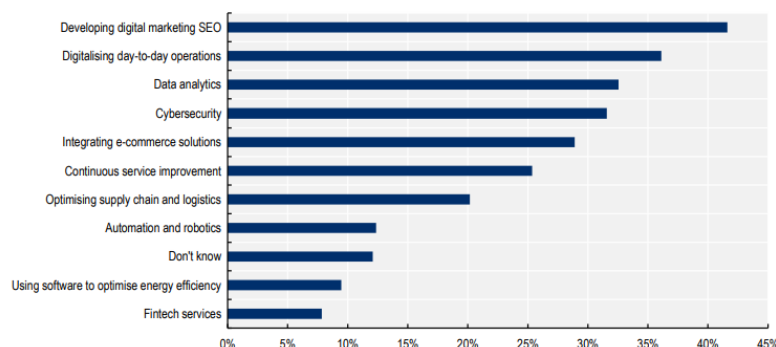As an average percentage of responses across surveyed countries

Figure 1. Areas Where Businesses Most Desire Training
***Source.** (SME digitalization for competitiveness The 2025 OECD D4SME Survey)*

Figure 1 shows that the corporations participating in the survey most frequently indicated a need for training in digital marketing and CEO (Central Engine Optimization), digitization of daily operations, data analytics, and cybersecurity. At the same time, there are significant skill gaps in e-commerce integration, continuous improvement of customer service, and supply chain optimization, whereas the demand for training in automation, robotics, and fintech services is comparatively lower. These results indicate that developing digital skills has become a top priority for businesses in many countries, and investment in human capital particularly professional training in CEO, digitization, data analytics, and cybersecurity is a key factor for the sustainable development of digital entrepreneurship.

From a theoretical generalization perspective, it should be noted that despite the various approaches in recent research on entrepreneurship and digital entrepreneurship, there is a consensus among scholars that digital entrepreneurship has irreversible and significant development potential. It is also worth noting that, as in other developing regions of the world, research on digital entrepreneurship in the South Caucasus and Central Asia has increased in recent years.

According to data provided by the World Bank in 2022, the digitalization of the Logistics Corridor between the South Caucasus and Central Asia has been implemented as a key initiative for promoting digital solutions. It is noted that, "This activity will help clients explore different options for digitalizing the corridor and provide recommendations for further digitalization of trade and transport operations along the corridor between the South Caucasus and Central Asia. At the end of this ASA (Advisory Services and Analytics), clients in Azerbaijan, Georgia, and Kazakhstan can expect to have a service model vision to determine the implementation path along the corridor. This will initiate concrete efforts to address the information-sharing gaps along the corridor" (World Bank (2022), Annual Review Towards Green, Resilient and Inclusive Digitalization, pg:66; Muradov, et.al, 2025).

Furthermore, "Digital partnerships will be developed and proposed with emerging and developing economies. These partnerships, for example, in Central Asia (covering Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan), will be jointly financed with Member States through Team Europe Initiatives (TEIs) in which the Bank seeks to engage. These partnerships can be further supported through the creation of a digital connectivity fund" (European Bank; *The EBRD's Approach to Accelerating the Digital Transition; 2021–25*, 2021, p. 26).

The partnership for digital inclusion led the United Nations Development Program (UNDP), with its long-standing experience in digital development, to co-host a high-level Digital Event on the Sustainable Development Goals (SDGs) alongside the International Telecommunication Union (ITU), aiming to accelerate the use of digital technologies in support of the SDGs. The event, held during the SDG Action Weekend, brought together over 500 participants, including high-level representatives from governments, the private sector, civil society, and international organizations,

with additional participants joining online (European Central Bank (2021), The EBRD's approach to accelerating the digital transition: 2021-25, pg;26). Among the participating countries from the South Caucasus and Central Asia were Azerbaijan, Uzbekistan, Turkmenistan, Tajikistan, Kazakhstan, Georgia, and Kyrgyzstan. One of the programs available to partner countries is the "Venture Capital Investment Program," which is expected to play a significant role in advancing digital entrepreneurship. Nevertheless, the limited venture capital market and the shortage of human capital remain key barriers.

Although the impact of digital entrepreneurship on economic growth has been extensively studied in the international literature, there is very limited research on the comparative analysis of emerging digital entrepreneurship in the South Caucasus and Central Asian countries. In particular, systematic studies examining the relationship between digital entrepreneurship indicators and GDP growth, empirical comparisons of startup ecosystem metrics, and the effect of regional innovation policies are almost nonexistent. In this regard, the present study aims to fill this gap and empirically assess the economic impact of the startup ecosystem in the region.
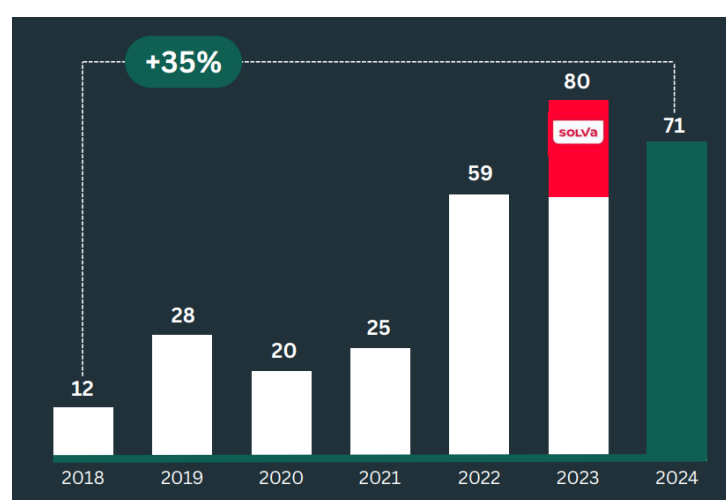

Figure 2. Kazakhstan venture capital volume, 2018-2024, $M
Source. RISE Research' database, surveys and interviews with VC market players

In 2024, Kazakhstan's VC volume is $71M, down from $80M in 2023, primarily due to a $20M outlier deal (Solva). Excluding this, the market reflects a more consistent positive trend. Since 2018, when VC volume was $12M, the market has grown at an average annual rate of ~35%, demonstrating steady expansion (Rice Research (march 2024), Venture Capital in Central Asia 2nd edition).

The study covers the South Caucasus and Central Asia regions. Considering data availability and similarities in economic structures, the following countries were selected:
- **South Caucasus:** Azerbaijan, Georgia, Armenia
- **Central Asia:** Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan

The impact of digital entrepreneurship on economic growth in these countries is evaluated comparatively. A panel data model is used to assess the effect of digital entrepreneurship on economic growth:

Component	Indicator / Variable	Description
Dependent Variable	GDP	**Gross Domestic Product (GDP Growth Rate)**
Independent Variables	HUM	Human Capital Indicator (Digital Skills, Higher Education Level)
	INV	Innovation Indicators (GII Index, R&D Expenditures)
	DS	Digital Entrepreneurship Indicator (Startup Indices + Number of Digital Businesses)
	ICT	Digital Infrastructure Indicators
Model Specification	Panel Data Model	$GDP_{it} = \alpha + \beta_1 DS_{it} + \beta_2 INV_{it} + \beta_3 ICT_{it} + \beta_4 HUM_{it} + \epsilon_{it}$
Study Scope	South Caucasus Countries	Analysis of the digital entrepreneurship ecosystem and its impact on economic growth

Table 1. Variables and Model Specification for Assessing the Impact of Digital Entrepreneurship on Economic Growth in the South Caucasus

In recent years, Azerbaijan has demonstrated significant progress in digital transformation and innovation, largely driven by government initiatives. Programs such as *Startup Azerbaijan*, the *E-Government* platform, the Innovation Agency, and the activities of technoparks have played a pivotal role in supporting the development of the startup ecosystem. Key sectors, including digital payments, fintech, and e-commerce, are experiencing rapid growth. Despite these advances, challenges remain, particularly regarding the limited availability of venture capital and the degree of integration of Azerbaijani startups into the global entrepreneurial ecosystem. While the country has established the necessary institutional framework to foster digital entrepreneurship, human capital constraints, insufficient digital skills, and the relatively small size of the domestic market continue to limit the scalability and global competitiveness of startups.

A comparative analysis across the South Caucasus region indicates a reliance on government-led initiatives for digital transformation, yet venture financing and the development of a robust global startup culture remain nascent. In Azerbaijan, Baku functions as a key technological hub, with its *Startup Center* and designated innovation zones driving activity in energy technologies, fintech, and digital services. Georgia distinguishes itself with an open economic environment, favorable foreign investment legislation, and active startup support programs, with Tbilisi emerging as a regional technology center. Nevertheless, both countries face limitations related to human capital and the availability of skilled technological personnel. Armenia, by contrast, demonstrates a strong startup ecosystem, particularly in IT and software development, supported significantly by diaspora investments and international incubation programs. However, economic and political instability, geopolitical risks, and a constrained domestic market pose significant impediments to further development.

The Central Asian context presents a more heterogeneous landscape. Kazakhstan occupies a leading position in digital entrepreneurship, with initiatives such as *Astana Hub* providing internationally recognized platforms for innovation. The country's digital strategy is closely integrated into its long-term 2050 development plan, with strong sectors including fintech, logistics technologies, and government digitalization. Uzbekistan's startup ecosystem is rapidly evolving in response to broader economic reforms, supported by *IT Park Uzbekistan*, digital education programs, and targeted tax incentives. Key sectors such as e-commerce and digital banking are expanding, although the ecosystem remains in an early development stage relative to Kazakhstan. Kyrgyzstan maintains a small but active IT community, with relative strengths in crowdfunding, online services, and the freelancing sector, yet limited infrastructure and financial resources constrain further growth. Tajikistan exhibits early-stage development in digital entrepreneurship, with government programs promoting digital services hampered by low internet penetration, underdeveloped infrastructure, and insufficient technological skills among the workforce. Turkmenistan demonstrates the most limited development of digital entrepreneurship in the region. Although government programs in information and communication technologies exist, restrictive regulations, scarce economic resources, and a small

domestic market significantly hinder the establishment and growth of startups, leaving sectors such as online services and e-commerce largely underdeveloped.

Overall, the analysis indicates that while government initiatives have laid the foundation for digital entrepreneurship across the South Caucasus and Central Asia, systemic challenges—including human capital shortages, limited access to finance, underdeveloped infrastructure, and geopolitical risks—remain critical constraints. Countries such as Azerbaijan and Kazakhstan demonstrate relatively advanced ecosystems, yet further efforts are needed to enhance venture financing, integrate startups into global markets, and develop sustainable mechanisms for scaling digital enterprises. The regional patterns suggest that targeted policy interventions, investment in skills development, and the creation of robust innovation ecosystems are essential for fostering competitive and resilient digital entrepreneurship landscapes in the South Caucasus and Central Asia

Criteria	South Caucasus	Central Asia
Level of Startup Infrastructure	Developing	High in Kazakhstan, Medium/Initial in Others
Government Support	Strongly	Strong, Especially in Kazakhstan and Uzbekistan
Venture Capital	Limited	More Developed in Kazakhstan
Human Capital	High Potential, Strong in Selected Areas	Increasing Level in Kazakhstan and Uzbekistan
Pace of Digital Transformation	Increasing, but Requires Systematic Transition	Rapid in Kazakhstan, Gradual in Others

Table 2. Comparative Analysis by Region

Conclusions drawn from the table:
- Digitalization is a priority in government strategies in both regions;
- Kazakhstan and Azerbaijan act as regional leaders;
- Georgia gains an advantage through a favorable foreign investment environment;
- Uzbekistan is expanding its innovation ecosystem through a wave of reforms;
- Startup culture and venture capital are still in the development phase;
- Strengthening human capital and expanding technological specialties is necessary.

A comprehensive analysis of the current state of digital entrepreneurship in the South Caucasus and Central Asian countries has revealed several trends. Firstly, the number of startups in both regions has shown an upward trend over the past five years (2020–2025). Additionally, the expansion of fintech and digital payment services, the faster development of innovation infrastructure in Kazakhstan and Azerbaijan, and the ongoing differences in investment-attraction potential are noteworthy trends.
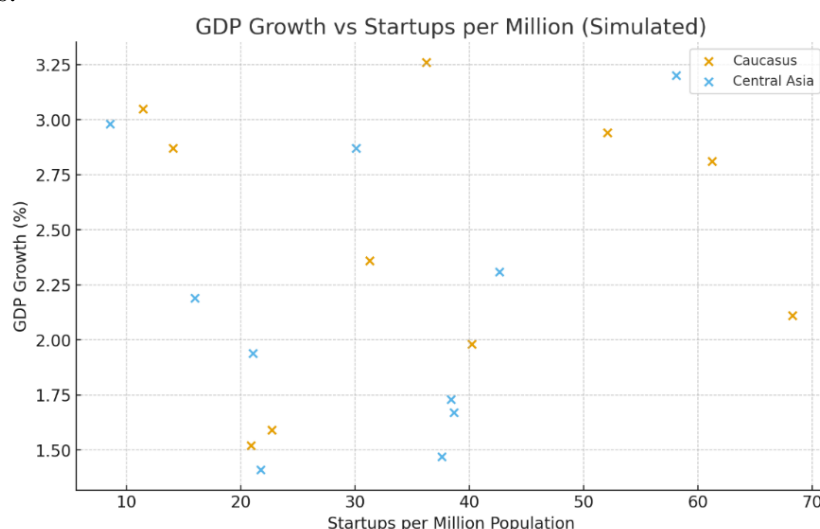

Figure 3: The Impact of Startup Projects on GDP

Startup projects affect economic growth both directly and indirectly, in terms of quantity and quality. When the impact of these projects on economic growth is assessed from quantitative and qualitative perspectives, a distinctly different picture emerges. The diagram below illustrates the relationship between startup density (the number of startups per one million people) and the annual GDP growth rate in the South Caucasus and Central Asian countries.

The figure shows that in both regions, as startup density increases, there is a positive trend in GDP growth. In the South Caucasus countries (Azerbaijan, Georgia, Armenia), overall startup density is higher, and in certain years, higher economic growth rates are observed. In Central Asian countries (Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan), although startup density is relatively lower, the growth trend is positive and appears correlated with economic development. Overall, the graph indicates that the development of digital entrepreneurship and the increase in startups are positively associated with economic growth, supporting the research hypotheses.

Conclusion

The research findings indicate that in the South Caucasus and Central Asia, digital entrepreneurship is one of the key mechanisms positively influencing economic growth. Startup activity, the expansion of digital investments, the development of innovation infrastructure, and the enhancement of human capital are statistically correlated with GDP growth. The South Caucasus features a more diversified startup environment and a well-developed innovation ecosystem, whereas Central Asian countries particularly Kazakhstan and Uzbekistan are undergoing rapid digital transformation under their leadership. This highlights the existence of different approaches in shaping the digital economy models of these regions. The study demonstrates that digital entrepreneurship, especially startup ecosystems, makes a significant contribution to economic growth in both regions. Empirical and comparative analyses show that startup density, the proliferation of digital platforms, and innovation infrastructure (venture capital, accelerator centers) can accelerate socio-economic development. Establishing a regional cooperation model is advisable, and platforms should be created to enhance startup contributions, investment flows, and knowledge exchange between the South Caucasus and Central Asia. Additionally, training programs to develop digital skills (e.g., coding, data analytics, digital marketing) should be expanded, and strong incentives should be provided to establish venture capital funds and attract both local and foreign investors to the region.

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Digitalization in the field of human resources in Azerbaijan: The North-West Example

Abstract

The term digitalization has affected all areas of daily life. This rapid integration and its effects have not bypassed the field of human resources (HR). With the continuous updating of technologies and the new opportunities created by economic resources, digitalization also influences the management functions of HR. The main purpose of this study is to determine the directions defined for digitalization in Azerbaijan and to identify the steps taken in human resource management (HRM) in public and private institutions operating in the North-West region of the country. In this research, initial steps taken for the development of a digital society supporting modern technological fields and the efforts of the Azerbaijani government to improve its systems in the field of digitalization are particularly emphasized. In the study, qualitative, logical generalization, semi-structured survey, and comparative methods were used.

The practical significance of the article is to identify the current state of digitalization in HRM in public institutions operating in Azerbaijan, particularly in the North-West region. Based on the research, it was concluded that the limited number of academic studies conducted on the relationship between HRM and digitalization in public institutions in Azerbaijan is one of the study's main limitations. As an information base for the study, foreign literature, authors' articles, the statistical compendium "Digital Development of Azerbaijan", reports from the Center for Analysis and Coordination of the Fourth Industrial Revolution, the Global Digital Economy Report, and a number of online resources were used.

The research results show that certain steps have been taken in institutions operating in the country toward the digitalization of HRM functions. Particularly in the North-West region, digitalization in this field is expanding; however, not all organizations have yet achieved full integration.

Keywords: HRM, digitalization, management, HR, digital economy, Azerbaijan

Introduction

In the modern world, digitalization rapidly affects the field of management, the national economy, and society as a whole. In addition, digitalization is a process of changing the business model and transitioning to a digital business through the use of digital technologies. This process, considered one of the most important trends for the economies of world countries, is a significant issue that should be applied in all areas. In an era where digitalization is at its peak, every organization regardless of its size or field of activity understands that digital transformation is

inevitable in order to progress in a competitive environment. The digitalization of management in public institutions is designed to reduce existing barriers, ensure that feedback becomes easier, faster, and more transparent, and minimize costs (Bobrovskyi et al., 2023). These points indicate that opportunities for progress are decreasing day by day for companies that cannot keep up with the spirit of the times. One of the first correct steps taken toward digitalization in management processes is in the field of HRM. This field encompasses creativity, strategy, and most importantly, flexibility. Digitalization ensures that key HRM processes such as employee performance evaluation and recruitment are organized faster and more efficiently.

The concept of Digital HRM was first used in the late 1990s (Olivas-Lujan et al., 2007: 419). Through digitalized HRM departments, it becomes possible to obtain information about employees' knowledge and skills, determine organizational needs, and execute tasks rapidly in this direction (Öztırak and Mesut, 2023). Just as HRM functions play an important role in achieving economic efficiency, the digitalization of these functions also holds particular importance in the modern era. Indeed, the efficiency, speed, and effectiveness of management are significantly improved through new technologies. This indicates that digitalization in HRM plays a key role in HR strategies and in the overall formation of an organization. At present, companies use digital HRM functions to stand out in competition. Therefore, Digitalization Roadmaps are developed in alignment with HR strategies to guide digitalization processes. For this purpose, the HR departments must first identify the processes to be digitalized. In the following chart, we can see the main processes defined for digitalization in HRM, as well as the "Digital Maturity Level" of these processes.
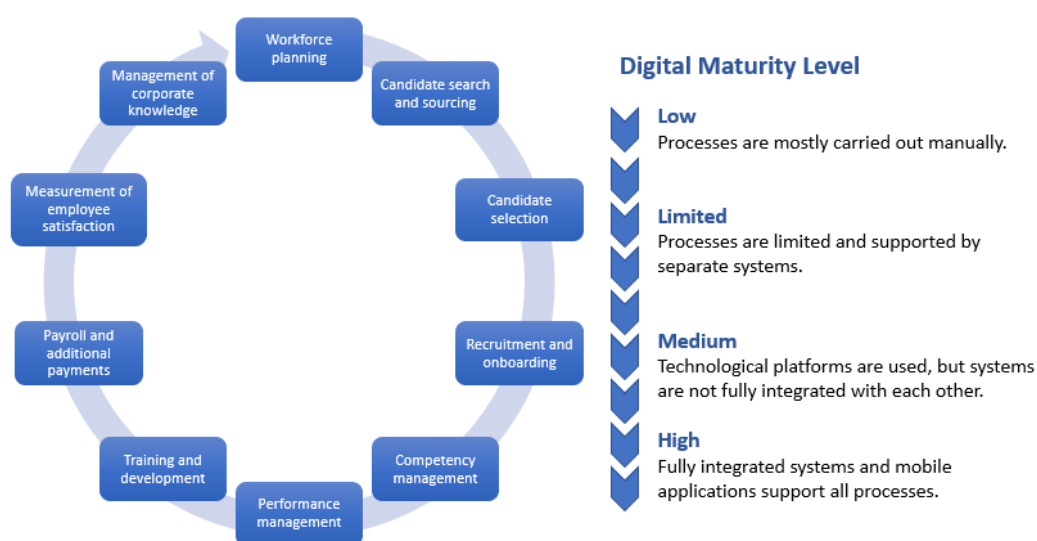

Figure 1. Identification of processes to be digitalized in HR functions
Source. *It was prepared by the author based on the information from Digital HR:*
A Guide to Digitalisation in Human Resources (2024)

Without identifying the processes within projects and without a proper strategy and well-planned roadmap, many investments made in companies unfortunately turn directly into waste. The positive effects of digitalization in the HRM process can include the following:

• Recruitment and skills management – The manual review of applications submitted for an open vacancy often leads to a significant loss of time. For this reason, Applicant Tracking Systems (ATS) can considerably simplify this process. These systems serve to manage and monitor the recruitment process.

• Information accessibility – The collection of employee documents on a single platform by HR departments allows documents to be stored, sent, and signed digitally without the need for additional paper carriers.

• Increased employee satisfaction
• Efficient time management

Among the business functions most affected by the Fourth Industrial Revolution are HRM departments. Conducting training through digital platforms creates opportunities for a larger number of employees to receive training. As a result, employees working in enterprises can now develop their skills through online training without difficulty. Many organizations already use digital platforms starting from candidate selection to the stages of training and development. Particularly, the use of artificial intelligence can be mentioned here. For example, the DBS Bank, officially known as DBS Group Holding and located in Singapore, has implemented a recruitment bot called Jobs Intelligence Maestro (JIM) since the second half of 2018. As a result, the evaluation time for applicants' CVs has accelerated fourfold from 32 minutes down to 8 minutes. In addition, the bot performs important tasks such as conveying the bank's culture and values to the candidates (Kambur, 2022). Accelerating the digitalization process is currently one of the main obligations of countries around the world. Its primary goal is to improve the quality of services provided to society and to strengthen public trust in government institutions. The role of digital public services is essential in establishing an efficient management system in developing countries (Wargadinata and Tendean, 2024).

The experiences of countries that have already passed certain stages in this direction also show that accelerating the digitalization process contributes to an increase in the number of new jobs, an improvement in the population's welfare, growth in productivity, the development of entrepreneurship, and ensuring transparency in management. This, in turn, emphasizes the importance of the digital economy. If we examine it more closely, the digital economy is an economic activity based on digital technologies. The main feature distinguishing it from the traditional economy is that it relies on factors such as Artificial Intelligence, Big Data, Augmented Reality (AR), Virtual Reality (VR), etc.

It can also be particularly noted that the effects of digitalization have led to changes in consumer behavior and expectations. According to experts' assessments, the share of the digital economy in the Gross Domestic Product (GDP) of major global economies is reported to be around 50–60%. In the future, as a result of the steps taken toward the digitalization of HRM in the public sector, it will support lifelong learning for employees, lead to the creation of new jobs, and help identify positions that remain insufficiently filled (Dudová and Matúšová, 2022). According to the Global Digital Economy 2025 Report, the digital economies of world countries are grouped into four phases (Highly Developed, Fundamentally Developed, Early, and Initial) on a 0–100 scale. In this classification, we can see the indicators of certain countries included in each phase particularly Azerbaijan and its neighboring countries in the chart below.
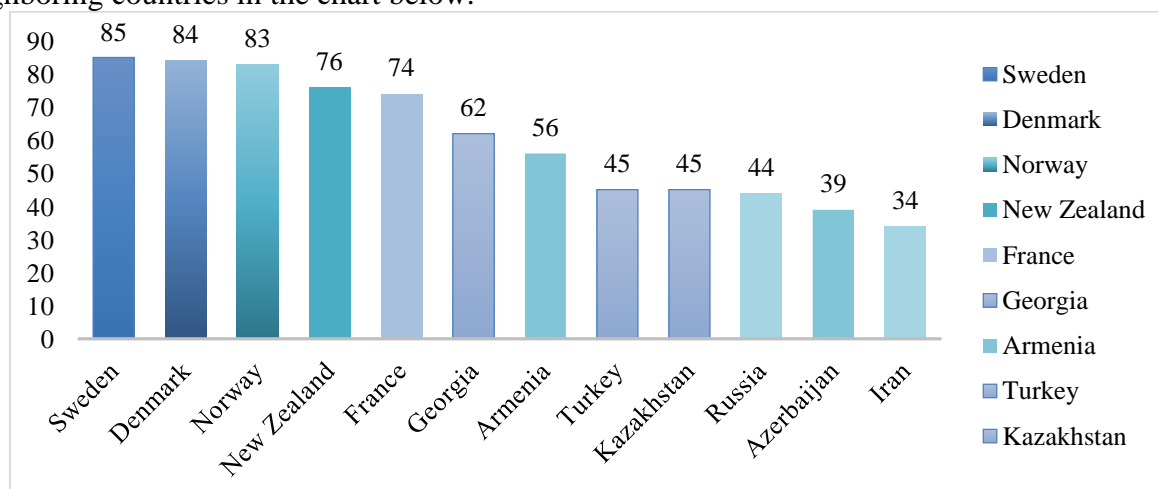

Figure 2. National Ranking of Digital Economies (2024)

Source. It was prepared by the author based on the information from Global Digital Economy Report –2025
According to the latest indicators presented by the World Bank, in 2024, the digital economy accounted for 15% of the world's nominal GDP approximately 16 trillion USD. In the coming years, fluctuations in these indicators are
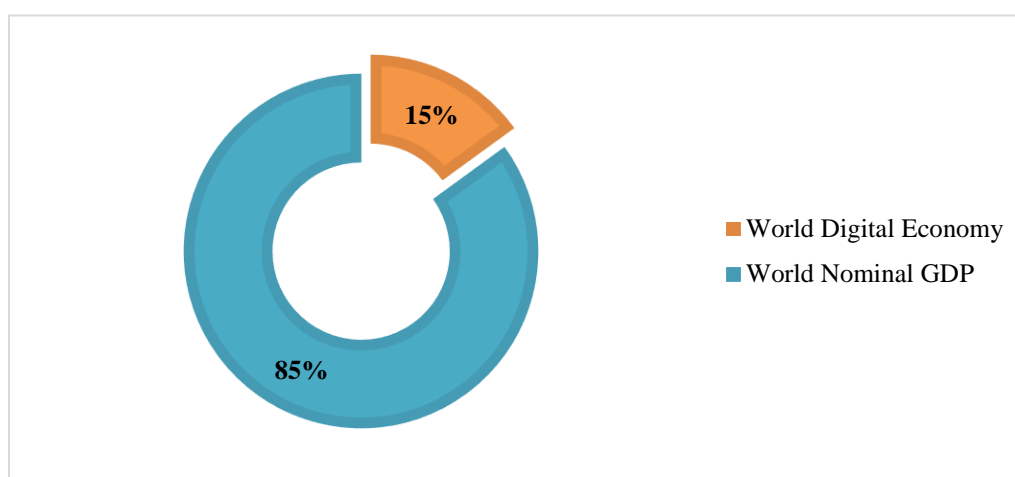
absolutely inevitable.

Figure 3. Percent of Digital Economy of Nominal World GDP (2024)
Source. *It was prepared by the author based on the information from Global Digital Economy Report – 2025*
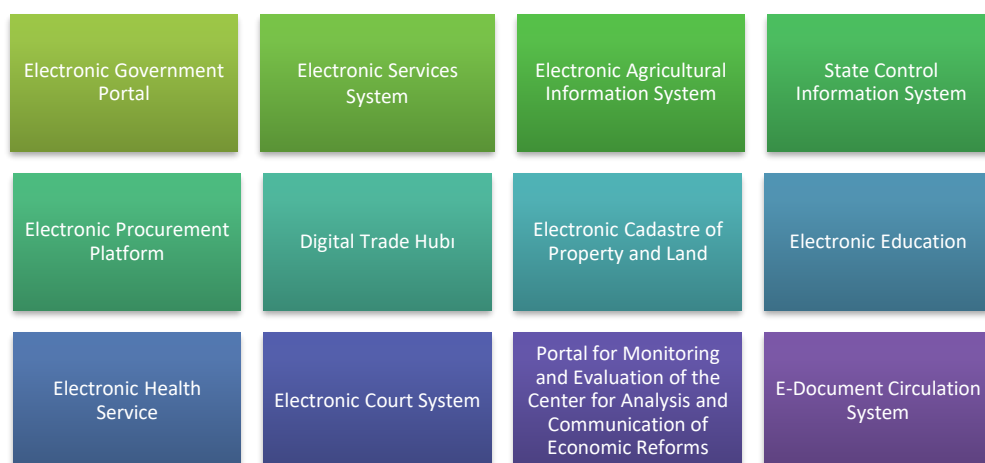
Steps Taken Toward Digitalization in Azerbaijan
When examining the digital economy, it can be observed that economic development in the country is accompanied by technological progress. It is an undeniable fact that the development of science and technology ensures increased labor productivity and economic growth. The technological advancements achieved by world countries are considered one of the main drivers of economic transformation. Over time, the rise in GDP per capita has become dependent on digital transformation (Konya, 2024). In recent years, the scope of the digital economy has rapidly expanded, affecting all areas of economic activity. The establishment of a digital economy is one of the main strategic priorities for Azerbaijan as well. To ensure the sustainable development of the digitalization process in our country, several tasks need to be implemented.
These tasks include:
• Development of digital infrastructure and services
• Financial resources
• Skilled HR
• Cybersecurity
• Legislation
• Application of Fourth Industrial Revolution technologies
• Digital networking

To successfully implement these tasks, a number of decrees, orders, and state programs have been signed by the head of state over the past five years. The "Socio-Economic Development Strategy of the Republic of Azerbaijan for 2022–2026," approved on July 22, 2022, includes the measure titled "Preparation and implementation of the strategy for the development of the digital economy". In January 2025, by the relevant decree of the President of the Republic, the "Digital Development Concept of the Republic of Azerbaijan" was adopted to accelerate digital transformation in the country, ensure the digitalization of the economy, and make public administration more efficient (Digital Development Concept of the Republic of Azerbaijan). It should be particularly noted that, according to the relevant digitalization strategy, work has been carried out in various directions throughout the country. As an example, the following systems can be mentioned:

Electronic Government Portal	Electronic Services System	Electronic Agricultural Information System	State Control Information System
Electronic Procurement Platform	Digital Trade Hubı	Electronic Cadastre of Property and Land	Electronic Education
Electronic Health Service	Electronic Court System	Portal for Monitoring and Evaluation of the Center for Analysis and Communication of Economic Reforms	E-Document Circulation System

After the COVID-19 pandemic, the importance of electronic systems increased significantly, the transition to digital services in both the public and private sectors accelerated, and opportunities for providing remote services to citizens and business entities expanded.

In the "Digital Development in Azerbaijan" 2025 Statistical Compendium published by the State Statistical Committee of the Republic of Azerbaijan, important information such as the main macro indicators of the Information and Communication Technologies (ICT) sector and the current state of ICT systems in enterprises operating in the country are provided. If we look at the table below, the distribution of institutions operating in the country by purpose of internet use for both years is presented.

Indicators	2022	2023
Sending and receiving emails	22,6	21,3
Obtaining information about goods and services	7,7	7,7
Obtaining information from public administration bodies	16,1	15,5
Internet banking	11,7	12,0
Use of other financial services	13,0	13,1
Interactive communication with government agenciess (excluding access to information)	6,5	6,7
Customer service	5,9	6,3
Real-time sales of products	1,8	2,1
Conduct video conferencing or IP telephony	4,2	4,1
Conducting trainings for staff	2,5	2,7
Attracting staff	3,0	3,3
Online correspondence and placement of announcements	5,0	5.2

Table 1. *Distribution of enterprises by purposes of internet use, in percentage*
Source. *It was prepared by the author based on the information from "Digital Development in Azerbaijan" Statistical Compendium (2025)*

It can be seen that most of the indicators in the table increased compared to the previous year (2023). In particular, along with other indicators, HR functions have also shown a trend of growth.

Digitalization in the Field of HR in the North-West Region

For research purposes, a survey was conducted with the participation of public and private institutions operating in Azerbaijan's North-West region (including the manufacturing sector, education, healthcare, tourism facilities, and the banking sector). The survey covered HR departments, managers, and employees involved in recruitment (staff development). In the conducted survey, 14 public and 18 private institutions actively participated, making a total of 32 organizations. The questionnaire consisted of 10 questions in total. It should be noted that one of the main reasons for the limited number of participating enterprises is that many organizations operating in the regions are branches and representative offices, where a

centralized management system is in place. If we look at the responses given by employees working in 32 different sectors, we can see that, regarding the question about the current state of digitalization in HR processes, only 47% of employees stated that all processes are carried out digitally. The remaining 31% reported that processes are partially digitalized, while 22% indicated that no processes have been digitalized.
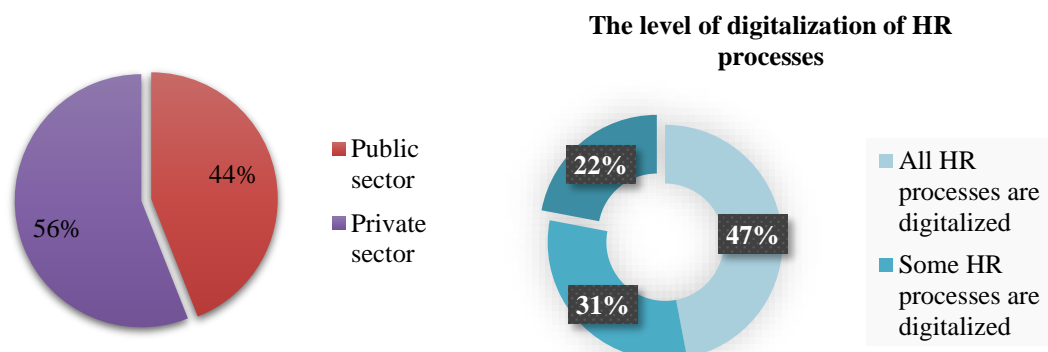
The level of digitalization of HR processes

Figure 4. The level of digitalization of HR processes
Source. It was prepared by the author based on survey results.

The results show that digitalization in the field of HRM in the North-West region is already expanding, although full integration has not yet been achieved across all enterprises. One of the issues that should not be overlooked is determining the current state of digitalized HR functions in enterprises, which was also addressed as a question in the survey.
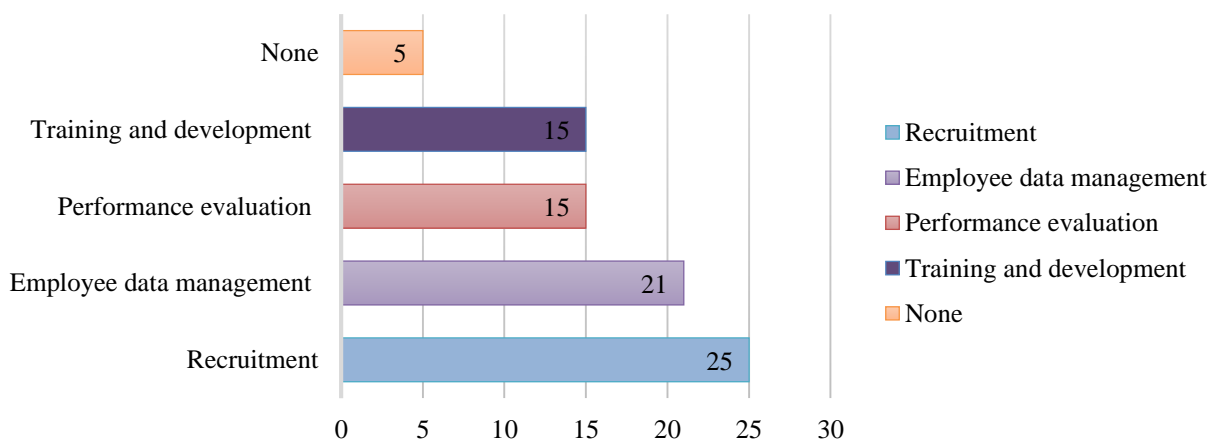

Figure 5. Digitalized HR functions
Source. It was prepared by the author based on survey results.

Among employees working in different organizations, the most frequently digitalized management functions were identified as "recruitment" and "employee data management." Examining the responses, it can be seen that in some enterprises all these processes have been digitalized, while in others, only a few functions are affected. This fact shows that HR digitalization is mainly carried out at the operational level, while strategic HR activities (such as career planning, training, and development) have not yet been fully integrated
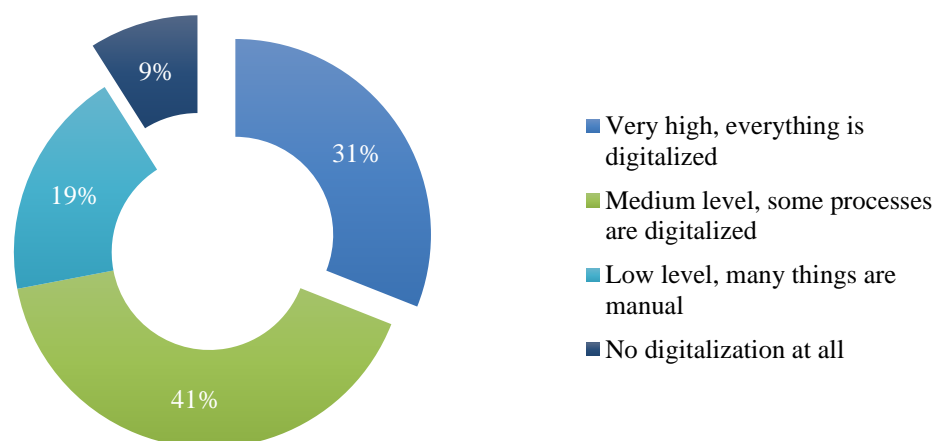
Figure 6. Overall assessment of the level of HR digitalization in institutions
Source. *It was prepared by the author based on survey results.*

When looking at the results of another question, it can be observed that 28% of respondents stated they do not use digital HR tools or that such tools do not exist at all. Another 31% indicated that digital tools are used, while 41% stated they are used occasionally. These results demonstrate that digitalization in the region is still in its initial stage. In addition, the low level of use of platforms such as HRM360, Systems, Applications, and Products in Data Processing (SAP), or DataHRM indicates that digital literacy remains limited. Regarding another question aimed at assessing the impact of current trends on the workflow in organizations operating in the region, six participants noted that they could not fully answer because they do not use any digital processes in their work at all. In another question, problems arising from the lack of digitalization in the organization were identified as follows:

  a. "Slow and inefficient recruitment process"
  b. "Delays and loss of time in work processes"
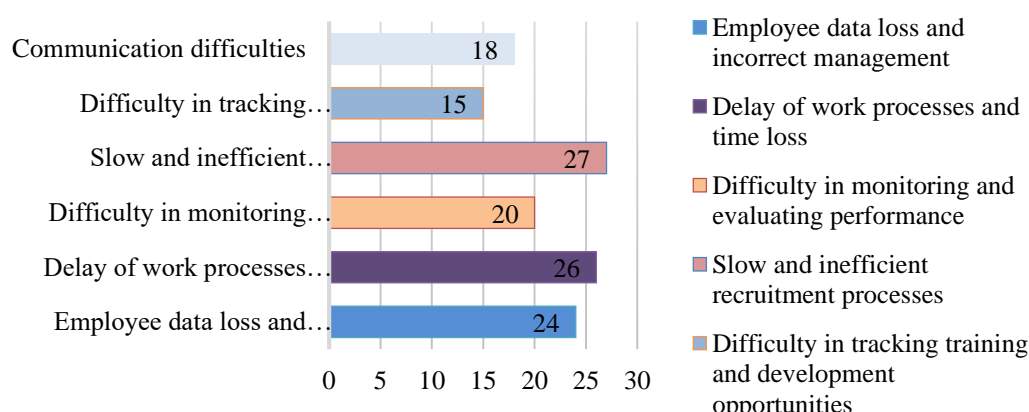 c. "Loss or incorrect management of employee data."

Figure 7. Problems arising due to the absence of digitalization
Source. *It was prepared by the author based on survey results.*

27% of survey participants noted that digitalisation "minimises time wastage" as a positive impact on HRM. Furthermore, 16% cited it as significant for productivity, 18% for time savings, 20% for ensuring transparency, and 19% for increasing data availability.
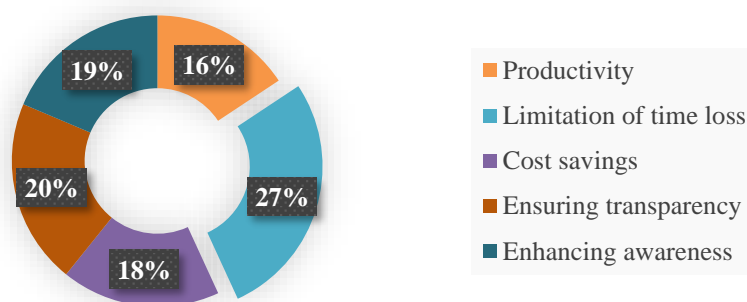
Figure 8. Positive effects of digitalization on HRM
Source. It was prepared by the author based on survey results.

One of the other questions included in the survey was "Possible outcomes of applying Artificial Intelligence (AI) in HRM." Most of the respondents stated that AI contributes to saving time and resources, automates HR processes, and plays a supportive and analytical role in HR activities. However, they also emphasized that human experience remains essential in decision-making.

Conclusion

The results of the study show that in Azerbaijan particularly in the regions the process of digitalization in HRM is being implemented gradually and is creating significant changes in the management mechanisms of organizations. The use of digital technologies facilitates more efficient and transparent implementation of HR functions such as personnel data management, recruitment, payroll systems, and performance evaluation.

This finding indicates that the process of digitalization in Azerbaijan and the neighbouring countries is still at an early stage, and additional measures are needed to ensure the full integration of digital technologies into the activities of the public and private sectors. In particular, deepening digitalization in the areas of HRM, education, and healthcare is of great importance for enhancing economic efficiency and competitiveness. The study identified that 31% of organizations operating in the North-West region carry out their HR processes fully digitally, 41% partially digitally, while 28% have not yet taken significant steps in this direction. The most digitalized areas include recruitment and electronic management of employee data. However, at the strategic level such as career planning, employee motivation, and training systems digitalization has not yet been fully implemented.

Most respondents consider the integration of artificial intelligence and automated decision-support systems into HR processes as necessary. Nonetheless,, uneven technological infrastructure development, low levels of digital literacy, and resistance to change in some organizations hinder the expansion of this process. At the state level, strategic documents such as the "Digital Development Concept", the "Socio-Economic Development Strategy for 2022–2026", and others create a foundation for the formation of a digital management environment in the country, particularly accelerating digital transformation in HRM. Overall, the results of the study show that digitalization has become a key tool for increasing efficiency, transparency, and accountability in Azerbaijan's management system. The continuous development of this direction will, in the future, ensure the improvement of quality in HR management at both the public and private sector levels, enhance decision-making mechanisms, and strengthen the competitiveness of the labor market.

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Implementation of the Green Economy in Azerbaijan

Abstract

This paper explores how Azerbaijan has adopted and applied the principles of a green economy as one of the central drivers of modern global economic transformation. Within the framework of accelerating green development, it evaluates future projections for the oil and gas sector between 2010 and 2040. The analysis focuses on distinguishing long-term and short-term trends influenced by external and internal factors that shape the industry's evolution. Moreover, the paper investigates the strategic directions available for the petroleum sector in a period when green transformation becomes a national priority. The primary aim is to determine integrated strategic models and policies that can promote an efficient and sustainable transition toward a green economy in Azerbaijan, a country where hydrocarbons still play a major role. A SWOT analysis was employed to examine the sector's strengths, weaknesses, opportunities, and threats. Concepts of green growth, the green economy, and sustainable development models were discussed comprehensively. The research drew on relevant academic sources and official documents. It concludes that all sectors, particularly energy should align with green economy standards to guarantee sustainable development and continuity in this direction. Consequently, the integrated framework of green growth and sustainable development provides promising prospects for Azerbaijan's future progress.

Keywords: Sustainable Development, Economic Transformation, Green Economy, Diversification, Green Growth.

Introduction

Although human needs are unlimited, natural resources are finite. Economics, as a discipline, seeks ways to satisfy growing needs with limited means. As the pace of economic development accelerates, pressure on resources also intensifies. Therefore, economies worldwide are being forced to adapt in harmony with nature to maintain balance. The concept of the green economy has consequently emerged as a global necessity rather than an option, as it represents the only viable path toward sustainable growth. Ignoring this shift risks triggering an ecological crisis capable of causing irreversible damage to the environment. The idea of a green economy has gained prominence as societies search for development strategies that ensure environmental protection alongside economic advancement. Countries rich in natural resources and energy potential have begun implementing targeted policies to enhance energy security, protect their ecosystems, and support economic diversification through the adoption of green economy principles. In Azerbaijan, this direction is aligned with the national strategic vision outlined in "Azerbaijan 2030: National Priorities for Socio-Economic Development", approved by Presidential Order No. 2469 (February 2, 2021). One of the five national priorities highlights the goal of transforming Azerbaijan into a nation characterized by a clean environment and green growth. This framework calls for the efficient use of energy and water resources, prevention of

resource depletion, expansion of renewable energy, and minimization of air, water, and soil pollution (Orders of the President of the Republic of Azerbaijan, 2021). At international level, Azerbaijan reaffirmed its commitment at the COP 26 Climate Conference in Glasgow (2021), pledging to cut greenhouse-gas emissions by 40 percent and to establish "net-zero-emission zones" in the liberated territories by 2050. Furthermore, during preparations for COP 29, to be hosted in Baku, President Ilham Aliyev emphasized that Azerbaijan's modern energy strategy is centered on developing renewable energy and ensuring its efficient transmission to global markets (BBC Azerbaijan). National policies now focus on expanding renewable capacity and improving energy efficiency. For example, the Karabakh and East Zangezur regions, which possess solar potential exceeding 7,000 megawatts and wind potential around 2,000 megawatts, are designated as green-energy zones (Gasimli, V. A, 2022, p.180). These initiatives demonstrate Azerbaijan's firm dedication to aligning its economic model with sustainable and environmentally responsible growth.

Transition from Brown to Green Economy

The global economy has traditionally been shaped by the brown economic model, which relied heavily on fossil fuels and intensive use of natural resources (Ministry of Energy of the Republic of Azerbaijan). This model supported industrial expansion for more than a century but also caused deep environmental and climatic consequences, including greenhouse gas accumulation and ecological degradation (Orders of the President of the Republic of Azerbaijan, 2021). In the 21st century, a paradigm shift toward a green economy has become essential to ensure sustainable growth and environmental balance (SOCAR).

For Azerbaijan, the concept of the green economy is especially relevant, given its long history as one of the world's earliest oil-producing nations. The country's petroleum industry began developing in the second half of the 19th century, when Baku became a major global oil center. By the early 20th century, Azerbaijan accounted for over half of the world's oil production, contributing significantly to industrialization and economic growth (New Azerbaijan Party). During the Soviet era, Azerbaijan remained a vital supplier of crude oil and petrochemical products to the Union's energy system (BBC Azerbaijan). After gaining independence in 1991, the oil and gas sector continued to play a central role in the national economy. The signing of the "Contract of the Century" in 1994 marked a turning point, attracting foreign investment and transforming Azerbaijan into a major exporter of crude oil and natural gas (Customs Committee of Azerbaijan). These developments provided strong economic growth but also reinforced structural dependence on fossil fuels.

In recent decades, however, the need to transition from a brown to a green economy has gained momentum. The Government of Azerbaijan has recognized that reliance on oil revenues alone poses both environmental and economic risks. Therefore, diversification through renewable energy, efficient resource management, and low-carbon technologies has become a strategic goal (Ahmad, T., 2020, p. 1975). Achievement of the transformation in Azerabijan means balancing continued energy production with responsible environmental stewardship. The country's vast potential in solar, wind, and hydro resources provides opportunities to create a resilient, diversified, and sustainable economic system (D'Amato, D., 2021, p. 107-143). Consequently, the transition from a brown to a green economy in Azerbaijan is not merely a technological transformation but also a profound economic and social evolution toward a sustainable future (Gaisina, LM, 2022, p. 106-113).

Green Economy in Global Power Centers

The emergence of a green economy demonstrates clear geographical disparities among leading global economies. Europe has historically functioned as a central region for green economic initiatives, primarily depending on energy imports to satisfy its demand. In contrast, the United

States and China, two of the largest economies and major consumers of oil and gas, are actively advancing policies to foster green economic development. Unlike Europe, these nations are pursuing a more balanced and sustainable approach. Both the US and China offer substantial support for scientific and technological projects in the green energy sector and provide strong incentives for industrial enterprises that develop innovative environmental solutions (Gaisina, LM, 2022, p. 106-113) Simultaneously, these countries impose relatively fewer restrictions on traditional oil and gas activities compared to Europe, and domestic and foreign energy companies face less regulatory burden (Gaisina, LM, 2022, p. 106-113).

The Impact of the Green Economy on the Oil and Gas Sector

In evaluating the influence of the green economy on the oil and gas sector, it is important to note that the countries considered are not only major exporters of oil and gas products but also substantial global consumers. This group includes nations such as Azerbaijan, Russia, Brazil, Nigeria, among others, all of which possess significant hydrocarbon reserves. These countries demonstrate varying approaches regarding the interaction between green energy initiatives and the traditional oil and gas sector. A detailed analysis was carried out for each of these country groups, and the results are summarized in Table 1.

Classification			
	Country group	**The position of the fuel and energy company**	**Represented countries**
1	Countries that actively promote the green economy	1) Imposition of regulatory constraints on oil and gas industry stakeholders; 2) Differentiated treatment of oil and gas firms in public procurement; 3) Macroeconomic planning neglecting international oil and gas potential	The countries of the European Union, particularly the Scandinavian nations (excluding Norway), as well as Germany, France, the Benelux states, and the newer member states of the EU
2	Countries exhibiting a moderate level of support for the green economy	1) Strategic planning for gradual decline of oil and gas in the national energy balance; 2) Substantial state support for green research and implementation; 3) Minimal restrictions on oil and gas with opportunities for green alternatives	1) Countries with extensive oil and gas reserves and advanced full-cycle industry; 2) Emerging industrial hubs and oil and gas importers
3	Oil and gas exporting countries	1) Absence of independent initiatives for green-oriented energy market restructuring; 2) Conditional support for green projects based on long-term profitability; 3) Strategic energy sector planning considering global trends and key partners	1) OPEC member states; 2) Major oil-producing countries outside OPEC; 3) Countries with large oil reserves but limited domestic industrial demand.

Table 1. Classification of the Extent to Which Energy Resources Are Replaced by Green Alternatives in the Oil and Gas Market

Source. (Ahmad, T., 2020, p. 1973-1991; D'Amato, 2021, p. 107-143)

Within the context of green economy formation, the first group of countries is most extensively documented regarding the evolution of the oil and gas sector. The transformations observed in the oil and gas markets of the second and third groups of countries are expected to follow similar patterns as the first group, albeit with a temporal delay. For the second group, this lag is estimated at approximately 8-12 years, while for the third group it ranges from 10 to 15 years (Gromova, E. 2020, p. 461-467). Assuming that the European Union achieves its targeted green economy development indicators, the restructuring processes of the oil and gas market are projected to reach their final stage by 2040 (Gaisina, LM, 2022, p. 106-113)

In the first group of countries, the main obstacles to the advancement of a green economy which simultaneously sustain stable demand for oil and gas products include the following factors (Table 1):

➢ Limited availability of green resources and restrictions on the expansion of green technologies;

➢ Lower logistical accessibility of renewable energy carriers compared to the well-established logistics of oil and gas distribution;

➢ Intensifying competitive pressure on European companies, the leaders of the green economy, from major oil and gas-consuming countries, notably China and the United States;

➢ Legal and logistical constraints that prevent breaches of long-term contracts for oil and gas supply to countries transitioning toward a green economy;

➢ Potential competition from emerging technologies, particularly dual-component nuclear energy projects, which may rival green energy initiatives (Litvinenko, IL, 2021, p. 220-224; Litvinenko, IL, 2021, p. 225-230).

Table 2 illustrates the energy potential of a green economy in terms of the substitution of oil and gas products with renewable alternatives.

Dynamics and forecast				
	2010	**2020**	**2030 (P)**	**2040 (P)**
Total energy consumption by source (million tons equivalent)	10.5	11.4	12.4	13.3
Biomass	1,313.0	1,791.0	2,483.0	3,271.0
Large-scale hydropower	266.0	309.0	341.0	358.0
Geothermal energy	86.0	186.0	333.0	493.0
Small-scale hydropower	19.0	49.0	106.0	189.0
Wind energy	44.0	266.0	542.0	688.0
Solar thermal energy	15.0	66.0	244.0	480.0
Photovoltaic energy	2.0	24.0	221.0	784.0
Solar thermal electricity	0.4	3.0	16.0	68.0
Marine energy	0.1	0.4	3.0	20.0
Total	**1,745.5**	**2,964.4**	**4,289.0**	**6,351.0**

Table 2. Forecast of Global Energy Demand by Source Until 2040
Source. (Kumar M., 2020, p. 2)

There is a pressing global economic necessity to develop alternatives to the oil and gas sector, particularly with respect to substituting hydrocarbons. Experience from European Union countries, regarded as leaders in establishing a green economy, demonstrates that the immediate replacement of conventional hydrocarbon resources with environmentally sustainable alternatives is not feasible (Revel-Muroz, P. A., 2017, p. 49–55). Considering the outcomes of the European Commission's experiment in directive-based economic restructuring according to green principles, a SWOT analysis was carried out to assess the strengths, weaknesses, opportunities, and threats of the oil and gas sector as a key participant in the global energy market for the period 2022–2030 (Table 3)

Table 3. SWOT Analysis of the Oil and Gas Sector in the Context of Green Economy

SWOT analysis	
Strengths	**Weaknesses**
1) The existence of long-term contracts for international trade in oil and gas products; 2) The impossibility of the transition of the economies of the world to green energy sources without significant adaptation of infrastructure and production processes; 3) The presence of alternative buyers for green western economies in the face of growing eastern markets and their own markets of oil-exporting countries; 4) The lack of green energy opportunities to completely replace hydrocarbon energy sources; 5) The dependence of the green economy on state support	1) Negative attitude of consumers with great power towards the energy potential of the oil and gas sector; 2) Depletion of oil and gas industry resources; 3) Asymmetry of the geographical location of oil and gas industry resources, the desire of the most developed economies not to depend on oil and gas exporting countries; 4) Environmental attractiveness of green energy, its higher social responsibility than the oil and gas sector; 5) Significant state support for green energy by the world's leading economies
Opportunities	**Dangers**
1) The potential to redirect oil and gas flows to countries with the least environmental constraints; 2) The potential to expand gas exports as an ecological alternative to oil; 3) The opportunity to earn extra profits from the sale of oil and gas in the context of the depletion of world hydrocarbon reserves; 4) The opportunity to earn extra profits from the sale of oil and gas in the context of setting limits on the use of hydrocarbons by green economies; 5) The opportunity to increase the environmental friendliness of the oil and gas industry through the implementation of innovative initiatives in the oil and gas sector	1) The expected decline in the use of oil and gas resources in the long term; 2) Risks of pressure from green economies in the form of restrictions on the import of oil and gas products by countries using the products of the oil and gas sector; 3) Risks of depletion of the resource potential of the hydrocarbon economy; 4) Threats associated with the logistical complexity of redistributing oil and gas flows in the event that major countries that are importers of oil and gas products refuse to import a significant part of previously imported oil and gas; 5) Risks associated with the resumption of price wars between leading exporters of oil and gas products

Development
Source. (Gorokhova, AE, 2018, p. 103-108; Sekerin, VD, 2018, p. 68-72)

The SWOT analysis indicates that the strengths and opportunities of the oil and gas sector are primarily linked to the current impossibility of fully substituting oil and gas with disposable green alternatives. This provides exporters with sufficient time to optimize technological and logistical processes, thereby mitigating potential negative impacts of the green economy transition. Conversely, weaknesses and threats arise from potential uncoordinated actions among industry stakeholders, a focus on short-term profits, and technological stagnation within the sector (Gorokhova, AE, 2018, p. 103-108; Sekerin, VD, 2018, p. 68-72).

Green Growth

In 2009, in response to the global financial crisis, South Korea adopted the National Strategy for Green Growth along with a Five-Year Plan, establishing itself as a global promoter of green development, primarily via the OECD platform. At the OECD Ministerial Council meeting in June 2009, 30 member countries and five candidate countries, representing approximately 80% of global economic capacity, endorsed the principle that environmental protection and economic growth can coexist. Work commenced on a green growth strategy to comprehensively integrate economic, environmental, social, and technological considerations (UNESCAP, 2012).

The OECD currently leads the implementation of green growth, with additional support from institutions such as the World Bank, Green Growth Leaders, and various think tanks. The Green Growth Strategy, first presented in the 2011 OECD forum, is designed to foster economic

dynamism, create green jobs, improve energy and material efficiency, and properly value environmental services. Its objectives include establishing national accounting frameworks that account for environmental and social factors, providing tools and recommendations for national policies, supporting developing economies, and promoting both short and long-term employment opportunities (Prague Economic Papers, 2017, p. 489).

National green development strategies are critical because social and economic activities impact ecosystems, creating imbalances that threaten economic growth. Natural capital, including mineral resources, is often undervalued, leading to inefficiencies and reduced societal well-being. The absence of coherent strategies can discourage investment and innovation, slowing sustainable development. Overall, these strategies aim to encourage environmentally responsible behavior among businesses and consumers, ensure equitable redistribution of jobs, capital, and technology, and provide incentives for ecological innovation (Prague Economic Papers, 2017, p. 490).

Green Growth, Green Economy, and Sustainable Development

Although green growth and the green economy are often considered subcategories or indicators of sustainable development, they should be distinguished. Green growth and the green economy do not replace sustainable development but serve as practical frameworks to achieve it. Implementing a green growth strategy allows measurable progress in economic and environmental terms by:

➢ Improving resource and energy efficiency while reducing waste;
➢ Stimulating innovation to address environmental challenges;
➢ Creating new markets and employment through demand for green technologies and services;
➢ Increasing investor confidence by ensuring predictable and stable government action;
➢ Supporting stable macroeconomic conditions, reducing volatility in resource prices, and promoting fiscal consolidation (OECD, 2012).

The green economy focuses on identifying all sectors that can be "green" including natural capital-dependent sectors such as agriculture, fisheries, forestry, and water management, as well as transport, energy, and manufacturing. Resource efficiency not only reduces environmental pressure but also enhances economic growth and employment. Economically, green growth increases overall welfare; socially, it improves quality of life; and ecologically, it optimizes the use of natural capital (Prague Economic Papers, 2017, p. 495).

Conclusion

The transition to a green economy will gradually reduce global demand for oil and gas products. Nevertheless, the oil and gas sector has an adaptation window of at least ten years. Coordinated efforts among market participants, avoiding price wars, can lead to revenue growth. Technological innovations will further stabilize the position of oil and gas suppliers in the long term.

The integration of green growth, green economy, and sustainable development forms a strategic development model that promotes rapid social prosperity within an ecologically sustainable framework. Resource conservation and optimized utilization are among the most effective and low-cost strategies for startups, providing both immediate and long-term benefits.

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Ecological Aspects of the Development of Ecological, Circular and Green Economy and Azerbaijan Realities

Abstract

The article analyzes issues related to the environmental aspects of the application of the principles of ecological, circular and green economy and provides an overview of the current state of affairs in Azerbaijan. It also pays attention to the historical aspects of the formation of the stages of economic development of Azerbaijan. The article describes the ecological and economic aspects of the impact of the development of industry, agriculture and other economic sectors on the environment. Studies show that resource constraints, the use of consumption and production waste have always existed. However, these issues have been solved differently in different historical periods. The solution to these accumulated problems consists in the transition to an ecological and circular economy model, which ultimately means a "green" economy. The introduction of more advanced technologies not only reduces the negative impact of current production activities on the environment, but also reduces the volume of waste accumulated from past production periods. Special attention is paid to government initiatives and institutional reforms aimed at reducing environmental impacts and improving the efficient use of natural resources. The advantages of investment activities in the green sector and the relationship between environmentally friendly projects and the dynamics of economic growth are determined.

The article examines a special approach to the economic structure of modern society, which has been known in recent years as the "green" economy. The green economy aims to ensure sustainable socio-economic development of society through the efficient use of natural resources, their protection and restoration.

The article notes that the rapidly changing climate, the irreversible destruction of animals and plants, the increase in pollution-related diseases, and the impact of industrial waste, water and soil pollution and depletion clearly indicate that the old economy has led to a crisis in the relationship between humanity and the world.

Keywords: ecological economy, circular economy, green economy, environment, waste, sustainable development

Introduction

The ecological aspects of the development of ecological, circular and green economies are associated with minimizing negative impacts on the environment through the efficient use of natural

resources, reducing waste and implementing sustainable production and consumption models. In modern times, the increase in environmental problems on a global scale, processes such as depletion of natural resources and climate change have necessitated a rethinking of economic development models. In this regard, the concept of "circular economy" comes to the fore as an alternative to the traditional brown economy model. Azerbaijan has also taken important steps in this direction in recent years, trying to achieve sustainable development goals by protecting ecological balance and restoring ecosystems.

The relevance of writing the article stems from the fact that modern economic development is associated with increasing negative impacts on the environment, depletion of natural resources, and disruption of the balance of ecosystems. The consequences of climate change are noticeable not only in the world, but also in every region of Azerbaijan. All this exacerbates ecological, economic and social problems and limits future development opportunities. Only the implementation of sustainable development and the transition to an ecological and circular economy can stop these processes. The purpose of writing the article is to examine the advantages of the transition to an ecological and circular economy in sustainable development, its current application, development prospects, and to assess the sustainability and difficulties of their implementation in Azerbaijan.

The methodological basis for solving the tasks set in the article is the use of systematic analysis, historical, chronological, dialectical and comparative methods, as well as the analysis of economic and statistical data. The database for writing the article is the works of well-known foreign scientists, statistical materials of the UN, the World Bank and the Republic of Azerbaijan, and normative and legal documents prepared by international and national legislative bodies in the field of sustainable development.

The essence of ecological, circular and green economy

The need to develop new paths for human and economic development has long been recognized by the world community. As early as the late 1980s and early 1990s, the feasibility of transforming the traditional development model had a profound impact on the discussion of new conceptual and methodological approaches to assessing the development of society and the economy, in particular, new development models, which laid the foundation for two new theories that emerged within the framework of the UN structures. These are sustainable development and human development. The need to solve environmental problems for the progress of humanity is reflected in the UN Millennium Development Goals for 2000-2015, adopted by all countries of the world, one of which is related to ensuring environmental sustainability. In September 2015, the UN Summit adopted a new agenda and Sustainable Development Goals, which will serve as the main benchmark for the world from 2016 to 2030. It is clear that a new economic model is also needed for Azerbaijan. This situation is due to the obvious exhaustion of the raw material-exporting development model. In the conditions of modern industrialization, there is a need for continuous research to develop theoretical models for the direct application of cyclical technologies and practice-oriented concepts for the application of closed-loop systems in the production processes of enterprises *(UNEP 2023. Report of the United Nations Conference on the Environment and Development, 1992).*

The international community has adopted the circular economy model as an alternative to the development of the economic system. It eliminates the use of harmful chemicals that hinder reuse and aims to completely eliminate waste through improved design of materials, products, systems and business models. The circular economy is characterized as a complex economic system that is restorative in terms of design and structure. It will replace the concept of "life cycle" with the concept of "transition to the use of renewable and renewable energy sources" and is characterized by its closed nature *(Varkholova, Dubovitska, 2015; Skripnyuk, Kikkas, Didenko, 2018).* An ecological economy is an economic model that takes into account the carrying capacity of nature, reconciling social well-being with ecological stability. Various trends in the development of the modern economy - knowledge economy, low-carbon economy, energy-efficient economy, circular economy and others - emphasize the importance of various aspects of the main trend. Solving socio-economic

problems while minimizing environmental damage is today called the "green" economy. Its goal is to ensure the "greening" of all areas of the economy and our lives, from industry to households. The "green" economy is built on two main principles and pays special attention to the environment. These are the "double win" policy, which requires economic and environmental efficiency in the implementation of any project, and the principle of "decoupling" the processes of economic growth and natural capital depletion, which were previously closely linked. The circular economy is the practical application of this approach. It is based on extending the life of products, remanufacturing, and using renewable energy sources. According to the classical definition, ecology is the economy of nature. Today, it is increasingly common to hear that ecology is an economy. This means that the modern economy must increasingly meet the environmental requirements of people and society, harmonize the relationship between people and nature. This is the goal of the "green" economy. The term "green" economy itself is to determine the current directions of economic development and modernization. Its goal is to ensure that environmental requirements are taken into account and to "green" the economy *(Ellen MacArthur Foundation 2021, Henning Wilts. 2021).*

This does not apply to any specific area, part or sector of the economy, but to the general trend of its future development. Therefore, it is already difficult to accurately assess the share of the "green" economy. In addition, the fate of the "green" economy is predetermined by the simultaneous, equal existence of the traditional "brown" economy, which aims to ensure economic growth at all costs, without taking into account the consequences of the new "green" economy for people and nature. This is currently more expensive and implies investments in future crisis-free development. Therefore, an economy based on ecological requirements will most likely be increasingly referred to not as a "green" economy, but simply as a modern economy with no alternative, and this will become even clearer in the future. Currently, the features of the "green" economy are clearly visible in the global economy. Certain trends in this direction are beginning to manifest themselves to some extent in the economy of each country *(Management of Green Development of the National Economy 2017).* Such trends are also evident in the Azerbaijani economy. These include measures to ensure energy efficiency and energy saving, the development of renewable energy, the decision to limit greenhouse gas emissions, the direction of development towards innovative development and modernization. All these are steps of the country towards a "green" economy.

According to UN reports, a "green" economy is defined as an economy that improves human well-being and ensures social justice, while significantly reducing environmental risks and degradation. This requires a number of measures aimed at the efficient use of natural resources, the protection and enhancement of natural capital, the reduction of pollution and carbon emissions, the prevention of the loss of ecosystem services and biodiversity, and the increase of incomes and employment *(Pearce, D., Turner, R. K. 1990).*

Not to mention the ecosystem services that ensure the existence of life on Earth, no economy in the world today can function without natural resources. Any economy faced with environmental problems is forced to stop and spend a lot of money to improve the situation.

Directions for the formation and environmental advantages of an ecological, circular and green economy in Azerbaijan

The development of an ecological, circular and green economy in Azerbaijan covers several areas - the development of renewable energy, reducing water consumption, waste management, increasing energy efficiency and the use of green technologies. At the same time, it provides environmental benefits such as reducing greenhouse gas emissions, improving air and water quality, reducing pressure on natural resources and minimizing waste generation. For this, the transition to renewable energy sources such as solar and wind, increasing energy efficiency in industry, housing and utilities, implementing water-saving technologies in agriculture from water resources, switching to less water-intensive agriculture and cooperation with neighboring countries for the protection of large water bodies such as the Caspian Sea are of great importance.

Waste management is also one of the pressing problems in Azerbaijan. In this regard, on June

30, 1998, the Law "On Production and Municipal Waste" was adopted in Azerbaijan. The development of systems for separate collection, recycling and disposal of waste, as well as the implementation of the principles of a circular economy, in which waste from one production enterprise becomes raw material for another, is considered an important link in the transition to a "green" economy in the country *("Green Growth Concept" of the Republic of Azerbaijan, 2022).* Stimulating the application of innovative and environmentally friendly technologies in various sectors of the economy in the country, supporting projects aimed at reducing negative impacts on the environment also play a special role in ensuring environmental sustainability. According to the report of the State Statistical Committee, in 2024, 4365.0 thousand tons of waste were generated in the country, of which 69.3 percent were solid household waste, and 30.7 percent were various types of waste generated as a result of the production activities of enterprises.

Of the 3,025.4 thousand tons of solid household waste generated in 2024, 80.5 percent were transported to landfills for disposal, 19.2 percent were used for energy generation, and 0.3 percent were sold within the country. 232.5 million kWh of electricity was generated through the use of household waste *(Azerbaijan State Statistical Committee, 2024).*

Including residues generated in previous years in industry and other sectors of the economy, 22.2 percent of production waste last year was used as raw materials in enterprises, 15.3 percent was sold within the country, 1.4 percent was exported, 11.6 percent was transported to landfills for disposal, and 49.5 percent remained in the yards of enterprises. As a result of the production activities of enterprises, 260.2 thousand tons of hazardous waste were generated in 2024, and their share in the total amount of waste was 6.0 percent. 71.9 percent of waste was generated in mining enterprises, the majority of which was generated in Baku. Including residues from previous years, 115.7 thousand tons of hazardous waste were completely neutralized in 2024 *(Azerbaijan State Statistical Committee, 2024).* Azerbaijan has significant untapped potential for waste-to-energy conversion, which might be crucial for improving energy security and economicresilience. But to reach this potential, we need a plan that includes investments ininfrastructure, changes to policies, and programs that encourage people to alter theirbehavior *(Elshan & Hacar, 2025).*

Since regaining its independence and signing oil contracts in 1994, Azerbaijan has succeeded in creating one of the leading economies in the region. While the country's economy benefits from the export of natural resources, it has also begun to benefit from a steady inflow of investment. However, there are still certain social, economic and environmental challenges that threaten the long-term sustainability of the country's development model. The country's transition from an oil-dependent economy to inclusive "green" development remains a key priority at the highest level.

In the national priority plan "Azerbaijan2030: National Priorities for Social and Economic Development", approved on February 2, 2021, one of the five main priorities is called "A Country of Clean Environment and Green Growth". The declaration of 2024 as the "Year of Solidarity for a Green World" in the country within the framework of "COP29" is an indicator of giving priority to recycling, the use of renewable energy sources, and the application of ecological technologies within the framework of the "transition to a green economy". The "Social and Economic Development Strategy of the Republic of Azerbaijan for 2022–2026" is a strategy prepared on the basis of these priorities. As a continuation of this, the "Social and Economic Development Strategy of the Republic of Azerbaijan for 2027–2030" dated May 30, 2025 will give a significant impetus to the country's ecological and economic development. At the same time, the Strategy tasks the relevant institutions with the preparation of the "II State Program on the Great Return to the Liberated Territories" *(https://president.az/).*

Azerbaijan faces serious environmental problems that affect the country's economy and shape new realities. These include land degradation and desertification, which negatively affect both the population and economic development, poor management of urban infrastructure, industrial and domestic waste, air pollution, and depletion of water resources. It is reasonable to say that future economic development in Azerbaijan will be closely linked to the application of environmentally friendly technologies, the use of clean energy sources, waste recycling, and increased work in the

field of remediation of contaminated areas. In accordance with the National Priorities, environmental sanitation, rapid restoration and increase of greenery, and efficient use of water resources and sustainable energy sources will be ensured.

More than 20% of irrigation water in the country is lost due to deterioration of irrigation infrastructure, and the melting of more than 30% of existing glaciers will lead to a decrease in water resources. At the same time, current policies and investments in climate change adaptation, sustainable waste and water resource management, and biodiversity conservation are insufficient and require more resources *(Ministry of Ecology and Natural Resources. 2024)*.

Azerbaijan's National Priorities for the transition to a "green" economy envisage the establishment of an economy capable of raising the standard of living of the population, using natural resources prudently and efficiently in the interests of present and future generations, in accordance with the country's international environmental obligations. The "Green" economy in Azerbaijan is an economy aimed at protecting the well-being of society through the efficient use of natural resources, as well as ensuring the return of end-use products to the production cycle. First of all, the "green" economy is aimed at the economical consumption of resources such as oil, gas and other minerals in the country, which are currently subject to depletion. Also, reducing emissions of harmful substances into the atmosphere, resulting in improved air quality, more efficient use of water and restoration of aquatic ecosystems, reducing wind and water erosion, minimizing waste through recycling and reuse, reducing energy and water consumption in production and consumption, and strengthening the economy's resilience to climate change and other environmental problems are the basis for ensuring an ecological, circular and "green" economy in Azerbaijan *(Ministry of Ecology and Natural Resources. 2024, Azerbaijan State Statistical Committee, 2024)*.

The goal of the formation of an ecological and circular economy is to decouple economic growth from primary raw materials by creating a cyclical production and consumption system with minimal waste. Resources should be managed efficiently throughout their entire life cycle, from production and consumption to disposal and recycling, and they should create added value from existing resources while reducing waste generation. In addition to reducing environmental impact, the effective application of circular economy principles allows companies to reduce costs, increase growth potential and improve their corporate image. Therefore, the transition to a resource-efficient circular economy is of paramount importance in the interests of competitiveness and sustainable economic growth. The transition to a circular economy requires changes in the entire product value chain, from product design to new business models and the development of consumer habits. For new and existing products, the main focus is on the selection of sustainable materials, product quality, optimization of the distribution chain, and full life cycle development, with an emphasis on recycling and reuse. Along with smart design solutions, ecological innovations and technological development play an important role in facilitating the transformation of economic development *(Henning Wilts. 2021)*.

The principles of the green and circular economy cover all areas of activity, so cooperation between businesses and international agreements cannot be underestimated. Successful commercial cooperation is characterized by industrial symbiosis; its goal is a closed production cycle in which the waste, residual heat and other by-products of one enterprise are consumed by another.

The way we consume goods and services also requires significant changes. The daily choices of millions of consumers have a significant impact on the environment. Increasing consumer awareness and creating demand for environmentally friendly products contribute to the development of an environmentally friendly economy *(Ellen MacArthur Foundation 2021)*. The role of government in the transition to a green and circular economy is to create favorable conditions for the implementation of the principles of the "green" economy and to remove obstacles to its implementation.

As can be seen from Figure 1, the 5 main principles of the circular economy have an equal share of 20%. This approach shows that the circular economy is not based on a single stage, but on the entire chain of processes. The graph also shows that all stages of the life cycle of a resource are

continuously interconnected.
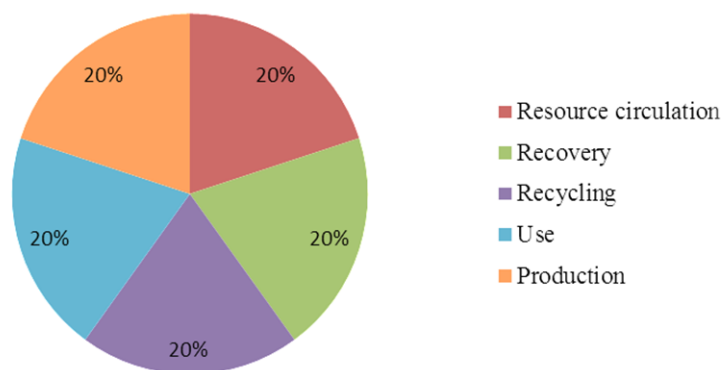
Basic principles of the circular economy

Figure 1. Basic principles of the circular economy
Source: Ellen MacArthur Foundation 2021

An ecological and circular economy is a production and consumption model that promotes the sharing, renting, reuse, repair, improvement and recycling of existing materials and products for the longest possible time. This extends the life cycle of products. In practice, this means minimizing waste. When a product reaches the end of its useful life, its materials are retained in the economy through recycling, where possible. They can be reused productively, creating added value. Although the new model is based on a large amount of cheap and easily available materials and energy, it contradicts the traditional linear economic model.

On the contrary, the reuse and recycling of products will slow down the use of natural resources, the destruction of landscapes and habitats, and help limit the loss of biodiversity. Another benefit of the ecological and circular economy is the reduction of total annual greenhouse gas emissions. According to the European Environment Agency, 9.1% of greenhouse gas emissions in the EU are caused by industrial processes and product use, and 3.32% by waste management *(Вархолова Т., Дубовицка Л. 2015)*.

The ecological and circular economy should use climate protection instruments and the synergies resulting from their application. The decarbonization of the economy is inextricably linked to circular production and consumption patterns *(Скрипниук Д.Ф., Киккас К.Н., Диденко Н.И. 2018)*.
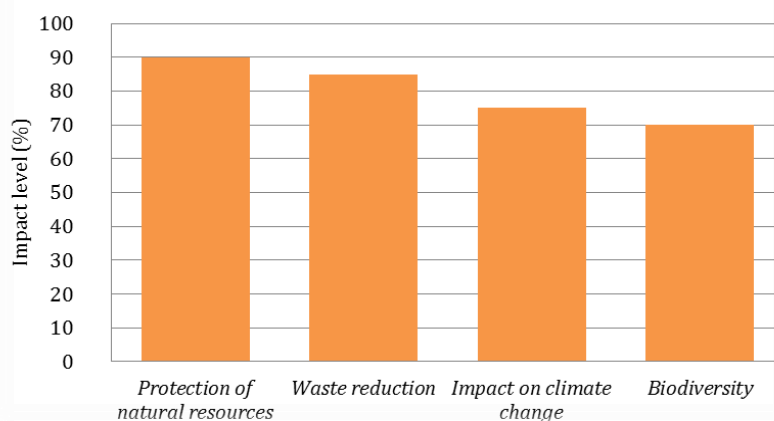

Figure 2. Environmental benefits of a circular economy
Source. *Ellen MacArthur Foundation 2021, Korhonen, J., Honkasalo, A.,Seppälä, J. 2018*

According to the data provided in the diagram of the environmental benefits of the circular economy (Figure 2), the protection of natural resources has the highest indicator (90%) in terms of environmental benefits. This can be mainly explained by the reuse of resources, optimization of the production process and prevention of waste. The indicator for waste reduction is estimated at 85%, which indicates the efficiency of the waste management system and the application of a closed loop in the production process. The impact on climate change at 80% reflects the positive impact of the circular economy on reducing greenhouse gas emissions and increasing energy efficiency. The positive impact of the circular economy on biodiversity protection at 75% proves that this model contributes to the stability of ecosystems as a whole and the protection of the natural environment.

The results obtained in recent years confirm the effectiveness of the circular economy approach in terms of environmental sustainability. The transition to a circular economy provides complex benefits related to the protection of natural resources, climate change mitigation, waste reduction and biodiversity preservation.

Restructuring the economy in Azerbaijan will require solving a number of key problems.

This is because the linear economic model has created numerous dependencies that need to be eliminated for many years to make circular solutions and products competitive. It must be frankly admitted that restructuring the existing system will lead to high operating costs. Therefore, it is necessary to continue an innovation and investment-oriented policy to ensure the success and preservation of the necessary transformation. Therefore, it is absolutely clear that the transition to an ecological and circular economy cannot be achieved through environmental policy alone. Such an economy is a classic issue that requires a revision of both tax legislation and scientific and industrial policy. In the Republic of Azerbaijan, the transition to a "green growth" model has been identified as one of the priority directions of state policy since 2022.

Measures are being taken in this area in the following areas:

- **Creation of green energy zones:** Implementation of renewable energy projects in the Karabakh and East Zangezur economic regions (especially hydro, wind and solar power plants).
- **Waste management:** Expansion of household waste sorting and recycling as a result of the activities of "Tamiz Shahar" OJSC.
- **Ecological technologies in industrial parks:** Acceleration of the implementation of waste-free production and energy efficiency principles in the Sumgayit Chemical Industrial Park.
- **Resource circulation in the agricultural sector:** More efficient implementation of measures such as soil fertility protection, use of organic fertilizers and reuse of irrigation water *("Green Growth Concept" of the Republic of Azerbaijan, 2022, Ministry of Ecology and Natural Resources. 2024).*

The transition to a "green growth" model has been identified as one of the priority directions of state policy in the Republic of Azerbaijan. As a result of the implementation of an ecological and circular economy in the country, a number of environmental benefits are achieved, including reducing the pressure on production from the reuse of resources, reducing the burden on the environment as a result of recycling processes, the role of production efficiency and energy saving in reducing CO_2 emissions, and improving the quality of soil, water and air, which creates conditions for the restoration of ecosystems, which is considered the path to a "green" economy. For example, in Baku, waste recycling in the "Balakhani Industrial Park" prevents thousands of tons of waste from being released into nature per year, which has a significant impact on the health of ecosystems.

Synthesis of sustainable development and ecological economy in Azerbaijan

The synthesis of sustainable development and ecological economy in the Republic of Azerbaijan is achieved through the integration of the UN Sustainable Development Goals (SDGs) into national policies and business practices, the application of environmental, social responsibility

and governance principles in production sectors, and the promotion of green development that creates conditions for a balance between economic development, environmental protection, and social justice. On October 6, 2016, a Decree was signed on the establishment of the National Coordination Council for Sustainable Development of the Republic of Azerbaijan. According to that decree, a coordination mechanism was formed to ensure sustainable development until 2030, the activities of the Council, the responsibilities of state bodies, and the reporting system were determined. The country also undertook to work together with International Organizations to support the implementation of the Development Concept "Azerbaijan 2020: A Vision for the Future", as well as the implementation of key development issues after 2015 and the Sustainable Development Goals. This will address the country's development priorities in collaboration with national partners, international development partners, civil society, the private sector, international financial institutions, and other stakeholders *(https://president.az/, UNEP 2023).*

The concept of sustainable development is based on the understanding of the need to meet the growing needs of humanity within the limits of the planet's natural resources. The synthesis of sustainable development and ecological economics involves finding a balance between economic growth, social progress and environmental protection. This is achieved by integrating ecological principles into economic models and making decisions that do not harm future generations.

According to the United Nations Development Programme (UNDP), 40% of land is degraded due to soil erosion, loss of fertility and depletion. Up to 1 billion people lack access to clean drinking water, 2.6 billion people lack basic sanitation, and 1.4 million children under the age of five die each year due to lack of clean water and sanitation. Forest cover is decreasing by 13 million hectares each year, and climate change could affect about 2 billion people in coastal areas *(Sustainable Development: Ecology, Economy, Society and Culture: 2023).*

The current environmental problems of resource depletion, ecosystem degradation, pollution, loss of biodiversity, climate change, disruption of the biosphere balance and risks to human health are also relevant for Azerbaijan. Thus, increasing consumption due to the unlimited exploitation of natural resources in the country, which increases every year, leads to an aggravation of environmental problems. As a result, processes such as environmental pollution, the negative impact of climate change on ecosystem components, depletion of natural resources, including freshwater shortages, deforestation and loss of biodiversity occur. As a result, the disruption of the overall balance of the biosphere and the established harmony and interaction of its components leads to more and more unexpected consequences, including epidemic diseases. At the same time, a clear distinction between the roles of natural and social factors both at the level of causation of ongoing anomalies and at the level of their consequences is becoming an increasingly complex task. All this demonstrates the need to ensure harmony between man and nature when determining the paths of economic development.

Currently, international organizations, summarizing the experience of implementing the concept of sustainable development, have been forced to note that in practice the relationship between the three fundamental elements differs from that assumed in theory. Despite all the political declarations and justifications for prioritizing environmental problems, minimal attention is paid to environmental issues, which form the basis of the initially proposed development concept, the third, economic aspects are the most important, and social aspects are the second. This has created difficulties in ensuring that environmental requirements are taken into account not as separate programs, but primarily by including them in the solution of socio-economic problems that concern everyone *(Pearce, D., Turner, R. K. 1990; Управление зеленым развитием национальных экономики 2017).*

As the experience of implementing sustainable development ideas shows, it is difficult to meet environmental requirements without achieving the main socio-economic goals, primarily poverty eradication. As there is an urgent need to solve long-term sustainable development goals, the problems related to ensuring people's survival and development are becoming increasingly urgent. The threat of ecological crisis, scarcity of natural resources, and negative consequences of human activity for future generations are already manifesting themselves today. In Azerbaijan, the synthesis

of sustainable development and green economy is achieved through the transition to a "green" economy, which includes the development of renewable energy (wind, solar, bioenergy and hydroelectric power plants) and the solution of national environmental problems. The country gives greater priority to environmental protection and minimizing the impact of climate change, and seeks to integrate economic and social goals with environmental problems *(Administration of Green Development of the National Economy 2017, Ministry of Ecology and Natural Resources. 2024)*.
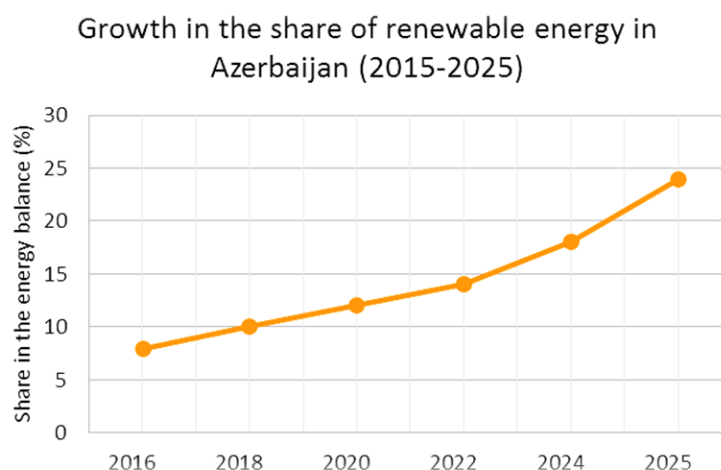

Figure 3. Growth of the share of renewable energy in Azerbaijan
Source. *Azerbaijan State Statistical Committee, 2024*

As can be seen from the given graph (Figure 3), the share of renewable energy in Azerbaijan has increased from 7 percent in 2015 to 23 percent in 2025. That is, an increase of about 3.3 times over 10 years. This increase was achieved as a result of greater technological progress and, at the same time, the state's "green energy" policy. The growth trend is sustainable and this growth shows that Azerbaijan can significantly increase the share of renewable energy in the energy balance in the near future. Also, the linear increase in growth starting from 2020 should be explained by the implementation of new projects in the country in the field of renewable energy, especially the construction and commissioning of plants based on wind and solar energy.

Azerbaijan has set the establishment of a "green economy" model as a priority target by 2030 within the framework of the UN's "Sustainable Development Goals" (SDGs). In this strategy, the principles of the circular economy – waste-free production, resource recycling, eco-innovations and "green business" initiatives – are considered as key components. The results achieved and the ongoing qualitative changes in the economy, society and politics already allow us to set goals for the transition to the next stage, aimed at achieving sustainable development goals in the long term. At the same time, it is important to fully and comprehensively take into account and address global trends and challenges when developing a long-term development strategy. In this context, one of the effective tools for ensuring sustainable development is to achieve the full transition of the country to a "green" economy *(Вархолова Т., Дубовицка Л. 2015)*.

Structural changes in the Azerbaijani economy in recent years, state support for the development of entrepreneurship, undoubtedly affect the use of natural resources and the level of environmental pollution. Therefore, in this period, the economic aspects of environmental decision-making, that is, the integration of environmental and economic policies, are especially important. In these conditions, the Azerbaijani state, using a wide range of economic instruments, pays special attention to the implementation of policies aimed at the introduction of resource-saving and low-waste technologies, new types of services, entrepreneurship and other measures. Nevertheless, the development of an ecological and circular economy in the country faces a number of problems:

- The culture of waste sorting has not yet been fully formed in society;

- The high cost of environmental technologies and the limited potential of local production;
- Inadequate legal and regulatory framework in some cases;
- Weak implementation of environmental awareness and innovations at the regional level.

Joint action of the state, private sector and civil society is necessary to overcome these problems (*The "Green Growth Concept" of the Republic of Azerbaijan, 2022, Ministry of Ecology and Natural Resources, 2024*).

In order to successfully solve environmental protection issues in the country, to ensure efficient use of natural resources and to prevent negative impacts on the environment, economic methods of environmental management and regulation of the use of natural resources are applied based on the principles of paid use of natural resources, that is, the "polluter pays" principle. Thus, the development of an ecological, circular and green economy plays the role of a guarantor of both economic stability and environmental security in the country.

Conclusion

The analysis of the sources shows that a successful ecological-economic policy mix largely depends on the effectiveness of the measures. An ecological, circular and "green" economy will have a positive impact on climate and resource protection, balancing and coordinating various economic interests and ecological processes. On the one hand, climate protection will be ensured, and on the other hand, resource protection will be ensured through an ecological and circular economy. Therefore, it can be argued that any concepts and approaches currently used in climate policy can be applied to the development of an ecological and circular economy.

The consequences of economic growth based on the unlimited exploitation of natural resources in Azerbaijan limit the opportunities for further development on this path. The deterioration of ecological problems and the disruption of the overall balance of ecosystems lead to consequences such as increasing pollution, climate change and epidemics. If ecological problems are not resolved, this will further exacerbate ecological crises, which will lead to an aggravation of socio-economic problems. Distinguishing the role of social and natural factors in ongoing changes is becoming increasingly complex. The development of an ecological, circular and "green" economy in Azerbaijan is of strategic importance in terms of ecological stability, efficient use of resources and environmental protection. Strengthening state programs, renewable energy projects and recycling infrastructure in this direction will contribute to the restoration of ecological balance and economic modernization in the country. In the future, the widespread application of the ecological and circular economy model in the country will ensure not only sustainable economic growth, but also the protection of ecosystems. One of the most effective tools for ensuring sustainable development in Azerbaijan is the country's transition to a "green" economy. The country's green transition strategy is based on the results achieved and the more rapid development of economic sectors such as energy, water resources, land resources and waste. The application of ecological and circular economy principles should be expanded in the national economic strategy. Specific incentive mechanisms should be developed for the efficient use of resources at the production and consumption stages, waste reduction, increasing the share of renewable energy sources and the application of ecological technologies. This approach will serve both to preserve ecological balance and to ensure the sustainability of economic growth. Educational measures should be strengthened to form the ecological mindset of society. It is important to develop environmental education at all levels, promote a culture of "green behavior" among the population and business entities, and increase public participation in environmental initiatives. This will allow for increased environmental responsibility and strengthening the social foundations of the green economy.

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