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Agricultural sciences

ASSESSMENT OF THE TOTAL AMOUNT OF CARBON (CO₂ eq) ACCORDING TO THE FERTILIZATION VARIANTS -CASE STUDY-

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Methodology and Background

The aim of the current study was to assess the total amount of carbon (CO₂ eq) according to the fertilization variants. The research activity, based on the realization of numerous analyses, determinations and studies of an economic nature, was performed in the agricultural bio base of the Research and Development Station for Bovine Arad, Romania during the year 2024. The structure of the fodder system of this farm included the following crops:

- grain barley (100 ha-10%)
- alfalfa (79 ha-8%),
- corn silage (256 ha-25%)

The results of the current study aimed to establish the amount of "net" fixed carbon and the general distribution of carbon fixed by photosynthesis, at the level of the manure-fertilized forage system.

Following the analyses in respect to the quantitative evaluation of raw carbon captured and fixed through photosynthesis, in the case of the fertilization variant based on manure administered in a quantity of 30 t/ha, a series of values were obtained, presented in table no. 1. In this respect, the total amount of carbon were exposed (reported per ha and per entire cultivated area) associated to the studied crops named "Gross" C, C returned through respiration and "net" C associated with the manure fertilization variant.

The analysis of these data highlights the following:

- the total amount of carbon captured and fixed at the level of the 3 representative crops included in the study is 134 t, of which 57 t (43%) is found in the aboveground biomass, respectively 77 t (57%) at the level of the underground biomass. The average for each cultivated ha is 6352 kg C/ha, of which 2366 kg/ha found within the aboveground biomass and 3986 kg/ha at the level of the underground biomass. The total value, expressed in CO₂ eq is 23185 t, with an average per ha of 2878 kg at the aboveground level and 4850 kg/ha at the underground level.

Table 1 Fertilization with manure (30 t/ha)

Of the foraging system		Gros C fixed through photosynthesis		Gros C –CO ₂ eq		C returned through respiration		"Net" C fixed by photosynthesis		"Net" C–CO ₂ eq	
		Kg/ha	Total (t)	Kg/ha	Total (t)	Kg/ha	Total (t)	Kg/ha	Total (t)	Kg/ha	Total(t)
Barley grain (10 ha)	Supraterran biomass	3020	30	11023	110	453	5	2567	26	9369	94
	Underground biomass	2310	23	8431	84	346	3	1963	20	7167	72
	Total	5330	53	19455	194	799	8	4530	46	16536	166
Silage corn (10 ha)	Supraterran biomass	1368	14	4993	50	205	2	1163	12	4245	42
	Underground biomass	1098	11	4008	40	165	2	933	9	3405	34
	Total	2466	25	9001	90	370	4	2096	21	7650	76
Alfalfa (5 ha)	Supraterran biomass	2709	13	9888	49	406	2	2303	11	8406	42
	Underground biomass	8551	43	31211	156	1282	7	7269	36	26532	133
	Total	11260	56	41099	205	1688	9	9572	47	34938	175
Total 25 ha	Supraterran biomass	2366	57	8635	209	355	9	2011	49	7340	178
	Underground biomass	3986	77	14550	280	598	12	3388	65	12368	239
	Total	6352	134	23185	489	952	21	5399	114	19708	417

- following the respiration processes in plants and soil, the total amount of carbon returned to the atmosphere is 21 t, of which 12 t comes from underground biomass (57%) and 9 t (43%) from aboveground biomass. The calculation per hectare highlights a total loss of carbon, through respiration, of 952 kg/ha, of which 598 kg/ha from underground biomass and 355 kg/ha from aboveground biomass.

- after calculating the difference between the total amount of raw carbon and the total amount of carbon returned through respiration, the total amount of carbon fixed through photosynthesis was obtained. In this regard, the data obtained highlight a total net amount of carbon of 114 t (417 t CO₂ eq), of which, in the underground biomass we find the average amount of 65 t (239 t CO₂ eq, 57%) and in the aboveground biomass we find the amount of 49 t (178 t CO₂ eq, 43%). The average amount of net carbon fixed per hectare is 5399 kg (19708 kg/ha CO₂ eq) of which 3388 kg/ha (12368 kg/ha CO₂ eq) in the underground biomass and 2011 kg/ha (7340 kg/ha CO₂ eq) in the aboveground biomass.

Determining the average degree of humification of organic matter in the soil in the variant of fertilization with manure

In order to determine the amount of humus in relation to the amount of organic matter accumulated in the soil, the average degree of humification of organic matter was taken into account, (0.42).

Table 2. Determination of the amount of humus, depending on the amount of net carbon sequestered in the soil and the average degree of humification of organic matter

Crops structure		C/N	V1= stubble, roots						V2= straw, stems, stubble, roots					
			Amount of net carbon sequestered in soil			Humus			Amount of net carbon sequestered in soil			Humus		
			Kg/ha	%	Total	Kg/ha	%	Total	Kg/ha	%	Total	Kg/ha	%	Total
Barley grains	10	44,3	1715	27	17	720	17,5	7,2	2505	23,5	25	1052	23,6	10,5
Silage corn	10	29,1	945	15	9,5	397	9,7	3,9	945	8,9	9,5	397	8,9	4
Alfalfa	5	16,2	7172	58	36	3012	72,8	15	7172	67,6	36	3012	67,5	30
Total	25	-	3277	100	62,5	1376	100	26,1	3540	100	70,5	1487	100	44,5

* average degree of humification of organic matter: 42% of sequestered carbon (with variations between 0.34-0.48 t humus/t of net carbon sequestered in the soil)

The amount of humus was calculated in 2 variants proposed for calculation, depending on the structure of plant residues and roots of the studied plant species, which are part of the composition of soil organic matter, as follows:

V1=stubble, roots

V2= straw, stems, stubble, roots

In the case of variant V1, which includes only stubble and plant roots, the average amount of humus was 1376 kg/ha, with limits ranging between 397 kg/ha (corn crop) and 3012 kg/ha (alfalfa crop). At the level of the 3 representative crops, with this fertilization variant, a total amount of humus of 26.1 t was estimated, with an average per hectare of 1376 kg.

In the case of variant V2, where more organic field products were included (straw, stems, stubble, roots), the amounts of humus have higher values. Thus, depending on the amount of net carbon sequestered in the soil, the limits of variation of the amount of humus are between 397-3012 kg/ha, with an average of 1487 kg/ha (8% more than variant V1). At the level of the 3 representative crops, in this fertilization variant, a total amount of humus of 44.5 t was estimated, with an average per hectare of 1487 kg.

Determining the number of carbon credits and the value of carbon certificates

The calculation of the amount of net carbon sequestered in the soil also allowed the determination of the number of credits and their value in the case of manure fertilization, the data being presented in table 3.

Table 3. Number of credits and their value related to the crop structure of the forage system, depending on the amount of net carbon sequestered in the soil

Crops structure		Amount of net carbon sequestered in soil		Carbon credits *)			Value of the carbon credits **)	
Crops	S (ha)	Kg/ha	Total (t)	No of. credits/ha	Total credits		Euro/ha	Total euro/surface
					Nr	%		
Barley grains	10	2505	25	2,5	25	36	170	1,7
Silage corn	10	946	9,5	1	10	14	68	0,7
Alfalfa	5	7169	7,2	7	35	50	475	2,4
Total	25	-	41,7	-	70	100	-	4,8

*) Carbon credit -unit of measurement equivalent to 1 t of CO₂, respectively 1 t of CO₂ sequestered = 1 carbon credit

**) Carbon credits are tradable rights representing one tonne of unemitted or sequestered C-CO₂ eq. The EU carbon market traded an average of €67.94/carbon credit in September 2024.

The data presented in the table shows that, depending on the amount of net carbon sequestered in the soil, a total number of 70 credits was obtained, with a variation between 10-35 credits/crop. The average per hectare proved to be between 1-7 credits. The highest number of credits, 7 credits/cultivated area, was associated with the alfalfa crop, which also recorded the highest amount of net carbon sequestered (7.2 t). The total value of the credits, at the average price of 67.94 euros/credit, was 4800 euros.

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Architecture

PARKS AND GARDENS AS A DESIGN ELEMENT OF THE MODERN URBAN ENVIRONMENT

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Abstract

The formation of landscape components, gardens and parks plays an important role in creating a favorable urban environment. Gardens and parks perform important functions in the urban landscape related to air ionization, dust deposition, noise absorption, microclimate formation, sanitation, hygiene, aesthetics and recreation. From the moment of their creation and to this day, gardens and parks are considered a complex work of art, including elements of the most diverse types, due to their nature and quality. The use of living plants and various forms of landscape cover (water and stone), as well as various works of art (sculpture, architecture and fine art) and other similar elements, as well as ensuring harmony and balance between these elements requires special knowledge, skill and pleasure. In the face of rapid urbanization, the integration of green spaces such as parks and gardens has become a vital design element in shaping the modern urban environment. These green spaces serve not only as aesthetic enhancements but also play a critical role in improving environmental quality, public health, and social well-being. This article explores the multifaceted functions and benefits of parks and gardens within urban settings, emphasizing their contribution to ecological sustainability, urban planning, and community development.

Modern cities are increasingly recognizing the need to balance built infrastructure with natural elements. Parks and gardens contribute to this balance by mitigating urban heat island effects, enhancing biodiversity, and improving air and water quality. From a social perspective, these spaces act as communal areas that encourage physical activity, recreation, and social interaction among diverse demographic groups. The presence of well-designed green areas has also been linked to reduced stress levels, improved mental health, and a higher quality of life for urban residents.

This study also examines the evolving design principles guiding the creation of urban parks and gardens. Contemporary urban design now integrates landscape architecture with sustainability concepts, using native plant species, green roofs, water-sensitive urban design (WSUD), and multifunctional landscapes that accommodate both ecological processes and human activity. Moreover, inclusive design is emphasized to ensure accessibility and usability for people of all ages and abilities.

In conclusion, parks and gardens are not merely decorative elements but essential components of urban resilience, livability, and sustainability. As urban populations continue to grow, city planners, architects, and policymakers must prioritize the development of accessible, functional, and ecologically sensitive green spaces. Their integration into urban design is not only a reflection of aesthetic values but a fundamental strategy to ensure the health and vitality of future urban environments.

Keywords: *landscape, gardens, parks, sculpture, architecture, fine art*

Introduction.

The formation of landscape components, gardens and parks plays an important role in creating a favorable urban environment. Gardens and parks perform important functions in the urban landscape related to air ionization, dust deposition, noise absorption, microclimate formation, sanitary and hygienic, aesthetics and recreation.

Using trees and shrubs, we can improve the ventilation of the entire urban area or its individual parts, protect urban buildings from unfavorable winds, regulate air speed, and change the direction of air flow.

Since its inception, gardens and parks have been considered a complex work of art, which includes elements of various natures due to their nature and quality. The use of living plants and various forms of the landscape (water and stone), as well as various works of art (sculpture, architecture and fine arts), and other such elements, and the provision of harmony and harmony between these elements requires special knowledge, skills and taste. In order for gardens or parks to provide people with comfortable access, relaxation, and time in the bosom of nature, and at the same time to get fresh air, it is important that they form a single harmonious unity in terms of art and combine with humans in a system of interaction and connection.

Principles of garden and park compositions.

A garden is a volumetric spatial composition. A garden space is distinguished by three types of composition: frontal, volumetric and perspective. Frontal composition is on the same plane. A volumetric composition has clearly visible forms in all three dimensions (x, y, z). Perspective spatial composition is expressed by the arrangement of natural forms in deep perspectives, since their perception is determined by the laws of linear and spatial perspective.

Gardens are public spaces accessible to all categories of the population. They include multifunctional and specialized parks, squares, boulevards, forest parks, water parks, meadow parks, short-term recreation areas near water, and green areas of public centers.

Parks are green areas of more than 5 hectares designed for various purposes - recreational activities and ecological functions. The park is dominated by plantations and includes elements of recreational infrastructure - educational, entertainment, sports, food, children's entertainment areas and water bodies - to serve vacationers (1).

Design and construction experience shows that the basis of the park's composition is the skillful use of the spatial characteristics of the terrain, relief, water table, and plants. In this regard, in design, it is necessary to deeply study the natural conditions, the appearance of the place, and to know the decorative and biological properties of plants.

The following can be attributed to the general principles of garden and park compositions (2):

- Unity - there must be unity in each element and as a whole;
- Hierarchy - elements must follow a construction hierarchy;
- Completeness - there should be no additional or missing elements;
- Interconnection - all elements must be interconnected.
- Rhythm - repetition of individual elements or the distances between them;
- Contrast can be in form, color, size, and spatial type.
- Nuance - there must be a subtle transition or a barely perceptible difference;
- Symmetry - characterized by adherence to order and rigor;
- Asymmetry - the pond, groups of trees, flower beds and lighting are shifted to one side;
- Module- space can be divided into equal-sized squares or rectangles;
- Dominant- the center of the composition, it can be a solitaire in the landscape - a tree, bush or flower bed;
- and so on.

Parks are mainly divided into several types according to their functions (3):

Ethnographic park It is designed to demonstrate unique examples of living, household and other structures of the past in a natural landscape setting. The park organizes thematic exhibitions and conducts scientific research on the history of architectural creativity. The ethnographic park also serves as a recreation area for the population.

Memorial park They are organized in areas of historical-revolutionary or historical-cultural significance in connection with an important historical event or in connection with the name of an outstanding scientific, cultural and political figure. Visitors are received here on an excursion basis, as the main goal is to ensure the protection of memorial structures and their sites.

Children's parks A green area with favorable sanitary and hygienic conditions, intended for children's games, physical education, and cultural and educational activities with school-age children during their free time outside of school. Children's parks can be created in separate areas of adult parks or in specially designated areas. The main core of the park should be an entertainment zone and attractions.

City gardens. A garden is a greened area (from 2 to 10 hectares) in a construction zone, equipped with landscape, sports and park facilities, intended for recreation and transit movement of the population. Gardens complement the park network in a complex of residential districts and microdistricts. They are created mainly in those districts where there are not enough areas for building a park.

Historical parks. Monuments of garden and park art. The main purpose of the activities of such parks is to acquaint visitors with historical monuments of landscape architecture. Visiting the historical park is organized in an excursion mode. Its main task is to ensure the preservation of small architectural forms and their planning and restoration of their historical features.

The composition of each garden and park is unique, it is impossible to repeat or create something completely similar.

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Arts

PAINTING TECHNIQUE USED IN THE WORK OF "QADILI VILLAGE" OF QUBADLI REGION

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ТЕХНИКА ЖИВОПИСИ, ИСПОЛЬЗУЕМАЯ В РАБОТЕ "СЕЛА ГАДИЛИ" ГУБАДЛИНСКОГО РАЙОНА

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Abstract

The article is about a painting dedicated to the village of Gadili in the Gubadli region. It also discusses the techniques used by the artist in this painting.

Gubadli (also spelled Qubadli) is a region (rayon) located in the southwestern part of Azerbaijan, bordering Armenia to the west and the Azerbaijani regions of Lachin, Zangilan, and Jabrayil. It lies in the foothills of the Lesser Caucasus Mountains and includes a mix of mountainous and hilly terrain.

Historical and Political Context:

- In **1993**, during the First Nagorno-Karabakh War, Armenian forces took control of Gubadli, leading to the displacement of the Azerbaijani population.
- It was under Armenian occupation for about 27 years and was considered part of the self-proclaimed Republic of Artsakh (Nagorno-Karabakh Republic), though not internationally recognized.
- During the **2020 Second Nagorno-Karabakh War**, Azerbaijani forces regained control of the Gubadli district in late October 2020.
- Since then, efforts have been underway to rebuild infrastructure and resettle displaced populations.

Аннотация

В статье говорится о картине, посвященной селу Гадили Губадлинского района. В статье также обсуждаются приемы, использованные художником в этой картине.

Губадлинский район — административный район в юго-западной части Азербайджана. Граничит с Арменией на западе, а также с Лачинским, Зангеланским и Джебраильским районами. Район расположен у подножия Малого Кавказа, рельеф в основном горный и холмистый.

Исторический и политический контекст:

- В **1993 году**, во время Первой Карабахской войны, район был оккупирован армянскими силами, и азербайджанское население было вынуждено покинуть свои дома.
- В течение примерно **27 лет** район находился под армянской оккупацией и считался частью непризнанной «Нагорно-Карабахской Республики».
- В ходе **второй Карабахской войны в 2020 году**, азербайджанская армия освободила Губадлу в конце октября.

В настоящее время в районе ведутся восстановительные работы, планируется воз-

вращение вынужденных переселенцев.

Xülasə

Məqalə Qubadlı rayonunun Qədili kəndinə həsr edilərək çəkilmiş rəsm əsərinə aiddir. Eləcə də bu rəsm əsərində rəssamın istifadə etdiyi texnikalardan bəhs edilir.

Gubadlı rayonu — Azərbaycanın cənub-qərbində yerləşən inzibati rayondur. Qərbdə Ermənistanla, digər tərəflərdə isə Laçın, Zəngilan və Cəbrayıl rayonları ilə həmsərhəddir. Rayon ərazisi əsasən dağlıq və meşəlikdir, Kiçik Qafqaz dağlarının ətəklərində yerləşir.

Tarixi və Siyasi Kontekst:

- **1993-cü ildə**, Birinci Qarabağ müharibəsi zamanı Gubadlı rayonu Ermənistan silahlı qüvvələri tərəfindən işğal edildi və yerli azərbaycanlı əhali məcburi köçkünə çevrildi.

- Rayon təxminən **27 il** ərzində erməni işğalı altında qaldı və tanınmamış "Dağlıq Qarabağ Respublikası"nın tərkibinə daxil edildi.

- **2020-ci ildə**, İkinci Qarabağ müharibəsi zamanı Azərbaycan Ordusu Gubadlını oktyabr ayının sonlarında azad etdi.

- Hal-hazırda rayonda bərpa və yenidənqurma işləri aparılır, məcburi köçkünlərin geri qayıdışı planlaşdırılır.

Keywords: Gubadli, Qədili, painting work, master technique

Ключевые слова: Губадли, Гедили, живопись, техника живописи

Açar sözlər: Gubadlı, Qədili, rəsm əsəri, rəsm texnikası

Əsas hissə. Rəssamlıq sadəcə rənglərin kağıza və ya kətana düşməsi deyil, ruhun dillə ifadə edə bilmədiyi hisslərin sənətə çevrilməsidir. Hər bir fırça toxunuşu rəssamın daxili dünyasının bir aynası, hər rəng seçimi isə onun hisslərinin ahəngidir. Rəssamlıq duyğuların adıdır. İnsanın içindəki hissləri, düşüncələri və fikirləri rənglər və formalar vasitəsilə ifadə etmək üsuludur. Bəzən bir rəsm, sözlərlə ifadə olunması çətin olan duyğuları çatdırmaqla bilər. Hər bir rəsmi gözəlləşdirən fırçalar vardır. Fırçalarında özünün ayrı ayrılıqda özünə məxsusluğu vardır. Yumuşaq fırçalar incə keçidlər və bulanıq effektlər yaratmaq üçün idealdır. Sərt fırçalar isə aydın xətlər və struktur əlavə etmək üçün uyğundur. Hər bir fırça sanki bir sənətkarın sirdəşidir. Duyğularını, düşüncələrinin və xəyallarını həyata keçirmək üçündür. Rəssamlıqda müxtəlif rəsm növləri vardır, təkcə tablo boyamaq deyil, portret, peyzaj, natürlər, abstrakt sənət, mural (divar rəsmi), akvarel, qrafika, hətta rəqəmsal rəsm (digital art) kimi çox fərqli sahələri əhatə edir. Rəssamlar böyük əsərləri gizli mesajlarla doldururlar. Bir sözlə bir toxunuşla əfsanələr yaradırlar. Boyaların harmoniyası belə gözəllik yaradır. Hər bir rəngin fırçalar kimi özünə məxsus gözəlliyi vardır, sadəcə bu gözəlliyi biz rəssamlar çox gözəl görə bilirik. Mən rəssam Orucova çəkdiyim Qubadlı rayonu Qədili kəndi peyzajında öz əksini tapmışdır. Bu mənzərənin gözəlliyini kətan üzərində fırçalarla gözəlləşdirmişəm. Bir çox insanlar tərəfindən çox maraqla qarşılanmışdır. Məhv edilmiş bir yeri, təsəvvürümdə olmadan yenidən qurmaq rəsmini peşakarcasına işləmək çox maraqlı idi. Yetər ki, bir gözəlliyi qurmaq üçün işinin peşəkarı olasan. Rəssamlıq sadəcə huzur, xoşbəxtlik verən sənətdir. Bir peşakar rəssam olaraq sənətimdən zövq alıram. Onunla yaşayıram. Çünki hər zaman arzuladığım həyatı rəsmlərdə əks etmişəm. Sadəcə sənətimin vurgunuyam. Artıq yüzlərlə tələbələrə gözəl rəsmlərlə sərgilərdə iştirak edirlər. Onların içində fiziki qüsurlu (əngəlli) uşaqlarda var.

Hal hazırda çəkdiyi rəsmlər sərgilərdə canlandırırlar.

Mənbələr-Recources-Источники

1. **Caliber.Az – Gubadlı'nın azad olunması: 23 illik işğaldan sonra azadlıq**

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Chemical sciences

THE ESSENTIAL ROLE OF SURFACTANTS IN ENHANCING WATER PURIFICATION PROCESSES: MECHANISMS, APPLICATIONS, AND CHALLENGES

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Abstract

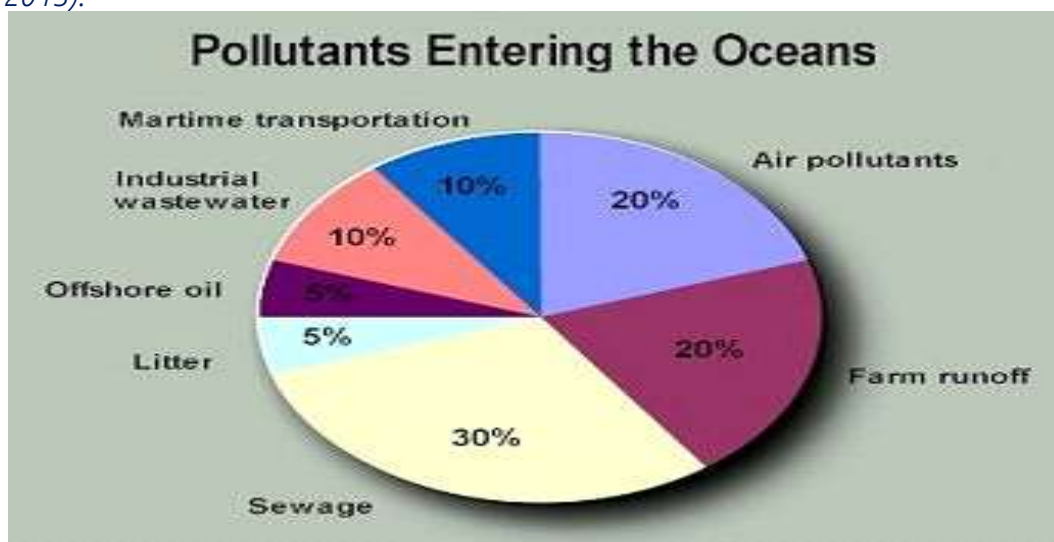
With their particular physicochemical properties, surfactants significantly increase the efficiency of contaminant removal and, thus, advance the processes of water purification. This abstract analyzes the role of surfactants in solubilizing, dispersing, and separating pollutants, which may include organics, heavy metals, and oil, using various water treatment techniques, such as micellar-enhanced ultrafiltration, flotation, and adsorption. Their ability to solubilize a hydrophobic tail enables them to form micelles where hydrophobic contaminants become trapped. Thus, cleaning aqueous systems. The more important examples are: treating wastewater, remediating groundwater, and treating industrial effluents. In these processes, surfactants improve the effectiveness of filtration and separation processes. Nevertheless, surfactant toxicity, environmental persistence, and cost-effectiveness make these reagents difficult to use on a large scale. This research underscores the need for biodegradable, environmentally friendly surfactants, optimized for low impact while maintaining efficacy, guiding sustainable water purification technologies designed for the future.

Keywords: Surfactants, water purification, contaminant removal, micellar-enhanced ultra-

filtration, adsorption, flotation, amphiphilic properties, micelles, wastewater treatment, groundwater remediation, industrial effluent, eco-friendly surfactants, biodegradability, toxicity, cost-effectiveness.

Introduction:

Surfactants are chemical compounds that play an important role in the water purification process. These substances reduce the surface tension of water, facilitate the decomposition of impurities, oils and other organic substances and the process of separation from water (U.S. Environmental Protection Agency [EPA], 2021). These substances are widely used in the water purification process both in households and in industry. They remove dirty substances from the water with their emulsifier, dispersant and foam-forming functions (Pal et al., 2020). The most commonly used surfactants are anionic, cationic, non-ionic, and amphoteric. Anion-type substances, such as sulfate-based substances, have a strong cleansing property. Cation types have a disinfecting effect and lead to the elimination of bacteria and microorganisms. Non-ionic substances, on the other hand, have a softer cleaning function, and surface active substances cause less damage to the environment, cover the oily impurities in the water through micelle structures and ensure their separation from the water (Rosen & Kunjappu, 2012). As a result of this process, the water becomes more transparent and clean. The field of use of surfactants includes sewage treatment, industrial waste processing and primary treatment of drinking water. Proper adjustment of the amount of surfactants is important, as excessive use can harm the environment. Because some surfactants are biodegradable, they are considered more environmentally safe. For this reason, in recent years, preference has been given to products containing surfactants of natural origin (Tadros, 2013).

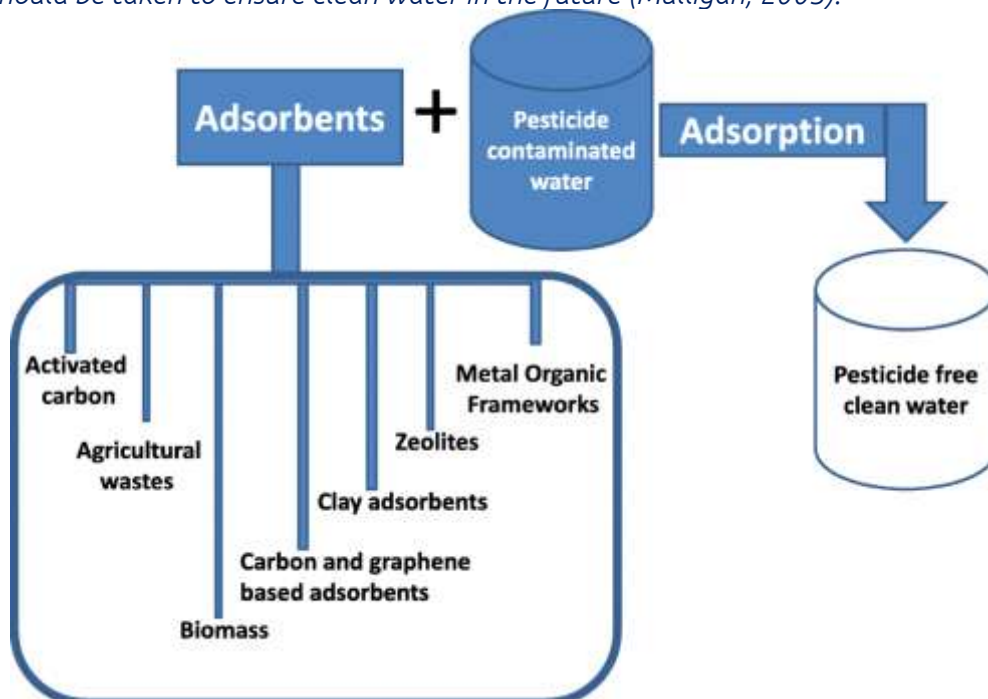


Water pollution is one of the serious environmental problems around the world today. Industrial waste, agricultural fertilizers and household waste pollute the water, and these impurities disrupt the water content and harm living organisms (World Health Organization [WHO], 2019). The decrease in clean water resources has a negative impact on people's health and living. Millions of people around the world live in areas where there is no access to clean drinking water. Clean water scarcity is mainly associated with drought, population growth, and inefficient management (UNICEF & WHO, 2021). Dirty water causes the spread of some diseases, including cholera, hepatitis A and dysentery. In developing countries, this problem is even more serious. Water pollution damages ecosystems and poses a threat to fish and other aquatic life. Oxygen levels in water bodies decrease, which can lead to the death of living organisms (EPA, 2021). The effects of environmental damage are long-lasting. Clean water is of particular importance both as food and in agriculture and industry. To solve this problem, water reuse and filtration systems must be developed. People should use water correctly and sparingly, states should take legislative measures to protect water resources, etc. International cooperation is also an important factor in this field. The number of educational measures on the importance of clean water should be increased and water wastage should be prevented in schools and public places. More effective water purification methods should be used with the help of technology. The role of the population is also important because it is impossible to eliminate this problem without the participation of the population (UNESCO, 2023).

Water Purification Methods and the Role of SAMs

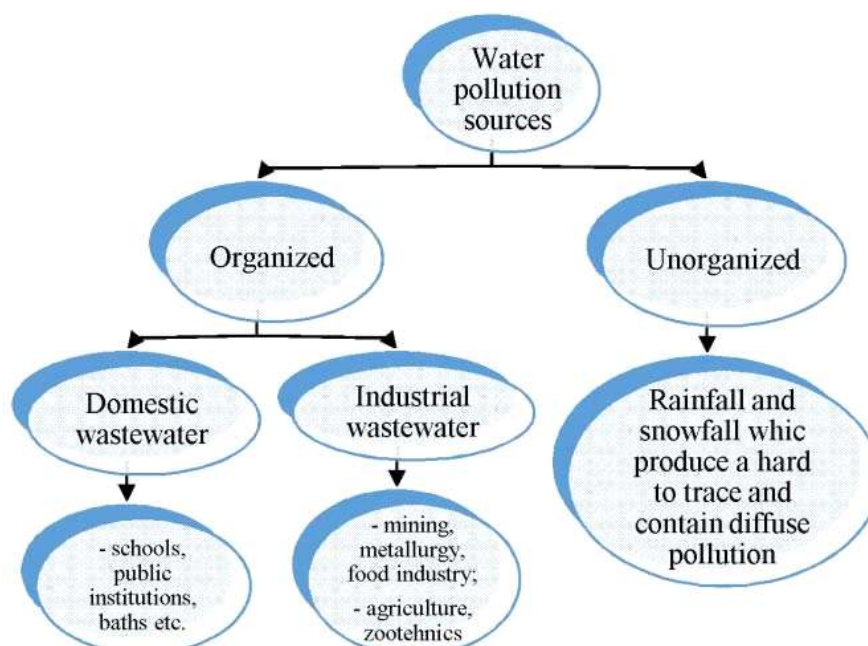
The main purpose of this study is to investigate the role of surfactants in water purification processes. Surfactants facilitate the release of pollutants by reducing the surface tension of the water, making them effective cleaning agents. The efficacy of anionic, cationic, and non-ionic SAMs against different types of pollutants is different. This determines their choice and application areas. The ability of surfactants to form micelles leads to the dissolution and separation of hydrophobic pollutants. The study examines the effectiveness and potential of surfactants in the water purification process. This study also involves assessing the environmental impacts of using Surfactants in water treatment technologies. The biodegradability and ecotoxicity of surfactants indicate their potential effects on the environment. The effect of surfactants on membrane filtration processes is directly related to the effects on membrane pollution and performance. Their role in membrane filtration processes refers to factors such as adsorption, polymerization, and pore obstruction. The results of the study can stimulate the development of new approaches in the water purification process. The use of surfactants in the water purification process is important for improving water quality and also protecting the environment.

As the global population continues to grow, so does the need for clean drinking water. However, it is becoming increasingly difficult to meet this demand. Research shows that about 26% of the world's population lacks access to safe drinking water. Since only 3% of the world's water is fresh water, maintaining and maintaining this limited resource is extremely important. Immediate and sustainable measures should be taken to ensure clean water in the future (Mulligan, 2005).



One of the main threats to these efforts is water pollution. Water pollution occurs as a result of harmful substances falling into rivers, lakes, seas, underground water bodies and other water sources (usually chemicals or microorganisms) disrupting water quality and making it harmful to humans and the environment. Water pollution is mainly divided into three categories: physical, chemical and biological pollution. Physical pollution is characterized by suspended particles, waste and other substances that change the transparency and quality of water. Chemical pollution occurs as a result of harmful substances such as heavy metals, pesticides, fertilizers and industrial waste falling into water sources. Biological pollution is related to the presence of pathogenic microorganisms such as bacteria, viruses and protozoa and poses serious risks to human health.

The main sources of these pollutants are industrial waste, agricultural runoff and domestic wastewater. These substances threaten the safety of drinking water, damage aquatic ecosystems and disturb the balance of nature. Therefore, effective water purification methods are important. In this context, surfactants (SAMs) play an important role in purifying water from pollutants. Their amphiphilic structure – interacts with both hydrophilic (water-loving) and hydrophobic (water-pushing) substances making – SAMs an effective tool in water purification technologies (Banat et al., 2010).



Adsorption – is an effective cleaning method in which contaminants attach to the surface of a solid adsorbent. SAMs, such as self-aligning monogates (SAMS) or amphiphilic molecules, make this process even more effective by increasing the surface area of the adsorbent and enhancing pollutant-adsorbent interactions. Their double – hydrophilic and hydrophobic – properties facilitate the capture of substances such as dyes, heavy metals, and organic pollutants. When used in combination with active carbon or bioadsorbents, SAMs greatly increase the removal efficiency of pollutants (Mulligan (2005)).

In coagulation and flocculation processes, SAMs act as effective flocculants, destabilizing colloidal particles and facilitating their fusion. SAMs help form large and sediment-prone flocks by reducing the repulsive forces between particles, which increases water clarity and purification efficiency during the deposition and filtration of solids and microorganisms (Pacwa-Płociniczak et al., 2011).

In membrane technologies, such as ultrafiltration and nanofiltration, SAMs enhance the overall performance of the system by preventing membrane blockage (fouling). They prevent contamination by changing the properties of the membrane surface or interacting with clogging agents, maintaining filtration efficiency and extending membrane life (Franzetti et al., 2010).

Biofilters and bioreactors:

SAMs, especially biosurfactants, enhance biological water purification by increasing the ability of microorganisms to break down pollutants. In biofilters and bioreactors, biosurfactants facilitate the assimilation of hydrophobic pollutants by microorganisms and accelerate biodegradation. This leads to more effective removal of organic pollutants and improved overall cleaning performance (Sharma et al., 2009)

Heavy metals:

SAMs have the ability to form complexes with heavy metals such as lead (Pb), cadmium (Cd), and chromium (Cr) due to their structure. This complexation increases the solubility and mobility of metals in water, which facilitates their separation from water by filtration, deposition, or float (flotation) methods. This method is particularly useful in industrial wastewater treatment (Sobrinho et al., 2013).

Pesticides and pharmacotoc residues:

The hydrophobic nature of pesticides and many medicinal residues causes them to remain in the environment for a long time. SAMs collect these molecules in micelles, making them easier to dissolve in water and remove during purification. In particular, biosurfactants reduce their environmental impact by mobilizing and breaking down such organic pollutants (Nguyen et al., 2016).

Real examples:

Numerous scientific studies and industrial applications have proven the effectiveness of surfactants (SAMs) in water purification. For example, studies show that nonionic surfactants such as SDS (sodium dodecyl sulfate) and Triton X-100 play a crucial role in removing pharmaceutical residues in wastewater. At the same time, cationic SAMs such as CTAB (cetyltrimethylammonium bromide) are effective in binding with negatively charged contaminants. In addition, cationic surfactants, especially quaternary ammonium compounds (QACs), play an important role in the effective elimination of microbial pollutants. These substances destroy pathogens and facilitate the dissolution of organic

pollutants to improve water quality (Das & Kumar, 2016; Zhang et al., 2015). However, their long-term effects and toxicity in the environment, especially the risks that can lead to antimicrobial resistance, should be carefully managed (Anjum et al., 2019).

Factors affecting cleaning processes:

A number of environmental and operational factors affect the effectiveness of surfactants in cleaning processes. These factors have the potential to increase or weaken the ability of SAMs to remove pollutants (Desai & Banat, 1997).

SAM Concentration (CMC – Critical Micelle Concentration):

CMC is the minimum concentration at which surfactants begin to form a micelle (ball). Below the CMC, SAMs exist as individual molecules and have limited efficacy. When it reaches the CMC, micelles are formed, and at this time hydrophobic pollutants are caught, and the cleaning efficiency increases. Therefore, keeping the SAM concentration close to or slightly higher than the CMC gives an optimal result (Ron & Rosenberg, 2001).

pH, Temperature and Ion Power:

The pH value of the environment changes the ionization state of surfactants and pollutants and affects their interaction. For example, in acidic or alkaline conditions, the solubility of contaminants and the charge of SAMs can vary. Temperature, on the other hand, affects the ability of micelle formation and SAMs to dissolve pollutants – as the temperature increases, this ability can increase, but sometimes the stability of micelles can be disturbed. Also, salts in the medium (ionic strength) can alter the aggregation (combination) behavior of SAMs, increasing or decreasing their purification capacity.

Comparison of SAMs:

The efficiency of each SAM differs according to their structure. For example:

Triton X-100 (nonionic) – hydrophobic is widely used in the extraction of organic matter.

SDS (Sodium Dodecyl Sulfate) (anionic) – is effective in dissolving organic impurities.

CTAB (Cetyltrimethylammonium Bromide) (cationic) – performs well in binding.

Role of Surfactants in Water Treatment Ecological Effects and Alternatives of Surfactants

Chemicals that minimize the stress at the interface of two or more fluids are referred to as surfactants and more formally known as Surface Active Agents (SAMs). These are household cleaning agents, industrial cleaners, water purifiers, and cosmetics. Despite their functionality, synthetic surfactants can be an environmental hazard because they are chemically stable and can be toxic to aquatic organisms.

Biological Fission Capability of Surfactants

The environmental consequences of surfactants depend greatly on their biodegradability. Surfactants that are easily broken down under aerobic conditions, for example linear alkylbenzene sulfonates (LAS), are viewed as less hazardous. More harmful under anaerobic conditions, these substances can persist in the environment where they are likely to bioaccumulate resulting in long-term environmental damage (PubMed, 2005).

Examples of compounds known to undergo such breakdown include alkylphenol ethoxylates (APEO). These Nonylphenol APEO surfactants alter to more toxic nonylphenols that disrupt the hormonal balance of an organism's body. Such substances have a persistent, bioaccumulative and endocrine disrupting effects on the body. Their decomposition products can act as pseudo hormones to aquatic animals and potentially disrupt their reproductive and growth processes as well as impair immune functions. (Wikipedia – Nonyl)

Research demonstrates that even minimal levels of certain surfactants can reduce aquatic ecosystem biocompetitiveness. In particular, surfactants may hinder the functions of microorganisms responsible for water purification processes like nitrification and organic matter decomposition (Wiley Online Library, 2023).

Environmental Risks

Untreated or partially treated wastewater that contains synthetic surfactants can lead to the following environmental risks:

Aquatic Toxicity - Surfactants are able to disrupt the cell membranes of cells of aquatic organisms, which may result in cell death.

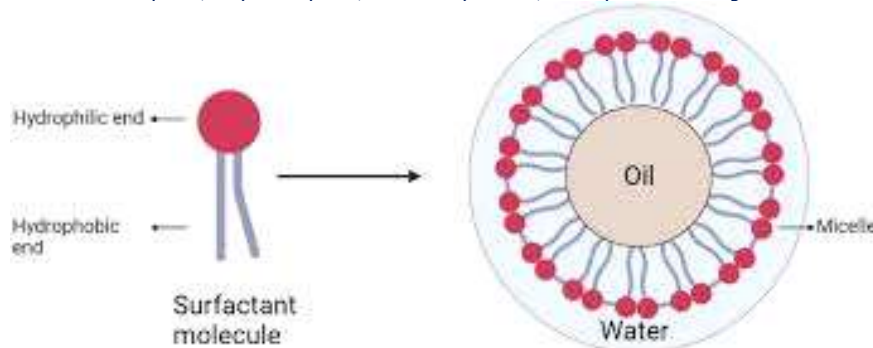
Bioaccumulation - Some persistent surfactants have the potential to bioaccumulate in the tissues of organisms, thus amplifying their effects throughout the food web.

Reduction of Oxygen - Increased concentrations of oxygen demanding bacteria can incur oxygen (hypoxia) deficiency in water bodies and some surfactants also have the ability to cause hypoxia.

Surfactants are also capable of scrambling with other contaminants and enhancing their mobility or toxicity. For instance, they may elevate the toxicity of water insoluble substances like polycyclic aromatic hydrocarbons (PAKs) resulting in increased bio-fluidity and enhanced harmfulness.

Biosurfactants: Alternative that does not harm the Environment

For these problems, scientists are paying more attention to biosurfactants – on surfactants produced naturally by – bacteria, yeasts and fungi. Water treatment is currently being researched with biosurfactants like rhamnolipids, soforolipids, and surfactin, and preliminary results are encouraging.



These compounds offer the following benefits:

- High Biopiercing Capability
- Low Toxicity
- Effective Performance
- Sustainability

According to the data from PubMed (2022), in a wastewater treatment biosurfactants both being physically separated from the mixture as well as bioremediating oil pollution, extracting heavy metals, and accelerating the decomposition of hydrophobic pollutants demonstrate a high efficiency. Therefore, while synthetic surfactants remain the primary commercial face as has been previously stated, their risk on the environment shows the need to change to safe biologically surfactants. Focus on biosurfactants cost reduction during synthesis and **ions** to enable production on a larger scale would be beneficial.

Methodology

This study used a qualitative-based literature analysis methodology to investigate the environmental impact of surfactants and identify safer alternatives. During the research, the following stages were carried out:

1. **Literary Search:** Academic bases such as PubMed, ScienceDirect, SpringerLink and Wiley Online Library have been used. Keywords include “surfactant biopiercing”, “surfactant environmental impact”, “biosurfactants use in water purification”, and “synthetic surfactants ecotoxicity”.

2. **Inclusion Criteria:** Preference was given to studies published between 2005 and 2024 in the field of environmental behavior, toxicology and bioremediation.

3. **Data Collection and Thematic Analysis:** Results from more than 15 articles are grouped into the following topics:

- Biological breakdown and durability of surfactants
- Toxic effects on aquatic ecosystems
- Advantages and applications of biosurfactants
- Restrictions and problems in the production of biosurfactants

4. **Limitations:** This study is not based on laboratory or field experiments carried out by the author, but only on the basis of existing literature analysis.

Conclusion

Based on the results of the research, we conclude that the application of antimicrobial agents can play a leading role in water purification. Microbiological analyses and various purification experiments confirm that the integration of antimicrobial agents with membrane technologies and biofiltration systems plays an indispensable role in the treatment of water.

In particular, such substances create new opportunities for decentralized and low-cost purification systems used in agriculture and in areas with limited resources. These systems are considered economically favorable as they require low energy and cost. As a result of such approaches, not only is access to clean drinking water improved, but they also contribute to environmental safety. Furthermore, although the scalability and economic efficiency of these agents remain subjects of discussion, the

growing demand for sustainable materials and increasing environmental requirements provide a solid foundation for further research and optimization in the future.

Naturally derived antimicrobial agents are sustainable and environmentally safe substances, and their use appears especially promising. These materials are low in toxicity and comply with the principles of green chemistry. Therefore, from both ecological and economic perspectives, antimicrobial agents are expected to play a broader and more advanced role in future water purification strategies.

The findings of our studies clearly demonstrate that antimicrobial agents improve the biological quality of water by killing pathogenic microorganisms or inhibiting their growth. Microbiological analyses, laboratory tests, and pilot-scale purification trials have shown that these agents, when used synergistically with membrane filtration, flocculation, and biofiltration techniques, also play an effective role in removing chemical contaminants.

Moreover, it is essential to develop cost-effective and sustainable bioreactor technologies for their large-scale production, thereby conserving raw materials and ensuring product accessibility. To assess the long-term impacts of antimicrobial agents on aquatic ecosystems, comprehensive multi-parameter monitoring programs must be established in order to evaluate potential bioaccumulation and toxicity risks in advance. At the same time, thorough economic analyses covering production, application, and waste-management costs will help guarantee the financial viability and sustainability of these projects.

Finally, at both national and international levels, the deployment of antimicrobial agents will strengthen multidisciplinary collaboration and technology transfer among the fields of chemistry, microbiology, ecotoxicology, and engineering. It will also underpin the development of robust health and environmental standards and thereby ensure the successful implementation and sustainable advancement of future water-treatment strategies from both ecological and economic perspectives.

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Economic sciences

FEATURES OF IMPLEMENTING AN INCLUSIVE ECONOMY IN GEORGIA

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Abstract

An inclusive economy is focused on increasing the well-being of the population and improving their living conditions. The implementation of an inclusive economy in Georgia has given rise to new emphases and priorities. In order for the implementation of an inclusive economy in Georgia to be successful, it is necessary to continue the rapid growth of the economy and create the prerequisites for its further development.

Inclusive economy is a multifaceted and multi-vector relationship, and it is clear that it is not possible to analyze all its directions in one article. But we will highlight several sectors of the economy whose consistent and rapid progress will significantly accelerate Georgia's sustainable development. These fields are: small and medium-sized businesses and insurance sector.

აბსტრაქტი

ინკლუზიური ეკონომიკა ორიენტირებულია მოსახლეობის კეთილდღეობის ამაღლებასა და ცხოვრების პირობების გაუმჯობესებაზე. საქართველოში ინკლუზიურმა ეკონომიკის იმპლემენტაციამ გააჩინა ახალი აქცენტები და პრიორიტეტები. იმისათვის, რომ ინკლუზიური ეკონომიკის იმპლემენტაცია საქართველოში იყოს წარმატებული, საჭიროა გაგრძელდეს ეკონომიკის სწრაფი ზრდა და შეიქმნას მისი შემდგომი განვითარების წინაპირობები.

ინკლუზიური ეკონომიკა მრავალწახნაგოვანი და მრავალვექტორული ურთიერთობებია და ცხადია ყველა მისი მიმართულების ანალიზი ერთ სტატიაში ვერ მოხერხდება. მაგრამ გამოვყოფთ ეკონომიკის რამოდენიმე სექტორს, რომელთა თანმიმდევრული და სწრაფი წინსვლა მნიშვნელოვნად დააჩქარებს საქართველოს მდგრად განვითარებას. ეს სფეროებია: მცირე და საშუალო ბიზნესი და სადაზღვევო სექტორი.

Keywords: *inclusive economy, small and medium-sized businesses, insurance sector, competitive environment, agricultural insurance.*

საკვანძო სიტყვები: ინკლუზიური ეკონომიკა, მცირე და საშუალო ბიზნესი, სადაზღვევო სექტორი, კონკურენტული გარემო, აგროდაზღვევა.

The capabilities and resources of an inclusive economy are tailored to the needs of citizens, and it has a clearly social vector. An inclusive economy is focused on increasing well-being of population and improving living conditions.

An inclusive economy is purposeful by its inherent nature, as it establishes the principle of justice in the distribution of wealth and enhances the role of the civil sector in public life.

In Georgia, we should consider an inclusive economy as an economic relationship that radically changes the paradigm of justice in the distribution of wealth and aims to use material, financial, and human resources efficiently.

Justice is the foundation of the inclusive economy paradigm in Georgia. Although it is an existential category by its very nature, it is nevertheless shaped as a perception and representation of people in the country, taking into account the tradition of historical, economic, ethnic, and religious coexistence.

The implementation of an inclusive economy in Georgia has given rise to new emphases and priorities. Their implementation requires the mobilization of significant resources in order to create new jobs in the country, overcome poverty, improve the ecological environment, and provide the population with access to quality education, medical services, and social security.

In order for the implementation of an inclusive economy in Georgia to be successful, it is necessary to continue the rapid growth of the economy and create the prerequisites for its further development. However, economic growth alone is not enough to develop inclusiveness; active involvement of the public sector is also necessary. Inclusiveness should encourage high economic activity.

The implementation of an inclusive economy in Georgia also includes addressing environmental issues. These include the rational use of electricity and water resources, recycling of secondary resources and waste, the development of ecologically clean water, solar and wind energy production, etc.

An inclusive economy in Georgia should establish principles of fairness and transparency in the process of distributing public wealth under conditions of fair competition. This is an extremely difficult process, because not only in Georgia, but also in the modern world, the concentration of large volumes of capital in the hands of a small number of owners has made the fair distribution of public wealth problematic.

The famous French economist Thomas Piketty writes in his book "Capital in the Twenty-First Century": "If we look at the overall growth of the US economy in the 30 years before the global crisis, from 1977 to 2007, we notice that the richest 1% of the population received 60% of the total national income surplus." ¹

According to Klaus Schwab, founder and director of the World Economic Forum, "several fundamental principles of modern capitalism need to be reconsidered. First and foremost, this is neoliberal ideology. It is clear that the entrepreneurial spirit and the ability to take risks were the basis of all past successes. However, the current perception of the concept of "capital" itself needs to change. Modern consumers not only want more goods and services at lower prices, but also expect more social responsibility from corporations. The reset must give the right to vote to everyone who is currently in the back row. Some of the pillars of the current system need to be changed, some need to be corrected. This is exactly what is needed for universal progress." ²

The current situation in the labor market remains one of the most pressing challenges for the Georgian economy. The demand and supply of labor in Georgia are quite far apart, which is due to the shortage of professional qualified human capital in Georgia. Low qualifications and a shortage of qualified human resources in sought-after professions do not allow for the introduction of modern technologies in the country. "According to the second quarter of 2023, the unemployment rate in the country was 16.7%." ³ Despite the dynamics of multi-year decline, this indicator still indicates the severity of the problem of unemployment and poverty in the country. An inclusive economy should create new stable jobs, which should be achieved by improving the investment climate and encouraging small and medium-sized businesses.

Inclusive economy is a multifaceted and multi-vector relationship, and it is clear that it is impossible to analyze all its directions in one article. However, we would like to highlight several sectors of the economy, the consistent and rapid progress of which will significantly accelerate the sustainable development of Georgia. These areas are: small and medium-sized businesses and the insurance sector.

Small and medium-sized businesses are a segment of the economy that can quickly adapt to customer needs and has greater ability to respond to challenges. "According to the European Commission, in 2022, small and medium-sized businesses accounted for 42.1% of gross domestic product

¹ Politikano.blog/2018/07/22/Thomas Piketty - Economic Inequality - The Most Important Problem of the 21st Century.

² Schwab K., Zahidi S. (2018) 10 Things You - and Your - Government Should Know about Competitiveness in the Fourth Industrial Revolution, [Online] 16 October.

³ www.geostat.ge.

in France, 46.6% in Germany, 42.1% in Spain, and 62.9% in Italy."⁴ According to the Organization for Economic Cooperation and Development, small and medium-sized businesses play a significant role in China's economy. In 2020, small and medium-sized businesses accounted for 68% of Chinese exports and 50% of tax revenue."⁵

What is the situation in Georgia in this regard? According to Geostat, small and medium-sized businesses accounted for 50.4% of the gross domestic product in 2022, which indicates the importance of this sector of the economy. However, it should be taken into account that 44% of the economic structure of small businesses falls on construction and automobile repair enterprises, which do not carry out innovative activities and the investments made here are not venture in nature.

The establishment of a fair competitive environment and the activities of insurance companies in such a situation are one of the important prerequisites for the proper functioning of the Georgian insurance market. According to the data of the State Insurance Supervision Service, 18 insurance companies operated in the insurance market in 2023. During the same period, the net profit of insurance companies amounted to 73.5 million. GEL, and the insurance premiums collected amounted to 1063.5 million. GEL. Compared to the same period of the previous year, the volume of insurance premiums collected increased by 16.8%. Among the types of insurance, the largest share of premiums collected falls on medical insurance (35.2%).⁶

Although the insurance industry in Georgia is developing dynamically, its share in the country's economy is still small. "According to the data for 2023, if we compare the volume of total insurance premiums to gross domestic product, this figure will be 2.0%," while the same figure in the European Union countries is 7-8%. According to a report by the European Insurance and Reinsurance Federation (Insurance Europe), in 2015, insurance penetration (the ratio of total premiums written to gross domestic product) averaged 7.4% and varied between 0.9% (Latvia) and 11.4% (Finland).⁷

The development of the insurance industry in Georgia, as an effective means of protecting citizens from risks, should accelerate the process of implementing an inclusive economy.

One of the important directions of insurance market development in Georgia is agricultural insurance. The main problem that hinders the development of this segment of the insurance market is, on the one hand, the fear of risks of non-compensation of losses by small farmers, and on the other hand, the lack of financial resources available to farmers. The list of agricultural risks (hail, wind, excessive precipitation, frost) that insurance companies compensate for within the framework of the state agricultural insurance program is small, and farmers also demand insurance for agricultural risks such as drought and unseasonal frosts. The development of insurance relations is also hampered by the problem of non-registration of land ownership in the public registry. Because of this, many farmers remain without insurance services. Disputes regarding the assessment of losses are also common.

ინქლუზიური ეკონომიკის შესაძლებლობები და რესურსები მორგებულია მოქალაქეთა მოთხოვნებზე, მას აქვს მკაფიოდ სოციალური ვექტორი. ინქლუზიური ეკონომიკა ორიენტირებულია მოსახლეობის კეთილდღეობის ამაღლებასა და ცხოვრების პირობების გაუმჯობესებაზე.

ინქლუზიური ეკონომიკა თავისი იმანენტური ბუნებით მიზნობრივია, რადგან იგი დოვლათის განაწილებაში ამკვიდრებს სამართლიანობის პრინციპს და ამაღლებს სამოქალაქო სექტორის როლს საზოგადოებრივ ცხოვრებაში.

საქართველოში ინქლუზიური ეკონომიკა უნდა განვიხილოთ, როგორც ეკონომიკური ურთიერთობა, რომელიც რადიკალურად ცვლის დოვლათის განაწილების სფეროში სამართლიანობის პარადიგმას და რომლის მიზანია მატერიალური, ფინანსური და ადამიანური რესურსების ეფექტიანად გამოყენება.

სამართლიანობა საქართველოში ინქლუზიური ეკონომიკის პარადიგმის ფუნდამენტია. მართალია ის შინაგანი ბუნებით ეგზისტენციალური კატეგორიაა, მაგრამ მაინც ყალიბდება როგორც ადამიანთა აღქმა და წარმოდგენა ქვეყნაში ისტორიული, ეკონომიკური, ეთნიკური და რელიგიური თანაცხოვრების ტრადიციის გათვალისწინებით.

⁴ <https://rg.ru/2024/02/07/eksperty-obiasnili-pochemu-v-rossii-dolia-biznesa-ustupaet-ekonomikam-evropy-i-azii.html>

⁵ <https://rg.ru/2024/02/07/eksperty-obiasnili-pochemu-v-rossii-dolia-biznesa-ustupaet-ekonomikam-evropy-i-azii.html>

⁶ <https://www.insurance.gov.ge/ka/Statistics>.

⁷ EUROPE FOR GEORGIA The insurance market is preparing for fundamental changes. Tbilisi 2017 year. <http://eugeorgia.info/ka/article/607/sadazgvevo-bazari-dzireuli-cvlibebestvis-emzadeba/>.

საქართველოში ინტელუზიურმა ეკონომიკის იმპლემენტაციამ გააჩინა ახალი აქცენტები და პრიორიტეტები. მათ განსახორციელებლად საჭიროა საკმაოდ მნიშვნელოვანი რესურსების მობილიზაცია, რათა ქვეყანაში შეიქმნას ახალი სამუშაო ადგილები, დაიდლოს სიღარიბე, გაუმჯობესდეს ეკოლოგიური გარემო, მოსახლეობას ჰქონდეს შესაძლებლობა მიიღოს ხარისხიანი განათლება, სამედიცინო მომსახურება და სოციალური უზრუნველყოფა.

იმისათვის, რომ ინტელუზიური ეკონომიკის იმპლემენტაცია საქართველოში იყოს წარმატებული, საჭიროა გაგრძელდეს ეკონომიკის სწრაფი ზრდა და შეიქმნას მისი შემდგომი განვითარების წინაპირობები. თუმცა მხოლოდ ეკონომიკური ზრდა ინტელუზიურობის განვითარებისათვის საკმარისი არ არის, ასევე აუცილებელია საზოგადოებრივი სექტორის აქტიური ჩართულობა. ინტელუზიურობამ უნდა წახალისოს მაღალი ეკონომიკური აქტიურობა.

საქართველოში ინტელუზიური ეკონომიკის იმპლემენტაცია ეკოლოგიური საკითხების მოწესრიგებასაც ითვალისწინებს. ეს არის ელექტროენერგიისა და წყლის რესურსების რაციონალური ხარჯვა, მეორადი რესურსებისა და ნარჩენების გადამუშავება, ეკოლოგიურად სუფთა წყლის, მზის და ქარის ენერგიის წარმოების განვითარება და ა.შ.

ინტელუზიურმა ეკონომიკამ საქართველოში სამართლიანი კონკურენციის პირობებში უნდა დაამკვიდროს საზოგადოებრივი დოვლათის განაწილების პროცესში სამართლიანობის პრინციპები და გამჭვირვალობა. ეს უაღრესად რთული პროცესია, რადგან არა მარტო საქართველოში, არამედ თანამედროვე მსოფლიოში მცირე რაოდენობის მესაკუთრეთა ხელში კაპიტალის დიდი მოცულობების კონცენტრაციამ საზოგადოებრივი დოვლათის სამართლიანი განაწილება პრობლემური გახდა.

ცნობილი ფრანგი ეკონომისტი თომას პიკეტი თავის წიგნში „კაპიტალი XXI საუკუნეში“ წერს: „თუ გადავხედავთ აშშ - ს ეკონომიკის საერთო ზრდას მსოფლიო კრიზისამდე 30 წლის განმავლობაში, 1977 - 2007 წლების პერიოდში, მაშინ შევამჩნევთ, რომ ყველაზე მდიდარი მოსახლეობის 1% -ზე მოდის მთლიანი ეროვნული შემოსავლების ნამეტის 60%.“⁸

მსოფლიო ეკონომიკური ფორუმის დამაარსებლის და დირექტორის კლაუს შვაბის აზრით „თანამედროვე კაპიტალიზმის რამდენიმე ფუძემდებლური პრინციპი გადახედვას საჭიროებს. პირველ რიგში ეს არის ნეოლიბერალური იდეოლოგია. ცალსახაა, რომ წარსულში მიღწეული ყველა წარმატების საწინდარი სამეწარმეო სული და რისკზე წასვლის უნარი იყო. თუმცა თავად ცნება „კაპიტალის“ დღეს არსებული აღქმა უნდა შეიცვალოს. თანამედროვე მომხმარებლებს არა მხოლოდ მეტი საქონლის და მომსახურების ნაკლებ ფასში მიღება სურთ, არამედ ელიან კორპორაციების მხრიდან მეტ სოციალურ პასუხისმგებლობას. გადატვირთვამ ხმის უფლება ყველას უნდა მისცეს ვინც დღეს უკანა რიგებშია. დღეს არსებული სისტემის საყრდენების ნაწილი უნდა შეიცვალოს, ნაწილი შესწორდეს. სწორედ ეს არის საჭირო საყოველთაო პროგრესისთვის.“⁹

შრომის ბაზარზე არსებული მდგომარეობა რჩება საქართველოს ეკონომიკის ერთ - ერთ ყველაზე აქტუალურ გამოწვევად. სამუშაო ძალაზე საქართველოში მოთხოვნილება და მიწოდება ერთმანეთისგან საკმაოდ დაშორებულია, რაც საქართველოში პროფესიული კვალიფიციური ადამიანური კაპიტალის დეფიციტით არის განპირობებული. დაბალი კვალიფიკაცია და მოთხოვნად პროფესიებზე კვალიფიციური ადამიანური რესურსების დეფიციტი არ იძლევა შესაძლებლობას, დაინერგოს ქვეყანაში თანამედროვე ტექნოლოგიები. ქვეყანაში „2023 წლის მეორე კვარტლის მონაცემებით უმუშევრობის დონემ შეადგინა 16,7%.“¹⁰ მიუხედავად მრავალწლიანი შემცირების დინამიკისა, ეს ინდიკატორი კვლავ მიგვანიშნებს ქვეყანაში უმუშევრობის და სიღარიბის პრობლემის სიმწვავეზე. ინტელუზიურმა ეკონომიკამ უნდა შექმნას ახალი სტაბილური სამუშაო ადგილები, რაც უნდა მოხერხდეს საინვესტიციო კლიმატის გაუმჯობესების და მცირე და საშუალო ბიზნესის წახალისების გზით.

ინტელუზიური ეკონომიკა მრავალწახნაგოვანი და მრავალვექტორული ურთიერთობებია და ცხადია ყველა მისი მიმართულების ანაღზი ერთ სტატიაში ვერ მოხერხდება. მაგრამ

⁸ Politikano.blog/2018/07/22/ტომას პიკეტი - ეკონომიკური უთანასწორობა - XXI საუკუნის უმთავრესი პრობლემა.

⁹ Schwab K., Zahidi S. (2018) 10 Things You - and Your - Government Should Know about Competitiveness in the Fourth Industrial Revolution, [Online] 16 October.

¹⁰ www.geostat.ge.

გამოყოფილით ეკონომიკის რამოდენიმე სექტორს, რომელთა თანმიმდევრული და სწრაფი წინსვლა მნიშვნელოვნად დააჩქარებს საქართველოს მდგრად განვითარებას. ეს სფეროებია: მცირე და საშუალო ბიზნესი და სადაზღვევო სექტორი.

მცირე და საშუალო ბიზნესი არის ეკონომიკის ის სეგმენტი, რომელიც სწრაფად გადაეწყობა მომხმარებლების მოთხოვნილებებზე და აქვს გამოწვევებზე რეაგირების მეტი შესაძლებლობები. „ევროკომისიის მონაცემებით 2022 წელს მცირე და საშუალო ბიზნესმა მთლიან შიდა პროდუქტთან მიმართებაში საფრანგეთში შეადგინა 42,1%, გერმანიაში 46,6%, ესპანეთში 42,1%, იტალიაში 62,9%.“¹¹ ეკონომიკური თანამშრომლობის და განვითარების ორგანიზაციის მონაცემების თანახმად, მცირე და საშუალო ბიზნესი მნიშვნელოვან როლს ასრულებს ჩინეთის ეკონომიკაში. 2020 წელს მცირე და საშუალო ბიზნესმა უზრუნველყო 68% ჩინური საქონლის ექსპორტი და 50% ბიუჯეტში გადასახადების შემოღინება.¹²

რა მდგომარეობაა ამ მიმართულებით საქართველოში? მცირე და საშუალო ბიზნესმა მთლიან შიდა პროდუქტთან მიმართებაში 2022 წელს საქსტატის მონაცემებით შეადგინა 50,4%, რაც ეკონომიკის ამ სექტორის მნიშვნელობაზე მეტყველებს. მაგრამ აქ გასათვალისწინებელია ის გარემოება, რომ მცირე ბიზნესის ეკონომიკურ სტრუქტურაში 44% მშენებლობასა და ავტომობილების სარემონტო საწარმოებზე მოდის, რომლებიც არ ანხორციელებენ ინოვაციურ საქმიანობას და აქ განხორციელებული ინვესტიციები თავისი ბუნებით არ არიან ვენჩერული.

სამართლიანი კონკურენტული გარემოს ჩამოყალიბება და ასეთ ვითარებაში სადაზღვევო კომპანიების საქმიანობა არის საქართველოს სადაზღვევო ბაზრის გამართულად ფუნქციონირების ერთ - ერთი მნიშვნელოვანი წინაპირობა. დაზღვევის სახელმწიფო ზედამხედველობის სამსახურის მონაცემების მიხედვით 2023 წელს სადაზღვევო ბაზარზე 18 სადაზღვევო კომპანია ფუნქციონირებდა. ამავე პერიოდში სადაზღვევო კომპანიების წმინდა მოგება 73,5 მლნ. ლარი შეადგინა, ხოლო მოზიდულმა სადაზღვევო პრემიამ 1063,5 მლნ. ლარი. წინა წლის ანალოგიურ პერიოდთან შედარებით მოზიდული სადაზღვევო პრემიების მოცულობა გაზრდილია 16,8% - ით. დაზღვევის სახეობებიდან მოზიდული პრემიების მიხედვით ყველაზე დიდი წილი სამედიცინო დაზღვევაზე მოდის (35.2 %).¹³

მიუხედავად იმისა, რომ სადაზღვევო ინდუსტრია საქართველოში დინამიურად ვითარდება, მისი წილი ქვეყნის ეკონომიკაში ჯერ კიდევ მცირეა. „2023 წლის მონაცემებით თუ მთლიანი სადაზღვევო პრემიის მოცულობას შევუფარდებთ მთლიან შიდა პროდუქტს, ეს მაჩვენებელი იქნება 2.0%“, მაშინ, როდესაც იგივე მაჩვენებელი ევროკავშირის ქვეყნებში 7 - 8%-ია. ევროპის დაზღვევისა და გადაზღვევის ფედერაციის (*Insurance Europe*) ანგარიშის მიხედვით 2015 წელს დაზღვევის პენეტრაცია (მთლიანი მოზიდული პრემიის ფარდობა მთლიან შიდა პროდუქტთან/საშუალოდ 7,4%-ია და ვარირებს 0,9%-სა (ლატვია) და 11,4%-ს (ფინეთი) შორის.¹⁴

საქართველოში სადაზღვევო ინდუსტრიის განვითარებამ, როგორც მოქალაქეებისთვის რისკებისგან დაცვის ეფექტიანმა საშუალებამ ინქლუზიური ეკონომიკის იმპლემენტაციის პროცესი უნდა დააჩქაროს.

საქართველოში სადაზღვევო ბაზრის განვითარების ერთ - ერთი მნიშვნელოვანი მიმართულებაა აგროდაზღვევა. მთავარი პრობლემა, რომელიც აფერხებს სადაზღვევო ბაზრის ამ სეგმენტის განვითარებას არის, ერთი მხრივ მცირე ფერმერთა მხრიდან ზარალების აუნაზღაურებლობის რისკების შიში და მეორე მხრივ ფერმერთა ხელთ არსებული ფინანსური რესურსების სიმცირე. მცირეა იმ აგრორისკების ჩამონათვალი (სეტყვა, ქარი, ჭარბი ნალექი, ყინვა), რასაც სადაზღვევო კომპანიები ანაზღაურებენ აგროდაზღვევის სახელმწიფო პროგრამის ფარგლებში, ხოლო ფერმერთა მხრიდან ასევე მოთხოვნადია ისეთი აგრორისკების დაზღვევა, როგორებიცაა გვალვა და არასეზონური ყინვები. სადაზღვევო ურთიერთობების განვითარებას

¹¹ <https://rg.ru/2024/02/07/eksperty-obiasnili-pochemu-v-rossii-dolia-biznesa-ustupaet-ekonomikam-evropy-i-azii.html>

¹² <https://rg.ru/2024/02/07/eksperty-obiasnili-pochemu-v-rossii-dolia-biznesa-ustupaet-ekonomikam-evropy-i-azii.html>

¹³ <https://www.insurance.gov.ge/ka/Statistics>.

¹⁴ EUROPE FOR GEORGIA სადაზღვევო ბაზარი ძირითადი ცვლილებებისთვის ემზადება. თბილისი 2017 წ. <http://eugeorgia.info/ka/article/607/sadazgvevo-bazari-dzireuli-cvlibebestvis-emzadeba/>.

აფერხებს ასევე საჯარო რეესტრში მიწების საკუთრებაში დაურეგისტრირებლობის პრობლემა. ამის გამო ბევრი ფერმერი რჩება სადაზღვევო მომსახურების გარეშე. ხშირია დავები ზარალების შეფასებასთან დაკავშირებითაც.

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FISCAL POLICY IN THE AGE OF CLIMATE PROBLEMS: OPPORTUNITIES FOR INTEGRATING THE PRINCIPLES OF BIOECONOMICS**Mikayilova Inji Yusif**

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<https://orcid.org/0009-0000-4636-4553>**Abstract**

The contemporary global agenda is increasingly shaped by the intersection of environmental degradation, climate change, and resource depletion, prompting the need for innovative fiscal and economic strategies. This paper explores the integration of green fiscal policy with the principles of the bioeconomy as a response to these challenges. Green fiscal policy focuses on aligning public revenues and expenditures with environmental sustainability, emphasizing carbon taxation, the reduction of harmful subsidies, and financial incentives for eco-innovation. At the same time, the bioeconomy presents a transformative economic model that is based on the sustainable use of renewable biological resources across sectors such as agriculture, forestry, fisheries, and biotechnology.

This integration is not merely theoretical but is reflected in a growing number of national and international policy initiatives. The study underscores the role of fiscal instruments, such as public spending and tax incentives, in supporting the development of bioeconomic sectors and accelerating the transition toward environmentally responsible growth. Countries that have implemented green taxation and targeted subsidies have demonstrated the potential for simultaneous economic and environmental benefits, including job creation and biodiversity preservation.

The paper also examines the relevance of this integration in the context of developing countries, particularly Azerbaijan, where initial steps are being taken to reform fiscal policy in favor of renewable energy projects and green innovation. The alignment of fiscal measures with bioeconomic objectives can help ensure macroeconomic stability while addressing climate risks and supporting social welfare. This strategic convergence provides a new framework for sustainable development, requiring a balance between ecological imperatives and economic competitiveness.

Through the lens of case studies and comparative policy analysis, the research demonstrates that the synergy between fiscal mechanisms and bioeconomic strategies can serve as a foundation for inclusive and resilient economies. The findings point to the necessity of multi-layered policy approaches that harness both financial and technological resources to achieve long-term sustainability goals. Ultimately, this paper argues that the integration of green fiscal tools with bioeconomic models is a viable pathway to overcoming climate-related challenges and fostering a more sustainable and equitable economic future.

Keywords: Green fiscal policy, bioeconomy, climate change, sustainable development, carbon taxation, environmental innovation, renewable resources

Introduction. Climate change, depletion of natural resources, and environmental degradation are at the root of economic, social, and environmental threats worldwide today. As science and politics work together to find answers to these problems, two main concepts are in the spotlight: green fiscal policy and bioeconomics. Green fiscal policy includes strategies aimed at harmonizing the economic and tax policies of States with environmental objectives. This approach is implemented through tools such as carbon taxes, eco-subsidies, and green investment incentives to reduce negative environmental impacts. On the other hand, bioeconomics acts as an economic model based on renewable biological resources, combining sustainable development and technological innovation. This model aims to align economic growth and environmental protection, covering the fields of agriculture, forestry, fisheries, bioenergy, and biotechnology. In recent years, there has been a policy formation between international organizations and national Governments aimed at integrating these two concepts. Among the goals, Goal number 7 (clean and affordable energy), 12 (responsible consumption and production) and 13

(measures to combat climate change) are of particular interest, and within the framework of the UN Sustainable Development Goals for 2030, they require strengthening the links between fiscal policy and bioeconomics (UN, 2020).

The experience gained shows that an effective response to climate challenges is possible not only with technological and industrial transformation, but also with the proper mobilization of financial and fiscal instruments. In particular, environmental tax policies and green government spending can serve as important incentives for the development of bioeconomics sectors. For example, in the European Union, investments in bioeconomics are increasing due to fiscal policy within the framework of the Green Agreement strategy (European Commission, 2020).

Azerbaijan is also taking the first steps in this area: the promotion of renewable energy projects, initiatives such as the Alat Garadagh district solar power plant, improvement of environmental legislation and accession to international treaties (for example, the Paris Agreement) show that the country is committed to fiscal reforms in the bioeconomical direction. In this regard, the alignment of green fiscal policy with bioeconomic principles can become the key to environmental safety and sustainable economic development of the country. The main part. Against the background of climate change, environmental imbalances and reduced availability of natural resources, the economic policy of States should be aimed not only at macroeconomic stability, but also at protecting the environment and ensuring sustainable development. In this context, the concept of green fiscal policy appears. Green Fiscal policy includes taxation, subsidy, and government spending strategies implemented to minimize negative environmental impacts, promote sustainable development, and promote environmental innovation. Key elements of this policy include carbon taxes, the elimination of harmful subsidies, incentives for environmentally-oriented investments, and financial mechanisms based on the principle of "pollutants pay" (World Bank, 2021, pp. 17-21).

However, bioeconomics occupies a special place in modern economic models. Bioeconomics is an economic system based on the use of renewable biological resources and biotechnological processes. It covers bio-based production and services in agriculture, forestry, fisheries, bioenergy and pharmaceuticals. The goal is to ensure both economic development and long-term environmental protection through the sustainable use of biological resources (Lewandowski, 2018, pp. 42-46; MDPI, 2024).

There are notable interactions between green fiscal policy and bioeconomics. Fiscal instruments — especially government budget expenditures, incentives for green investments, and tax incentives - can provide a powerful boost to the development of key sectors of the bioeconomy. For example, channeling funds raised from carbon taxes to biotechnological research or renewable energy sources ensures not only economic growth, but also environmental safety. In this regard, while green fiscal policy acts as a tool, bioeconomics is being formed as its main strategic goal. In addition, there has been significant growth in bioeconomics sectors in some countries as a result of the introduction of green fiscal policies. In Sweden, for example, in parallel with the carbon tax introduced since 1991, there has been a significant expansion in the renewable energy and biofuel sectors. The success of this model is practical evidence that Fiscal Policy is purposefully focused on bioeconomic potential (OECD, 2020).

Thus, green fiscal policy and bioeconomics together become central elements of the state's economic policy in response to climate challenges. This integration is of strategic importance for both economic stability and environmental sustainability and forms the theoretical and practical foundations for its wider application in the future.

Conclusions. In the modern world, against the background of pressure caused by climate change and ecosystem degradation, it is necessary to reformulate the fiscal policy of states not only for the purpose of economic stability, but also from the point of view of sustainability and environmental protection. In this context, the integration of bioeconomics principles into fiscal policy is a priority issue. This integration necessitates a multifaceted approach that combines both environmental goals and economic growth. As a first direction, it is proposed to direct revenues from carbon taxes to the sectors of the bioeconomy. These financial resources can have serious consequences, especially in the field of biodiversity conservation in agriculture, bioenergy production and the introduction of environmentally friendly technologies. For example, in countries such as Sweden and Finland, funds generated by carbon taxes have been directed towards environmental innovation and the green sector, which has led to both job creation and environmental improvement (World Bank, 2021, pp. 31-33). The second strategic mechanism is the direction of green subsidies in the field of bioeconomics. Subsidies specifically targeted at manufacturing industries based on organic agriculture, agrobiotechnology, and renewable

bioresources can strengthen the market positions of these industries and create conditions to reduce environmental damage. Subsidies reduce risks and increase investment attractiveness (OECD, 2020).

The third area, investment incentives, is important from the point of view of commercialization and expansion of the use of technological innovations aimed at bioeconomics. Targeted investments from the State budget have led to progress in areas such as innovative biotechnological solutions, such as bioplastics, biofuels, and biochemical products. In addition, deepening cooperation between research institutions and industry through such incentives can ensure the structuring of the bioeconomy based on innovation (Lewandowski, 2018, pp. 51-56).

Therefore, the integration of fiscal policy with the principles of bioeconomics is an effective basis not only for maintaining financial balance and reducing climate risks, but also for building a sustainable, inclusive and biologically based economy. This integration gives public policy not only an environmental focus, but also makes an important contribution to long-term macroeconomic stability, regional development, and improved social well-being. In particular, for developing countries, such strategies serve both the goals of sustainable development and the improvement of the competitiveness of national economies.

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Historical sciences

HEYDAR ALIYEV AND THE NEW GENERATION OF AZERBAIJANI YOUTH

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ГЕЙДАР АЛИЕВ И НОВОЕ ПОКОЛЕНИЕ АЗЕРБАЙДЖАНСКОЙ МОЛОДЕЖИ

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Abstract

During the periods when Heydar Aliyev led Azerbaijan, state youth policy was always one of the main priorities. Even during the years of Soviet rule, the National Leader created opportunities for hundreds of Azerbaijani youths to study in the major and prestigious cities of the USSR. These young people were sent to the leading higher education institutions of the union in various specialties, and after completing their education, they returned to their homeland and began working as professional personnel. In the period of independence, the majority of these young individuals continue to contribute to Azerbaijan's development by working in key positions in public administration. Those employed in law enforcement agencies, science, healthcare, and the cultural sphere were formed precisely as a result of the great leader's farsighted policy.

Аннотация

В периоды, когда Гейдар Алиев возглавлял Азербайджан, государственная молодежная политика всегда была одним из основных приоритетов. Даже в годы советской власти Национальный лидер создавал возможности для сотен азербайджанских молодых людей обучаться в крупных и престижных городах СССР. Эти молодые люди направлялись в ведущие высшие учебные заведения Союза по различным специальностям, а после завершения образования возвращались на родину и начинали работать в качестве профессиональных кадров. В период независимости большинство этих молодых специалистов продолжает вносить вклад в развитие Азербайджана, занимая ключевые должности в системе государственного управления. Те, кто работает в правоохранительных органах, науке, здравоохранении и культурной сфере, были сформированы именно благодаря дальновидной политике великого лидера.

Keywords: *First Youth Forum, Modern Youth, Patriotism, Youth Policy, State Youth Policy, Independent Azerbaijan, National Leader.*

Ключевые слова: *Первый молодежный форум, Современная молодежь, Патриотизм, Молодежная политика, Государственная молодежная политика, Независимый Азербайджан, Национальный лидер.*

Introduction. Heydar Aliyev paid special attention to educated and talented youth, providing comprehensive support for their development. He personally selected the most promising among the young people, tested their knowledge and skills, and then sent them to study in Moscow and Leningrad. There, they were given broad opportunities both in terms of receiving high-quality education and financial support. For this reason, when Heydar Aliyev returned to power in 1993, it was the youth who supported this decision the most. In return, the National Leader placed great trust in young people, stating that they were the main driving force for Azerbaijan. In one of his speeches, he expressed this trust as follows:

"You are the present and future of Azerbaijan. Great responsibilities fall on your shoulders. These responsibilities will only grow in the future. You will be the builders and developers of independent Azerbaijan in the 21st century. We will entrust the fate of independent Azerbaijan to you."

The main part. During the periods when Heydar Aliyev led Azerbaijan, state youth policy was always one of the main priorities. Even during the years of Soviet rule, the National Leader created opportunities for hundreds of Azerbaijani youth to study in the major and prestigious cities of the USSR. These young people were sent to the leading higher education institutions of the union in various specialties, and after completing their education, they returned to their homeland and began working as professional personnel. In the period of independence, the majority of these young individuals continue to contribute to Azerbaijan's development by working in key positions in public administration. Those employed in law enforcement agencies, science, healthcare, and the cultural sphere were shaped precisely as a result of the great leader's farsighted policy. [4]

When we look back at history, we see that during the early years of Heydar Aliyev's leadership, the main focus was on training youth as professional specialists. However, from 1993 onwards, promoting young people into state governance became a top priority. The establishment of the Ministry of Youth and Sports by the National Leader, the adoption of key decisions regarding youth policy, the approval of the Law "On Youth Policy," and the implementation of concrete steps aimed at the development of youth all serve as proof of this commitment. [5]

In particular, the First Forum of Azerbaijani Youth, held on February 2, 1996, became the most striking example of the state's attention to youth. Initiated and attended by Heydar Aliyev himself, this forum is considered the first major celebration of his youth policy. As a continuation of this care, in 1999 the National Leader signed the decree "On State Youth Policy," and on April 9, 2002, the Law of the Republic of Azerbaijan "On Youth Policy" was approved. These decisions laid the firm foundation of youth policy, established by Heydar Aliyev. [3]

One of the key conditions for strengthening the state, consolidating independence, and building a reliable future is the development of patriotic and intellectual youth. Azerbaijan's youth policy is built precisely on these principles. Heydar Aliyev repeatedly emphasized that one of the main duties of young people is to serve in the military.

Even today, thousands of Azerbaijani youth fulfill their duty to the Motherland by serving in the Armed Forces. The April battles and the Second Karabakh War particularly demonstrated that Azerbaijani youth possess a strong spirit of patriotism. As a result of the "Iron Fist" policy implemented under the leadership of the Commander-in-Chief, President Ilham Aliyev, the brave soldiers and officers of the Azerbaijani Army sacrificed their lives for the liberation of our lands. This victory also became a clear testament to the loyalty and fighting spirit of the younger generation. The people of Azerbaijan and its youth showed that they are always ready to respond to any call from the Commander-in-Chief. President Ilham Aliyev's words, "I have a special attitude toward youth, my heart is with you. You can rely on me in everything. I also rely on you," reflect the deep trust placed in Azerbaijani youth. [6]

The statement by the National Leader Heydar Aliyev — "Every Azerbaijani youth must, above all else, think about the present and future of independent Azerbaijan" — remains highly relevant today. President Ilham Aliyev, by successfully continuing his father's political legacy, does not spare attention and care for the youth. [2]

Azerbaijani youth once again proved their love for the Motherland during the 44-day Patriotic War. The brave heroes who participated in this war sacrificed their lives to liberate our lands from occupation. During his address to the people in Shusha, at Cidır Plain, President Ilham Aliyev specifically highlighted the role of Azerbaijani youth in this glorious victory, stating:

"We did not accept this situation, and I repeatedly said that the Azerbaijani people would never come to terms with it. A deliberate policy was carried out in political, economic, military, and moral directions, including the education of the younger generation — and such a generation was raised that they sacrificed their lives for the land. A generation was raised that took back our land from the enemy at the cost of their blood and lives." [7]

Azerbaijani youth were the main heroes of this victory. They not only fought on the battlefield but also exposed the enemy's lies on the information front, bringing Azerbaijan's just voice to the world. Through social networks, media platforms, films they produced, and facts they presented, they countered and defeated Armenian propaganda.

Today, every Azerbaijani young person follows the ideas of Heydar Aliyev in their activities and unequivocally supports the policies of President Ilham Aliyev. They work tirelessly for the development of the country and are always ready to achieve new victories for the Motherland.

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PROBLEMS OF STUDYING THE CONSEQUENCES OF NUCLEAR TESTS IN NEW GEOPOLITICAL CONDITIONS

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In the new geopolitical environment, the approach to studying the history of nuclear testing is becoming more complex and multidimensional, considering the changes in world politics. It is also important to note the significant influence of postcolonial research methodology on the study of the impact of nuclear testing on the fate of traditional societies, supplementing and expanding traditional historical narratives, considering the diversity of cultural, political, and social contexts.

Thus, by studying the consequences of nuclear testing in postcolonial discourse, researchers focus on several essential aspects previously ignored in historical science. As is well known, one of the crucial arguments regarding the reason for the opening of the Semipalatinsk test site and the creation of the Soviet atomic bomb was that "the creation of atomic weapons in the USSR clearly became the main deterrent to the outbreak of nuclear war and the possibility of ensuring military and defense parity between the world's leading powers, the USSR and the US, in the future" [1, 5]. It is, of course, impossible to disagree with this. However, in the new geopolitical conditions, considering new methodological approaches from a postcolonial and decolonial perspective, it should be noted that the territories chosen by the major powers as testing grounds for nuclear weapons, uranium mining, and other nuclear materials, as well as sites for nuclear waste disposal, were located on the lands of indigenous peoples, on the outskirts of empires. This fact forces us to take a fresh look at and assess the consequences of the political decisions of the second half of the 20th century on the fate of ordinary citizens who were in a colonial or subordinate position.

The term "colonialism" is one of the central themes of the discourse characterizing the historical stage of subjugation and exploitation by a state or group of states through military, political, and economic coercion of peoples, countries, and territories, usually economically less developed and with a foreign population. Accordingly, this concept is used in historical and political science to describe the system of domination of developed countries in Europe, the United States, and Japan over vast areas of Asia, Africa, Latin America, Australia, and Oceania.

Alongside this, the concept of "internal colonialism" has become established in historical science, which, as a derivative of the concept of "colonialism," implies the exploitation of a state's resources by the forces of that same state. This term is generally used in sociology, political science, and economics. Usually, it refers to the exploitation of a country's "periphery" (often meaning the capital or a similarly important region where the political elite is concentrated) by its "center." This characteristic applies to the Russian Empire and the Soviet state as a striking example of such a policy. Russian historian V. Klyuchevsky wrote about this in 1904, characterizing the essence of Russian colonialism: "The history of Russia is the history of a country being colonized. The expanse of colonization expanded along with state policy" [2, p. 9]. The term "internal colonialism" was introduced into scientific discourse by the classic Marxist-Leninist V.I. Lenin, who thus attempted to reconcile his theory of imperialism with the "center-periphery" relations that existed at the time. Therefore, the Soviet state, which proclaimed, "freedom for the peoples" in 1917, continued in practice to colonize its territories and peoples, but in a different context, spreading "linguistic colonization," "educational colonization," "spiritual colonization," "raw material colonization," and so on.

In recent years, foreign historical and political science has used a wide range of terms and concepts to study the consequences of nuclear testing, vividly characterizing the essence and content of the colonial policies of major world players during the Cold War. These include definitions such as "nuclear colonialism," "radioactive colonialism," "nuclear imperialism," "ecological racism," "scientific authoritarianism," etc. They emerged because of the deconstruction of established dominant narratives about nuclear testing and its consequences, revealing their often-hidden colonial and imperial aspects.

In many sources, the territory of nuclear test sites was referred to as sparsely populated or supposedly deserted lands. Numerous postcolonial studies have shown that perceptions of the emptiness of peripheral lands are projections of the colonial and imperial gaze [3, 4]. Thus, in the United States in

1945, when the search for a site for a nuclear test site began, the choice was also based on the colonial view of its creators. As Horacio Rivera, a member of the then newly created Naval Special Weapons Division, recalled, "We just got dozens of maps and started looking for remote places. And this place 'must first and foremost be far from US settlements...yet still within an area controlled by the United States, "testified one congressional official [5, 158]. In January 1946, Bikini Atoll in the Marshall Islands was declared a place that "can be accurately described as one of the most remote places on Earth" [5, 158].

This view of the Kazakh steppe as a vast desert territory that needed to be settled, developed, and utilized was characteristic of Russian historical scholarship in the second half of the 19th and 20th centuries, as well as of the country's leadership. As is well known, the Kazakh steppes were formed under the influence of past and present land use, such as former nomadic and then Soviet livestock farms with winter and summer pastures, meat production, collective farms, small and large villages, and settlements. Each piece of land had its own specific economic and cultural significance. Twenty thousand people living near the test site in villages and over 100,000 people living approximately 140 kilometers away in the city of Semipalatinsk were ignored [6]. These facts were not considered by the creators of the nuclear test site in the Kazakh steppe.

A similar situation occurred on the British Crown Islands off the coast of Australia, which were used as nuclear test sites. Emu Field and Maralinga Islands were home to several different Aboriginal tribes. However, the Australian government and the British military considered them nomadic peoples, and their land was therefore considered "virtually uninhabited."

French nuclear test sites were also located quite far from Paris.

China, like the Soviet Union, chose the location for its nuclear test site based on internal resources, settling on the lands of the Xinjiang Uyghur Autonomous Region (XUAR), which are also far from major population centers. The XUAR is not a traditional place of residence for China's dominant ethnic groups, especially the Han Chinese. Today, most of the Xinjiang's population is Muslim and consists of many ethnic groups, mainly Uyghurs.

When characterizing the policy of nuclear colonialism, it is essential to note that the activities of governments possessing atomic weapons were often accompanied by the displacement and deprivation of indigenous peoples of their traditional lands. This disrupted their way of life and social and cultural practices and exacerbated existing social and economic inequalities. The inhabitants of Bikini Atoll, where the US conducted 23 nuclear bomb tests between 1946 and 1958, were forced to leave their homes under pressure from the persuasive arguments of the US military governor of the Marshall Islands, Ben H. Wyatt. He convinced the Bikinians that the relocation was temporary and would benefit humanity. However, the inhabitants of Bikini Island had to go through several stages of relocation: first they moved to Rongelap (an atoll 200 km east of Bikini) in 1946, then in 1948, after food shortages brought them to the brink of starvation, to the atoll of Kwajalein, and later to the island of Kili in the south of the Marshall Islands. The inhabitants of Bikini chose Kili Island as a temporary refuge, as it was considered uninhabited and was not under the jurisdiction of any other Marshallese community [7, 586] (Keown, 2018: 586).

However, the further problem for the Bikinians was that the uninhabited nature of Kili Island was not accidental; it was in fact unsuitable for habitation: there were no convenient lagoons for fishing, and the island was constantly threatened by flooding, which in turn destroyed homes and crops. However, the greatest tragedy for the Bikinians, who were forced to leave their homes in March 1946 and were relocated to other atolls, was that because of the relocation, they lost touch with their past, their history, and their native places where their ancestors were buried. The US military authorities could not understand why the Bikinians wanted to return to their atoll so much, since Bikini and Rongelap were as similar as two potatoes [6, 160].

As is well known, the Semipalatinsk Nuclear Test Site (SNTS) included the lands of three regions: Semipalatinsk, Pavlodar, and Karaganda. A total of 18,000 square kilometers of fertile land and mineral-rich subsoil were expropriated, taken away from the national economy and collective farms, and allocated to the SNTS. Farms were forced to give up pastures, arable land, mineral resources, polymetallic ore deposits, gold, and coal, which had a negative impact on their economic and social development. For example, of the 1,908,000 hectares of land that belonged to the Abzalinsky District of the Semipalatinsk Region, 445,000 hectares were transferred to the military department, and the district itself was abolished by a special decree of the Presidium of the Supreme Soviet of the Kazakh SSR dated January 22, 1955. The military authorities dispersed the district's population when it was gaining momentum in its post-war reconstruction. Having lost their territorial unity, people scattered in all directions. Over 40 years of nuclear testing and fragmentation of the population, the once rich region, abundant not only in

natural resources but also in talented people, fell 20-30 years behind other regions regarding socio-economic development. This was written in an appeal to the President of the Kazakh SSR, First Secretary of the Central Committee of the Communist Party of Kazakhstan, N.A. Nazarbayev, by the Abyralinsky District Council of People's Deputies chairman, D. Koshkarbekov [8, 22].

Thirdly, the colonial approach was also evident in the lack of agreement and consultation with local communities. As is well known, the Soviet government conducted nuclear tests in Semipalatinsk under the strictest secrecy. All work on the construction and development of the test site, the creation of nuclear weapons, and reports on the results of their testing remained a deep secret and were guarded by the USSR Ministry of Internal Affairs. Information about the timing, scale of nuclear impact, and possible consequences was strictly classified. There was no question of any consultation with the local population.

A separate issue concerns the assessment of the consequences of nuclear testing. As stated in the "Review of Medical and Dosimetric Data on the Consequences of Nuclear Testing at the Semipalatinsk Test Site," the population exposed to radiation is estimated at around 3 million people, of whom 1.5 million are residents of Kazakhstan. Approximately 0.5 million residents of Kazakhstan were exposed to radiation doses exceeding 10 rads. The next largest group is in the Altai region and numbers approximately 1,300,000 people [9, 2]. Overall, the sanitary and hygienic situation in the Semipalatinsk test site region in 1949-1989 was unprecedented and unparalleled in world practice. Acute, subacute, and chronic exposure occurred several times and in various combinations, leading to the emergence of new groups at risk from radiation every year. External exposure was combined with internal exposure, and acute and chronic exposure in small doses continued throughout the entire period of operation of the Semipalatinsk test site [9, 25]. In this case, the colonial perspective manifested in the fact that the official authorities had a poor understanding of the level of radiation's impact on traditional societies, whose way of life was directly and figuratively connected to the land. This meant working on the land, sleeping on the ground, and eating close to the earth.

However, no research was conducted on the effects of radiation on the health of people living near the test site. This scientific knowledge was virtually ignored during the Cold War. Scientists were only required to "study the degree of impact of the damaging factors of nuclear explosions on samples of various military equipment and weapons, as well as on various objects and structures" [10], including the impact on the human body. This lack of consultation and disregard for the rights of indigenous peoples living in the territories of nuclear test sites illustrates the dynamics of nuclear colonialism, where decisions on nuclear activities are made by influential actors without regard for the interests or well-being of the affected indigenous communities, regardless of their location.

Thus, nuclear colonialism is a form of environmental racism and injustice, where indigenous peoples are forced to bear a disproportionate burden of the risks and consequences associated with nuclear activities. The Semipalatinsk Nuclear Test Site, once located in present-day Kazakhstan, is closely linked to the concept of nuclear colonialism due to its history of nuclear testing and the consequences for the country's population in the past, present, and future. In this regard, studying the consequences of nuclear testing in the new geopolitical context, where the danger of nuclear weapons use is on the brink of possibility, should help reveal the deep structural and historical aspects of nuclear colonialism policy, once again draw attention to the problem of overcoming the consequences of nuclear testing, and propose alternative approaches to analyzing and solving problems in this area.

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Journalism

THE TRANSFORMATION OF THE ROLE AND COMPETENCIES OF SOCIO-POLITICAL COMMUNICATION IN THE CONTEXT OF A NEW ERA

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ЖАҢА ДӘУІР ЖАҒДАЙЫНДАҒЫ ӘЛЕУМЕТТІК-САЯСИ КОММУНИКАЦИЯНЫҢ РӨЛІ МЕН ҚҰЗЫРЕТТЕРІНІҢ ТРАНСФОРМАЦИЯСЫ

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Abstract

The article examines the issues of transformation of social relations and their strengthening through the forms of communication in the new era, the problems of integration of socio-political communication and the improvement of scientific definitions, the processes used.

In the context of political theory, the concept of communication is considered in connection with the process of mutual exchange of information and its dissemination in society. Such a situation emphasizes the importance of revealing the contradictions between micro- and macro-level approaches in the analysis of the phenomenon of political and social communication.

The purpose of the investigation. Analyzing the basic models of the theory of political communication, the author tries to prove the hypothesis that instead of centralized one-way communication comes a form of information dissemination with enhanced feedback communication and inter-audit communication. This is due to the fact that digital technologies lead to the increase of "horizontal" streams with "vertical" communication between participants in the exchange of information.

Results of the scientific article. The article systematizes and analyzes the role and changes in the competencies of socio-political communication in the conditions of rapid development of the digital environment. Recommendations on the unification of scientific definitions used in the study of the processes of socio-political communication are developed. For example, on the basis of official documents are given the grounds for the use of the concept of "means of mass communications" and "means of mass information".

Түйін

Мақалада жаңа дәуірдегі әлеуметтік қатынастардың түрленуі және оларды коммуникациялық формалар арқылы бекіту мәселелері, әлеуметтік-саяси коммуникациялық ықпалдасу мен осы процестерді зерттеуде қолданылатын ғылыми дефиницияларды жетілдіру, біріздендіру проблемалары қаралған. Саяси теорияның контекстінде коммуникация ұғымы өзара ақпарат алмасу мен ақпараттың қоғамға таралу үрдісімен байланысты қаралады. Бұл жағдай саяси-әлеуметтік коммуникация феноменін талдауда микро мен макро деңгейлі тәсілдемелердің арасында туындайтын қарама-қайшылықтарды анықтаудың маңызын бірінші кезекке шығаруда.

Зерттеу жұмысының мақсаты. Автор зерттеу жұмысында саяси коммуникация теориясының басты модельдерін талдай отырып, орталықтандырылған бір бағытты коммуникацияның орнын аудитория мен саяси-коммуникациялық процестердің қатысушылары арасында кері байланыс күшейтілген ақпарат тарату формалары алмастырады деген болжамды дәлелдеуді мақсат еткен. Өйткені, цифрлық технологиялардың дамуы басқарушы мен бағынышты арасындағы коммуникативтік «вертикалды» байланыстармен қатар «горизонталды» коммуникативтік-ақпараттық ағындардың ұлғаюына бастайтын болады деген тұжырым жасайды.

Ғылыми мақаланың нәтижесі. Мақалада цифрлық ортаның ықпалымен әлеуметтік-саяси коммуникацияның орны мен құзыреттерінің өзгерістері жақсы жүйеленіп, сарапталған. Әлеуметтік-саяси коммуникациялық ықпалдасу процестерін зерттеуде қолданылатын ғылыми дефиницияларды жетілдіру, біріздендіру проблемаларын шешуде ұсыныстар жасалған. Мысалы, автор «бұқаралық коммуникация құралдары» мен «бұқаралық ақпарат құралдары» сияқты ұғымдардың қолдану тарихын жан-жақты зерттеп, олардың дұрыс анықтамаларын терең дәлелдермен сипаттап берген.

Keywords: communication interaction, vertical communication, political actors, socialization, mediocracy.

Түйін сөздер: коммуникациялық ықпалдасу, вертикалды коммуникация, саяси акторлар, әлеуметтену, медиакратия.

Kіріспе

Саяси-экономикалық салада өзара әрекеттесу құбылысын түсіндіретін негізгі тұжырымдардың генезисі мен дамуын талдау коммуникациялық процестердің әлеуметтік қатынастарға әсерін дұрыс болжау үшін керек. Бұл жерде саяси-әлеуметтік әрекеттесудің

тұжырымдарының генезисі деп – саяси-әлеуметтік әрекеттесудің ғылыми категория түрінде пайда болуы мен шығу себептерін, қалыптасуы мен дамуын, жойылуын түсінеміз.

Коммуникацияның қажетті және жеткілікті шарттарына: таңдалған мақсаттың, екі немесе одан да көп қатысушылардың, хабарламаның, тарату каналдарының және хабарлама мән-мәтінінің болуын жатқызамыз. Коммуникация адам өмірінің барлық салаларын қамтиды және әлеуметтік, саяси, экономикалық жүйелердің жұмыс істеуінің міндетті атрибутын құрайды.

Ақпараттық ықпалдасудың өзгеше формасының ерекшелігі – экономикалық, саяси салалармен байланысты ақпараттың ерекше тақырыптық бағдары мен коммуникацияның әлеуметтік-саяси үрдістердің жүргізілу барысына әсер ету мақсатына тәуелді. Саяси теорияның контекстінде коммуникация ұғымы саяси акторлардың, бір жағынан, билікке қатысты өзара ақпараттық қатынасын, екінші жағынан, саяси мағыналы ақпараттың қоғамға таралу үрдісін білдіреді. Екеуі де бірімен-бірі тығыз байланысқан: индивидтердің жеке немесе топтасып ықпалдасуы ақпараттық әрекеттесуді және ақпарат алмасуға бағытталса, ақпарат таратудың мәні – қолданылған каналдар мен техникалық құралдардың түрлеріне қарамастан адресаты (индивид, ұйым және қауымдастықтың) айқындалған кезде ғана пайда болады.

Бұл жағдай саяси-әлеуметтік коммуникация феноменін талдауда микро мен макро деңгейлі тәсілдемелердің арасында айтарлықтай қарама-қайшылықтар жоқтығын көрсетіп, оларды біріктіріп жинақтау мүмкіндігін туғызады. Саяси коммуникацияның теориялық модельдерінің генезисі мен эволюциясын талдай отырып, «хабар тарату моделі» үлгісіндегі бір бағытты, орталықтандырылған коммуникацияның орнын аудитория мен саяси-коммуникациялық процестердің қатысушылары арасында кері байланыс күшейтілген ақпаратпен бөлісу формалары біртіндеп алмастырып жатқан тенденцияның ашықтығын тұжырымдай аламыз.

Негізгі бөлім. Талқылау

Азаматтық қоғам институттары нығайып, цифрлық технологиялардың дамуы мен жаңа бұқаралық коммуникация құралдарының пайда болу кезеңінде қоғамдағы дәстүрлі басқарушы мен бағынышты арасындағы «вертикалды» коммуникативтік байланыстармен бірге «горизонталды» коммуникативтік-ақпараттық ағындардың ұлғаюы байқалатын болады. Алайда бұның өзі де электоралды коммуникация аясындағы манипулятивтік (бұрмалау) технологиялардың таралуына кедергі бола алмайды. Қоғамдағы бұқаралық коммуникация жеке тұлғалар өздеріне бағытталған хабарламаларды қабылдап, түсінуге қабілетті деп пайымдайды. Коммуникаторлар мақсатты аудиториясына тиісті хабарламаны жеткізіп, реципиенттің өздеріне қажетті реакциясын алуға күш салады. Бұл жерде олар өздерінің коммуникативтік іс-әрекеттерін бақылап, жіті сүзгіден өткізіп түзетіп отыруға міндетті (Мангейм Дж. Б., Рич, 1997; Castells, 2012).

Егерде саяси құрылымдар мен қоғам арасындағы кері байланыстың тиімді механизмдері қосылмаса, онда азаматтардың электоралды және саяси белсенділігінің төмендеуін, биліктің қимыл-қозғалыстарына наразылығын болжауға болады. Қателік түзетілмесе саяси жүйе мен қоғамдағы тұрақтылыққа қатер төндіру ықтималдығы жоғарылайды.

Қазақстандық бұқаралық коммуникация құралдарының қалыптасуындағы саяси-экономикалық және әлеуметтік аспектілерді талдауда коммуникациялық жүйенің негізгі акторларын, олардың бір-бірімен қарым-қатынасының эволюциясына көңіл бөлінуі тиіс. Және де бұл қарым-қатынастағы өзгерістер ғаламдық модернизацияның беталысы мен елдегі саяси демократиялық процестерден бөліп қаралмайды.

Қоғамдық-саяси процестердің феноменін түсіндіретін тұжырымдарды сараптауда саяси акторлардың қоғамды дамытушы рөліне барынша көңіл бөлінеді. Аталған контексте саяси актор деп саясатта, әлеуметтік немесе экономикалық процестерге жеке немесе ұжымдық қатысушы субъектіні қабылдаймыз. Мысалы, Қазақ мемлекеті халықаралық, аймақтық және ішкі саяси кеңістіктегі саяси актор, қоғамдағы жетекші әлеуметтік актор болып саналады.

Саяси процестер деп макро деңгейдегі саяси өмірдің серпінін көрсететін коммуникативтік актілер мен билік үшін, қаржылық үстемдік үшін күресетін саяси субъектілердің ықпалдасуын меңзейтін әлеуметтік құбылыстарды айтады. Бұндай кешенді процестер қоғамдағы белсенділіктің бірігуін көрсете отырып мемлекет пен қоғамның, әлеуметтік ортаның, мемлекеттік институттардың, жеке тұлғалардың ықпалдасу қағидаларын бекітеді. Сондықтан да, болашағын ойлаған Қазақ Елінде саяси процестердің басты функциясына елдегі

саяси жүйенің ішкі және сыртқы жағдаяттарға икемделуін, ұлттық мүдденің қорғалуын жатқызылуын өмірлік қажеттіліктен туындаған бағыт деп бағалауға тиістіміз.

Қоғамдық-саяси кеңістік тығыздалған кезде және саяси процестердің субъектілерінің арасындағы бәсеке күшейген тұста БКҚ-ның рөлі жаңаша бағалана бастайды. Масс-медиа да әлеуметтік-саяси коммуникацияның негізгі акторы болып орнығады, трансформацияланады. Осы кезеңнен бастап бұқаралық медиа жүйесінің үдемелі эволюциясына жол ашылады (Giddens, 2011; Krastev, 2014).

Бұқаралық коммуникацияның басты акторлары (саяси акторлар да) аудиторияның басымдықтарын қалыптастырып, оның іс-қимылын реттеуді мақсат етеді. Бұқаралық коммуникация социумның (кәсіби, мәдени сипаттары немесе білім дәрежесі бойынша біріккен адамдар тобы) ішкі қарым-қатынастарының ынтымақтаса дамуын көздейді. Ал, социум өз кезегінде коммуникаторға ықпал жасай алады. Коммуникатор – өз серіктестеріне, басқа адамдарға әсер ете алатын танымал тұлға. Ол өзінің үлгісімен, сөзімен, интонациясымен адамдардан қажетті іс-әрекеттерді, жауаптарды ала алады. Коммуникатор байланыс жасауға нақты мақсаттарын айқындап алып, дайындалып барып қана кіріседі. Коммуникатордың қызметінде ескерілетін әлеуметтік қарым-қатынастар кешенді фактор түрінде индивидтерді функционалды алаңға жұмылдырып тұрақтылыққа, дамуға мүмкіндік туғызады. Сол қатынастар қоғамдық институттардың, акторлардың, әлеуметтік топтар мен мемлекеттік органдардың алуан түрлі коммуникативтік байланыстарына негіз болады (Sztompka, 2014; Брызгалова, 2010).

Ақпараттық қоғам қалыптаса бастағанда саяси және көпшілік салалар туралы дәстүрлі түсініктер өзгереді, БКҚ қоғамдағы саяси субъектілердің басты құралы болып бекиді. Осындай жағдайда дамыған телекоммуникациялық жүйелер жаңа бұқаралық коммуникация түрлерін өмірге алып келеді, мемлекеттік жүйенің платформасындағы бұқарамен байланыс формаларын жетілдіреді. Осылайша медиа жүйелердің әлеуметтік, экономикалық салалардағы функцияларында жаңа технологиялық шешімдерді көреміз. Әсіресе, бұндай технологиялық шешімдер ақпараттық, әлеуметтендіру, біріктіру, қалпына келтіру мен ойын-сауық, кері байланыс функцияларында жақсы көрініс табады.

Жаңа медиа ортаның тағы бір ерекшелігі – бұқаралық коммуникация құралдары саяси акторлардан тыс, қоғамдық пікір жасайтын, билікке қысым көрсетуге қабілетті дербес актор болуға да лайық. БКҚ билік саласымен қабаттаса отырып қызмет істегенімен қажетті деңгейде тәуелсіз болуға деген бейімін де дамыта алады. Өйткені, олар түрлі процестердің ажырамас компоненті формасында әлеуметтік тұрақтылықтың белсенді элементтер жүйесін, бұқара халықтың іс-әрекетін әлеуметтік бақылау механизмін құрайды.

XXI-ғасырмен өріле басталған ғылыми технологиялық ралли ғаламдық медиакратия үрдістерін жаңа арнаға бұрып жіберді. Геосаясаттан бастап, мемлекетаралық, аймақтық саяси процестер, халықаралық қаржы-экономикалық кеңістік медианың араласуынсыз дами алмайтынын дәлелдеуде. Билік үшін күресте, саяси-әлеуметтік шынайылық үшін күресте аудиторияның сеніміне ие болып, аудиторияға ұнау да БКҚ-ның маңызын өсірді, функцияларын трансформациялады. Ақпараттандыру мен жеке тұлғаның әлеуметтік жүйеге кірігуі, сол ортаның нормаларын, құндылықтарын, ережелерін қабылдап мойындауы, бір сөзбен айтқанда, әлеуметтендіру функцияларын іске асыру үшін асқан дәлдікпен жүргізілетін санаға әсер ету, бұрмалау технологияларына деген сұранысты күшейтуде (Mironov, 2019; Asadullina, 2009; Adali and et.; 2010).

Цифрлық дәуірдің жылдам өзгерістерін айшықтайтын бұқаралық ақпарат құралдары (БАҚ) мен бұқаралық коммуникация құралдарына (БКҚ) берілген анықтамалар уақыт талаптарына сай толықтырылып келеді. Көпшілік ғалымдар дәстүрлі бұқаралық ақпарат құралдары деп мерзімді баспасөзді, телевизия мен радионы, киноқұжаттама, дыбыс-бейне жазбасы және интернет-ресурстарды анықтайды. Ал, бұқаралық коммуникация құралдарына баспа, радио мен телевизиядан басқа бүгінгі цифрлық коммуникация құралдарын, кинематография, театр, жарнамалық сурет пен графика, видео және аудио формадағы ақпараттар, кітаптар және басқа да бұқаралық санаға ықпал ететін құралдарды жатқызамыз.

Қорытынды бөлім және нәтижелер

Болашақта қазақ қоғамын жаңғыртудың маңызды аспектісі – ұлттық мүдде платформасына негізделген медиаларды дамыту екенін естен шығармаған абзал. Жақын перспективада саяси салада медиатизацияның орын алуы – билікті заңды деп танып

мойындаудың, қоғамды мойындатудың дәстүрлі қолданылатын тәсілдерін жоққа шығарып құнсыздандырады. Өзінің беделін жоғалтудан қорыққан саяси билік медиа ресурстарды бақылаудың түрлі формаларына жүгінуге мәжбүр. Тәуелсіз коммуникация құралдарының қожайындарына қысым көрсету, меншік иелерін өзгерту, қаржылай ынталандыру, журналистерді әлеуметтік қолдау формаларын ұсыну (байқаулар өткізу, гранттар, сыйлықтар беру, мемлекеттік тапсырыстар және т.б.) арқылы ақпараттық кеңістікте өз ықпалын сақтауға ұмтылады.

ВВС телевизия мен радиотарату холдингінің журналистерінің құндылықтары біздің осы тұжырымымызды толық дәлелдейді. ВВС журналистері ұстанатын фундаменталды құндылықтардың қысқаша тізімі мынандай: ақиқат және нақтылық; әділдік және бейтараптық; тәуелсіздік; қоғамдық мүддеге жұмыс істеу; аудиторияның алдында жауапты болу, есеп беру.

Жаңа медиалар жүйесінің құрылымдық және мәдени ерекшеліктерін қолдануда ақпаратты таратудың іріктеу әдісіне, негативті мазмұндағы контентке басымдық беру, медианы күмәнді әрекеттерде қолдану қысқа перспективада ғана нәтижелі болуы мүмкін. Бұндай тәсілдерді қолданған биліктің беделі қатты төмендеп, оның заңды деп танылуы қиындайды. Ғылыми қауымдастық демократиялық қағидалардың орнын медиакратиямен алмастыру тенденцияларының күшеюін цифрлық дәуір тудырған проблемаларының қатарында атап жүр. Бұның көріністері Қазақ елінің бұқаралық медиа кеңістігінде де байқалып қалады. Келеңсіз тенденциялардың алдын алуда бұқараның биік танымдық деңгейін, білім дәрежесін, қоғамдық ой-сананың кең өрісін басты факторлар деп тани аламыз.

Ғаламдық тенденциялардың ықпалымен түрленген саяси модернизация әлеуметтік-саяси коммуникацияның орны мен құзыреттерін өзгертуде. Әлеуметтік коммуникация саяси процестердің қасиеттерін түрлендіріп, жүйенің элементтеріне және ақпаратты жеткізу процестеріне ықпалын күшейтуде. Бұл өзгерістердің әсерімен өздерінің саяси рөлдері мен функцияларын орындауға ынталанған акторлардың әлеуметтік қатынастары нәтижелі болуда. Осының бәрін қорыта келе, нәтижелі әлеуметтік коммуникация – саяси жүйенің функционалды тиімділігін және ілгері дамуын анықтайтын арқалы фактор болып орнығуда деген қорытынды тұжырым жасай аламыз.

Қаржыландыру

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Jurisprudence

THE LEGAL AUTONOMY OF REGIONAL INTEGRATION ORGANISATIONS UNDER INTERNATIONAL LAW: BETWEEN SOVEREIGNTY AND OBLIGATION

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Abstract

This thesis explores the legal autonomy of Regional Integration Organisations (RIOs) under international law, focusing on the balance between delegated supranational authority and the continuing sovereignty of member states. As RIOs increasingly exercise regulatory and adjudicatory powers — particularly within customs unions, common markets, and monetary unions — their evolving legal status raises important questions about the limits of international legal personality and institutional independence.

The study examines the constitutive treaties of RIOs as legal instruments that both authorise and constrain their autonomy, with particular attention to their classification as framework or constitutional treaties. It also assesses the compatibility of RIO functions with the fundamental principles of international law, including those derived from the UN Charter and jus cogens norms.

The thesis argues that international law is progressively recognising the functional legitimacy of RIOs, provided that their operations remain consistent with core legal values. This shift reflects a measured evolution of sovereignty — one that enables deeper cooperation without abandoning foundational international obligations.

Keywords: *Regional integration organisations, supranational authority, international institutional law, state sovereignty, legal autonomy, constitutive treaties, jus cogens, Vienna Convention, delegation of competences, international legal order*

I. Introduction

The proliferation of regional integration organisations (RIOs) over the past decades has raised fundamental questions about the legal autonomy of such bodies within the framework of public international law. These organisations, while grounded in international treaties concluded by sovereign states, increasingly exercise functions that appear to transcend the traditional limits of intergovernmental cooperation. The emergence of supranational competences, independent institutional frameworks, and binding decision-making mechanisms challenges conventional doctrines of state sovereignty and demands a re-evaluation of the status of RIOs in relation to general international law.

This paper critically examines the extent to which RIOs possess legal autonomy, and how this autonomy coexists with the continuing international legal obligations of their member states. It explores the doctrinal and normative tensions between sovereignty, delegated competences, and the binding nature of constitutive treaties, while also assessing the compatibility of RIO practice with foundational principles of international law, including the Charter of the United Nations and norms of jus cogens.

II. Legal Personality and Institutional Autonomy

The legal personality of RIOs is a primary foundation for their autonomy. Once established by treaty, a RIO may acquire distinct legal personality under both international and domestic law, enabling it to conclude agreements, appear before international courts, and act independently in its fields of competence [2, p. 36]. The European Union (EU), the Andean Community, and ECOWAS exemplify this development. However, the scope of legal personality does not in itself resolve the issue of normative autonomy. A more difficult question concerns whether such organisations can exercise autonomous legislative or adjudicative functions in a manner that produces binding effects on states and individuals.

The doctrine of attributed competences suggests that RIOs only possess the powers expressly conferred upon them by their founding treaties. Yet, in practice, many RIOs have developed forms of implied or functional competences, especially where the effective functioning of integration requires

action beyond the explicit treaty text [3, p. 204]. This phenomenon has generated legal debate over whether such evolutions are consistent with the principle of state consent that underpins international treaty law [4, p. 91].

III. Sovereignty, Delegation, and Binding Authority

The delegation of powers to RIOs inevitably implicates the sovereignty of member states. While delegation is rooted in sovereign consent, the irreversible or expansive character of certain delegations—particularly those involving binding regulations or judicial enforcement—raises the question of whether member states can still be regarded as fully sovereign within the transferred fields. The European Court of Justice (ECJ) famously declared in *Costa v ENEL* (1964) that member states had permanently limited their sovereign rights within the areas covered by EU law [1].

In legal theory, a distinction is often made between the external sovereignty of states (i.e., their legal independence from other states) and internal sovereignty (their capacity to govern affairs within their territory). RIOs challenge both dimensions. Internally, supranational rules may override national legislation. Externally, RIOs often act on behalf of their member states in multilateral negotiations, such as those conducted within the institutional frameworks of the WTO and different organs of the United Nations [7, p. 48].

The binding nature of RIO acts—particularly those of a supranational character—must also be reconciled with the international legal obligations of states under other treaties, including the UN Charter. In some cases, RIO obligations may conflict with multilateral commitments. Article 103 of the Charter provides that Charter obligations prevail in such conflicts, limiting the normative autonomy of RIOs in certain domains [9].

IV. Compatibility with General International Law

Constitutive treaties of RIOs rarely contain explicit references to general international law, though their validity is nonetheless conditioned by it. Article 53 of the 1969 Vienna Convention on the Law of Treaties stipulates that treaties conflicting with *jus cogens* norms are void [10]. Thus, integration initiatives must not violate peremptory norms such as the prohibition on the use of force, racial discrimination, or fundamental human rights [6, p. 72].

Additionally, Article 52 of the UN Charter affirms the legitimacy of regional arrangements for the maintenance of international peace and security, provided they act consistently with the purposes and principles of the UN [9]. Although this article explicitly refers to security arrangements, its logic arguably extends to the economic and political activities of RIOs, which may have systemic implications for international order. The Declaration on Principles of International Law of 1970 further confirms the obligation of all international institutions to respect sovereign equality, non-intervention, and peaceful cooperation [8, para. 2].

RIOs must also adhere to the principle of *pacta sunt servanda* in their external relations. A critical issue arises when a member of a Regional Integration Organisation (RIO) seeks to justify non-performance of obligations under one treaty by invoking duties assumed under an integration treaty. While such conflicts are increasingly common in a dense international legal order, they pose complex interpretive challenges. The International Law Commission's study on the fragmentation of international law advocates a contextual and systemic approach to resolving normative collisions. [5, para. 492] However, despite this interpretive guidance, the absence of a definitive hierarchy among treaty regimes continues to create uncertainty, particularly when integration agreements contain autonomous legal orders with potentially competing obligations.

V. Conclusion

The legal autonomy of regional integration organisations remains bounded by the foundational norms of international law. While RIOs may exercise considerable authority—legislative, executive, and judicial—within delegated competences, this authority must be grounded in the consent of member states and exercised consistently with broader legal obligations [2, p. 47-48]. The tension between sovereignty and obligation, coordination and autonomy, lies at the heart of modern legal debates over the legitimacy and limits of regional integration. As RIOs continue to evolve, legal scholarship must grapple with the emergence of plural legal orders and their implications for the unity and coherence of international law.

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Mathematical sciences

APPLICATION OF CONVEX PROGRAMMING TO OBJECT SEARCH

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The main objective is to develop and substantiate effective methods for detecting various objects. To achieve this goal, it is necessary to solve the following problems:

- study the properties of the object that can be lost, the properties of the environment in which the search is carried out, and develop search tools;
 - establish cause-and-effect relationships between the conditions of the search and its results by constructing and analyzing relevant mathematical models;
 - substantiate optimal search and tracking methods that can ensure the maximization or minimization of the selected efficiency criterion;
 - substantiate the optimal distribution of search resources.
- Various mathematical methods are widely used to solve these problems, in particular, methods of operations research [1]. An operations researcher, faced with a new problem, must first of all construct a mathematical model of the problem, determine what class it belongs to, and then select a method for solving it.

Let us assume that a certain movie consists of K frames. Let F_k denote the k -th frame of this movie, and let W denote the embedded object. Then the result of the procedure of embedding an object into the k -th frame can be represented as a linear combination of the object and the k -th frame

$$F_k^w = F_k + aW, \quad k = 1, \dots, K, \quad (1)$$

where a is the scale factor. However, this procedure cannot be used in at least the following cases:

- in the absence of the original video frames;
- in the case of various attacks against the film, in particular, geometric attacks in the form of frame shifting, rotation and scaling [2].

Therefore, in practice, the problem of extracting the object arises, including those cases when the original video frames are missing or if certain attacks were undertaken against the film containing the object in order to remove or destroy them.

Let us consider a possible solution to this problem. First of all, we note that the procedure for embedding the object in the k -th frame according to (1) can be represented as a linear combination of two discrete two-dimensional signals, one of which represents the object, and the other is the k -th frame of the film.

Results

Consequently, the search for a sequence of frames containing an object must be performed within the first part for 6.5 hours and within the third part for 3.5 hours. Within the second and fourth parts, there is no point in performing a search at all. Thus, as a result of using the convex programming model for a specific example, the optimal time costs for searching for a sequence of frames containing an object in each part of the film were determined.

Keywords: convex, programming, object, problems, determine.

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Medical sciences

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MALIGNANT BONE TUMORS: MODERN REALITIES AND TRENDS

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This scientific and analytical work presents modern world and local-regional data on incidence, mortality, lethality rates and five-year survival of such oncological pathology as malignant bone tumors. The issues of etiology and pathogenesis, features of distribution, modern principles of complex diagnostics, as well as prognosis are covered in detail. The epidemiological characteristics of this pathology in our republic are given in the context of regions of the country.

Keywords: *oncology, traumatology and orthopedics, malignant bone tumors, bone sarcomas, biomarkers, epidemiology, incidence, mortality, lethality, five-year survival, prognosis.*

Malignant bone tumors (BT) are divided into: osteosarcoma; chondroblastic osteosarcoma; fibroblastic osteosarcoma (osteofibrosarcoma); telangiectatic osteosarcoma; osteosarcoma in Paget's disease of bone; small cell (round cell) osteosarcoma; central osteosarcoma; intraosseous well-differentiated osteosarcoma; parosteal (juxtacortical) osteosarcoma; periosteal osteosarcoma; highly malignant superficial osteosarcoma; intracortical osteosarcoma; aggressive (malignant) osteoblastoma; chondrosarcoma; conventional chondrosarcoma; mesenchymal chondrosarcoma; dedifferentiated chondrosarcoma; malignant giant cell tumor of bone; giant cell tumor (GCT) of bone; Ewing's sarcoma; undifferentiated sarcoma of bone; chordoma; peripheral neuroectodermal tumor; fibrosarcoma [1].

The TNM classification system is applicable to all primary malignant BT except for malignant lymphoma, multiple myeloma, superficial/juxtacortical osteo- and juxtacortical chondrosarcoma. There must be histological confirmation of the diagnosis, allowing to determine the morphological type of the tumor and the degree of malignancy.

The diagnostic criteria are as follows. Complaints about: the presence of a BT, enlargement of peripheral lymph nodes. Anamnesis: the time of tumor onset and/or other symptoms associated with the tumor, the diagnostic and/or therapeutic measures taken are specified.

Physical examination: palpation of the tumor localization area, determination of size, density, mobility, tenderness, involvement of adjacent anatomical structures and regions; palpation of all accessible groups of lymph nodes (cervical, axillary, inguinal-femoral, etc.).

Laboratory tests: 1) cytological examination (increase in cell size up to giant, change in shape and number of intracellular elements, increase in size of nucleus, its contours, different degrees of maturity of nucleus and other cellular elements, change in number and shape of nucleoli); 2) histological examination (pronounced cellular polymorphism, increase in cell size, pronounced hypochromia, large nuclei contain one or more nucleoli, there are glandular structures of cancer cells in the form of rosettes, many cells in a state of mitosis); 3) immunohistochemical examination of biopsy and surgical material for detailed determination of sarcoma subtype; 4) molecular genetic study of microsatellite instability to determine the possibility of immunotherapy.

Instrumental tests: 1) Ultrasound of abdominal organs and retroperitoneal space (determination of metastatic lesions of abdominal organs and retroperitoneal space); 2) computed tomography (CT) of the chest, abdominal cavity and pelvis (assessment of the pelvic lymph nodes and retroperitoneal space, organic changes in the chest and abdominal organs); 3) magnetic resonance imaging (MRI) of the brain (performed in case of suspected metastatic lesions of the brain); 4) CT of the chest and abdominal cavity (mandatory determination of metastatic lesions of the chest organs); 5) positron emission tomography (PET), PET/CT of the whole body (performed to diagnose the prevalence of the tumor process or disease progression, or to assess the dynamics of the effectiveness of special treatment); 6) MRI of the brain (if CT is not possible) for alveolar sarcoma, osteosarcoma, Ewing's sarcoma (metastatic lesions of the brain are most often detected).

As noted by Hosseini H. et al. [2], though relatively rare, BT significantly impact patient health and treatment outcomes. This systematic review analyzes the incidence, types, survival rates, and risk factors associated with BT, including both benign and malignant forms. This systematic review was conducted using the keywords "BT," "epidemiology," "benign BT," "malignant BT," "osteosarcoma," "Ewing sarcoma," "chondrosarcoma," "risk factors," and "survival" in electronic databases including PubMed, Scopus, Web of Science, and Google Scholar from 2000 to 2024. The search strategy was based on the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement. Finally, 9 articles were selected for inclusion in the study. The systematic review highlights that primary BT can be classified into benign and malignant types, with osteosarcoma being the most prevalent malignant form, particularly among adolescents and young adults. The epidemiology of BT is influenced by factors such as age, gender, geographic location, and genetic predispositions. Recent advancements in imaging techniques have improved the detection of these tumors, contributing to an increasing recognition of their prevalence. Data shows that the limited-duration prevalence of malignant bone tumors has increased significantly. This increase is from 0.00069% in 2000 to 0.00749% in 2018, indicating an increasing recognition and diagnosis of these rare tumors over time. Survival rates vary significantly by tumor type, with approximately 50-60% for osteosarcoma and around 70% for Ewing's sarcoma, though these rates decrease with metastasis. Key risk factors identified include genetic predispositions such as Li-Fraumeni syndrome and TP53 mutations, environmental exposures like radiation, and growth patterns related to height.

The authors emphasize that this systematic review lays the groundwork for further investigations into the epidemiological profile of bone tumors, yet several promising avenues remain for future research. Building on the current findings, future studies could aim to: 1) expand data integration across geographies and populations: the present review focused on studies published in English and derived primarily from databases frequently used in Western countries; future research should seek to incorporate data from non-English literature and diverse geographical regions to enhance the generalizability of results on bone tumor prevalence, risk determinants, and survival patterns; 2) employ prospective and multicenter study designs: moving beyond the retrospective analyses predominating in the current literature, prospective and well-coordinated multicenter studies can help validate and refine the observed associations; these studies would ideally be designed to monitor patients over time, allowing for a more robust assessment of factors such as the impact of genetic predispositions, environmental exposures, and growth patterns on tumor pathogenesis and survival outcomes; 3) leverage advanced methodologies for biomarker discovery: the association between genetic predispositions (e.g., Li-Fraumeni syndrome) and osteosarcoma risk provides a compelling case for further

research into specific biomarkers; future perspectives include integrating high-throughput sequencing and other omics technologies to identify genetic and molecular signatures that might predict tumor behavior or response to treatment; 4) investigate preventive and therapeutic strategies: considering the identified risk factors – including the role of ionizing radiation exposure and rapid growth patterns – targeted prevention strategies should be developed; future research could explore screening protocols for high-risk groups and also evaluate novel therapeutic interventions that modify the underlying biological pathways (e.g., insulin-like growth factor (IGF)-1 signaling) linked to tumorigenesis; 5) incorporate meta-analytic techniques where feasible: although data heterogeneity limited the scope of meta-analysis in the current review, ongoing accumulation of homogeneous and high-quality data may allow for comprehensive meta-analyses in future studies; such efforts could provide more definitive evidence regarding survival rates and the impact of various risk factors on different bone tumor types.

Clinical implications: 1) enhanced early detection and screening: the rising prevalence of malignant bone tumors highlights the need for improved screening protocols; clinicians should consider integrating routine examinations for high-risk populations, particularly those with known genetic predispositions such as Li-Fraumeni syndrome or individuals with a history of significant ionizing radiation exposure; 2) risk stratification and personalized management: given the identified risk factors – including genetic mutations, environmental exposures, and rapid growth patterns – there is a clear rationale for implementing personalized risk assessment strategies; tailoring follow-up, diagnostic testing, and preventive interventions to the individual risk profile could lead to earlier diagnosis and better treatment outcomes; 3) multidisciplinary approach to treatment planning: the variation in survival rates between osteosarcoma and Ewing's sarcoma, and the impact of localized versus metastatic disease, underscore the importance of a coordinated, multidisciplinary approach to patient management; collaboration among oncologists, radiologists, surgeons, and genetic counselors can ensure comprehensive care that addresses the complexities of bone tumor treatment; 4) implementation of genetic counseling and testing: with the significant association between osteosarcoma and genetic conditions such as Li-Fraumeni syndrome, clinicians should consider referring patients with a positive family history or suggestive clinical indicators for genetic counseling and testing; early identification of genetic risks can facilitate timely surveillance and intervention strategies; 5) informed decision-making based on epidemiological insights: the detailed synthesis of prevalence, risk determinants, and survival patterns in this review can aid clinicians in making evidence-based decisions; this includes counseling patients regarding prognosis and potential treatment outcomes, and may also inform the development of local or national guidelines aimed at reducing disease burden; 6) promotion of preventive strategies: the association of environmental factors such as ionizing radiation with an increased risk of developing bone tumors suggests that minimizing unnecessary radiation exposure could be a crucial preventive measure; this calls for the careful consideration of radiation doses in medical imaging and therapeutic procedures, as well as public health initiatives to reduce exposure in high-risk settings.

These clinical implications underscore the importance of integrating epidemiological data into clinical practice, promoting risk-adapted screening and management strategies, and fostering multidisciplinary collaboration to enhance patient outcomes in the field of bone tumor management [2].

At the same time, our colleagues highlight the limitations of this systematic review. They are as follows: 1) language and publication bias: the review exclusively included studies published in English; this language restriction, along with the omission of non-indexed or unpublished studies, may have introduced a publication bias, thereby limiting the comprehensiveness of the evidence base; 2) heterogeneity of study designs and data sources: the included studies varied widely in methodological approaches, sample sizes, and populations studied; this heterogeneity, particularly in data collection and analysis methods, could affect the consistency and comparability of the reported outcomes, potentially reducing the robustness of the synthesized findings; 3) retrospective nature of most studies: a significant proportion of the evidence was derived from retrospective analyses, including database studies and reviews; such designs are subject to inherent limitations (e.g., recall bias, and incomplete data) that may influence the accuracy and reliability of the conclusions related to risk factors and survival patterns; 4) limited assessment of confounding factors: although efforts were made to assess methodological quality using tools like the Joanna Briggs Institute critical appraisal tools, many studies did not thoroughly control for confounding variables, which may have impacted the observed associations between risk determinants and bone tumor outcomes; 5) restricted time frame and data availability: the literature search was confined to publications from 2000 to 2024; this temporal limitation may have excluded earlier but potentially relevant studies and the rapidly evolving nature of cancer diagnosis and treatment may mean that some findings could soon require re-evaluation as new data emerge; 6) reliance on

secondary data sources: the review depended heavily on data extracted from established databases [(such as the Surveillance, Epidemiology, and End Results (SEER) database)] and gray literature; while these sources provide valuable insights, they might also be accompanied by issues related to data completeness, accuracy, and potential reporting biases.

In conclusion, the researchers say that bone tumors represent a critical area within oncology, characterized by their unique epidemiological features and significant impact on affected individuals. This systematic review provides valuable insights into the incidence rates, survival outcomes, and risk factors associated with various types of bone tumors, including both benign and malignant forms. The findings indicate that osteosarcoma remains the most common primary malignant bone tumor, particularly affecting adolescents and young adults. The review highlights the importance of early diagnosis and treatment intervention, as survival rates are significantly better for patients with localized disease compared to those with metastatic conditions. The observed variations in survival rates across different tumor types underscore the need for tailored treatment strategies. Key risk factors identified include genetic predispositions, environmental exposures, and growth patterns, which can inform targeted screening protocols for high-risk populations. The increasing recognition of bone tumors, facilitated by advancements in imaging techniques and heightened awareness among healthcare professionals, suggests a positive trend in early detection. Despite these advancements, there remains a need for ongoing research efforts to improve diagnostic accuracy and treatment strategies further. Enhanced awareness among healthcare providers regarding the epidemiological landscape of bone tumors can lead to timely interventions that ultimately improve patient outcomes. Future studies should focus on novel biomarkers and the application of machine learning techniques to refine diagnosis and treatment approaches for bone tumors [2].

In the study by Vaezi M.A. et al. [3] tried to provide insights into the expression pattern and diagnostic significance of the IGF-1 axis main mediators in three main primary bone tumor types with different degrees of severity. The real-time quantitative reverse transcriptase/polymerase chain reaction [(qRT-PCR) (to analyze IGF-1 receptor (R) gene expression)], the immunohistochemistry (to measure IGF-1R protein), and the ELISA assay (to assess the circulating level of IGF-1, IGF-binding protein (BP)-1, and IGFBP-3) were applied to confirm this hypothesis. A total number of 180 bone tissues (90 tumors and 90 noncancerous adjacent tissues) and 120 blood samples drained from 90 patients with bone tumors and 30 healthy controls were enrolled in the study. The association of IGF-1 axis expression pattern with the patient's clinical pathological characteristics and tumor aggressive features, the diagnostic and predictive values were assessed for all tumor groups. A significantly elevated level of IGF-1R gene and protein was detected in bone tumors compared to the noncancerous bone tissues that were prominent in osteosarcoma and Ewing sarcoma compared to the GCT group. The positive association of the IGF-1R gene and protein level with tumor grade, metastasis, and recurrence was detected in the osteosarcoma and Ewing sarcoma groups. The circulating level of IGF-1, IGFBP-1, and IGFBP-3 were increased in osteosarcoma and Ewing sarcoma and GCT groups that were correlated significantly to the tumor severity. The ability of the IGF-1 axis to discriminate between bone tumors also malignant and benign tumors was considerable. In conclusion, the researchers emphasize that their data indicate that IGF-1R, IGF-1, IGFBP-1, and IGFBP-3 levels are associated with bone tumor malignancy, metastasis, and recurrence, which may serve as biomarkers for osteosarcoma and Ewing sarcoma recurrence.

In the study on homogeneous and heterogeneous prognostic factors for patients with bone sarcoma [4], the survival of patients with different bone sarcomas and homogeneous and heterogeneous prognostic factors for different types of bone sarcomas were studied. The inclusion criteria were as follows: (i) patients with malignant bone sarcomas, including osteosarcoma, chondrosarcoma, Ewing sarcoma, and chordoma; (ii) patients with clear information on the metastatic sites and surgery treatments; (iii) vital status was recorded and the survival time was provided; (iv) the related variables to be analyzed were complete; and (v) the survival time and related prognostic factors were retrospectively analyzed. The exclusion criteria were as follows: (i) bone sarcomas originated from other sites; and (ii) bone sarcomas diagnosed at autopsy or indicated in death certification. All the data were obtained from the SEER program and organized using the SEER*Stat application (version 8.3.5). The database, named Incidence-SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2018 Sub (1975-2016 varying), was released on April 2019. To obtain enough detailed information about metastases, authors collected all patients with malignant bone sarcomas [(adolescents and young adults (AYA) site recode/ World Health Organization (WHO) 2008 = 4 Osseous & Chondromatous Neoplasms)] diagnosed between January 2010 and December 2016. According to the inclusion criteria, the primary site was restricted to "bones and joints" (the ICD-O-3 topographical code: C40.0-C41.9) in the SEER

program. A total of 5274 patients who were actively followed up were selected initially. According to "AYA site recode/WHO 2008" in the SEER program, "4.1 Osteosarcoma," "4.2 Chondrosarcoma," and "4.3 Ewing tumor," presented osteosarcomas, chondrosarcomas, and Ewing sarcomas, respectively, were selected from these 5274 patients. Because chordoma (defined using the International Classification of Diseases for Oncology, third edition morphological code 9370/3) took up a large proportion of the section "4.4 Other specified and unspecified bone tumors," patients with chordoma were also included in final cohort.

The primary outcome of the survival analysis was the overall survival (OS), which was defined as the time from the diagnosis of bone sarcomas to death by all causes. For subjects who had been lost to follow up prior to death, the last follow-up time is usually calculated as time of death. The OS was used to reveal the survival condition of patients. The survival curve, which is a Kaplan-Meier curve, is the curve describing the survival condition of patient on time. It is important in the survival analysis and can be used to compare the survival difference of various cohorts. Prognostic factors are factors related to the survival of patients and can be used to predict the prognosis of patients. They are determined using Cox proportional hazard regression analysis. They can be used in the prediction of survival outcome and for clinical management. A total of 4732 patients were included with a follow up of 25 (0-83) months. The mean age of patients was 39.7 ± 24.1 years. The 1-year, 3-year, and 5-year OS rate for the entire cohort was 86.2% (95% confidence interval [CI]: 85.2%-87.2%), 70.5% (95% CI: 68.9%-72.1%), and 63.0% (95% CI: 61.2%-64.8%), respectively. Factors including age older than 40 years, higher grade, regional and distant stage, tumor in the extremities, T2 stage, bone and lung metastases, and non-surgery were significantly associated with the poor survival of the entire cohort. The mean OS duration of patients with chordoma, chondrosarcoma, Ewing sarcoma, and osteosarcoma was 66.86 (95% CI: 64.06-69.66), 63.53 (95% CI: 61.81-65.25), 58.06 (95% CI: 55.49-60.62) and 54.91 (95% CI: 53.14-56.69) months, respectively. Compared with chordoma, the hazard ratio and 95% CI for patients with chondrosarcoma, Ewing sarcoma, and osteosarcoma were 1.30 (95% CI: 1.04-1.62; $P = 0.023$), 1.69 (95% CI: 1.33-2.14; $P < 0.001$), and 2.00 (95% CI: 1.61-2.48; $P < 0.001$), respectively. Different bone sarcomas showed homogenous and heterogenous prognostic factors. In conclusion, our colleagues note that the best survival was found in patients with chordoma, followed by chondrosarcoma, Ewing sarcoma, and osteosarcoma. Different bone sarcomas showed homogenous and heterogenous prognostic factors, which can be used to assist sarcoma-specific management [4].

Eghtedari A.R. et al. [5] in their study determined the expression pattern, diagnostic value and association of PD-L1, IFN- γ and TGF- β with bone tumor type, severity and recurrence. 300 human samples from patients with osteosarcoma, Ewing sarcoma, and GCT were enrolled. The PD-L1 gene and protein expression were assessed by qRT-PCR and immunohistochemistry, respectively. Enzyme-linked immunosorbent assay and flow cytometry was used to detect cytokines and CD4/CD8 T cell percentages, respectively. A considerable increase in PD-L1 level was detected in bone tumor tissues at both gene and protein levels that was considerable in osteosarcoma and Ewing sarcoma. A positive correlation was detected regarding the PD-L1 and tumor metastasis and recurrence in osteosarcoma and Ewing sarcoma. The increased IFN- γ level was detected in patients with metastatic, and recurrent osteosarcoma tumors that were in accordance with the level of TGF- β in these samples. The simultaneous elevation of IFN- γ and TGF- β was detected in Ewing sarcoma and GCT, also the CD4 + /CD8 + ratio was decreased significantly in patients with osteosarcoma compared to GCT tumors. The elevated levels of PD-L1, TGF- β , and IFN- γ were associated with bone tumor severity that can provide insights into the possible role of this axis in promoting immune system escape, suppression, and tumor invasion.

Wang Z. et al. [6] in their work they say that aggressive benign, malignant and metastatic bone tumors can greatly decrease the quality of patients' lives and even lead to substantial mortality. Several clinical therapeutic strategies have been developed to treat bone tumors, including preoperative chemotherapy, surgical resection of the tumor tissue, and subsequent systemic chemo- or radiotherapy. However, those strategies are associated with inevitable drawbacks, such as severe side effects, substantial local tumor recurrence, and difficult-to-treat bone defects after tumor resection. To overcome these shortcomings and achieve satisfactory clinical outcomes, advanced bifunctional biomaterials which simultaneously promote bone regeneration and combat bone tumor growth are increasingly advocated. These bifunctional bone substitute materials fill bone defects following bone tumor resection and subsequently exert local anticancer effects. In their study, the authors describe the different types of the most common bone tumors and provide an overview of the common treatment options. Our colleagues also review the current progress in the development of bifunctional bone replacement materials that combine osteogenic and anticancer efficacy. To this end, they classify these

biomaterials based on their anticancer mechanism resulting from i) the intrinsic properties of the biomaterial, ii) local release of anticancer agents, and iii) biomaterials inducing oxidative stress and iv) inducing hyperthermia. Accordingly, this review offers researchers, surgeons, and oncologists an up-to-date overview of our current knowledge about bone tumors, their treatment options, and the development of modern bifunctional biomaterials with great potential for clinical application in oncological orthopedics.

Scuderi S.A. et al. [7] focus on the fact that micro ribonucleic acids (miRNAs) are small endogenous noncoding RNAs molecules that regulate gene expression post-transcriptionally. A single miRNA is able to target hundreds of specific messenger RNA (mRNAs) by binding to the 3'-untranslated regions. miRNAs regulate different biological processes such as cell proliferation, differentiation and apoptosis. Altered miRNA expression is certainly related to the development of the most common human diseases, including tumors. Osteosarcoma, Ewing's sarcoma, and chondrosarcoma are the most common primary bone tumors which affect mainly children and adolescents. A significant dysregulation of miRNA expression, in particular of mir-34, mir-21, mir-106, mir-143, and miR-100, has been revealed in osteosarcoma, Ewing's sarcoma and chondrosarcoma. In this context, miRNAs can act as either tumor suppressor genes or oncogenes, contributing to the initiation and progression of bone tumors. The in-depth study of these small molecules can thus help to better understand their biological functions in bone tumors.

Our colleagues point out that despite countless scientific advances, current therapies and diagnostic procedures for osteosarcoma, Ewing's sarcoma, and chondrosarcoma have not yet proven very satisfactory. Thus, continuous research is needed in order to identify new molecular targets and new therapies for osteosarcoma, Ewing's sarcoma, and chondrosarcoma and to improve outcomes and quality of life for patients. Thanks to their direct involvement in biological processes and in human diseases such as tumors, miRNAs could reveal useful treatments and early diagnosis techniques for bone tumors such as osteosarcoma, Ewing's sarcoma and chondrosarcoma. It is well-demonstrated that miRNAs can be valid biomarkers for cancer diagnosis and prognosis. To date, however, the available evidence on miRNAs as diagnostic and prognostic biomarkers for bone tumors is only in the early stages. The present state of knowledge on miRNAs suggests that they are able to regulate osteoblast differentiation and bone formation and that their dysregulation induces bone degeneration and bone-related diseases, thus conferring relevant value for both medicine and basic research. Therefore, further studies are needed in order to better understand their role and function in bone tumors in a way that could be useful for the development of new biomarkers for the treatment and early diagnosis of osteosarcoma, Ewing's sarcoma, and chondrosarcoma. In the field of oncology research, miRNAs represent very interesting molecules to study for the development of new therapeutic approaches to counteract bone tumor progression. Advances in molecular techniques have contributed to better understanding of the molecular mechanisms involved in bone tumors. Thanks to their multiple properties, miRNAs could represent alternatives therapeutic treatment vectors for the management of bone tumors such as osteosarcoma, Ewing's sarcoma, and chondrosarcoma, either alone or in association with common chemotherapy drugs, thereby improving patients' quality of life [7].

Now, as for this pathology in our country at the republican level. The incidence of BT in the Republic of Kazakhstan in 2023 was 0.87 per 100 thousand population (0.93 in 2022), amounting to 174 people in absolute numbers (181 cases a year earlier). The proportion of cases with a diagnosis established for the first time in life, recorded by oncology organizations, was 0.5%, as in 2022. At the same time, 99 men fell ill (proportion - 0.6%), women - 75 (proportion - 0.4%) [8].

Above the average republican level of BT (0.9 per 100 thousand population) was established in 7 regions of the country: Zhetysay - 1.3 (maximum indicator); Turkestan and Almaty - 1.2; Aktope and the city of Almaty - 1.1; Zhambyl and Atyrau - 1.0. Two regions - North Kazakhstan and Pavlodar - are on par with the national average. This indicator is lower than the national average in 11 regions: West Kazakhstan - 0.4 (the lowest level); Ulytau, Karaganda and Abay - 0.5; Akmola, Kyzylorda, Mangistau regions, as well as in the cities of Astana and Shymkent - 0.6; East Kazakhstan - 0.7; Kostanay - 0.8 regions per 100 thousand people.

Mortality from this pathology was 0.3 per 100 thousand people (0.4 - a year earlier). The regions with the BT mortality rate above the national average (0.3 per 100,000 population) include: North Kazakhstan and East Kazakhstan - 0.8 (maximum level); Akmola, Turkestan and Ulytau - 0.5; Almaty, Kostanay regions and the city of Almaty - 0.4. Zhambyl, West Kazakhstan, Karaganda regions, as well as the cities of Astana and Shymkent are on par with the national average. The lowest rates were noted in Atyrau and Mangistau - 0.0; Aktope, Zhetysay, Kyzylorda and Pavlodar - 0.1; Abay - 0.2 regions per 100,000 population [8].

The one-year lethality rate was a high 20.8% (19.7% in 2022). At the same time, the ratio between one-year lethality and neglect (stage IV) was 1.8. At the same time, we recall that the farthest from "1" is the worst ratio between one-year lethality and neglect.

Now, regarding preventive examinations. It should be noted that during large-scale preventive examinations of the population in 2023, significantly more patients with malignant neoplasms were actively identified than in 2022. This is 25,193 patients versus 23,623 patients identified in 2022, i.e. +6.6%. This is due to the further abatement of the epidemiological troubles due to coronavirus and the increased availability of preventive care for the population. The proportion of patients identified during preventive examinations increased from 62.0% to 62.4% of the total number of patients identified per year.

Of course, when analyzing the epidemiological situation, early diagnosis indicators are very important issues.

In general, in terms of the total number of detected cancer cases of all localizations, in 2023 the proportion of forms detected at early stages (0, I-II stages) increased from 66.3% to 67.9%.

As for BT, during preventive examinations the early detection of this pathology increased from 52.6% to 54.4%. The absolute number of BT patients detected during preventive examinations was 92 people (91 - a year earlier).

At the same time, it should be noted that the proportion of BT patients detected at early stages has significantly decreased from 73.6% to 64.1%. In absolute numbers, this is 59 people in 2023 and 67 in 2022, detected at stages I-II of the disease. The regions where the proportion of patients with early stage I of the pathology under consideration is higher than the national average (14.8% and a low 16th rank place) include the following: Kyzylorda - 60.0% (the best indicator); North Kazakhstan - 40.0%; West Kazakhstan - 33.3%; Atyrau and Kostanay - 28.6%; Akmola and Zhetysu - 25.0%; Aktobe - 22.2%; East Kazakhstan - 20.0% and the city of Almaty - 16.0%. The lowest indicators of early diagnosis were recorded in: Abay, Almaty, Zhambyl, Karaganda, Mangistau, Pavlodar and Ulytau regions (the worst indicator is not a single patient detected at stage I of the disease - 0.0%). Next come: the city of Astana - 11.1%; Turkestan region - 12.5% and the city of Shymkent - 14.3% [8].

BT among all nosological forms of malignant tumors by early diagnosis (stages I-II) took 12th place, amounting to 62.1%.

The regions where the proportion of patients with BT, identified at stages I-II is above the national average include the following regions. The undisputed leaders (indicator - 100.0%) include five regions, including Abay, West Kazakhstan, Kyzylorda, North Kazakhstan and Ulytau. Then come: Atyrau and Pavlodar - 85.7%; the city of Astana - 77.8%; Akmola and Zhetysu - 75.0%; Kostanay - 71.4%; Aktobe - 66.7% of the region of the republic. Low rates of early diagnosis were recorded in the following regions. The anti-leader in this indicator and the worst result in the country is the Karaganda region, where not a single patient with this pathology was identified in the early stages of the disease - 0.0%. Mangistau and East Kazakhstan - 40.0%; Zhambyl - 41.7%; the city of Shymkent - 42.9%; Turkestan - 50.0%; Almaty - 58.8% of the region and the city of Almaty - 60.0% [8].

As is clearly seen from the above data, there is a very large spread in the early diagnostics rates across the country, from very good to disappointing. Of course, it is necessary to take into account migration processes and other factors that affect the early diagnostics rates, but nevertheless, the results obtained give reason not to stop there, both for oncologists and traumatologists, radiologists - visual diagnostics doctors, sports medicine doctors, and, of course, for general practitioners, since improving the early diagnostics rates of malignant tumors, as one of the main postulates and one of the main tasks of medicine as a whole, continues to be relevant today.

The proportion of stage IV BT among all nosological forms of malignant neoplasms was 11.2%, and this is the 16th ranking place. In general, in 2023, the share of malignant neoplasms of stage IV in the republic for the sum of all nosologies decreased from 12.58 to 11.7% (from 4790 to 4735 patients). As for the average republican indicator of the share of stage IV (11.2%), the following regions stand out against this background: Abay, Almaty, Atyrau, Zhetysu, West Kazakhstan, Kyzylorda, Kostanay, Pavlodar, North Kazakhstan, Ulytau regions and the city of Astana - 0.0%. Then come: the city of Almaty - 8.0% and the Zhambyl region - 8.3%. In the Karaganda region, every second patient with BT was detected in the terminal stage of the disease - 50.0%. Next come: the city of Shymkent - 42.9%; Mangistau and East Kazakhstan 40.0%; Akmola 25.0%; Aktobe - 22.2% and Turkestan - 12.5% regions.

The morphological verification rate of the disease in the country was 84.6%. In 12 regions out of 20, this is a 100% figure (Abay, Akmola, Aktobe, Atyrau, East Kazakhstan, Zhambyl, West Kazakhstan, Mangistau, Pavlodar, North Kazakhstan, Ulytau regions, as well as the city of Astana). The lowest figure

is in the city of Almaty - 44.0%. Further down the list: Zhetysu - 50.0%, Kyzylorda - 60.0%; Kostanay - 71.4%; Karaganda - 83.3%; the city of Shymkent - 85.7%; Almaty - 94.1% and Turkestan 95.8% regions [8].

The total number of patients with malignant neoplasms registered with specialized oncology organizations of the republic continued to grow and by the end of 2023 amounted to 218,186 people, with an increase of 6.0% compared to the level of the previous year (2022 - 205,822, +5.8%). The overall incidence rate of malignant neoplasms increased by 3.9%, from 1055.3 to 1096.4 per 100 thousand population. The growth of this indicator is due to both the increase in the incidence and detection of pathology, and the increase in the survival rate of cancer patients.

In addition, statistical data on patients diagnosed with malignant neoplasms, who have been under observation for 5 years or more and continue to be observed in 2023, showed that the number of patients under observation by oncological organizations in Kazakhstan for over five years continued to grow and at the end of the reporting year amounted to 117,616 people, with an increase of 6.2% (2022 - 110,790 people, +6.6%) (form No. 7).

One cannot ignore such an important clinical aspect as the coverage in the Republic of Kazakhstan of special treatment for patients diagnosed with BT for the first time in their lives. In 2023, the number of hospitalizations for all nosological forms of malignant tumors in oncological organizations of the country amounted to 108,252 cases (2022 - 101,095), with an increase of 7.1% compared to the previous year, which is associated with a constant increase in the number of cancer patients, improvement of the standardization of oncological care, and the development of palliative and restorative services.

At the end of 2023, the absolute number of BT patients who completed specialized treatment was 83 people, continuing treatment - 64 patients. In percentage terms, the following results were obtained by methods and types of treatment. The overwhelming majority of patients received complex treatment - 53.0%, only surgical - 26.5%, only drug - 9.6%, combined - 2.4%, only radiation - 1.2%, chemoradiation - 1.2%.

Further, regarding the five-year survival of patients. As for BT, at the end of 2023, 1,661 people were registered with the dispensary, or 8.3 per 100 thousand of the population (at the end of 2022 - 1,637 patients, or 8.4 per 100 thousand of the population, respectively).

At the same time, the mortality rate of the observed contingents in 2023 was 3.9%, 4.8% - a year earlier.

The five-year survival rate of patients with BT slightly decreased from 74.0% in 2022 to 73.1% - in 2023 [8].

Summarizing the above, we can conclude that BT, despite not having the highest place in terms of incidence among all existing malignant tumors of other localizations, a priori leads to high disability of this contingent of patients. At the same time, despite the small percentage of patients detected at stage IV, given a number of factors, low rates of early diagnosis do not allow oncologists to "sleep peacefully", since the locally advanced stage III, which significantly prevails over all stages, in addition to the prevalence itself, leads, as indicated above, to aggressive treatment methods and, as a consequence, to disability of these patients, despite the recent development and implementation of various technologies for prosthetics of bone defects. The veiled and variable symptoms, and in some cases their complete absence, the similarity of clinical manifestations with various non-core processes, leads to the neglect of the disease. All this requires both oncologists and, first of all, primary health care workers and, of course, traumatologists, radiologists - visual diagnostic doctors, sports medicine doctors to increase the level of cancer alertness, inform the population about early symptoms that may indicate this pathology or the onset of proliferative changes and conduct high-tech diagnostic measures and, as a result, timely treatment. People from the risk group are recommended to visit specialized specialists annually and, if necessary, undergo an examination.

An epidemiological assessment of the situation with BT in our country suggests that there are sometimes significant differences in the regions not only in incidence rates, but also in the parameters of early diagnosis and mortality from this pathology. In connection with the above, this pathology continues to be a serious problem in modern clinical oncology.

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Pedagogical sciences

CROSS-CULTURAL INTERACTION BETWEEN CHINA AND BELARUS AS A FACTOR IN THE DEVELOPMENT OF THE EDUCATIONAL SPACE

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Abstract

In recent years, China and Belarus have been actively developing cross-cultural interaction in the educational field. As the number of students studying at Belarusian universities continues to grow, understanding the educational and cultural differences between the two countries becomes an important factor in the development of the educational space and overcoming cross-cultural barriers. This interaction fosters the strengthening of educational cooperation, the formation of new educational formats, and the improvement of mutual understanding between the countries.

Keywords: *cross-cultural interaction, educational cooperation, cultural differences, educational space, intercultural communication*

Education is not only a cultural phenomenon but also an important component of the development of international educational space. Differences in educational cultures reflect not only the social, cultural, and geographical features but also the different educational systems. These differences help create diverse educational models, promoting effective cooperation between countries.

Cross-cultural interaction between China and Belarus serves as a link for creating new educational practices, playing an essential role in the development of educational systems and the formation of an open educational space, based on mutual understanding and respect for cultural differences. Joint educational initiatives such as academic exchanges, cultural projects, language training, and cooperation in educational technologies strengthen friendly relations and facilitate the development of educational potential in both countries.

1. Current State of Educational Cooperation Between China and Belarus

China and Belarus have established broad educational cooperation, with significant cross-cultural exchange shaping the educational landscape of both countries. In Chinese universities 11 centers of Belarusian studies and one institute dedicated to economic research on Belarus provide crucial platforms for educational exchange between the two nations. [1. Chinese Language and Culture Centers]

In Belarusian educational institutions, there are 6 Confucius Institutes and 8 Chinese language courses, fostering greater cultural understanding and language proficiency. Furthermore, 7 joint research and teaching centers (3 laboratories, 2 centers, and 2 institutes) have been established across the educational institutions of both countries, enhancing the collaborative academic environment.

In recent years, Belarusian educational institutions have signed over 100 direct cooperation agreements with Chinese educational entities, bringing the total number of such agreements to more than 500. [2. Ministry of Foreign Affairs of Belarus]

From 2021 to 2024, the number of Chinese students studying in Belarus has consistently exceeded 6,000 annually, making China the largest source of foreign students in Belarus, surpassing Turkmenistan.

This growth reflects the dynamic development of educational exchange between the two countries, further contributing to the development of a shared educational space.

	2019/20	2020/21	2021/22	2022/23	2023/24
Всего	19 745	20 936	24 338	20 474	18 838
из них из:					
Китая	2 112	3 634	8 011	6 492	6 608
Узбекистана	418	1 045	2 327	2 999	2 434
Туркменистана	10 056	8 738	6 451	3 462	2 214
Шри-Ланки	819	1 016	1 439	1 583	1 828
Российской Федерации	1 489	1 517	1 397	1 391	1 492
Индии	656	734	772	781	825
Ливана	531	659	545	534	490
Израиля	82	115	285	338	318
Нигерии	322	259	284	274	256
Азербайджана	313	284	266	261	218
Конго, Демократической Республики	65	156	188	179	181
Таджикистана	425	323	223	222	175
Казахстана	231	170	194	171	150
Ирана, Исламской Республики	539	416	313	190	144
Удельный вес иностранных граждан в общей численности студентов и магистрантов, процентов	7,2	7,9	9,5	8,6	8,1

Figure 1 – Number of students and graduate students – foreign nationals, studying at higher education institutions of the Republic of Belarus [3. Belstat, p. 31].

2. Differences in the Educational Systems of China and Belarus

There is a clear distinction between the educational systems of China and Belarus. Belarus has 42 state universities and 7 private universities offering education at various levels. State universities provide free education, but the competition is fierce, and only the top students can secure a free spot. Typically, only the strongest candidates out of 3-5 applicants are accepted. Depending on the specialty, competition can be even more intense. [4. Bely, Adashkevich, p. 76]

In contrast, education in China is highly competitive, especially during the entrance examinations and the process of gaining admission to prestigious universities. The large population of China and the uneven distribution of educational resources across regions lead to significant inequalities in access to quality education. Educational resources are mainly concentrated in large cities and economically developed regions, making it difficult for students from less developed areas to gain admission to top universities. This, in turn, can impact their future career opportunities and social status.

These differences reflect the distinct educational approaches and policies of the two countries. China focuses on selection and competitiveness, while Belarus places greater emphasis on student interests, allowing them to develop comprehensively. This disparity in educational systems also reflects the cultural characteristics and directions of educational reforms in each country. [5. Jin Xingyu, Cheng Caichao, Bai Shan, p. 12]

3. Social Competitiveness

According to data from the National Statistical Committee of Belarus, the largest group of international students in Belarus consists of Chinese nationals. This is due to the increasingly intense competition in education and the labor market within China. As the number of students in Chinese universities grows, many Chinese students choose Belarus for higher education, particularly in language studies and graduate programs.

It is also noteworthy that an increasing number of Chinese students are opting for graduate programs in Belarus that are taught in English. This trend reflects their desire to quickly improve their qualifications and enhance their competitive position in the labor market back home. This growing preference for Belarus as an educational destination contributes to the rising international perspective among Chinese students, while also highlighting the attractiveness of Belarusian education as a means to enhance personal competitiveness.

This trend of studying abroad not only illustrates the cross-cultural interaction between China and Belarus but also showcases how Belarus is becoming an essential part of the educational space, contributing to the development of both countries' educational systems.

4. Differences in Education from the Perspective of Language and Culture

Language serves as an essential bridge for cross-cultural communication. However, language differences also pose significant challenges in educational exchange between China and Belarus. For Chinese students, the Belarusian Russian language is the official language, and studying it, especially in terms of spoken language and grammar, presents certain difficulties. The Chinese language, as an isolating language, differs significantly from Russian, which is a fusional language. For example, Chinese does not use inflections to indicate case or tense, while Russian expresses these grammatical relationships through word endings. These differences create challenges for Chinese students learning Russian.

As a result, many Chinese students opt for English as their primary language of instruction rather than Russian. This trend facilitates the learning process and helps students better integrate into the educational system of Belarus. However, since most Chinese students are not proficient in Russian, they face language barriers in daily life, which affects their communication with locals and may limit their social interactions and cultural integration. [6. Shou Jiarui, Yang Lipin, p. 78]

5. Paths for Developing Educational Cooperation

For further development of educational cooperation, China and Belarus should strengthen mechanisms for cross-cultural exchange and deepen cooperation in the following areas:

1. Deepening Project-based Cooperation: Expand cooperation based on existing programs in academic exchange, language training, and educational technologies, especially in the areas of dual degree programs, joint learning, and other flexible and multifaceted models.

2. Strengthening Cultural Adaptation for Teachers and Students: Conduct regular cultural exchanges, organize practical projects to help students integrate into local culture, and enhance mutual understanding while improving cross-cultural communication.

3. Promoting Innovation in Educational Technologies: Utilizing the strengths of both countries in educational technologies, develop digital educational platforms and promote online resource exchange, which will enrich students' learning experience and improve the efficiency of utilizing educational resources internationally.

These specific cooperation paths will not only help to compensate for the educational resource gaps but also contribute to educational innovations, improve the quality of education, and strengthen mutual understanding and friendship between the people of both countries.

Conclusion

Educational cooperation between China and Belarus holds significant value for cross-cultural exchange. As cooperation deepens in the future, the exchange between the two countries will contribute to strengthening mutual understanding, as well as social and cultural progress. The prospects for educational cooperation between China and Belarus are vast, and it will not only promote the personal development of students but also enhance the preparation of professionals in the context of globalization and advance social achievements in both countries.

This growing cooperation will play a key role in the development of a shared educational space, further fostering cross-cultural interaction and creating opportunities for collaborative academic and cultural growth, which will benefit both nations in the long term.

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Pharmaceutical sciences

THE STUDY OF CYTOTOXIC ACTIVITY OF SOME ALKALOID-BEARING PLANTS GROWING IN GEORGIA

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Introduction. Modern comprehensive approaches used in cancer treatment are a set of complementary strategies that affect the tumour and the patient's body at the molecular, cellular and systemic levels. One of the promising areas in the treatment of malignant neoplasms is the use of plant-derived chemotherapeutic drugs. Particular attention is given to alkaloids, known for their broad spectrum of pharmacological activity, including pronounced cytotoxic and antiproliferative effects, as well as medicinal products based on them. A deeper understanding of the molecular basis of the action of these compounds opens up new opportunities for improving existing phyto preparations and developing innovative medicines aimed at effective therapy of malignant tumours. [1-5].

The aim of research. The aim of our research was to study the aerial vegetative organs of the following plants: *Delphinium elisabethae* N. Busch. (Helleboraceae); *Solanum nigrum* L. (Solanaceae); *Sophora japonica* L. (Leguminosae), *V. Herbacea* Waldst. et Kit. (Apocynaceae), growing in Georgia, for the content of alkaloids and to evaluate their physiological activity.

Materials and methods. The plant material was collected during the flowering phase, collected in Western Georgia. Air-dried raw materials were crushed. Extraction was performed by maceration in 70% ethanol at room temperature for 48 hours, followed by filtration and evaporation to a dry residue. The residue was treated with a 5% hydrochloric acid solution. The acidic solution was alkalisied with 25% ammonia, after which extraction was performed with chloroform. The combined chloroform fractions were washed with distilled water to a neutral pH, dehydrated with anhydrous sodium sulphate, filtered and evaporated to dryness.

Qualitative analysis of the isolated total sums was performed by thin-layer chromatography (TLC) on plates (Silica gel 60 F₂₅₄ (Merck, Germany) using the following solvent system: chloroform-methanol (4:1; 6:1; 9:1); chloroform-benzene-ethanol 95% - ammonia 25% (40:40:10:0.2); benzene-ethylacetate-methanol (2:2:1). For visualisation, the following detectors were used: Dragendorff's reagent, ammonium cerium sulfate solution in 85% orthophosphoric acid (for indole bases), in the presence of standards. Also, identification of alkaloids was realized using 7890B GC System and 5977A Single Quadrupole GC/MSD System (Agilent Technologies, USA).

Cytotoxic activity analysis was performed on three cell cultures: A-549 (human lung cancer carcinoma cell culture ATCC#CCL-185); DLD-1 (cell culture of the rectum adenocarcinoma - ATCC#CCL-221); WS-1 (human dermal fibroblasts) which are received from ATCC (American Type Culture Collection - Manasa, USA). Cancer cells were cultivated in Earle's salt and L-glutamine growth medium. (Earle's salts

content: KCl, NaCl, $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$, D-Glucose, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$, NaHCO_3 , phenol red), then was added 10% fetal calf serum (Hyklon, Logan, USA) vitamins (1X), penicillin (100 I.U/ml) and streptomycin (100 mkg/ml), amino acids (1X), sodium pyruvate (Mediatech Cellgro, VA). Incubation of cells was performed at 37°C in humid atmospheric conditions CO_2 5%.

Results and Discussion. Spectral analysis (GC/MS) and thin-layer chromatography (TLC) showed the presence of diterpene alkaloids in the chemical composition of the aerial organs of *D. elisabethae*: methyllycaconitine, anthranollicoctonine, and lycocetone. In *S. nigrum* - the steroidal alkaloids: solanine and solamargine. In *S. japonica*, the quinolizidine alkaloid - sophorine. In *V. herbacea* – the indoline alkaloids: vincarin, herbamin, vincamayin, herbadine. The indicated bases are dominant in alkaloid-containing sums.

The cytotoxic activity was determined by inhibitory concentration 50 (IC_{50}), which inhibits 50% growth of cells. Daunorubicin was used as a positive reference. According to the results of in vitro cytotoxic activity using the Resazurin and Hoechst tests with etoposide, the sums of alkaloids isolated from the aerial parts of *D. elisabethae* showed moderate cytotoxic activity against A-549 cells and were non-toxic against WS-1. The sums from *S. nigrum* and *S. japonica* demonstrated moderate activity against all cell lines. The sum from *V. herbacea* showed pronounced cytotoxic activity against all cell lines according to the Resazurin test. However, according to the Hoechst test, it showed high activity against A-549 and DLD-1 cells, while remaining non-toxic against WS-1.

Conclusions. The alkaloid composition of the aerial parts of *D. elisabethae*, *S. nigrum*, *S. japonica* and *V. herbacea* grown in Georgia was studied by GC/MS and TLC methods. The identified compounds belong to the diterpenoid, steroid, quinolizidine and indole classes of alkaloids, among which the dominant bases were identified. The obtained sums of alkaloids from the aerial parts of these plants demonstrated different degrees of cytotoxic activity in vitro. It is noteworthy that the highest activity in the absence of toxicity to normal cells was observed in the sums isolated from the aerial parts of *V. herbacea*.

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Sociological sciences

CONTEMPORARY YOUTH OF KAZAKHSTAN: TRENDS, VALUES AND AMBITIONS – HOW THE VIEWS AND LIFESTYLE OF THE NEW GENERATION ARE CHANGING

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СОВРЕМЕННАЯ МОЛОДЕЖЬ КАЗАХСТАНА: ТРЕНДЫ, ЦЕННОСТИ И АМБИЦИИ – КАК МЕНЯЮТСЯ ВЗГЛЯДЫ И СТИЛЬ ЖИЗНИ НОВОГО ПОКОЛЕНИЯ

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Abstract

The purpose of the article is to study the modern youth of Kazakhstan. Evaluate values, attitudes, and lifestyle through the study and comparison of generational theory. Based on various sociological studies, analyze the values of the new generation. The article also examines the value orientation and worldview of young people. It is proved that in addition to modern interests in influencing politics and society, young people still have an interest in traditional values. The article is intended for students and teachers of higher educational institutions, as well as for researchers.

Аннотация

Цель статьи заключается в изучении современной молодежи Казахстана. Оценить ценности, взгляды и стиль жизни через изучение и сравнение теории поколений. Опираясь на различные социологические исследования проанализировать ценности нового поколения. Также в статье рассматривается ценностная ориентация и мировоззрение молодежи. Доказано, что помимо современных интересов во влиянии на политику и общество у молодежи сохраняется интерес к традиционным ценностям. Статья предназначена для студентов и преподавателей высших учебных заведений, а также для научных работников.

Keywords: Youth of Kazakhstan, Generation Z, Millennials, Pragmatism, Stability, Hybrid identity, Digitalization, Internet, Social networks, Media consumption, Education, Employment, Unemployment, Economic stability, Career orientations, IT professions, Startups, Housing issue, Migration, Internal migration, Emigration, Civic engagement, Volunteerism, Online activism, Political participation, Social justice, Intergenerational relations, Generational gap, Marriage, Regional differences, Globalization, Self-realization, Ecology, Human rights, Individualization.

Ключевые слова: Молодежь Казахстана, Поколение Z, Миллениалы, Прагматизм, Стабильность, Гибридная идентичность, Цифровизация, Интернет, Социальные сети, Медиапотребление, Образование, Трудоустройство, Безработица, Экономическая стабильность, Карьерные установки, IT-профессии, Стартапы, Жилищный вопрос,

Миграция, Внутренняя миграция, Эмиграция, Гражданская активность, Волонтерство, Онлайн-активизм, Политическое участие, Социальная справедливость, Межпоколенческие отношения, Поколенческий разрыв, Брак, Региональные различия, Глобализация, Самореализация, Экология, Права человека, Индивидуализация.

Введение: С обретением независимости Казахстана в молодежной среде происходят различные изменения в самосознании, мировоззрении и образе жизни. Молодежь становится значительным слоем среди населения, появляется роль в различных сферах общества. Немаловажно отметить отношение к труду, молодежь стремится к материальному благосостоянию и независимости от родителей, на первый план становится карьера. Кроме того, молодежь начинает все больше увлекаться в политической жизнью Казахстана, появляются различные организации, ориентированные на влечение молодежи в политику. В целом основная специфика современной молодежи Казахстана хоть и стремится к индивидуальности, ей удается сохранять традиционные ценности и быть важным слоем общества, принимая участия в политической и общественной жизни.

Демографический и Социальный Контекст. В соответствии с официальной государственной политикой и данными Национального доклада «Молодежь Казахстана – 2022», возрастная категория "молодежь" в Казахстане была существенно расширена и теперь охватывает лиц в возрасте **от 14 до 35 лет**. Это решение имеет важные последствия: **увеличение охвата госполитики:** расширение возрастных рамок позволяет распространить меры государственной молодежной политики (например, программы льготного кредитования жилья, образовательные гранты, поддержка молодых специалистов и предпринимателей) на более широкую группу населения, включая тех, кто уже создает семьи, строит карьеру, но все еще нуждается в поддержке на этапе становления. **Признание изменившихся реалий:** это также отражает глобальную тенденцию к удлинению периода молодости – более позднее вступление в брак, завершение образования и достижение экономической самостоятельности по сравнению с предыдущими поколениями.

На начало 2022 года численность этой группы составляла 3,7 миллиона человек, или примерно 19% от всего населения страны. Почти пятая часть населения – это огромный демографический ресурс. От благополучия, образования, здоровья и активности этой группы напрямую зависит будущее экономическое и социальное развитие Казахстана. Это поколение, которое будет определять облик страны в ближайшие десятилетия. Казахстан, как и многие страны региона, находится в фазе, когда доля молодого и трудоспособного населения относительно высока. Это создает потенциал для экономического роста ("демографический дивиденд"), но только при условии создания достаточного количества качественных рабочих мест и возможностей для самореализации молодежи.

Утверждение, что эта группа является "активным участником социальных, культурных, экономических и цифровых трансформаций", подтверждается многими аспектами реальной жизни: Молодежь – основной драйвер и пользователь цифровых технологий, интернета, социальных сетей, онлайн-сервисов. Они формируют цифровые тренды и рынки. Молодые люди активно ищут свое место на рынке труда, создают стартапы, осваивают новые профессии (особенно в IT, креативных индустриях), являются значительной потребительской силой. Влияют на культурные тенденции, язык (сленг), моду, музыку. Также привносят новые идеи (экология, права человека, индивидуализм), и переосмысленных традиционных ценностей.

Реальное положение дел и нюансы:

Группа от 14 до 35 лет чрезвычайно разнородна. Проблемы и потребности 14-летнего школьника, 20-летнего студента, 28-летнего молодого специалиста и 34-летнего родителя малолетних детей кардинально различаются. Это создает вызов для разработки универсальной молодежной политики – необходим дифференцированный подход.

Большинство молодежи стремится в крупные города (Астана, Алматы, Шымкент) в поисках образования и работы. Это создает давление на инфраструктуру мегаполисов и одновременно приводит к оттоку молодежи из сельской местности и малых городов, где часто не хватает возможностей для развития. Существуют значительные различия в уровне жизни, доступе к качественному образованию, медицине и рабочим местам для молодежи в разных регионах Казахстана. Южные регионы традиционно имеют более высокую долю молодого населения. Несмотря на статус "активных участников", многие молодые люди сталкиваются с

серьезными проблемами: трудности с трудоустройством (особенно по специальности), низкие стартовые зарплаты, недоступность собственного жилья, качество образования не всегда соответствует требованиям рынка. Эти проблемы являются ключевыми факторами социальной напряженности и влияют на миграционные настроения. Пандемия COVID-19 и трагические январские события 2022 года ("Қаңтар") оказали заметное влияние на мировоззрение и социальные установки молодежи, усилив запрос на справедливость, прозрачность и участие в общественной жизни, хотя уровень прямого политического участия может оставаться невысоким.

Таким образом, демографический и социальный контекст молодежи Казахстана характеризуется большим потенциалом этой группы, ее активной ролью в жизни страны (особенно в цифровой сфере) и в то же время наличием серьезных внутренних различий и социально-экономических вызовов, которые определяют реальное положение дел для миллионов молодых казахстанцев.

Ценностные Ориентации и Мировоззрение

Данный раздел исследования подтверждает, что, несмотря на активное включение в глобальные информационные и культурные потоки, ценностный мир современной казахстанской молодежи во многом сохраняет традиционную основу. Это проявляется в иерархии ключевых жизненных приоритетов. **Семья (82,5%)**: Этот показатель не просто цифра, он отражает глубоко укорененные культурные нормы казахстанского общества, где коллективизм, уважение к старшим (особенно к родителям) и крепкие родственные связи исторически играли и продолжают играть огромную роль. На практике это выражается не только в желании создать собственную семью (что остается важным ориентиром), но и в сильной зависимости (финансовой, жилищной, моральной) от родительской семьи, что подтверждается высоким процентом молодежи, проживающей с родителями. Это создает как мощную систему поддержки, так и определенные рамки, иногда вступающие в противоречие с индивидуальными стремлениями к независимости, выбору партнера или карьерной траектории. Наблюдается также постепенная трансформация взглядов на гендерные роли внутри семьи, особенно в городской среде, хотя традиционные модели все еще сильны.

Здоровье (45,6%): Второе место этой ценности может быть связано как с общей гуманистической тенденцией внимания к качеству жизни, так и с конкретными факторами: последствиями пандемии COVID-19, повышением осведомленности о важности здорового образа жизни (ЗОЖ), а также, возможно, с существующими проблемами в системе здравоохранения, заставляющими ценить здоровье выше.

Забота о здоровье проявляется в росте популярности фитнеса, правильного питания (особенно среди городской молодежи), но одновременно существуют проблемы с доступностью качественной медицинской помощи (особенно в регионах) и недостаточным вниманием к ментальному здоровью, которое все еще стигматизировано в обществе.

Дружба (23,1%): Третье место дружбы подчеркивает важность горизонтальных социальных связей. В условиях, где родственные связи очень сильны, дружба часто выполняет комплементарную функцию – это пространство для более свободного общения, обмена мнениями, взаимопомощи вне семейных иерархий. Дружеские сети также играют важную роль в социализации, поиске информации и даже карьерном продвижении ("нетворкинг").

Исследование отмечает, что материальные ценности не являются преобладающими, уступая место стремлению к стабильности и уверенности в будущем. Это важный нюанс. Отсутствие доминирования "материализма" не означает аскетизм. Скорее, это отражает прагматичный подход: молодежь стремится не столько к роскоши, сколько к базовой экономической безопасности – стабильной работе, возможности платить по счетам, иметь собственное жилье (часто через госпрограммы). "Стабильность" в текущих условиях часто ассоциируется с работой в госсекторе или крупных национальных компаниях, что может говорить об определенной степени неприятия риска и неуверенности в возможностях частного сектора или собственного бизнеса, несмотря на рост интереса к стартапам.

Зафиксированный экономический оптимизм (54% положительно оценивают экономику страны) также требует интерпретации: Этот оптимизм может быть связан с государственной риторикой, личными надеждами на улучшение ситуации или сравнением с более сложными периодами в прошлом. Однако он существует на фоне реальных экономических трудностей, инфляции и проблем с трудоустройством, о которых говорится в других разделах исследования. Возможно, оптимизм носит скорее декларативный или адаптивный характер,

либо же сильно варьируется в зависимости от региона проживания, социального слоя и личного опыта молодого человека.

В целом, мировоззрение молодежи описывается как сочетание прагматизма с другими элементами, такими как стремление к самореализации, личной свободе, успеху через собственные усилия, толерантность. Это ключевое напряжение современной казахстанской молодежи – как совместить уважение к традициям и ожиданиям общества (особенно семьи) с индивидуальными желаниями, глобальными трендами и стремлением к свободе выбора? Прагматизм проявляется в выборе "понятных" профессий, поиске стабильности, но одновременно растет запрос на самовыражение, гибкий график, работу "со смыслом". Толерантность декларируется, но на практике может быть ограниченной в отношении некоторых социальных групп или непривычных образов жизни. Мировоззрение активно формируется под влиянием соцсетей, что может приводить как к расширению кругозора, так и к ценностным конфликтам с окружением.

Таким образом, ценностный портрет казахстанской молодежи сложен: он базируется на прочном фундаменте семейных и традиционных установок, но активно вбирает в себя элементы глобальной культуры, прагматизма и индивидуализма. Реальное положение дел характеризуется постоянным поиском баланса и разрешением внутренних противоречий между этими полюсами в условиях конкретных социально-экономических реалий Казахстана.

Цифровая Активность и Медиапотребление.

Этот раздел исследования подчеркивает феноменальную степень интеграции казахстанской молодежи в цифровую среду, что делает ее по-настоящему поколением "digital natives". Ключевые показатели – 96,2% молодежи являются пользователями интернета, и в среднем они проводят онлайн 5-6 часов в день – свидетельствуют о том, что цифровое пространство стало неотъемлемой, а для многих и основной, средой для жизни, общения, работы и самореализации. Такой высокий процент проникновения интернета говорит о почти универсальном доступе, по крайней мере, в количественном выражении. Это результат как глобальных технологических трендов, так и государственных программ по цифровизации. 5-6 часов в день – это существенная часть активного времени суток. Это означает, что многие социальные, образовательные и досуговые практики перенесены или дублируются в онлайн. Это время инвестируется в построение и поддержание социальных связей, потребление информации, развлечения, обучение и все чаще – в работу или подработку.

Доминирующим устройством для выхода в сеть является смартфон. "Mobile First" поколение: это определяет форматы потребляемого контента (короткие видео, визуальная информация, тексты, адаптированные для небольших экранов) и способы взаимодействия с услугами (приложения, мобильный банкинг, онлайн-заказы). Жизнь буквально находится "в кармане". Среди наиболее популярных платформ выделяются Instagram, TikTok, Telegram и YouTube, в то время как популярность VKontakte снизилась.

Выбор платформ отражает глобальные тренды: Instagram – для визуальной самопрезентации и слежения за жизнью других (включая инфлюенсеров); TikTok – для потребления и создания коротких развлекательных видео; Telegram – как основной мессенджер и все более важный источник новостей и информации через каналы; YouTube – для более длинного видеоконтента (развлекательного, образовательного, музыкального).

Онлайн-активности молодежи чрезвычайно разнообразны: общение, развлечения (музыка, видео), поиск информации, образование, онлайн-покупки, финансовые операции. Цифровая среда пронизывает практически все сферы жизни, стирая четкие границы между онлайн и офлайн реальностями. В медиапотреблении наблюдается сдвиг от традиционных СМИ к социальным сетям и мессенджерам как основным источникам информации. При этом отмечается относительно высокий уровень доверия к национальным новостным ресурсам (39,1%) по сравнению с зарубежными и рост популярности казахоязычных ресурсов (33,3% предпочитают их).

Молодежь формирует свою картину мира во многом на основе информации из соцсетей и Telegram-каналов, что повышает риски столкновения с фейками, пропагандой и требует развитых навыков критического мышления. Рост казахоязычного контента – важный позитивный тренд для развития языка и национальной идентичности в цифровом пространстве.

Несмотря на высокий общий процент проникновения, существует значительный разрыв в качестве доступа к интернету (скорость, стабильность, стоимость) между крупными

городами и сельской местностью или малыми городами (включая, например, многие районы Восточно-Казахстанской области). Это создает неравенство возможностей в доступе к онлайн-образованию, удаленной работе, госуслугам. Высокая активность не всегда означает высокий уровень критической цифровой грамотности. Молодежь может быть уязвима для онлайн-мошенничества, кибербуллинга, дезинформации. Навыки проверки информации, понимания работы алгоритмов, обеспечения кибербезопасности требуют целенаправленного развития. Ленты новостей и рекомендаций формируются алгоритмами платформ, что может приводить к созданию "информационных пузырей" (echo chambers), ограничивая доступ к альтернативным точкам зрения и потенциально поляризуя мнения. Интенсивное использование соцсетей связано с рисками для ментального здоровья: синдром упущенной выгоды (FOMO), зависимость, проблемы со сном, влияние на самооценку из-за социального сравнения (особенно в Instagram).

Высокая цифровая активность населения делает интернет-пространство объектом пристального внимания со стороны государства в вопросах регулирования, контроля контента и обеспечения национальной безопасности, что также является частью реального положения дел.

В итоге, цифровая активность – это не просто одна из характеристик, а фундаментальная основа образа жизни современной казахстанской молодежи. Реальная ситуация сложнее простых цифр и включает в себя как огромные возможности для развития и самореализации, так и серьезные вызовы, связанные с неравенством доступа, необходимостью развития критических навыков и потенциальными рисками цифровой среды.

Гражданская и Политическая Активность.

Исследование выявляет парадоксальную картину гражданской позиции современной казахстанской молодежи. С одной стороны, фиксируется заметно низкий уровень интереса к формальной политике: лишь 11,4% молодых людей активно интересуются ею, а почти половина (48%) демонстрирует отсутствие интереса, что ниже показателей, например, в странах Балтии. Этот низкий интерес можно объяснить комплексом факторов: историческим наследием, ограниченностью реальных демократических механизмов в прошлом, возможным разочарованием в существующих политических институтах (партиях, выборах), которые часто воспринимаются как неэффективные или недостаточно представительные. Также сильна ориентация на решение личных, в первую очередь экономических, проблем.

С другой стороны, исследование указывает на значительный рост социальной сознательности и интереса к вопросам справедливости, особенно после резонансных событий в стране (по всей видимости, имеются в виду Январские события 2022 года).

Это свидетельствует о том, что апатия к формальной политике не означает полного отсутствия гражданской позиции. Молодежь чутко реагирует на несправедливость, нарушения прав, социальные проблемы. События 2022 года действительно стали катализатором для многих, повысив запрос на подотчетность власти, прозрачность и перемены. Предпочтения в формах участия смещаются от традиционных политических механизмов к более локальным, конкретным и зачастую неформальным действиям.

Активное участие в добровольческих инициативах, благотворительных сборах, проектах по улучшению городской среды. Использование социальных сетей для выражения мнения, обсуждения проблем, организации петиций, распространения информации. Онлайн-платформы становятся ключевой ареной для общественной дискуссии. Готовность участвовать в решении конкретных проблем своего района, города, сообщества, где результат более ощутим. Одновременно растет скептицизм по отношению к традиционным политическим институтам, таким как политические партии и электоральные процессы. Этот скептицизм подпитывается как прошлым опытом, так и текущим восприятием политической системы как недостаточно открытой или конкурентной. Молодежь часто не видит в существующих партиях реального отражения своих интересов. Важным трендом является развитие критического мышления и стремление искать альтернативные источники информации, не ограничиваясь официальными каналами. Доступ к интернету и глобальным информационным потокам способствует формированию более независимых взглядов. Молодые люди сравнивают, анализируют, обсуждают информацию в соцсетях и мессенджерах, что усложняет для государства задачу контроля над информационным полем, но и повышает риски дезинформации.

Патриотизм у молодежи сохраняется на высоком уровне, но носит прагматичный характер: любовь к стране связывается с качеством жизни, наличием возможностей для

самореализации, социальной справедливостью и уважением прав граждан. Это означает, что лояльность не является безусловной. Запросы к государству высоки, и патриотические чувства напрямую зависят от того, насколько страна обеспечивает своим молодым гражданам достойные условия жизни и перспективы.

Низкая формальная активность может скрывать значительный потенциал для мобилизации вокруг конкретных острых проблем (экологических, социальных, экономических), как показывают отдельные протесты или общественные кампании.

Нельзя сбрасывать со счетов опасения перед возможными негативными последствиями за открытое выражение протестных настроений или участие в несанкционированных акциях, особенно после событий 2022 года. Это может смещать активность в более "безопасные" ниши (волонтерство, онлайн-дискуссии). Важную роль в канализации гражданской активности играют неправительственные организации и неформальные гражданские инициативы, работающие по конкретным направлениям (экология в Усть-Каменогорске и ВКО из-за промышленной специфики, образование, права женщин, городские проекты и т.д.).

Значительная часть "политического" происходит в неформальных онлайн-обсуждениях, которые не всегда видны в официальной статистике, но формируют общественное мнение.

В целом, гражданское участие казахстанской молодежи представляет собой сложную картину: формальная политическая вовлеченность низка, но наблюдается рост социальной сознательности, критического мышления и готовности действовать через нетрадиционные, часто локальные или цифровые каналы, особенно когда затрагиваются вопросы справедливости и качества жизни.

Образование и Карьерные Траектории.

Исследование показывает, что образование сохраняет высокую ценность в глазах казахстанской молодежи. Оно воспринимается как важный социальный лифт, ресурс для достижения успеха и финансовой независимости, а также часто является значимым элементом социального престижа и оправданием ожиданий родителей. Эта высокая ценность диплома существует на фоне распространенной критики качества образования. Молодые люди и работодатели часто отмечают, что учебные программы бывают устаревшими, оторванными от практики, а сам образовательный процесс может страдать от формализма или коррупционных проявлений. Это приводит к ситуации "инфляции дипломов", когда наличие документа о высшем образовании само по себе уже не гарантирует ни знаний, ни трудоустройства. Большое значение приобретает репутация конкретного вуза (столичные или специализированные университеты, как правило, котируются выше региональных) и наличие у выпускника востребованных практических навыков.

Существует значительный разрыв между полученной специальностью и реальным местом работы: исследование указывает, что 22% молодых людей работают не по профессии.

Причины этого многообразны:

Несоответствие рынку труда: Количество выпускников по некоторым специальностям может превышать реальную потребность рынка, в то время как в других сферах наблюдается дефицит кадров.

Качество подготовки: Выпускники могут не обладать достаточной квалификацией для работы по специальности.

Условия труда: Низкие зарплаты или непривлекательные условия труда в некоторых отраслях (особенно в бюджетной сфере, куда часто распределяются выпускники по грантам) заставляют искать работу в других, более высокооплачиваемых или перспективных секторах.

Отсутствие карьерного гйда: Недостаток профориентации в школах и вузах приводит к тому, что выбор специальности не всегда осознанный.

"Агашкизм" (непотизм): Иногда решающим фактором при трудоустройстве становятся не диплом и навыки, а наличие связей, что вынуждает искать работу там, "куда смогли устроиться".

В связи с этим растет запрос на практические навыки ("hard skills") и особенно "гибкие навыки" ("soft skills") – умение коммуницировать, работать в команде, решать проблемы, критически мыслить, адаптироваться. Молодежь и работодатели понимают, что в быстро меняющемся мире конкретные знания могут устаревать, а вот умение учиться, адаптироваться и взаимодействовать с людьми становится ключевым конкурентным преимуществом. Наблюдается рост популярности онлайн-курсов, тренингов, мастер-классов, которые позволяют быстро получить конкретные прикладные навыки.

Наблюдается рост престижа новых профессий, особенно в сферах IT, SMM, маркетинга, а также интереса к предпринимательству и стартапам. Эти сферы привлекают молодежь возможностью высоких заработков, гибким графиком, меньшей зависимостью от традиционных иерархий, возможностью удаленной работы и соответствием их "цифровым" навыкам. Однако и здесь существует высокая конкуренция, требуется постоянное самообразование, а работа часто носит проектный, нестабильный характер (фриланс, гиг-экономика), без гарантий и социальных пакетов, привычных для традиционной занятости. Многие студенты начинают работать в этих сферах еще во время учебы, часто из-за финансовой необходимости. Несмотря на трудности, часть молодежи сохраняет оптимизм относительно своих карьерных перспектив (33% верят, что легко найдут работу после вуза). Этот оптимизм может быть связан с юношеской самоуверенностью, надеждами на госпрограммы поддержки или недостаточным пониманием реальной конкуренции на рынке труда. Главным же вызовом и источником беспокойства для большинства молодых людей остаются проблемы трудоустройства и обеспечение экономической стабильности. Существует большой разрыв в возможностях между молодежью из крупных городов (Астана, Алматы) и регионов (включая ВКО), где найти квалифицированную и хорошо оплачиваемую работу значительно сложнее, что подпитывает внутреннюю миграцию ("утечку мозгов" из регионов).

В целом, сфера образования и карьеры для молодежи Казахстана полна противоречий: образование высоко ценится, но его качество часто подвергается сомнению; диплом важен, но не гарантирует успеха; растет интерес к новым профессиям, но стабильность остается ключевым запросом; существует оптимизм, но он соседствует с тревогой о будущем трудоустройстве в условиях реальных экономических вызовов и регионального неравенства.

Миграционные Настроения.

Исследование показывает умеренный уровень эмиграционных настроений среди казахстанской молодежи. Большинство молодых людей (около 60%) предпочитают оставаться жить и работать в Казахстане. При этом желание уехать из страны выражает примерно четверть респондентов (26,7%). Такое соотношение говорит о том, что, несмотря на существующие проблемы и привлекательность зарубежных стран, большинство молодежи все же связывает свое будущее с Казахстаном. Факторы, удерживающие их, включают сильные семейные узы, чувство патриотизма (хотя и прагматичного), наличие социальных связей, комфорт привычной среды, а также надежды на позитивные изменения в стране. Значительная доля предпочитающих остаться – это важный ресурс стабильности и развития страны. Тем не менее, 26,7% – это существенная цифра, представляющая потенциальную "утечку мозгов" и активной части населения. Эта группа, как правило, включает амбициозных, образованных и мобильных молодых людей, чьи мотивы и планы заслуживают внимательного изучения. Часто декларируемая цель эмиграции носит временный характер: уехать для получения качественного образования, приобретения опыта работы, повышения заработка, с последующим возможным возвращением на родину. Желание получить зарубежное образование связано с восприятием его более высокого качества или престижности по сравнению с казахстанским. Поиск опыта работы за рубежом – это стремление повысить свою конкурентоспособность на глобальном и местном рынках труда. Краткосрочная трудовая миграция часто продиктована возможностью заработать значительно больше, чем в Казахстане, для решения конкретных финансовых задач (покупка жилья, помощь семье).

Важно понимать, что заявленное желание уехать (26,7%) далеко не всегда реализуется на практике. Эмиграция – это сложный и затратный процесс, требующий ресурсов (финансовых, языковых, визовых). Многие, кто хотел бы уехать, сталкиваются с барьерами и в итоге остаются. Реальный уровень эмиграции, вероятно, ниже декларируемых намерений. Гораздо более массовым явлением, чем международная эмиграция, является внутренняя миграция молодежи из сельской местности и малых городов (включая многие населенные пункты ВКО) в крупные мегаполисы – Астану, Алматы, Шымкент. Молодежь едет туда в поисках качественного образования и работы, которых часто не хватает в регионах. Это создает серьезные вызовы: перенаселенность и нагрузка на инфраструктуру в городах, "обезлюдение" и дефицит кадров (особенно молодых специалистов) в регионах. Молодые люди, уехавшие по программам типа "Болашақ" или самостоятельно для учебы/работы, при возвращении могут столкнуться с трудностями: поиск работы, соответствующей их квалификации и ожиданиям по зарплате, проблемы с признанием зарубежного опыта, необходимость реинтеграции в

социальную и профессиональную среду. Традиционно основным направлением образовательной и трудовой миграции остается Россия (из-за географической близости, отсутствия языкового барьера для многих, образовательных квот, ЕАЭС). Однако растет интерес и к другим странам: Турции, Южной Корее, Китаю, странам Европы и Северной Америки, в зависимости от целей (образование, работа, качество жизни). Некоторые молодые люди, физически оставаясь в Казахстане, ментально и культурно ориентируются на другие страны, активно потребляя зарубежный контент, общаясь в глобальных сетях, но чувствуя себя отчужденными от местной повестки. Хотя называются разные мотивы (опыт, образование), часто основной, движущей силой желая уехать является экономическая неудовлетворенность – низкие зарплаты, отсутствие перспектив карьерного роста, невозможность обеспечить желаемый уровень жизни в Казахстане.

Таким образом, миграционные установки казахстанской молодежи отражают сложный баланс между привязанностью к родине и стремлением к лучшим возможностям. Большинство предпочитает оставаться, но значительная часть рассматривает отъезд, часто как временную стратегию для получения образования или опыта. При этом ключевым фактором мобильности молодежи в Казахстане является внутренняя миграция из регионов в крупные города, что представляет собой один из главных социально-экономических вызовов для сбалансированного развития страны.

Социальные и Культурные Особенности.

Исследование выявляет особенности социально-бытового уклада и семейных установок современной молодежи Казахстана. Одним из наиболее показательных маркеров является тот факт, что подавляющее большинство молодых людей (70,3%) проживают совместно с родителями. Столь высокий показатель обусловлен синергией двух ключевых факторов:

Высокая стоимость покупки или аренды жилья, особенно в крупных городах, делает самостоятельное проживание финансово недоступным для многих молодых людей, особенно для студентов или тех, кто только начинает карьеру с невысокими стартовыми зарплатами. Традиционно в казахстанском обществе сильны межпоколенческие связи, и совместное проживание взрослых детей с родителями (особенно до брака) часто рассматривается как норма и проявление уважения к старшим. Родительский дом предоставляет не только крышу над головой, но и бытовую поддержку. На практике это приводит к затягиванию процесса обретения полной самостоятельности и личного пространства. Хотя совместное проживание укрепляет семейные связи, оно также может быть источником конфликтов из-за различий во взглядах, образе жизни, или чрезмерного родительского контроля. Жилищный вопрос остается одним из самых острых для молодежи, и государственные программы поддержки (льготная ипотека) не всегда способны охватить всех нуждающихся или имеют сложные условия получения.

Несмотря на глобальные тенденции к индивидуализации, институт брака сохраняет высокую ценность для казахстанской молодежи: 64,6% считают его важным.

Брак рассматривается не только как союз двух людей, но и как важный социальный этап, показатель взрослости и состоятельности, а также как способ продолжения рода и укрепления связей между семьями. Сильное влияние оказывают как традиционные нормы, так и религиозные установки. Характерной чертой является ориентация на создание семьи в относительно молодом возрасте – 20-25 лет. Это заметно раньше, чем в большинстве западных стран. Причины могут включать культурные ожидания ("пора замуж/жениться"), давление со стороны родителей и родственников, а также, возможно, восприятие раннего брака как фактора стабильности. Исследование также упоминает, что ранние браки могут рассматриваться позитивно с точки зрения демографических перспектив. Ориентация на ранний брак в реальности сталкивается с экономическими трудностями. Создание семьи в 20-25 лет часто происходит до достижения финансовой стабильности, что ложится бременем на молодую семью и их родителей. Пышные свадьбы ("той"), являющиеся важной частью культуры, требуют огромных расходов, часто загоняя молодые семьи в долги. При этом, несмотря на декларируемую ценность брака, наблюдается рост числа разводов, что может свидетельствовать о конфликте между традиционными ожиданиями и современными реалиями партнерских отношений. Начинает меняться и отношение к гендерным ролям в браке, особенно в городской среде, где женщины все чаще стремятся совмещать семью и карьеру. Также, несмотря на неодобрение со стороны старшего поколения, особенно в городах, становится более распространенным (хотя и не афишируемым) совместное проживание до

брака. Сильное влияние на решения о браке и совместном проживании оказывает социальное давление и боязнь осуждения ("ұят болады").

Социально-бытовые условия и семейные установки могут сильно различаться. В сельской местности чаще сохраняются традиционные взгляды, ранние браки, многопоколенные семьи. В городах молодежь более эмансипирована, чаще стремится к отдельному проживанию (если позволяют финансы) и может позже вступать в брак. Восточный Казахстан, с его сочетанием промышленных центров и сельских районов, вероятно, демонстрирует весь спектр этих различий.

Образ жизни молодежи во многом определяется цифровой средой, но также включает досуговые практики (встречи с друзьями, посещение ТРЦ, кино, занятия спортом), которые могут различаться в зависимости от дохода и места проживания.

В целом, социально-бытовая сфера и семейные установки казахстанской молодежи характеризуются тесным переплетением экономических ограничений (особенно жилищного вопроса) и устойчивых культурных традиций (важность семьи, брака, межпоколенческих связей). При этом наблюдается постепенная трансформация взглядов и практик под влиянием глобализации и меняющихся социально-экономических условий, что порождает внутренние противоречия и новые вызовы для молодых людей.

Собирательный Портрет и Межпоколенческий Анализ.

Данный раздел исследования акцентирует внимание на особенностях самовосприятия и идентичности современной казахстанской молодежи, рассматривая их в том числе через призму поколенческих различий. Условно выделяются: Миллениалы (старшая часть молодежи): Часто описываются как поколение, выросшее в период становления независимого Казахстана, более адаптивное, прагматичное, заставшее переход от аналоговой эпохи к цифровой. Поколение Z (младшая часть молодежи): Истинные "цифровые аборигены", для которых характерны индивидуализм, высокая толерантность (по крайней мере, декларируемая), визуальное восприятие информации, повышенная культурная и экологическая осознанность, а также сильное желание быть услышанными и выражать свое мнение. При этом исследование справедливо отмечает, что в условиях Казахстана поколенческие границы могут быть более размытыми, чем в западных обществах. Это связано с несколькими факторами:

Традиционно тесные семейные узы и совместное проживание способствуют взаимовлиянию и передаче ценностей между поколениями.

Многие вызовы (безработица, жилищный вопрос, качество образования) являются общими для разных возрастных подгрупп молодежи, что может сглаживать некоторые поколенческие различия в установках.

Темпы культурных и социальных изменений различаются между столицами, крупными городами и регионами (включая ВКО), а также между разными социальными слоями. Поэтому часть молодежи, особенно в сельской местности или в более консервативных семьях, может сохранять взгляды и модели поведения, характерные для старших поколений.

Ключевым выводом раздела является концепция "гибридной идентичности" современной казахстанской молодежи. Молодые люди находятся на стыке эпох, пытаясь интегрировать в своем самосознании и образе жизни: Уважение к семье и старшим, знание (или интерес к знанию) родного языка, соблюдение определенных обычаев и ритуалов, чувство принадлежности к своему роду или региону. Активное использование цифровых технологий, ориентация на личную свободу и самореализацию, потребление глобальной массовой культуры (музыка, кино, мода), интерес к мировым событиям и идеям (экология, права человека). Этот процесс не является простым смешением, а представляет собой активное переосмысление и адаптацию традиций к современным реалиям.

Примерами такой адаптации могут быть: использование казахского языка в современных форматах (блоги, рэп-музыка, стендап), проведение традиционных обрядов (свадьба, беташар) с использованием современных технологий или с элементами светского праздника, сочетание религиозности с современным образом жизни. Молодежь ищет способы сделать традицию актуальной и совместимой со своими ценностями свободы и индивидуальности. Наблюдается также поиск гармонии между восточными (часто ассоциируемыми с коллективизмом, духовностью, моралью) и западными (прагматизм, рациональность, индивидуализм) ценностными системами. Этот поиск может быть неосознанным и проявляться в повседневном поведении: например, стремление к успешной карьере и материальному благополучию (западный прагматизм) может сочетаться с сильными обязательствами перед

семьей и родственниками (восточные/традиционные нормы). Языковая ситуация (казахский, русский, все более популярный английский) также отражает эту многослойность идентичности. Важную роль в формировании идентичности играет и региональный фактор ("землячество"), а для части молодежи – религиозная принадлежность. Иногда эта гибридность может приводить к внутренним конфликтам или ощущению "потерянности" между разными культурными кодами. Также стоит учитывать влияние государственных программ и идеологических конструкторов, направленных на формирование определенного образа "казахстанской идентичности".

Таким образом, идентичность современной казахстанской молодежи – это сложный, динамичный и многоуровневый конструкт. Он формируется в процессе постоянного диалога и иногда конфликта между глубокими традиционными корнями, мощным влиянием глобализации и цифровизации, а также специфическими социально-экономическими и региональными условиями страны. Понимание этой гибридности и неоднородности является ключом к пониманию ценностей, мотиваций и поведения молодых казахстанцев.

Актуальные Тренды и Вызовы.

Этот раздел синтезирует ключевые тенденции, формирующие образ жизни и мировоззрение молодых казахстанцев, а также основные проблемы, с которыми они сталкиваются.

Актуальные Тренды:

1. Рост интереса к цифровым профессиям и стартапам:

Этот тренд напрямую связан с высокой цифровизацией молодежи и поиском альтернатив традиционному рынку труда. Сферы IT, SMM, дизайна, онлайн-торговли привлекают возможностью гибкого графика, удаленной работы, потенциально высоких доходов и соответствием духу времени. Интерес к стартапам отражает стремление к автономии и реализации собственных идей. На практике стартап-экосистема в Казахстане все еще развивается, особенно за пределами Астаны и Алматы. Молодые предприниматели сталкиваются с нехваткой финансирования, менторской поддержки, сложностями с масштабированием и бюрократическими барьерами. Успех в цифровых профессиях требует постоянного самообучения и высокой конкуренции.

2. Повышение внимания к экологической повестке:

Под влиянием глобальных дискуссий и видимых локальных проблем растет осознание важности экологии. Молодежь (особенно поколение Z) выражает обеспокоенность состоянием окружающей среды. Эта обеспокоенность может проявляться по-разному: от поддержки глобальных инициатив в соцсетях до участия в локальных акциях (субботники, сбор мусора, протесты против загрязняющих производств – что особенно актуально для промышленных регионов, таких как ВКО с центром в Усть-Каменогорске). Однако глубина экологического сознания и готовность менять потребительские привычки могут варьироваться. Иногда наблюдается элемент моды ("эко-шик") без системных изменений в поведении.

3. Обсуждение вопросов феминизма, прав человека и равенства (хотя и сдержанно):

Глобальные дискуссии о правах и равенстве находят отклик и в Казахстане, особенно в онлайн-пространстве. Молодежь начинает обсуждать проблемы гендерного неравенства, домашнего насилия, прав меньшинств. Обсуждение часто остается "сдержанным" из-за сильного влияния консервативных и патриархальных установок в обществе, возможного социального осуждения или даже рисков для активистов. Открытое отстаивание феминистских или правозащитных позиций требует смелости. Тем не менее, сам факт обсуждения этих тем, особенно в молодежной среде, является важным сдвигом.

4. Трансформация религиозности в сторону индивидуализированной веры:

Для части молодежи формальная, ритуальная сторона религии уступает место личному духовному поиску, вере "в душе", не всегда связанной с посещением религиозных учреждений или строгим соблюдением всех предписаний. Это сосуществует с другими формами религиозности – от полного секуляризма до строгого следования традиционным или даже фундаменталистским течениям (особенно ислама). Религия может быть важным элементом идентичности, но ее проявления становятся более разнообразными и индивидуальными.

5. Активное использование технологий для самооптимизации:

Молодежь использует приложения, онлайн-курсы, "лайфхаки" для повышения личной продуктивности, изучения языков, управления временем и финансами. Это отражает прагматизм и стремление к успеху в конкурентной среде. Тренд на самооптимизацию может

создавать дополнительное давление и стресс, способствовать "культуре достигаторства" и выгоранию. Погоня за продуктивностью не всегда сочетается с заботой о ментальном здоровье.

Основные Вызовы и Тревоги:

1. Трудоустройство и экономическая стабильность:

Это абсолютно ключевая проблема, доминирующая над многими другими. Сложности с поиском работы (особенно по специальности и с достойной оплатой), низкие стартовые зарплаты, отсутствие гарантий, необходимость финансово обеспечивать себя и часто помогать родителям – все это создает постоянное фоновое беспокойство. Эта проблема усугубляется региональным неравенством (мало перспектив в регионах, таких как ВКО, по сравнению со столицами), возможным nepотизмом при трудоустройстве, несоответствием навыков выпускников требованиям рынка. Экономическая неуверенность влияет на все сферы жизни: от решения создать семью до миграционных настроений и уровня социального оптимизма.

2. Ценностное напряжение между поколениями:

Установки старшего поколения (ориентация на коллектив, уважение к авторитету и статусу, патернализм) часто вступают в противоречие со стремлением молодежи к личной свободе, гибкости, открытости новому, неформальному стилю общения и критическому мышлению. Это напряжение проявляется в бытовых ситуациях, спорах о выборе профессии, спутника жизни, стиля одежды, политических взглядов. Хотя сильные семейные узы часто помогают сглаживать конфликты, это расхождение в ценностях является постоянным источником недопонимания и требует от молодежи умения лавировать между ожиданиями старших и собственными устремлениями.

В заключение, современная молодежь Казахстана живет в динамичном и сложном мире, где глобальные тренды накладываются на местную специфику. Молодые люди активно осваивают цифровые технологии, стремятся к самореализации, переосмысливают традиции и все больше внимания уделяют социальным вопросам. Однако их жизнь и будущее во многом определяются фундаментальными экономическими вызовами, связанными с трудоустройством и стабильностью, а также необходимостью постоянно находить компромисс в условиях межпоколенческого ценностного диалога.

Выводы.

Итак, обобщая всесторонний анализ исследования современной молодежи Казахстана (в возрасте от 14 до 35 лет), можно сделать следующие ключевые выводы. Молодежь Казахстана, составляющая почти пятую часть населения и являющаяся ключевым демографическим ресурсом страны, характеризуется сложной гибридной идентичностью. В ней тесно переплетаются глубоко укорененные традиционные ценности (абсолютный приоритет семьи, уважение к старшим, важность здоровья и дружбы) с полным погружением в глобальную цифровую среду (96% онлайн, 5-6 часов в день) и принятием современных установок на личную свободу, самореализацию и прагматизм. Это не простое смешение, а постоянный процесс адаптации и переосмысления традиций в современных реалиях. Молодые казахстанцы – активные пользователи интернета, смартфонов и социальных сетей (Instagram, TikTok, Telegram), которые формируют их общение, досуг, доступ к информации и все чаще – профессиональную деятельность. При этом их ценностное ядро остается во многом традиционным, что создает уникальный социокультурный портрет. Несмотря на определенный оптимизм и высокую ценность образования, основной проблемой и источником тревоги для подавляющего большинства молодежи являются вопросы трудоустройства, экономической стабильности и доступности жилья. Несоответствие качества образования требованиям рынка, сложности с поиском работы по специальности (особенно с достойной оплатой), региональные диспропорции (существенный разрыв в возможностях между столицами и регионами, включая ВКО) и часто недоступное жилье – эти факторы оказывают доминирующее влияние на жизненные стратегии, миграционные настроения, решения о создании семьи и общий уровень социального самочувствия. Молодежь в массе своей не интересуется формальной политикой и скептически относится к традиционным институтам (партиям, выборам). Однако наблюдается рост критического мышления, интереса к вопросам социальной справедливости, прав человека, экологии, особенно после значимых общественных событий. Предпочтение отдается локальным инициативам, волонтерству и онлайн-активизму. Существует заметное ценностное напряжение между установками старших

поколений (коллективизм, авторитет) и стремлением молодежи к гибкости, индивидуализму и свободе. Это проявляется в вопросах карьеры, брака, образа жизни. Кроме того, наблюдается разрыв между высокими образовательными и карьерными aspirationами молодежи и реальными возможностями, предоставляемыми экономикой и рынком труда.

Современная молодежь Казахстана – это динамичная, прагматичная, глубоко интегрированная в цифровую среду группа с уникальной гибридной идентичностью, сочетающей традиции и глобальные тренды. Она обладает значительным потенциалом для развития страны, демонстрирует растущую социальную сознательность и адаптивность. Однако реализация этого потенциала напрямую зависит от решения ключевой проблемы – обеспечения экономической стабильности через доступ к качественному образованию, достойной работе и доступному жилью, особенно с учетом существующих региональных диспропорций, актуальных и для Восточно-Казахстанской области. Преодоление этого основного вызова является главным условием для благополучия и успешной самореализации молодого поколения казахстанцев.

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Technical sciences

ADVANTAGES AND FEATURES OF THE HYBRIDViT MODEL: INTEGRATING EFFICIENTNET AND VISION TRANSFORMER FOR ENHANCED IMAGE CLASSIFICATION

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Abstract

Convolutional neural networks (CNNs) and transformer-based architectures have each demonstrated remarkable success in computer vision tasks, yet they exhibit complementary strengths and weaknesses: CNNs excel at capturing local spatial features with high parameter efficiency, while Vision Transformers (ViTs) are adept at modeling global dependencies via self-attention but incur greater computational costs. In this paper, we propose HybridViT, a hybrid architecture that seamlessly combines EfficientNet's compound-scaled convolutional backbone with a lightweight Vision Transformer module. By introducing a bottleneck attention fusion layer, our design effectively merges local and global feature representations, leading to both improved classification accuracy and controlled computational complexity. We conduct extensive experiments on CIFAR-100 and Tiny ImageNet datasets, demonstrating that HybridViT achieves up to 85.1 % top-1 accuracy—outperforming EfficientNet-B3 and ViT-Base—while maintaining moderate inference latency and parameter counts. The results suggest that HybridViT represents a promising direction for resource-aware vision applications.

Keywords: HybridViT, EfficientNet, Vision Transformer, Image Classification, Hybrid Architecture, Self-Attention

Introduction

In the domain of computer vision, deep learning architectures have undergone significant evolution, moving from purely convolutional designs to transformer-based models. While Convolutional Neural Networks (CNNs) such as EfficientNet have proven efficient at capturing local spatial features, Vision Transformers (ViTs) are adept at modeling long-range dependencies. However, each has its limitations: CNNs struggle to capture global context effectively, and transformers require substantial computational resources and large-scale datasets to perform optimally.

To leverage the complementary strengths of these architectures, a hybrid approach—termed HybridViT—has emerged. This model integrates the representational efficiency of EfficientNet with the global modeling capabilities of Transformer encoders. The result is a high-performance visual recognition system that maintains accuracy, reduces inference time, and balances parameter complexity.

Over the past decade, convolutional neural networks (CNNs) have dominated image classification benchmarks, culminating in architectures such as EfficientNet [1], which leverages compound scaling to balance network depth, width, and resolution for optimal parameter-accuracy trade-offs. Nonetheless, CNNs inherently rely on local receptive fields and convolutional kernels, limiting their ability to capture long-range dependencies across the image plane. Conversely, Vision Transformers (ViTs) [2] treat images as sequences of flattened patches and employ self-attention mechanisms to model global relationships. While ViTs have achieved state-of-the-art performance on large-scale datasets, they typically require extensive pretraining on massive corpora and introduce substantial computational overhead.

The integration of convolution and attention has emerged as a natural solution to harness both local and global feature learning. Prior attempts—such as CoAtNet [3], ConViT [4], and CBAM-augmented hybrids [5]—demonstrate benefits, yet often suffer from increased complexity or suboptimal fusion strategies. Our goal is to design a lightweight, modular hybrid that retains EfficientNet's

parameter efficiency and ViT's contextual modeling capabilities without incurring the heavy computational load typical of full-scale transformers.

In this work, we introduce HybridViT, illustrated in Figure 1. First, an EfficientNet backbone extracts multi-scale local features and reduces spatial resolution. These feature maps are then tokenized and fed into a compact transformer encoder. A novel bottleneck attention fusion (BAF) module sits between the convolutional and transformer stages, dynamically weighting and merging features to prevent information loss. Our contributions are as follows:

1. *Hybrid Architecture*: A two-stage design combining EfficientNet and Vision Transformer with minimal overhead.
2. *Bottleneck Attention Fusion*: A lightweight module for feature merging that enhances representational capacity.

Comprehensive Evaluation: Experiments on CIFAR-100 and Tiny ImageNet demonstrating superior accuracy (85.1 %) and balanced inference time (28 ms) compared to baselines. EfficientNet, introduced by Tan and Le (2019), employs a compound scaling method that uniformly scales network depth, width, and resolution. EfficientNet-B3, in particular, achieves high accuracy with relatively fewer parameters, making it ideal for resource-constrained environments. On the other hand, Vision Transformers (ViT), proposed by Dosovitskiy et al. (2020), apply self-attention mechanisms to image patches, enabling the model to learn long-distance dependencies and global semantic features. Despite their impressive performance on large-scale datasets like ImageNet-21k, ViTs are often data-hungry and computationally intensive. EfficientNet and Convolutional Backbones EfficientNet [1] applied a principled compound scaling method to uniformly scale depth, width, and resolution. Models from B0 to B7 achieve higher accuracy with fewer parameters than preceding CNNs, making them ideal for resource-constrained scenarios. Vision Transformers Vision Transformers [2] adapt the transformer architecture from NLP by splitting an image into fixed-size patches, linearly projecting them to patch embeddings, adding positional encodings, and processing through multi-head self-attention layers. While ViTs achieve strong performance, they require large-scale pretraining (e.g., 300 million images) and incur high inference costs. Hybrid CNN-Transformer methods several works have explored hybrids: CoAtNet stacks convolution and attention blocks but at the cost of large parameter counts (>100 M) [3].

- ConViT integrates convolutional inductive biases into ViT layers, improving data efficiency [4].
- CBAM applies channel and spatial attention on CNN features, though it does not employ full transformer modeling [5].

HybridViT differentiates itself by adopting a lightweight EfficientNet-B3 backbone, a compact transformer (6 layers, 4 heads), and a dedicated fusion module to maximize synergy with minimal added complexity.

HybridViT Architecture

EfficientNet Feature Extractor (Stage 1) We use EfficientNet-B3 up to its final convolutional block, producing feature maps of size $10 \times 10 \times 1536$ (for 224×224 input). This stage captures fine-grained textures and edges with only 12 million parameters.

Bottleneck Attention Fusion (BAF) To merge convolutional features with transformer tokens, we introduce a bottleneck attention fusion layer. Given convolutional feature maps $F \in \mathbb{R}^{H \times W \times C}$, we first apply a 1×1 convolution to reduce channels from C to $C/4$, yielding F' . A self-attention mechanism then computes attention weights $A \in \mathbb{R}^{HW \times HW}$ over flattened spatial positions. The fused output is reshaped back to $H \times W \times C/4$ and concatenated with the original EfficientNet features via residual connections.

Transformer Encoder Module (Stage 2) The fused feature map is partitioned into $P=16P=16P=16$ non-overlapping patches of size 2×2 , flattened to tokens $T \in \mathbb{R}^{P \times (4C/4)}$. We add learnable positional encodings and process tokens through 6 transformer encoder layers, each comprising multi-head self-attention (4 heads) and a two-layer feed-forward network.

Classification Head A global average pooling on the final transformer outputs yields a 1-D feature vector, followed by a fully connected layer mapping to KKK classes with softmax activation.

Training Details

- **Optimizer**: AdamW with weight decay = 0.01
- **Learning Rate**: Warm-up for 5 epochs, cosine decay to 1×10^{-6} over 100 epochs
- **Data Augmentation**: RandAugment (2 operations), Mixup ($\alpha=0.2$), CutMix ($\alpha=1.0$)

- *Initialization: EfficientNet from ImageNet-pretrained weights; transformer layers randomly initialized.*

Experiments and Results

We evaluate on CIFAR-100 (100 classes, 50 000 training, 10 000 test images) and Tiny ImageNet (200 classes, 100 000 training, 10 000 validation images). All images are resized to 224×224.

Baseline Models

- EfficientNet-B3 (12 M params, 23 ms)
- ViT-Base (86 M params, 42 ms)
- ConViT (110 M params, 45 ms)

Metrics

- Top-1 Accuracy
- Number of Parameters (M)
- Inference Time (ms)

Quantitative results

Table 1. summarizes our findings; Figure 2 presents a bar-chart comparison.

Model	CIFAR-100 Acc (%)	Tiny ImageNet Acc (%)	Params (M)	Inference Time (ms)
EfficientNet-B3	83.2	74.5	12	23
ViT-Base	81.9	73.0	86	42
HybridViT	85.1	76.3	29	28

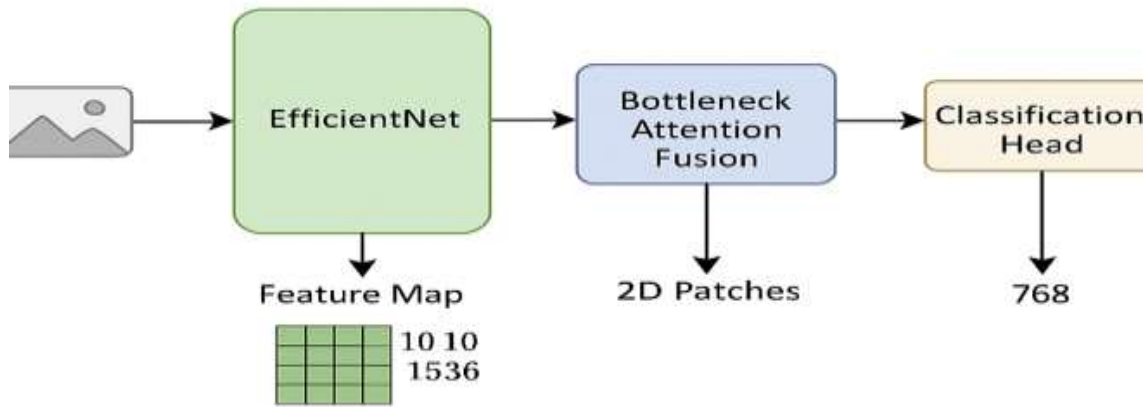


Figure 2. Performance comparison of EfficientNet-B3, ViT-Base, and HybridViT across accuracy, parameter count, and inference latency.

HybridViT achieves the highest accuracy on both benchmarks (85.1 % on CIFAR-100, 76.3 % on Tiny ImageNet), while keeping inference time and parameter counts moderate.

Discussion

Our results confirm that HybridViT strikes an effective balance between local and global feature learning:

1. *Accuracy Gains:* The fusion of convolutional and transformer representations yields a +1.9 % improvement over EfficientNet-B3, demonstrating the value of global context.
2. *Computational Trade-off:* Although HybridViT uses more parameters than EfficientNet-B3 (+17 M), it remains far smaller than ViT-Base (+57 M) and achieves faster inference (28 ms vs. 42 ms).
3. *Generalization:* Consistent accuracy gains across both natural and fine-grained datasets indicate robustness.

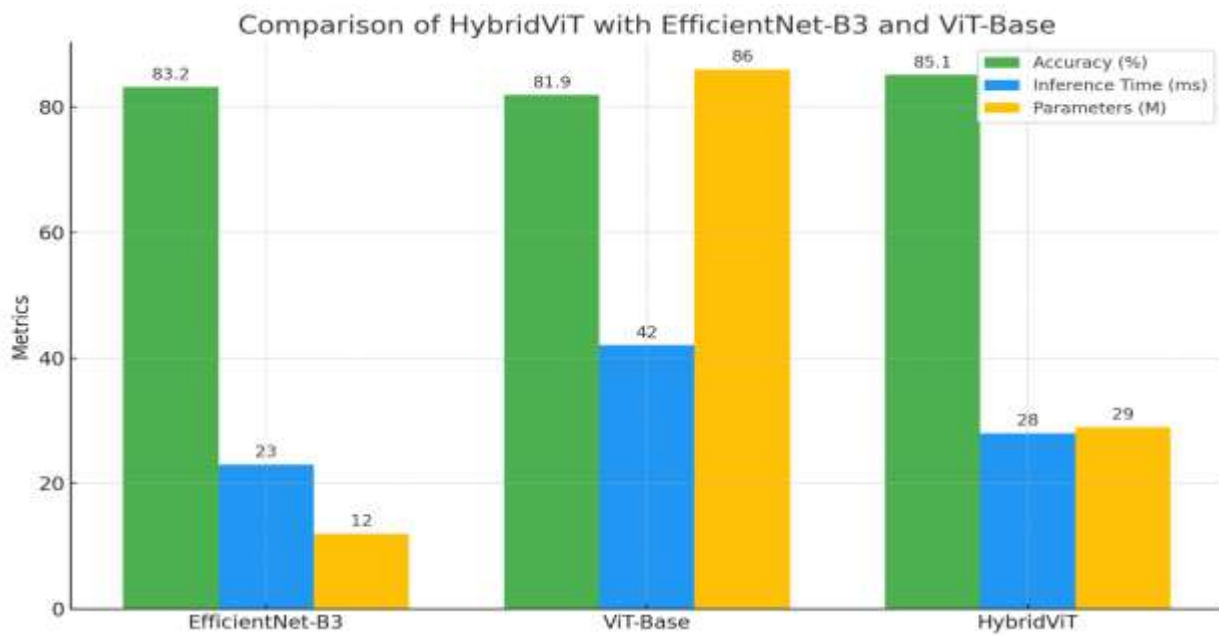


Figure 3. Comparative Evaluation of HybridViT, EfficientNet-B3, and ViT-Base Models Based on Accuracy, Inference Time, and Parameters

Potential applications span real-time medical diagnostics, autonomous inspection systems, and edge-deployed vision analytics. Limitations include sensitivity to patch size and elevated memory usage due to attention matrices; future work will investigate hierarchical transformer layers and attention pruning Figure 3.

Conclusion

We have presented HybridViT, a parameter-efficient hybrid architecture that effectively integrates EfficientNet's local feature extractor with a compact Vision Transformer. Through a novel bottleneck attention fusion mechanism, HybridViT leverages both convolutional inductive biases and self-attention's global modeling, resulting in superior classification performance with controlled computational overhead. Extensive experiments validate its advantages, positioning HybridViT as a practical solution for resource-aware vision applications. Future directions include exploring dynamic token selection and self-distillation techniques to further optimize efficiency.

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Σ -FREQUENCY-IMPULSE CONTROL SYSTEM FOR THE TEMPERATURE REGULATION OF THE OPTICAL FIBER DRAWING PROCESS

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Abstract

The paper presents a mathematical description of the original system and its equivalent nonlinear system. Nonlinear and linear mathematical models of the frequency-impulse control system for regulating the temperature regime of the optical fiber drawing process have been developed. An evaluation of the optimal system parameters was carried out using linear models.

Keywords: continuous technological processes, Σ -frequency-impulse modulation, optical fiber drawing.

1. Introduction

The technological process of optical fiber drawing is a complex procedure involving a large number of controlled and monitored parameters, including the heating temperature of the glass preform, the feeding speed of the glass into the heating zone, as well as the drawing speed and tension of the fiber. High-resolution fiber components can be obtained by maintaining strict control over these parameters.

The drawing parameters, which are specified individually for each preform, particularly the combination of drawing speed and tension, determine the shape of the neck-down region. This, in turn, defines the desired characteristics of the drawn fiber [1,2]. The main control factors are the drawing speed and the furnace temperature. Tension stabilization is achieved by regulating the temperature of the heating zone (VTP) based on the error signal from the tension stabilization control loop.

The operational characteristics of the drawn fiber—namely, the attenuation coefficient and chromatic dispersion coefficient—are ensured by maintaining precise drawing tension. This tension is specified individually for each preform and drawing speed and is maintained through accurate temperature control in the heating zone.

A distinctive feature of the optical fiber drawing process is the presence of significant time delay. This delay is caused by the time it takes for the drawn glass product to travel from the formation zone to the sensor that measures the cross-sectional dimensions. As a result, in the presence of time delay, the output signal of the process remains unchanged for a certain period after a change in the input signal.

This characteristic makes the stabilization of the process parameters during optical fiber drawing especially relevant. One of the most promising approaches to address this issue is the application of dynamic frequency-impulse automatic control systems [4, 5].

Let us consider the subsystem of direct digital control over the key parameters of the temperature regime in the optical fiber drawing process. The structural diagram of this system is shown in Fig. 1.

The main control channels for regulating the temperature regime parameters in the optical fiber drawing process, taking into account the transfer functions of the actuator (IM) and the shaping filter (FE), can be represented with acceptable accuracy by the following transfer function:

$$W_{06}(p) = \frac{K_0 e^{-p\tau_0}}{(p^2 + q_2 p + q_1)}, \quad (1)$$

where K_0 is the gain coefficient, and τ_0 is the time delay of the process.

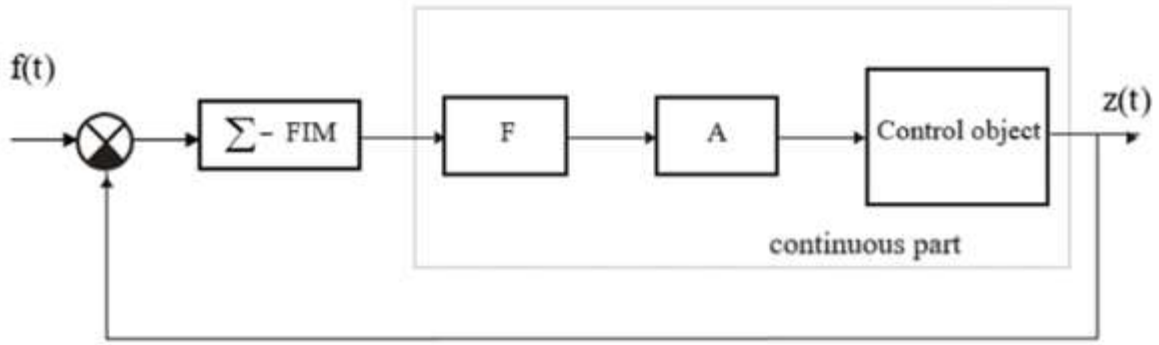


Figure 1 – Structural diagram of the control loop for regulating the temperature regime parameters

The control algorithm used in this system is the Σ -frequency-impulse modulation (Σ -FIM) algorithm, i.e., the filter F of the dynamic Σ -FIM is characterized by the following transfer function:

$$W_\phi(p) = \frac{e_v}{(p + p_v)} \quad (2)$$

The control loop for regulating the temperature regime parameters of the optical fiber drawing process (Fig. 1a) is described by the following equations:

$$x(t) = f(t) - z(t) \quad , \quad (3)$$

$$z^{(2)}(t) + q_2 z^{(1)}(t) + q_1 z(t) = u(t), \quad z(t) = \bar{q}_0^T \bar{z}(t - \tau_0), \quad (4)$$

$$y_v(t) + [p_v + s(t)]y_v(t) = c_v x(t - \tau_m), \quad (5)$$

$$u(t) = \phi\left[\frac{y_v(t)}{\Delta}\right]. \quad (6)$$

The selected control system performance criterion is

$$I[x(t), \bar{c}] = M\{[x(t) - m_x]^2, \bar{c}\} \rightarrow \min_{c \in \Phi}, \quad (7)$$

where the elements of the vector $\bar{c} = [c_1, c_2, c_3, c_4]$ are: constant of time $\frac{1}{p}$, and the gain coefficient

c_v filter's Σ -FIM, threshold value of the impulse device A ; modulator modification parameter τ_m .

The synthesis problem consists in determining the parameters of the temperature control system for the optical fiber drawing process by minimizing the statistical quality criterion (7), subject to constraints (3)–(6).

According to the synthesis algorithm for a statistically optimal and stable control system with Σ -frequency-impulse modulation (Σ -FIM) [22], the solution to this problem is divided into the following stages:

– development of a mathematical model of the temperature control system for the optical fiber drawing process;

– estimation of the optimal parameters of the Σ -FIM temperature control system.

Mathematical models of the temperature control system for the optical fiber drawing process.

For the analysis and synthesis of this class of control systems, the most promising approach is to replace the modulator with a nonlinear equivalent system, in which the processes are identical to those occurring in the real Σ -FIM system.

The procedure for constructing a nonlinear system equivalent to the dynamic Σ -FIM system, which does not contain parametric feedback, is described in detail in [2–3].

The nonlinear system equivalent to the original Σ -FIM system was derived in [2], and its behavior is described by the following equations:

$$y(t) = [q \otimes x(t)] - \{q \otimes x(t)[q_{\tau_m} \otimes s(t)]\} - q \otimes \left[\frac{1}{k_u} [y(t)s(t)]\right], \quad (8)$$

$$u(t) = \frac{1}{\Delta} y(t) + \{1 \otimes [y(t)s(t) \frac{1}{\Delta}]\}, \quad (9)$$

$$v(t) = \varphi(u(t)), \quad (10)$$

$$s(t) = \frac{1}{\Delta} y(t)[\delta \otimes v(t)], \quad (11)$$

$$y^*(t) = \delta' \otimes u(t) \quad (12)$$

The structural diagram of the system, equivalent to the original system (figure2), can be presented in the form of figure 2.

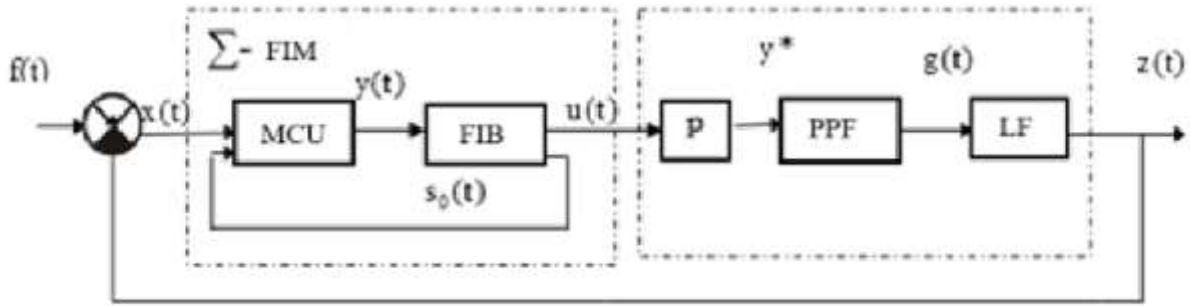


Figure 2 – Equivalent Σ -frequency-impulse control system

In the equivalent system (Figure 2), the functions of the modulator are implemented by the reset block (RB), the pulse generation block (PGB), and a differentiating element with the transfer function $W(p) = p$.

B [3,5] combining the description of individual blocks of the modified Σ - FIM the Voltaire model has been obtained Σ - FIM

$$v(t) = \sum_{m=2}^{\infty} [m_r \otimes x(t)]. \quad (13)$$

By combining the equations of the presented continuous part, we obtain a Volterra model of the open-loop system in the form:

$$z(t) = \theta_0 + \sum_{r=1}^{\infty} [\theta_r \otimes x(t)]. \quad (14)$$

Taking into account the system closure equations (3) and (14), we obtain the Volterra model of the closed-loop system.

$$x(t) = n_0 + \sum_{r=2}^{\infty} [n_r \otimes f(t)]. \quad (15)$$

Finally, the application of statistical linearization methods makes it possible to obtain a simplified model of the stochastic system in the form:

$$\hat{x}(t) = \int_0^{\infty} 1_0^{(i)}(\tau_0, \tau_m, \tau) d\tau + \int_0^{\infty} 1_1^{(i)}(\tau_0, \tau_m, \tau) f^0(t - \tau) d\tau, \quad (16).$$

The optimal parameters of the temperature control system for the optical fiber drawing process are evaluated using the quality criterion (7), based on the Volterra model (15) or the linearized model (16).

For the synthesis of this system, it is convenient to use the fourth method of linearization to obtain a stochastic equivalent of the temperature control system for the fiber drawing process. In this case, the synthesis problem (6.9) can be written in the form:

$$\min \{ MQ(\int_0^{\infty} 1_0^{(4)}(\tau_0, \tau_m, \bar{c}, \tau) m_f d\tau + \int_0^{\infty} 1_1^{(4)}(\tau_0, \tau_m, \bar{c}, \tau) f^0(t - \tau) d\tau) \};$$

at

$$M\left(\int_0^{\infty} 1_0^{(4)}(\tau_0, \tau_m, c, \tau) m_f d\tau + \int_0^{\infty} 1_1^{(4)}(\tau_0, \tau_m, c, \tau) f^0(t - \tau) d\tau \leq 0\right), \quad (17)$$

where $\vec{c} = \left[\tau_m \quad \Delta \quad c_v \quad \frac{1}{p_v} \right]$ – tuning parameter vector Σ -FIM, used for controlling objects with delay.

The results of the computational experiment for determining the optimal values demonstrate the effectiveness of the proposed control strategy and confirm its applicability for practical implementation:

$$C = 5,38, \quad \frac{1}{p_v} = 0,42, \Delta = 8,44, \tau_m = 4,72.$$

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AUTOMATED LAND PARCEL BOUNDARY DETECTION USING AERIAL IMAGERY**Ikhinov Andrey Vladimirovich***1st year master's student, East Siberia State University of Technology and Management,
Ulan-Ude, Russia***АВТОМАТИЗИРОВАННОЕ ОПРЕДЕЛЕНИЕ ГРАНИЦ ЗЕМЕЛЬНЫХ УЧАСТКОВ НА ОСНОВЕ
ДАННЫХ АЭРОФОТОСЪЁМКИ****Ихинов Андрей Владимирович***магистрант 1 курса, Восточно-Сибирский Государственный Университет
Технологий и Управления, г. Улан-Удэ, Россия***Abstract**

The rapid pace of urbanization and growing demand for land resources highlight the need for precise and efficient tools for territorial management. This article introduces an intelligent remote monitoring service designed for automated detection of land parcel boundaries using aerial imagery data. The proposed solution leverages advanced computer vision and machine learning technologies, specifically convolutional neural networks (CNNs), to perform image segmentation and object classification. These methods ensure high accuracy in boundary delineation, even in challenging conditions such as rugged terrain, dense vegetation, or man-made structures. The development process involves several key stages: data collection and preprocessing, model training on diverse landscape datasets, service architecture design, and performance evaluation using metrics like accuracy, recall, and F1-score. The service aims to address the shortcomings of traditional geodetic methods, which are often labor-intensive, costly, and prone to errors due to human factors. Its practical applications span cadastral registration, urban planning, and agricultural land management, offering a scalable and cost-effective solution. For instance, in cadastral systems, the service automates parcel registration, reducing errors and speeding up data processing. In urban planning, it provides precise boundary data for infrastructure design, while in agriculture, it optimizes land use and monitors field conditions. Despite its potential, challenges remain, including the need for high-quality input data and substantial computational resources. Future research should focus on enhancing model robustness across diverse scenarios and improving processing efficiency. The study demonstrates the potential of artificial intelligence in geospatial analysis and lays the groundwork for further advancements in automated land resource management.

Аннотация

Стремительный рост урбанизации и увеличение спроса на земельные ресурсы подчёркивают необходимость разработки точных и эффективных инструментов для управления территориями. В данной статье представлен интеллектуальный сервис для дистанционного мониторинга, направленный на автоматизированное определение границ земельных участков, на основе данных аэрофотосъёмки. Предложенное решение использует передовые технологии компьютерного зрения и машинного обучения, в частности, свёрточные нейронные сети (CNN), для выполнения сегментации изображений и классификации объектов. Эти методы могут обеспечивать высокую точность выделения границ даже в сложных условиях, таких как пересечённая местность, густая растительность или антропогенные объекты. Процесс разработки включает несколько ключевых этапов: сбор и предварительная обработка данных, обучение модели на наборах данных с различными ландшафтами, проектирование архитектуры сервиса и оценка производительности с использованием метрик, таких как точность, полнота и F1-метрика. Сервис рассчитан устранить недостатки традиционных геодезических методов, которые часто являются трудоёмкими, дорогостоящими и подверженными ошибкам из-за человеческого фактора. Практическое применение сервиса охватывает кадастровый учёт, градостроительное планирование и управление сельскохозяйственными угодьями, предоставляя масштабируемое и экономичное решение. Например, в кадастровых системах сервис автоматизирует регистрацию участков, снижая вероятность ошибок и ускоряя обработку данных. В градостроительстве он

обеспечит точные данные о границах для проектирования инфраструктуры, а в сельском хозяйстве оптимизирует использование земель и контроль состояния угодий. Несмотря на перспективы, остаются вызовы, включая потребность в качественных исходных данных и значительных вычислительных ресурсах. Будущие исследования должны сосредоточиться на повышении устойчивости модели к разнообразным сценариям и оптимизации эффективности обработки. Исследование демонстрирует потенциал искусственного интеллекта в геопространственном анализе и создаёт основу для дальнейших разработок в области автоматизированного управления земельными ресурсами.

Keywords: Remote monitoring, aerial photography, land parcel boundaries, machine learning, computer vision, geospatial analysis, cadastral accounting, neural networks

Ключевые слова: Дистанционный мониторинг, аэрофотосъёмка, определение границ, земельные участки, машинное обучение, компьютерное зрение, геоинформационные системы, кадастровый учёт, нейронные сети

Введение

Сегодня технологии дистанционного мониторинга территорий играют всё более важную роль, поскольку точность и оперативность в управлении земельными ресурсами необходимы для эффективного планирования и использования территорий, а также предотвращения различных проблем [1, 2, 3]. Одна из ключевых задач в этой области является определение границ участков [4]. В условиях стремительного роста урбанизации и увеличения спроса на земельные ресурсы технологии дистанционного мониторинга становятся ключевым инструментом для управления территориями. Определение границ земельных участков является одной из наиболее сложных и трудоёмких задач в этой области, поскольку традиционные методы, такие как наземные геодезические измерения, требуют значительных временных и финансовых затрат. Кроме того, сложный рельеф, растительность и антропогенные объекты часто приводят к ошибкам в распознавании границ.

Современные достижения в области искусственного интеллекта и компьютерного зрения открывают новые возможности для автоматизации этого процесса. Использование данных аэрофотосъёмки в сочетании с алгоритмами машинного обучения позволяет не только повысить точность локализации границ, но и минимизировать влияние внешних факторов. Такие решения особенно востребованы в крупных проектах, связанных с кадастровым учётом, градостроительным планированием и управлением сельскохозяйственными угодьями. В данной статье рассматривается разработка интеллектуального сервиса, который решает задачу автоматического определения границ земельных участков, на основе данных аэрофотосъёмки.

Актуальность проблемы

Необходимость точного и определения границ земельных участков обусловлена несколькими факторами. Во-первых, рост числа земельных споров и необходимость их быстрого разрешения требуют автоматизированных решений. Во-вторых, традиционные методы, такие как ручная обработка данных или использование устаревших технологий, не справляются с увеличивающимся объёмом информации. В-третьих, сложные природные и антропогенные условия, такие как густая растительность или плотная застройка, создают дополнительные трудности для точного картографирования.

Современные технологии дистанционного зондирования, включая аэрофотосъёмку и спутниковые данные, предоставляют детализированные изображения, которые могут быть обработаны с помощью алгоритмов искусственного интеллекта. Например, использование нейронных сетей для сегментации изображений может позволить выделять границы участков с высокой точностью даже в условиях сложного ландшафта. Это делает задачу разработки интеллектуальных сервисов для мониторинга территорий особенно актуальной.

Обзор современных подходов

В статье Ермохина А.В. и Иванова Н.Н. рассматриваются различные методы дистанционного зондирования [5]. Основное внимание уделяется алгоритмам обработки данных, позволяющим анализировать изображения и выделять различные классы объектов. В

исследовании применяются методы классификации на основе машинного обучения, включая нейронные сети, что способствует повышению точности извлечения информации из аэрофотоснимков. В статье упоминается, что спутники GHGSat используют спектрометрию для измерения концентрации метана в диапазоне 1600–1700 нм с помощью широкоугольного спектрометра Фабри-Перо (WAF-P etalon), обеспечивая точные значения для более чем 200 000 пикселей на изображение. Также подчеркивается, что спутниковые данные обрабатываются с помощью искусственного интеллекта и алгоритмов машинного обучения для оценки состояния окружающей среды, включая индекс площади листьев и запасы углерода, что позволяет проводить более быстрый и точный анализ по сравнению с человеческим трудом.

В исследовании, проведенном Заславским М.М., описываются методы пространственной разметки, использующие алгоритмы компьютерного зрения для анализа изображений [6]. Основное внимание уделяется методам сегментации и распознавания объектов, которые позволяют выявлять изменения в экосистемах и следить за состоянием природных ресурсов. В работе подчеркивается важность применения глубокого обучения для улучшения результатов классификации и повышения эффективности мониторинга. В статье говорится, что разработана программная система экологического мониторинга на основе технологий пространственной разметки и машинного зрения, которая унифицирует гетерогенные данные RGB-снимков и БПЛА. Указывается, что система использует четырехэтапный метод (пространственная разметка, фильтрация, сегментация, фрагментация) и реализована с веб-интерфейсом. Также отмечается применение фильтров (медианный и анизотропный) и NDVI-индекса для анализа растительного покрова.

В работе Кургановича К.А. акцент делается на использование алгоритмов искусственного интеллекта, таких как машинное обучение и глубокое обучение, для мониторинга паводков [7]. Исследуются методы предсказания рисков на основе анализа исторических данных и текущих снимков. Внедрение автоматизированных систем позволяет более эффективно отслеживать изменения и управлять рисками, связанными с паводками. В статье говорится, что после 10 тысяч итераций процесса обучения производили оценку производительности по F1-метрике. Исходя из статьи, наилучший результат по скорости и точности продемонстрировала архитектура U-net, построенная с использованием сверточной нейронной сети с энкодером SE-ResNeXt50. Также подчеркивается, что при обучении класс "ограждения" продемонстрировал самую низкую точность из всех классов, связано это с проблемой несбалансированной выборки, то есть с разными размерами объектов попадающих в классы.

В статье Мухаммада Ихсана описывается использование искусственного интеллекта для решения задач земельного кадастра, таких как устранение наложений и ошибок в геометрии участков [8]. Автоматизированный подход на основе SAM (Segment Anything Model) позволяет эффективно обрабатывать большие объемы данных аэрофотосъемки, что особенно полезно для мониторинга территорий с высокой плотностью участков. Это демонстрирует потенциал ИИ в управлении пространственными данными. Статья описывает метод сегментации границ земельных участков на ортофотомозаиках (разрешение 5 см, точность 12,4 см) с помощью модели SAM, обученной на 11 млн изображений, для нахождения контрольных точек (определение точных координат на ортофотомозаиках, например, углы зданий, заборов или пересечения границ, которые служат опорными точками для блочной корректировки – процесса выравнивания и уточнения геометрии земельных участков.). Процесс включает сегментацию, выделение центральной линии, упрощение и фильтрацию, что дает изменение площади участков на 4–6% (допустимо до 10%), но без точных данных о погрешности или скорости обработки

Статья Куракиной Н.И. касается методов интеграции аэрофотосъемки с геоинформационными системами (ГИС) [9]. Рассматриваются подходы к обработке и анализу пространственных данных, включая методы обработки изображений и пространственного анализа для выявления изменений на территории. В исследовании акцентируется внимание на важности точности геопрограммных данных и применении аналитических инструментов для эффективного мониторинга. Статья рассматривает обработку данных аэрофотосъемки с использованием ГИС, включая создание ортофотопланов и цифровых моделей местности. Преимуществами являются высокая точность (до 0,025 м), где каждый пиксель соответствует 2,5 см реальной местности, что позволяет детально различать границы участков, дороги и постройки, а также интеграция с ГИС. Ограничения связаны с качеством исходных данных, высокими вычислительными затратами и сложностью объединения

разнородных снимков. Методика эффективна для землеустройства, мониторинга и картографирования.

Эти подходы демонстрируют различные технологии, используемые для анализа и мониторинга территорий, включая комбинацию дистанционного зондирования, компьютерного зрения и искусственного интеллекта.

Научно обоснованный выбор подхода

На основании проведённого обзора статей можно сделать вывод, что для задач локализации объектов на аэрофотоснимках наиболее эффективными являются методы, сочетающие компьютерное зрение и машинное обучение. В частности, сверточные нейронные сети (CNN) демонстрируют высокую производительность в задачах сегментации изображений, что делает их подходящим выбором для определения границ земельных участков.

Основные этапы разработки сервиса

Разработка интеллектуального сервиса для автоматического определения границ земельных участков включает несколько ключевых этапов:

1. Сбор и предварительная обработка данных. Необходима подготовка аэрофотоснимков;
2. Обучение модели. Применение сверточных нейронных сетей, например, YOLO, для сегментации изображений и выделения границ участков [10]. Обучение проводится на размеченных данных, включающих различные типы ландшафтов и условий;
3. Проектирование архитектуры сервиса. Сервис должен включать модули обработки изображений и визуализации результатов;
4. Тестирование и оценка. Точность модели должна оцениваться на реальных данных с использованием метрик, таких как precision, recall и F1-score [11].

Практическая значимость

В области кадастрового учёта сервис позволит автоматизировать процесс регистрации участков, снижая вероятность ошибок и ускоряя обработку данных. Для градостроительного планирования сервис предоставит точные данные о границах, что упрощает проектирование инфраструктуры. В сельском хозяйстве автоматизированный мониторинг поможет оптимизировать использование земель и контролировать состояние угодий.

Применение интеллектуального сервиса также способствует снижению затрат. По сравнению с традиционными методами, требующими значительных человеческих ресурсов, автоматизированная обработка данных сокращает время и расходы на анализ.

Заключение

Разработка интеллектуального сервиса для автоматического определения границ земельных участков на основе данных аэрофотосъёмки представляет собой перспективное направление в области дистанционного мониторинга. Использование технологий компьютерного зрения и машинного обучения позволяет значительно повысить точность и эффективность анализа пространственных данных. Вместе с тем, дальнейшие исследования необходимы для преодоления ограничений, связанных с качеством исходных данных, вычислительными затратами и обработкой сложных сценариев.

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RESEARCH ON THE PRODUCTION PROCESS OF MINERAL FERTILISER ENRICHED WITH POTASSIUM NUTRIENT BASED ON PHOSPHORITES

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Abstract

This study investigates the synthesis of mineral fertilizers derived from unenriched phosphorite flour (UPF), in combination with nitric acid, ammonium nitrate solution, and potassium chloride. Laboratory-scale experiments were carried out to determine the feasibility and optimal conditions for producing efficient fertilizer compositions. The UPF used in this research had the following chemical composition: P_2O_5 – 16,6%; CaO – 42,7%; CO_2 – 15,7%; MgO – 1,7%; R_2O_3 – 2,5%; SO_3 – 1,1%; F – 2,3%; H_2O – 2,1% and loss on ignition (n.o.) – 3,7%. Based on the experimental results, optimal reaction parameters and processing conditions were established for the formation of new-generation mineral fertilizers with enhanced agronomic potential.

Keywords: Raw phosphorite material, nitric acid treatment, ammonium nitrate-based solution, potassium chloride additive, synthesis of mineral fertilizers, efficient phosphorus extraction.

Introduction

It is impossible to imagine productivity without the use of mineral fertilisers containing various nutrients (nitrogen, phosphorus, potassium). In recent years, there has been an increasing trend in the production of phosphate raw materials and it is not surprising that the world phosphate ore production today is 191 million tonnes per year. The annual production and consumption of phosphate raw materials is expected to be about 71 million tonnes of P_2O_5 (222 million tonnes of phosphate rock) by 2050 [1]. Phosphorites are the main raw material of phosphate used in the production of phosphorus fertilisers. They are not suitable for fertilisers containing dense phosphorus. For this reason, active studies have been carried out in recent years on the conversion of such phosphate rocks into liquid and suspended fertilisers. The production of liquid suspension NP-fertiliser has been previously studied [2,3]. The production of NPK suspension fertilisers with insecticidal activity was also investigated [4].

Aims and objectives of the study

The aim and objective of the study is to obtain liquid suspension complex fertilisers based on low quality phosphorites.

Materials and methods

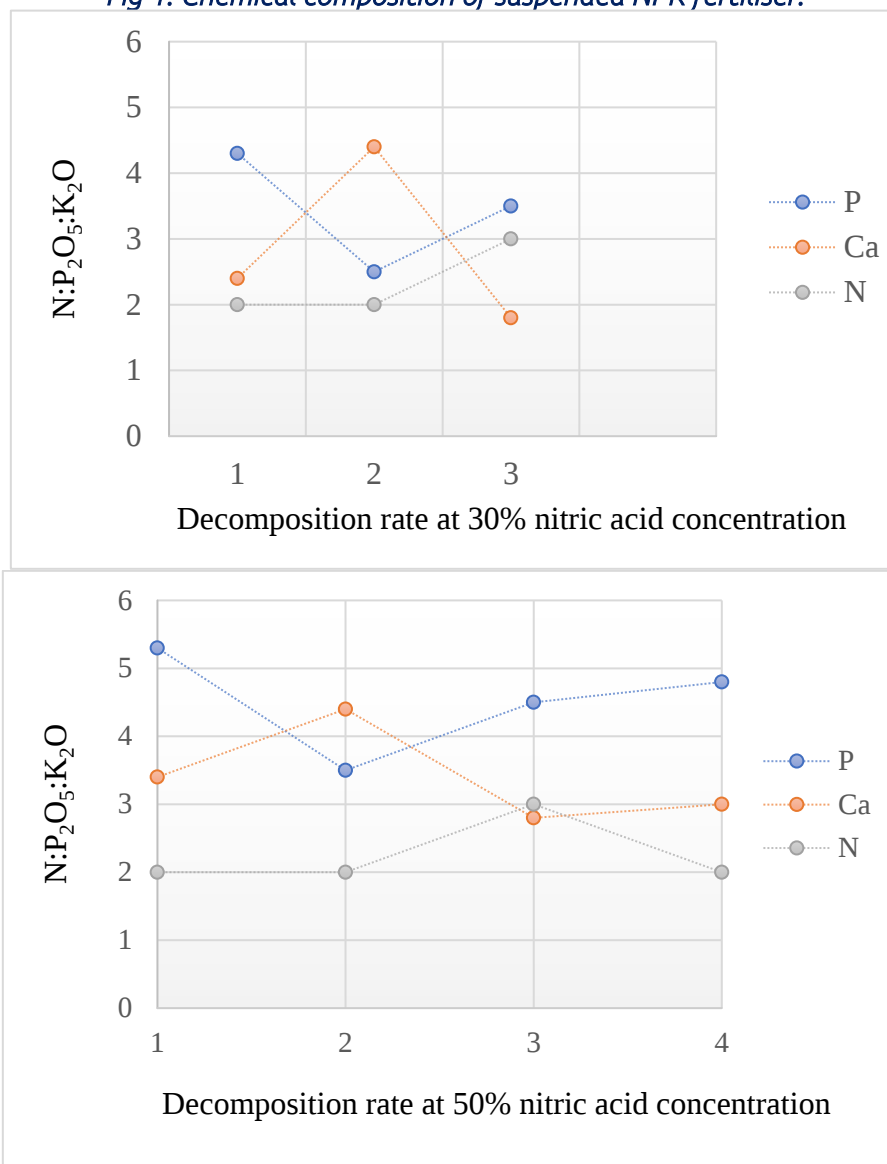
For laboratory experiments, unenriched phosphorite flour with the following composition (wt.%) was used: P_2O_5 – 16,6%; CaO – 42,7%; CO_2 – 15,7%; MgO – 1,7%; R_2O_3 – 2,5%; SO_3 – 1,1%; F – 2,3%; H_2O – 2,1%; (n.o.) – 3,7% and 56% nitric acid. The decomposition of phosphate feedstock with nitric acid was carried out in a glass reactor at 25-35°C with continuous stirring for 20-25 minutes. The calculated amount of nitric acid was added to the phosphate feedstock within 4-5 minutes. At the same time, there was an intense interaction of the acid with the components of the high carbonate phosphate feedstock in the reactor. Since the process was carried out in solid-phase mode, abundant foaming did not occur, since there was almost no liquid phase in contact with high-carbonate phosphorite incomplete nitric acid. The calculated amount of water was added to the solution obtained after digestion to obtain an 80% fertiliser suspension, i.e. the moisture content of the slurry was constantly maintained at 20% H_2O . For the preparation of suspended complex NPK fertilisers with different nutrient ratios, the nitrogen-phosphoric acid solution was mixed with a calculated amount of ammonium nitrate solution obtained by neutralising nitric acid with aqueous ammonia solution or gaseous ammonia, and then a calculated amount of potassium chloride was also added to the NP-fertiliser suspension. The resulting complex NPK-fertiliser samples were analysed in suspensions with different nutrient ratios according to the methods presented in [5,6].

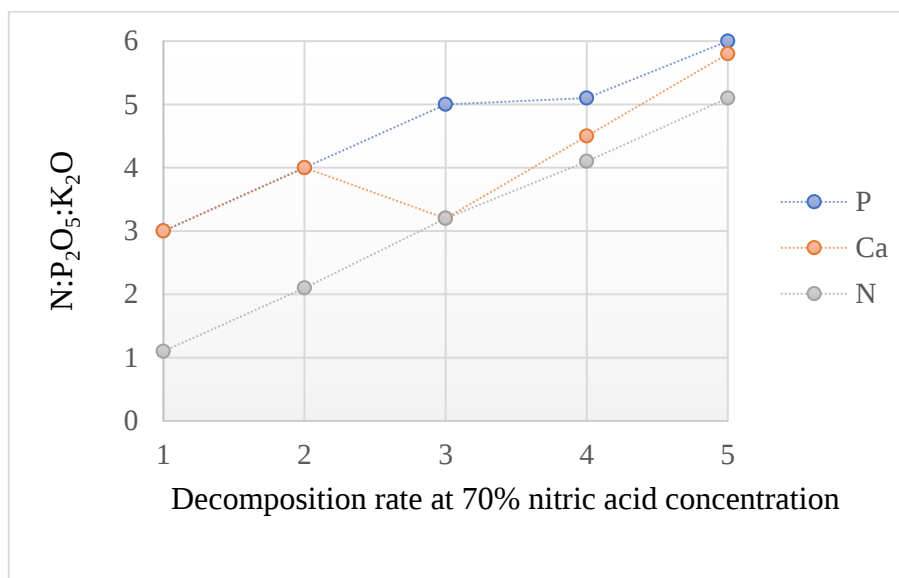
Results and discussion

The results obtained are given in Figure 1. According to the data in Figure 1, 34% of the suspended complex nitrogen-phosphorus-potassium fertiliser ($N:P_2O_5:K_2O=1,0:2,0:2,0$), 34% was in ammonia form, the remaining 66% was in nitrate form, total 8% nitrogen, 35% of which was in absorbed nitrogen form,

total 7,2% P_2O_5 , total 6,2% K_2O and 18% CaO . Of the 35% in absorbable form, only 7% is K_2O and 18% is CaO , of which 33% is in absorbable CaO and 25% is in water soluble form. It contains mainly calcium nitrate – 12,7%, ammonium nitrate - 13%, as well as mono- and dicalcium phosphates and phosphate flour in active form - 27% and potassium chloride - 12%. $N+P_2O_5+K_2O+CaO_{basic}$. the total amount of nutrients is 26%.

Fig 1. Chemical composition of suspended NPK fertiliser.





By increasing the proportion of ammonium nitrate in the suspension to 27%, i.e. changing the N:P₂O₅:K₂O ratio from 1,5:2,0:2,5 to 1,0:1,5:2, the rate of decomposition of phosphate rock increases from 35% to 37%. Increasing the nitric acid ratio from 30% to 70% in the decomposition of unenriched phosphorite flour causes the amount of absorbed phosphorus and calcium to increase from 3% to 5% and from 6% to 9%, respectively.

Under these conditions, the separation coefficient of phosphate flour varies between 44% and 75%. The changes of water-soluble forms of phosphorus and calcium in suspended complex nitrogen-phosphorus-potassium fertilisers depending on nitric acid content and nutrient ratios were also investigated. It was found that water soluble forms of phosphorus and calcium increased with increasing nitric acid content. For example, in 30% nitric acid solution, the amount of water-soluble forms of phosphorus and calcium was 1,2% and 2,8%, respectively, while in 70% nitric acid solution, these amounts were 2,4% and 5,6%, respectively, i.e. 2-fold increase. Based on the research, the optimal conditions for obtaining new forms of liquid suspended complex fertilisers were determined: the ratio of nitric acid for decomposition of unenriched phosphorite flour -30-70% of stoichiometry; decomposition time - 20-25 minutes.

Conclusion

It has been experimentally proven that new effective forms of liquid suspension complex fertilisers can be obtained by disintegrating unenriched phosphorite flour and adding ammonium nitrate and potassium chloride solutions to the resulting slurry. Complex NPK fertiliser in liquid suspension stands out with its ease of production compared to standard solid fertilisers and meets the basic requirements of agricultural production. However, the fertilisers obtained also have some disadvantages: poor rheological properties and thus technical difficulties in application. In order to overcome these shortcomings and to improve the technology of suspended complex fertiliser production based on low-quality phosphate rock, it is necessary to investigate the most suitable approaches to the production of liquid suspended complex fertiliser, which is another topic of our research.

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