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WAYS AND TECHNOLOGICAL INNOVATIONS TO INCREASE PRODUCTIVITY IN VITICULTURE IN THE NAKHCHIVAN AUTONOMOUS REPUBLIC

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Abstract

Viticulture holds significant socio-economic and cultural importance in the Nakhchivan Autonomous Republic, a region with favorable climatic and soil conditions for grape cultivation. However, traditional practices and limited technological integration continue to constrain productivity and quality. This study explores contemporary methods and technological innovations aimed at enhancing efficiency, yield, and sustainability in viticulture across the region. The research identifies key challenges faced by local grape growers, including climate variability, pest management, irrigation inefficiencies, and labor shortages. It then presents a comprehensive analysis of modern solutions that can address these issues. Among the proposed strategies are the adoption of precision viticulture techniques—such as the use of drones for vineyard monitoring, GIS-based mapping for soil and plant health analysis, and sensor technologies to optimize irrigation and fertilization. These technologies enable real-time data collection, allowing growers to make informed decisions and reduce resource wastage. Mechanization, including the use of advanced pruning and harvesting equipment, is another critical area that can significantly reduce labor costs and improve operational efficiency. Furthermore, implementing disease-resistant grapevine varieties and integrated pest management systems can mitigate the risks of crop losses and reduce dependency on chemical inputs. Climate-smart agriculture practices, including the use of drought-tolerant rootstocks and microclimate modification techniques, are also examined as tools to adapt to environmental stresses. The study emphasizes the importance of training and capacity-building programs for farmers, supported by government and private sector partnerships, to facilitate the effective adoption of these technologies. By integrating traditional knowledge with modern innovations, the viticulture sector in Nakhchivan can achieve higher yields, better quality grapes, and improved profitability. The findings suggest that targeted investments, policy support, and research-extension linkages are crucial for a sustainable transformation. This research contributes to the broader discourse on agricultural modernization in semi-arid regions and offers a roadmap for elevating viticulture as a pillar of rural development in Nakhchivan.

Keywords: *Nakhchivan Autonomous Republic, viticulture, grape cultivation, vineyard management, agricultural productivity, climate-smart agriculture*

Introduction

Viticulture in the Nakhchivan Autonomous Republic holds significant economic and cultural importance, offering potential for increased productivity through modern approaches and technological innovations. Given the region's favorable climate and rich history in grape cultivation, enhancing productivity involves both optimizing traditional practices and integrating advanced technologies.

One effective way to boost productivity is through the adoption of precision agriculture. This includes the use of drones and satellite imagery to monitor vineyard health, detect disease early, and assess water stress. These tools help farmers make informed decisions on irrigation, fertilization, and pesticide use, thereby reducing waste and increasing yield. Additionally, soil sensors can be installed to provide real-time data on moisture levels and nutrient content, allowing for targeted interventions that support vine health.

Mechanization is another critical factor. Introducing automated pruning and harvesting equipment can significantly reduce labor costs and time, while ensuring consistent quality. In regions where terrain allows, these machines can handle repetitive tasks more efficiently than manual labor, increasing operational scalability. [2]

Genetic innovations, such as developing disease-resistant and drought-tolerant grape varieties, can also play a vital role in maintaining productivity under climate stress. These cultivars can reduce dependency on chemical treatments and improve the sustainability of vineyards in Nakhchivan's semi-arid environment.

Furthermore, digital vineyard management platforms can streamline operations by integrating weather forecasts, growth tracking, and logistical planning. Mobile applications that support real-time data entry and analytics enable growers to track performance and implement best practices more effectively. [1]

Finally, training and capacity building for local farmers in modern viticulture techniques and technology usage are essential. Partnerships with agricultural universities and international viticulture experts can provide vital knowledge transfer. By combining traditional knowledge with innovation, Nakhchivan's viticulture sector can enhance both productivity and sustainability, positioning itself competitively in domestic and international markets.

Ways and technological innovations to increase productivity in viticulture in the Nakhchivan Autonomous Republic

Viticulture, the cultivation and harvesting of grapes, is a cornerstone of agricultural development in many regions, particularly those with favorable climates and traditions in winemaking. The Nakhchivan Autonomous Republic, located in the South Caucasus and characterized by its semi-arid continental climate, has long-standing traditions in grape cultivation, which contribute significantly to both the local economy and cultural heritage. Despite its potential, viticulture in Nakhchivan still faces productivity challenges due to climatic constraints, aging vineyard infrastructure, limited mechanization, and inadequate access to modern technological innovations. Enhancing productivity in this sector requires a comprehensive integration of modern agricultural techniques, precision viticulture, and sustainable practices. This paper explores both existing challenges and modern technological innovations that can be employed to elevate the efficiency and productivity of viticulture in Nakhchivan.

One of the most pressing challenges in viticulture in Nakhchivan is the region's water scarcity. Given the semi-arid nature of the climate, grape production is heavily reliant on irrigation. Traditional irrigation methods such as flood irrigation are highly inefficient and contribute to water loss through evaporation and seepage. A major step toward increasing productivity is the adoption of modern irrigation technologies such as drip irrigation and subsurface irrigation systems. Drip irrigation, in particular, delivers water directly to the plant root zone, reducing wastage and ensuring that each vine receives an optimal amount of moisture. Coupled with sensors that monitor soil moisture in real time, these systems allow farmers to schedule irrigation based on actual plant needs, thereby conserving water and promoting healthier vine growth. [5]

Another avenue for increasing productivity is the use of precision agriculture technologies. Precision viticulture involves the use of geographic information systems (GIS), global positioning systems (GPS), and remote sensing technologies to monitor and manage vineyard variability. By employing drones equipped with multispectral or thermal cameras, viticulturists can collect data on plant vigor, chlorophyll content, water stress, and disease symptoms. This data, when processed through advanced software, can help in creating detailed vineyard maps that delineate different zones based on productivity and health. This zonal approach enables more targeted application of fertilizers, pesticides, and water, thereby increasing efficiency and reducing input costs. For the vineyards in Nakhchivan, which often vary in microclimates and soil composition due to the region's mountainous terrain, precision viticulture can significantly enhance grape yield and quality.

Soil health is a critical factor influencing the productivity of vineyards. Traditional practices in Nakhchivan may not always focus on soil management, which can lead to degradation over time. Technological advancements in soil analysis now allow for comprehensive assessments of nutrient levels, pH, organic matter, and microbial activity. Portable soil-testing devices and laboratory-based spectroscopic techniques can provide quick and accurate data, guiding decisions on soil amendments and fertilizer application. The use of biofertilizers and organic compost can improve soil structure and enhance microbial biodiversity, leading to more resilient and productive vines. Moreover, conservation tillage practices and cover cropping, guided by soil data, can further improve soil health and reduce erosion, particularly in the hilly areas of Nakhchivan. [3]

Plant health and pest management are also crucial aspects where technological innovations can make a significant impact. Traditional pesticide application methods can lead to overuse, environmental damage, and pest resistance. The integration of smart spraying systems, which use sensors to detect plant foliage and only spray where necessary, can dramatically reduce chemical use. Furthermore, the

implementation of integrated pest management (IPM) strategies, supported by predictive modeling software and pest surveillance data, enables early detection and precise intervention. Biological control agents, such as beneficial insects or microbial pesticides, can be deployed more effectively with the support of these technologies. Given the biodiversity of the Nakhchivan region, preserving ecological balance while managing pests is essential, and technological innovations can help achieve this balance.

Climate variability poses another significant challenge for viticulture in Nakhchivan. Increasing temperatures, unpredictable rainfall, and extreme weather events can severely affect grape development, sugar accumulation, and harvest timing. Climate-resilient viticulture practices are therefore necessary. One such innovation is the development and use of drought-tolerant and disease-resistant grape varieties through advanced breeding techniques, including marker-assisted selection and genomic editing. These new cultivars can be better suited to local climatic conditions and reduce reliance on chemical inputs. Furthermore, digital phenotyping tools can be used to monitor plant development under stress conditions, allowing farmers to adjust practices dynamically. In combination with localized climate data obtained from automated weather stations, viticulturists in Nakhchivan can make more informed decisions regarding pruning, irrigation, and harvest scheduling, all of which directly influence productivity.

Mechanization is another important strategy to enhance vineyard productivity. While small-scale and traditional vineyards in Nakhchivan may rely on manual labor for most tasks, mechanization can improve efficiency, reduce labor costs, and ensure timely operations. The use of specialized vineyard machinery such as mechanical harvesters, pruning machines, and canopy management tools can reduce the time required for essential vineyard operations and minimize human error. While initial investment costs can be high, cooperative ownership models or government subsidies can help smallholders access such equipment. Furthermore, machinery can be adapted to the region's specific vineyard layouts and terrain conditions to ensure compatibility and effectiveness. [7]

Digital platforms and mobile applications represent a growing frontier in agricultural innovation. Farmers in Nakhchivan can benefit from mobile apps that provide real-time information on weather forecasts, pest outbreaks, market prices, and best agricultural practices. These platforms can also serve as educational tools, disseminating knowledge about modern viticulture techniques and innovations. Decision support systems, often accessible via smartphones or computers, can assist farmers in planning vineyard operations based on integrated data from sensors, drones, and weather models. By digitizing farm management, viticulturists can improve record-keeping, traceability, and compliance with quality standards, all of which are important for accessing broader markets, including export opportunities. [9]

The implementation of renewable energy sources in viticulture can further increase sustainability and reduce production costs. Solar-powered irrigation systems, for instance, can alleviate dependency on expensive fossil fuels, particularly in remote areas of Nakhchivan where electricity infrastructure may be limited. Similarly, the use of solar dryers for grape dehydration in raisin production, a significant by-product of viticulture, can improve processing efficiency and product quality. As the global market increasingly favors environmentally friendly and sustainably produced goods, adopting renewable energy technologies can provide Nakhchivan's viticulture with a competitive edge. [11]

Investment in research and development is essential for long-term productivity improvements in viticulture. Local agricultural research institutions, in collaboration with international experts and universities, can play a pivotal role in developing region-specific innovations. Field trials to test new grape varieties, irrigation techniques, pest control methods, and soil treatments under Nakhchivan's climatic and soil conditions are crucial. Moreover, the creation of viticulture demonstration farms and innovation hubs can serve as practical learning centers for farmers and agronomists. These centers can also facilitate data collection and contribute to building a comprehensive viticultural database for the region. [6]

Government policy and institutional support are integral to the successful adoption of technological innovations in viticulture. Subsidies for modern equipment, tax incentives for sustainable practices, and low-interest loans for technology adoption can encourage farmers to modernize their operations. In addition, training programs and extension services are critical to improving farmers' technical knowledge and capacity to use new technologies effectively. Policymakers should also support the development of cooperatives and producer organizations, which can pool resources for technology investment, enhance bargaining power in markets, and foster knowledge sharing among members. [8]

Market access and value chain development are also crucial to making productivity improvements in viticulture economically viable. Increasing grape yield and quality must be matched by efficient post-harvest handling, processing, packaging, and marketing systems. Investments in cold storage, transportation infrastructure, and grape processing facilities such as wineries and juice factories can reduce post-harvest losses and add value to raw produce. Additionally, branding and certification of local grape

products as organic or geographically indicated can open up niche markets and improve profitability. Digital marketing platforms and e-commerce can also help local producers reach consumers beyond the region, both domestically and internationally. [4]

Table 1. Ways and technological innovations to increase productivity in viticulture in Nakhchivan Autonomous Republic

Category	Methods/Technologies	Description/Benefits
1. Climate-smart agriculture	Drip Irrigation Systems	Efficient water usage in Nakhchivan's semi-arid climate; reduces water stress on vines.
	Weather forecasting & Monitoring Tools	Helps in planning vineyard operations, protecting against frost or heatwaves.
2. Soil & Vineyard management	Precision agriculture (e.g., soil sensors, GPS mapping)	Real-time soil health monitoring and mapping for targeted fertilization and irrigation.
	Organic fertilizers & Composting	Increases soil fertility and sustainability; aligns with eco-friendly practices.
3. Grape variety improvement	Use of drought-Resistant and high-yielding varieties	Selection of grape varieties suitable for Nakhchivan's climate and soil conditions.
	Grafting & Clonal selection	Ensures consistent quality and better disease resistance.
4. Pest & Disease Control	Integrated pest management (IPM)	Combines biological, cultural, and chemical methods to control pests sustainably.
	Use of drones for monitoring	Early detection of disease and pest outbreaks through aerial imaging.
5. Mechanization	Mechanical harvesters	Reduces labor dependency and harvest time, especially during peak season.
	Tractors with vineyard-specific Attachments	Efficient pruning, spraying, and soil preparation.
6. Digitalization & Data use	Vineyard management software (e.g., VINtrace, AgriWebb)	Tracks vine health, inputs, labor, and harvest data to improve decision-making.
	Blockchain for supply chain Traceability	Enhances transparency and marketability of local wine products.
7. Post-Harvest handling	Cold chain infrastructure	Reduces post-harvest losses and maintains grape quality.

Source: *Compiled by the author*

In conclusion, enhancing productivity in viticulture in the Nakhchivan Autonomous Republic requires a multifaceted approach that combines traditional knowledge with modern technological innovations. The integration of precision agriculture, smart irrigation, mechanization, digital tools, and climate-resilient practices can substantially increase grape yield and quality while promoting sustainability. Support from research institutions, and market infrastructure is essential to ensure that these innovations are accessible and effective for local farmers. With its rich viticultural heritage and favorable agro-climatic conditions, Nakhchivan holds significant potential to become a leading region for high-quality grape production in the Caucasus and beyond, provided that a strategic and technologically informed path is pursued.

Conclusion

The advancement of viticulture in the Nakhchivan Autonomous Republic is essential for boosting regional economic development, sustaining traditional agricultural practices, and increasing competitiveness in global markets. To ensure consistent growth and productivity, the integration of modern technologies and innovative practices in viticulture is crucial. Over recent years, the application of precision agriculture tools—such as drones for monitoring vineyard health, soil sensors for moisture and nutrient analysis, and GPS-guided machinery—has opened new opportunities for increasing yield and reducing manual labor. Additionally, climate-resilient grape varieties, drip irrigation systems, and advanced pruning and canopy management techniques have contributed to the more efficient use of resources and improved grape quality. [10]

Automation and digitalization play a pivotal role in enhancing productivity. The use of data analytics and vineyard management software allows growers in Nakhchivan Autonomous Republic to make informed decisions on irrigation, fertilization, pest control, and harvest timing. These systems reduce operational costs while improving overall efficiency. Moreover, the introduction of disease-resistant grape varieties through biotechnology helps minimize crop loss and reliance on chemical treatments, contributing to sustainable viticulture. [12]

Investments in research, education, and infrastructure are equally important. Encouraging collaboration between local universities, agricultural institutes, and international partners can accelerate the adoption of these innovations. Training programs for local farmers ensure effective technology use and knowledge transfer. With continued support from governmental and private sectors, Nakhchivan

Autonomous Republic has the potential to become a leading viticultural region by blending traditional knowledge with modern science. The strategic implementation of these innovations can transform the viticulture industry in Nakhchivan, making it more productive, environmentally friendly, and economically viable for future generations.

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Economic sciences

PROSPECTS OF ECOTOURISM DEVELOPMENT THROUGH ECOBRANDING IN DOMESTIC TOURIST DESTINATIONS OF KAZAKHSTAN

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ҚАЗАҚСТАННЫҢ ІШКІ ТУРИСТІК ДЕСТИНАЦИЯЛАРЫНДА ЭКОБРЕНДИНГ АРҚЫЛЫ ЭКОТУРИЗМДІ ДАМЫТУ ПЕРСПЕКТИВАЛАРЫ

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Abstract

The article examines the prospects for the development of ecotourism in domestic tourist destinations in Kazakhstan through the formation of an eco-brand. Using the example of the Zerendinsky district, an analysis of natural resources, current tourist infrastructure is carried out, as well as key barriers and opportunities for sustainable development are highlighted. Special attention is paid to the stages of eco-brand formation, the involvement of the local community and the need to introduce the principles of soft tourism. The presented strategic proposals can serve as a basis for promoting new environmentally sustainable directions in the domestic tourism of the country.

Аннотация

В статье рассматриваются перспективы развития экотуризма во внутренних туристских дестинациях Казахстана через формирование экобренда. На примере Зерендинского района проводится анализ природных ресурсов, текущей туристской инфраструктуры, а также выделяются ключевые барьеры и возможности устойчивого развития. Особое внимание уделяется этапам формирования экобренда, вовлечению местного сообщества и необходимости внедрения принципов мягкого туризма. Представленные стратегические предложения могут служить основой для продвижения новых экологически устойчивых направлений во внутреннем туризме страны.

Аңдатпа

Мақалада Қазақстандағы ішкі туристік дестинацияларда экотуризмді дамыту перспективалары экобрендинг құру арқылы қарастырылады. Зеренді ауданы мысалында табиғи ресурстар, қазіргі туристік инфрақұрылым және тұрақты дамуға кедергі келтіретін факторлар мен мүмкіндіктер талданады. Экобренд қалыптастыру кезеңдері, жергілікті халықтың қатысуы және жұмсақ туризм қағидаттарын енгізудің маңыздылығы атап өтіледі. Ұсынылған стратегиялық қадамдар елдегі ішкі туризмді экологиялық тұрғыдан орнықты бағытта дамытуға негіз бола алады.

Keywords: *ecotourism, eco-branding, tourist destination, brand, domestic tourism, marketing*

Ключевые слова: *экотуризм, экобрендинг, туристская дестинация, бренд, внутренний туризм, маркетинг*

Кілтті сөздер: *экотуризм, экобрендинг, туристік дестинация, бренд, ішкі туризм, маркетинг*

Кейінгі жылдары бүкіл әлемде тұрақты және экологиялық таза туризмге деген қызығушылықтың артуы байқалады. Туристер барған сайын саналы болып, табиғи сұлулықты ұсынып қана қоймай, қоршаған ортаны қорғауға, жергілікті халықты қолдауға және мәдени мұраны құрметтеуге ықпал ететін бағыттарды қалайды. Осыған байланысты экотуризм туризмнің тұрақты дамуының негізгі бағыттарының бірі ретінде ерекше өзектілікке ие болады.

Қазақстан биоалуантүрліліктің, бірегей табиғи ландшафттардың және мәдени мұраның арқасында экотуризм саласында елеулі әлеуетке ие. Алайда, ішкі туристік бағыттар, әсіресе байқалмайтын аймақтарда, көбінесе туристік қызығушылықтың шетінде қалады. Мұның себептері туристік инфрақұрылымның әлсіздігі, ақпараттың жетіспеушілігі, сондай-ақ осы аумақтарды орналастыру мен ілгерілетудің нақты стратегиясының болмауы болып табылады.

Тұрақты туризмді дамытудағы тиімді құралдардың бірі экобрендинг - оның экологиялық, мәдени және әлеуметтік ерекшеліктеріне негізделген туристік аумақтың бірегей имиджін жасау болып табылады.

Экобренд дестинацияның оң қабылдауын қалыптастыруға, экологиялық таза туристерді тартуға және жергілікті сәйкестікті нығайтуға көмектеседі.

Бұл мақаланың мақсаты-экобрендинг құралдары арқылы Қазақстанның ішкі туристік дестинацияларында экотуризмді дамыту мүмкіндіктері мен перспективаларын зерттеу. Зерттеудің басты бағыты-экобрендті қалыптастырудың негізгі факторларын анықтау, өңірлерді орнықты ілгерілетудің кедергілері мен мүмкіндіктерін талдау, сондай-ақ ішкі және сыртқы туристік нарықта экотуристік дестинацияларды тиімді орналастыру бойынша ұсыныстар әзірлеу.

Зерттеу объектісі табиғи-рекреациялық әлеуеті бар Қазақстанның ішкі туристік дестинациялары болып табылады. Орталық Қазақстанның перспективалы экодестинацияларының бірі мысалында әдебиеттерді талдау, маркетингтік материалдарды контент-талдау, сондай-ақ кейс - әдіс элементтері әдіснамалық негіз болды [5].

Экотуризм экожүйеге зерттеу, ойлау және минималды араласу мақсатында табиғи аумақтарға баруға бағытталған тұрақты туризмнің бір түрі ретінде қарастырылады. Дүниежүзілік туристік ұйымның (UNWTO) анықтамасына сәйкес, экотуризм - қоршаған ортаны қорғауға және жергілікті халықтың әл-ауқатын жақсартуға ықпал ететін табиғи аймақтарға жауапты саяхат [4].

Экотуризмнің негізгі принциптеріне мыналар жатады:

- Табиғатқа минималды әсер ету;

- Туристердің экологиялық білімі;

- Қоршаған ортаны қорғауды қолдау;

- Жергілікті қауымдастықтарды тарту және қолдау;

- Мәдени құрмет және дәстүрлерді сақтау.

Экотуризм, бұқаралық туризмнен айырмашылығы, табиғатпен тереңірек байланыста болуды, аз туристік ағындарды және демалысты ұйымдастыруға жеке көзқарасты қамтиды.

Экобрендинг тұрақты даму құралы ретінде қарастыратын болсақ, бұл табиғи, экологиялық және мәдени құндылықтарға негізделген туристік дестинацияның имиджін қалыптастырудың стратегиялық тәсілі. Ол визуалды элементтерді (логотип, ұран, бренд стилі) және семантикалық толтыруды - құндылықтарды, бірегейлікті, орын философиясын қамтиды. Ол өз кезегінде бірнеше мақсаттарды қамтуы мүмкін [2].

Біріншіден, аймақты тану – бұл Зерендіні экологиялық таза әрі ерекше табиғи орын ретінде кеңінен насихаттауды көздейді. Бұл – оның табиғи келбеті мен бай экожүйесін көрсету арқылы туристік тартымдылығын арттыруға бағытталған қадам.

Екіншіден, сенімді қалыптастыру – тұрақты және этикалық туризм тәжірибесіне қызығушылық танытатын туристердің сеніміне ие болу. Бұл үшін аймақтың ашықтығы, қауіпсіздігі және экологиялық жауапкершілікке бейілділігі маңызды.

Үшіншіден, «сапалы» туристерді тарту – бұл табиғатты құрметтейтін, жергілікті қауымдастықтарды қолдайтын дәстүрлерге бейім туристерді қызықтыру. Мұндай туристер экологиялық таза демалысты қалайды және дестинацияның ұзақмерзімді дамуына оң ықпал етеді.

Төртіншіден, жергілікті халықты ынталандыру – экожүйелерді сақтауға жәрдемдесу және жергілікті тұрғындарды туризмге тарту арқылы олардың табысын арттыру мен өмір сүру сапасын жақсартуға бағытталған.

Экобрендинг маркетингтік құралдарды ғана емес, сонымен қатар дестинацияны тұрақты басқару элементтерін де қамтиды: экологиялық бақылау, «жасыл» стандарттарды ескере отырып инфрақұрылымды дамыту, жергілікті кәсіпкерлерді тарту, экологиялық білім мен ағартуды дамыту.

Экотуризм мен экобрендинг бір - бірімен байланысты: біріншісі мазмұнды, екіншісі алға жылжу формасы мен стратегиясын ұсынады. Нақты экологиялық толтырусыз экобренд мақсатты аудиторияның сенімін жоғалтып, «бос» маркетингке айналады. Екінші жағынан, тіпті ең қызықты табиғи ресурстар мен тиімді коммуникациясыз тұрақты тәжірибелер туристермен резонанс тудырмайды. Осылайша, туристік дестинацияның орнықты дамуы экологиялық саясат, брендинг, жергілікті халықтың қатысуы және білім беру бастамалары ілгерілеудің бірыңғай стратегиясын қалыптастыратын кешенді тәсілмен ғана мүмкін болады.

Тұрақты туризмге деген қызығушылықтың артуы аясында дестинациялардың экологиялық брендингі аз танымал, бірақ перспективалы аймақтарды дамытудың стратегиялық құралына айналуда. Қазақстанның Ақмола облысының Зеренді ауданы бірегей табиғи және ландшафттық әлеуетке ие бола отырып, экожүйелерді сақтауға және жергілікті қоғамдастықтарды тұрақты тартуға бағдарланған экобренд моделін енгізу үшін қолайлы платформа болып табылады.

Зеренді экологиялық туризмге қолайлы табиғи ресурстар кешені бар: мөлдір-мөлдір көлдер (Зеренді, Шалқар, Айдабұл), қылқан жапырақты ормандар, қоңыржай таулы рельеф және флора мен фаунаның алуан түрлілігі. Аймақ урбанизацияның төмен деңгейімен және сақталған табиғи ортамен ерекшеленеді, бұл «жұмсақ» туризмді дамытуға тамаша жағдай жасайды: жаяу жүру жолдары, велосипед турлары, жабайы табиғатты бақылау және мәдени-танымдық бағдарламалар [3].

Осы талдаудан байқағанымыздай, Зеренді өңірі табиғи ресурстары мен әлеуеті жағынан экотуризмді дамытуға қолайлы дестинациялардың бірі болып табылады. Климаттық жағдайы, көлдер мен орманды аймақтардың үйлесімі, тыныш әрі жүктемесі аз экожүйе - мұның бәрі экобрендинг үшін ерекше мүмкіндік туғызады. Дейтін себебіміз, мысалы, Ақмола облысындағы «Бурабай» мемлекеттік ұлттық паркіне 2024 жылдың көрсеткіші бойынша, келушілер саны 15% - ға артты. Жыл басынан бері саябақ аумағына 578 мыңнан астам адам келген, бұл өткен жылдың сәйкес кезеңінің көрсеткішінен 15% - ға артық.

Келушілердің негізгі шыңы дәстүрлі түрде жаз айларында болады. Жағажай демалысы әсіресе Бурабай, Щучье, Катаркөл, үлкен Чебачье көлдерінің жағасында сұранысқа ие, ал спорттық балық аулау әуесқойлары Жүкей көлін таңдайды. Жеті айдың ішінде саябақ аумағына 175 мың көлік кірген. Әрбір үшінші жолаушылар көлігі саябаққа орта есеппен кемінде үш рет кіреді. Келушілер санының артуы саябақтың экожүйесіне айтарлықтай әсер етеді. Бұл, ең алдымен, қалдықтар көлемінің ұлғаюынан көрінеді. Осы жылдың басынан бастап Ұлттық парк аумағынан 440 тоннаға жуық қоқыс шығарылған [1].

Сол себепті, қазіргі таңда туризм саласында басты назарда тұрған Бурабай ұлттық паркімен салыстырғанда, Зеренді – жүктемесі төмен, бірақ табиғи және рекреациялық мүмкіндіктері ұқсас аумақ ретінде қарастырылуы мүмкін. Туристер ағыны Бурабайда шамадан тыс көп болғандықтан, экожүйеге түсетін қысым да жоғары. Ал Зеренді болса – сол табиғи байлықтарды сақтай отырып, тұрақты туризм принциптеріне негізделген жаңа бағыт ретінде даму мүмкіндігі бар өңір. Оны төменде көрсетілген талдаудан байқауға болады (2-кесте).

1- кесте. Зеренді ауданының экотуризм және экобрендинг тұрғысынан мүмкіндіктеріне SWOT-талдау

Күшті жақтары (Strengths) *- Табиғи ресурстардың байлығы (көлдер, орман, таза ауа)* *- Экологиялық жағынан салыстырмалы түрде таза аймақ* *- Туристік ағынның аздығы → экожүйеге қысым төмен*	***Әлсіз жақтары (Weaknesses)*** *- Туристік инфрақұрылымның жеткіліксіздігі* *- Маркетингтің әлсіздігі және брендтің болмауы* *- Кәсіби гидтер мен экоқызметкерлер тапшылығы*
Мүмкіндіктер (Opportunities) *- Жұмсақ туризм мен экотуризмге деген сұраныстың артуы* *- Мемлекеттік және өңірлік деңгейдегі туризмді қолдау бағдарламалары* *- Экоинфлюенсерлермен серіктестік және сандық платформалар арқылы насихаттау*	***Қауіптер (Threats)*** *- Бақылаусыз туризм → экожүйеге зиян келуі мүмкін* *- Инвестиция тартудың қиындығы* *- Климаттық өзгерістер және маусымдық шектеулер*

Табиғи тартымдылығының жоғары болуына қарамастан, Зерендінің туристік инфрақұрылымы фрагментті болып қала береді: экологиялық маршруттардың шектеулі саны, туристік нарықтағы өңірдің әлсіз сәйкестігі, цифрлық ілгерілету арналарының жеткіліксіз дамуы, сондай-ақ жергілікті халықтың экотуристік бастамаларға тартылу деңгейінің төмендігі [6].

Негізгі кедергілердің ішінде мыналарды атап өтуге болады:

- бірыңғай маркетингтік тұжырымдаманың болмауы;
- тұрақты туризм саласындағы жергілікті шағын бизнестің дамымауы;
- келушілер мен қызмет көрсетушілердің экологиялық мәдениеті әлсіз;
- бақыланбайтын туризмнің ең жоғары маусымдық тәуекелдері.

Осы аталған кедергілер Зеренді ауданының экологиялық туризм әлеуетін толық іске асыруға айтарлықтай тосқауыл болып отыр. Бұл проблемаларды жүйелі түрде шешу үшін Зеренді дестинациясының бірегей ерекшеліктерін айқындай отырып, экобренд қалыптастырудың нақты кезеңдерін белгілеу қажет. Төмендегі кестеде Зеренді экобрендингінің негізгі стратегиялары мен кезеңдері ұсынылған.

2- кесте. Зеренді экобрендингін қалыптастыру кезеңдері

№	*Кезең*	*Іс-шаралар*
1	*Зерттеу және позициялау*	*-Аймақтың бірегей табиғи және мәдени бейнесін анықтау* *- Мақсатты аудиторияны зерттеу* *- Экобренд тұжырымдамасын жасау: логотип, ұран, стиль*
2	*Коммуникациялық стратегия*	*- Сандық платформаларда (Instagram, YouTube, eco-travel сайттары) ілгерілету* *- Табиғат пен жергілікті мәдениетке басымдық беретін контент жасау* *- Эко-инфлюенсерлермен бірлескен турлар ұйымдастыру*
3	*Әлеуметтік қатысу*	*- Жергілікті халықты экосервис пен экологиялық туризм бойынша оқыту* *- Қолөнер мен агротуризмді дамыту* *- Жергілікті өнімдерді қолдау үшін кооперациялар құру*
4	*Экологиялық инфрақұрылым*	*- Экомаршруттарды әзірлеу және бағыттаушы белгілер орнату* *- Экологиялық менеджмент жүйесін енгізу* *- Туристік жүктемені бақылау жүйесін енгізу*
**Автормен құрастырылған*		

Қорыта келе, Зеренді ауданы – ерекше табиғи ландшафттары мен экологиялық әлеуеті бар өңір. Алайда туризм саласының кейбір жүйесіздігі, экологиялық мәдениеттің төмендігі мен маркетингтік стратегияның болмауы өңірдің толық мүмкіндігін іске асыруға кедергі келтіруде. Осы тұрғыда экобрендинг – аймақты жаңа деңгейге көтерудің маңызды құралы бола алады.

Экобрендингтің сәтті жүзеге асуы үшін Зеренді табиғи, әлеуметтік және мәдени ресурстарын кешенді түрде зерттеп, оны туристік нарықта нақты әрі тартымды бейнемен ұсыну қажет. Бұл үдеріс экологиялық таза туризмді дамытуға, жергілікті қауымдастықты белсенді қатыстыруға және сапалы туристік өнімді ұсынуға мүмкіндік береді.

Болашаққа ұсыныстар:

-Зеренді экобрендін ілгерілету үшін бірыңғай коммуникациялық стратегия әзірлеу;

-Жергілікті тұрғындарға арналған экотуризм мен қызмет көрсету саласына бағытталған оқыту бағдарламаларын енгізу;

-Аймақтағы туризм субъектілерінің экологиялық стандарттарға сәйкестігін арттыру;

-Экобрендті танымал ету үшін цифрлық платформалар мен әлеуметтік желілерді белсенді пайдалану;

-Туристік маусым кезінде келушілер санын реттейтін экологиялық менеджмент жүйесін құру.

Зеренді үлгісінде жасалған бұл экобрендинг стратегиясы басқа да ішкі туристік дестинациялар үшін үлгі бола алады. Бұл тәсіл ішкі туризмнің сапасын арттырып қана қоймай, еліміздің экологиялық мәдениетін де жаңа деңгейге шығаратыны сөзсіз.

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ENHANCING THE EFFICIENCY OF MONETARY EXCHANGE POLICY IN THE NEW ECONOMIC MODEL

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Abstract

The main goal of the economic policy of any state is to ensure economic growth, full employment of the population, price stability and macroeconomic balance. One of the components of economic policy is monetary policy. Monetary policy, being a public political phenomenon, is a subject of research in various social sciences. Monetary policy, being a research sphere of economic science, is an economic-political strategy developed by the state in a certain sphere of economic relations and combining goals and means to achieve it. It is impossible to implement a purposeful economic policy without a correct and efficient monetary policy.

In various countries, including the USA, the European Union, etc. In such countries, the term monetary policy is clearly defined by legislation. In the CIS countries and at the same time in Azerbaijan, sometimes concepts such as monetary policy and sometimes monetary-credit policy are used.

The article focuses on the analysis of the monetary policy of Azerbaijan in modern conditions. An analysis of the monetary policy of Azerbaijan is carried out in conditions of economic crisis. The article shows the impact of monetary policy on the country's economy and growth of gross domestic product. The article shows the important principles and priority directions of the state monetary policy of the Republic of Azerbaijan. Based on the conclusions drawn in this article, proposals have been put forward regarding the formation of the country's monetary policy in the context of the instability of the world economy.

Keywords: financial markets, globalization process, monetary policy, financial transactions, inflation, money circulation, commodity-money relations, commercial banks, central bank, world economy, financial crisis, refinancing.

I. Introduction

In the context of the global financial crisis, the importance and role of monetary policy as an integral part of the state's economic policy is constantly increasing. The implementation of a well-thought-out monetary and exchange rate policy helps to ensure the creation of optimal conditions for effective interaction between the banking sector and economic entities, and to comprehensively solve the socio-economic issues facing the country.

It is no coincidence that the malfunctions in the functioning of world financial markets prompted monetary authorities in market economy countries to search for means and ways to counteract the growing destabilization in the monetary and credit sphere. In the context of globalization and Azerbaijan's involvement in world economic relations, similar issues are becoming increasingly relevant for the national economy.

Monetary and exchange rate policy (MOP) is an important element of macroeconomic regulation of the modern economy. It ensures the sustainable functioning of payment, money, and credit systems and creates conditions for the development of the real sector of the economy. MOP is based on objective economic processes determined by the regularities of development of the economic system. The measures implemented within its framework have a significant impact on the dynamics of the main macroeconomic indicators. The main objectives of the PSC are economic growth, employment, and price stability.

II. Discussion

In 2014-2015, the Azerbaijani economy faced strong external shocks. They were added to the internal problems accumulated in previous years and led to negative consequences. First, in conditions of excess supply, world oil prices decreased by more than 2 times. This was a serious challenge for the Azerbaijani economy, which is significantly dependent on raw material revenues. Although the floating exchange rate of the manat ensured the adaptation of the economy to these changes, revenues from

foreign economic activity decreased.

Against the background of increasing uncertainty, this led to a decrease in consumption and investment activity. In the conditions of the relative narrowness of the Azerbaijani financial market and increased lending risks, the private sector's ability to attract finance from foreign banks was limited.

As a result of the above and other factors, prices, especially consumer goods, increased significantly under the influence of the weakening of the manat.

In countries where devaluation was carried out, scientific and business circles express different opinions about the contribution that the Central Bank can make to the development of the country's economy. Thus, a number of economists believe that monetary policy should be aimed at supporting economic growth by significantly reducing the key rate and increasing the money supply. In their opinion, large-scale targeted credit issuance under a low interest rate will lead to an increase in the level of monetarization of the economy, an increase in investments and production, and, as a result, to an acceleration of economic development and a decrease in inflation.

In this case, they refer to the fact that our economy lags behind other countries by two or more in terms of the level of monetarization, which is characterized by the ratio of the volume of the money supply to the volume of gross domestic product.

Table 1. Monetarization of the economy (IMF data - 2023) il)

Countries	Monetization level	Countries	Monetization level
China	200	Czech Republic	99
Japan	180	USA	97
Switzerland	150	Canada	90
South Korea	150	Saudi Arabia	70
Singapore	149	Turkey	65
Eurozone	110	RF	59
BB	101	Azerbaijan	30

The monetization indicator of the economy reflects the adequacy of the money supply to the needs of the national economic system. Analysis of this ratio gives an idea of the possibility of implementing the UDM using legal tender at current prices. However, for the analysis of money flows in the national economy, it is necessary to understand what this indicator reflects more - the demand for money or its supply. In the conditions of developed market relations and financial markets, the analysis of this indicator mainly indicates the dynamics of the demand for money. This demand leads to corresponding changes in the money supply, and also indicates the degree of confidence in the national currency and monetary system.

The experience of many countries shows that the increase in the money supply, stimulated by the emission of the central bank, often does not lead to an increase in the volume of physical production and an increase in investments. Rapidly increasing the money supply and the formation of its surplus lead to an increase in inflationary pressure, an increase in risks in the financial sphere, and, as a result, to the destabilization of the situation in the financial sector and the economy as a whole.

According to the well-known equation of I. Fisher, the level of monetarization is determined by both the dynamics of the money supply and economic growth and inflation. An increase in prices can significantly weaken the effect of emission on the increase in monetarization, and in periods of strong inflation - it can completely devalue the expansion of the money supply in previous years.

Examples of the monetarization effect of inflation are also shown in the most recent economic history of Azerbaijan. In the early 1990s, the realization of the "inflationary gap" and large-scale emission of state budget deficit financing led to a sharp increase in prices. As a result, the level of monetarization of the Azerbaijani economy decreased significantly. As inflation decreased, the decrease in monetarization first slowed down, and then was replaced by an increase. Local episodes of decline observed in the subsequent period of monetarization (1999, 2008, 2014) occurred against the background of accelerating inflation processes.

Thus, one of the important conditions for achieving a high level of monetarization is a consistently low inflation rate. In addition, the level of monetarization is related to the characteristics of the development of the national monetary and credit sphere, production and trade activity, and the structure of the economy as a whole. Large production and trade turnover, as a rule, leads to an increase in lending, but does not always condition an increase in monetarization.

The deeper the specialization and division of labor in the economy, the more freely active economic entities connected with each other by cooperative relations; the higher the competition and the lower the concentration of production, the higher the level of monetarization.

One of the points that should be paid attention to when assessing the transmission of monetary

policy to the economy is the structure of the money supply. As of the end of 2023, cash in circulation (M0) amounted to 15.9 billion manat, M1 money supply was 29.7 billion manat, M2 money supply was 35.4 billion manat, and M3 money supply was 45.1 billion manat. One of the important conditions for the effectiveness of monetary policy transmission is the low share of cash in manat in the volume of broad money supply (M2). This indicator was 82.2 percent in 2023 and has increased by 4 percentage points compared to 2015, maintaining its high level. Despite significant work being done by the CBA to develop payment systems, the level of cashization of the economy still remains high.

In other words, monetarization is not a condition for economic growth, but a result.

According to the Central Bank, in 20105–2023, the money supply in the national currency in Azerbaijan – the monetary base – increased by 2.1 times, reaching 45.1 billion manat. Money in circulation increased by 4.8 times, and the volume of excess liquid funds in banks' correspondent accounts increased by 3.3 times.

In manat, the broad money supply (M2) increased by 4.1 times during this period, reaching 35.4 billion manat. During this period, the monetization of the economy (M2/GDP) increased from 8 percent to 30 percent. The volume of loans provided to the economy by the banking sector increased and amounted to 18 billion manat, and its specific weight in GDP reached 30 percent.

Monetization in Azerbaijan tends to grow steadily, and the monetization coefficient reached its maximum level in 2023, 30%. Table 1 indicates a moderately stable increase in the level of monetization of the Azerbaijani economy. However, it is low compared to developed countries and countries with emerging markets, and primarily Eastern Europe, especially the Baltic countries.

The monetization ratio in Azerbaijan is still low not only compared to Eastern European countries, but even compared to the countries of the former Soviet Union. is very low, that is, only 30%. Since the share of savings in GDP (Gross Domestic Product) is unsatisfactory, it is very important to carry out the necessary work in this direction. The fact that a significant part of savings is kept in banks in foreign currency, as well as the fact that savings are still kept at home (in hand), is an important indicator of how banks provide services.

Table 2. National currency devaluation and GDP oil exports

Countries	Devaluation	Oil exports/GDP
Kuwait	4	70
Angola	50	55
Azerbaijan	60	50
Venezuela	55	50
Iraq	5	40
Libya	10	45
Kazakhstan	70	30
Nigeria	40	35
Algeria	30	30
Iran	25	20
RF	80	18

During the period of high oil prices, the monetary policy of the Central Bank of Azerbaijan played an active role in maintaining macroeconomic stability in the country. Positive qualitative changes in the structure of the money supply continued, and the level of dollarization in the economy decreased further.

However, since the end of 2014, the sharp decline in energy prices in global commodity markets, as well as the psychological impact of the strengthening of devaluation trends in our country's main trading partners, increased the demand for foreign currencies, especially the US dollar, in the domestic currency market.

The fall in prices for oil and oil products on the world market in early 2015 coincided with the implementation of the CBA exchange rate policy, which increased demand for foreign currency. That is, the change in the manat exchange rate is directly proportional to the fall in oil prices.

Since the end of 2014, the sharp decline in energy prices on global commodity markets, as well as the psychological impact of the strengthening of devaluation trends in our country's main trading partners, has increased the demand for foreign currencies, especially the US dollar, in the domestic foreign exchange market. The increase in demand for foreign currency was observed in both segments of the domestic foreign exchange market - cash and non-cash foreign exchange markets. In 2023, the total volume of the foreign exchange market increased by 1.4 times compared to the corresponding period of the previous year. 91% of transactions were carried out in US dollars, and the remaining 9% in other currencies. Compared to the same period last year, the volume of currency transactions conducted in the US dollar increased by 2.4 times, and the volume of transactions in the Euro increased by 2.3 times.

The level of dollarization in the economy is also one of the most important factors affecting the transmission of monetary policy. The negative processes that occurred in the financial and banking system in the early 1990s resulted in a weakening of confidence in the banking system. However, the economic reforms carried out since the second half of the 1990s and the stabilization of the national currency exchange rate allowed us to significantly reduce the dollarization indicator. The dollarization indicator, which was 80 percent in 2004, was reduced to 36 percent in 2014 and to 30 percent in 2023, which in turn increased the potential maneuvering opportunities of monetary policy.

One of the negative effects of the new era on the banking sector, as well as on the effective transmission of monetary policy to the economy, is the resurgence of dollarization trends in the economy.

According to the IMF report, Azerbaijan has implemented a de facto exchange rate targeting regime until the end of 2024. During this regime, the exchange rate acted as the anchor of monetary policy. The sharp drop in oil prices on the world market has created serious challenges regarding ensuring the balance in the external sector, and the problems in the external sector have had a negative impact on the internal economic balance. In order to adapt to the conditions of the new era and ensure the internal and external economic balance, the national currency has depreciated almost twice, and in fact, the application of the money supply targeting regime has begun. The implementation of this regime was ensured by choosing the money supply - the monetary base as the anchor of monetary policy.

At the end of 2024, the level of dollarization in the economy began to increase again. Taking into account the situation in the foreign exchange market, the exchange rate of the US dollar against the manat was set at 1.70 AZN by the decision of the Board of the Central Bank of Azerbaijan. This decision was made in order to create additional incentives for the diversification of the national economy, further strengthen its international competitiveness and export potential, and on this basis ensure the strategic stability of the balance of payments and the country's international solvency.

On the eve of the adoption of this decision, the level of appreciation of the manat against the currencies of partner countries had reached its peak. Thus, from the beginning of 2024 to the end of 2023, the manat maintained its exchange rate against the currencies of its trading partners. During this period, the Russian ruble depreciated against the US dollar by 26%, the Euro by 5%, the Kazakh tenge by 6%, the Turkmen manat by 2%, the Moldovan leu by 4%, the Belarusian ruble by 5%, the Turkish lira by 23%, the Iranian rial by 12%, and the Georgian lari by 3%. The exchange rate correction was able to neutralize the weighted average appreciation of the manat against the mentioned currencies.

On this basis, the CBA planned to ensure the country's balance of payments and strategic stability of international solvency.

At the end of 2014, when the Azerbaijani economy was exposed to serious shocks, the transition to a floating exchange rate was objectively necessary. A floating exchange rate allows the exchange rate to compensate for the negative impact of external shocks. It is, in fact, a stabilizer of the economy.

It was the manat exchange rate that took the main blow. The weakening of the manat supported exporters, led to the emergence of import substitution processes and ensured adequate adaptation of the Azerbaijani balance of payments to the changed conditions. In addition, under a floating exchange rate, gambling and speculation against the manat in the foreign exchange market decreased, which, in turn, prevented a decrease in the country's international currency reserves.

A floating exchange rate does not mean an unstable exchange rate. Of course, adapting to a floating exchange rate is a difficult process, as confirmed by the experience of many countries. This process is often accompanied by both increased volatility of the national exchange rate and an increase in the reaction of prices to exchange rate fluctuations. However, graduallyli, enterprises, banks are adapting to the conditions of a floating exchange rate, learning to hedge currency risks.

The volatility of the national currency exchange rate is decreasing, and the impact of exchange rate fluctuations on consumer prices is also decreasing.

How can the CBA create opportunities for balanced development of the economy? The CBA sees its main contribution in reducing the level of inflation and supporting it. This is directly indicated in the Main Directions of the Monetary and Credit Policy for 2017. Low and stable inflation forms confidence in the population and business in the economic perspective, and allows for long-term planning. In conditions of low and stable prices, the population is not afraid to make deposits in the national currency. During low inflation, lenders are ready to offer funds for a long period at relatively low rates, because they are confident that high inflation will not devalue their investments. Available credit resources create the basis for increased investments, economic development and, ultimately, an increase in the well-being of the population.

In order to reduce inflation expectations, it is necessary to break this trend and show in practice

that inflation can be low.

The CBA is trying to achieve exactly this. World experience shows that in countries with low inflation and low inflation expectations, the reaction of prices to shocks, including exchange rate fluctuations, is less. In such conditions, the central bank can implement a softer monetary policy. Therefore, we need a policy that will lead to a decrease in inflation.

In the current situation, a very soft monetary policy aimed at low inflation can threaten social stability and economic development, leading to its further acceleration and subsequent consolidation at a high level. At the same time, a very tight monetary policy can destabilize the situation in the banking sector and deepen the decline in the economy.

Therefore, the CBA is trying to implement a balanced monetary policy. This does not mean that. The CBA has a large number of targets. When making decisions on monetary policy, the CBA analyzes the emerging economic situation and its development prospects, considers the trajectory of inflation reduction taking into account the capabilities of the Azerbaijani economy, and assesses the impact of decisions on financial stability. These factors impose certain restrictions on the range of possible decisions.

The most important challenge in this direction is to increase the transmission of monetary policy to the economy. In order to ensure high transmission, it is required to establish an interbank money market, reduce dollarization by increasing confidence in monetary policy, establish an adequate framework for managing economic expectations, and further strengthen coordination with financial stability policy.

Ensuring disciplined coordination through the NSC, taking into account its mandate and powers, is important for the sustainability of the economy. With its effective activities, the NSC can be a very useful institution in creating public trust. Sound coordination and effective implementation through this institution can ensure an increase in the attractiveness of the manat and, in parallel, a decrease in the level of dollarization. At the same time, as part of this Strategic Roadmap, increasing FDI and exports will help limit dollarization in the economy. In the long term, dedollarization of deposits will be used to convert liabilities into manat and, potentially, to use more sophisticated instruments, including derivatives. In addition, the Council will take appropriate measures to strengthen financial stability. This, in turn, will strengthen the transmission of monetary policy by deepening financial intermediation.

III. Conclusion

The above allows us to put forward the following proposals aimed at bringing monetary policy into line with the interests of economic growth of the state, the country's innovation-investment development, and the elimination of structural deformation of the economy:

1. Subordinating monetary policy to the state's economic security and growth goals. Rejecting the priority of reducing inflation and making any economic models that harm economic growth absolute. Considering the creation of conditions for economic growth, structural restructuring, and innovation-investment development of the economy in Azerbaijan as a priority goal of monetary policy.

2. Implementing complex targeting by determining the target benchmarks of the inflation rate and the exchange rate of the manat with indicators that encourage maximum investment in areas producing products for economic growth and domestic consumption and non-raw material production, as well as science and education.

3. Conducting detailed scientific research on determining the shares of non-monetary factors affecting the inflation level in Azerbaijan (expenditure inflation, including the formation of monopoly prices and administrative regulation of prices; increase in prices for imported goods and services, including as a result of the devaluation of the manat; increase in budget expenditures, etc.). In this case, only the monetary component of inflation can be in the area of responsibility of the CBA.

4. Obliging the CBA to publish the mechanism for making decisions on monetary policy issues, provide detailed explanations on the projected trajectories of inflation and the key rate, as well as any deviations from the specified parameters.

5. Continuing to reduce the key rate in order to increase the money supply. Developing mechanisms for issuing long-term money aimed at financing the innovative and investment development of the Azerbaijani economy by acquiring securities of state-controlled investment funds. The mechanisms specified for preventing stagflation tendencies should provide for strict control over the efficient and targeted use of investments, and should not allow their outflow to the consumer sphere and the foreign exchange market.

6. Development of a program to encourage the domestic innovation development of the country's economy, which includes the creation of mechanisms for the formation of investment funds with the

participation of the state, tax holidays for enterprises that replace imports and invest in the creation of their own special modern equipment.

7. Formation of a mechanism for preferential lending (using loans allocated by the AMBNP) of enterprises recognized as growth points of the real sector of the economy on a competitive basis.

8. Development and consistent implementation of a policy for encouraging the consumption of local products by households, including the development of mortgage programs, the creation of mechanisms for preferential consumer lending for the acquisition of durable goods produced in Azerbaijan.

9. Development of mechanisms for the gradual replacement of foreign currency loans by strategic sector enterprises with local sources.

10. Deliberation of currency legislation and strengthening of currency control in order to close the channels of capital flows and reduce the possibilities of large-scale currency speculation, including currency speculation of an externally coordinated origin.

11. Development of a mechanism for limiting the size of the currency position of credit institutions in order to close the channel of flow of resources received from the AMPNP to the foreign exchange market, if they have obligations to the AMPNP.

12. Another traditional point of criticism of the Central Bank is the introduction of a floating exchange rate regime. Opponents propose to return to regulation and even fix the exchange rate of the manat. However, the experience of many countries shows that it is impossible to maintain the national currency exchange rate at a certain level for a long time during external shocks for an economy whose development is significantly dependent on the external economic situation. This requires the expenditure of significant gold and foreign exchange reserves, and imbalances in the economy increase. As a result, central banks are forced to significantly lower or release the exchange rate. Illustrative examples: Mexico in 1994, Argentina in late 2001-early 2002, Kazakhstan in 2014-2015, Azerbaijan in 2015. Today, the main goal should be to stabilize the manat exchange rate.

13. Determining the personal responsibility of the CBA leadership for achieving the results envisaged in the Main Directions of Monetary Policy.

14. Monetary Policy and Financial Market Regulation Formation of an independent scientific council under the Financial Stability Council for the primary and subsequent mandatory scientific expertise of the impact of decisions taken in the following spheres on the country's economy.

15. Improvement of monetary-credit and budget-tax policy. Development of a new budget rule, which envisages directing budget surplus revenues during the next oil price spike in advance (until the oil price rises again) to the innovation-investment development of non-oil sectors aimed at the production of high-tech products that meet the needs of the domestic market of Azerbaijan, as well as financing scientific research and the higher education system.

16. Radically changing the approaches to the formation of the expenditure part of the budget by prioritizing the financing of the education system, making the work of higher education teachers extremely prestigious. This will allow gradually reviving the quality of specialist training for the Azerbaijani economy and training specialists at the pre-perestroika level.

17. The tendency of the modern economy towards a more behavioral economy, including the expansion of access to information for consumers of financial and banking services, necessitates focusing attention on the transparency and accountability of monetary policy. When assessing the accountability and transparency indicators of monetary policy according to the criteria of progressive central banking, the result is at a satisfactory level. However, tasks such as constantly increasing attention on the rapidly changing channel of expectations on quality parameters and increasing confidence in monetary policy remain the most important challenges.

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DIGITAL TRANSFORMATION IN THE EDUCATION MANAGEMENT SYSTEM IN AZERBAIJAN: PROBLEMS AND PROSPECTS

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Abstract
Digital transformation in the education management system of Azerbaijan is considered a necessary change in the modern era. This transformation makes education management more flexible, transparent and effective through technology. However, there are difficulties such as lack of infrastructure, insufficient human resources and resistance to change related to the application of digital technologies. The presented thesis extensively analyzes the role of digital transformation in education management systems, the problems faced by this process and future prospects. The aim is to explore potential solutions to bring the education system to a higher level with digital capabilities.

Keywords: *digital transformation, educational management, technological infrastructure, innovation, problems, prospects.*

Introduction. *Digital transformation continues to create radical changes in various areas of society, and education management is not left out of this impact. Traditional methods in the field of education management have difficulty adapting to the rapidly changing world. For this reason, with the application of digital technologies, education management systems are being updated, and more transparent and effective management models are being established. This transformation is not limited to the application of technology. It also changes conceptual approaches to education management, increasing the role of analytics and artificial intelligence in decision-making. The main goal of the study is to examine the changes that digital transformation has brought to the education management system of Azerbaijan and to determine the future prospects of this process against the background of existing difficulties.*

Analysis of recent research and publications. *Today, a number of important studies have been conducted on the digital management of education, both in Azerbaijan and internationally. Among them, the studies on the digital development of education by F. Aliyev, M. Guliyev, R. Hamidova, J. Smih, Y. Lee, M. Peters, Y. Zhao and others can be cited.*

The purpose of the work *is to analyze the problems and prospects of digital transformation in the education management system of Azerbaijan and to provide recommendations based on the relevant results.*

The main material of the study. *The modern era has entered a stage where digital technologies manifest themselves in every aspect of our lives. Education management systems are not left out of this process. Through digital transformation, education management systems are becoming more efficient, transparent and dynamic structures [1, 6]. Effective data management is one of the most important advantages of this transformation [3]. Through digital tools, information about students and teachers is systematically collected and processed, and decision-making based on this information becomes more accurate [7]. Automated management processes significantly reduce the workload of human resources [4]. Traditionally, time-consuming tasks are solved quickly and effectively through digital systems. This allows management to focus on more strategic issues. At the same time, digital technologies provide transparency in education management systems, as parents, teachers and the public can easily access information about processes [8].*

The process of implementing digital transformation is accompanied by a number of problems. One of the main problems is the poor development of technological infrastructure [2]. It is extremely difficult to implement this transformation in regions where access to the Internet is limited and modern devices are lacking. This situation creates a serious obstacle to the digitalization of the education system in developing countries. In addition, the limited human resource potential is another difficulty. The lack of

specialists with the skills to use technology in the education sector can slow down the transformation process. Special training is required to increase digital literacy among teachers and administrators [5]. At the same time, the resistance of personnel accustomed to traditional management methods to innovations is another obstacle to digital transformation. This resistance can delay the implementation of changes and cause uncertainties in the management system. Finally, cybersecurity issues should also be in the spotlight. The protection of digital data in education management systems must be an absolute priority, since data leaks can lead to serious consequences. Zhao notes that the application of artificial intelligence in education necessitates considering not only technical but also ethical and pedagogical approaches [9].

In modern times, the application of innovative technologies in education management has become one of the main priorities of countries around the world. Many developed countries have achieved significant achievements in this direction and have formed advanced models in the fields of digital management, artificial intelligence, distance learning and educational analytics. Analysis of these experiences shows that state policy, strengthening of infrastructure, teacher training and public support play an important role in achieving successful results.

For example, countries such as Finland and Estonia are leading the way in the digitalization of education. In these countries, the entire educational process - from registration to assessment - is fully automated through electronic management systems. Estonia, on the other hand, has created an exemplary model by integrating digital management of education into the country's general digitalization policy within the framework of the "e-Estonia" program.

Asian countries such as South Korea and Singapore have also created a dynamic learning environment tailored to the needs of students by expanding individual learning paths through artificial intelligence and educational technologies in the field of education. In addition, these countries are continuously improving the technological skills of teachers and forming a strong scientific and research base for the application of innovations in education.

In the European Union countries, coordinated measures are being implemented for the digital transformation of education systems within the framework of the "Digital Education Action Plan" (2021–2027) strategy. This plan covers priorities such as improving digital infrastructure, increasing digital literacy, and disseminating innovative learning methods.

Azerbaijan, on the other hand, is contributing to the development of digital education initiatives at the regional level by taking certain steps in this area. The "Digital Skills" project implemented by the Ministry of Science and Education has promoted the application of information and communication technologies in schools and created conditions for the formation of digital competencies for teachers and students. The rapid implementation of the "Virtual School" platform during the pandemic and the transition to online education in a short time have demonstrated the country's technological agility.

At the same time, the use of digital platforms in the assessment of education by the "Quality Assurance Agency in Education" (QAEA) and the reliance on information technologies in the accreditation process of educational institutions show that the country is open to innovative approaches in education management.

However, compared to international experience, Azerbaijan still faces some structural and strategic challenges in this area. The uneven development of technological infrastructure across regions, the uneven level of digital skills of teachers, and in some cases the failure of the legal and regulatory framework to respond to innovations are among the current problems.

Despite all this, the role of innovative technologies in the development strategy of Azerbaijani education is increasing day by day. The country's transition to a competitive education system, thanks to the study of international experience, its adaptation to local conditions and the continuous development of human capital in this area, seems to be a real prospect. Despite the problems mentioned, digital transformation promises new prospects for education management systems. First of all, this transformation creates conditions for improving the quality of education. The development and implementation of educational programs tailored to the individual needs of students are one of the main advantages of this process. In addition, global cooperation opportunities are expanding. Thanks to digital technologies, the exchange of experience between education management systems of different countries becomes easier. Environmental sustainability is also one of the striking aspects of digital transformation. The transition from paper documentation to digital databases ensures more efficient use of resources. In the long term, this transformation not only reduces management costs, but also makes the education system more flexible and sustainable (Table 1).

TABLE 1.

Digital transformation in educational management: a comparison of global trends and local approaches

Approaches	*Global trends*	*Azerbaijani experience*
Leadership approach	*Democratic, inclusive, technology-focused leadership*	*Hierarchical, command-based leadership*
Technological infrastructure	*Cloud technologies, centralized databases*	*Local servers, limited internet infrastructure*
Human resource potential	*Digital literacy, professional development programs*	*Minimal technological skills, need for intensive technical training*
Communication technologies	*Video conferencing, AI-based communication tools*	*Email, local print forms*
Cybersecurity	*Multi-level protection systems, international standards*	*Simple protection systems, minimal recovery procedures*
Approach to topics	*Innovative methodologies, creating a dynamic environment*	*Traditional approaches, formal curricula*

Source: prepared by the author

Conclusion. Digital transformation is a great opportunity for the modernization of education management systems. However, for the successful implementation of this process, strategic planning is required to overcome the challenges. Strengthening infrastructure, increasing the skills of personnel and preparing the public for digital innovations are important components of this process. Thus, digital transformation is not only the application of technology, but also a cultural change in the education system, and this change can provide a more competitive educational environment for future generations.

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Jurisprudence

THE ROLE OF THE COUNCIL OF EUROPE AND INTERNATIONAL CONVENTIONS IN PROMOTING ALTERNATIVE SANCTIONS

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Abstract

This paper aims to analyze the role of the Council of Europe and international conventions in promoting alternative and more effective and humane sanctions within the criminal justice system. Focusing on international instruments such as the "Tokyo Rules", European Rules on Sanctions and Community Measures, and practical guidelines from the Council of Europe, the study evaluates their impact on criminal policy in member states, with a particular focus on Albania.

Through the analysis of legal documents, official statistics, and best practices from European countries, the paper identifies challenges related to the effective implementation of alternative sanctions and proposes concrete measures to improve the functioning of the justice system.

The paper highlights the need for professional staff training, strengthening of probation services, and the guarantee of a justice system that promotes rehabilitation and crime reduction.

Keywords: Council of Europe, alternative sanctions, criminal justice, community measures, international conventions, Albania.

1. INTRODUCTION

In recent decades, the concept of criminal justice has undergone a significant transformation, shifting from the traditional punishment model through imprisonment to a more rehabilitative and reintegrative approach. In this context, alternative sanctions have gained increasing importance as a means to avoid incarceration and exclusion, to reduce prison overcrowding, and to promote the reintegration of offenders into society. These measures include community service, probation, restorative justice, treatment programs, house arrest, mediation, and other modern approaches for a more effective contemporary criminal justice system.

The Council of Europe has been one of the most important actors in promoting and institutionalizing alternative sanctions in its member states. Through instruments such as the European Rules on Community Sanctions and Measures (1992), the Recommendations of the Committee of Ministers (CM/Rec), and in cooperation with bodies like the European Committee for the Prevention of Torture (CPT) and the Council for Penological Co-operation (PC-CP), this institution has established standards aimed at equal, humane, and more effective treatment for all categories of offenders.

Another important reference point in international justice is the UN Resolution "Tokyo Rules" (1990), which defines standards for the treatment of persons sanctioned with non-custodial measures. These documents have laid the foundation for reforms in the criminal justice systems of many countries, directly influencing the development of legal frameworks for alternative sanctions.

Albania, as a member state of the Council of Europe since 1995, has taken important steps towards aligning its justice system with these international standards. With the entry into force of Law no. 10192, dated 03.12.2009 "On the execution of alternative sentences to imprisonment", efforts have been made to offer alternatives to imprisonment. However, major challenges persist, such as limited institutional capacity, lack of professional staff in the justice sector, and low societal awareness regarding the effectiveness of these measures.

This paper addresses the most important international instruments related to alternative sanctions, how they have influenced criminal policy development in the Council of Europe and in Albania, and analyzes the main obstacles for their implementation. Furthermore, it offers concrete recommendations for strengthening practical mechanisms for applying alternative sanctions in line with the Council of Europe's standards and international conventions.

2. SPECIFIC OBJECTIVES OF THE STUDY:

1. To examine the contribution of the Council of Europe in developing and promoting European standards for alternative sanctions, through documents such as Recommendation R(92)16 and the European Rules on Community Sanctions and Measures.

2. To analyze the impact of international conventions, such as the European Convention on Human Rights and the International Covenant on Civil and Political Rights, in ensuring the humane and proportionate treatment of convicted individuals.

3. To identify the benefits and positive effects of alternative sanctions compared to traditional imprisonment, especially in terms of reducing recidivism and lowering the costs for the justice system.

4. To highlight best European practices in the implementation of alternative measures and to propose possible improvements in the penal system in accordance with international standards.

5. To encourage in-depth reflection on the challenges related to penal policy reform and the role of international institutions in guiding these reforms.

3. METHODOLOGY OF THE STUDY

This work follows a theoretical and analytical approach, based on:

- *Analysis of documents of international and European legislation*
- *Interpretation of recommendations and instruments of the Council of Europe*
- *Comparison of various practices in EU member states and outside of it*

The main sources used are:

- *Official documents of the Council of Europe*
- *International conventions of the United Nations*
- *Academic literature in the field of criminal justice*
- *Concrete cases from countries that have successfully implemented alternative punishments*

4. ANALYSIS OF INTERNATIONAL INSTRUMENTS AND THEIR USE IN EUROPE

1. SPACE II – Council of Europe Statistics for 2023

According to SPACE II data (2023), there were about 1,330,838 persons under supervision within probation services in 30 member administrations, reflecting a 1% increase compared to 2022. This translates to an average of 164 persons per 100,000 inhabitants, with countries like Poland (636/100,000) and the UK & Wales (284/100,000) showing high levels of use of alternative sanctions. These statistics indicate a consistent trend of integrating non-custodial measures into European criminal justice systems.

2. Guidelines on Community Sanctions and Measures (2019)

The Council of Europe published new guidelines in late 2019 for probation services and supervisory authorities. The document covers key points: definition, organizational structure, training, inter-institutional cooperation, electronic monitoring, community service, and service integrity. These guidelines reinforce standards set by the European Rules and recommend best practices to improve the effectiveness of justice and reduce recidivism.

3. Recommendations of the Committee of Ministers (PC-CP)

In 2017, the Committee of Ministers adopted CM/Rec(2017)3, a set of recommendations for the use of community sanctions, highlighting gender-sensitive treatment, protection of minors, and therapeutic objectives. In subsequent years (2018/2019), the recommendations were expanded to include restorative justice and treatment for individuals with mental health issues.

4. Ongoing Efforts and New Recommendations (2024–2025)

On February 26, 2024, the Council of Europe issued recommendations for improving the mental health of individuals in conflict with the law, including prisoners with psychiatric disorders, aiming to align these services with international standards. These measures signaled a shift toward the integration of psychological well-being into the implementation of alternative sanctions.

5.DISCUSSION

- *Structural Changes: Statistically, out of 30 administrations, 23 use probation services more than imprisonment, indicating a steady trend toward mass use of alternative sanctions.*
- *Compliance with Standards: The 2019 guidelines and ongoing recommendations continue to raise the level of compliance with "Tokyo Rules" (execution, proportionality, victim inclusion, monitoring) and youth protection standards.*
- *Challenges: Diverse levels of state development highlight the need for national adaptation of instruments; the UK's use of electronic monitoring shows the potential for reducing recidivism.*

• *Innovation and Inclusion: The 2024–2025 recommendations reflect the Council of Europe's broader approach toward integrating mental health care into alternative sanctions.*

6. RECOMMENDATIONS

Based on the analysis of international documents, European practices and the experience in Albania, several recommendations are identified to strengthen alternative sentencing in line with European Council standards and international conventions:

➤ *Improvement of the legal framework and implementation of international standards*

• *Explicit inclusion of European rules and the Tokyo Rules in Albanian legislation, as part of guidance summaries for judges, prosecutors, and probation services.*

• *Drafting a new Detailed Guideline for the implementation of alternative sentences, in cooperation with the Council of Europe, including manuals for special cases such as minors, people with mental health issues, and victims of domestic violence.*

➤ *Strengthening institutional and professional capacities*

• *Development of a national continuous training program for all professionals, including judges, prosecutors, probation officers, and social service workers.*

• *Creation of a specialized unit for alternative sentencing within the Ministry of Justice, which monitors, coordinates, and promotes the practical implementation of community-based measures.*

➤ *Expansion of innovative technological sentencing*

• *Pilot implementation of electronic monitoring (GPS bracelets) in suitable cases (e.g. house arrest, domestic violence protection orders), based on models from the UK or the Netherlands.*

• *Implementation of personalized rehabilitation programs through cooperation with civil society organizations, faith-based institutions, and cultural community centers.*

➤ *Funding and resources for effective implementation*

• *Allocation of a specific annual budget for alternative sentencing, managed by the Ministry of Justice and monitored by the Council of Ministers, to ensure implementation is not solely dependent on international donors.*

• *Creation of incentives for partner organizations to assist in treatment, monitoring, and reintegration of individuals with alternative sentencing measures.*

➤ *Public awareness and promotion of a new penal culture*

• *National public awareness campaigns to demystify alternative sentences and highlight their contribution to restorative justice and reintegration.*

• *Partnerships with media, universities, and NGOs to promote public debate and legal culture that prioritizes rehabilitation over punishment.*

➤ *Independent monitoring and evaluation of implementation*

• *Establishment of an independent evaluation mechanism of implementation effectiveness, in cooperation with the Council of Europe, to increase transparency.*

• *Inclusion of civil society and academic institutions in monitoring the transparency of court decisions and the enforcement of measures.*

7.CONCLUSION

The instruments of the Council of Europe and the "Tokyo Rules", the European Rules, and the most recent guidelines on probation are foundational to the formation of a stable framework for alternative sanctions in Europe. The SPACE II statistics show that such models are widely implemented in practice.

However, challenges remain: the need for training, functional institutions, national adaptation, and economic resources. The rest of the paper will focus specifically on analyzing practical cases in Albania and proposing recommendations for improvement.

These measures are essential to give Albania modernized penal system aligned with European standarts. The implementation of alternative sentences is not just a technical requirement, but a foundational pillar for the rule of law, a more human justice system, and an inclusive society.

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Medical sciences

ORGANIZATION OF MEDICAL NUTRITION IN SANATORIUM AND RESORT FACILITIES OF THE REPUBLIC OF BELARUS

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ОРГАНИЗАЦИЯ ЛЕЧЕБНОГО ПИТАНИЯ В САНАТОРНО-КУРОРТНЫХ УЧРЕЖДЕНИЯХ РЕСПУБЛИКИ БЕЛАРУСЬ

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Abstract
The article discusses the scientific basis of the nature of nutrition of vacationers staying in health resorts, dietary changes and legal support for the organization of therapeutic nutrition in sanatorium-resort institutions of the Republic of Belarus.

Аннотация
В статье рассматриваются научные основы характера питания отдыхающих, находящихся в здравницах, изменение рациона питания и правовое обеспечение организации лечебного питания в санаторно-курортных учреждениях Республики Беларусь.

Keywords: *preventive and curative nutrition, optimal diet, nutritional status, norms of therapeutic nutrition, vacationers.*
Ключевые слова: *профилактическое и лечебное питание, оптимальный рацион, статус питания, нормы лечебного питания, отдыхающие.*

Диетическое профилактическое питание - вид диетического питания по специальному рациону пациентов с хроническими заболеваниями вне периода обострения, направленного на предотвращение заболеваний или обострений путем устранения причин и условий их возникновения и развития, а также путем повышения устойчивости организма к воздействию факторов, способных вызвать патологические реакции [1].

Организацию профилактического и лечебного питания в санаторно-курортных организациях Республики Беларусь следует рассматривать с позиции действующих установленных правил и нормативных актов. Охрана здоровья граждан в Республике Беларусь регламентируется Конституцией и Законом Республики Беларусь «О здравоохранении». Конституцией Республики Беларусь гарантируется право граждан на охрану здоровья, включая бесплатное лечение в государственных учреждениях здравоохранения. Закон Республики Беларусь № 2435-XII (от 18 июня 1993 г.) определяет основные принципы и правила охраны здоровья в Республике Беларусь [1]. Впервые в белорусском законодательстве требования к организации питания в санаториях, включая диеты и их назначение, установлены постановлением Министерства труда и социальной защиты Республики Беларусь от 19.01.2006 N 6 «Об утверждении норм питания в домах-интернатах и санаториях системы Министерства труда и социальной защиты Республики Беларусь». Постановлением Министерства здравоохранения Республики Беларусь от 21 ноября 2019 г. №106 была введена Инструкция об организации диетического питания в государственных организациях здравоохранения, измененная и дополненная Постановлением Министерства здравоохранения Республики Беларусь от 10 февраля 2023 г. N 28. [1].

Организация питания отдыхающих на период оздоровления проводится во всех санаторно-курортных организациях Республики Беларусь и направлена на улучшение общего состояния здоровья и повышение эффективности лечения. В зависимости от заболевания и состояния пациента диета может быть адаптирована (например, уменьшение или увеличение калорийности, изменение соотношения макронутриентов). В здравницах Беларуси широко применяются различные виды питания, в том числе шведский стол (неограниченный выбор блюд), заказное меню (перечень блюд, из которых можно выбрать свой завтрак, обед и ужин), 5-разовое питание (завтрак, второй завтрак, обед, полдник и ужин). При этом особое внимание уделяется своевременности и правильности употребления пищи, а также использованию свежих и качественных продуктов.

В настоящее время организация питания в белорусских санаториях регламентируется постановлением Министерства здравоохранения Республики Беларусь от 10.02.2023 № 28

«Инструкцией о порядке организации диетического питания» [1]. В данном нормативном акте представлен перечень стандартных диет с буквенными обозначениями (Б, Н, М, П, Т, НК).

Базовый рацион (диета Б) представляет собой диету с физиологическим содержанием белков, жиров, углеводов и растительной клетчатки (овощи), обогащенную витаминами и минеральными веществами. При назначении данной диеты пациентам с сахарным диабетом исключаются сахар и другие рафинированные углеводы. Режим питания 3–6 раз в день. Данный рацион питания показан при наличии заболеваний со стороны органов зрения; органов пищеварения в стадии выздоровления; при хронических заболеваниях почек с сохранными функциями почек; при нервно-психических заболеваниях; при травмах опорно-двигательного аппарата; сахарном диабете 2-го типа с нормальной массой тела; при заболеваниях сердечно-сосудистой системы с нерезким нарушением кровообращения; при ишемической болезни сердца и атеросклерозе сосудов. При необходимости для пациентов назначается протертый вариант диеты. Данная диета представлена в 90 здравницах Республики Беларусь [2].

На втором месте по распространенности в санаториях Беларуси находится диета П – это рацион с механическим и химическим щажением, который представлен в 70 санаториях республики (например, Белая Русь, Боровое, Летцы, Надежда ДРОЦ и др.) [3]. Данная диета назначается при заболеваниях органов пищеварения, нарушении функции жевательного аппарата, после операций на внутренних органах, кроме органов желудочно-кишечного тракта при соблюдении принципа дробности питания, регулярности потребления пищи (до 4-6 раз в день) и включение в рацион продуктов, являющихся слабыми возбудителями желудочной секреции. Для механического щажения в рационе максимально снижается количество продуктов, богатых грубой растительной клетчаткой и соединительной тканью. Термическое щажение обеспечивается за счет поддержания температуры блюд в диапазоне от 15 до 60–65 °С, а также их приготовление в отварном виде или на пару. Необходимо отметить тот факт, что принципы щажения соблюдаются при приготовлении и подаче блюд при всех диетах, поскольку они направлены на обеспечение диетического профилактического и диетического лечебного питания.

В последние десятилетия в Беларуси, как и во всем мире, нарастает проблема избыточного веса и ожирения (в 2022 г. по данным ВОЗ избыточную массу тела имели 43% взрослых в возрасте 18 лет и старше, а 16% страдали ожирением) [4]. Поэтому особую актуальность имеет назначение диеты, которая направлена на коррекцию веса отдыхающих – низкокалорийный рацион питания (диета НК). Снижение калорийности рациона достигается за счет уменьшения доли жиров (как животных, так и растительных) и углеводов. Из рациона питания исключаются максимально кондитерские и хлебобулочные изделия из пшеничной муки, фруктовые и овощные соки, соль (до 3 граммов в сутки) и свободная жидкость от 0,8 до 1,5 л. В настоящее время рацион питания диеты НК предлагается на базе 12 санаториев Беларуси (Жемчужина, Озерный, Ружанский и др.) [2].

Диета Н предусматривает рацион с пониженным содержанием белка (низкобелковый) для пациентов с хроническими заболеваниями почек, нарушением азотовыделительной функции, заболеваниями сердечно-сосудистой системы с недостаточностью кровообращения 2–3 степени, циррозом печени и печеночной энцефалопатией. Ограничение белка до 0,8, или 0,6, или 0,3 г/кг идеальной массы тела (до 60, 40 или 20 г/день) и жидкости (0,8–1 л/день). В диету вводятся безбелковый белый хлеб, пюре, муссы из набухающего крахмала. Режим питания 4–6 раз в день. Этот принцип соблюдается как на этапе стационарного лечения, так и во время проведения реабилитационных мероприятий при санаторно-курортном лечении. Реабилитация, включающая лечебное питание, при данных патологических состояниях предлагается в 50 санаториях Республики Беларусь (например, Золотые пески, Ислочь, Неман, Радон и др.) [2].

Показанием для назначения диеты М являются заболевания, при которых повышен распад белка либо организму требуется белок для пластических целей. Поэтому данный вид диеты будет назначен при ожоговой болезни; при заболеваниях почек в случае почечно-заместительной терапии и нефротическом синдроме; а также при восстановлении пациентов после оказания высокотехнологичной медицинской помощи и т.д. При повышенном содержании белка в рационе диеты М количество жиров и сложных углеводов соответствует физиологическим нормам при снижении доли легкоусвояемых углеводов. При необходимости для пациентов назначается протертый вариант диеты. Рационы питания, соответствующие диете М, представлены в 53 здравницах Беларуси (например, Берестье (Брестагроздравница), Буг, Серебряные ключи и др.) [2].

Повышенным содержанием белка и повышенной калорийностью характеризуется диета – Т, которая показана при нарушении глотания вследствие неврологических заболеваний, при хронической обструктивной болезни легких, при хронических инфекциях, как например туберкулез, при заболеваниях печени, поджелудочной железы, кишечника, при муковисцидозе и при ожоговой болезни. При этих заболеваниях преобладают процессы распада белка на фоне повышения обмена веществ, что сопровождается развитием резко выраженной недостаточности питания, снижением массы тела, потерей как жировой, так и мышечной ткани. Повышается риск развития инфекционных и других осложнений, а также инвалидизации больного человека. Высококалорийный, высокобелковый рацион питания в Беларуси представлен в 4 санаториях: Магистральный (Брестская область), Рассвет (Любань, Минская область), Пралеска (Гродненская область), Сосны (Могилёвская область) [2].

Отдельно следует остановиться на рационе питания для лиц с сахарным диабетом. В каждой из диет, представленных в «Инструкции о порядке организации диетического питания», предусмотрены рекомендации по питанию данной категории отдыхающих и отличительной особенностью диеты является ограничение количества сахара, других рафинированных углеводов, а также соблюдение принципа регулярности и дробности питания (прием пищи на завтрак, обед, ужин и во время двух небольших перекусов). В некоторых санаториях с заказным меню для диабетиков, которым показан прием инсулина, предусмотрен второй ужин.

Организация питания осуществляется на основании 2-недельного меню, которое составляется с включением блюд «Сборника технологических карт на кулинарную продукцию общественного питания», «Сборника технологических карт блюд диетического питания» [4, 5], а также блюд собственной разработки с учетом всех технологических параметров приготовления. Назначение диеты в соответствии с утвержденным списком производится при первичном осмотре отдыхающего врачом-терапевтом, либо врачом-диетологом (при наличии такой должности на базе санатория). Организация работы пищевого блока, формирование лечебных рационов для различных групп, отдыхающих на основе стандартных диет, специальных диет, разработанных с использованием пищевых продуктов, в том числе диетических, являются основой формирования системы диетического профилактического и диетического лечебного питания в санаториях Беларуси.

Отдельным вопросом при организации лечебного питания является наличие в санаторно-курортных учреждениях специализированных продуктов диетического лечебного питания, предназначенных для питания лиц с наследственными нарушениями обмена веществ (например, фенилкетонурии, лактозной недостаточности и др.), из состава которых исключаются нутриенты, расщепление которых нарушено и избыточное накопление которых оказывает токсическое воздействие на организм человека. Специализированные продукты лечебного питания представляют собой специально разработанные продукты для питания с целью обогащения пищевых рационов или замены обычных продуктов, ограниченных или запрещенных по медицинским показаниям. В качестве специализированных продуктов диетического лечебного питания в санаторно-курортных учреждениях Республики Беларусь могут быть использованы продукты, содержащие основные макро– и микронутриенты в оптимальных соотношениях или в количестве, необходимом для коррекции основных компонентов пищи. Так, при фенилкетонурии, относящейся к группе орфанных заболеваний, полностью исключается из питания аминокислота фенилаланин. В рацион питания на постоянной основе включаются специализированные малобелковые и безбелковые продукты на основе крахмала и/или мальтодекстрина в виде сухих полуфабрикатов для выпечки хлеба, кондитерских и мучных изделий, приготовления напитков и других блюд для обеспечения соответствующей возрасту энергетической ценности рациона [6].

Следовательно, из представленных выше данных, обеспечение диетическим профилактическим и диетическим лечебным питанием, в соответствии с нормативным документом Министерства здравоохранения Республики Беларусь «Инструкция о порядке организации диетического питания», регламентирующим порядок его оказания, осуществляется во всех санаториях Республики Беларусь и обеспечивает преемственность восстановления состояния здоровья человека после стационарного лечения или оздоровления. Необходимо отметить, что на сегодняшний день в рамках Единых санитарных правил таможенного союза ЕврАзЭС определяются как подлежащие обязательной государственной регистрации специализированные пищевые продукты, в том числе продукты детского питания,

продукты для беременных и кормящих женщин, продукты диетического, лечебного и профилактического питания.

В числе документов таможенного союза, регулирующих вопросы специализированной пищевой продукции, в том числе диетического лечебного и диетического профилактического питания – Технический регламент Таможенного союза ТР ТС 027/2012 «О безопасности отдельных видов специализированной пищевой продукции, в том числе диетического лечебного и диетического профилактического питания» [8]. Белковая коррекция готовых диетических блюд в Республике Беларусь, проводится в соответствии с нормативными документами Министерства здравоохранения [1].

Правильно организованное питание в санаторно-курортных организациях Республики Беларусь повышает качество жизни человека и является важным аспектом общего комфорта и удовлетворенности отдыхом. Соблюдение специальной диеты позволяет улучшить общее состояние, уменьшить вероятность, или исключить развитие побочных явлений. Важным элементов является выбор метода кулинарной обработки, предпочтителен режим щажения. Необходимо учитывать ряд особых приёмов тепловой обработки приготовления пищи: варка продуктов на пару, использование комбинированных способов тепловой обработки. Несмотря на ряд особенностей в диетическом профилактическом и диетическом лечебном питании, блюда должны обладать высокими вкусовыми качествами, быть красиво оформленными для хорошего усвоения.

Таким образом, рациональное питание, сбалансированное по составу и соответствующее медицинским показаниям, является неотъемлемой частью санаторно-курортного лечения и играет ключевую роль в поддержании и укреплении здоровья населения Республики Беларусь.

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MANAGEMENT OF PROFESSIONAL OBSTETRIC RESPONSIBILITIES-META-ANALYSIS

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Abstract

There are a number of career opportunities in healthcare, each with a different set of responsibilities and responsibilities. Midwives care for pregnant women and women during every stage of the pregnancy monitoring process, from sharing advice on prenatal care to assisting mothers in childbirth and providing postnatal care.

Understanding and studying the responsibilities of midwifery care can help professionals to be better prepared, to increase their alertness when performing routine or urgent, often life-saving activities. In this article, we bring out the responsibilities of Midwives, detail their general duties, present important skills needed to perform specific activities and explore their typical work environment. The analysis of the regulatory framework shows that a number of legislative mechanisms are missing, such as: standard of health care, methodology for costing the work done, adequate pay, opportunity for scientific work and participation in clinical studies, opportunity for upgrading and continuing training. The mechanisms for maintaining the qualification are internal training courses, trainings from professional organizations or different partner structures.

Conclusions: the lack of rules and methodologies are demotivating factors for young professionals who leave the profession or choose realization abroad. This leads to difficulties in ensuring continuity of care, an increase in the age limit of working specialists, who have difficulty with the new guidelines of the control institutions for work. Motivation and attestation as mechanisms do not have the desired effect to ensure quality of care. Urgent regulatory reforms are needed to create security in the workplace, the work process and the provision of specialists.

Keywords: *responsibility, obstetric activities, professional skills, obstetric competence, communication.*

Introduction

Institutional education in the specialty of midwifery is acquired in the medical universities [10,19,20], recognized by the state and the training in it corresponds to the state requirements for training of the Educational-Qualification Degree „Bachelor" in health care with professional qualification „midwife" [19]. As the profession is regulated, all higher education schools that train midwives are obliged to comply with the uniform state requirements for the specialty. Training is only regular and takes place within 4 years [19]. Students are taught a curriculum that includes general medical, clinical, special and humanities subjects. The main task of the training is the formation of knowledge, habits and skills in the field of primary prophylaxis, general and special obstetric care for pregnant, birthing, parturition and newborns and for women with gynecological diseases, family planning, etc. The practical training has a minimum duration distributed in academic (clinical) practice – from the first to the sixth semester inclusive, and pre –Graduate Internship-in the seventh and eighth semester.

Graduates of Midwives acquire the Educational-Qualification Degree „Bachelor" and can work in state, municipal and private medical institutions. They may have independent practice in accordance with the provisions of the Medical Institutions Act [13].

The ongoing reforms in the health sector require reforming the methods and modes of education in universities so that they can adequately prepare new professionals according to the requirements of the environment [6,7], with the new trends in the provision of health care [12,18] and adequately meet the expectations of health service users (by defining trends, the services sought and the quality of the care provided).

In the implementation of certain activities, leading normative guidelines are the medical standards by Profile Specialties, The Protocols of professional companies [8,27] and the guidelines of the regulations on the implementation of activities on clinical pathways under the national framework contract for medical activities [15]. All this is determined and documented by the doctor –medical specialist, who reports The performed medical activity of the Regional Health Insurance Fund, as a local authorizing officer of the National Health Insurance Fund [13,15]. The care after the medical service rendered to the

patient is not defined and is not taken into account in the full extent of its provision [15]. This has a negative effect on the motivation to attract qualified healthcare professionals, to ensure the state of the healing structure and to ensure continuity of care.

In order to be able to speak and provide adequate obstetric care to women, childbirth and newborns, it is necessary to have a standard of health care, on the basis of which the responsibilities and contributions of the relevant specialists are defined. This requires the recognition of the midwifery profession as independent of its responsibilities, duties and importance in the exercise of the profession of midwifery [25,26,27].

I. Responsibilities of the midwife

The responsibilities of the midwife cover every aspect of the birth process, from patient examinations and prenatal care to competent maternity care and postnatal care. Midwives specialise in providing care for both mothers and babies, ensuring they are safe and as comfortable as possible before, during and after birth [2,3,12]. Some midwives can be implemented in clinics where highly specialized medical activities of expectant mothers are carried out to ensure that their pregnancy progresses safely. Others are implemented in maternity, nonantological or gynecological structures in hospitals and indicate the necessary care for patients after performing a medical service (according to BG legislation under the clinical pathways of the Regional Health Insurance Fund - support the process of childbirth, monitoring of patients and providing support during childbirth) [13,15].

II. Duties of the midwife

Midwives can have several duties depending on their place of work and realization (fig.1). Here are some common duties of Midwives [14]:

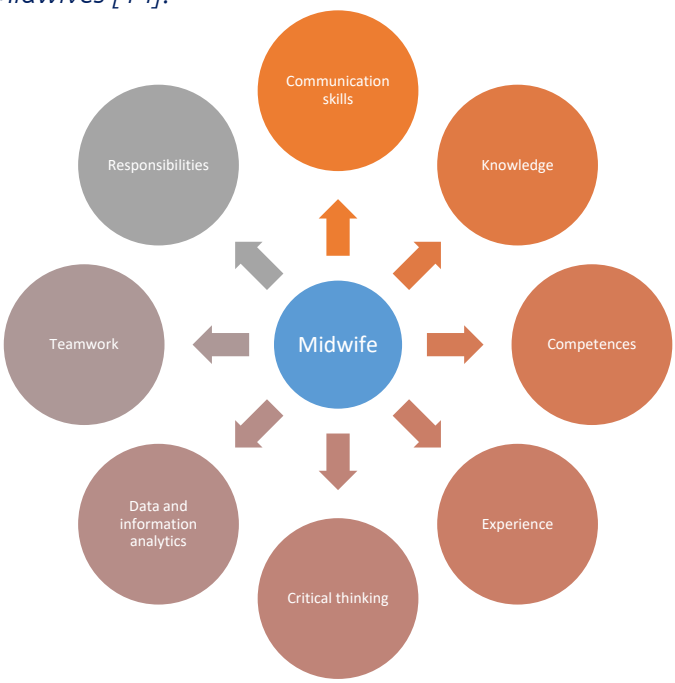

Fig. 1. Midwifery professional skills and competences

1. Prenatal midwife care

Midwives help patients both before and after birth by performing a number of activities during pregnancy monitoring (monitoring of vital signs, auscultation, beveling, anthropometry, sampling of blood, secretions, etc. materials, if necessary, giving advice on nutrition and exercise regime). Their competences are related to the establishment of primary obstetric diagnosis and monitoring of the general condition of the pregnant woman, monitoring of DST, giving instructions on rational nutrition, through which they assess the health of the pregnant woman and the expected outcome of pregnancy. These activities assist the specialist doctor in the follow-up and sharpen, if necessary, attention to the appearance of certain deviations. Midwives work in a team of specialists (doctors, laboratory specialists, clinicians, etc.), which interpret the information collected and the documented obstetric activities and outcomes [16,17].

In order to conduct an adequate obstetric consultation, it is necessary to have legislative changes, by the ministry, and recognition of the role and competence of the midwife.

2. Provision of prenatal education for parents

Midwives help teach expectant mothers how to properly care for themselves and developing children. They can provide tips on nutrition, exercise, and methods to relieve the discomfort that comes from pregnancy. Midwives help pregnant women understand the changes they are experiencing, recognize symptoms for signs of problems. They can provide advice on different approaches to childbirth and guide mothers to further information on the birthing process [21].

The Midwife does not take into account the extra-curricular activities in prenatal care. Assists in documenting the activities performed and reported by the specialist doctor.

3. Midwife assistance in birth

During childbirth, midwives stay by the mother's side and provide support, empathy, assistance and assistance. The midwife performs monitoring of the vital signs of the fetus and the mother, makes a primary assessment of the needs of the birthing, carries out Coordination activities with the obstetrician-gynecologist to implement the delivery plan and actively monitors the mother during childbirth. Prepares the workplace for work, monitors the processes of sterilization, sepsis and asepsis. Performs manipulations, assists in carrying out various diagnostic and treatment procedures aimed at relieving and assisting the woman in labor. The midwife prepares the expectant mother for surgery, provides support and assistance to the operating room, assists the mother in the process of recovery, in building the relationship with the newborn, provides support in breastfeeding [24].

For the implementation of all these activities, the Midwife does not have statutory protocols and instructions for implementation, there is no obstetric specific documentation, and does not take into account the activities performed by the control body.

III. Basic tasks are defined:

1. Newborn Care after birth. Immediately after birth, midwives stay with the mother and baby to monitor and provide support. They support both mother and child in the first days, provide assistance in adaptation, monitor for any complications and perform tests and screening to ensure good health and development. They can give instructions to the mother on how to hold and feed the baby safely without any tension. Midwives continue to monitor the mother and baby as they recover and coordinate with doctors while resolving any complications [4,5].

2. Postpartum care. Midwives monitor the mother and baby, prepare them for sleeping in an outpatient environment. Midwives monitor the development of the mother and baby according to the days during the simple stay in the maternity home and ensure a regime of feeding, sleep and wakefulness. They share tips on caring for the baby and ensure that the mother is ready to handle the new responsibilities on her own. They can take blood samples from the baby or administer the necessary vaccines according to the vaccination calendar [23].

If necessary, they provide emotional support and psychological assistance in registered deviations from the norm in the baby and the mothers themselves. Midwives are involved in communicating unwanted news to the relatives and family of the mother or newborn.

All activities in postpartum care are not documented in obstetric protocols and are not reported to the controlling body.

3. Administrative responsibilities. Midwives perform many administrative tasks in the course of their daily activities. They can record information about patients in diagrams so that doctors can immediately understand the current situation. Nurses add information to medical records and update them as needed. They consult patient records to develop a care plan and note any important issues. Midwives often take responsibility for the condition of the delivery room, sterilize the instruments, ensure that everything is in the right place and follow individual hospital procedures.

4. Coordination of care. Midwives work with doctors, other nurses and patient staff to coordinate care and ensure patient safety. They take instructions from doctors and make sure they have all the tools they need to help mothers during childbirth. Midwives coordinate with other midwives – senior midwives- to provide care for all patients in the structure, allocating their time appropriately [25,27]. Midwives can instruct other hospital staff to transport patients or clean the hall after childbirth.

5. Important skills for midwives. Midwives work in a dynamic, challenging environment, so they require several skills to be successful. Here are some of the most important skills for nurses.:

A) communication/ the art of communicating with a patient. Midwives use communication skills as they connect with patients and monitor their symptoms. They ask appropriate questions to determine the condition of each patient and check for problems. They use active listening skills as they pay special attention to patients ' problems and respond to their requests. Midwives require strong communication skills to be able to explain baby care techniques to new mothers and educate them on how to keep their

child healthy [4,27]. Communication skills help nurses build strong relationships with colleagues and work together to provide excellent patient care.

B) Personal Empathy. Empathy helps midwives work with patients as they go through the challenging process of childbirth. Entering a hospital can be a frightening experience for new mothers, and midwives take responsibility for accompanying patients as they undergo tests, go through Labor and deliver a baby. Patients can become frightened and unpredictable, so midwives use empathy to help calm them down and guide them to a successful birth. Empathy helps nurses provide quality care and stay focused on the comfort of each patient they encounter [4,27].

(C) Professional Identity. Very little attention is paid to professional identity. It identifies the independence of the profession, knowledge, acquired and upgraded skills, qualifications. Rarely, the profession of midwife has the opportunity to declare its independence, according to the nomenclature of the professions, except for the independent practices, which are entirely in the field of paid services and do not have the right and legal regulation to conclude a contract with a health insurance source. With regard to pre-hospital and hospital obstetrics, midwives are executors of orders of Doctors, Without being able to make independent decisions, due to the need to verify all appointments, decurs in the National Health Information System at the National Health Insurance Fund [15,22]. The work of the doctor is institutionalized, but not the midwife. But when seeking responsibility and traceability from control bodies, doctors have defined their activity in the patient's documentation, while the healthcare professional – a midwife-cannot verify their care and monitoring in the system.

D) Critical thinking. Midwives use critical thinking skills to make decisions in stressful medical situations. When unexpected problems arise during the birth process, midwives use their learning and decision-making skills to accurately diagnose problems and determine the best course of action. They monitor symptoms and make changes to the patient's care plan according to the circumstances. The hospital environment is dynamic, so midwives demonstrate critical thinking skills to make important medical decisions in an environment of uncertainty, risk, or stress [9].

(E) Attention to detail. Attention to detail helps midwives focus on their patients and monitor any change in their condition. They define and manage the patient's risk by providing health care. Midwives remain vigilant while performing medical procedures such as drawing blood or administering medication to ensure they follow best practices. They strive to administer care while minimizing the patient's discomfort. Midwives connect patients to the monitoring equipment and record the results, carefully noting all anomalies. Attention to detail allows them to notice problems and take steps to solve them before they become serious [1,9].

5) Teamwork. Midwives often work as part of a team in a hospital setting. They receive instructions from a doctor and assist during operations or other procedures. They listen carefully to all instructions and help doctors in their work. Midwives can work as part of a team with other healthcare professionals and hospital staff, so they focus on building strong relationships and sharing responsibilities while working to make sure each patient receives quality care [11].

6) The Midwife at the center of care and the working environment. Some midwives work in a prehospital or hospital environment and, depending on the subject of work, perform a number of activities, combine different skills, continuous communication with patients, staff, superiors, supervisors, non-medical personnel, relatives of patients, suppliers and others. clinical setting, providing care for Obstetric and gynecological patients. This requires strict coordination of the executed activities, precision of the tasks, grading in importance, analytical and critical thinking, opportunity for corrective actions and, if necessary, training in new responsibilities (continuous change of the regulatory framework, new requirements of the National Health Insurance Fund, National Health Information System, etc. [9.15]) (fig.2).

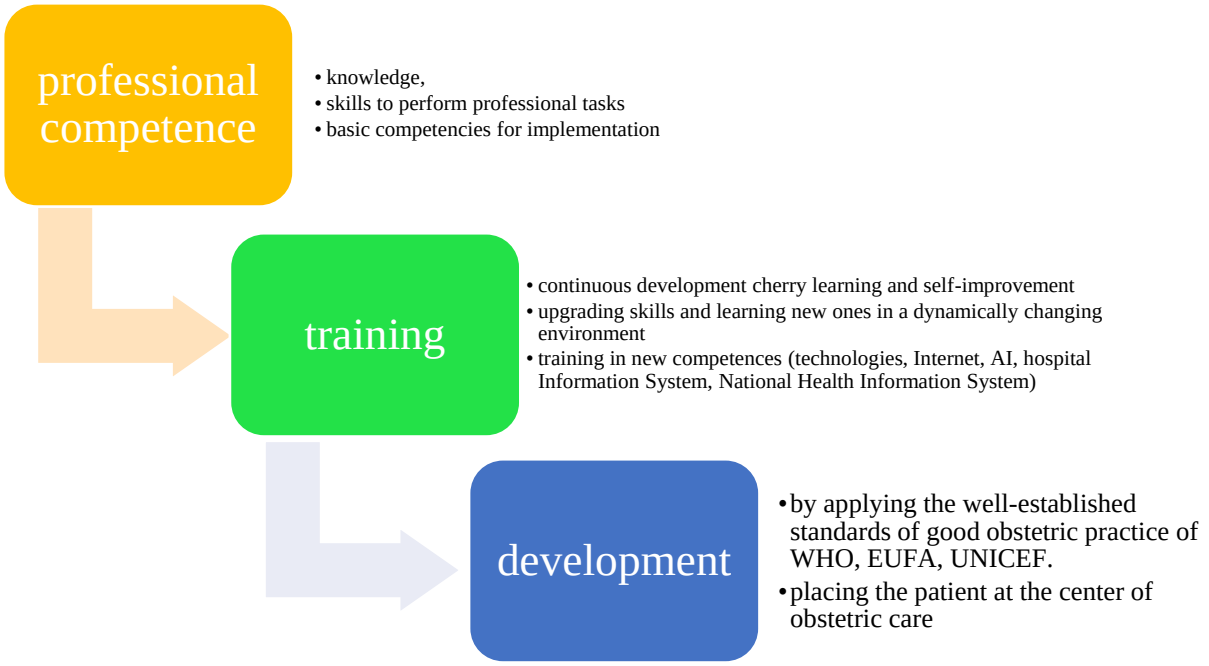

Fig. 2. Development of obstetric skills

Conclusion

The high requirements of the environment raise a number of questions regarding the provision of specialist in the environment and a favorable working environment. it requires the ability to apply the teachings and competences in a real environment in order for the patient to touch the essence of obstetric care and to ensure the optimal opportunity for the natural course of the birth process and First care for the mother and baby, in an environment close to the home. demand requires new models of service delivery, with no real opportunity for midwives to care for patients postnatally and peri. legislative justification and introduction of regulatory standards and protocols for obstetric care, creation of stable communication channels and upgrading trainings are needed.

Changes in communication patterns are required by health care users. The increased awareness and requirements on the part of patients, the reduction of their stay in the hospital with the introduction of modern methods of treatment necessitates a change in the attitudes and nature of the patient - medical team Relations. In a free market community, they are able to make their choice of a doctor, team or medical institution.

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KIDNEY CANCER: A MODERN VIEW OF THE PROBLEM

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Abstract

This scientific and analytical work presents modern world and local-regional data on incidence, mortality, lethality and five-year survival rate of such a common oncological pathology as kidney cancer. The issues of etiology and pathogenesis, modern approaches and principles of complex diagnostics, prospects for improving treatment results, as well as the prognosis are covered in detail. The epidemiological characteristics of this pathology in our republic are given in the context of the regions of the country.

Keywords: *oncology, urology, nephrology, kidney cancer, renal cell carcinoma, metabolic biomarkers, metabolites, exosomes, gene expression, epidemiology, incidence, mortality, lethality, five-year survival rate, prognosis.*

Kidney cancer (KC) is a malignant tumor of the kidney, which is most often a carcinoma and develops either from the epithelium of the proximal tubules and collecting ducts (renal cell carcinoma - RCC) or from the epithelium of the renal pelvis and calyces (transitional cell carcinoma) [1].

The diagnostic criteria are as follows. Complaints: pain in the side, visible hematuria and a palpable formation in the projection of the kidney. Extrarenal symptoms: inferior vena cava compression syndrome (leg edema, varicocele, dilated subcutaneous veins of the abdomen, deep vein thrombosis of the lower extremities, proteinuria - develops in about 50% of patients with massive tumor thrombosis of the inferior vena cava or with compression of the inferior vena cava by a tumor and enlarged lymph nodes; paraneoplastic syndrome - cachexia, weight loss, fever, neuromyopathy, amyloidosis, increased erythrocyte sedimentation rate, anemia.

Physical examination: with small formations, an objective examination does not reveal any pathology characteristic of RCC. As the kidney formation grows, the following can be determined: a palpable formation in the projection of the kidneys; palpable enlarged cervical and supraclavicular lymph nodes; persistent varicocele or bilateral edema of the lower extremities, which indicates a tumor Invasions of the inferior vena cava. Laboratory tests: complete blood count – the most typical finding is anemia of varying severity; increased erythrocyte sedimentation rate; complete urine analysis – macro- or microhematuria, or changes in the analysis may be absent; biochemical blood test (total protein, urea, creatinine, bilirubin, glucose, alanine aminotransferase, aspartate aminotransferase, albumin, amylase) – creatinine urea may increase with signs of renal failure; coagulogram – there may be signs of blood clotting disorders; glomerular filtration rate – to assess renal function, especially in the case of a tumor in a single kidney [1].

Instrumental studies: 1) excretory intravenous urography - radiographic signs of formation - afunction or decreased function of the kidney on the affected side, deformation of the renal pelvis and calyces - displacement, displacement of the calyces, pelvis, amputation of the calyces, enlarged kidney contours, etc.; in the case of computed tomography (CT) with bolus enhancement, excretory urography may not be performed; 2) angiography of the renal vessels and inferior vena cava - have limited indications, are used as additional diagnostic tools in individual patients; 3) isotope renography of the kidneys - indicated for patients with decreased renal function for a complete assessment of renal function in order to optimize the planned treatment, for example, when it is necessary to preserve renal function (in case of a locally advanced process or concomitant pathology of the gastrointestinal tract, it is necessary to examine these organs, where esophagogastroduodenoscopy, irrigoscopy, fibrocolonoscopy are used; osteoscintigraphy and CT of the brain are indicated for patients with stage III-IV KC, as well as patients with symptoms that may be manifestations of a metastatic process; 4) angiography of the renal vessels - when planning renal artery embolization; 5) magnetic resonance imaging (MRI) of the retroperitoneal organs or abdominal organs - when detecting fluid formations in the kidney for differential diagnosis of cystic RCC and cancer in a cyst from benign fluid formations; 6) percutaneous kidney biopsy - for the purpose of establishing a histological diagnosis, for selecting patients with a small tumor for dynamic observation; for clarifying the histological nature of the tumor before its removal or the use of ablative treatment methods; for selecting patients with metastases most suitable for targeted pharmacological therapy (kidney biopsy is not indicated for patients with concomitant pathology and a weakened state, who can only be considered for conservative treatment (watchful waiting) regardless of the biopsy results); 7) ultrasound examination of the kidneys and retroperitoneal space, ultrasound of the abdominal organs - detection of a formation at an early stage, on the basis of which a further in-depth examination is decided; 8) echocardiography - prescribed to patients with concomitant cardiac pathology or suspected presence of a thrombus in the atrium; 9) ultrasound dopplerography of the renal vessels and inferior vena cava (if a thrombus is suspected) and / or MRI; to assess the spread of a tumor thrombus and the state of blood flow in the examined area; 10) ultrasound dopplerography of the vessels of the lower extremities - when planning surgery on a kidney tumor to exclude thrombosis of the veins of the lower extremities; 11) ultrasound of the pelvic organs - assessment of the condition of the pelvic organs; 12) chest X-ray in two projections - to exclude pulmonary changes when preparing the patient for surgery; 13) multispiral CT of abdominal organs and retroperitoneal space with bolus enhancement - prescribed as an additional examination if formations of unclear etiology are detected on ultrasound; 14) MRI of abdominal organs (with contrast) - to determine the nature of the neoplasm, study the spread of tumor thrombus in the inferior vena cava, if it was not possible to obtain clear information during CT examination; also indicated for patients with allergy to intravenous contrast, and pregnant women without impaired renal function; 15) CT of the chest - necessary to clarify the spread of the process in the lungs, pleura, chest bones; 16) CT of the pelvic organs - if MRI examination is impossible (due to metal implants in the patient, an installed pacemaker, etc.); 17) CT scan of the brain – if there is a suspicion of metastases to the brain, in the presence of any brain symptoms, since one of the common locations of metastases in RCC is the brain [1].

As noted by Safiri S. et al. [2], KC globally accounts for more than 131,000 deaths each year and has been found to place a large economic burden on society. The etiology of KC is mainly unknown, but appears to be multifactorial in nature. A number of different risk factors have been studied, some of which are modifiable, thus creating an opportunity for primary prevention. The risk factors for KC have been categorized as: (a) life style risk factors – tobacco smoking, excess body weight, alcohol consumption, physical activity and diet; (b) medical history – hypertension, chronic kidney diseases, kidney stones, and diabetes mellitus; (c) environmental and occupational exposures – trichloroethylene and aristolochic acid; (d) genetic risk factors and others [2,3].

Our colleagues conducted a very important study [2], the aim of which was to present a status report on the incidence, mortality and disability-adjusted life years (DALYs) associated with KC in 195 countries, from 1990 to 2017. In 2017, there were 393.0 thousand [(95% uncertainty interval (UI): 371.0-404.6)] incident cases of KC, with an age-standardised rate of 4.9 (95% UI: 4.7-5.1). This increased by 4.7% (95% UI: – 1.1 to 11.7) between 1990 and 2017, but this increase was not statistically significant. About 138.5 thousand (95% UI: 128.7-142.5) deaths occurred due to KC, with an age-standardised death rate of 1.7 (95% UI: 1.6-1.8). This death rate increased by 4.4% (95% UI: – 0.3 to 10.5) across the measurement period, but was not statistically significant. KC accounted for 3.3 million (95% UI: 3.1-3.4) DALYs in 2017, with an age-standardised rate of 41.1 (95% UI: 38.7-42.5). There was a decrease of 3.6% (95% UI: – 9.2 to 3.2) across the reporting period, but again this was not statistically significant.

At the regional-level, authors found that High-income North-America [12.1 (95% UI: 11.6-13.2)],

Southern Latin America [11.6 (95% UI: 10.4-13.0)] and Eastern Europe [10.0 (95% UI: 9.5-10.5)] had the highest age-standardised incidence rates. In contrast, South Asia [1.9 (95% UI: 1.7-2.0)], Eastern Sub-Saharan Africa [2.5 (95% UI: 2.1-2.9)] and Central Sub-Saharan Africa [2.7 (95% UI: 2.2-3.3)] had the lowest age-standardised incidence rates. The age-standardised death rates were highest in Southern Latin America [4.3 (95% UI: 3.9-4.7)], Central Europe [3.8 (95% UI: 3.3-4.0)] and Eastern Europe [3.8 (95% UI: 3.6-3.9)]. In contrast, South Asia [0.62 (95% UI: 0.56-0.66)], Eastern Sub-Saharan Africa [0.77 (95% UI: 0.67-0.88)] and Central Sub-Saharan Africa [0.85 (95% UI: 0.68-1.1)] had the lowest age-standardised death rates. The age-standardised incidence and death rates were higher for males in all of the Global Burden of Disease (GBD) regions, although this difference was not statistically significant in all regions. Most regions experienced an increase in age-standardised incidence rates, with South Asia [48% (95% UI: 22-80)], Tropical Latin America [36% (95% UI: 28-45)] and High-income Asia Pacific [35% (95% UI: 13-50)] showing the largest increases. In contrast, the Caribbean [– 24% (95% UI: – 34 to 21)] and Southern Latin America [– 4% (95% UI: – 18 to 44)] showed non-significant decreases in their age-standardised incidence rates. The age-standardised death rates increased the most in East Asia [49% (95% UI: 5-75)], South Asia [39% (95% UI: 17-69)] and Central Europe [37% (95% UI: 20-45)]. The opposite was true for the Caribbean [– 22% (95% UI: – 30 to 16)], Southern Latin America [– 7% (95% UI: – 18 to 30)] and High-income North America [– 1% (95% UI: – 6 to 11)], which all showed non-significant decreases in age-standardised death rates [2].

In 1990 the highest number of incident cases were found in Western Europe [44,006 (95% UI: 38,633-45,652)], High-Income North America [39,473 (95% UI: 35,501-40,625)] and East Asia [25,170 (95% UI: 22,570-30,076)]. In 2017, the highest numbers were found in Western Europe 72,675 (95% UI: 65,477-76,756)], High-Income North America [68,842 (95% UI: 65,663-74,202)] and East Asia [52,290 (95% UI: 46,830-56,228)]. In 1990, the number of deaths were found to be highest in Western Europe [18,583 (95% UI: 16,369-19,093)], High-Income North America [11,117 (95% UI: 10,077-11,359)] and Eastern Europe [8,812 (95% UI: 7,751-9,794)]. In 2017, the highest number of deaths were found in Western Europe [30,325 (95% UI: 27,097-31,837)], High-Income North America [19,048 (95% UI: 18,297-20,091)] and East Asia [18,634 (95% UI: 16,488.19,986)]. In 2017, the age-standardised incidence rates ranged from 1.5 to 15.8 per 100,000 people for the 195 countries studied. Uruguay [15.8 (95% UI: 13.6-19.0)], Slovakia [14.1 (95% UI: 7.7-16.5)] and the Czech Republic [13.1 (95% UI: 10.7-14.5)] had the highest age-standardised incidence rates. In contrast, Bangladesh [1.5 (95% UI: 1.0-1.8)], Kenya [1.5 (95% UI: 1.1-1.9)] and Nepal [1.8 (95% UI: 1.1-2.6)] had the lowest age-standardised incidence rates. The age-standardised death rate also varied substantially by country, ranging from 0.47 to 5.6 per 100,000 people. The Czech Republic [5.6 (95% UI: 4.6-6.1)], Uruguay [5.5 (95% UI: 4.8-6.5)] and Iceland [5.2 (95% UI: 4.8-5.7)] had the highest age-standardised death rates, while Bangladesh [0.47 (95% UI: 0.34-0.58)], Kenya [0.52 (95% UI: 0.39-0.66)] and Madagascar [0.58 (95% UI: 0.41-0.73)] had the lowest rates [2].

It is very important to note the fact that, as the researchers note [2], the percentage change in age-standardized incidence rates from 1990 to 2017 varied substantially between countries. At the same time, the largest increases observed in our neighboring countries, such as Armenia [284.2% (95% UI: 115.0-390.1)], Belarus [241.0% (95% UI: 88.1-324.9)] and Latvia [216.3% (95% UI: 78,8-29P3,8)]. In contrast, Qatar [– 44.3% (95% UI: – 65.1 to – 3.4)] Bermuda [– 43.9% (95% UI: – 54.2 to – 11.8)] and Trinidad and Tobago [– 36.9% (95% UI: – 53.1 to 30.7)] showed decreasing trends, although not all of these were statistically significant. The percentage change in age-standardised death rates (from 1990 to 2017) also differed between countries. The largest increases were seen in Armenia [396.6% (95% UI: 187.3-526.2)], Belarus [277.5% (95% UI: 114.9-359.9)] and Latvia [256.3% (95% UI: 113.4-336.1)]. In contrast, the largest decreases during this period were found in Qatar [– 49.4% (95% UI: – 67.5 to – 10.8)], Bermuda [– 43.5% (95% UI: – 51.5 to – 15.4)] and Trinidad and Tobago [– 41.4% (95% UI: – 54.7 to 10.2)].

Sex differences in the incident rates first appeared in the 35-39 age group and increased up to the oldest age group (95+). The number of incidents was also higher in males, from the 30-34 age group up to the 85-89 age group, with a peak being seen in the 65-69 age group. The death rate was also higher in males, than in females, in all age groups. The number of DALYs was also higher in males, in most of the age groups, except the 5-9, 10-14, 90-94 and 95+ age groups. The number of DALYs peaked in the 60-64 age group. At the regional-level, the age-standardised DALY rate increased up to an Socio-Demographic Index (SDI) of approximately 0.74 and then decreased with increasing SDI values. The global age-standardised disability-adjusted life-year (DALY) rate was initially higher than expected, but then the rate fell below the expected level for the last 14 years. High-income Asia-Pacific was the only region in the

GBD high-income super regions that had a lower than expected DALY rate across the entire measurement period. For the GBD super-regions of Central Europe, Eastern Europe and Central Asia, only Eastern Europe had a higher than expected DALY rate for the entire measurement period, while Central Europe had a higher than expected level for the last 13 years. From the Latin America and Caribbean super-region, only Southern and Central Latin America had higher than expected DALY rates across the entire measurement period. In the Sub-Saharan Africa super-region, only Southern Sub-Saharan Africa was found to have a lower than expected DALY rate for the entire measurement period. In the Southeast Asia, East Asia and Oceania super-regions, only Southeast Asia and East Asia had a lower than expected DALY rate from 1990 to 2017, but Oceania was lower than expected during the last 3 years of the measurement period. The South Asia region had a lower than expected DALY rate for the entire measurement period, while the North Africa and Middle East region was lower for most of the measurement period (from 1992 to 2017). There were large national differences in age-standardised DALY rates. Uruguay, the Czech Republic, Lithuania, Ukraine, Iceland, Greenland and many other countries showed higher than their expected DALY rates, whereas Singapore, Kuwait, China, Algeria, Morocco and many other countries had much lower than expected DALY rates, based only on their SDI. Globally, 18% of KC DALYs was attributable to high body mass index (BMI) in both sexes (Male: 16.5%; Female: 22.1%). The proportion of KC DALYs there were attributable to high BMI ranged from 7.1% in Eastern Sub-Saharan Africa to 29.2% in High-income North America. Furthermore, 16.6% of KC DALYs was attributable to smoking in both sexes, but this burden was higher in males (21.6%) than females (7.3%). The smoking-attributable burden also differed across GBD regions, ranging from 3.9% in Western Sub-Saharan Africa to 22.9% in Eastern Europe. Finally, the burden of KC attributable to occupational exposure to trichloroethylene was negligible [2].

An interesting study was conducted by Lin L. et al. [4]. They emphasize that metabolic reprogramming plays an important role in KC. At the same time, KC is increasingly acknowledged as a disease of metabolism [4,5].

In the work of Xu Q. et al. [6] in all age-specific groups, smoking among males, high BMI among females, and high BMI among males were the first three contributions to DALYs. The proportions of DALYs attributed to smoking, high BMI, and occupational exposure to trichloroethylene differed between genders. The most significant contribution to DALYs for males was smoking, accounting for more than 19.5% from 1990 to 2019. The contribution of smoking to KC DALYs was about 10 times higher for males than that for females. However, a high BMI more significantly contributed to DALYs among females than that of males. Occupational exposure to trichloroethylene accounted for the lowest proportion of DALYs in both sexes. Age-specific groups analysis indicated that smoking had a great impact on the elderly male groups and occupational exposure to trichloroethylene had a great impact on middle-aged groups. The influence of high BMI did not show a significant difference between age-specific groups. Increased trends of DALYs attributable to smoking and high BMI were observed in the elderly population and males. Therefore, smoking was the most significant contributor, and the high BMI was the most increasing risk factor. Their projection indicated that the rates of incidence, mortality, and the number of new cases and deaths would continue to increase in both sexes in the next decade.

Nizioł J. et al. [7] in their publication say that today based on histological classification, a number of different types of KCs were classified including both benign tumors like adenoma, oncocytoma and angiomyolipoma and the most common malignant type of KC - RCC. RCC is accounting for approximately ninety percent of all neoplasms originating from the kidney. There are three main types of RCC known, namely clear cell RCC (ccRCC), papillary RCC and chromophobe RCC. Mentioned types may differ in stage, grade, and cancer-specific survival. Other subtypes of RCC are very rare and include angiomyolipoma, collecting duct carcinoma, or simple renal cyst. Currently, RCC diagnosis is based on magnetic resonance imaging, ultrasound examination or CT. Unfortunately, more than 60% of RCC cases are diagnosed incidentally. This tumor is difficult to detect, especially in its early stages, due to the lack of characteristic symptoms including lack of the classic triad of visible haematuria, flank pain and palpable abdominal mass symptoms. Poor prognosis and high mortality rate are related to metastases and resistance to chemotherapy and radiotherapy. The study authors subjected the most differentiating metabolites between KC and normal tissues among the three analytical platforms to pathway analysis using MetaboAnalyst 5.0. MetaboAnalyst is a web-based platform dedicated for comprehensive metabolomics data analysis, interpretation and integration with other omics data (https://www.metaboanalyst.ca/). However, only the compounds selected in the nuclear magnetic resonance (NMR) analysis turned out to be important in the metabolic pathways in the human body, therefore the quantitative data from this platform was used to identify the most relevant pathways involved in the KC. The concentrations of

fumarate, sarcosine, leucine, tryptophan and phenylalanine were subjected to pathway analysis and quantitative enrichment analysis using a MetaboAnalyst 5.0. 12 metabolic pathways, including tyrosine metabolism, arginine and proline metabolism, purine metabolism, citric acid cycle, urea cycle, aspartate metabolism, mitochondrial electron transport chain, Warburg effect, phenylalanine and tyrosine metabolism, valine, leucine and isoleucine degradation, glycine and serine metabolism, methionine metabolism and tryptophan metabolism were significantly related to KC. Furthermore, in order to expand metabolomic analysis of pathway related to KC, the quantitative enrichment analysis module in MetaboAnalyst, with extensive list of pathways from Small Molecule Pathway Database (SMPDB) was performed. SMPDB is an interactive, visual database containing more than 30 000 small molecule pathways found in humans only. The majority of these pathways are not found in any other pathway database. SMPDB is designed specifically to support pathway elucidation and pathway discovery in metabolomics, transcriptomics, proteomics and systems biology. It is able to do so, in part, by providing exquisitely detailed, fully searchable, hyperlinked diagrams of human metabolic pathways, metabolic disease pathways, metabolite signaling pathways and drug-action pathways. All SMPDB pathways include information on the relevant organs, subcellular compartments, protein_complex cofactors, protein_complex locations, metabolite locations, chemical structures and protein_complex quaternary structures (https://smpdb.ca/). Concentrations of 5 metabolites, identified from the global metabolomic profiling, were entered as input data. It was found that 6 additional pathways including aspartate metabolism, methionine metabolism, mitochondrial electron transport chain, purine metabolism, urea cycle and Warburg effect significantly related to KC. The power of metabolic pathways analysis was confirmed by p-value Holm p-values and false discovery rate of less than 0.001 for every pathway.

In conclusion, the researchers note that with regard to biomarker discovery, five potentially robust metabolic biomarkers in 49 tumor tissue samples of KC patients and 49 adjacent normal tissues treated as controls were identified using high-resolution 1H NMR spectroscopy, while 11 mass spectral features were identified from nanoparticle-based laser desorption ionization mass spectrometry analyses. The most important endogenous compounds and trace elements having bioactive properties and pharmacological applicability were discussed in details. Moreover, they also demonstrated the possibility of discriminating between different KC types using high-resolution 1H NMR metabolomics. This study also supports the value of integrated NMR and mass spectrometry to identify candidate biomarkers and characteristic changes in small molecule metabolite levels which could prove to be very valuable for use as diagnostics or to track disease progression, offering less invasive ways to screen patients with KC [7].

In spite of great efforts there are still no clinically available biomarkers for early detection, diagnosis or prognosis of KCs. Analysis of metabolic profiles from tissues and biofluids is a promising approach for the discovery of biomarkers that would enhance our abilities to predict cancer progression and to assess the effectiveness of cancer treatment [7,8].

A very interesting scientific work concerning exosomes was presented by Mao W. et al. [9]. The authors note that KC exerts a high degree of malignancy, and most of the distant metastasis occurs at an early stage; it is insensitive to chemoradiotherapy and easily develops drug resistance. The current treatment for KC mainly includes surgery, interventional embolization and targeted therapy; however, the treatment efficacy is poor. In recent years, the role of exosomes as mediators of intercellular communication and information exchange in the tumour microenvironment in tumour pathogenesis has attracted much attention. Exosomes are rich in bioactive substances such as nucleic acids, proteins and lipids and are involved in angiogenesis, immune regulation, drug resistance, formation of pre-metastatic niche, invasion and metastasis. Based on the conducted research it was established that early diagnosis of KC is one of the key factors in improving the survival rate of patients. Exosomes may benefit early diagnosis. Exosomes secreted by KC cells are abundantly present in blood, urine and other body fluids, thus providing advantages such as easy availability, non-invasive examination and tumour specificity. Owing to their small size, high mobility and lipid bilayer structure, they can easily passthrough biological membranes and protect rich bioactive substances present inside the membranes from degradation; therefore, exosomes have become a prime focus of research. Tumour-derived exosomes carry a large number of substances, including proteins, nucleic acids and lipids, which can alter the biological behaviour of target cells and participate in the development of KC. Numerous studies have found that the expression of exosomes is significantly different in patients with KC and normal subjects. Exosomes play an important role in the infiltration and metastasis of KC and also participate in tumour drug resistance and immune escape. Studies related to exosomes provide new ideas for the diagnosis and treatment of KC and offer adequate developmental prospects. However, studies on exosomes derived from RCC are mostly retrospective, and the tissue types mostly include RCC carcinoma. To promote the application of

exosomes in clinical settings, more extensive studies combined with clinical trials are required, and future studies should include increased sample sizes and different tissue types and adopt a prospective study design, which will be more convincing and provide substantial medical data support for clinical translation. In addition, the study of exosomes in KC is relatively independent and none of the molecules identified seem to have been repeatedly validated in different studies, which requires more prospective clinical trials leading to more reproducible biomarkers. Moreover, further investigation is required for developing exosome-mediated tumour vaccines and understanding the effect and mechanism of drug resistance on targeted therapy for KC.

Apanovich N. et al. [10] say that the most common type of KC is a RCC (approximately 90% of cases), of which 80% are ccRCC. Moreover, distant metastases are present in approximately 30% of patients at the time of the first examination. Therefore, the ability to predict the occurrence of metastases in patients at early stages of the disease is an urgent task aimed at personalized treatment. The prediction of metastasis in patients with localized and locally advanced RCC can be of great practical importance, since it can affect both the volume of surgical intervention, the need for lymphadenectomy, and the need for adjuvant immunotherapy. In cases where renal tumors do not have metastases, the standard scope of surgical intervention is nephrectomy without regional lymph node dissection. Conducting a tumor biopsy prior to surgery or using non-invasive methods of obtaining biological material in the future, such as liquid biopsy, may make it possible to identify a group of patients with a high risk of developing metastases based on the results of gene expression analysis and methylation. In these patients, lymphadenectomy can improve long-term treatment outcomes and provide better staging. Furthermore, prediction of metastasis may be the key to deciding whether adjuvant therapy is necessary. Samples of tumor and paired histologically normal kidney tissue from patients with metastatic and non-metastatic ccRCC were studied. Gene expression was analyzed using real-time polymerase chain reaction. The level of gene methylation was evaluated using bisulfite conversion followed by quantitative methylation-specific PCR. Two groups of genes were analyzed in this study. The first group includes genes whose expression is significantly reduced during metastasis: CA9, NDUFA4L2, EGLN3, and BHLHE41 [(p <0.001, receiver operating characteristic (ROC) analysis)]. The second group includes microRNA genes: MIR125B-1, MIR137, MIR375, MIR193A, and MIR34B/C, whose increased methylation levels are associated with the development of distant metastases (p = 0.002 to <0.001, ROC analysis). Based on the data obtained, a combined panel of genes was formed to identify patients whose tumors have a high metastatic potential. The panel can estimate the probability of metastasis with an accuracy of up to 92%.

Next, regarding KC screening. Harvey-Kelly L.L.W. et al. [11] note that KC is often asymptomatic, leading to proposals for a screening programme. The views of the public towards introducing a new screening programme for KC are unknown. The aim of study was to explore attitudes towards KC screening and factors influencing intention to attend a future screening programme. Authors conducted an online population-based survey of 1021 adults aged 45-77 years. The main outcome measure was intention to attend four possible screening tests (urine, blood, ultrasound scan, low-dose CT) as well as extended low-dose CT scans within lung cancer screening programmes. They used multivariable regression to examine the association between intention and each screening test. Most participants stated that they would be 'very likely' or 'likely' to undergo each of the screening tests [urine test: n = 961 (94.1%); blood test: n = 922 (90.3%); ultrasound: n = 914 (89.5%); low-dose CT: n = 804 (78.8%); lung CT: n = 962 (95.2%)]. Greater intention to attend was associated with higher general cancer worry and less perceived burden/inconvenience about the screening tests. Less worry about the screening test was also associated with higher intention to attend, but only in those with low general cancer worry (cancer worry scale ≤ 5). Compared with intention to take up screening with a urine test, participants were half as likely to report that they intended to undergo blood [odds ratio (OR) 0.56 (0.43-0.73)] or ultrasound [OR 0.50 (0.38-0.67)] testing, and half as likely again to report that they intended to take part in a screening programme featuring a low dose CT scan for KC screening alone [OR 0.19 (0.14-0.27)]. Participants in this study expressed high levels of intention to accept an invitation to screening for KC, both within a KC specific screening programme and in conjunction with lung cancer screening. The choice of screening test is likely to influence uptake. Together these findings support on-going research into KC screening tests and the potential for combining KC screening with existing or new screening programmes.

As the researchers note this study is the first to assess public attitudes towards potential KC screening programmes. Participants expressed high levels of intention to take-up KC screening, both within KC specific screening programmes and in conjunction with lung cancer screening. This was despite over 80% knowing nothing about KC or having only heard of the condition before participating in the survey. There were significant differences in intention between screening modalities, with a preference for urine

testing or low-dose CT combined with lung cancer screening over a blood test, ultrasound scan or low-dose CT alone. Participants were also more likely to intend to undergo screening if they reported higher general cancer worry or less burden/inconvenience associated with the screening test. Less worry about the screening test was also associated with higher intention to attend, but only in those with lower general cancer worry. For those with higher general cancer worry, the general worry about cancer appeared to dominate any worry associated with the screening test itself. In that study over 90% of survey respondents believed that there was benefit to lung cancer screening, with the majority agreeing that lung screening could reduce chances of lung cancer death and only a small minority endorsing avoidance of lung cancer screening due to fear of what might be found or low perceived effectiveness of screening. The observed differences between tests in intention to take part in a screening programme, with a preference for urine testing over a blood test, ultrasound scan or low-dose CT alone, is also consistent with existing literature which reports a preference for non-invasive tests requiring no preparation and causing no pain or long-term harm [11].

The National Comprehensive Cancer Network (NCCN) Guidelines for KC focus on the screening, diagnosis, staging, treatment, and management of RCC. Patients with relapsed or stage IV RCC typically undergo surgery and/or receive systemic therapy. Tumor histology and risk stratification of patients is important in therapy selection. The NCCN Guidelines for KC stratify treatment recommendations by histology; recommendations for first-line treatment of ccRCC are also stratified by risk group. To further guide management of advanced RCC, the NCCN KC Panel has categorized all systemic KC therapy regimens as "Preferred," "Other Recommended Regimens," or "Useful in Certain Circumstances." This categorization provides guidance on treatment selection by considering the efficacy, safety, evidence, and other factors that play a role in treatment selection. These factors include pre-existing comorbidities, nature of the disease, and in some cases consideration of access to agents [12,13].

At the same time, as Jung M. et al. [14] point out comorbidity could influence cancer diagnosis, treatment, prognosis, or survival. Although comorbidity burden in KC patients is high, limited evidence exists on the longitudinal patterns of individual comorbidity prevalence and its impact on overall survival among KC patients, particularly in Asian populations. In their study, the authors included adults diagnosed with KC between 2010 and 2021 using the Korean nationwide health insurance database. Comorbidities assessed were any 1 of 19 specific medical conditions, diagnosed within 1 year prior to cancer diagnosis. Our colleagues calculated the incidence and age-standardized incidence rate of KC, prevalence of individual medical conditions as single or multiple comorbidities, and overall survival probability of KC patients over a 12-year period. They estimated the OR of having individual and multiple comorbidities with age and sex as independent covariates and adjusted for other comorbidities. Kaplan-Meier curves were used for overall survival at different time frames up to 5 years of follow-up. Among KC patients (N = 42,740), 68.7% were men, and median (interquartile range) age was 59 (49-68) years. Approximately 76% of patients had at least one comorbidity at the time of cancer diagnosis. Overall, hypertension (51.3%), dyslipidemia (40.2%), mild liver disease (27.4%), diabetes (25.1%), and peptic ulcer disease (18.9%) were the most prevalent comorbidities. The proportion of patients having three or more comorbidities continuously increased from 2010 (29.4%) to 2021 (44.9%). Having more comorbidities was associated with a lower probability of overall survival. The researchers emphasize that their study has several strengths, including the nationwide population-based design, a substantial cohort of KC patients, a recent and long-term study period, and systematic methodologies for assessing the longitudinal patterns of comorbidity and survival. Several limitations also should be noted. In conclusion, the authors note that this nationwide population-based study found that comorbidities were prevalent in KC patients and the proportions of patients having multiple comorbidities increased over the recent 12-year period. Although overall survival increased over time, it was attenuated by having more comorbidities. These data emphasizes the importance of comprehensive management for both cancer and comorbidity in KC patients.

Now, regarding this pathology in our country at the republican level. The incidence rate of KC in the Republic of Kazakhstan in 2023 was 8.1 per 100 thousand population (7.4 in 2022) with a growth rate of 9.6% compared to the previous year, taking a high 6th rank place among all nosological forms of malignant tumors, and amounting to 1608 people in absolute numbers (1438 cases - a year earlier). The proportion of cases with a diagnosis established for the first time in life, recorded by oncological organizations, was 4.3% (4.1% - in 2022). At the same time, 835 men fell ill (proportion - 5.2%), women - 773 (proportion - 3.7%) [15]. The average national level of the KC was set in 10 regions of the country: Pavlodar - 16.2 (the maximum indicator); North Kazakhstan - 15.2; Kostanay - 12.9; Karaganda - 12.2; East Kazakhstan - 11.1; Akmola - 9.9; the city of Almaty - 9.6; Abay - 8.9; the city of Astana - 8.8; West Kazakhstan - 8.4. Ulytau region is on par with the average national indicator. This indicator is below the

average national level in 9 regions: Turkestan - 4.0 (the lowest level); the city of Shymkent - 4.2; Atyrau - 5.0; Almaty and Mangistau - 5.1; Kyzylorda - 5.8; Zhambyl - 6.3; Zhetysu - 6.7 and Aktobe - 8.0 regions per 100 thousand population.

Mortality from this pathology was 1.8 per 100 thousand population with an increase rate of 18.0% compared to the previous year, second only to thyroid cancer (19.1%) and non-melanoma skin cancer (26.0%).

The regions where the mortality rate from KC is higher than the average in the republic (1.8 per 100 thousand population) include: Pavlodar - 4.2 (maximum level); North Kazakhstan - 3.9; Abay - 3.4; Kostanay - 3.0; Akmola - 2.8; East Kazakhstan - 2.6; West Kazakhstan and Karaganda - 1.9. The lowest rates were recorded in: Almaty, Ulytau regions and the city of Shymkent – 0.9 (the lowest rate); followed by: Mangistau – 1.0; Turkestan and Aktobe – 1.3; Atyrau, Zhetysu regions and the city of Astana – 1.4; the city of Almaty – 1.5; Zhambyl and Kyzylorda regions – 1.6 per 100 thousand population [15].

One-year lethality increased by 1.2% compared to the previous year and amounted to 10.1% (8.9% in 2022). At the same time, the ratio between one-year lethality and neglect (stage IV) was 0.6, in 2022 - 0.5, and this is the best indicator among all nosological forms of malignant tumors after prostate cancer (0.3) and thyroid cancer (0.5). At the same time, we recall that the farthest from "1" is the worst ratio between the indicators of 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 situation with coronavirus and the increased availability of preventive care for the population. The proportion of patients identified during medical examinations increased from 62.0% to 62.4% of the total number of patients identified over the year.

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

As for KC, during preventive examinations, the early detection of this pathology increased from 58.7% to 64.4%. The absolute number of patients with KC identified during medical examinations was 1008 people (828 - a year earlier). At the same time, 767 are patients with early stages (in 2022 - 623 patients). In general, according to the amount of detected cases of cancer of all localizations, in 2023 the proportion of forms detected at early stages (0, I-II stages) increased from 66.3% to 67.9%. At the same time, detection at 0, I-II stages in KC increased from 75.2% to 76.1%. The regions where the proportion of patients with early stage I of the pathology in question is above the national average (50.6% and 5th rank place among the best indicators after non-melanoma skin cancer, thyroid cancer, uterine cancer and bladder cancer) include the following regions: Ulytau - 83.3% (the best indicator); North Kazakhstan - 69.2%; the city of Astana - 63.0%; Zhambyl - 62.2%; the city of Almaty - 59.5%; West Kazakhstan - 58.9%; Almaty – 56.0%; Pavlodar – 55.4%; Karaganda – 53.4%.

The lowest rates of early diagnosis were recorded in: Aktobe – 22.7% (the worst rate); East Kazakhstan – 24.7%; Kostanay – 36.3%; Shymkent city – 37.3%; Abay – 38.5%; Zhetysu – 43.5%; Mangistau – 44.7%; Kyzylorda – 45.8%; Akmola – 48.1%; Atyrau – 48.6% and Turkestan – 50.0% regions [15]. The following regions are among the regions where the proportion of patients with KC detected at stages I-II is above the national average (68.6% – 11th place). The best rate is in Ulytau region – 88.9%. It is followed by: the city of Almaty - 81.5%; Zhambyl - 78.4%; North Kazakhstan - 78.2%; Almaty - 77.3%; Kostanay - 73.5%; West Kazakhstan - 73.2%; the city of Astana - 71.4%.

Two regions are on par with the national average - Atyrau and Turkestan.

Low rates of early diagnosis were recorded in the Abay region - 50.0% (the worst result in the country, i.e. only every second patient is detected in the early stages of the disease). The situation is not much better in the East Kazakhstan - 50.6% and Akmola - 51.9% regions. Then follow: Aktobe - 57.3%; Zhetysu - 58.7%; Mangistau - 63.2%; Karaganda - 63.9%; the city of Shymkent - 64.7%; Kyzylorda - 66.7% and Pavlodar - 67.8% regions [15].

As is clearly seen from the above data, there is a very large spread in the indicators of early diagnosis across the country, from very good to thought-provoking. Of course, it is necessary to take into account migration processes and other factors affecting the indicators of early diagnosis, but nevertheless, the results obtained give reason not to stop there, both for oncologists and nephrologists, urologists, ultrasound diagnosticians, and general practitioners, since improving the indicators of early diagnosis of malignant tumors, as it remained one of the main postulates and one of the main tasks of medicine in general, continues to be relevant today. The proportion of stage IV KC among all nosological forms of

malignant neoplasms was 15.1%, and this is the 10th rank place for this indicator. In general, in 2023, the proportion 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 national indicator of the proportion of stage IV (15.1%), the best indicator is in the East Kazakhstan region - 3.9%. It is followed by the following regions: Ulytau - 5.6%; North Kazakhstan - 7.7%; Almaty - 9.3%; Kyzylorda - 10.4%; the city of Almaty - 11.7%; Aktobe - 12.0%; Kostanay - 13.7%; West Kazakhstan and Atyrau - 14.3%; Zhambyl - 14.9%. The worst indicator for the neglect of KC was recorded in the Abay region, where almost every third patient was diagnosed in the terminal stage of the disease - 30.8%. It is followed by: Zhetysu - 23.9%; Karaganda - 21.8%; Akmola - 19.5%; Turkestan - 18.6%; the city of Astana - 18.5%; the city of Shymkent - 17.6%; Mangistau - 15.8% and Pavlodar - 15.7% of the regions.

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 KC for the first time in their life.

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 patients with KC who completed specialized treatment was 836 people, continuing treatment - 472 patients. In percentage terms, by methods and types of treatment, the following results were obtained. The overwhelming majority - 82.7% of patients received surgical treatment only, complex - 9.8%, drug treatment only - 3.3%, combined - 1.2%, radiation treatment only - 0.6%, chemoradiation - 0.4%. Further, regarding the five-year survival rate of patients. As for KC, at the end of 2023, 10,236 people or 51.4 per 100 thousand of the population were registered with the dispensary (at the end of 2022 - 9,506 patients or 48.7 per 100 thousand of the population, respectively); and this is a high 5th rank place among all nosological forms of malignant neoplasms.

At the same time, the mortality rate of the observed contingents in 2023 increased by 0.4% and amounted to 3.5% (3.1% - a year earlier).

The five-year survival rate of patients with KC decreased from 55.2% in 2022 to 54.8% - in 2023 [15].

Summarizing the above, we can conclude that with KC, despite the increased effectiveness of preventive examinations and fairly high rates of early diagnosis, a high number of patients with this pathology is noted annually, and the five-year survival rate does not reach 60%. Scarcity, variability and veiled symptoms, its similarity with various non-core processes, lead to neglect and progression of the disease, even during dispensary observation. All this requires both oncologists and, first of all, primary health care workers and, of course, nephrologists, urologists, ultrasound diagnostic 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, including for the purpose of differential diagnosis 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 KC in our country shows that there are sometimes significant differences between 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 of modern clinical oncology.

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Philological sciences

DEVELOPING FLUENCY IN EFL THROUGH GAMIFICATION

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Abstract

In the rapidly evolving landscape of language education, the development of fluency in English as a foreign language (EFL) continues to be a primary and challenging objective for educators worldwide. Achieving proficiency in a new language requires not only the mastery of vocabulary and grammar but also the ability to communicate effectively and confidently in real-world situations. Traditional teaching methodologies have predominantly relied on approaches such as rote memorization of vocabulary and grammatical rules, repetitive drilling, and passive listening exercises. While these methods can provide a foundational knowledge base, they often fall short in motivating learners, fostering authentic communication skills, or sustaining long-term engagement with the language. Consequently, educators and researchers have been exploring more dynamic and learner-centered strategies to address these limitations.

One such innovative approach gaining significant attention is gamification—the process of incorporating game design elements, mechanics, and principles into non-game educational contexts. By integrating features such as points, badges, leaderboards, challenges, and narrative storytelling into language learning activities, gamification aims to transform the learning experience into a more engaging, interactive, and enjoyable process. According to Dicheva D. and etc. [1, 78], gamification has the potential to boost learners' motivation, increase participation, and foster a positive attitude toward language acquisition. It encourages learners to take risks, persist through challenges, and actively use the language in meaningful contexts, which are crucial factors for developing fluency.

This article delves into the ways in which gamification can effectively support fluency development in EFL settings. It examines recent empirical research that investigates the impact of gamified learning environments on language proficiency, motivation, and learner autonomy. Additionally, it explores practical implementations within various classroom contexts—ranging from digital language learning platforms to classroom-based gamified activities—and discusses best practices for integrating game elements into EFL curricula. By analyzing these developments, the article aims to provide educators with insights and strategies to leverage gamification as a powerful tool for fostering more engaging, effective, and sustainable language learning experiences.

Keywords: *language learning, fluency, gamification, motivation, learning platforms, language skills, feedback.*

Theoretical Foundations of Gamification in Language Learning

Gamification in education, particularly in language learning, is grounded in several well-established psychological and pedagogical theories that explain how motivational strategies influence learner engagement and achievement. Among these, Self-Determination Theory is particularly influential. This theory emphasizes that human motivation is maximized when three basic psychological needs are satisfied: autonomy, competence, and relatedness [2, 229]

***Autonomy**: The feeling of volition and control over one's learning process. In gamified language learning platforms, autonomy is supported when learners can choose topics, select difficulty levels, or customize their learning paths. For example, Duolingo allows users to select specific skill areas, such as grammar or vocabulary, and to set their own daily goals, thereby fostering a sense of ownership and control over their learning [3, 45].*

***Competence**: The need to feel effective and capable of mastering tasks. Gamification satisfies this need by providing immediate feedback, challenges appropriate to learners' proficiency levels, and opportunities for mastery. For instance, language learners receive instant correction and encouragement after*

completing a vocabulary quiz, which boosts their confidence and motivates continued practice [2, 233]. Badge systems or progress bars visually represent mastery levels, reinforcing learners' sense of achievement.

***Relatedness**: The desire to feel connected with others. Many gamified platforms incorporate social features like leaderboards, peer challenges, or discussion forums, fostering social interaction and a sense of community. For example, language exchange apps such as HelloTalk integrate gamified elements with social networking, enabling users to practice with native speakers and earn rewards for consistent engagement [1,78].*

Examples of Gamification Aligned with Motivation Theory

An illustrative example is Duolingo, which employs various gamified features such as streaks (daily practice badges), points, levels, and leaderboards to motivate learners [3, 47]. These elements tap into the intrinsic motivation by providing tangible recognition of progress, encouraging learners to sustain their practice routines. The platform also allows learners to choose specific skills, fostering autonomy, while immediate feedback addresses competence needs.

Another example is Memrise, which uses spaced repetition and mnemonic techniques combined with gamified elements like badges and rankings to reinforce vocabulary retention. The social aspect is integrated through community leaderboards and peer challenges, fulfilling relatedness needs.

Alignment with Communicative Language Teaching (CLT)

The theoretical basis of gamification also aligns with the principles of Communicative Language Teaching (CLT), which emphasizes authentic, meaningful communication as central to language learning [4,102]. Gamification enhances this approach by creating simulated real-world scenarios where learners practice language functions. For example, virtual role-plays within gamified platforms, such as negotiating prices in a simulated marketplace or participating in storytelling quests, provide contextualized environments for practicing language skills in engaging ways.

The theoretical underpinnings of gamification, primarily rooted in Self-Determination Theory, explain how it can effectively motivate language learners by satisfying their psychological needs for autonomy, competence, and relatedness. These principles are operationalized through features like choice, feedback, social interaction, and achievement recognition, which collectively foster sustained engagement and facilitate meaningful language acquisition. By integrating these motivational strategies into language learning environments, educators can create dynamic, learner-centered experiences that promote both motivation and proficiency.

Gamification and Fluency Development: Empirical Evidence

Recent research efforts have provided compelling evidence that gamification can significantly enhance fluency development among EFL learners. Gamification integrates game elements, such as points, challenges, and rewards, into educational activities, creating a motivating and interactive learning experience and more engaging learning environments.[5, 49] Multiple empirical studies have demonstrated that integrating game elements into language learning activities not only increases learner motivation but also facilitates the acquisition and automatization of spoken language skills, which are critical for achieving fluency.

For instance, Al-Khatib and Al-Hmouz conducted a study involving a specially designed gamified platform tailored for EFL learners focusing on speaking practice. Their findings revealed notable improvements in learners' speaking fluency over a designated period. [6, 123] The researchers attributed these gains to increased motivation, as learners found the gamified activities enjoyable and engaging, leading to more frequent practice sessions. Additionally, participants reported experiencing reduced anxiety when speaking, which is often a significant barrier in traditional classroom settings. The reduction in communication apprehension allowed learners to experiment more freely with language use, thereby accelerating their fluency development.

Similarly, Lee et al. (2020) explored the impact of gamified mobile applications on EFL learners' speaking skills over a semester-long period. Their study showed that learners using these applications practiced speaking more regularly outside of formal classroom hours. [7, 283] The gamified features—such as earning points for correct pronunciation, completing speaking challenges, and progressing through levels—motivated learners to engage in consistent practice. As a result, these learners demonstrated higher fluency levels, including improved speech flow, coherence, and spontaneity, compared to groups using traditional learning methods. This evidence underscores how gamification can foster autonomous, sustained language practice essential for fluency.

Beyond motivation and practice frequency, gamification also promotes repeated and meaningful language use within authentic or semi-authentic contexts. Engaging in game-based activities exposes

learners to a variety of language inputs and outputs that are contextually relevant, thereby facilitating the automatization of speech patterns. This repetitive exposure in meaningful scenarios helps learners develop the automaticity needed for fluent speech, such as smooth transitions, appropriate intonation, and natural phraseology.

Furthermore, the interactive nature of gamified environments supports spontaneous language production—a core component of fluency—by simulating real-life communicative scenarios. Huang and Spector (2019) highlight that many gamified tasks involve role-playing, problem-solving, and real-time decision-making, which mimic authentic conversations and social interactions. Such tasks require learners to produce language spontaneously, adapt to dynamic situations, and think on their feet, all of which are crucial for developing true fluency. The immersive and engaging qualities of these game-based activities thus serve to bridge the gap between classroom practice and real-world communication demands.[8, 274]

In summary, empirical evidence underscores the multifaceted benefits of gamification in promoting fluency development among EFL learners. By enhancing motivation, providing opportunities for repeated meaningful practice, and simulating authentic communicative contexts, gamification emerges as a powerful pedagogical strategy for fostering the spontaneous and automatic language use that underpins true fluency.

Practical Strategies for Implementing Gamification

To effectively leverage gamification for fluency development, educators should incorporate elements such as points, badges, leaderboards, and narrative storytelling into their curricula. For instance, language learning platforms like Duolingo utilize gamification mechanics to motivate learners through immediate feedback and progress tracking. In classroom settings, incorporating role-plays, language quests, or competitive challenges can stimulate active participation and reduce learner apprehension.

Additionally, personalization and meaningful feedback are crucial. Allowing learners to choose tasks aligned with their interests enhances engagement, while timely feedback helps reinforce correct language use and build confidence. The social aspect, such as collaborative multiplayer games, also fosters peer interaction, promoting fluency through authentic communication.[9, 56]

Challenges and Considerations

Despite the numerous benefits associated with gamification—such as increased motivation, engagement, and active participation—its implementation in EFL instruction is not without challenges. One significant issue is that learners are diverse in their responses to game-based approaches; what motivates one student may not motivate another. For example, some learners may find gamified activities highly engaging and motivating, while others may feel anxious or dismissive of game elements, perceiving them as trivial or distracting from serious language practice [10, 371]. This variability necessitates careful consideration of individual learner differences, including motivation styles, age, proficiency levels, and cultural backgrounds.

Furthermore, cultural differences can greatly influence how gamification is received and experienced. In certain cultures, competitive elements such as leaderboards or rankings may be seen as motivating, while in others, they might evoke discomfort or shame, thereby hindering participation. For instance, collectivist cultures may prioritize group harmony over individual achievement, making competitive gamified features less effective or even counterproductive. Educators need to be aware of these cultural nuances and adapt gamification strategies accordingly, perhaps emphasizing collaborative or non-competitive elements to foster inclusivity.

Another critical consideration is the potential overemphasis on extrinsic rewards—such as points, badges, or leaderboards—which can undermine learners' intrinsic motivation for language learning. When learners focus solely on earning rewards, they might engage in superficial learning strategies aimed at rather than meaningful language development. Deci et al. (2017) warn that excessive reliance on extrinsic motivators can lead to decreased internal motivation, reducing learners' willingness to engage in sustained, autonomous language [2, 245] For example, a student might rush through vocabulary exercises just to earn a badge, neglecting the importance of contextual understanding or communicative competence.

Additionally, there is a risk that gamification could distract learners from the core pedagogical goals if not carefully aligned with language learning objectives. Implementing game mechanics without integrating them thoughtfully into the curriculum may result in superficial engagement that lacks educational depth. For instance, focusing on earning points without providing opportunities for authentic communication can undermine the goal of developing real-world language skills. Therefore, educators

must strike a balance by designing gamified activities that support meaningful language use, such as simulated conversations, project-based tasks, or real-world problem-solving scenarios.

Moreover, technical challenges and resource constraints can impede effective gamification. Not all educational institutions have access to sophisticated digital tools or platforms, and teachers may lack the training needed to design gamified activities effectively. There is also the risk of technical glitches or usability issues that can frustrate learners and diminish the motivational benefits.

In light of these challenges, educators should adopt a reflective and flexible approach when integrating gamification into their teaching. This includes continuously assessing learner responses, soliciting feedback, and making adjustments to ensure that gamified elements serve pedagogical purposes rather than merely serving as entertainment. It also involves fostering a classroom environment where intrinsic motivation is nurtured through meaningful, communicative, and culturally sensitive activities that leverage gamification as a supportive tool rather than a superficial add-on.

Conclusion

Gamification offers a compelling avenue for developing fluency in EFL learners by increasing motivation, providing authentic practice opportunities, and fostering a supportive learning environment. Recent research underscores its potential to transform traditional language instruction into engaging, learner-centered experiences. To maximize its effectiveness, educators should thoughtfully design gamified activities that align with pedagogical objectives and cater to diverse learner needs. As technology continues to evolve, integrating gamification into EFL classrooms promises to play a vital role in nurturing confident, fluent speakers of English.

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THE SOCIOLINGUISTIC FUNCTION OF ANTI-PROVERBS IN THE ENGLISH LANGUAGE

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Introduction. Proverbs have long played a vital role in the English-speaking world's oral and written traditions. They are compact expressions of collective wisdom, distilled through generations. However, in recent decades, a fascinating linguistic phenomenon has emerged: anti-proverbs—deliberate alterations of traditional proverbs to create humor, irony, or social commentary. Examples such as "If at first you don't succeed, skydiving is not for you" demonstrate how language users repurpose familiar structures for novel purposes. This thesis explores the structural patterns, communicative functions, and cultural significance of anti-proverbs in English.

Defining anti-proverbs. An anti-proverb, sometimes called a perverb or proverb transformation, is a variant of a well-known proverb in which part of the original is modified, parodied, or extended to produce a humorous or ironic effect. Unlike random jokes, anti-proverbs rely on the audience's prior knowledge of the original proverb for their effect. For example, "A penny saved is a government oversight" plays on the original "A penny saved is a penny earned", inserting social critique into a traditional format [2].

Types and structures of anti-proverbs. Anti-proverbs can be classified into several common types based on the linguistic mechanism of transformation:

a) Substitution. Part of the original proverb is replaced with new content: "When the going gets tough, the tough go shopping." (Original: "When the going gets tough, the tough get going.")

b) Extension. An additional clause is added, creating contrast or subversion: "Curiosity killed the cat—but satisfaction brought it back."

c) Permutation or Wordplay. The structure is reworded for comedic or rhetorical effect: "Early to bed and early to rise makes a man suspicious." (Original: "...makes a man healthy, wealthy, and wise.") [3]

d) Literalization. The figurative meaning is interpreted literally for humor: "Don't put all your eggs in one basket—use Tupperware."

These structures showcase the flexible creativity of speakers, using humor as a mechanism of engagement and critique.

Communicative and social functions. Most obviously, anti-proverbs entertain. Their twist relies on cognitive dissonance between expectation and delivery. They are common in stand-up comedy, memes, and advertising.

Anti-proverbs can contain subtle or overt social commentary. Consider: "The early bird gets the worm—but the second mouse gets the cheese."

This shifts the value from ambition to caution, possibly critiquing capitalist or competitive ideologies.

Proverbs often represent conservative or moralistic values. Altering them can challenge societal norms: "Honesty is the best policy—but insanity is a better defense." This example undermines a moral principle in favor of legal cynicism [1].

In-jokes based on anti-proverbs can function as group markers. Tech communities might use versions like: "To err is human—to really foul things up requires a computer."

Cognitive and pragmatic considerations. From a cognitive perspective, anti-proverbs engage the hearer's script-switching ability. The listener activates the original proverb's semantic frame and must revise it mid-sentence. This process resembles the punchline structure of a joke, as analyzed in Gricean pragmatics—violating conversational maxims (e.g., of relevance or truthfulness) for effect.

Anti-proverbs also depend on intertextuality—the cultural and linguistic competence to recognize allusions. This creates an implicit dialogue between past and present language use, where speakers negotiate meaning and cultural relevance.

Corpus and usage examples. An informal corpus of 100 English anti-proverbs gathered from online sources, advertising, and satirical writing reveals several trends [4]:

1. *High frequency of anti-proverbs targeting work culture: "Hard work never killed anyone—but why take the chance?"*
2. *Widespread presence in political discourse: "All's fair in love and war—and campaign financing."*

3. *Use in commercial slogans or ad copy: "The grass is greener on our side of the fence." (Lawn care company)*

These findings illustrate how anti-proverbs are embedded in everyday discourse, shaping and reflecting modern social values.

Conclusion. Anti-proverbs in English demonstrate the dynamic nature of proverbial expression. Far from being relics of tradition, they illustrate how speakers adapt cultural forms to suit contemporary needs. Whether humorous, subversive, or critical, anti-proverbs act as linguistic tools for creative expression and social commentary. As language continues to evolve, the study of anti-proverbs offers insights into how societies negotiate authority, humor, and shared meaning.

Keywords: *linguistics, anti-proverbs, transformation, pragmatics, proverbial expressions*

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THE ROLE OF METAPHOR IN LANGUAGE AND THOUGHT

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Introduction. Metaphors are not only literary techniques or artistic flourishes; they are at the core of how humans think, speak, and understand the world. Rather than being limited to creative writing, metaphors help shape the way people interpret abstract ideas through more concrete experiences. In every language, metaphors are used to describe emotions, ideas, and social relationships. However, the meanings behind these metaphors are not universal—they are shaped by culture, history, and environment. This paper explores the role of metaphor as both a linguistic tool and a mental framework, emphasizing how cultural background plays a critical role in how metaphors are formed, used, and understood.

In daily life, people often use expressions like "running out of time," "bottled up emotions," or "breaking under pressure." These are examples of metaphorical language that reflects deeper mental associations. For instance, we often describe time using terms that relate to money or a limited resource. Phrases like "spending time" or "saving time" reflect an underlying mental model where time is treated as something valuable and limited. These metaphorical expressions are not random—they represent patterns of thought. People use familiar physical experiences (such as holding something or moving through space) to explain complex or invisible ideas (like time, emotion, or ambition). These mental shortcuts make it easier to process information and communicate ideas efficiently [2].

However, these patterns are not the same in every culture. What one culture sees as natural or intuitive might be completely foreign to another. This is where the cultural context becomes essential to understanding how metaphors function globally.

How Culture Shapes Metaphors. Different societies experience the world in different ways, and this influences how they use metaphors. Language reflects these differences by encoding the cultural values, beliefs, and experiences that shape metaphorical thinking. Take, for example, how different cultures perceive time. In many Western societies, time is thought of as a line moving from left to right or as something that lies ahead of us. Expressions like "looking forward to the future" or "leaving the past behind" are based on this way of thinking. But not all cultures share this view. In Aymara, a language spoken in the Andes, the past is described as being in front of a person—because it is known and visible—while the future is described as behind, unseen and unknown. This suggests a reversed understanding of time, rooted in cultural perceptions of knowledge and visibility.

Another area where cultural differences show up is in how emotions are described. In English, sadness might be described as "heartache," but in other cultures, emotions might be felt or expressed through the liver, stomach, or other parts of the body. In Chinese, for example, the heart and liver are often metaphorically connected to feelings of anger or sorrow. These expressions reflect deeper beliefs about how the body, mind, and emotions are connected [3].

Even power and status are described through metaphors that differ by culture. In English, we often use height to describe importance—"top official," "high-level meeting," "climbing the ladder." These ideas match the values of individualism and upward mobility. In contrast, cultures that value balance or harmony may use metaphors that focus less on dominance and more on positioning within a group or system.

Metaphors as Mirrors of Society. Metaphors do more than describe the world—they influence how we act in it. The ways people talk about abstract ideas can shape their behavior, attitudes, and even public policies. For example, describing a country's economy as "strong" or "collapsing" uses metaphor to create urgency or confidence. When politicians speak of "fighting poverty" or "battling inflation," they turn social issues into conflicts or wars, framing the problems in ways that encourage specific types of action.

Sometimes, metaphors reflect deeper ideologies. For example, the metaphor of "nature as a machine" is common in modern, industrial societies. It suggests that nature can be controlled, fixed, or broken—ideas that support the exploitation of natural resources. On the other hand, Indigenous cultures often describe nature using metaphors of family or spirituality, such as "Mother Earth," promoting a more respectful and sustainable relationship with the environment [1].

Metaphors can also serve as tools for social change. Activists and cultural leaders often introduce new metaphors to shift public opinion or change how people see themselves. The idea of "breaking the

glass ceiling" is a metaphor that helped visualize the barriers women face in professional advancement. Similarly, the metaphor of "coming out" has become a powerful way to describe openness and acceptance in LGBTQ+ communities.

Understanding Metaphors Across Cultures. Because metaphors are rooted in culture, they don't always translate clearly between languages. A phrase that makes perfect sense in one culture might sound strange or meaningless in another. For instance, a Russian expression that says "the soul dropped into the heels" is a poetic way of saying someone was frightened—but without cultural knowledge, this might be confusing to outsiders.

This is why cultural awareness is so important in international communication, translation, and language learning. Translators must do more than find matching words—they must understand the deeper meaning behind metaphorical expressions. Language learners, too, benefit from understanding how metaphors work, because it helps them grasp not only the language itself but the worldview that comes with it. Educators can improve communication by teaching students how metaphors function in both their native and second languages. This kind of teaching fosters greater empathy, intercultural understanding, and linguistic skill [4].

Conclusion. Metaphors are not just figures of speech—they are mental tools that shape how we view and interact with the world. They allow us to simplify complex ideas and share experiences through language. However, metaphors do not exist in a vacuum. They grow out of cultural experiences, beliefs, and values. What may be an everyday metaphor in one society can be completely unfamiliar in another.

By paying attention to how metaphors differ across cultures, we gain insight into how people think and what they value. In a world where global communication is increasingly important, understanding cultural metaphors is essential. It improves how we connect with others, how we teach and learn languages, and how we interpret the messages around us.

Metaphors, then, are more than linguistic curiosities—they are cultural windows into the human mind.

Keywords: *cultural context, metaphors, expressions, figurative language, intercultural semantics*

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Technical sciences

MAİN CHARACTERİSTİCS OF DEVİCES USED İN REMOTE SENSİNG OF THE EARTH

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Remote dynamic sensing devices for studying the Earth's surface, subsoil and space objects are used in engineering and geodetic practice for the following purposes:

obtaining spatial measurement data on the surface and subsoil of the Earth, as well as on objects in space;

-obtaining an image of the Earth's surface or some of its sections on maps and plans;

-coordinate-time referencing of objects, processes and phenomena on the Earth's surface and in space;

-digital terrain modeling;

-carrying out work on disseminating and collecting geospatial information within the boundaries.

Remote sensing devices are divided into two groups:

-image-forming systems - transmit information about the spatial structure of an object and some spectral information;

-spectral data systems - provide detailed spectral information about an object, but do not create an image.

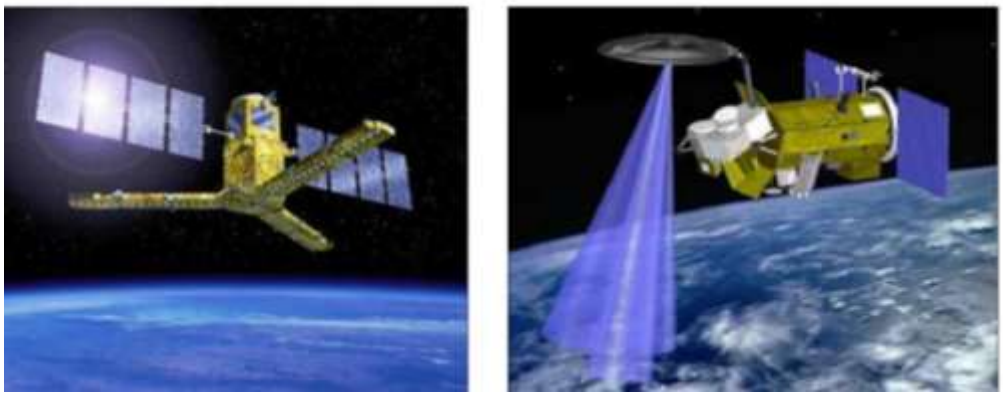

Figure 1. Schematic diagram of the Soil Moisture and Ocean Salinity Observing Satellite (SMOS) with the MIRAS instrument on board (left) and the Scientific Applications Satellite (SAC-D) with the Aquarius instrument (right). The Aquarius instrument has a real aperture diameter of 2.5 m. The MIRAS synthetic aperture antenna is inscribed in a circle with a diameter of 4 m.

-Image-forming systems are divided into scanning and frame-based. In the latter, image elements are obtained synchronously in a frame. In scanning, image elements are made sequentially, but can be further converted into a frame format. These types of systems transmit spectral data, receiving multi-spectral image elements.

Spectral data systems operate by spectral scanning. In remote sensing, systems of this type are mostly used in field studies.

These systems are used in engineering and geodetic practice, including environmental surveys for construction.

Spectral data systems

Devices of this type are considered spectroradiometers, since they use the sun instead of internal radiation sources. Field spectral instruments include such devices as: an interferometer, a spectroradiometer with a diffraction grating or dispersive prism, a spectroradiometer with rotating replaceable filters.

Systems that form an image are divided into:

Photographic systems. Here, the film acts as a detector, and the lenses act as an optical system. This system is a frame system, so all information about the image is obtained simultaneously. The film used as a detector has a limited spectral range, unlike a multispectral scanner system. However, photographic systems have a very high spatial resolution.

Television systems. Electronic systems form an image on a photoelectric surface. These systems consist of a shutter, an optical system, and, if possible, a system for compensating for image blur.

Induced on the photoelectric surface, they are processed more electronically than chemically and are quickly transmitted from the sensor platform to the receiving station. It is also possible to record images on magnetic tape for further transmission when the sensor platform is close to the receiving station.

Analog-to-digital conversions

For these conversions, digitization is used. The quantization step should not be less than twice the component of the highest frequency that the system itself must preserve. This component will check the correctness of the signal reproduction after digitization. The number of digitization levels is determined based on the operating characteristics of the digital system. As practice shows, in most cases quantization to 256 levels is satisfactory for remote sensing data. The quantization step is selected depending on the instantaneous field of view of the scanner and its height. These parameters affect the characteristics of the electrical signal.

Improvement of target equipment of remote sensing spacecraft and creation of a single information space allowed to create Earth monitoring systems not only with high and detailed resolution, but also with high observation frequency [1, 2, 5].

A stable class of spacecraft has formed on the global data market, generating the most popular Earth remote sensing data with a resolution of 0.5 m and better. The current balance of tactical and technical characteristics, orbital altitude and number of spacecraft was achieved as a result of work on replacing the expensive group of heavy KeyHole-type spacecraft with a series of spacecraft from various manufacturers with an emphasis on commercial distribution of data.

Development of the technology of small-sized high-resolution remote sensing spacecraft began in 1999 on the Iconos-2 spacecraft, which successfully completed its work in 2015, and continued on QuickBird with wide-angle equipment, launched in 2001. The specified spacecraft made it possible to obtain high-quality digital images with a resolution of 1 m.

Achieving a resolution of 0.5 m and better became possible on the GeoEye-1 spacecraft with a four-mirror optical system of 1.1 m. Then came WorldView-2 and its modification WorldView-3 (GeoEye-2).

Currently, at least six foreign spacecraft of this class are operating (WorldView, Pleiades, CSO-1, EROS, KazEOSat-2, etc.). Many spacecraft continue to be used beyond the warranty period. The mass of spacecraft of this class does not exceed 3000 kg. The flight altitude of the spacecraft is from 600 to 800 km. The target equipment is based on a mirror optical system with a diameter of 0.7 to 1.3 m.

The main suppliers of Earth remote sensing data are GeoEye and DigitalGlob corporations. Since 2013, GeoEye corporation has merged with DigitalGlob. The spacecraft is being developed within the framework of a private-public partnership. The main budget funding for the purchase of data is provided by the EnchancedView program for US geospatial intelligence tasks. The main stages of the development of the remote sensing spacecraft are most clearly traced in the unified orbital group Digital Glob.

Initially, the Iconos spacecraft with a meter resolution (developed by Lockhid Martin and Ratheon) and the Early Bird for survey observation were developed to replace the heavy remote sensing spacecraft. To ensure a large capture band, the Early Bird was equipped with a full-aperture scanning mirror. The first Iconos spacecraft was lost as a result of a launch vehicle accident, and the Early Bird failed in the first days after launch.

The optical-electronic complex with a meter resolution with a compact three-mirror Korsch anastigmat and a Kodak image receiver on time delay and accumulation matrices was successfully tested on the Iconos-2 spacecraft. A resolution of 0.6 m in a 16.5 km swath was first achieved by the QuickBird-2 spacecraft using the Bell BHRC60 optical-electronic complex (OEC). The scanning mirror was eliminated thanks to the off-axis Cook mirror anastigmat with a 2.12 degree field of view. The image receiver used was the same as the one tested on Iconos-2, with a doubled width and number of elements. To ensure the required throughput, the radio link speed and storage capacity of the QuickBird-2 spacecraft were doubled compared to the Iconos-2 spacecraft.

The Iconos and QuickBird space platforms provided precision imaging modes with three-axis tracking, which made it possible to image complex polygonal areas. The dynamic characteristics of these spacecraft were low. Flywheel engines were used as actuators of the orientation system. Operation of

QuickBird demonstrated the possibility of achieving high resolution in a wide swath. The improved off-axis mirror Cook WV100 anastigmat from Bell was installed on the WorldView-1 spacecraft with better dynamic characteristics. Improvement of spatial resolution to 0.3–0.5 m was achieved as a result of the creation by ITT and its subsidiary Harris of a three-mirror Korsch anastigmat with a diameter of 1.1 m and a field of view of up to 1.3°. At the same time, the specified company created an optical-electronic converter with a pixel size of 8 μm and a width of 35,000 pixels. The Harris SpaceView 110 optical-electronic complex with an aperture of 1.1 m was first used on the GeoEye-1 spacecraft, which improved spatial resolution to 0.4 m. With minimal changes, SpaceView 110 is used on the WorldView-2, -3, -4 spacecraft.

The increase in the dimensions of the UEC required the use of heavier space platforms. The GeoEye-1 spacecraft was developed by ITT with an integral layout based on the SA-200 HP platform from General Dynamics. The disadvantage of GeoEye-1 was its low retargeting speed.

The Bell WorldView-1, -2, -3 spacecraft were created on the same type of BCP-5000 platform (Fig. 1). The dynamic characteristics of this series of spacecraft were significantly improved due to the use of power gyroscopes.

Later, on WorldView-4, ITT also used the improved LM900 platform from Lockhid Martin with increased power of the power supply system and power gyroscopes as actuators.

The increase in aperture allowed the orbital altitude to be increased to 800 km and the use of a complex off-axis Cook anastigmat was eliminated for solving problems requiring a large capture band with moderate resolution.

As a result, WorldView-2 achieved the same swath as QuickBird and WorldView-1, with a slightly better resolution. Improved dynamic characteristics of the platforms made it possible to photograph routes and areas by retargeting the spacecraft. Subsequent WorldView-2, -3, -4 spacecraft were launched into a lower orbit for observation with a resolution of 0.4 m and better

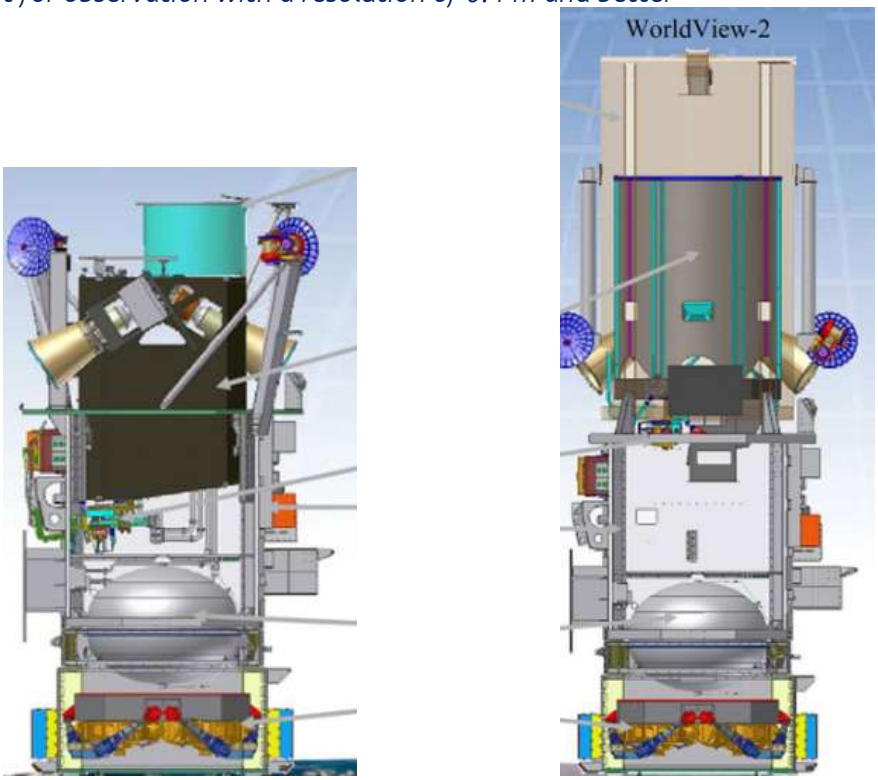

Fig. 2. Placement of two types of optical-electronic complexes of the WorldView-1, -2, -3 spacecraft on a unified platform

The optical-electronic converter is improved by increasing the number of channels, the radio link speed and the storage capacity. For example, the same type of optical-electronic converter (OEC) with a different number of multispectral channels is used for GeoEye-1, WorldView-1, -2, -3, -4 spacecraft. Only a panchromatic receiver is installed on the WorldView-1 spacecraft. In WorldView-2, compared to GeoEye-1, the number of multispectral ranges is increased from 4 to 8. On the WorldView-3 spacecraft, 8 additional channels of the near infrared range are added.

The development of solid-state memory devices has increased the storage capacity to 2200 Gbit. The radio link speed has been increased to 800 Mbit/s. The large number of channels in the WorldView-3 OEP required the installation of a 1200 Mbit/s radio link in a single case.

The development and modernization of the remote sensing satellites used by Digital Globe is carried out by improving the optical-electronic converter (increasing the number of channels) and the radio link (increasing the speed) together with the use of a unique large-sized optical system (OS) and proven space platforms.

In this case, the increase in productivity and efficiency is achieved mainly by expanding the orbital grouping of remote sensing satellites. The required image detail is provided by two satellites in orbit with an altitude of 620 km. At least one satellite of the same type is at an orbital altitude of 770–800 km for the purpose of observation with a larger capture bandwidth and efficiency.

Thus, it is possible to outline an approach to the creation of remote sensing spacecraft, in which the spacecraft contains a variable (dynamic) component (electronic pulse, ground control unit, high-speed radio link) and a conservative component (large-sized optical system, space platform).

Spatial resolution in optical-electronic surveillance systems is determined by the observation range and angular resolution. The improvement of remote sensing satellite systems is aimed at improving the angular resolution to a level better than 0.2 arcsec by increasing the OS diameter (GeoEye-1, CSO-1). This is due to the fact that remote sensing satellite systems with large-diameter OSs have better linear resolution on the ground from a higher flight altitude and, accordingly, higher observation frequency and information delivery efficiency [3, 4, 5]. In addition, large-sized OSs make it possible to bring the spatial resolution closer to the limitation caused by atmospheric turbulence.

Methodological support for the creation of remote sensing satellite systems is a complex scientific and technical problem, requiring the coordination of the characteristics of the constituent elements of the space system. Increasing the OS diameter requires improving the stabilization accuracy. Most OECs are based on the optical system of a three-mirror Korsch anastigmat (TMA) with a relative focal length of at least 12. The low relative focal length is determined by the large size of the image receiver pixel, less than 8–13 μm. The use of a sufficiently large size of the image receiver cells is due to the requirement to provide a sufficient potential well for signal accumulation to ensure radiometric sensitivity. In addition, a limitation on image blur from vibrations caused by the operation of the actuators of the stabilization system is provided. The pixel size and relative focal length for most modern high-resolution OECs are matched according to the principle of equality of the radius of the circle of confusion and the pixel size. A further increase in the focal length can theoretically increase the resolution, but in practice, systematic and random image blur and residual defocusing do not allow this to be done. At the same time, an increase in the relative aperture of more rational values significantly reduces the illumination of the image receiver cells and radiometric sensitivity. Increasing the aperture diameter of the optical system has improved the periodicity and performance by increasing the orbital altitude to 770–800 km (WorldView-2 and CSO-1). In order to improve the resolution, satellites are used simultaneously at altitudes of 617–680 km (WorldView-3, -4 and Pleiades-1, -2).

The number of simultaneously operating identical satellites in the orbital group increases from two or three in Pleiades and WorldView to the planned four in CSO. An increase in the number of orbital groups is possible as a result of reducing the spacecraft production time from 3–4 years to 2–3 years.

An alternative path for the development of remote sensing satellites was demonstrated by Airbas Defence (former Astrium) during the transition from the Pleiades-1, -2 satellites. The methodology and technology for creating satellites with an integral layout and a large-sized OEK were tested on Pleiades-1, -2. In the CSO-1 spacecraft there is no division into a target equipment module and a service platform. The proven principles of the integral layout of the Pleiades-1, -2 type spacecraft have been preserved (Fig. 3).

The transition from diameters of 0.7 m to 1.3 m was made without changing the main design parameters and the relative focal length of the OS.

The mass characteristics of the optical system were most likely improved by using silicon carbide SiC in the telescope mirrors and silicon nitride SiN in the structural elements. The specific mass of the main mirror of Pleyades-1, -2 with a frame is about 68 kg/m2. The Euclid space observatory has a Korsch-type OS with a diameter of 1.25 m, presumably an analogue of the CSO-1 OS. The specific mass of the 1.25 m Euclid mirror is 30 kg/m2. Foreign remote sensing satellites with optical system diameters of 0.3...0.4 m have been developed in the direction of simplified small satellites of the SkySat type with a mass of no more than 100 kg. The resolution of such satellites is 1-2 m. The number of satellites in the group is more than twenty, which ensures high observation frequency.

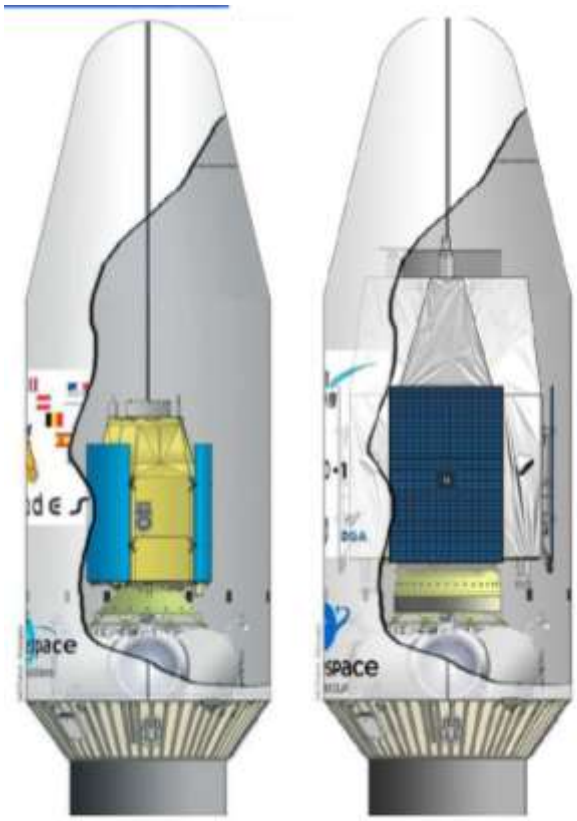

Fig. 3. Comparison of the Pleiades and CSO spacecraft

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RESTORING SALINE LANDSCAPES - THE ROLE OF NATIVE HALOPHYTES IN POST-MINING LAND RECOVERY IN ROMANIA

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Abstract

The Ocna Dej salt mine in Romania has experienced significant land degradation due to centuries of extraction. This study explores the integration of native halophytic plant species with advanced surveying technologies as a sustainable solution for rehabilitating saline post-mining landscapes. Using a combination of total station measurements, GNSS, UAV imagery, and Digital Elevation Models (DEMs), the research identifies suitable areas for vegetation and designs effective land restoration layouts. A selection of salt-tolerant species, including Atriplex tatarica, Festuca pseudovina, Limonium gmelinii subsp. hungaricum, Salicornia europaea, and Suaeda maritima is proposed based on their ecological adaptability and soil stabilization potential. These species can show high adaptability to extreme soil conditions and significant potential for soil stabilization, erosion control, and biodiversity enhancement. The methodology demonstrates that combining ecological knowledge with precision geospatial technologies offers a replicable and low-impact model for restoring degraded saline environments in Romania and beyond.

Keywords: *Salt mine, monitoring, post-mining recovery, land rehabilitation GPS, GNSS, UAV, halophytes, ecological restoration, deformations, topography, surveying, Ocna Dej.*

Introduction

Intensive and long-term exploitation of mineral resources has led to significant imbalances in the geological structure and the functioning of natural ecosystems in many regions across the globe. The Ocna Dej Salt Mine area serves as a clear example, being marked by geomorphological instability and the progressive degradation of surrounding land. These processes pose not only geotechnical and environmental risks but also have substantial social and economic impacts on local communities. In this context, the need to develop coherent and sustainable land rehabilitation strategies has become urgent.

The main objective of this study is to identify and propose viable technical and ecological solutions for the rehabilitation of the degraded land within the affected perimeter of the Ocna Dej Salt Mine. The paper addresses several critical challenges, such as land instability, soil salinization, biodiversity loss, and the uncontrolled use of degraded surfaces, with a strong emphasis on the sustainability of the proposed interventions. Both the technical feasibility and the social impact of these measures are carefully evaluated.

This work aims to contribute to the necessary efforts for the effective rehabilitation of areas impacted by mining activities and to the development of replicable models for other regions facing similar issues.

Materials and Methods

Ocna Dej, located in northern Romania near the town of Dej (Cluj County), has a long and rich history of salt mining that dates back to ancient times. Archaeological evidence suggests that salt extraction in the area began as early as the pre-Roman period, continuing under Roman rule, when the region became part of the province of Dacia. The natural salt deposits, easily accessible due to surface outcrops, made Ocna Dej an important site for local and regional salt production.

During the Middle Ages, salt mining became increasingly organized and economically significant. Under the Austro-Hungarian Empire, particularly in the 18th and 19th centuries, the mining operations were modernized, with deeper shafts and more systematic extraction techniques introduced. Salt from Ocna Dej was a valuable resource, used for both domestic purposes and trade throughout Central and Eastern Europe.

Figure 1 – The location of the Ocna Dej salt mine in Romania.
https://ro.wikipedia.org/wiki/Ocna_Dejului,_Cluj

In the 20th century, industrialization further expanded salt production, but it also led to serious environmental challenges, including land subsidence and groundwater contamination. Today, while industrial-scale mining has declined, the area remains geologically and historically important, and efforts are being made to rehabilitate affected land and preserve the site's cultural heritage.

The 21st century is seeing the Ocna Dej salt mine integrating a range of advanced tools and technologies to optimize extraction, enhance safety, and reduce environmental impact. Among the most important tools are automated drilling and injection systems used in solution mining, which allow precise control over the dissolution of salt deposits and the use of topographical equipment for the purpose of data analytics and predictive maintenance

Figure 2 – A mechanized drilling machine in operation at Ocna Dej salt mine.
https://www.salinaocnadej.ro/galerie-foto-2/

Using plants to restore land affected by salt mining in the Ocna Dej area of Romania is a sustainable and effective strategy for environmental rehabilitation. One of the key benefits of using vegetation in such areas is its ability to stabilize the soil and prevent erosion. After mining activities, the soil is often loose and highly vulnerable to wind and water erosion. Plant roots help anchor the soil, reducing the risk of further degradation and contributing to the physical recovery of the land.

Certain salt-tolerant species, known as halophytes, are particularly useful for restoring saline soils. These plants can survive in high-salinity conditions, gradually improving soil quality by absorbing excess salt and promoting beneficial microbial activity. Over time, this process helps detoxify the soil, making it more suitable for other forms of vegetation and agricultural use.

Reintroducing plants into the affected landscape also plays a key role in enhancing biodiversity. Native and adaptive species attract pollinators, birds, and small mammals, helping to re-establish a balanced ecosystem. This increase in biodiversity supports the resilience of the local environment and helps restore natural ecological processes.

In addition to environmental benefits, vegetating former mining sites significantly improves the area's visual and recreational appeal. Ocna Dej has potential for tourism due to its salt lakes and spas, and rehabilitated green spaces can enhance the local experience for both residents and visitors. A more attractive landscape can encourage eco-tourism and community engagement with natural spaces.

Another advantage of using such plants for land restoration is that it is cost-effective and low-impact compared to mechanical or chemical methods. Once established, it requires minimal maintenance and can continue to improve the soil and landscape over time, naturally. This approach is extremely practical from both an economical and environmental point of view.

This could contribute to climate change mitigation through carbon sequestration. Restoring plant cover helps capture carbon dioxide from the atmosphere and improves local microclimates. This contributes to regional climate resilience and aligns with set sustainability goals.

Topographic measurements play an important role in planning and executing land restoration in the Ocna Dej area, where the risk of terrain significantly altered by salt mining is extremely high. These measurements provide essential information about the physical layout of the land, which directly influences key decisions such as plant selection, drainage design, soil stabilization strategies, and erosion control.

The process begins with a comprehensive topographic survey. This involves documenting elevation, slope gradients, slope orientation (aspect), and identifying surface features such as ridges, and remnants of former mining activity. Such data is useful when understanding how water moves across the local landscape, as in case of poor drainage the risk of poor plant growth increases.

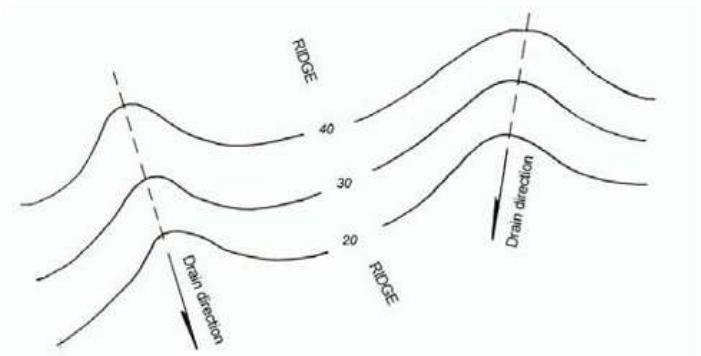

Figure 3 – Contour lines indicating the drain direction.
https://iho.int/uploads/user/pubs/cb/c-13/english/C-13_Chapter_6.pdf

Analyzing slope conditions is especially important in Ocna Dej, where mining has often resulted in steep, unstable slopes. These areas are highly susceptible to erosion and may require special treatment, such as reinforcement structures or the introduction of deep-rooted vegetation that can hold the soil together. On the other hand, flatter areas or gently sloping land are better suited for planting salt-tolerant grasses or shrubs that can gradually improve soil quality and support long-term restoration.

Detailed contour mapping further supports restoration efforts by enabling the design of maximum efficiency. Features like terraces or planting along contour lines help slow water runoff, enhance water absorption, and reduce salinity by directing water flow in controlled ways.

Such measurements serve as a benchmark for the development and implementation of such projects and monitoring restoration progress. Advanced tools such as Digital Elevation Models (DEMs) and Geographic Information Systems (GIS) provide in-depth spatial analysis of the site.

All collected data done by using total stations, GPS equipment, and UAV (drone) technology is used to develop topographic plans and the technical drawings required for the design of the restoration layout. These documents form the foundation for the project's approval, implementation, and long-term monitoring phases.

The automation of topographic and geodetic surveying represents a significant advancement in the field of land surveying and measurements, improving the efficiency, accuracy, and safety of data collection and processing. In the modern context and ecological restoration and development, such as the creation of a park on land affected by industrial exploitation, automated equipment and technologies allow for faster and more precise terrain modeling. This supports interdisciplinary collaboration between surveyors, engineers, architects, and environmental specialists.

In areas with high geological risk or difficult access, automation not only streamlines fieldwork but also minimizes the exposure of personnel to hazardous conditions, making the surveying process both safer and more effective.

The careful selection of appropriate plant species is a step toward ensuring long-term ecological recovery and landscape stability. The proposed plant species have been chosen based on their tolerance to high soil salinity, adaptability to climatic conditions and ability to contribute to soil stabilization. The following list presents recommended plant species that will form the foundation for restoring the affected site.

Atriplex tatarica (Tatarian orache) is an annual herbaceous plant from the Amaranthaceae family, commonly found in saline areas of Transylvania, including around Ocna Dej. This species prefers salty soils, degraded grasslands, and the edges of roads or abandoned farmland where soil salinity is moderate. The leaves are triangular, slightly fleshy, and covered with a fine layer of white hairs. The flowers are small and green. Atriplex tatarica is well adapted to poor, saline soils and is considered a wild relative of cultivated orache.

Figure 4 – Atriplex tatarica.
https://www.flora-cs.com/foto/cz/129189/

Festuca pseudovina (Meadow fescue) is a perennial grass species belonging to the Poaceae family, often encountered in alkaline and saline meadows in hilly and plateau regions. Around Ocna Dej, this species often dominates steppe-like salt grasslands. It forms dense tufts with fine, bluish-green leaves and is highly resistant to grazing, drought, and soil salinity. Festuca pseudovina plays an important role in stabilizing salty soils and is sometimes used as forage in nutrient-poor agricultural areas.

Figure 5 – Festuca pseudovina.
https://inaturalist.lu/photos/360609693

Limonium gmelinii subsp. hungaricum (Transylvanian sea lavender) is a perennial halophytic species from the Plumbaginaceae family, found in saline meadows and moist depressions with salty soils. It is easily recognized by its dense panicle inflorescences with small, violet flowers and basal rosettes of leaves. This plant is ecologically valuable and is protected in Romania. Limonium gmelinii subsp.

hungaricum is associated with steppe-like saline landscapes and also has ornamental potential due to its elegant appearance.

Figure 5 – Limonium gmelinii subsp. hungaricum.
https://inaturalist.lu/photos/360609693

Salicornia europaea (Common glasswort) is one of the best-known halophytic plants, part of the Amaranthaceae family. It is an annual, succulent species that naturally grows in strongly saline soils, especially on the edges of salt lakes or areas with surface salt crusts, such as those near the salt mine. Its stems are segmented, fleshy, and green, turning reddish in autumn. This species lacks true leaves, performing photosynthesis through its stem. Salicornia europaea is an excellent bioindicator of saline soils and is also known for its culinary and medicinal uses.

Figure 6 – Salicornia europaea.
https://en.wikipedia.org/wiki/Salicornia_europaea

Suaeda maritima (Seablite) is another annual halophytic plant from the Amaranthaceae family, which thrives in wet, salty areas, especially along the shores of salt lakes or temporary saline marshes. It has cylindrical, fleshy leaves and small, green, petal-less flowers. The plant stores salts in its tissues to cope with the osmotic stress caused by saline environments. Due to its adaptability, Suaeda maritima is one of the most widespread species in halophytic vegetation across Transylvania.

Figure 7 – Suaeda maritima.
https://www.123rf.com/photo_64450127_close-up-of-suaeda-maritima-tree-this-is-vegetables-that-are-beneficial-to-health.html

These species are well adapted to the specific conditions found in area and are used in soil stabilization, biodiversity support, and long-term landscape rehabilitation. Their natural resilience to salinity not only ensures successful revegetation but also sets the foundation for the gradual recovery of the local ecosystem.

Results and Discussion

The selected halophytic species—Atriplex tatarica, Festuca pseudovina, Limonium gmelinii subsp. hungaricum, Salicornia europaea, and Suaeda maritima can successfully establish on such soils, which are structurally compromised. Their ability to germinate, grow, and persist under high difficult conditions confirms their suitability for such environments. Species like Salicornia europaea and Suaeda maritima can be especially effective in colonizing the most saline zones, while Festuca pseudovina can be effective in transitional, less saline areas.

After using such plants, the gradual improvement in soil structure and organic matter content is expected to be observed, proving that halophyte planting also supports physical soil rehabilitation. Over a single vegetation cycle the soil properties in the Ocna Dej salt mine perimeter can improve.

Topographic measurements and terrain modeling can be performed using total stations, GNSS receivers and UAV, with data processing software used to significantly improve the output and ensure the success of such projects. Digital Elevation Models (DEMs) help identify stable zones for planting and areas at risk of erosion or waterlogging. Vegetation can be strategically placed along designated lines and determined areas, optimizing runoff control and water retention. The exact planting position can be determined using specific tools, such as total stations or GNSS receivers by using the landscaping and topographical plans. UAV-based imagery allowed for high-resolution, repeatable monitoring of plant growth, soil surface changes over time. The use of native species offers a cost-effective, low-maintenance solution for restoring saline and structurally degraded land. This approach avoids the intensive input requirements of mechanical or chemical methods, while still producing ecologically meaningful outcomes. The restoration strategy developed for the area of the Ocna Dej salt mine can serve as a replicable model for similar saline post-industrial sites in Romania and other Eastern European regions.

Conclusions

The use of halophytic plant species for ecological restoration in the vicinity of the Ocna Dej salt mine can show promising results in addressing the challenges posed by salinity and land degradation. A selection of halophytes—such as Atriplex tatarica, Festuca pseudovina, Salicornia europaea, Limonium gmelinii subsp. hungaricum, and Suaeda maritima can successfully establish and develop in the proposed area. The combined use of total stations, GPS receivers, and UAVs provides a highly efficient, accurate, and comprehensive approach to generating topographic maps essential for land restoration projects.

These technologies enable precise measurement of elevation, slope, and terrain features, even in difficult or hazardous areas such as those affected by salt mining. The resulting data can support informed decision-making in restoration planning, including vegetation placement, erosion control, ultimately contributing to the success and sustainability of ecological rehabilitation efforts.

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NUCLEAR WASTE: RECYCLING AND SAFE DISPOSAL TECHNOLOGIES

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ЯДЕРНЫЕ ОТХОДЫ: ТЕХНОЛОГИИ ПЕРЕРАБОТКИ И БЕЗОПАСНОГО ЗАХОРОНЕНИЯ

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Abstract

This paper reviews modern technologies for reprocessing spent nuclear fuel (SNF) resulting from the operation of nuclear power plants. The main attention is paid to chemical reprocessing methods, such as PUREX and UREX processes, which allow to extract valuable elements - uranium and plutonium - from spent nuclear fuel for reuse, as well as to reduce the volume and radiotoxicity of high-level waste. Additional processes (TRUEX, SANEX, pyrometallurgy) that expand the possibilities of deep reprocessing are described. The issues of safe storage and final disposal of residual radioactive waste are considered, including deep geological disposal as the most promising method. Schemes of technological processes reflecting the stages of reprocessing are given. The paper emphasises the importance of transition to a closed nuclear fuel cycle and improvement of radiation safety.

Аннотация

В данной работе рассмотрены современные технологии переработки отработавшего ядерного топлива (ОЯТ), образующегося в результате эксплуатации атомных электростанций. Основное внимание уделено методам химической переработки, таким как процессы PUREX и UREX, позволяющим извлекать из ОЯТ ценные элементы — уран и плутоний — для повторного использования, а также снижать объём и радиотоксичность высокоактивных отходов. Описаны дополнительные процессы (TRUEX, SANEX, пирометаллургия), расширяющие возможности глубокой переработки. Рассмотрены вопросы безопасного хранения и окончательного захоронения остаточных радиоактивных отходов, включая глубинное геологическое захоронение как наиболее перспективный способ. Приведены схемы технологических процессов, отражающих этапы переработки. Работа подчёркивает значимость перехода к замкнутому ядерному топливному циклу и повышения уровня радиационной безопасности.

Keywords: *spent nuclear fuel, reprocessing, PUREX, UREX, radioactive waste, disposal, closed fuel cycle, geological storage.*

Ключевые слова: *отработавшее ядерное топливо, переработка, PUREX, UREX, радиоактивные отходы, захоронение, замкнутый топливный цикл, геологическое хранилище.*

Введение

Современное общество зависит от устойчивых источников энергии, и ядерная энергетика занимает важное место в глобальной энергетической политике[1]. В условиях роста энергопотребления и необходимости сокращения выбросов парниковых газов атомные электростанции (АЭС) становятся ключевым элементом энергобаланса многих стран. Однако одной из серьёзных проблем, сопровождающих развитие ядерной энергетики [2], остаётся обращение с отработавшим ядерным топливом (ОЯТ) и радиоактивными отходами (РАО).

ОЯТ содержит остатки делящихся материалов — урана и плутония, а также продукты деления и трансурановые элементы, обладающие высокой токсичностью и длительным периодом полураспада. Эти характеристики делают ОЯТ опасным материалом, требующим специализированных методов переработки, хранения и окончательного захоронения. Проблема

переработки и утилизации отходов ядерной энергетики носит не только технический, но и экологический, экономический и политический характер [3].

Существует два основных подхода к обращению с ОЯТ: открытый (без переработки) и замкнутый (с переработкой и повторным использованием делящихся материалов). Разрабатываются более безопасные, экономически эффективные и экологически устойчивые технологии переработки и захоронения. Международное сообщество предпринимает усилия по формированию единых стандартов обращения с радиоактивными отходами [4].

Целью данной статьи является анализ современных технологий переработки отработавшего ядерного топлива, методов его безопасного захоронения, а также оценка перспектив и вызовов, стоящих перед мировой атомной отраслью. Особое внимание уделено международному опыту, состоянию дел в России и Казахстане, а также инновационным подходам, разрабатываемым в рамках научных программ в области атомной энергетики.

ОЯТ условно делится на:

Высокоактивные отходы (ВАО): содержат продукты деления и трансураны, требуют глубокого геологического захоронения.

Средне- и низкоактивные отходы (САО и НАО): включают облучённые компоненты оборудования, фильтры, смолы и другие материалы.

Современные технологии переработки отработавшего ядерного топлива

Современные технологии переработки отработавшего ядерного топлива (ОЯТ) обеспечивают эффективное использование ядерных материалов и снижение радиационной нагрузки на окружающую среду. После завершения работы в реакторе топливо сохраняет до 95% делящихся материалов, включая уран и плутоний, а также множество продуктов деления и минорных актиноидов. Переработка позволяет извлекать ценные элементы, повторно использовать их и уменьшать объём и токсичность остаточных отходов.

Наиболее распространённой промышленной технологией переработки является процесс PUREX (Plutonium Uranium Redox Extraction), основанный на экстракции урана и плутония из раствора ОЯТ с использованием трибутилфосфата в керосине. Перед экстракцией топливо растворяется в концентрированной азотной кислоте. Уран и плутоний переходят в органическую фазу, откуда затем последовательно извлекаются и очищаются. PUREX обеспечивает извлечение более 99% урана и плутония, позволяя вернуть их в топливный цикл, однако оставшиеся отходы требуют изоляции и захоронения.

Усовершенствованной версией является процесс UREX (Uranium Extraction), [5] направленный на селективное извлечение только урана. Плутоний и другие актиноиды остаются в растворе, что снижает пролиферационные риски. Данная технология позволяет последующую переработку оставшихся компонентов с целью их утилизации или трансмутации.

Для более глубокой переработки применяются процессы TRUEX, DIAMEX, SANEX и UNEX. Они используют селективные экстрагенты, отделяющие актиноиды от продуктов деления, снижая радиотоксичность остатков и упрощая их хранение или подготовку к трансмутации.

Альтернативой экстракционным методам являются пирометаллургические технологии, особенно перспективные для топлива быстрых реакторов. Эти методы используют расплавленные соли (NaCl-KCl) и электрохимические процессы. В электрорафинировании топливо растворяется в солевом расплаве, а целевые металлы осаждаются на катоде. Преимущества: компактность оборудования, устойчивость к радиации, отсутствие жидких кислот, возможность создания замкнутого топливного цикла.

Активно исследуется замкнутый топливный цикл [6], при котором все делящиеся материалы возвращаются в оборот, что позволяет рационально использовать уран и значительно сократить объёмы окончательных отходов. Также изучаются технологии трансмутации долгоживущих радионуклидов в быстрых реакторах, что снижает радиационную опасность.

Таким образом, технологии переработки ОЯТ объединяют химию, ядерную физику и материаловедение. Их развитие направлено на повышение безопасности, снижение экологических рисков и устойчивость ядерной энергетики в долгосрочной перспективе. Успешная реализация требует комплексного подхода, международного сотрудничества и строгого контроля на всех этапах.

Заключение

Проблема безопасного обращения с отработавшим ядерным топливом и радиоактивными отходами остаётся одной из ключевых задач, стоящих перед мировой ядерной энергетикой.

Развитие технологий переработки, таких как PUREX, UREX, пирометаллургия и другие, демонстрирует серьёзный научно-технический прогресс, направленный на сокращение объёмов и радиотоксичности отходов, а также повышение эффективности использования ядерного топлива. Одновременно ведётся разработка и внедрение систем глубинного геологического захоронения, обеспечивающих долговременную и надёжную изоляцию остаточных радиоактивных материалов от биосферы.

Будущее атомной энергетики всё в большей степени связано с концепцией замкнутого топливного цикла, который позволяет не только минимизировать отходы, но и повысить энергетическую независимость стран. Важную роль играют международное сотрудничество, гармонизация стандартов, развитие нормативно-правовой базы и повышение уровня прозрачности и доверия общества к атомной отрасли.

Таким образом, устойчивое развитие ядерной энергетики невозможно без комплексного подхода к проблеме переработки и захоронения ОЯТ. Только сочетание передовых технологий, строгого контроля и долгосрочного стратегического планирования позволит обеспечить экологическую безопасность, энергетическую эффективность и общественную приемлемость ядерной энергетики в XXI веке.

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