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Geological and Mineralogical Sciences

DIRECT-PROSPECTING TECHNOLOGY OF SATELLITE AND PHOTO IMAGES FREQUENCY-RESONANCE PROCESSING: RESULTS OF TESTING WITHIN LARGE BLOCKS AND LOCAL AREAS IN CHINA

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Annotation. The results of a reconnaissance survey using direct-prospecting technology of satellite images and photographs frequency-resonance processing within big blocks and local areas in China are presented. Experimental researches of a reconnaissance nature were carried out with the aim of demonstrating the performance, efficiency and information content of direct-prospecting methods. The experimental studies at the Luntan-1 well drilling site show the possibility of direct-prospecting methods using to assess the oil and gas potential of deep and ultra-deep horizons of cross-section. The seismic sections of exploration areas can be used for additional frequency-resonance processing together with satellite and photographic images of survey sites during sites selecting for oil and gas wells drilling. In area of the Yilan impact structure location responses at the frequencies of diamonds, limestones and kimberlites were recorded from the surface. During a cross-section scanning, signal of kimberlites began to be recorded from 609.8 m, and diamonds – from 763 m. When frequency-resonance processing of a photograph of the Yilan crater, responses of basalts, hydrogen and living (healing) water were recorded also from the surface. In the central part of the geothermal springs search area signals of hydrogen, phosphorus, living water and basalts were recorded. The lower edge of the basalts was detected at a depth of 99 km, responses of dolomites were obtained from the interval of 99-218 km, and signals of siliceous rocks were recorded at the surface of 218 km from the lower part of cross-section. During frequency-resonance processing of a fragment of an image with a circle on Qinghai Lake responses of living water, ice, hydrogen and basalts were recorded on the surface. At the Chinese lunar spacecraft Chang'e landing site of the Moon signals of hydrogen and basalts were recorded at the surface. The root of the basalt volcano was identified at a depth of 84 km. At the surveyed drilling site of Baodao 21-1 gas field, responses at gas frequencies were recorded from the surface, as well as in four intervals of the salt section by scanning. Responses were also recorded from the surface at the frequencies of condensate, gas, white phosphorus, and salt. The data of the local areas reconnaissance surveying within coal basin show the possibility of detecting oil, condensate and gas deposits in the deep and ultra-deep horizons of cross-section underneath

coal deposits. Materials of experimental studies at the Fuman oil field site indicate the potential possibility and feasibility of direct-prospecting methods using in the process of selecting the most optimal sites of the deep exploratory wells for oil and gas drilling. Helium deposits may be discovered at an ultra-deep well drilling site in the Taklamakan Desert at depths of over 7120 m. By detailed scanning of this cross-section interval, the depths of helium accumulations in the reservoirs can be determined. In general, the super-operative method of integral assessment of oil, gas and ore potential prospects provides the opportunity to significantly speed up and optimize the geological exploration process for fuel and ore minerals. Mobile methods of direct-prospecting technology can also be used to study the deep structure of the structural elements of the Earth, establish the genesis of ring structures, examine volcanic complexes of various types, as well as when performing archaeological research in areas of the ancient settlements location in order to detect and localize local objects that are promising for further excavations. Proven super-mobile technology of satellite images and photographs frequency-resonance processing is recommended for practical use on the territories of different countries for the purpose of preliminary assessment of the prospects for oil and gas content, ore content and water content of poorly studied and unexplored prospecting blocks and local areas. The use of super-operational and low-cost direct-prospecting technology will significantly speed up the exploration process for oil, gas, natural hydrogen and ore minerals, as well as reduce the financial costs of its implementation.

Keywords. China, deep well, impact structure, coal basin, oil, gas, methane, basalts, hydrogen, phosphorus, bacteria, direct searches, volcano, abiogenic genesis, sounding of the cross-section, remote sensing data processing.

Introduction

The super-mobile direct-prospecting technology of satellite images and photographs frequency-resonance processing and decoding [33-34] provides an opportunity to conduct research in order to search for minerals of various types, as well as to study the deep structure of various structural elements in different regions of the globe. The technology was used also to study the structural features of various structural objects on the planets and satellites of the Solar system. During this technology large-scale testing and approbation in 2019-2023 [35-61] numerous facts (evidences) were obtained in favor of 1) deep (abiogenic) genesis of oil, condensate and gas in the process of the Earth hydrogen degassing, 2) migration of gas (methane), carbon dioxide and hydrogen into the atmosphere of the Earth planet and 3) a "volcanic" model of the formation of structural elements and the appearance of the Earth, planets and satellites of the Solar system, as well as deposits of hydrocarbons, ore minerals and water. The results of studies conducted in various regions of the globe showed also that the super-mobile technology used makes it possible to significantly speed up and optimize (cheapen) the exploration process for combustible and ore minerals, as well as water. Financial resources, saved during the exploration phases of oil and gas fields, can be used further at the stages of their extraction and energy production with using increased environmental standards regarding air polluting gases.

Approbation of mobile direct-prospecting methods was carried out at local areas and sites of the exploratory wells for oil and gas drilling on onshore and offshore, within large and small exploratory blocks in order to integrally assess the prospects for oil and gas content, in areas of volcanic complexes and ring structures of various types location, on local areas and sites along seismic profiles, as well as on some planets and satellites of the Solar system. The results of the experimental work carried out were published in journal articles, as well as in the materials of numerous scientific conferences [33-61].

In the course of experimental works, the possibility of targeted use of mobile direct-prospecting technology was additionally studied for detecting and localizing hydrogen accumulations in areas of visible hydrogen degassing and assessing (determining) the depths

(intervals) of their occurrence, as well as an integral assessment of the prospects for detecting hydrogen deposits within local areas and large prospecting blocks. At present, the problem of searching for accumulations of natural hydrogen and organizing its production is quite relevant due to the intention of the world community to switch in the near future to carbon-free energy, in which an important place is given to hydrogen, the environmentally friendly fuel of the future. The main results of experiments already carried out (instrumental measurements) with the aim of studying the possibility of using direct-prospecting methods for localizing hydrogen accumulations in a cross-section were published in [35-38, 40, 45, 47-51, 54, 57-58].

From the standpoint of the deep (abiogenic) origin of hydrocarbons within the framework of the concept of deep degassing of the Earth, it can be assumed that in coal and shale basins, oil, condensate, and gas deposits also exist in deep (and ultra-deep) horizons of the cross-section. In this regard, the experimental studies of reconnaissance character were carried out using mobile direct-prospecting methods in regions of coal deposit's location in China, India, Kazakhstan, France, Ukraine [56].

To demonstrate potential capabilities and effectiveness of super-mobile direct-prospecting methods and technologies, the results of experimental studies within large blocks and local areas in China are presented in this paper. The data of mobile methods testing on local areas within deep deposits of oil and gas, ultra-deep and deep wells drilling in China are included in article.

Research methods

Experimental studies of a reconnaissance and detailed nature are purposefully carried out using mobile methods of satellite images and photographs frequency-resonance processing and decoding, vertical scanning (sounding) of cross-section in order to determine (estimate) the depths and thicknesses of various rock complexes and sought minerals, as well as methods an integral assessment of the prospects for oil and gas potential (ore content, water content) of local areas and large blocks [33-34]. Some methods of the technology used are based on the principles of the "substance" paradigm of geophysical research [16], the essence of which is to search for a specific (searchable in each individual case) substance – oil, gas, gas condensate, gold, iron, water, etc. The developed methods are based on the standing electric waves discovered by Nikola Tesla in 1899 in the deep horizons of the Earth [28-29]. Mobile technology as a whole, as well as its individual methods, are actively used in the testing mode to search for hydrocarbon accumulations at the initial stages of the geological exploration process, including for the integral assessment of the oil and gas potential of large and hard-to-reach blocks and areas, as well as local areas of prospecting and exploratory wells drilling.

In modified versions of the methods of satellite images and photographs frequency-resonance processing, as well as vertical sounding (scanning) of cross-section, bases (sets, collections) of chemical elements, minerals, rocks and minerals (specific samples) are used [33]. Thus, the collection of oil samples used during instrumental measurements includes 117 samples, gas condensate – 15 samples (Fig. 1). Figure 2 shows a photomontage of several chemical elements and substances, the frequency spectrum of which is used to record responses of oil, condensate and gas during the implementation of one instrumental measurement procedure.

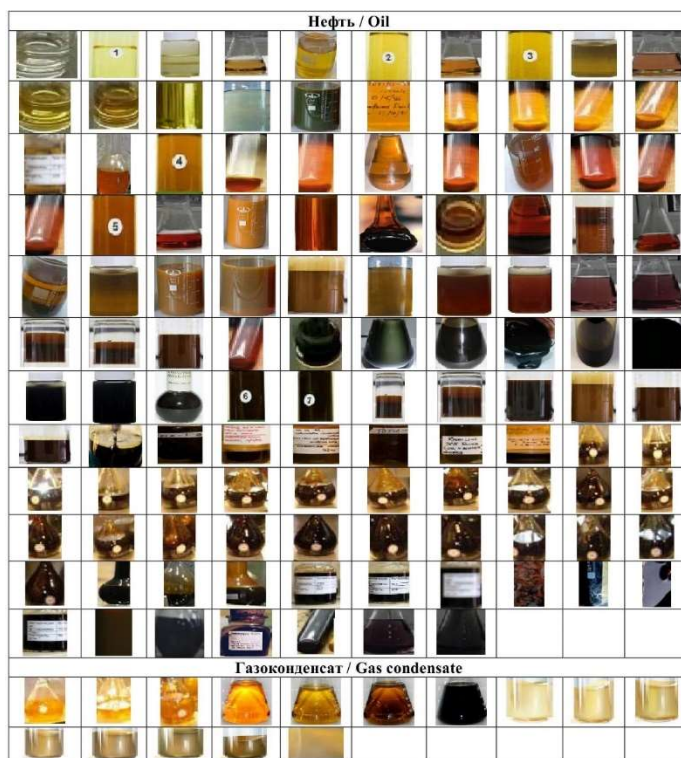


Fig. 1. Photographs of oil and gas condensate samples.

The set of photographs of sedimentary rocks consists of 11 groups: 1) psephites, monomineralic conglomerates (22 samples, sample numbers in the set are 2-23) (Fig. 3a); 2) psammites (18, 25-42) (Fig. 3b); 3) silts, mudstones, clays (6, 44-49) (Fig. 3c); 4) kaolinite mudstones (6, 51-57) (Fig. 3d); 5) kaolinite clays (10, 59-68) (Fig. 3e); 6) sedimentary-volcanoclastic rocks; tuff breccias (9, 70-78) (Fig. 3f); 7) limestones (24, 80-103) (Fig. 3g); 8) dolomites (11, 105-115) (Fig. 3h); 9) marls (10, 117-126) (Fig. 3i); 10) siliceous rocks (13, 128-140) (Fig. 3j); 11) salt.

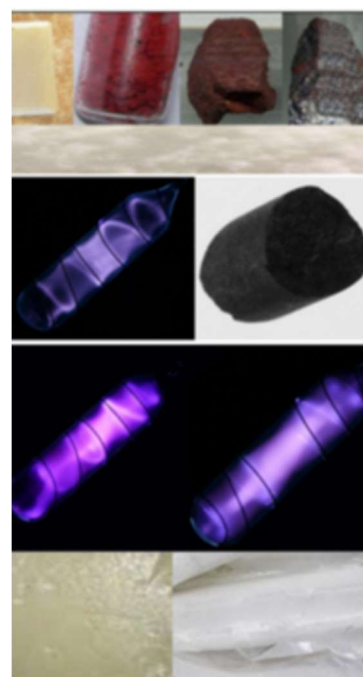


Fig. 2. Photomontage of the frequency spectrum of oil, condensate and gas.



Fig. 3. Photographs of rock samples whose resonant frequencies are used during images processing [9]: *a)* psephites, monomineralic conglomerates; *b)* psammites; *c)* silts, mudstones, clays; *d)* kaolinite mudstones; *e)* kaolinite clays; *f)* sedimentary-volcaniclastic rocks; tuff breccias; *g)* limestones; *h)* dolomites; *i)* marls; *j)* siliceous rocks; *k)* 1st group of granite rocks; *l)* gabbros and basalts; *m)* 7th group of igneous (ultramafic) rocks; *n)* kimberlites and lamproites.

The database of photographs of igneous and metamorphic rocks includes 18 groups: 1) granites and rhyolites (29 samples, sample numbers in the database are 1-29) (Fig. 3k); 2) granodiorites and dacites (7, 31-37); 3) syenites and trachytes (18, 39-56); 4) diorites and andesites (14, 58-71); 5) lamprophyres (14, 73-86); 6) gabbro and basalts (32, 88-119) (Fig. 3m); 7) non-feldspar ultramafic rocks (20, 121-140); 8) feldspathoid syenites and phonolites (23, 142-164); 9) feldspathoid gabbroids and basaltoids (6, 166-171); 10) feldspar-free ultramafic and mafic rocks (10, 173-182); 11) kimberlites and lamproites (20, 184-203) (Fig. 3n); 12) non-silicate carbonatites (8, 205-212); 13) metamorphic granulites (10, 214-223); 14) metamorphic gneisses (26, 225-250); 15) metamorphic crystalline schists (44, 252-295); 16) metamorphic microcrystalline schists (phyllites) (11, 297-307); 17) metamorphosed slates, cleaved sandstone (1, 308); 18) metamorphosed slates, cleaved siltstone (1, 309). Figure 3 shows 13 groups of rocks from the sets listed above. Photos of some chemical elements and minerals samples, used during satellite images processing, are shown in Fig. 4.

Photos of the used sets of samples of sedimentary, metamorphic and igneous rocks are borrowed from the electronic document [9]. Let us add to this that in our publications the rock classification proposed by the authors of the document [9] is also used.

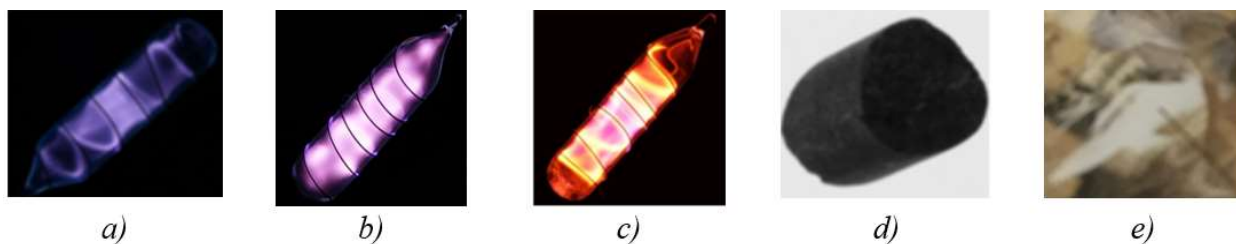


Fig. 4. Photographs of hydrogen (*a*), helium (*b*), neon (*c*), carbon (*d*), diamonds (*e*).

Materials of earlier experimental studies, obtained with the used set of mobile direct-prospecting methods, are presented in publications [33-61]. The same articles describe the methodological features of measurements during the satellite images and photographs processing using the developed technical means.

When conducting numerous studies using the described direct-prospecting methods in 2019-2023, the optimal procedure (processing graph, sequence of actions) was worked out (and constantly improved), which is used when carrying out work within the blocks and areas of survey. The most used processing graph for a separate satellite image (or its local fragment) includes the following sequence of actions (steps).

1. The procedure for fixing responses (signals) from the surface at the frequencies of the following set of substances: oil, condensate, gas, amber, methane-oxidizing bacteria, oil shale, gas hydrates, ice, coal, anthracite, hydrogen, living (deep) water, dead water, diamonds, potassium magnesium salt, sodium chloride salt.

2. Graph of the response's registration from the groups of sedimentary, metamorphic and igneous rocks that make up the cross-section.

3. Procedure for determining the presence within survey area of deep channels (volcanoes), filled with various groups of rocks; depths assessment of the volcano's root's location.

5. Graph for determining groups of rocks (or individual samples of groups), from which signals are recorded at frequencies of oil, condensate, gas and water (deep, live).

6. The procedure for recording responses of oil, condensate, gas and phosphorus at the surface (depth) of 57 km – the boundary of the hydrocarbons and amber synthesis in deep channels (volcanoes), filled with certain groups of rocks.

7. Graph of signals registration of water (deep, live) on the surfaces of 11, 46, 57, 68 km – the predicted boundaries of water synthesis in volcanoes of a certain type.

8. The procedure for scanning a cross-section with different steps from the surface up to 15 km to determine the depth intervals, within which responses are recorded at the resonant frequencies of oil, condensate, and gas. Refinement of the depths of location of the most promising for hydrocarbons intervals of cross-section during additional scanning with a finer step.

9. Graph for assessing the depth of the upper boundary (edge) of basalts, as well as the depths of the beginning of fixing responses at the resonant frequencies of hydrogen and living (healing) water from basalts. It is implemented in case of fixing responses from the 6th group of igneous rocks (basalts) on the surveyed area.

10. Procedure for determining the depths of occurrence of the upper edge of kimberlites, as well as the depth interval within which responses at diamond frequencies are recorded. It is implemented when establishing the presence of signals from the 11th group of igneous rocks (kimberlites) in the survey area.

Given the reconnaissance nature of the studies performed, the described set of separate procedures for satellite images processing in full was not implemented within all surveyed areas.

Possible stages of direct-prospecting methods application. Numerous results of approbation and practical application of the frequency-resonance technology for satellite images processing [35-61] have shown that this super-mobile direct-prospecting technology can be successfully used on the following stages of prospecting for oil and gas, natural hydrogen, ore minerals and water:

a) *stage 1: demonstration* – processing of a satellite image or a photograph of the well or field location, known to the potential Customer, to further demonstrate the operability and efficiency of mobile direct-prospecting technology;

b) *stage 2: integral* – detailed processing of satellite images of large areas in order to determine the types of volcanic structures, present within survey area, as well as minerals for which it is advisable to conduct reconnaissance and detailed prospecting;

c) *stage 3: reconnaissance* – splitting satellite images of large areas into sequences of fragments and their detailed processing in order to identify the most promising local blocks for conducting detailed prospecting for the desired minerals;

d) *stage 4: detailed* – detailed processing of images of the most promising local blocks, identified at the previous stage (reconnaissance), in order to select sites for drilling prospecting and exploration wells.

Possible projects for working with national and foreign Partners:

1. Reconnaissance survey of large blocks or the entire territory of a particular country in order to identify local areas of detailed exploration for: a) oil, gas, condensate; b) natural hydrogen; c) ore minerals.

2. The detailed exploration works carrying out within the most promising areas for hydrocarbons and natural hydrogen in order to assess the feasibility of drilling exploratory wells within them and the choice of sites for their laying.

3. Detailed survey of local areas (sites) of drilled wells for oil and gas in order to identify missed oil and gas layers and assess the prospects of HC deposits detection in the cross-section below the wells bottom.

4. Detailed inspection within the sites of design wells for oil and gas location in order to further assess the feasibility of their drilling.

5. Survey within areas of the springs with living and dead water location in the country in order to study the healing properties of healing waters and assess the feasibility of its production.

6. Detailed survey of local areas, promising for precious and non-ferrous metals (cuprum, lithium, cobalt and others), as well as rare earth chemical elements.

Once again, we focus on the distinctive feature of the direct-prospecting frequency-resonance methods being developed. Unlike classical geophysical methods, the methods used make it possible in each specific case to fill the cross-section under study with the complexes of sedimentary, metamorphic and igneous rocks present in it, as well as to determine in the first approximation (and refine at the stages of detailing) the intervals of cross-section that are promising for the detection of combustible and ore minerals, immediately, in the process of measurements (registration of signals) by the developed instrumentation and measuring devices (i.e. without additional stages of modeling and geological interpretation of the results of instrumental measurements). In this article, as well as in other published materials, the emphasis is mainly on the presentation of measurement results.

We also note that the developed technology uses the frequency-resonant principle of the useful signals' registration [16]. Satellite images or photographs of research objects, as well as photographs of rock samples, minerals and chemical elements, are, in principle, antinodes of

standing electric waves, discovered by Nikola Tesla in 1899 in the deep horizons of the Earth [28, 29].

When carrying out instrumental measurements using the developed computerized complexes, the spectra of satellite or photographic images of objects studied are sequentially compared with the spectra of rock samples, the desired minerals and chemical elements. In the process of comparison, the measuring unit registers resonances (electromagnetic responses), which make it possible to draw a conclusion about the presence (absence) of specific rocks, the desired minerals and chemical elements in the cross-section of the object of study. Such features of the developed methods of satellite images processing and decoding are the basis for the use of the terms "frequency-resonance technology" ("frequency-resonance methods").

The processing of satellite images and photographs is carried out in laboratory conditions, without organizing and conducting field geological and geophysical studies. This provides an opportunity to quickly conduct research in any region of the globe, and, consequently, developing technology is super-mobile.

In addition to what was said in the previous paragraph, it is worth adding the following. As a result of testing and practical application of the developed measuring equipment in various regions of the world, numerous evidences (facts) have been obtained in favor of the "volcanic" model of the formation of many structural elements of the Earth (and other planets and satellites of the solar system), as well as deposits of combustible and ore minerals (hydrogen and water as well). Instrumental measurements established the existence of 10 types of volcanic complexes filled with various types of rocks. And what is characteristic, the roots of all volcanoes are almost always fixed by scanning the cross-section at the same depths, namely: 95-98 km, 214-218 km, 470 km, 723 km, 996 km.

It is quite natural that the depths of the roots of 470 km or 723 km of a salt or dolomite volcano cause rejection and skepticism among many experts. We also note that at the initial stages of testing the technology, such depths of roots were also surprising to the authors of the experiments. However, the ubiquitous repetition of such depth values during many hundreds of measurement experiments gives grounds for the assumption that such strictly predetermined values of the depths of the roots of various volcanic complexes are due to certain wave processes in the solar system and our galaxy.

In this regard, it is only regrettable that such skepticism in relation to the depths of the roots of volcanoes is automatically (without detailed consideration and analysis of materials) transferred to the results of instrumental measurements in the upper part of cross-section accessible for drilling.

Deep well Luntan-1 (China)

To demonstrate the operability and efficiency of direct-prospecting technology, a purposeful survey of areas and local sites for drilling exploratory wells on land and shelf in various regions is carried out [40-41, 55, 60]. The survey of drilling exploratory wells areas is also carried out in order to develop and improve the methodology of instrumental measurements conducting, taking into account the peculiarities of the geological structure of blocks, local areas and drilling sites. In some areas of drilling, instrumental measurements are carried out additionally (repeatedly) if the results of the first stage of work differ significantly from the results of drilling. This section presents the results of surveying within the site with drilled deep well in China.

The abstract of the article contained information about the drilled deep well Luntan-1 [1], in which oil and gas inflows were obtained from the interval at great depths: 8203-8260 m. In this regard, experimental studies were carried out at the well location site in order to establishing the possibility of direct-prospecting methods using for the detection and localization of oil,

condensate and gas deposits in deep horizons of cross-section. For processing, a photograph of the drilling rig (Fig. 5) was used, borrowed from the site [1].

At the initial stage, during the frequency-resonance processing of drilling rig photograph (Fig. 5), the procedure for fixing responses at HC frequencies from the interval of 8203-8260 m was performed; signals from oil, condensate (of low intensity) and gas from this interval were recorded. By the cross-section scanning from 8200 m, step 5 mm, responses at oil frequencies were obtained from the following intervals (layers): 1) 8204-8216 m; transition to a step of 1 cm, 2) 8220-8235 m; 3) 8242-8248.5 m (scanned up to 8270 m). On the surface of 8270 m, responses at the frequencies of oil from the lower part of cross-section were also recorded. When scanning from 8200 m, step 1 cm, responses at gas frequencies were obtained from layers: 1) 8204-8205 m; 2) 8236.5-8241.5 m (scanned up to 8260 m).



Fig. 5. Photograph of the Luntan-1 well drilling site.

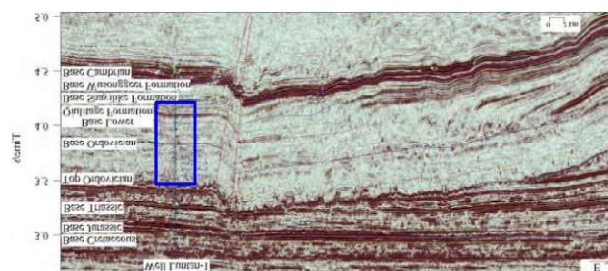


Fig. 6. E-W trend seismic profile cross well Luntan-1 [62].

When processing a photograph from the surface, responses were obtained of oil, condensate, gas, dead water, potassium-magnesium salt, as well as of 8th (dolomites), 9th (marls) groups of sedimentary rocks and 7th, 8th, 9th groups of magmatic rocks. By fixing the responses at various depths, the root of the volcano, filled with the 7th group of igneous (ultramafic) rocks, was determined at a depth of 723 km. The upper edge of these rocks was determined by scanning at a depth of 22.570 km.

In the range of 8203-8260 m, by scanning cross-section from 8203 m, step 1 cm, responses of dolomites were recorded from the intervals: 1) 8203.5-8220 m; 2) 8225-8238 m; 3) 8241-8255.5 m; 4) 8257 (out of range traced). By scanning the cross-section from 8219, step 1 cm, responses of marls were obtained from the interval 8220-8225 m. On the surface of 57 km, signals were received of oil, condensate, gas, dead water, lonsdaleite, potassium-magnesium salt, and at 59 km – of potassium-magnesium salt, dead water, lonsdaleite.

Article [62] provides detailed information about the deep well Luntan-1 drilled in China. This publication can be used to assess the information content of the results of surveying the interval of great depths 8203-8260 m using direct-prospecting technology.

Using graphic illustrations in Fig. 6-8 from article [62], additional instrumental measurements of an experimental nature were also carried out at the Luntan-1 well drilling site.

When scanning cross-section with a step of 1 m using a fragment of a photograph of the well drilling site in a rectangular contour (Fig. 5) and a fragment of a seismic section through the well (rectangular contour in Fig. 6), the common signals were recorded from the cross-section interval of 3584-4651 m.

When carrying out instrumental measurements using a core photograph (Fig. 8) and a fragment of a photograph of the well drilling site (rectangular contour in Fig. 5), common signals were recorded from the cross-section interval of 8220.78-8224.3 m.

Scanning of cross-section with a step of 1 cm was also carried out using a photograph with oil samples (Fig. 1), a fragment of a photograph of the well drilling site (rectangular contour in Fig. 5), as well as a fragment of a logging diagram (small rectangle in Fig. 7). Common scan signals using these images are obtained from section intervals 8203.99-8205.68 m and 8210.76-8216.84 m.

When conducting additional scanning of the cross-section with a step of 5 mm using the entire photograph of the area with the well (Fig. 5), responses at oil frequencies were recorded from depth intervals of 8219.46-8233.97 m, 8236.49-8248.73 m.

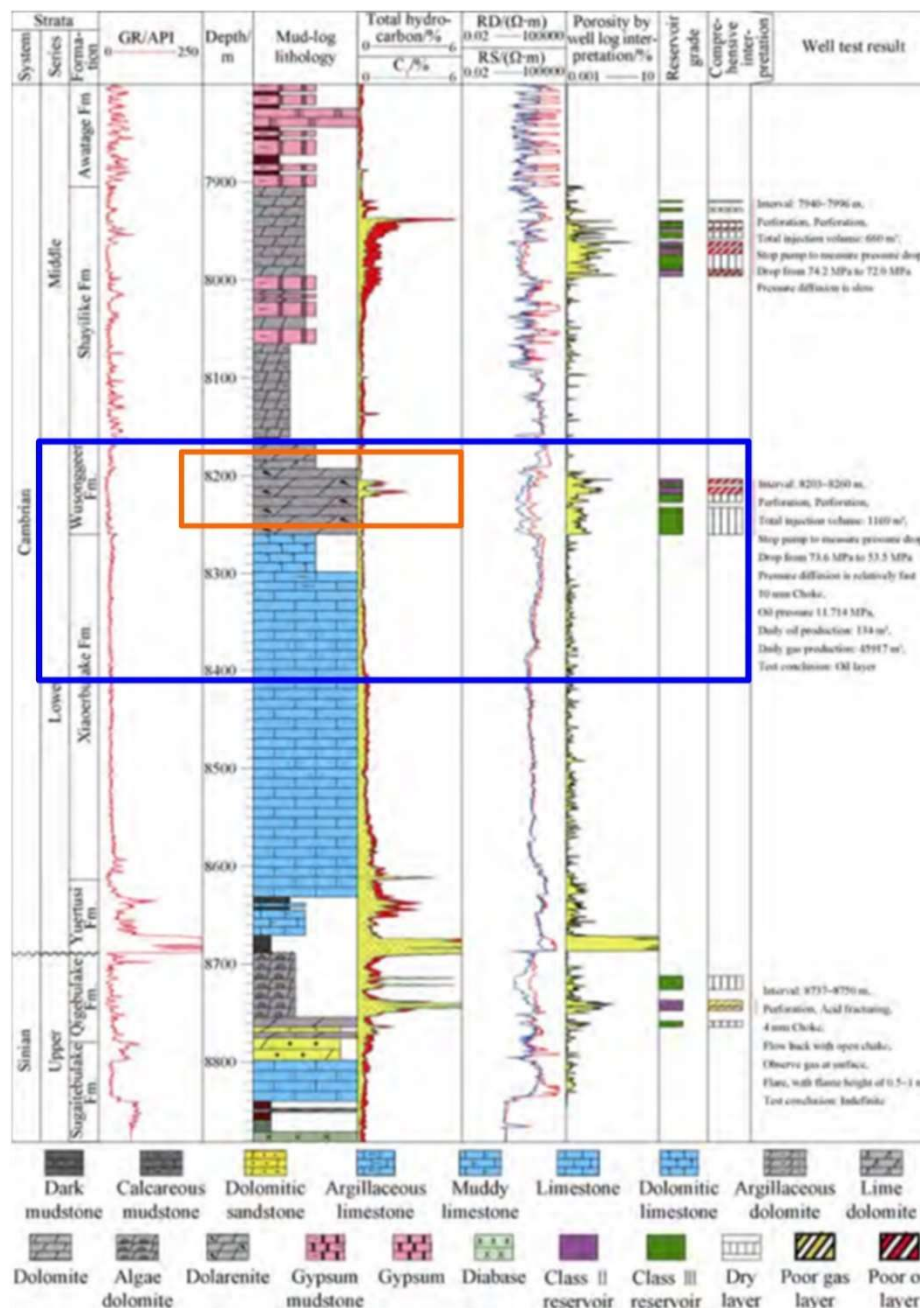


Fig. 7. Comprehensive column of Cambrian-Sinian strata in Well Luntan-1 [62].

Brief comments. 1. The experimental studies carried out at the Luntan-1 well drilling site demonstrate the possibility and feasibility of direct-prospecting frequency-resonance methods using to assess the oil and gas potential of deep and ultra-deep horizons of cross-section.



Fig. 8. Lithology and FMI characteristics of the reservoir in the Sinian Qigebulake Formation and the Lower Cambrian Wusonggeer Formation; (d) fractures and dissolved cavities [62].

2. In the process of selecting optimal sites for oil and gas wells drilling, seismic sections of exploration areas can be used for additional frequency-resonance processing together with satellite and photographic images of survey sites.

3. Photographs of core samples from wells can be used to determine the depths (intervals) of the location of specific types of rocks in the cross-section of the survey area.

4. Frequency resonance processing of core samples photographs also makes it possible to determine the types of fluids and gases contained in the core extracted from the well.

Research in the area of the Yilan crater location (China, Heilongjiang Province)

Testing of mobile direct-prospecting methods was carried out in areas of impact and ring structure's location in various regions of the world [40, 42, 55]. A significant number of instrumental measurement procedures have also been implemented in the region of the Yilan impact crater location in the Chinese province of Heilongjiang.

The results of research within the Yilan structure, carried out by Chinese specialists, are discussed in the information message [7]. The document also presents a diagram of the structure location in the province (Fig. 9), a satellite image of its area (Fig. 10), photographs of the structure (Fig. 11) and the site with the drilling rig (Fig. 12), as well as a photograph of the spherule, discovered in the structure contours (Fig. 13). These graphic materials were used during instrumental measurements conducting.



Fig. 9. Location of Yilan crater in Heilongjiang province [7].



Fig. 10. Satellite image of Yilan crater in Heilongjiang province [7].

During frequency-resonance processing of a satellite image fragment of the area with the impact structure location (rectangle in Fig. 10), responses at the frequencies of diamonds, the 7th group of sedimentary rocks (limestones) and the 11th group of igneous rocks (kimberlites) were recorded from the surface. By recording responses at various depths (50, 99, 218, 480, 722, 724 km), the root of the kimberlite volcano was determined at a depth of 723 km.

By scanning the cross-section from the surface with steps of 10, 50 and 1 cm, the lower edge of the limestones was recorded at a depth of 609.8 m. At the surface of 609 m from the upper part of the cross-section, no signals of diamonds and kimberlites were detected.

When scanning a cross-section from 609.8 m, a step of 10 cm, responses of diamonds began to be recorded from 763 m.



Fig. 11. Photo of Yilan Crater in Heilongjiang Province [7].



Fig. 12. Photo of the drilling rig at the site of the Yilan crater [7].

During processing of the entire image in Fig. 10 signals of limestones and kimberlites were recorded. At the surface of 700 m from the lower part of the cross-section there were no responses of limestones.

When scanning a cross-section using the image in Fig. 10 without a fragment in a rectangle from the surface, step 10 cm, the lower edge of the limestones was determined at a depth of 59 m. At the surface of 60 m from the lower part of the cross-section, responses of limestones were not received, but of kimberlites were recorded.

When frequency-resonance processing of the entire image in Fig. 11 signals of phosphorus (red and yellow), hydrogen, hydrogen bacteria, living water, and diamonds were recorded from the surface.



Fig. 13. Glass droplet-shaped particles found in the Yilan crater [7].



Fig. 14. Glass ejection from the Atacama Desert (Chile) [10].

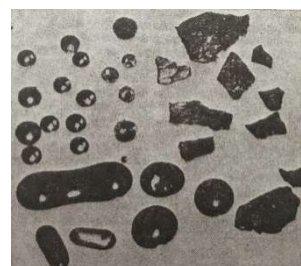


Fig. 15. Particles from rocks of explosive structures of Ukraine [31].

Responses of the 7th (limestones), 8th (dolomites), 9th (marls) groups of sedimentary rocks, as well as the 6th (basalts), 6A (dolerites and andesites) and 6B (lamproites) groups of igneous rocks were also recorded. By recording responses at various depths, the roots of volcanoes, filled with various rocks were determined: basalts – 218 km; kimberlites – 723 km; dolomites – 723 km; marls – 723 km; limestones – 470 km. From the interval 99-723 km, responses of the 10th group of sedimentary (siliceous) rocks were received.

At the 0 m surface, signals at hydrogen frequencies were received from the upper part of the cross-section, which indicates its migration into the atmosphere.

When processing a fragment of the image in Fig. 11 in a rectangular contour, signals of limestones, as well as 6A, 6B and 11th (kimberlites) groups of igneous rocks were recorded.

By scanning cross-section from 600 m, step 1 cm, responses of kimberlites began to be recorded from 606 m. Responses of limestones on the surface of 606 m were not recorded from the lower part of cross-section, but were obtained from the upper part.

When processing the entire image in Fig. 11, on the surface of 13 km from the lower part of cross-section, signals of 6A and 6B groups of igneous rocks were recorded, and at a depth of 14

km there were no signals from these rocks. In the process of scanning a cross-section from 13 km, a step of 1 m, responses of 6A and 6B groups of rock were recorded up to 13.150 km and 13.130 km, respectively.

During instrumental measurements carrying out, responses at spherule frequencies (Fig. 13) were obtained only from 6A (dolerites and andesites) and 6B (lamproites) groups of igneous rocks.

When processing the entire image in Fig. 10, as well as its fragment in a rectangle, responses at spherule frequencies (Fig. 13) were recorded. And when processing the image in Fig. 10, without a fragment in the rectangle, there were no signals of the spherules.

Responses of spherules were also recorded when processing a local fragment of an image of the drilling rig location area (Fig. 12, small rectangle in the lower right corner).

When processing a fragment of the image in Fig. 10, by recording responses at various depths, it was established that the upper limit of recording responses from spherules is located in the depths range of 400-500 m.

By scanning cross-section from the surface, a step of 20 cm with a transition to 2 cm, responses of spherules were obtained from the interval of 525-609.5 m. At the stage of clarifying the results by scanning with a step of 2 cm, responses of spherules were obtained also from the intervals of a) 406-407 m, b) 413.5-417 m, c) 421-430 m (no further scanning was carried out).

At a local section of the drilling rig location photograph (Fig. 12), responses of spherules were recorded on the surface of 400 m only from the lower part of cross-section. When scanning this fragment from 400 m, step 2 cm, signals of spherules were obtained from the interval of 408-412 m, signals were recorded also at a depth of 600 m from the lower part of cross-section and traced with steps of 2 cm to 605 m. At a depth of 606 m, responses of spherules from the lower part of cross-section were not obtained.

When the frequency-resonance processing of a photograph of spherules (Fig. 13), responses at spherule frequencies were obtained from 6A (dolerites and andesites) and 6B (lamproites) groups of igneous rocks. Instrumental measurements established in the spherules the presence of 1) biotite-hypersthene dolerite; 2) biotite-hornblende dolerite; 3) porphyrite-quartz dolerite (group 6A), as well as 1) odinite, 2) malchite, 3) monchikite, 4) alneite (group 6B).

When processing a photograph of spherules (Fig. 13), signals were recorded at the frequencies of 5 chemical elements: 1) hydrogen, 2) deuterium, 3) chlorine, 4) iron, 5) cobalt. In terms of the composition of chemical elements, spherules from the site are identical to spherules found in the Atacama Desert (Chile) (Fig. 14) and within explosive structures in Ukraine (Fig. 15).

During frequency-resonance processing of a photograph of the Yilan crater (Fig. 11), responses of basalts, hydrogen and living (healing) water were recorded from the surface. In this regard, additional research was carried out within the crater area in order to define of the basalt volcano location.

To carry out experimental work, seven local areas were selected around the crater, the position of which around the crater is indicated in Fig. 16 by rectangular contours. Frequency-resonance processing of images of all seven areas was performed separately.

During the entire image in Fig. 16 processing the signals were recorded of 1-6, 7th (limestones), 8th (dolomites), 9th (marls) groups of sedimentary rocks and 1st (granites), 2, 3, 5, 6th (basalts), 6A, 6B, 11th (kimberlites), 12, 13, 14 groups of igneous rocks.

Rectangle 1. Within this fragment of the image, responses were received only from 1-6 groups of sedimentary rocks. The lower edge of these rocks was determined at a depth of 99 km, and from the intervals 99-723 km and 723-996 km responses were obtained of siliceous rocks and granites, respectively.

Signals from hydrocarbons, phosphorus and methane-oxidizing bacteria were not recorded at the site – this is a volcano in which conditions exist only for the water synthesis. Responses of living water were obtained at a depth of 46 km, and of dead water – at 48 km.

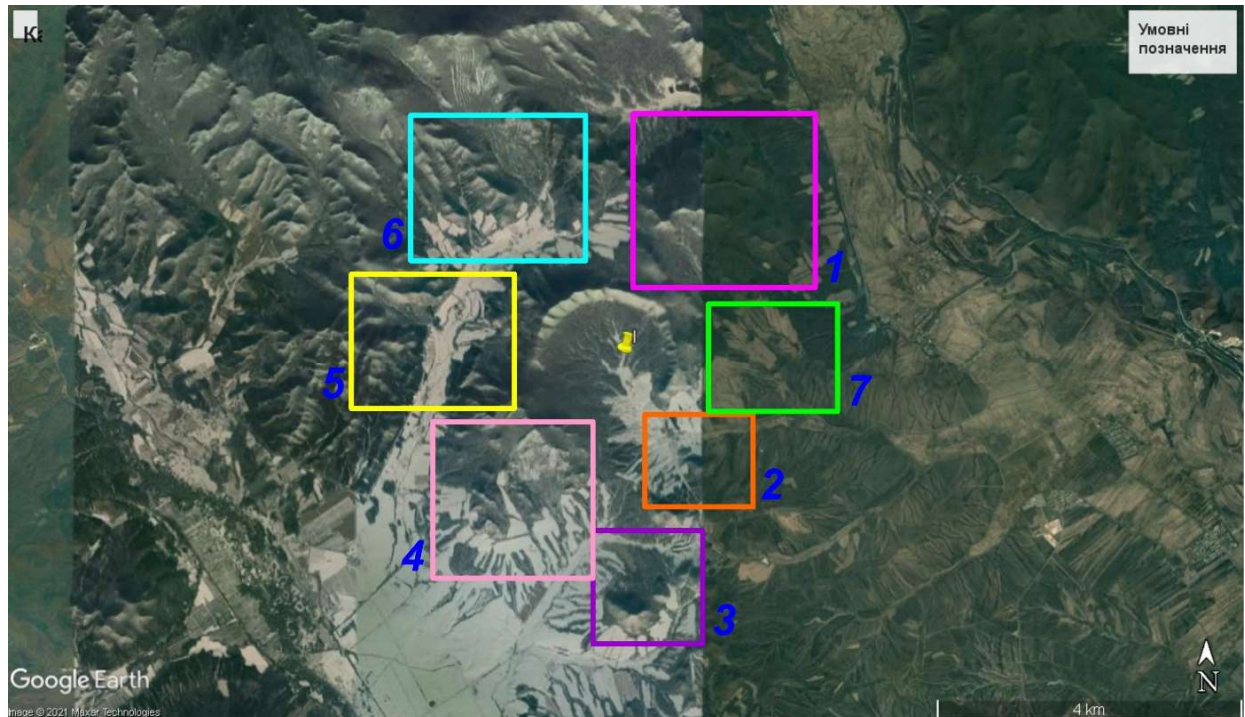


Fig. 16. Satellite image of the Yilan crater in Heilongjiang province and local areas (rectangular contours) of additional frequency-resonance processing.

Rectangle 2. At the site, responses were received of the 7th (limestone) group of sedimentary rocks and 1st (granites), 2, 3, 5 groups of igneous rocks. The root of the limestone volcano was determined at a depth of 723 km, and responses from granites (lower layer) were obtained from the interval of 723-996 km. The upper granite rocks are located in an interval of up to 50 km (their exact position in the cross-section was not determined).

Rectangle 3. Within the area, responses were recorded only of 1st (granites), 2, 3, 5 groups of igneous rocks. The root of the granite volcano was identified at a depth of 996 km. When scanning cross-section with a step of 10 cm, responses of granites began to be recorded from a depth of 7 m, and when using a step of 1 cm, from 1 m.

At the 0 m surface, responses were recorded at the frequencies of mercury, gold, and coesite. Signals of coesite and graphite were obtained at a depth of 996 km.

When scanning cross-section from the surface, a step of 1 m, responses at gold frequencies began to be recorded from 180 m, and when using a step of 10 cm, signals were obtained from the intervals of 129-136 m and 192-247 m (no further tracking was carried out).

Rectangle 4. Within the site, responses were received of the 7th (limestones) and 8th (dolomite) groups of sedimentary rocks. The root of the dolomite volcano was determined at a depth of 723 km, responses from granites were obtained from the interval 723-996 km, and the limestones are located in cross-section to a depth of 50 km (their position was not specified).

Rectangle 5. Responses of the 8th (dolomite) and 9th (marl) groups of sedimentary rocks were recorded at the site. The root of the volcano, filled with marls, was determined at a depth of 723 km, responses of granites were obtained from the interval of 723-996 km, and dolomites are located in the interval up to a depth of 50 km (their position in cross-section was not specified).

Rectangle 6. In the contours of the site, responses were received only from the 8th (dolomite) group of sedimentary rocks. The root of the dolomite volcano was determined at a depth of 723 km, and responses from granites were recorded from the interval of 723-996 km.

Rectangle 7. During the processing of an image fragment, from the surface signals of phosphorus (red and yellow), hydrogen (intensive), hydrogen bacteria (intensive) and living water were recorded.

Responses of 6th (basalts), 6A (dolerites and andesites) and 6B (lamproites) groups of igneous rocks were also recorded. The root of the basaltic volcano was determined at a depth of 723 km, and responses from granites were recorded from the interval of 723-996 km.

When cross-section scanning with steps of 1 m, 10 cm and 1 cm, responses of basalts began to be recorded at 30 m, 4 m and 40 cm, respectively.

At the 0 m surface, responses of hydrogen and phosphorus were obtained from the upper part of cross-section, indicating of their migration into the atmosphere.

When scanning cross-section from the surface up to 200 m, a step of 10 cm, responses of hydrogen were obtained from intervals of 12-90 m, 100-140 m, 150-190 m, and of living water – from 29-70 m and 104-189 m (no scanning deeper was performed).

Main results. Reconnaissance studies were carried out in the area of the Yilan structure location using direct-prospecting technology. Above are the results of the first stage of experimental work.

In the area with crater location, the diamond-bearing kimberlite volcanic complex with a root at a depth of 723 km and an upper edge in the interval of 606-609 m were revealed by instrumental measurements. Signals at diamond frequencies were recorded from kimberlites from a depth of 763 m.

A crater about 610 m deep in the upper part of a kimberlite volcano is filled with limestones, from which responses of glassy spherules were recorded, that were discovered when drilling a well within the structure.

Near the kimberlite volcano there are volcanic complexes filled with basalts, limestones, dolomites and marls.

Responses at hydrogen frequencies are almost always detected over basaltic volcanoes. They were also recorded within the surveyed area. The fact of hydrogen migration into the atmosphere also have been established by instrumental measurements.

From the glassy spherules, discovered at the research site (Fig. 13), responses were recorded at the frequencies of hydrogen, deuterium, chlorine, iron and cobalt. In terms of the composition of chemical elements, spherules from the site are identical to spherules, found in the Atacama Desert (Chile) (Fig. 14) and within explosive structures in Ukraine (Fig. 15).

The results of the studies can be considered as additional evidence in favor of the volcanic model of the formation of the external appearance and structural elements of the Earth, as well as mineral deposits.

Geothermal water prospecting site in northern of Beijing (China)

The article [61] presents the results of a reconnaissance survey of the sites of four geothermal stations, as well as five geysers. Experimental studies in these areas were carried out to study the features of the deep structure within areas of geothermal sources location. Reconnaissance studies were also carried out in the area of geothermal sources searching in the north of Beijing.

A satellite image of the search area is shown in Fig. 17. During the frequency-resonance processing of the entire image, signals of phosphorus, hydrogen, living water and the 6th group (basalts) of igneous rocks were recorded from the surface.

By scanning the cross-section from the surface, with a step of 10 cm, the upper edge of the basalts was determined at a depth of 35 m, and responses of living water began to be recorded from 55 m, and of hydrogen – from 49 m.

In the cross-section of the survey site, signals of basalts were recorded in the interval of 35 m - 99 km, of the 8th group of sedimentary rocks (dolomites) – in the interval of 99-218 km, of the 10th group of sedimentary (siliceous) rocks – in the interval of 218-723 km.

At the surface of 0 m, responses of hydrogen were obtained from the upper part of cross-section, which indicates its migration into the atmosphere.

Responses of living water were recorded at the surface of 57 km, at a depth of 68 km there were no signals of living water.

At a depth of 55 m in the lower part of cross-section, negative values of the redox potential (ORP) of water were recorded, and in the upper part – positive values.

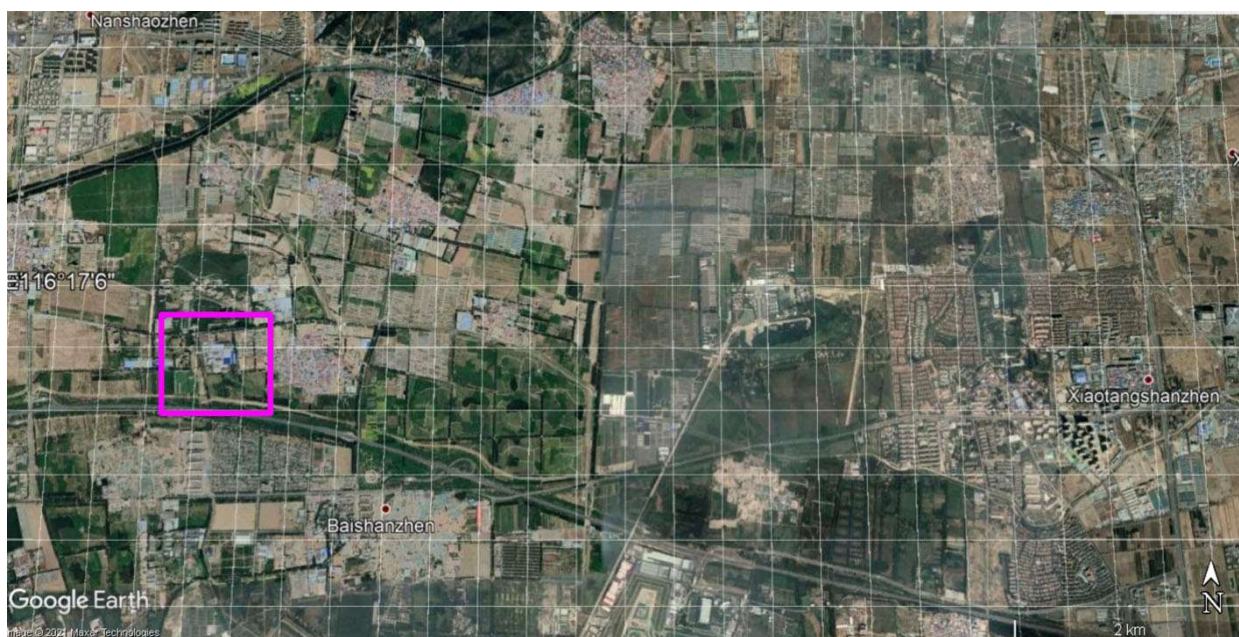


Fig. 17. Satellite image of the geothermal water prospecting site in the north of Beijing (China).

When processing a fragment of the image in Fig. 17 in a rectangular contour on the left, responses of phosphorus, hydrogen, living water and igneous rocks of the 6th group (basalts) are recorded.

By scanning the cross-section from the surface, with a step of 10 cm, responses of basalts began to be recorded from 40 m, hydrogen – from 53 m, and living water – from 77 m.

In the cross-section of the survey zone from the interval 40 m - 99 km responses of basalts were received, from the interval of 99-218 km – of the 8th group of sedimentary rocks (dolomites), and from the interval 218-723 km – of the 7th group of igneous (ultramafic) rocks.

At a depth of 77 m in the lower part of cross-section, negative values of the redox potential (ORP) of living water were recorded.

Responses of living water were recorded at a depth of 68 km, and at a depth of 57 km, there were no signals of living water.

During additional processing of the entire image in Fig. 17 without a cutout in the left rectangle, signals of living water were recorded at the surface of 57 km, and at a depth of 68 km, there were no responses.

On the surface of 218 km, signals of the 10th group of sedimentary (siliceous) rocks and very weak responses of the 7th group of igneous (ultramafic) rocks were recorded.

When processing a small fragment of the image on the right side of Fig. 17 signals from the surface were recorded of hydrogen, phosphorus, living water and basalts.

The lower edge of the basalts was recorded at a depth of 99 km, responses of dolomites were obtained from the interval of 99-218 km, and signals of siliceous rocks (10th group of sedimentary rocks) were recorded at the surface of 218 km from the lower part of cross-section.

Signals of living water were recorded at the surface of 57 km, and at depths of 59, 68 and 71 km, there were no signals of living water. On the surface of 57 km, negative values of the ORP of living water were recorded.

By scanning the cross-section from the surface, step 10 cm, responses of living water began to be recorded from 50 m. On the surface of 50 m, negative values of the ORP of living water were obtained in the lower part of cross-section, and positive values of the ORP of dead water were obtained in the upper part.

Main conclusions. In the surveyed areas of geothermal power plants and geysers in different regions of the world, the following features of the geological structure have been established by instrumental measurements within the framework of the volcanic model of their formation [61].

1. From the surface in the cross-section of surveyed areas, responses are recorded at the frequencies of phosphorus, hydrogen, living water and basalts.

2. The synthesis of living water occurs on the surface (depth) of 57 km. Outside of the geothermal source's location, including the areas of longevity and areas of hydrogen degassing, the synthesis of living water is carried out on the surface of 68 km.

3. In the cross-sections of the surveyed areas, basalts and gabbro are located in the upper part, in the interval up to 99 km. Under the basalts, at depths of 99-218 km, there are sedimentary rocks of the 8th group (dolomites), and even lower, in the interval of 218-723 km, sedimentary (siliceous) rocks of the 10th group. In almost all areas in the upper part of cross-section, sedimentary rocks of the 7th group (limestones) are located above the basalts.

4. In the areas where active geysers are located, facts of hydrogen migration into the atmosphere were recorded.

5. Living water at the synthesis boundary of 57 km, as well as in basalts, is characterized by high negative values of the redox potential (ORP).

The peculiarities (of the same type) of the geological structure established by instrumental measurements in ten local areas of experimental work in various regions of the world can be used as search features in reconnaissance and detailed geological exploration in order to detect and localize accumulations of geothermal water within poorly studied blocks and areas.

The application of the methodology for the integral assessment of the prospects for oil and gas content, ore content, water content of large blocks and local areas at the initial stages of prospecting and exploration provides an opportunity to significantly speed up and optimize the exploration process for various types of minerals.

Circle on Qinghai Lake (China)

During the mobile technology approbation, the features of the deep structure on the local sites with the of exotic objects location, including crop circles, were also studied. This chapter presents the results of a survey of area with circles, found on Qinghai Lake in China.

During frequency-resonance processing of a fragment of an image with a circle [19] (Fig. 18, lower rectangular contour), responses of living water, ice, hydrogen and the 6th group of igneous rocks (basalts) were recorded on the surface.

When scanning cross-section from the surface, with a step of 10 cm, responses of basalts began to be recorded from 91 m. By fixing responses at various depths, the root of the basalt volcano was determined at a depth of 723 km.



Fig. 18. Photo of circle on Qinghai Lake (China) [19].



Fig. 19. Satellite image of Qinghai Lake (China).

Within a rectangle with a circle at a depth of 3 m in the upper part of cross-section, the presence or absence (none) of signals of following chemical elements was determined: hydrogen (none), chlorine, iron, cobalt, lithium, beryllium, argon (none), nickel (none), potassium (none), calcium (none), helium (none), chromium, manganese (none), copper (none), yttrium, molybdenum, technetium, ruthenium, rhodium, palladium, tellurium, terbium, gadolinium, dysprosium, holmium, thulium, erbium, ytterbium, lutetium, hafnium, gold, mercury, radium, actinium, thorium, uranium, protactinium.

Within the rectangle above the circle at a depth of 3 m in the upper part of cross-section, the presence or absence (no) of signals from following chemical elements was determined: iron, cobalt, lithium, beryllium, scandium, chromium, vanadium, germanium, selenium, yttrium, niobium, technetium, ruthenium, rhodium, palladium, indium, antimony, lanthanum, cerium, praseodymium, promethium, neodymium, tellurium, terbium, gadolinium, dysprosium, holmium, thulium, erbium, ytterbium, lutetium, rhenium, osmium, iridium, gold, mercury, polonium, radium, actinium, thorium, uranium, neptunium. No responses of chemical elements were recorded within rectangular contour on the right.

During the reconnaissance survey of the lakes and reservoirs with waters, a satellite image of entire Qinghai Lake was also processed. When processing a satellite image of the lake (Fig. 19), no responses of oil, condensate, gas, amber, and salt were received from the surface. Signals of hydrogen, 8th group of sedimentary rocks (dolomites) and 6th group of igneous rocks (basalts) were recorded.

By fixing the responses at different depths (50, 150, 250, 350, 450, 550, 650, 750 km), the root of the basalt channel was determined at a depth of 723 km. The lower boundary of the dolomites is set in the range of 4-5 km. By scanning cross-section from the surface with a step of 50 cm, responses of basalts were obtained from a depth of 90 m, and of hydrogen, from 160 m.

By scanning cross-section with steps of 1 and 5 cm, responses of water were recorded from the surface up to 90 m. On the surface of 91 m, responses from the upper part of cross-section were obtained only of water, and from the lower part, only of hydrogen and basalts. There were no responses of water on the surface of 68 km.

Some comments. During frequency-resonance processing of images of all surveyed local areas with circles (in UK including [54]), a limited set of measuring procedures was performed – reconnaissance studies were carried out. We also note that the interest of the authors in carrying out this kind of experimental work is due to the information given on many sites that such crop circles are drawn by aliens. Taking into account this information, a certain amount of

measurement procedures was purposefully performed, the results of which could confirm or refute these assumptions.

The results of instrumental measurements at the initial stage of experimental work immediately turned out to be unexpected. It turned out that all the surveyed sites are located above basalt volcanic complexes, the upper edges of basalt rocks were fixed at a shallow depth, responses were obtained at basalts at hydrogen frequencies, and the facts of hydrogen migration into the atmosphere were confirmed by measurements.

The results of the experimental studies carried out allow us to conclude that when searching for accumulations of natural hydrogen, it is advisable to pay attention to the zones and areas where circles are located in different parts of UK! It should be noted that the website [<https://temporarytemples.co.uk/crop-circles/2019-crop-circles>] contains an archive of satellite images and photographs of crop circles that were found in UK in 1994-2022. The same site also provides links, using which you can get acquainted with additional materials on the crop circles problem. On Internet sites, you can also find information about crop circles in various countries of the world.

In conclusion, we also note that the analysis of the obtained results also allows us to pay attention to the facts that testify in favor of the assumption that the circles on the surveyed areas are "creations" of non-human hands. The results of experimental studies comments by the authors from this perspective (aspect) are given in this paper below.

Additional comments from a position that crop circles are creations of "non-human" hands. The expediency of publishing the comments below is due to the need to intensify research and technological work aimed at the search, production and practical use of natural hydrogen in the energy sector of the world economy!

1. All surveyed areas with circles are located above almost identical structural elements of cross-section – basalt volcanic complexes (volcanoes, basalt columns) with an upper edge at a depth of 5-6 m and with roots at a depth of 99 km.

2. Signals at hydrogen frequencies were recorded at all circles, and instrumental measurements established the facts of hydrogen migration into the atmosphere.

3. The deep structure features of local areas with circles in different regions of England [54] allow us to fairly reasonably assert that at the moment Man on Earth (Humanity) does not own technologies that allow you to quickly determine the position of a local area on Earth's surface with predetermined cross-section settings. Therefore, crop circles are "creations" of non-human hands!

The results of the implementation on some sites of the circles location of measuring procedures for recording responses at frequencies of a significant number of chemical elements generally confirm (strengthen) the previous conclusions (assumptions).

There is no objection to the assertion that such a wide range (set) of chemical elements (including rare earths) is not used in technical devices, created by Man.

The results of additional research on local areas with a circle on Qinghai Lake in China generally strengthen the above assumption: the crop circles were created using technical devices (aircraft, most likely) not by Man!

Further reflections and assumptions can (and should) be built (led) in the following direction. Currently, Humanity on Earth is planning (developing) and implementing projects for the transition to carbon-free energy – the use of hydrogen as a fuel. Hydrogen is known to be the most abundant chemical element in the Universe. And here it is quite possible to conclude that more advanced civilizations in the Universe have been using hydrogen as fuel for a long time.

Consequently, the results of the experimental studies carried out in the areas of the crop circles allow us to suggest that such a nature of the "image" in the fields is formed by unearthly

aircraft during (in the process) of their refueling (charging) with the fuel of the future on Earth – natural hydrogen!

And here the following thoughts (considerations, warnings) come to mind! Unfortunately, at present on Earth, the emphasis (bets) is not on the search, extraction and use of natural hydrogen (the most common chemical element in the Universe), but on its production! Paradox!!!

And the following assumption (statement) in conclusion. Crop circles are formed (purposefully, most likely) in the process (during) refueling of non-terrestrial aircraft with hydrogen – an environmentally friendly fuel of the future on Earth.

The process of detecting accumulations of natural hydrogen in the bowels (cross-section) of the Earth, its extraction and refueling of aircraft of unearthly origin is carried out quite quickly and efficiently.

It is advisable for the technological and mining sectors of the world economy to rely on the search, extraction and use of natural hydrogen (the most common chemical element in the universe), and not on its production.

And once again, we focus on the fact that the super-mobile direct-prospecting technology for frequency-resonance processing and decoding of satellite images and photographs can make a significant contribution to solving the problem of providing Humanity with an environmentally friendly fuel of the future – natural hydrogen!

Local site on the Moon

Testing of direct-prospecting methods for the satellite images and photographs frequency-resonance processing was also carried out on planets and satellites of the Solar System [43]. This section presents the results of an examination of the local landing site (lunar landing) of the descent module of the Chinese spacecraft Chang'e 5.

Figure 20a shows an image of a local site of the Moon, obtained from the Chinese lunar spacecraft Chang'e 5 at its landing site on December 1, 2020 [6].

During frequency-resonance processing of this image, signals of hydrogen and igneous rocks of the 6th group (basalts) were recorded from the surface. The root of the basalt volcano was identified at a depth of 84 km.



Fig. 20. Landing site of the Chinese lunar vehicle Chang'e 5: image from the descent module (a) [6]; image from NASA's LRO satellite (b) [22].

Of the 6th group igneous rocks (gabbros and basalts), available in the database, responses were recorded from three dolerite samples and a leucodolerite sample.

From all these samples, the responses from the upper part of cross-section were recorded on surfaces (depths) of 10 m, 1 m, 70 cm, 60 cm, 55 cm (of low intensity). On the surface of 50

cm, there were no responses from dolerite samples and a leucodolerite sample from the upper part of cross-section.

At a depth of 55 cm, signals from the 7th group of sedimentary rocks (limestones) were recorded from the upper part of cross-section; no responses from these rocks were obtained from the lower part of cross-section. On the surface of 0 m from the upper part of cross-section, responses from hydrogen were recorded, which indicates its migration into the space above the Moon surface.

Figure 20b shows an image of the landing site of the Chinese descent vehicle from NASA's LRO satellite [22]. During frequency-resonance processing of a fragment of this image, signals from the 7th group of sedimentary rocks (limestones) and basalts were recorded from a rectangular contour in the center. The thickness of the limestone layer is estimated at 55 cm. The root of the basalt volcano is established at a depth of 84 km.

The responses at hydrogen frequencies were recorded up to 84 km. The fact of hydrogen migration into the space above the Moon surface was confirmed.

Frequency-resonance processing of image fragment in a rectangular contour on the left revealed the presence of a volcano of sedimentary rocks of 7th group (limestones) with a root at a depth of 84 km.

It is also worth noting that during processing an image of a capsule with rocks from the Moon (delivered to Earth on December 17, 2020), signals of dolerite samples numbered 102 (intensive), 103, and 105 were recorded. No responses of the leukodolerite sample (105) were recorded.

Gas field in the deep-water part of the China Sea

In October 2022, information appeared on the Internet sites about the discovery by the Chinese CNOOC Limited Company of a large gas field in the deep-water part of the China Sea [17]. A well with a depth of 5188 m was drilled at the field site, in which a gas-saturated reservoir with a thickness of 113 m was found.

Some information messages, including [17], provide photographs of a drilling rig in the field area (Fig. 21). The presence of photographs of the drilling site provided the authors with the opportunity to conduct additional testing of the super-mobile direct-prospecting technology for frequency-resonance processing of satellite images and photographs [33-34] in order to replenish the base of surveyed blocks, areas and sites of exploratory and production wells drilling for oil and gas on land and in offshore areas in various regions of the globe. Such a base is necessary to demonstrate the operability and efficiency of mobile direct-prospecting methods and technologies that provide for oil and mining companies the possibility to accelerate and optimize (cheaper) significantly the exploration process for oil, gas, natural ("golden") hydrogen, ore minerals and water.

Results of instrumental measurements at October 28, 2022. For experimental studies, a small fragment (in rectangle) of a photograph of a drilling rig location was used (Fig. 21). During the frequency-resonance of this image, a limited number of instrumental measurements were made.

During image fragment at Fig. 21 processing, from surface, responses were recorded at the frequencies of hydrocarbons (oil, condensate, gas), white phosphorus, and sodium-chloride salt.

When scanning the cross-section to a depth of 5200 m with a step of 50 cm, the responses at the frequencies of gas from salt were recorded from the following intervals: 639-750 m, 3288-3410 m, 4718-4807 m, 4979-5155 m.

To clarify the position of gas-saturated intervals, the cross-section was additionally scanned with a step of 5 cm. Responses at the frequencies of gas from salt were recorded from

the intervals 1) 641-745 m (104 m), 2) 3295-3368 m (73 m), 3) 4719-4801 m (82 m), 4) 4982-5153 m (171 m).

It should also be noted that when performing the procedures of cross-section scanning, the depth reading is carried out from the water surface.

Further instrumental measurements at the well drilling site were not carried out.



Fig. 21. Drilling platform "Offshore Oil 982" on the site of the Baodao 21-1 gas field [17].

Brief comments. At the surveyed drilling site, responses at gas frequencies were recorded from the surface, as well as in four intervals of the salt section by scanning.

Responses were additionally recorded from the surface at the frequencies of condensate, gas, white phosphorus, and salt.

These results suggest that the gas field is located within a salt-filled volcanic structure in which, at a depth of 57 km, conditions exist for the synthesis of oil, condensate, and gas. The presence of a salt volcano in the area of the deposit can be confirmed (or refuted) by experimental studies of a detailed nature. We also note that in the contours of salt volcanic structures, signals at the frequencies of white phosphorus are almost always recorded.

The total thickness of the four intervals of fixing responses at gas frequencies in the cross-section significantly exceeds the value of the thickness of the gas-bearing reservoir given in the report [17]. On the one hand, it is advisable for the Company's specialists to additionally examine the intervals of cross-section, identified by scanning. On the other hand, these intervals can be refined (rather quickly) when scanning the cross-section with a step of 1 cm or less.

Additional studies of a detailed nature at the location of the field using the technology of frequency-resonance processing of satellite images and photographs allow:

- A) By scanning cross-section, determine the intervals of responses at the frequencies of oil and gas condensate;
- B) Establish the presence and determine the depth of location of oil and gas saturated formations at depths below the bottom of the well;
- C) Determine the optimal location within the field of exploration and production wells.

Areas of additional reconnaissance investigation in China

When testing mobile direct-prospecting methods, satellite and photo images from published articles were used, and were prepared also using the Google Earth software package. We also note that a limited set of instrumental measurement procedures was performed at the first three survey sites. A significantly larger volume of measurements was carried out at the site

with the Luntan-1 deep well. Processing procedures of the same nature can be additionally implemented also on the three local areas below. Some results of reconnaissance surveys of areas with coal mines in various regions are presented in articles [36, 40, part 1].

Shenfu deep CBM field in Yulin City (China) [11]. State-owned China National Offshore Oil Corporation (CNOOC) has announced the discovery of its first deep coalbed methane (CBM) field. Located at around 1,500 meters in northwest China's Shaanxi Province, the coalbed has reported reserves of over 110 billion cubic meters.

The coal seam of the Shenfu deep CBM field is about 2,000 meters deep and the thickness of a single layer is between 6 meters and 23 meters, with average gas content per tonne of coal reaching 15 cubic meters. Currently, more than 100 exploratory wells have been dug in the area, with a maximum daily gas output of 26,000 m³ per well [11].

The photographs presented in the information message [11] with wells within the Shenfu deep CBM field (Fig. 22) provide an opportunity, using the procedure of vertical scanning of cross-section, to determine the depths and thickness of gas-saturated reservoirs, including those located under coal seams at great depths. In this case, by additional instrumental measurements in a detailed mode the presence (absence) of natural hydrogen in cross-section of the field can be established. Let us note here that in the process of searching for the coalbed methane accumulations in the French coal basin, deposits of natural hydrogen were discovered in cross-section [12].

During the frequency-resonance processing of a photograph from a coal deposit in Fig. 22b, signals were recorded from the surface at frequencies (frequency spectra) of oil, gas condensate, gas, amber, carbon dioxide, yellow phosphorus, oil shale, gas hydrates, anthracite, nitrogen, oxygen. Instrumental measurements confirmed the synthesis of hydrocarbons (oil, condensate, gas) and amber on the surface of 57 km.

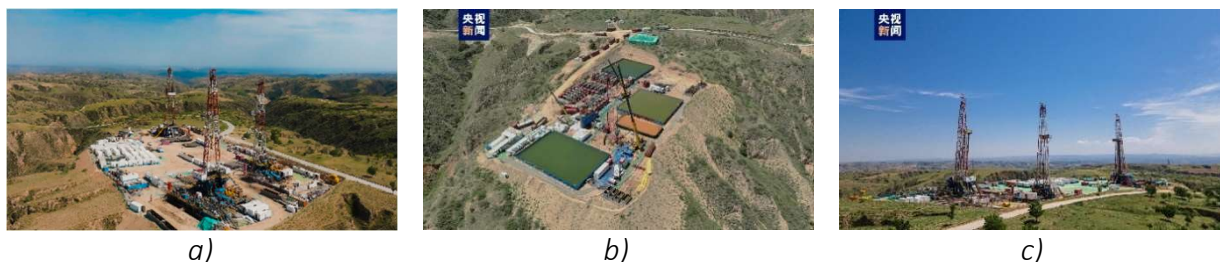


Fig. 22. The views of the Shenfu deep CBM field in Yulin City, northwest China's Shaanxi Province [11].

In the depth range of 0-2 km, signals at oil frequencies were recorded at 37 s of measurements, gas – at 7 s, and responses of condensate were not recorded for 150 s!

When scanning a cross-section from 2 km to 10 km with a step of 50 cm, responses at oil frequencies were recorded from the following depth intervals: 1) 2314.5-2553.0 m, 2) 2754.0-3042.5 m, 3) 3186.0-3392.5 m, 4) 3618.5-4970.0 m, 5) 5111.0-6206.5 m, 6) 6673.5-7262.0 m, 7) 7416.5-8469.0 m, 8) 9060.0-9930.5 m.

Signals at condensate frequencies in depth range of 2-10 km were not recorded within 180 s of measurements; gas responses in this interval were recorded at 25 s!

The Fuman oilfield in the Tarim Basin [3, 5]. When frequency-resonance processing of a photograph from field (Fig. 23b) in integral mode, signals at oil frequencies were recorded at 47 s of measurements, condensate – at 48 s, gas – at 12 s! Responses of methane-oxidizing bacteria and white phosphorus were also recorded.

From the depth interval of 312-7150 m, responses were obtained from salt (blotch of salt volcano deposit), 7.150 km - 57 km - 470 km – 8th (dolomite) group of sedimentary rocks. And on

the surface of 470 km and deeper, signals were recorded at the frequencies of the 1st group of igneous rocks (old granites).

In the depth range of 312-7150 m, signals at oil frequencies are recorded from 11 s of measurements, gas condensate – from 12 s, gas – from 7 s!

In the depth range of 0-312 m and 7150-10000 m, signals at HC frequencies were not recorded within 3 minutes of instrumental measurements!



Fig. 23. The views of Fuman oilfield in the Tarim Basin of northwest China's Xinjiang Uygur Autonomous Region. /China Media Group [5].

Deep well in the Taklamakan Desert (Tarim Basin) [4]. In 2023, Chinese specialists began implementing a project to drill a scientific exploration well with a design depth of 11100 meters. To implement this project, drilling equipment has been developed that allows drilling at great depths under conditions of high temperatures and pressure. The well is being drilled in the interior region of the Taklamakan Desert in the Tarim Basin. At the end of October 2023, the drilling depth exceeded 8 thousand meters. Photographs of the well location are shown in Fig. 24.

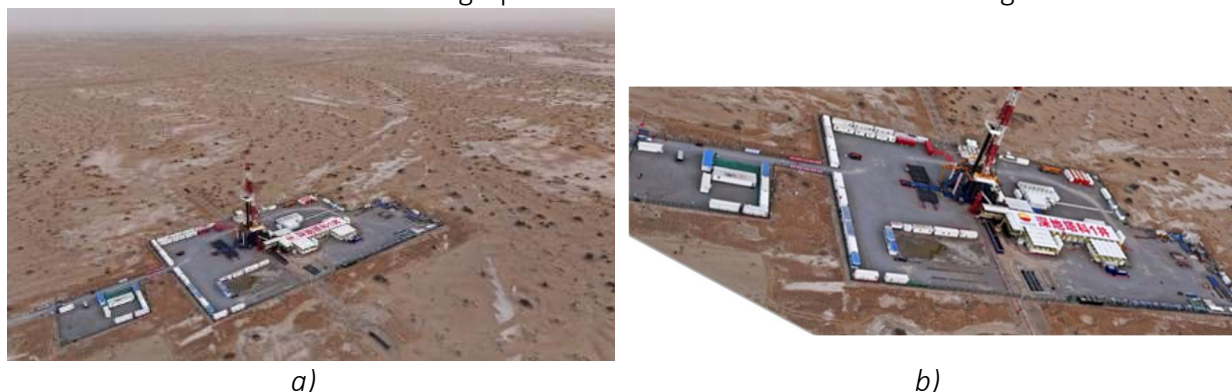


Fig. 24. Photographs of a deep well drilling site in the Taklamakan Desert [4] (Tarim Basin, China).

During the frequency-resonance processing of a photograph of a site with a well in Fig. 24a signals at HC frequencies are not detected. Responses from black phosphorus, lonsdaleite, potassium-magnesium salt and helium (in the 10th group of sedimentary (siliceous) rocks) were recorded from 14 s of measurements!

When processing the photo image in Fig. 24b signals were recorded from the following groups of rocks: 1) 0-1265 m – 1-6 groups of sedimentary rocks (2-5); 2) 1265-3908 m – 7th group of igneous (ultramafic) rocks; 3) 3908-5787 m – 8th group of sedimentary rocks (dolomites); 4) 5787-7120 m – 7th group of igneous (ultramafic) rocks; 5) 7.120-11.0-57-99-723 km – 10th group of sedimentary (siliceous) rocks),

In the depth range of 1265-3908 m, responses at HC frequencies were not recorded within 2 minutes of measurements. Signals at the frequencies of black phosphorus, lonsdaleite, potassium and magnesium salts were recorded from 6 s of measurements each. From the interval 5787-7120 m (7th group of igneous (ultramafic) rocks), signals from black phosphorus, lonsdaleite, potassium and magnesium salts were not recorded within 60 s of measurements each.

From the interval 0-7120 m, signals at helium frequencies were not received, but from the interval 7.120-15.0 km, responses from helium were recorded!

Projects of China's Provinces territories reconnaissance surveying

Oil and gas project. The results of approbation and practical application of the direct-prospecting technology of satellite images and photographs frequency-resonance processing allow us to reasonably conclude that their targeted use during the search and exploration of oil and gas deposits can significantly speed up and optimize the exploration process. Promptly carried out reconnaissance surveys of the territories of large blocks in various regions of the world (in China, including) can be considered as additional confirmation of the potential capabilities of mobile direct-prospecting technology. On the other hand, the results of the survey of large blocks indicate the potential possibility of a reconnaissance survey of the entire China's Provinces territories in order to identify the most promising areas (blocks) for oil and gas detailed exploration.

For the practical implementation of this project, the satellite images of China's Provinces territories may be divided into separate blocks, the frequency-resonance processing of which will be carried out separately. The possible options for dividing the satellite images of two China's Provinces territories into separate fragments is shown in Fig. 25. This images with rectangular contours show 66 and 190 local fragments (blocks) for processing.

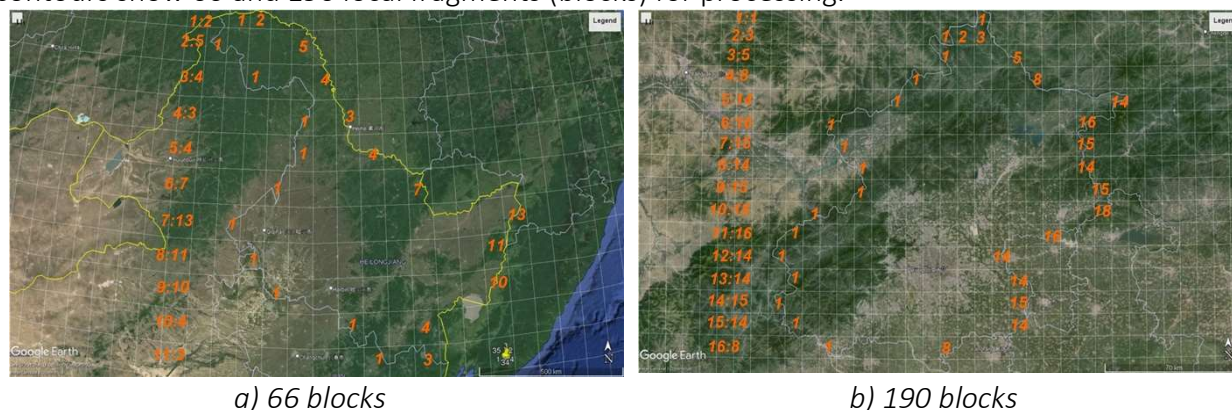


Fig. 25. Satellite images of China's Heilongjiang and Beijing Provinces territories.

Frequency-resonance processing of all 66 (190) fragments of two China's Provinces satellite images can be performed quite quickly. During image processing, the following set of measurement procedures may be performed: a) fixation from the surface of anomalous responses at frequencies of oil, condensate and gas; b) registration of signals at the frequencies of methane-oxidizing bacteria (bacteria, whose populations are analyzed in method of microbiological exploration for oil and gas by MicroPro GmbH, Germany); c) establishing the presence of a volcanic structure within the survey area, in which there are conditions for the hydrocarbon's synthesis at a depth of 57 km; additional fixation of responses of oil, condensate and gas at this depth; d) fixing signals at frequencies of oil, condensate and gas from lower part of cross-section at depths of 5, 10 and 15 km in order to assess prospects of oil and gas discovering in deep horizons of cross-section.

The listed procedures of instrumental measurements have fully demonstrated their effectiveness and informativeness in the process of direct-prospecting methods approbation in the areas (sites) of drilling exploratory wells on land and shelf in various regions of the globe and basalts volcano's location [35-38, 40-41, 45, 47-51, 54-55, 57-58, 60].

Notes. Additional procedures for instrumental measurements and the features of their implementation within the framework of this project can be formulated (clarified), if the expediency of its implementation will be recognized.

Within the most promising for oil and gas blocks, found in two China's Provinces, the detailed prospecting can also be quickly carried out using methods of satellite images and photographs frequency-resonance processing. The prepared fragments of a satellite images of two China's Provinces territories (Fig. 25) can be additionally processed in the reconnaissance mode within the framework of separate projects for identifying blocks, that are promising for detailed prospecting for: a) natural hydrogen; b) ore minerals; c) water.

Hydrogen project. During frequency-resonance processing of each fragment of the two China's Provinces territories images in the reconnaissance mode for natural hydrogen searching, a limited set of instrumental measurements of the following nature may be performed separately: a) procedure for recording signals (responses) at frequencies of the 6th group of igneous rocks (basalts); b) the procedure for determining the depth of basalt volcano root (in the case of fixing responses from the surface at basalt frequencies); c) procedures for fixing signals (responses) at the frequencies of hydrogen, phosphorus (red) and hydrogen bacteria; d) instrumental measurements to confirm (or establish absence) of hydrogen migration into atmosphere.

The expediency of implementing listed set of instrumental measurement procedures during survey is due to results of direct-prospecting methods testing in various regions of globe. The materials of numerous studies allow us to state following: a) responses at hydrogen frequencies are recorded almost everywhere during instrumental measurements in contours of basalt volcanic complexes; b) red phosphorus is almost always present in basalt volcanoes; c) hydrogen bacteria create their colonies in upper part of cross-section in areas of hydrogen migration into atmosphere.

To implement the second stage of the work, one of two conditions was met: within one surveyed fragment basalt complexes with hydrogen were found and responses were recorded at the frequencies of red phosphorus and hydrogen bacteria. Further continuation of research within local block is possible only with the participation of at least one "China Company" in the implementation of the "project".

At the second stage of project implementation within local block, studies of the following nature can be performed: a) the satellite image of the block may be processed in a detailed mode in order to localize areas (zones) of the basalt volcano's location and select the most promising for exploratory wells drilling for hydrogen; b) in the contours of the most promising local zones, a detailed scanning of cross-section will be performed in order to determine the depths and thicknesses of hydrogen reservoirs in the cross-section above the basalts, as well as in the basalts directly; c) within promising local zones, the depths and thicknesses of reservoirs with living (healing) water may be determined by detailed scanning, and healing properties of living water in identified reservoirs of cross-section may be also studied.

Based on the results of detailed processing of satellite image of local block, a decision will be made to drill exploratory wells in the most promising local areas. At the initial stage of drilling, wells can be designed to study reservoirs with hydrogen in the upper horizons of cross-section. During drilling, reservoirs with living water can also be studied. Based on the results of the first wells drilling, a decision can be made on the next stages of research for the further implementation of the "project".

About efficiency of geological-geophysical exploration for oil and gas

In many publications, including [24], it is noted that the efficiency of prospecting and exploration for oil and gas does not exceed 25–30%. It is also stated here that the main reasons for this situation are "the dogma of the organic genesis of hydrocarbons and the orientation of deep drilling towards positive structural traps of the sedimentary cover, the fund of which is currently close to exhaustion" [24]. At the end of this article, the authors also draw "attention to

the need for a mass transition to “direct” prospecting, which is important in the conditions of low success in hydrocarbon exploration” [24].

The authors of the monograph [25] in the introduction write (state) that in «the South Caspian Basin, the largest Western multinational companies and their consortium for period from 1995 to 2008, having drilled 28 exploratory wells with depths up to 7301 m on 21 highly promising structures, previously surveyed by high-resolution 3D seismic, **did not discover a single commercially viable field, spending about \$1 billion on their search**» [25, p. 10]. We add to this fragment of the text that some results of direct-prospecting methods testing in the Caspian Sea, which testify in favor of the expediency of their use in the exploration process for oil and gas in combination with traditional geological and geophysical ones, are presented in published article [52]. The publications [40-41, 55, 60] present materials of examination of sites for exploratory wells drilling in offshore areas in various regions of the globe.

The document on the website [23] provides the following information: “In the most recently updated resource accounts, the NPD estimates that there is a lot of oil and gas left on the Norwegian shelf. As of now, about **1,250 exploration** wells have been drilled in the North Sea. Despite many discoveries, **more than half of the wells are dry**”.

The article [30, p. 37] provides the following information about the results of well drilling: “During the long period of study of deep horizons in the Shebelynka deposit, a significant amount of seismic research was conducted and **11 wells with a depth of 4491–6106 m were drilled from 1997 to 2002. No industrial inflows were received.** Industrial gas inflows from Upper Carboniferous deposits were obtained only from well No. 701 within 10 hours”.

The above considerations in [24, 25] do not raise any objections from the authors of this paper. Moreover, they can be confirmed by the results of a large-scale (long-term) approbation of mobile direct-prospecting methods in various regions of the globe on large exploration blocks, local areas and drilling sites of exploration wells.

Comments and suggestions. Obtained during the testing process in 2019-2023 of super-mobile direct-prospecting methods new data can be characterized in the form of the following comments and suggestions.

New geological facts. As a result of a large volume of instrumental measurements, numerous facts (evidence) were obtained in favor of:

- a) a volcanic model of the formation of the external appearance (surface), as well as the structural elements of the Earth, planets and satellites of the solar system;
- b) a volcanic model of the formation of ore and combustible minerals, as well as water (mineralized, mineral, living, dead) in volcanic complexes of a certain type;
- c) abiogenic (deep) synthesis of oil, gas and condensate [46] in the process of hydrogen degassing of the Earth [26] within volcanic structures, filled with some types of sedimentary and igneous rocks.

Reasons of low efficiency. Based on the results of studies conducted using direct-prospecting methods, the low efficiency of exploration for oil and gas can be summarized as follows.

1. Conducted experimental studies in various regions of the globe on Earth established the presence of 10 types of volcanic complexes filled with 1) salt; sedimentary rocks 2) 1-6th, 3) 7th (limestones), 4) 8th (dolomites), 5) 9th (marls) and 6) 10th (siliceous) groups, as well as igneous rocks 7) 1st (granites), 8) 6th (gabbro and basalts), 9) 7th (ultramafic) and 10) 11th (kimberlites) groups.

2. Numerous experiments have shown that the conditions for the synthesis of oil, condensate and gas at the boundary (surface) of 57 km are created only in 5 types of the 10 volcanic complexes listed above: 1) salt, 2) 1-6th groups of sedimentary rocks, 3) limestone, 4)

granite and 5) ultramafic rocks. It should be noted that the conditions for HC synthesis do not arise in all volcanoes of the 5 listed types.

3. In the contours of volcanic structures, in which conditions are created for the synthesis of hydrocarbons at the boundary of 57 km, detailed studies fix vertical channels for the migration of hydrocarbons, fluids and mineral matter into the upper horizons of the cross-section. In the process of vertical migration, hydrocarbons fill reservoirs and form (and replenish) oil and gas deposits.

4. In the process of volcanic activity, the 10 types of volcanic complexes, listed above, can create anticlinal structures, which are quite confidently mapped by seismic methods. However, anticlinal traps in volcanic complexes, where there are no conditions for hydrocarbon synthesis, cannot be filled with oil and gas. Hydrocarbons can get into such traps only from adjacent volcanic structures, in which conditions for the synthesis of hydrocarbons and their migration to the upper horizons of the cross-section exist (and if such volcanoes are located nearby).

5. The results of the reconnaissance survey of the locations of "dry" drilled wells showed that almost all of them are located in the contours of volcanic complexes, in which there are no conditions for hydrocarbon synthesis! The low efficiency of prospecting for oil and gas is reasonably justified by the results of instrumental measurements by direct-prospecting methods. Such results should be considered weighty arguments in favor of the expediency of using direct-prospecting methods and technologies to search for hydrocarbon deposits, as well as ore minerals and water.

An additional survey of sites of exploratory wells drilling using direct-prospecting methods will significantly increase the drilling success rate. To assess the objectivity and information content of additional processing, a well-studied interval in an already drilled well can also be processed in parallel.

It should also be noted that a detailed survey by direct-prospecting methods of the structure, on which drilling of an exploratory well is planned, will provide additional information to assess the prospects for detecting hydrocarbon accumulations in industrial (commercial) volumes within the structure being drilled.

A detailed examination of the structure can reveal and localize a vertical channel of hydrocarbon migration from the synthesis boundary to the upper horizons of the cross-section, if the structure is located in the contours of a volcanic complex in which there are conditions for hydrocarbon synthesis (in the central part of the volcano). Drilling wells in the vicinity of such channels can help increase fluid inflows from prospective horizons.

6. When using the developed direct-prospecting methods, the criteria for the prospects of hydrocarbons detecting within of exploration areas are following:

a) fixation from the surface of anomalous responses at the frequencies of oil, condensate and gas;

b) registration of signals from the surface at the frequencies of methane-oxidizing bacteria (bacteria whose populations are analyzed in the method of microbiological exploration for oil and gas of MicroPro GmbH company);

c) establishing the presence of a volcanic structure in the survey area, in which there are conditions for hydrocarbon synthesis at a depth of 57 km; additional fixation of responses from oil, condensate and gas at this depth;

d) determination by the cross-section scanning of intervals (depths and thicknesses) of responses at the frequencies of oil, condensate and gas;

e) the listed criteria's have fully demonstrated their effectiveness and information content in the process of direct-prospecting methods testing in the areas (sites) of exploratory wells drilling on land and shelf in various regions of the globe.

Perspectives for efficiency improving. Above, the emphasis is on increasing the success rate of drilling exploratory wells. And the large-scale use of super-mobile technology of frequency-resonance processing and decoding of satellite images and photographs provides an opportunity to significantly increase the efficiency of geological exploration for oil and gas in general – to reduce the time and financial resources spent on its implementation. In this regard, let us pay attention to the following points.

1. Processing of satellite images and photographs of blocks and areas of study is carried out promptly in a laboratory mode without organizing and conducting field geological and geophysical work. The amount of time it takes to do this is very small.

2. The technology of integrated assessment of the prospects of discovering oil and gas deposits within the big blocks and local areas of study allows obtaining additional information with minimal time to make a decision on the feasibility of detailed work carrying out within a specific area (site).

Possible direction of direct-prospecting methods application. Let us briefly characterize a possible scenario for the mobile direct-prospecting technology using.

1. In some regions, licensed blocks (areas) are put up for auction (bidding) for geological exploration and subsequent development of discovered oil and gas deposits. At the same time, a certain amount of geological and geophysical work can already be performed on these blocks and areas.

2. Potential Investor (Subsoil User, Company) intends to take part in the auctions for some license areas.

3. For a more informed decision on the blocks of interest to the Investor, he can be offered to quickly assess the prospects of hydrocarbon deposits discovering in the required blocks by processing satellite images of these blocks in the integral mode. Prior to such an assessment, the performance and information content of the technology can be demonstrated to the Investor at promising intervals of 1-2 drilled wells, known to him.

4. After promptly carried out frequency-resonance processing of satellite images of licensed blocks, the Investor receives additional (and fairly objective) information to make an informed decision on which blocks to participate in the auction (including the block of First Priority, i.e., participation in the auction until victorious end). Let's add to the above that the information content of the processing materials for the priority block can be additionally confirmed by the results of the integral processing of the satellite image of the block known to the Investor, where hydrocarbons are already being produced.

5. After the Investor makes a decision on the Priority block, even before the auction, the satellite image of this block can be processed in a detailed mode to assess the prospects of commercial (industrial) hydrocarbon deposits detecting within it. If such local areas are found, within the most optimal site, a detailed cross-section scanning can be carried out to select the location of the exploratory well, as well as to prepare design documentation for its drilling.

6. And as soon as the Investor wins the auction for the Priority block, he immediately, without carrying out additional geophysical work within it, initiates actions to prepare for drilling and implements the drilling project itself. We also note that in case of loss at the auction, the Investor can sell the results of using direct-prospecting methods on the Primary block to the winning Competitor.

7. If the commercial volumes of oil or gas in the Priority block are confirmed by drilling, detailed studies can be carried out within it using direct-prospecting methods to assess the prospects of detecting hydrocarbon deposits in the deep horizons of the cross-section, detecting and localizing vertical channels of deep (abiogenic) hydrocarbons migration, as well as in local (promising) areas in other parts of the block. If a decision is made on the expediency of selling a

block (or part of its cost) to another Investor (Company), 3D seismic surveys can be carried out on the area, where the block is located.

Note also that currently seismic surveys (in 3D modification in particular) are the main method of oil and gas prospecting. In this regard, when assets are sold, the availability of seismic data increases their value.

On the other hand, experts also note that even with a significant increase in the detail of 3D seismic methods, the drilling success rate does not increase significantly. And it is quite clear why – only the accuracy of mapping structures increases. But the seismic method is not direct-prospecting, and what the structure is filled with from seismic data is not determined with the required reliability.

Of course, the best option in this situation is the combination of seismic and direct-prospecting methods. But seismic specialists will not agree to this – they will not advertise super-mobile direct-prospecting technologies, their potential competitor.

Direct-prospecting technologies and management. The proposed strategy can work only if a management structure (body), interested in accelerating (increasing efficiency) the search and exploration process and increasing oil and gas production, takes up its implementation.

Hydrocarbons deposits, discovered during the implementation of such a strategy, can be transferred (sold) in the future to mining companies or private investors. And the management structure itself can be engaged in the implementation of projects of a similar nature in other promising areas and sites.

Theories of oil and gas genesis. It has already been noted above that the biogenic theory of oil and gas formation does not contribute to the increase of the efficiency of geological exploration for hydrocarbons – most oil and gas geologists are not supporters of abiogenic (deep) hydrocarbon synthesis.

The influence of the biogenic concept is most clearly manifested in the oil and gas shale basins of the world. In these basins, the development of deposits takes place mainly in shale plays, in the upper part of the cross-section.

A survey by direct-prospecting methods of some areas (sites), located within the shale basins, showed that most of them are located in the contours of volcanic structures, in which, at a depth of 57 km, there are conditions for the synthesis of oil, condensate and gas. When scanning the cross-section in these areas, the intervals of responses at the frequencies of oil and gas in the deep horizons of the cross-section are fixed. A detailed survey of sites in shale plays in horizons, promising for the hydrocarbon's detection, can determine the types of reservoir rocks and seals.

In general, the results of a direct reconnaissance survey of a number of areas in shale basins allow us to reasonably assert that in these basins the volumes of oil and gas in the deep horizons of the cross-section significantly exceed the volumes of hydrocarbons in shale reservoirs directly.

Purposeful application of direct-prospecting methods and technologies in shale basins will speed up the study and assessment of the oil and gas potential of the deep horizons of the cross-section and significantly increase the volume of oil and gas production.

Natural hydrogen searching. At present, the processes of transition to hydrogen energy are taking place on a large scale in the world. Unfortunately, in this direction, the emphasis is on the production of hydrogen, and not on the search for and extraction of natural hydrogen. One of the reasons for this state of affairs is the lack of proven methods for natural hydrogen accumulations searching.

In this regard, we note once again that direct-prospecting methods of satellite images and photographs frequency-resonance processing can move the problem of searching for and extracting natural hydrogen accumulations from a dead center. The reconnaissance survey of numerous zones of visible hydrogen degassing, as well as basalt volcanic structures in various regions of the world, testify to the huge volumes of natural hydrogen in the bowels of the Earth.

Financial costs for the natural hydrogen searching using direct-prospecting methods and its subsequent extraction will be significantly less than for its production.

Discussion of results and main conclusions

The article presents the materials (results of instrumental measurements), obtained during experimental studies for purpose of additional testing, as well as improving the methodological technique of mobile direct-prospecting methods using during solving various geological problems. It should be noted, first of all, that a limited number of instrumental measurement procedures were performed in an accelerated mode on the surveyed blocks and areas.

A fundamentally important result of the performed experimental work are additional facts (evidence), obtained during the satellite images and photo image processing, in favor of the deep (abiogenic) genesis of oil, condensate and gas in the process of hydrogen degassing of the Earth [26]. At the moment, most specialists are guided in their practice by the principles and provisions of the biogenic theory of the hydrocarbon's genesis. From this point of view, the estimates of the volumes of methane and other gases, that migrate into the planet's atmosphere, can be significantly underestimated. Numerous facts of fixing signals (responses) from oil, condensate and gas at the boundary of their synthesis 57 km in various regions of the world (including within the surveyed areas) allow us to make an assumption about the migration of abiogenic methane into the Earth's atmosphere in colossal volumes!

The processes of hydrocarbon abiogenic synthesis continue to this day. Hydrocarbons synthesized at the 57 km synthesis boundary migrate to the upper horizons of cross-section, where they form deposits and replenish existing (known) ones. In areas where many known fields are located, as well as in promising for hydrocarbon blocks, the facts of gas (methane) and carbon dioxide migration into the atmosphere were recorded by instrumental measurements! In areas where basalt volcanic complexes are located, facts of hydrogen migration into the atmosphere are recorded also. Therefore, stopping the use of oil and gas will not stop the migration into the atmosphere of methane and carbon dioxide pollutants!

We also focus attention on the fact that results of experimental investigation, presented in this paper, as well as in other publications of the authors, performed with the developed measuring equipment using, are weighty arguments in favor of the "volcanic" model of the formation of various structural elements and the external appearance of Earth, planets and satellites of the solar system, as well as deposits of combustible and ore minerals (hydrogen and water including).

In general, the results of experimental studies at some blocks and sites in the China, replenish the existing database of the examined structures and mineral deposits in various regions of the world. The research materials accumulated in this database will allow us to formulate statistically substantiated recommendations of a methodological nature for the combustible and ore minerals searching.

The conducted studies show also that the super-mobile technology used makes it possible to significantly speed up and optimize (cheapen) the exploration process for combustible and ore minerals, as well as water.

We also note that many researchers focus on the expediency of accelerating the exploration process for various types of minerals. In particular, the article [8] discusses and analyzes the paradigms of prospecting studies for oil and gas, and proposes a new model of prospecting works: "Faced with a challenging economic scenario and the need to prospect immense frontier areas that could provide new and rewarding exploratory opportunities, the oil and gas industry needs to adopt a new exploration model, focused on a faster, less expensive and more direct way of identifying and assessing prospective leads. New and emerging technologies are the key to achieving this change. Fortunately, several of these technologies are now available,

and they have proven to be effective and compatible with the new exploration model proposed” [8, P. 140].

In the article [15] the breakthrough technologies for minerals prospecting are discussing. The author of this article [15] also notes the importance of using Earth remote sensing (ERS) data in the exploration process. We add to the above that modern technologies of remote sensing data processing and interpreting have made it possible to detect tens of thousands of volcanic structures of various types on Earth [14], Mars [20] and Venus [32], which significantly strengthens the position of the volcanic model of the formation of structural complexes of the Earth and planets and satellites of the Solar System.

It is necessary add to the above that NASA has developed the EMIT (Earth Surface Mineral Dust Source Investigation) technology, which is used to detect methane plumes on the surface [18]. Using its satellite capability, NASA says it has located at least 50 so-called “methane super-emitters” worldwide. One of the examples of technology application is presented in Fig. 26a; mapped methane plume in Permian shale basin. NASA experts associate its occurrence with the oil and gas production infrastructure [21]. Direct-prospecting technology can be used to study the deep structure in the areas of the methane plume’s location.

The results of a reconnaissance survey of a local area within the large Shenfu coalbed methane deposit once again confirm the conclusions drawn from previously conducted studies about the possibility of oil, condensate and gas deposits detecting in the deep and ultra-deep horizons of coal basins. It is advisable to carry out detailed geological exploration work in order to search for hydrocarbon deposits in coal deposits in various regions of the world!

Materials of experimental studies at the Fuman oil field site and the Luntan-1 deep well drilling site indicate the potential possibility and feasibility of direct-prospecting methods using during the most optimal locations selecting for drilling deep exploratory wells for oil and gas.

Helium deposits may be discovered at an ultra-deep well drilling site in the Taklamakan Desert at depths of over 7120 m. By detailed scanning of this section interval, the depths of helium accumulations in the reservoirs can be determined.

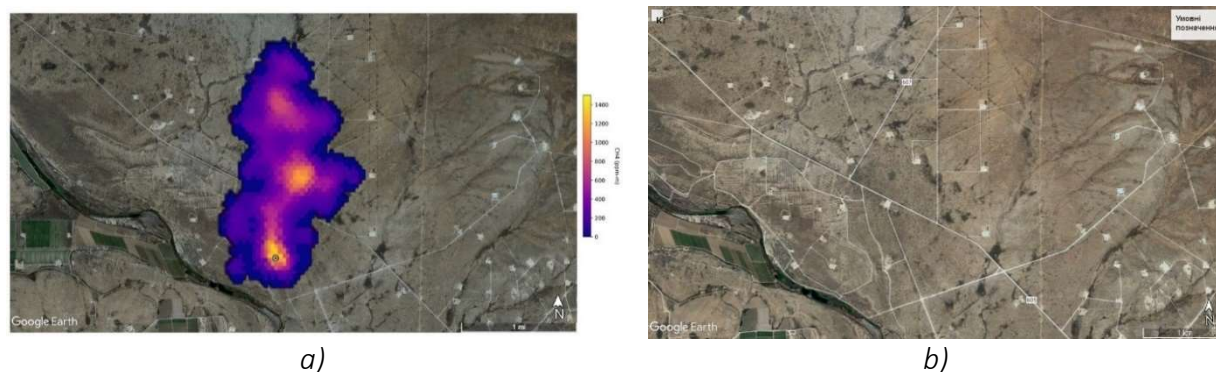


Fig. 26. Two-mile (3 km) long plume associated with Permian Basin oil and gas infrastructure [21].

The results of the approbation of direct-prospecting methods of frequency-resonance processing of satellite and photo images within areas of coal deposit’s location in various regions of the globe (on the China territory including) indicate that accumulations of hydrocarbons can be detected in the lower horizons of coal basins within the deep channels of fluid and mineral substance migration. In areas with lignite deposits, in the accelerated mode of conducting instrumental measurements, responses at oil frequencies are not recorded.

Features and the results of hydrogen deposits searching by direct-prospecting methods in different regions of the globe may be commented as following.

1. When testing direct-prospecting methods with numerous instrumental measurements in the contours of volcanic structures of a certain type at a depth of 57 km, a boundary was established at which conditions were created for the synthesis of oil, condensate and gas from hydrogen and carbon migrating from below. Signals (responses) at the frequencies of oil, condensate and gas are recorded at this boundary and above, and deeper – only of hydrogen and carbon.

2. Such results of instrumental measurements suggest that if not all hydrogen at this boundary is used for the synthesis of hydrocarbons (due to a lack of carbon, among other things), then it, together with hydrocarbons, can migrate to the upper horizons of cross-section and fill together with them the oil and gas reservoirs of cross-section. Hydrogen was discovered in wells that were drilled for oil and gas.

3. When conducting experimental studies at survey sites and areas in various regions in reconnaissance (accelerated) mode, with virtually no delays, intense responses were often recorded at the resonant frequencies of hydrogen and the 6th group of igneous rocks (basalts). Moreover, if the procedure for recording signals at basalt frequencies was carried out first, then responses at hydrogen frequencies were recorded almost always at the stage of performing the procedure for recording signals from hydrogen, and vice versa.

4. In this regard, in the future, when carrying out experimental work in order to detect and localize areas, promising for detailed geological exploration of natural hydrogen, procedures for measuring responses (signals) at the frequencies of basalts, hydrogen, hydrogen bacteria and red phosphorus were carried out. Additionally, instrumental measurements were also carried out in order to establish the presence (absence) of migration of hydrogen and red phosphorus into the atmosphere. Let us also note that hydrogen bacteria create their colonies in the near-surface parts of cross-section in areas of hydrogen migration into the atmosphere, and signals at red phosphorus frequencies are almost always recorded in the contours of basaltic volcanic complexes.

5. To the above, it is advisable to add a fragment of text from the article [2]: "Some scientists hold a different opinion regarding the coexistence of hydrogen and methane. In particular, in the work [27], it is noted that hydrogen deposits can be formed outside of hydrocarbon deposits, since hydrogen is spent on the formation of methane and its homologues. Although it is emphasized that the detection of hydrocarbon and hydrogen deposits should be solved as a single complex task, according to the principle: where there are hydrocarbons, there is no hydrogen. According to [27], this estimated hydrogen is already largely spent on the formation, maintenance and possible modern increase of hydrocarbon reserves in the basin. Only those parts of it that, due to the lack of active carbon and other reasons, remained not involved in the formation of hydrocarbons can be promising. Probably, both points of view regarding the coexistence of methane and hydrogen are appropriate, which is caused by various processes of their natural genesis. If the source of origin is common, for example, biogenic, then both methane and hydrogen can be present in the gas composition of rock massifs. In those cases where hydrogen, together with carbon, is the building material for the formation of methane, the amount of hydrogen will be limited or it will be completely absent."

6. The work carried out by the HyTerra Company [13] at the Hoarty NE3 well in Geneva (Nebraska, USA) to test promising intervals for hydrogen has not yet been completed with the publication of information about the discovery of hydrogen accumulations in commercial volumes. Most likely, HyTerra will not continue further work on the well. To this we add that in 2019, frequency resonance processing of a photograph from the well drilling site was carried out. Based on the results of the frequency resonance processing of a fragment of the photograph, it was concluded that hydrogen accumulations in the drilled well in commercial quantities will not be detected. The drilling area is promising for hydrocarbon exploration. The results of the processing

were published in 2019 [37]. Now we can state that these results have been confirmed by drilling. It is also advisable to pay attention to the time interval: 2019 – 2023!

7. The results of a reconnaissance survey of areas for searching and drilling wells for natural hydrogen allow us to conclude that the focus of Investors and Companies on conducting prospecting work and drilling in the areas, where drilled wells are located in which hydrogen is discovered, will not lead to the discovery of its accumulations in industrial (commercial) volumes in the near future! In this situation, the geological, geophysical and mining industries of the world economy are losing the race for financing large-scale projects to convert the economies of the world to the use of environmentally friendly fuel of the future – hydrogen!

8. Large-scale testing of super-mobile direct-prospecting methods for frequency-resonance processing of satellite images and photographs [35-38, 40, 45, 47-51, 54, 57-58] in local areas and large blocks in various regions of the globe has shown that intensive signals at the frequencies of natural hydrogen are almost always recorded within volcanic complexes, filled with basalts. In many cases, responses of hydrogen are also recorded at shallow depths in rock complexes overlying basalts. Such results allow us to conclude that the areas and blocks with basalt complexes are the primary targets for detailed prospecting work and drilling wells for natural hydrogen conducting.

In general, the results of the experimental reconnaissance studies, presented above, once again clearly demonstrate the operability, information content and efficiency of direct-prospecting methods for frequency-resonance processing of satellite images and photographs during the integral assessment of the prospects of detecting accumulations of oil, gas and natural hydrogen within survey areas, as well as when determining the depths of occurrence and thicknesses of predicted deposits in the cross-section. The materials of the article testify to the expediency of using the mobile technology of frequency-resonance processing and decoding of satellite images and photographs for the detection and localization of oil and gas accumulation zones within large blocks and local areas. The use of this technology can bring a significant effect in the search for industrial accumulations of hydrocarbons in unconventional reservoirs (including areas of shale, coal-bearing formations, and crystalline rocks distribution). Additional surveys promptly carried out using direct-prospecting methods in local drilling areas of prospecting and exploratory wells will contribute to an increase in the drilling success rate (an increase in the number of wells with commercial hydrocarbon inflows). The laying of wells in the areas, where vertical fluid migration channels are located, can lead to an increase in hydrocarbon inflows. Mobile technology can also be successfully used during the exploration of poorly explored areas and blocks within known oil and gas fields. The application of super-efficient and low-cost direct-prospecting technology will significantly speed up the exploration process for oil, gas, natural hydrogen and ore minerals, as well as reduce financial costs for its implementation.

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PORPHYRY COPPER DEPOSITS OF EAST KAZAKHSTAN

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Abstract. The approach to the non-ferrous metals consumption market has changed quite noticeably in the global economy. High-tech industries require new materials based on non-ferrous and rare metals from the market. Significant copper reserves are concentrated in various types of copper and copper-containing deposits. These are pyrite-polymetallic and copper-pyrite deposits.

Kazakhstan's potential for copper is large deposits of copper-porphyry type (Aktogay, Aidarly, Bozshakol, Koksai). The ores of these deposits are characterized by low copper content, but significant reserves. The study of the features of the mineral composition of copper and copper-porphyry deposits of East Kazakhstan is of great practical importance for replenishing the mineral resource base. The research will significantly increase the industrial significance of ore occurrences and small copper deposits that have not been sufficiently studied yet.

Keywords: perspective, copper sandstones, industrial value, Karasu river, ore occurrence, ore zone, copper porphyry, East Kazakhstan.

The production and consumption of copper in the world is increasing every year. In terms of consumption, the red metal ranks 3rd in the world. The richest countries in terms of copper reserves: Chile-22%, USA-12%, China -6%, Kazakhstan - 5%, Poland - 5%, Indonesia-4%, Russia-3%, Zambia-3%. Leaders in copper ore production (ICSG data): Chile - 34%, USA - 10%, Indonesia - 8%, Peru - 7%, Australia - 6%, Canada-5%, Russia - 4%, Poland-3%.

The world giants of the copper mining field: Chukicamata, Chile, have been mining for more than 100 years (26 million tons) and Escondida (23.6 million tons). T), which has been in Chile since 1990, in Grasberg (27.1 million. t) in Indonesia, Kolyahuasi (17 million. t) Chile, October (16 mil. t) Russia and Udokan (14 mil. t). Among the largest recently discovered deposits are: Antamina in Peru, El Tesoro in Chile, complain and Sossegu in Brazil, Nurkazgan in Kazakhstan, uyu-Tolga in Mongolia, Pebble in Alaska, El Pachon in Argentina [1, 2, 3].

There are large copper porphyry deposits in Kazakhstan-Aktogay, Aidarli, Konyrad, Bozshakol, Nurkazgan, Koksai, which are widely developed and intensively developed. The ores of these deposits are mined in most cases by open-pit method, differ in large reserves and low copper content (0.3-0.9%) [4].

The explored reserves of copper in the Republic are 40.8 million tons, of which more than 77% are concentrated in the Central and eastern regions. About 23% of reserves are evenly distributed in the rest of Kazakhstan. The main geological and industrial images of copper and complex deposits, where 91.8% of copper reserves are concentrated, are copper sandstones, pyrite-polymetallic, copper colchade and copper porphyry. Currently, the main industrial property is occupied by three main types, which guarantee the total volume of copper mining in the Republic. This article discusses the prospects for opening new copper porphyry facilities in East Kazakhstan.

The largest copper porphyry facilities in Kazakhstan include the nurkazgan, Aktogay,

Aidarli, Bozshakol, Koksay deposits.

Kazakhstan is among the five leading countries in terms of explored copper reserves (4th place). The share of global copper reserves is 6%. Copper porphyry deposits account for a significant weight in these reserves. The largest deposits of this type include the Bozshakol and Aktogay deposits, which in terms of ore reserves are comparable to such large world copper producers as Muryntau (Uzbekistan), superpit (Australia), Chikukanata (Chile) [1]. Bozshakol is a large open-pit mine where copper is mined. It is located on the territory subordinate to the Ekibastuz akimat of Pavlodar region, 18 km north of the railway station of the same name on the Pavlodar-Astana road.

The ores of the Bozshakol deposit are complex copper-molybdenum. The copper content averages 0.72% and molybdenum 0.014%. In high quantities, silver (9.26 g/t), gold (0.28 g/t), bismuth, platinum, palladium, cobalt (0.005%), selenium (3.82 g/t), tellurium (0.26 g/t), lead, zinc, cadmium, antimony, arsenic, rhenium (0.001 g / t).

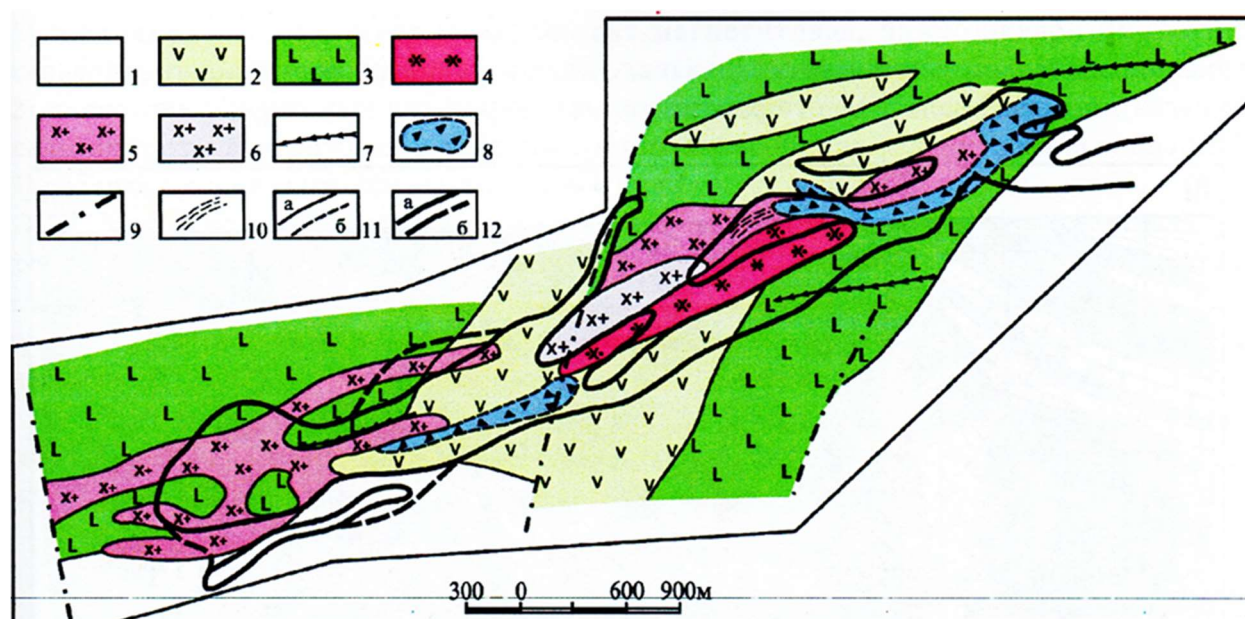


Figure 1 – A drawing of the geological structure of the Bozshakol deposit (according to V.P. Sedach and N.A. Taran))

1 – Ordovician and Neogene-quaternary deposits; 2 – medium – composition volcanites; 3 – main-composition volcanites; 4-plagiogranodiorites – porphyry, diorite – porphyry with a cryptovaya main mass; 5 – porphyry granodiorites; 6 – uniform crystalline granodiorites; 7 – diabases, dolerites, diorites; 8-large-capped breccias; 9-tectonic disturbances; 10-relaxation zones of rocks; 11-lithological (A) and conditional (B) connections; 12-contours of ore bodies (A) and scattered ore mineralization (B).

The main source of copper in East Kazakhstan is numerous colchedan-polymetallic deposits. Due to the relatively small reserves of lead, there are deposits that are considered copper-kolchedan (Nikolaevskoye, Akbastau, Kusmurun, Orlovskoye). Among other types of copper deposits in East Kazakhstan, the Aktogay deposit, which is currently being developed, is known. There are also resources in the form of small objects (copper-porphyry, copper-pyrrotin and copper-nickel), the industrial significance of which has not yet been studied.

The Aktogay field is located in Ayagoz District (East Kazakhstan).

The Aktogay ore Valley is bordered by the sub-latitudinal Gorstanticline (fig. 1, 2), its core is folded by the volcanites of the arm formation (C3-P1) and intruded by the granitoids of the arm

intrusion.

Volcanic rocks are represented by lava, Tuffs and ignimbrite of the andesite-dacite and andesite compounds. In the composition, intrusive formations form gabbro-diorite, granodiorite granite and granodiorite-porphry. Linear rocks consist of diorite and diabase porphyrites, microdiorites, diabases. Ore rocks are medium-grained Quartz diorites, granodiorites granites and volcanites. Cornification and subsequent hydrothermal changes make it difficult to diagnose the structure and composition of the original rocks of the hill remains. It was found that for less altered varieties, their mineral composition corresponds to dacites, less often to andesite-dacites.

Intrusive rocks in the deposit belong to different phases of arm intrusion. The southern part is dominated by porphyrite diorites and diorite porphyrites. While uniform granular diorites predominate in the northern part of the deposit, porphyritic varieties are rare. Sometimes there are gradual transitions from uniform granular diorites to granodiorites. The last time of introduction is uniform granular granodiorites, which stretch along the North-West expansion Strip in the southern part of the deposit and are widely developed in the East and North.

Ores are represented by linear-crossed copper-molybdenum ores. The main ore minerals include chalcopyrite, pyrite, bornite and molybdenite. Small minerals are sphalerite, pyrotite, magnetite and galenite. The oxidation zone is 15-20 m. the oxidation zone is characterized by the presence of typical minerals: malachite, chrysocolla, hematite, limonite.

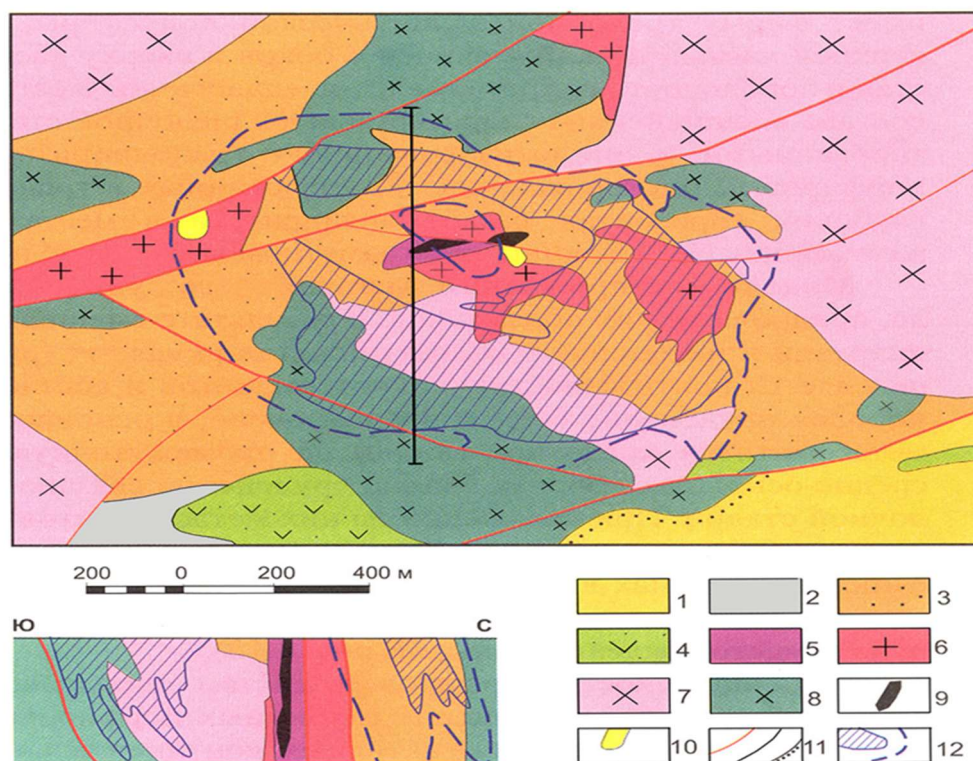


Figure 2 – A drawing of the geological structure of the Aktogai deposit (N.M. Zhukov)

1 - sandstones, gravelites, Tuffs, liparites and dacites (C3-P1); 2 - tuffs of dacite and andesite-dacite composition ; 3 - horn and horn porphyrites and tuffs; 4 - stock and andesite-dacite porphyrites; 5 - granodiorite-porphry; 6 - porphyrite granite-granodiorites; 7 - granodiorites; 8 - gabbrodiorites, diorites; 9 - breccia zones; 10 - quartz contacts ; 11 – contacts; 12 - projection of the boundaries of ore bodies.

On the territory of East Kazakhstan, many small deposits of particular interest are known (Kelteshat, Tulkuli, anomaly 29, Koktas, argarlyk copper, Mynbulak).

Among the promising areas, Kelteshat, Foxglove and Anomaly 29 stand out. Ore phenomena are located in East Kazakhstan, 80 km southeast of the city of Ayagoz. These copper objects were studied in the 60-70s of the last century. They are characterized by a small amount of reserves, which were not paid special attention at that time. Given the high price of copper today, they represent industrial value.

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Chemical Sciences

ҒАРЫШТЫ ИГЕРУДІҢ ҚАЗАҚСТАННЫҢ ЭКОЛОГИЯЛЫҚ ЖАҒДАЙЫНА ӘСЕРІ, ОНЫҢ ПРОБЛЕМАЛАРЫН ШЕШУ ЖОЛДАРЫ

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THE IMPACT OF SPACE EXPLORATION ON THE ENVIRONMENTAL SITUATION OF KAZAKHSTAN, WAYS TO SOLVE ITS PROBLEMS

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Аннотация. Жұмыстың мақсаты ғарыштық кеңістіктің ластануының қоршаған ортаға әсерін зерттеу. 1948 жылдан бастап 1961 жылдар аралығындағы кезеңде 29 геофизикалық зымырандарды ұшыруға дайындап және ұшыру жүзеге асырылғаны, Жердің 2 жасанды спутниктерін және 2 ғарыштық корабль-спутниктерді ұшыру жүзеге асырылғандығы анықталды. 48 итке эксперименттер қойылды, олардың ішінде 15 ит екі және одан көп рет ұшырылды, сондай-ақ көп мөлшерде басқа да биологиялық нысандар ұшырылды. Адамзат қысқа мерзім ішінде 4 мыңнан астам тасымалдаушы-зымырандарды ғана ғарышқа жіберіп қоймай, ғарыш кеңістігін де, жер бетін де ғарыштық қалдықтармен ластан үлгерді. Егер біз қоршаған ортаға қамқорлық жасамасақ, онда бізді қоршаған орта және тірі ағзалар жойылуы мүмкін.

Түйінді сөздер: ғарыш, зымыран, биологиялық нысан, ғарыштық қалдықтар, экология

Abstract. The objective of the work: a study of the influence of space debris on the environment. It is established for the period from 1948 to 1961 was prepared and implemented 29 starts geophysical rockets, implemented flights 2 of artificial Earth satellites and 2 spacecraft, satellites. They had done experiments on 48 dogs, of which 15 animals flew by 2 and more times, and also in a huge number of other biological objects. Humanity in such a short period of time to

not only make more than 4 thousand launches rockets, but also umudrilos' a clog. If we do not take care about the environment, then we all could die and the surrounding people.

Keywords: space, rocket, biological object, space waste, ecology

Адамзат әрдайым ауа райы құбылыстарының нормадан ауытқуына түсінік беруге тырысып келді. Яғни тарихтың белгілі бір уақыт аралығындағы байқалатын ауа райының жағдайының өзгерістеріне түсініктеме беруге тырысты.

Осындай түсініктеме беру үшін біздің өмірімізге кең ауқымда кіретін адамзаттың кейбір қызметінің жеке түрлері тартылды және тартылуда. Бұрын радиодан ауа райының өзгерістері жайлы хабарлар берілген кезде ауа райының нашарлығына радионың әсері бар деген сөздер айтылды. 1928 жылы англияның «Радиохабар тарату» акционерлік қоғамы Англияның метеорологиялық қоғамына тұрғындардың арасындағы радио ауа райының нашарлауына себепкер деген сенімділігін теріске шығаруын және ауа райының нашарлауына радионың қатысы бар деген айыптауды теріске шығаруын сұрады [1].

Қазіргі кезде кезекті жауын-шашынды күні өз істеріне асығып бара жатқан адамдар «тағы да спутник ұшырылған ғой – ауа райы тағы бұзылды» деген сөздерді жиі естиміз. Бұған байланысты айтар болсақ жердің жасанды серіктестері- спутниктер ауа райына ешбір әсер етпейді. Себебі қазіргі кездегі ауа райының жағдайы туралы метеорологиялық мәліметтер, осы спутниктердің және ғарышкерлердің орбитада жұмыс істеуі нәтижесінде алынады. Ауа райы жайлы мәліметтерді теледидардан берген кезде ғарыштан түсірілген суреттердің теледидар арқылы берілуі әдеттегі дүниеге айналды. Тіптен жақын арадағы ауа райы жағдайын білу үшін тікелей эфирден ғарыштағы ғарышкерлерден сұрау ешкімді таңдандырмайды да.

Ауа райына, климатқа және қоршаған ортаға адам қызметінің әсерімен байланысты антропогендік әсер етуін бірқатар жағдайда табиғи үрдістердің ғаламдық масштабымен салыстыруға болады. Әлемдік мұхит біртіндеп ластануда, табиғи су айналымы бұзылуда, атмосфера құрамында өзгерістер байқалуда.

Осының бәрі ғарыштық кеңістіктің де біртіндеп өзгеріске ұшырап жатқандығы туралы айтуға негіз болады. Сондықтан қазірдің өзінде ғарышты игеру нәтижесінде ғарышты экологизациялау үрдісі жүруде. Екінші жағынан алғанда ғарыштық техникалардың өзі қоршаған ғарыштық ортаға да белгілі бір әсерін тигізуде. Ғарыштық аппараттарды іске қосқан кезде, олардың орбитада жұмысы кезінде және ғарыштық кеңістікке кірген кезінде ғарыштық аппараттардан әр түрлі газ тәрізді, сұйық және қатты заттарды шығаруы есебінен болады. Дегенмен адамзаттың Жердегі шаруашылық қызметінің әсері басымдау болып отырғанын ғылыми зерттеулердің деректері растауда [2].

Жердегі де, ғарыштағы да адамның қызметімен байланысты Жер маңындағы ғарыштық кеңістікке антропогендік әсер ету проблемасын зерттеу мақсатында 1976 жылы ғылыми одақтардың Халықаралық кеңесі жанындағы ғарыштық зерттеулер жөніндегі Комитетінің шешімі бойынша ғарыштық ортаға осындай ықтимал зиянды әрекет етуді қарастыру жөнінде комиссия құрылды. 1979 жылы КОСПАР конференциясында осы комиссиямен жүргізілген зерттеулердің кейбір алдын ала нәтижелері хабарланды, 1982 жылы жерге және жер маңындағы ғарыштық кеңістікке антропогендік әсер ету проблемалары бойынша зерттеулердің кейбір алдын ала нәтижелері жарияланды.

Бұл тақырып мені өз мамандығымыд таңдаған кезден бастап қызықтыруда, себебі Қазақстанда бұл саладағы зерттеулер аз. Сондықтан осы тақырып бойынша зерттеу жұмыстарын қазірден бастап жүргізіп, болашақта да осы зерттеу жұмысын әрі қарай жалғастырғым келеді. Қазақстанда «Байқоңыр» ғарыш айлағы орналасқан. Сондықтан да зымырандарды ұшырған кезде қоршаған ортаға да, адам денсаулығына да олардың әсері зор. 2011 жылы адамның алғаш рет ғарышқа сапар шегіп, ғарышты игергеніне 50 жыл толды.

Осы 50 жыл ішінде Қазақстан Республикасының екі азаматы да ғарышқа сапарға аттанып, ғарышты игеруге өз үлестерін қосты. Менің де осы салада медициналық-биологиялық зерттеулер жүргізіп, ғарыштық ғылым саласына өз үлесімді қосқым келеді.

Осы мәселелерді зерттеу маған қызығушылық тудырды және осының жауабын тапқым келеді.

Жұмыстың мақсаты: Қазақстанда ғарыштық айлақтың орналасуына байланысты ғарыштық қалдықтармен қоршаған ортаның ластануын зерттеу.

Ғарышты зерттеу тарихы. Ғарыштық зерттеулерге иттер мен маймылдар пайдаланылды. себебі олар қолдан үйретуге тез көнеді және бейім болды. дегенмен де иттер маймылдарға қарағанда төзімдірек болғандықтан ғарышқа сапарға иттер жіберіле бастады. иттерді атмосфераның жоғарғы қабаттарына жіберу бойынша эксперименттің негізгі бөліктері астрахань облысындағы капустин яр полигонынан геофизикалық зымырандармен жүргізілді. зымырандардың 100-400 км биіктікке дейін ұшатын болды және олардың бөлінетін басты бөлігі жолаушыларымен қайтадан жерге парашютпен оралады. осындай зымырандарда иттердің ұшуын зерттеу үш сатыда жүргізілді.

Ғылыми зерттеудің бірінші сатысы (шілде-қыркүйек 1951 жыл). Ұшуды зерттеудің бірінші сатысы 100 км биіктікте **p-16, p-1в** геофизикалық зымырандардың көмегімен жүзеге асырылды. ұшу кезінде зымырандар қысқа уақыт аралығында 4212 км/сағат дейін жылдамдықпен ұшты [3].

Зерттеудің екінші сатысы (1954-1957 жылдары). Зерттеудің екінші сатысына жаңа катапуляцияланатын аппаратура жүйесін және жануарлардың ұшудың барлық деңгейіндегі жағдайын бақылайтын бақылау құралдарын сынау кірді. Ұшу 100-110 км биіктікте **p-1д** және **p-1е** зымырандарында жүргізілді, онда оттегі маскасынсыз арнайы скафандр кигізіп, иттерді әр түрлі биіктікте катапуляциялауға жағдай жасайтын аппаратуралар болды. әрбір ит жеке катапуляцияланатын арбаға орналастырылды. Арба мен скафандрлар «Звезда» зауытында арнайы дайындалды. зымырандар капустин яр полигонынан ұшырылды. бірінші Дамка және Мишка иттері ұшырылып, Дамка аман-есен оралды, Мишка өліп қалды [4].

Зерттеудің үшінші сатысы (1957-1960 жылдары). зерттеудің үшінші сатысында 212 және 450 км дейінгі биіктікке ұшатын **p-2а** және **p-5а** геофизикалық зымырандарында жүзеге асырылды. Бұл ұшуда иттер катапуляция жасамай, зымыранның басқы бөлігімен құтқарылды. Иттерден басқа кабинада егеуқұйрықтар мен тышқандар да болды. Екі рет иттермен бірге қояндар да ұшырылды. Кейбір эксперименттерде физиологиялық функцияларды зерттеу үшін иттерге наркоз беріп ұшырды. Белка мен Модница деген иттерді ұшырғанда Белкаға наркоз беріп ұшырды. Ұшу сәтті аяқталды [4].

Ғарыштық қалдықтардың сипаттамасы. Ғарыштық қалдық – бұл жұмысын тоқтатқан, алайда орбитада қалып қойған спутниктер, зымыран тасымалдағыштардың блоктары, тасталған отын бактары, сондай-ақ пружиналар, болттар және соған ұқсас ұсақ-түйектер. ғарыштық қалдық деген бұзылған, жұмыс істемейтін барлық жасанды спутниктер, ғарыштағы олардың бөлшектері. олар ғарышта ұшып жүрген ғарыштық аппараттар үшін қауіпті болып табылады. кей жағдайларда ғарыштық қалдықтардың нысандары борттағы ірі немесе ядролық, ұятты материалдар жер үшін де тікелей қауіп төндіреді. Олар орбитадан шығып кеткенде, толық жанбай қалғанда жер атмосферасының тығыз қабаттарынан өткенде және олардың сынықтары елді мекенге, өнеркәсіптік нысандарға, көлік коммуникацияларына түскенде қауіп төндіреді [5].

Ғарыштық қалдықтардың проблемалары. Ғарыш шексіз деген түсінік береді, алайда бұл жерде де жердегідей экологиялық проблемалар қалыптасуда. Бірнеше жылдар бұрын жерде де ауаның көлік шығарылымдарымен ластану қаупі болған жоқ. Қазіргі кездегідей кептелістер болған жоқ. Ғарышта да әзірше мұндай кептеліс әзірше жоқ. Алайда болашақта жер маңындағы өнеркәсіптік кешендерді тұрғызған және пайдалануға берген кезде, айды

игерген кезде жағдай күрт өзгеруі мүмкін. «Жер-космос» трассасы бойынша жүк тасымалдау қажет болады, орбитада ірі нысандар пайда болып, ғарыштық кеңістікте жасанды нысандар саны артады. сондықтан болашақ ғарыштық көлік проблемалары, әсіресе экологиялық жағы қазір жолға қойылуға тиіс. Заманауи қуатты зымыран-тасымалдағыштар орбитаға шығарылған кезде пайдалы жүктің массасынан 20-30 есе асатын бірнеше ондаған тонна отын жұмсайды. мысалы, американың «Сатурн-5» зымыранының старттық массасы 2900 т құрайды, ал оның пайдалы жүгінің салмағы 100 тоннаға жуық. қуатты зымыранды әрбір ұшырған сайын атмосфераға жүздеген тонна жану өнімдері тасталып отырды. Жер бетінде әр түрлі отындарды жағу есебінен атмосфераға жыл сайын қазір 20 млрд. тоннадан астам көмірқышқыл газы және 700 млн. тоннадан астам басқа газ тәріздес қосылыстар мен қатты бөлшектер, соның ішінде 150 млн. тоннаға жуық күкіртті газ шығарылады. күкіртті газ атмосфералық ылғалмен қосыла отырып күкірт қышқылын түзеді, оның өзі өсімдік және жануарлар әлеміне кері әсерін тигізетін қышқыл жаңбырлардың түсуіне әкеліп соғады [6].

Атмосфераның тығыз қабаттарында өз қызметін тоқтататын спутниктердің жану өнімдерімен атмосфераның ластану мүмкіндіктері туралы мәселе арнайы зерттелді. атмосфераның тығыз қабаттарында өз қызметін тоқтататын спутниктердің және басқа космостық аппараттардың жану әрекеттері атмосфераның күшті ластануына әкелмеуге тиіс. сондықтан космостық аппараттардың материалдарына қойылатын талаптардың бірі атмосферада жанған кезде уытты өнімдердің барынша аз мөлшерін бөліп шығару болып табылады.

Қазақстан үшін ғарыштық қалдықтар проблемасы өзекті мәселенің бірі. Батыс Қазақстан облысының аумағында екі белгісіз металл заттар аспаннан құлап түсті. Төтенше жағдайлар қызметі мамандарының ақпараты бойынша ол заттар орбитадан толық жанып кетпей жер бетіне жеткен орбитальдық спутниктің не болмаса зымыран тасымалдаушының сынықтары болуы мүмкін дейді. Бұл оқиға 2009 жылдың сәуірінде Батыс Қазақстан облысының Зеленовск ауданының Раздольное кентінің маңында болды. Алайда, ол туралы жақында ғана белгілі болды. 2009 жылдың 16 сәуірінде жергілікті шаруа қожалығы шаруашылығының екі механизаторы егу жұмыстарын аяқтаған соң үйлеріне қайтып келе жатқан. Түнгі саған 22-ге жуық Денис Кононов деген механизатор аспанда болидті көрді. Жарқыраған нысан күрт төмендей бастап, жерге құлап түскен. Метеоридтің құлаған жеріне Денис жеткен кезде ол жерден қып-қызыл болып жатқан металды көрген. Алдымен ол жақындауға қорыққан, алайда әуесқойлық қорқынышты жеңіп, ол суыған металды өз тракторына салып, кентке әкелді. Ауылдастарына көрсеткеннен кейін олар оны радиоактивті шығар деген соң лақтырып тастауға мәжбүр болған. Төтенше жағдайлар қызметі бұл жағдайды кейін естіп, білген. Меторит құлаған жерге санитарлық-эпидемиологиялық бақылау басқармасы мен төтенше жағдайлар министрлігінің қызметшілері келіп тексерген. Құлаған заттың басқа да бөліктері табылған. Олардың біреуі тіптен жоғары температураның әсеріне ұшырамаған. Аспаннан не құлағанын құзырлы органдар айта алмайды, алайда сыртқы белгілері бойынша - бұл ғарыштық қалдықтар. Нысандардың түрі бойынша олар ғарыштық аппараттардың қозғағыштары үшін отын сақталатын бактарға ұқсайды [6].

Соңғы кездерде ғарыштық қалдықтар проблемасы туралы өте жиі айтылып жүр. Қазіргі кезде біздің ғаламшарымыздың айналасында төменгі орбитада қолданыстағы ғарыштық аппараттармен соқтығысып қалу қаупі бар басқаруға келмейтін 10 мыңнан астам нысандар бар. Олар ғаламшардың кез келген жеріне құлауы мүмкін. 1978 жылдың өзінде-ақ американ ғалымы Дональд Кесслердің теориясына сәйкес жақын маңдағы космосты ластау космосқа кемелер жіберуді мүмкін емеске әкеледі. Жерден ұшқан әрбір зымыран ғарыштық қалдықтармен соқтығысары әбден мүмкін. Бұл теория бүгін «Кесслер синдромы» ретінде ғылымда белгілі [7].



Ғарыштық қалдықтардың Қазақстанның экологиялық жағдайына әсері. 2008 жылдың 24 тамызында Алтай тайгасына бортында құнды жүгі бар «Прогресс» ғарыштық аппараты құлап түсті. Апат әсерінен Халықаралық космостық станция (МКС) жұмысы тоқтап қалды. Сарапшылардың сөздері бойынша ғарыштық кеменің құлауы ресей аэрокосмонавтикаының жалпы дағдарысының салдары. «Прогрестің» құлауы экологиялық және экономикалық екі проблеманы тудырды. Апаттан кейін сарапшы экологтарда мазасыздық тудырды. Прогрестің бактарына құйылған

гептил өте уытты зат. Топырақтың, судың гептилмен ластануы экологиялық апатқа әкеледі.

Отын құйылған бактардың жарылысын вакуумдық бомбаның жарылуымен салыстыруға болады. Таралу аймағы бірнеше жүздеген шақырымды құрайды. Уытты зат гептилмен топырақтың терең қабаттары ластануы мүмкін. Құтқарушыларға радиацияға қарсы заттарсыз келуге тыйым салады [8].

Байқоңыр ғарыш айлағының сарапшылары жұртшылықты тыныштандыруға тырысты. Олардың пікірі бойынша отынның көп бөлігі «Прогресс» ұшқан кезде жанып кеткен. Қалғаны ғарыш кемесі жерге құлаған кезде түскен. Топырақпен реакцияға түсе отырып, содан кейін жанып кеткен соң қоршаған ортаға оның еш қауіпі жоқ деп санайды.

Ресейліктер топырақ пен судан алынған үлгілерде гептил жоқ деп жұртшылықты тыныштандыруға тырысты. Осыған қарамастан сол маңның тұрғындары ауруханаға тыныс жолдарының ауруымен қарала бастады. Бұл адамдар «Прогрестің» құлауының салдарынан осындай ауруға шалдыққандарына сенімді [9].



1999 жылдың 5 шілдесінде Байқоңыр ғарыш айлағынан ұшырғаннан кейін бірнеше минуттан соң «Протон» зымыран тасымалдаушы жарылысқа ұшырады. Оның сынықтары Қарағанды облысы Қарқаралы ауданына құлады. Сынықтың біреуі тіптен Көктас ауылының тұрғыны Ғалия Жүнісованың ауласына құлаған, қалғаны Беталыс көліне түскен. Қазақстан залалды бағалау және себебі анықталғанға дейін Байқоңыр ғарыш айлағынан ұшыруға тыйым салды. 14 шілдеде Қазақстан-Ресей келіссөздері

нәтижесінде Ресей спутниктерін ұшыруға салынған тыйым алынып тасталды. Ресей және Қазақстан медиктері Қарқаралы тұрғындарына төніп тұрған қауіп жоқ деген қорытынды жасады. Гептилмен улану белгілері таппады. Қазақстанға келген залалдың сомасы 270 мың доллар болды. 1999 жылдың 27 қазанында «Протон» зымыран тасымалдаушысының тағы бір апаты болды. Оның қалдықтары Қарағандыдан 100 шақырым жердегі Атасу кентінің маңына құлады. Оның тағы бір сынығы тұрғын үй ауласына құлады. Ақпан айында Байқоңырдан «Протондар» ұшыруға Қазақстан тағы рұқсат берді. 2001 жылы бірінші «Протон» құлаған ауданда орналасқан Милыбұлақ қыстауында белгісіз заттан уланып екі бала қайтыс болды. Сонымен қатар 25 мал өлген. Сол жердің тұрғындары сойған қойдың өкпесі мен бауыры іріңге толып, ыдырап кеткенін айтқан. Әрине мұның өзі гептилдің әсері екені айтпаса да түсінікті. Бұл ауылмен көршілес жатқан ауыл тұрғындары да бас ауруына, тіс ауруына жиі шалдығатын болған және осы ауылдың тұрғындарының арасында қатерлі ісік ауруына ұшырағандар саны да көбейген [10].

Беталыс өзенінен балық аулаушылар ондағы балықтар өте дәмді деп тамсануда. Ол ұланған ғой дегендерге гептилден ешнәрсе қалған жоқ қой деп жауап беруде. Ең алдымен гептил деген не соған тоқталайықшы: "*Gentil* – бұл өзіне тән иісі мөлдір сұйықтық. Суда жақсы ериды. Күшті әсер ететін у. Сениль қышқылынан алы есе уытты. Канцерогендік және мутагендік әсері бар. Сыртқы ортаның әрекетіне өте тұрақты. Гептилден де қауіптірек бірқатар заттарға ыдырайды. Бұл сипаттаманы 2002 жылы 28 қарашада «Новой газета» деп аталатын газет бетінде жарияланған мақаланы оқып таныстым. Бұл мақала Амур облысындағы Свободный ғарыш айлағының қызметіне арналыпты.



2001 жылдың қарашасында парламент мәжілісінің отырысы болды. Бұл отырыста ғарыш айлағынан гептил отынымен жұмыс істейтін екі мыңнан астам зымыран тасымалдағыштардың ұшырылғаны жайлы айтылды. Ғалымдардың зерттеулері Ұлытау ауданының топырағында, суындағы әр түрлі мөлшерде гептилдің бар екені анықтады. Кейбір жерлерде гептилдің ауадағы мөлшері бір шаршы метрде 0,1 мгм рұқсат етілген мөлшерге қарағанда бір шаршы метрде 2500 миллиграмға дейін жеткен. 2002 жылы 11 қаңтарда Астанада «Байқоңыр ғарыш айлағынан ұшырылатын зымырандардың тұрғындардың денсаулығына және қоршаған ортаға әсері» деген айдармен кеңес өткізілді. Осы отырыстан кейін көптеген нұсқаулықтар берілді. Ластанған жерлер шаруашылық айналымынан алынды. Алайда 2003 жылғы ақпанда Алматыда өткен конференцияға қатысушылар Байқоңырдан ұшырылған зымырандар экологияға әсер етпейді деп қорытынды шығарған. Гептилдің топырақтағы нормасы жоқ, сондықтан оның зиянын есептеу де мүмкін емес. Қарағанды облысы өнеркәсіптік аумақ, сондықтан адамдар мен малдардың өліміне гептилден де уытты қалдықтар әсер етуде деген қорытынды шығарған. Ғалымдардың пікірінше 1 грамм гептил 1 шаршы километр ауаны уландырады екен. Осы химиялық қосылыстардың туындылары өте уытты, сондықтан адам бірден уланады. Гептил уы әсіресе балаларда қауіпті ісік ауруын тудырады [11,15,16].



"Протон" бөлшектері құлаған жерлерде гептилдің шектеулі жол берілген деңгейі жоғары



Қарағанды облысында "Протон-М" зымыран тасмалдағышының құлауынан болған зиян республика үшін 8,2 миллион доллардан астамды құрайды. 2007 жылдың қыркүйек айында «Протон» зымыран тасмалдағыш тағы да ұшырылғаннан кейін қазақстан даласына құлап түсті. Қазақстан Ресейге «Протон» зымыран тасмалдағыштың құлауынан болған зардап үшін 8,6 млн. доллар төлеуін талап етті. Бұл зымыран тасмалдағыш Қарағанды облысы Жезқазған қаласынан 40 шақырым жерге құлаған [17,18].

«Протон» құлаған жерден 119 бөлшектері табылған, сондай-ақ зымыран тасымалдағыштың сынықтары құлаған кезде түзілген диаметрі 45 метр және тереңдігі 20 метр воронка табылды. Зымыран тасымалдағыш құлаған кезде онда 218 тонна 979 килограмм гептил (уытты зымыран отыны) қалған [12, 13].



А.К.Недайвода (ГКНПЦ) және В.С.Рачук (КБХА) даланың өртенуін тудырған РБ «Бриз» гептил бағын тексеруде



Апатқа себеп болған зымыран
қозғағышы



Далаға құлап түскен зымыран
қалдығы

Ғарыштық қалдықтарды болдырмау жолдары

Бұл проблемаларды шешу үшін:

- Қалдықтарды азайтуға әкелетін технологиялар мен құрастырылымдарды қалыптастыру қажет;
- Қызметтік жүйелер мен ғылыми аппаратураларды қоса алғанда, өз ресурстары біткеннен кейін космоста пайдалану үшін бейімделген космостық жабдықтардың құрастырылымдарын әзірлеу қажет;
- Экипаждың тіршілік әрекеті және жабдықтардың қызмет істеуі нәтижесінде түзілетін қалдықтарды ғарышқа ұшқанда қолданудың тиімдірек бағыттарын таңдау қажет;
- Ғарыштық қалдықтарды жою бойынша іс шараларды алдын ала ойластыру қажет;
- Көп мақсаттағы спутниктерді және аппараттарды космосқа шығару санын қысқарту керек;
- Қоршаған ортаға адам денсаулығына көп зиян келтірмейтін космостық кемелердің отынын ойлап табу керек [14].

Қорытынды. Адамзат өзіміздің ғаламшарымызды аялап, қорғай алмаймыз. Себебі бүгінгі күні қоршаған ортаның проблемасы қазіргідей жіті болмас еді. Дегенмен де, біздің Жеріміздің мөлшері шектеулі болса, әлем шексіз, оны қалдықтармен толтыра алмайтындай көрінеді. Бұл олай емес! Гравитация Заңы космостық қалдықтардың көп бөлігін жер маңындағы кеңістікке жиналуға мәжбүр етеді. Космосты игергенімізге жарты ғасыр уақыт өтсе де, адамзат ғарыштық кеңістікті қалдықтармен біршама ластап үлгерді. Тек ғарышты ғана ластап қойған жоқ. Космодром орналасқан менің Отаным, туған жерім Қазақстанның да даласы ғарыш кемелерінің қалдықтарымен ластануда. Оның өзі қоршаған ортаға, сол маңда тұратын адамдар мен жануарлардың денсаулығына кері әсерін тигізуде. Егер біз өзімізді қоршаған ортаға қамқорлық жасамасақ, қорғамасақ, онда біртіндеп тіршілік атаулы өз тіршілігін жояды. Космос та қамқорлықты талап етеді. Осы космосты игерудің елу жылы ішінде көптеген жетістіктерге жеттік, енді космосты игеруде Космос пен бізді қоршаған ортаны ластанудан қорғап, экологиясын жақсартуға да өз үлесімізді қосуымыз керек.

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EFFECT OF SILVER AND GOLD EXTRACTION FROM GOLD PRODUCTION WASTE ON GOLD VALUE

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SUMMARY

The article shows the materials for obtaining high-grade gold. To do this, copper and silver are displaced from gold ore. The first steps have been taken to obtain gold in our country. And for the most intensive prosperity of the production of ores from rocks, all new promising methods of their technology must be explored. This article provides several such methods.

Keywords: *gold, silver, copper, gold grade, etching method, cyanide acid.*

According to the 30-year contract signed between the British company "Anglo Asian Mining Pic" and the government of Azerbaijan since 1997, 400 tons of gold, 2500 tons of silver and 1 5 million tons of copper were produced.

In recent years, gold production in our republic has decreased sharply. During 2023, gold production decreased by 40% compared to 2022, while silver production increased by approximately 100%.

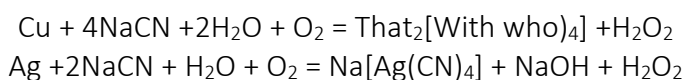
Currently, in the Söyüdlü-Zod gold field, located in the territory of the Kalbajar district, which was freed from the occupation of Armenian troops as a result of the second Karabakh war, and whose exploitation coincides with the 3rd millennium, "Chovdar" gold deposit in Dashkesan district. The exploitation works at "Azergold" CJSC have been taken under state control.

According to the mentioned, the mining industry in our Republic has started a new period of development. Therefore, there is a need for highly qualified personnel in this field, new discoveries, conducting scientific research works in the territories freed from occupation.

Our country has gold, silver, copper, etc. has metal reserves. The creation of special schools at the state level for the development of the mining industry requires the training of engineers with new teaching methods that meet modern requirements. One of the important issues is the creation of modern laboratories and the conduct of scientific work of Azerbaijani scientists in this field. Tons of gold have been produced in Azerbaijan for many years. An example of this is the gold plant operating in Gadabey, Dashkasan and the liberated territories (Kalbajar). New efficient technological methods should be developed for the intensive development of the mining industry.

Inspections carried out in Azerbaijan once again proved that Gadabey, Dashkasan, Tovuz, etc. There are large reserves of iron, gold, silver and copper in the area. Obtaining these metals in efficient ways is one of the actual problems. For this reason, attention should be paid to this field at the state level in our republic. Creation of modern laboratories, chemical engineers and skilled workers are needed for the mining industry. In this regard, in the article, the extraction of copper and silver, which lowers its percentage, has been studied in the purchase of gold.

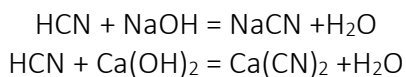
As is known, gold minerals used in industry contain copper and silver. Many methods are used to separate these metals from gold. It should also be noted that the amount of copper in the gold mineral is higher than that of silver. In the extraction of gold by etching methods, when the gold is put into solution, it goes into solution with the copper and silver contained in it. Buda prevents the process of pure extraction of gold. For this purpose, it is necessary to separate copper and silver from the solution. When gold is obtained by etching, copper and silver go into solution together with gold according to the following reaction.



One of the problems in buying gold is the high interest rate. In order to obtain a high quality of the gold produced at the Gadabey gold plant, it is necessary to clean it from silver and copper. Various methods are used to carry out this process. As is known, ores of copper and silver metals, which are elements of the first subgroup of the periodic system, are also found together with gold.

As we mentioned above, copper and silver go into the solution together with gold in the extraction of gold. To prevent this, it is necessary to precipitate copper and silver. Copper and silver $\text{Na}[(\text{Cu},\text{Ag})(\text{CN})_2]$ is in the form of a complex. To precipitate it, the pH of the solution must be lowered. For this purpose, sulfuric acid is added to the solution. At this time, NaCN , Na in the solution Na_2SO_4 and CuSO_4 such compounds are formed. The resulting salts are water-soluble compounds, so add Na to the solution Na_2S solution is added. At this time, silver and copper precipitate in the form of sulfides. Because they are hygroscopic, they absorb water from the environment and leave it in the form of mud. Special precipitants are used to completely separate it from the solution. For this purpose, it is appropriate to use organic compounds with large molecules, which behave as water absorbents when interacting with water.

During the above processes, HCN is released as a toxic gas. To neutralize this gas, the pH must be above 9.5. For this, it is appropriate to use calcium oxide or sodium hydroxide as a cheap means.



In the processes carried out, the pH should be strictly controlled. Thus, the change in pH reverses the process and causes problems in the extraction of gold. Thus, it is possible to separate silver and copper from gold by the indicated method. The indicated method is technologically very efficient as it is inexpensive.

A study was conducted in order to eliminate the environmental damage caused by the production waste of Gadabey and Dashkasan gold plants. For this purpose, the production wastes of Gadabey and Dashkasan gold plants were taken and brought to the laboratory, and the samples were studied. It was found that 1000 ml of waste contains Au - 0.07 mg/l, Ag - 0.09 mg/l, Cu - 5.3 mg/l, Zn - 2.825 mg/l, Fe - 10 mg/l. Small amounts of Rh and Pd metals were found in the waste.

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are several such methods.

Biological Sciences

ТҰРМЫСТЫҚ ҚАТТЫ ҚАЛДЫҚТАР, ОЛАРДЫҢ ҚОРШАҒАН ОРТАҒА ЖӘНЕ ДЕНСАУЛЫҚҚА ӘСЕРІ

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SOLID HOUSEHOLD WASTE, THEIR IMPACT ON THE ENVIRONMENT AND HEALTH

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Аннотация. Экологиялық нысан ретінде тұрмыстық қалдықтар алынып, олардың залалсыздандыру жолдары талданды. Жұмыста жалпы қалдықтар жіктеліп, оларды шикізат ретінде қолдану жолдары қарастырылды. Алматы қаласындағы тұрмыстық қатты қалдықтарды (ТҚТ) айқындау және сол тұрмыстық қалдықтардың шығу тегін сипаттау. ТҚТ-дан шыққан әр түрлі қосылыстардың бар екендігіне көз жеткізу. Олардың адам денсаулығына және қоршаған ортаға теріс әсер тигізетіні дәлелденді.

Түйінді сөздер: тұрмыстық қатты қалдықтар (ТҚТ), экология, денсаулық.

Abstract. As an environmental object, household waste was taken and ways of their disinfection were analyzed. In the work, general waste was classified and ways to use them as raw materials were considered. Determination of solid household waste in Almaty and description of the origin of these household waste. To make sure that there are different compounds that come out of the TFT. It has been proven that they have a negative impact on human health and the environment.

Keywords: solid waste, ecology, health.

Өзектілігі. Үшінші мыңжылдықтың басы ғылым мен технологияның геометриялық прогрессияға негізделіп дамудың жолында. Сонымен бірге адам қызметінің ең ірі саласы ретінде өнеркәсіп саласы да қарқынды алға басып келеді. Әрине мұндай түрдегі тенденция бүкіл әлемге жайылып дамушы елдердің көбінде таралған. Қазақстан Республикасы бүкіл

әлем бойынша ең қуатты өнеркәсіптік әлеуеті бар мемлекеттердің бірі болып табылады. Бұл байлықтың бір бөлігі Кеңес Одағы ыдырауы нәтижесінде қалды. Бұл бөліктің аса көп емес болғанына қарамастан Қазақстанның өнеркәсіптік саласы тұрақты және алға басып дамып келеді. Бұл саланың, яғни өнеркәсіп саласының, мінсіз емес болуына байланысты бұл этаптағы технологиялық үрдістер кесірінен қоршаған ортаға жағымсыз факторлар әсер етеді. Жыл сайын бүкіл әлемде, сонымен қатар біздің елімізде, биосфераға миллиардтаған тонна сұйық, газтәрізді, паста тәрізді қатты және т.б. қалдықтар түсуде. Осы қалдықтар әсерінен тірі және өлі табиғатқа орны толмас залал келуде. Жаһандық ауқымда өнеркәсіп саласының қалдықтары әсерінен су айналымы және атмосферадағы газдардың балансы бұзылды. Тірі ағзалардың көптеген түрі қауіпті қалдықтардың әсерінен көптеген тірі ағзаларға генетикалық деңгейде қауіп төніп тұр. Сол себептен кйбір ағзалардың мүлде жойылып кету қаупі тұр. Өнеркәсіп қалдықтарының мөлшері бір адамға шаққанда тұрмыс қалдықтарынан 20 еседен артық келеді. Агрегатты күйіне байланысты топтастыруда сұлы ерітінділер мен шламдарға араласқан (органикалық және аорганикалық), бейтарапты, сілтілі және қышқылды сұйық ерітінділер жатса, сусыздарға пайдаланылған шайырлар, мал мен өсімдік майлары, органикалық еріткіштер жатады. Әр өнеркәсіп өндірістері өнім өндіруге ғана назарларын аударып қоймай қор айналымын жүзеге асыратын әдістерге кешсе, қоршаған орта ластанудан қорғалынады. Аз немесе қалдықсыз технологиялық кешендер ұйымдастыру қажеттігі айқын, яғни бір жердің шеңберінен аспайтын қалдықсыз өндірістер емес, қалдықсыз өндірістік кешендер туралы сөз көтерілгені орынды. Бұл жағдайда бір өндірістің қалдығы басқа өндіріске шикізат ретінде пайдаланылады. Жұмыр жерді мекендейтін санмыңдаған тіршілік атаулының ішінде Жер-анаға адам баласынан артық қиянат жасайтын жан иесі жоқ екен. Басқасын былай қойғанда, саналы тіршілік иесі саналатын «*homo sapiens*»-тің күнделікті өмір қажеттілігінен артылған тұрмыстық қалдықтары мен күл-қоқысы ортақ планетамызды тұншықтырып барады. Қасиетті даласын көзінің қарашығындай аялайтын қазақ «ат аунаған жерде түк қалады» деп қастерлеуші еді. Енді табиғат аясына демалысқа шыққан әрбір адамның артында кемінде 10 кило қатты тұрмыстық қалдықтар қалатын болды. Қасіреті қалың қазақ даласында бүгінге дейін жиналған 22 млрд. тонна қалдықтың 96 миллион тоннасы қатты тұрмыстық қалдықтар екен. Бұл арнайы есепке алынған күл-қоқыс алаңдарына төгілгені. Ұлы даламыздағы күл-қоқыс «қоры» жыл сайын бірнеше миллион тоннаға көбейіп отыратын көрінеді. Ал ұлыдаланың жер-жерінде есепке алынбаған тау-тау күл-қоқыс қаншама?! Қазақстан ҚТҚ (қатты тұрмыстық қалдықтар) мен күл-қоқыстың 97 пайызын арнаулы күл-қоқыс алаңдарына төгумен ғана айналысады. Табиғат-бұл бізді қоршаған орта. Ол адам баласының санасынан тыс, өздігінен пайда болған дүние. Демек, «Адамдардың табиғатсыз күні жоқ, табиғаттың мұны айтуға тілі жоқ».

Табиғат – адамның бойына қуат, көңіліне шабыт, сезіміне ләззат шапағатын ұялататын сұлулық пен әсемдік әлемі, баға жетпес байлық. Ол- ырыс пен мол қазынаның қайнар көзі. Сондықтан халқымыз «табиғат адамзаттың өмір нәрі, қажетіңнің табылар содан бәрі» деп дәріптеген.

Жұмыстың мақсаты: Алматы қаласындағы тұрмыстық қатты қалдықтарды (ТҚТ) айқындау және сол тұрмыстық қалдықтардың шығу тегін сипаттау. ТҚТ-дан шыққан әр түрлі қосылыстардың бар екендігіне көз жеткізу. Олардың адам денсаулығына және қоршаған ортаға теріс әсерін тигізетінің дәлелдеу.

Зерттелетін нысан – оңтүстік астана – Алматы қаласындағы тұрмыстық қатты қалдықтар

Зерттеу әдісі: ғылыми бақылау, қадағалау, зерттеу.

Гипотеза: қоқыстың қоршаған ортаға ғана емес, біздің денсаулығымызға да әсері бар.

Тұрмыстық қоқыс мәселелері мен оны шешу жолдары. Ертеде қоқыстарды өңдеу мәселесі бүгінгідей бірінші орында тұрмаған. Себебі адамдар өз шаруашылығында шығарған өнімдерін өңдемей, түрлі қаптарға қаптамай, жарнама жасамай қолдана берген. Көкөністердің қалдықтары малға берілетін немесе жерге тыңайтқыш ретінде қолданатын.

Адамдардың ауылдан қалаға көшуі күнделікті қолданатын заттардың тұтыну және сұраныс құрылымын өзгертті. Ауылда өндірілетін өнімдерді қалада сату үшін және алушыға ыңғайлы болу үшін қаптау қажет. Қаланың экологиясына, әсіресе үлкен қалаларда халықтың кіші ауданда орналасуына, көлік және индустриялық кәсіпорындардың қалдықтары қала экологиясына кері әсер етеді.

Көшелерге қоқыстарды тастағанға тыйым салынатын бірінші құжат 500 жыл біздің заманымызға дейін Афинада шығарылған. Қоқыстырды тастау үшін қаладан тыс арнайы орындар бөлінген. Сол кезден бастап қоқыстарды арнайы бөлінген алаңшықтарға (полигондарға) тастайтын болған. Қалалардың өсу нәтижесінде бос орындар азайып, ал сүйкімсіз иіс және егеуқұйрықтың саны көбейуі нәтижесінде қаланың экологиялық жағдайы нашарлап кетті. Сол себепті алаңшықтар шыңыраулармен ауыстырылды[3].

Қалдықтар шығаратын негізгі көздерге өнеркәсіп, ауыл шаруашылығы, үй-жай шаруашылығы жатады. Үй-жай шаруашылығының қалдықтарына пайдалануда болған және тозған, өзінің тұтыну қасиетін жойған бұйымдар мен материалдар жатады. Тұрмыстық қалдықтардың тағы бір түрі – тамақ қалдықтары. Бұл қалдықтар тұрмыста тасталынады. Тамақ қалдықтарының қауіптілігі олардың түрленуіне байланысты.

Қалдықтардың көлемі мен құрамы және олардың алып жатқан ауданы жөнінде дәл мәліметтің болмауы мәселенің шешімін қиындатады. Сондықтан да болса керек Республика бойынша тұрмыстық қалдықтардың жинақталуы жөніндегі статистикалық мәліметтер әр БАҚ-да, ғаламторда әр түрлі.

Тұрмыстық қалдықтардың топтастырылуы. Тұрмыстық қалдықтардың қоршаған ортаға зиянды әсерін азайту немесе болдырмау үшін оларды міндетті түрде жіктеуге, топтастыруға тура келеді. Тұрмыстық қалдықтарды жіктеу және топтастыру аса күрделі де қиын мәселе. Қалдықтарды ең алдымен агрегаттық күйлеріне байланысты топтастыруға болады. Бұл кәдімгі қатты, сұйық және газ тәрізді деп жіктеу болып табылады. Тұрмыстық қалдықтар пайдаға асырылатын және пайдаға асырылмайтын болып бөлінеді. Пайдаға асырылатын және асырылмайтын қатты және сұйық қалдықтар, жанатын және жанбайтын топтарға бөлінеді. Жанбайтын пайдаға асырылатын қалдықтарға үй-жайды жөндеуден өткізу кезінде түзілетін қоқыстар, ыдыс-аяқтардың сынықтары, т.б. жатқызуға болады. Ыдыс-аяқ сынықтарын құрылыс материалдары ретінде, яғни қабырғаларға мозаика түрінде жапыстыруға, есік алдын, үй іргетасын әрлегенде пайдаланып жатады. Ал, мүлде пайдалануға жарамайтындары көмуге жіберіледі. Жанатын пайдаға асырылатын қалдықтарға ағаш қалдықтарын, қағаз қалдықтары – макулатураны, құрамында резеңкесі бар қалдықтарды, түрлі майлар мен еріткіштерді жатқызуға болады. Бұл қалдықтарды зиянсыз түрге айналдыру үшін камералық цехтарда жағады. Бөлініп шыққан жылуды өндірістік айналымдарда немесе жанбайтын қалдықтарды зиянсыздандыру үшін пайдаланады. Кейбір қалдықтарды көму алдында жағу арқылы көлемін кішірейтуге болады.

Тұрмыстық қоқыстар мен қалдықтарды негізгі түрлері келесі түрде топтастырылады : макулатура; медициналық қалдықтар; істен шыққан құрал-жабдықтар; қолданыстан шығып қалған аккумуляторлар мен қоректену элементтері; ағаш қалдықтары; мұнай өнімдерінің қалдықтары; азық-түлік өндірістерінің қалдықтары; полимер қалдықтар, пластмассалар; өндірістік қалдықтар; радиоактивті қалдықтар; шыны сынықтары мен қалдықтары; құрылыс қалдықтары, тоқыма қалдықтары және тері; түсті металл сынықтары; қара металл сынықтары; дөңгелектер мен резеңке қалдықтары; электрондық сынықтар.

Бүгінгі күні тұрмыстық тұтыну қалдықтарына қолданыстан шығып қалған компьютерлер, теледидарлар және ұялы телефондар, түрлі салқындатқыштар сияқты т.б. электр құралдары жатады. Осы электр құралдарының компоненттері қоршаған ортаға салыстырмалы түрде көп зиян келтіреді [4]. Қорғасын, мышьяк, сурьма, кадмий, кобальт, сынап, хром және пластиктердің адам денсаулығына және қоршаған ортаға зияны көп.



Тұрмыстық тұтыну қалдықтарының ішінде гигиеналық мақсаттарда пайдаланылатын заттардың қалдықтары да қоршаған ортаға және адам денсаулығына зиянды әсер етеді. Гигиеналық қалдықтар: памперстер; төсемдер; тампондар; мақтасы бар таяқшалар; гигиеналық ылғал майлықтар.

Егер қаланың күндіз – түні бір тынбайтын желін ескерсек, аталған қалдықтар мен қоқыстар ұшып, ауылды ластап, қоршаған ортаға зиянын тигізуде. Ауладағы қоқыс адамзаттың әсерінен туындап отыр. Табиғатта өте тамаша бір қасиет бар. Оның өзі бөліп шығарған қалдықтардан біздің көмегімізсіз-ақ өзін-өзі тазартып ала алады. Ал адам баласының бөліп шығарған көң-қоқысынан ақыл-оймен өмірге келген халық шаруашылығының ұлы, зиянды қалдықтарынан өздігінен тазалауға табиғатта шама жоқ.

Қалдықтар туралы жалпы түсінік. Қалдықтарды қосымша шикізат ретінде тиімді пайдалану көптеген проблемалардың шешу жолдарын ашуға мүмкіндік туғызады. Қалдықтарды қайтадан қолдану қоршаған ортаны қорғаумен, бастапқы минералдарды, электр энергияны үнемдеумен, еңбек ресурстарын босатумен байланысты көптеген заттар мен материалдар қалдықтарға жатқызыла береді, шын мәнінде оларды әртүрлі қажеттілікке немесе басқа өндірістерге шикізат ретінде қолдануға болады. Кезінде Д.И. Менделеев *“Химияда қалдықтар болмайды, тек қана қолданылмаған шикізат болады”* деп айтқан. Сонымен қатар, ол озат өнім алуға технологияның басты мақсаты пайдасыздан пайдалы өнім алуға бағытталған болу қажет деп те ескерткен.

Сондықтан, ішінара немесе толығымен қайта өңдеу арқылы қажеттілікке жаратылатын өндіріс пен тұтыну қалдықтарын екінші реттік материалдық ресурс ретінде қарауға болады. Біздің халық шаруашылығында жыл сайын шығатын қалдықтардың көлемі 1 млрд. тоннадай болады. Статистикалық мәліметтерге сүйенсек біздің елде жиналған сұйық өндіріс қалдықтарының көлемі 10 млрд. тонна шамасында. Табиғи ресурстардың қоры шексіз еместігіне байланысты оларды кешенді түрде пайдалануға ерекше көңіл аударып, атап айтқанда аз қалдықты немесе қалдықсыз технологияларды жасау және халық шаруашылығының әртүрлі салаларында шикізат базасын қалдықтарды кеңінен пайдалану элементтердің 2-3% ғана алынып 97-98% пайдасыз нәрсе ретінде тасталынады.

Қазақстанның түсті және кара металлургия саласындағы көптеген өнеркәсіптерден бөлініп шығатын газдар күкірт қышқылын алуға шикізат ретінде пайдаланылып келеді. Металлургия өнеркәсіптерінің құрамында күкірті бар газдардан алынған қышқылдың өзіндік құны, сонымен қатар, 1 т өнімге жұмсалған қаржының үлсс салмағы табиғи шикізаттан өндірілген күкірт қышқылына қарағанда 2 еседей төмен.

Қазіргі кезде Қазақстанда 20 миллиард тоннадан астам қалдықтар, соның ішінде 230 миллион тонна радиоактивті қалдықтар бар. Парламентаридің “Қалдықтар” туралы заңында әр адамға жылына 60 тонна қалдықтар түзіледі деп есептелген [1].

Адам өмірінің салалық жақсаруы адам санының өсуі айнала қоршаған биожүйе мен биосфера мүмкіндігін шектейді. Ғылыми деректерге сүйенсек дүниежүзілік биосфера мен экожүйенің мүмкіндігі жер бетінде 7-8 млрд адамға жеткілікті. ЮНЕСКО деректеріне

сүйенсек биосфера моделі тұрғысынан жер бетінің тұрғындары 6 млрдқа жетуі критикалық деңгей болып есептелсе, табиғи ресурстар өзінің даму тұрақтылығын жоғалту сатысында болады. Дүние жүзіндегі демографиялық жағдайдың даму тенденциясы дағдарыс жағдайына, экологиялық кризиске, соның ішінде «мусор кризисіне» тікелей жол ашуда. Сондықтан, өндіріс пен тұрмыстық қалдықтардың өсуі сен оны екінші реттік шикізат ретінде пайдалану – бүгінгі таңдағы экологиялық кәйекесті мәселелердің бірі.

Тұрмыстық заттардың қатты қалдықтары - қолданылу қасиетін жойған мүліктер, олар тұрмыстық пайдалану қалдықтарының негізін құрайды. Жылына мусор көлемі жөнінен 3 % артуда. ТМД елдері бойынша тұрмыстық қатты қалдықтар жылына 100 млн. тонна болса оның ¼ бөлігі Қазақстанның меншігіне тиісті екен. Қазақстанда жылына 3,8 млрд. тоннаға жуық қалдықтар шығарылады. Оның орта есеппен 10 % - 15 % қайта өңдеуден өтеді. Өндірістік қалдықтардың 35 % қайта өңделсе, тұрмыстық заттардың қатты қалдықтарының тек 3-4% ғана өңделеді. Негізінен қалдықтар қоқыс жиналатын жерге апарылып тасталады, қоқыс тастау көздерінің саны Қазақстанда 11 мыңға жуық. Ондағы қалдықтар 82 млрд. тоннаға дейін жетеді. Тұрмыстық қатты заттар қалдықтарының көлемі мен құрамы сан түрлі және ол елді мекен мен аймақтың ерекшеліктеріне ғана емес, жыл мезгіліне т.б. көптеген факторларға байланысты.

Көп елдерде тұрмыстық қатты қалдықтарды жоюдың негізгі жолы-өртеу, одан сиректеу қолданылатын әдіс - аэробты және анаэробты ферменттер көмегімен өңдеу жатады. Тұрмыстық қатты қалдықтарды бұл әдістерді қолданып, қайта өңдеу мүмкіндігі қалдықтардың морфологиялық құрамына (70-80% органикалық жанатын және биодырайтын фракция болғандықтан) тікелей тәуелді [10]. Тұрмыстық заттардың қатты қалдықтары қала мен елді мекендер үшін экологиялық зиянды фактордың, халықтың санитарлық жағдайы мен қоғамдық гигиенаның маңызды көрсеткіші. Тұрмыстық қалдықтарды жою әдістері ішінде бірінші орын қатты заттар сақтау полигоны еншісіне тиеді, себебі қалдықтардың тек 10% ғана өртеледі. Осы орайда баса айта кететін жайт, халық арасында, егер қалдықтар зарарсыздандырылып көмілсе, зиянсыз деген сияқты көзқарастар қалыптасқан. Шындығында қалдық полигондары баяу әсер ететін мина деуге болады, ол ондаған жылдар бойы қоршаған ортаға әсер етіп, тұрғындарға зор мөлшерде әрі экологиялық әрі әлеуметтік зиянын тигізеді. Қалдықтардың табиғи ыдырауы аса ұзақ уақытқа созылады. Мысалы: қағаз қалдығы өздігінен ыдырауға 2-10 жыл, консерві қалбырына-90 жыл, полиэтилен пакет- 200 жыл, әйнектің ыдырауына 1000 жыл қажет. Бұл бағыттағы авторлар жұмыстарына сүйенсек атты зат қалдықтары жинақталған полигон тек жер бетін ластап қана қоймай, жер асты сулары мен тереңдігі 20 м дейінгі топырақты да ластайды екен [2,3]. Соның ішінде су құрамында Fe, Ba, Cr, P, Ti, Ni Cl иондары мен аммоний және нитрат иондары рұхсат етілген шектік концентрация (ПДК) 2-ден 100 ПДК жеткен. Осыдан басқа ластаушы компоненттерге: Co, W, Mo, V, Zr, Pb, Bi, Zn, Li, Sr және т.б. жатады. Бұл элементтермен ластанған су - тірі организм үшін зиянды. Сонымен қатар табиғи ортаны қоқыстан бөлінген биогаздар-метан, көмірқышқыл газы, синтез-газ ластайды. Олардың мөлшері санитарлық норманы әлденеше есе артып кетіп, адамға зиянын тигізеді. Қоқыстағы қалдықтардың биологиялық ыдырауы мен химиялық тотығуы көп мөлшерде жылу бөле отырып кейде өздігінен тұтануға әкеледі.

Қалдықтардың жіктелуі. Адам баласының кез-келген шаруашылық іс-әрекеті әртүрлі қалдықтармен биосфераны ластайды, бұл халықтың денсаулығы мен өміріне, флора мен фауна түрлерінің қысқарылуына, қоршаған ортадағы тепе-теңдікке қауіп-қатер тудырады. Кен үйінділерін, өнеркәсіп тастандыларын, қоқыстарды, дала шөп-шаламдарын тек қоршаған ортаны бұзатын ластағыштар деп санауға болмайды, олар құнды шикізат көздеріне жатады. Қазіргі кезеңдегі ғылым мен техниканың даму деңгейіне сәйкес әбден жетілдірілген технологияның жоқтығына байланысты оларды өңдеп құнды өнімдер алу әзірше жолға қойылмаған, сондықтан бұларды сақтауға, жоюға, тасуға, көмуге, зиянсыз түрге айналдыруға көптеген қаражат, энергия, уақыт жұмсалып жатыр. Ерекше назар аударуға және кідіртпей оңдеуге жататын қалдықтарға тұрмыстық қалдықтар жатады, себебі осы қалдықтардың мөлшері мен әртүрлі аурулар эпидемиясының арасында тікелей байланыс бар. АҚШ-та тұрмыстық қатты қалдықтардың 41%-і "айрықша қауіпті" болып топтастырылады, ал Венгрияда 33,5%-і, Францияда - 6%-і, Ресейде - 10%-і, Ұлыбританияда - 3%-і, Италия мен Жапонияда - 0,3%-і. Жылына Мәскеу қаласынан шығатын тұрмыстық қалдықтың мөлшері 16 млн. м³, Алматыдан - 3 млн. м³ үстінде. Жылына үлкен қалаларда бір адамға шаққанда жалпы 300 кг тұрмыстық қалдық келеді, оның ішінде азық-түлік қалдықтарының жылдық мөлшері 80-90 кг. 1 т азық-түлік қалдықтарының құнарлығы орта есеппен 250 кг дәнді жсм-шөптікіне пара-пар келеді. Ресей ғалымдарының мәліметтеріне сүйенсек, осы мөлшерді жем ретінде мал өсіру саласында пайдаланғанда 45 кг-ға дейін шошқа етін алуға болады. Тұрмыстық қалдықтарды пайдаланбай тастайтын болсақ, онда әртүрлі ауруларды қоздыратын ошақтың көзін ашуымен қатар, біраз жер көлемін пайдасыз жерге айналдырамыз.

Екінші реттік энергоресурстарды тиімді пайдаланудың халықшаруашылық маңызы өте зор. Екінші реттік энергоресурстар дегеніміз тікелей тап осы өндірістің өнімдерінің, қалдықтарының, жанама және аралық өнімдерінің энергетикалық потенциалдары. Екінші реттік энергоресурстар 3 топқа бөлінеді: 1) жанғыштар (H₂, CH₄, CO, пеш газдары, май, шайыр целлюлоза және т.б.); 2) жылу (бөлінген газдардыкі, өнімдердікі, жанама өнімдердікі, суытылатын судыкі, экзотермиялық реакциялардыкі); 3) технологиялық аппараттардан шығатын газ бен сұйықтықтардың қысымы. Екінші реттік энергоресурстар химиялық өндірістің азот күкірт, фосфор, хлор қосылыстарын, соданы шығаратын және мұнай-химия салаларында пайдаланылады. Жанғыштар қазандықтарда отын ретінде қолданылады. Бөлінген жылу қалдықтарды өндейтін қондырғыларда, жылу айырбастағыштарда кейбір заттарды қыздыруға қолданылады, осы жағдайлармен жылуды тұтыну қажеттілігін төмендетуге болады. Қысым утилизациялық турбиналарда компрессорларды, сорғыштарды, желдеткіштерді жұмыс істетуге қолданылады және электроэнергия алуға пайдаланылады.

Қазіргі уақытта дүние жүзі бойынша жер қойнынан жыл сайын 100 млрд. тоннаға дейін руда, құрылыс материалдары, отын (4 млрд. т мұнай және газ, 2 млрд. т көмір) беткі қабатқа шығарылып отырылады, шамамен 92 млн. т. минералды тыңайтқыштар мен 2 млн. т. ұлы химикаттар пайдаланылып, олар да жер бетіне таралады. Атмосфераға 200 млн. тоннаның үстінде көміртек оксиді, 53 млн. тоннадай азот оксидтері, 50 млн. т көмірсутектері, 146 млн. т күкірттің диоксиді, 250 млн. т шаң газ тәрізді қалдық ретінде шығарылады. Ал су қоймаларына жыл сайын орта есеппен 32 млрд. м³ тазаланбаған су, әлемдік мұхиттарға - 10 млн. т дейін мұнай тасталынылады. Осы жағдайларға байланысты қоршаған ортада пайда болған қолайсыз өзгерістер қайтымсыз түрге айналып отыр.

Қалдықтар шығаратын негізгі көздерге өнеркәсіп, ауыл-шаруашылығы, үй-жай шаруашылығы жатады. Өнеркәсіп қалдықтарының мөлшері бір адамға шаққанда тұрмыс қалдықтарынан 20 еседен артық келеді. Агрегатты күйіне байланысты топтастыруда сулы ерітінділер мен шламдарға араласқан (органикалық және анорганикалық), бейтарапты,

сілтілі және қышқылды сұйық ерітінділер жатса, сусыздарға пайдаланылған шайырлар, мал мен өсімдік майлары, органикалық еріткіштер жатады. Әр өнеркәсіп өндірістері өнім өндіруге ғана назарларын аударып қоймай қор айналымын жүзеге асыратын әдістерге кешсе, қоршаған орта ластанудан қорғалынады. Аз немесе қалдықсыз технологиялық кешендер ұйымдастыру қажеттігі айқын, яғни бір жердің шеңберінен аспайтын қалдықсыз өндірістер емес, қалдықсыз өндірістік кешендер туралы сөз көтерілгені орынды.

Бұл жағдайда бір өндірістің қалдығы басқа өндіріске шикізат ретінде пайдаланылады. Қалдықтар өте көп мөлшерде пайдалы кендерді шығарғанда және байытқанда пайда болады. Қазіргі кезде қолданылатын технологияларға байланысты бастапқы алынған шикізат мөлшерінің 10 пайызы қалдыққа айналып отырады. Осыған байланысты бос жыныстан тұратын таулар пайда болады, көп көлемді сулар ағынға жіберіледі. Өнеркәсіптік қалдықтар химия-физикалық, токсикалық, әртүрлі биологиялық қасиеттері бар күрделі поликомпонентті заттардың қоспалары болып келеді. Қалдықтардың технологиялық шығу тегіне байланысты, химиялық табиғатына байланысты әртүрлі классификациясы болады. Біздің елімізде қайта өңдеу және көмудің шығындарына байланысты қауіпті заттар келесі 4 классқа бөлінеді: 1. Өте қауіпті. Құрамында сынап және оның қосылысы бар, мышьяк, калий цианиті, сүрме қосылыстары бар қалдықтарды жатқызады. 2. Жоғары қауіпті. Құрамында хлорлы мыс, мыс сульфаты, қорғасын қосылыстары бар қалдықтарды жатқызады. 3. Орташа қауіпті. Құрамында қорғасын оксидтері (PbO , PbO_2 , Pb_3O_4), никель хлориды, т.б. қосылыстары бар қалдықтары жатады. Қауіптілігі аз. Құрамында магний сульфаты, фосфаттар, мырыштың қосылыстары бар заттар жатқызылады.

Қалдықтардың жіктелуі келесі белгілер бойынша айқындалады: қалдық түзілу орны (өндіріс саласына байланысты); өндіріс циклінің кезеңі; қалдық түрі; қоршаған ортаға және адамға зиянды әсері; қолдану бағыты; қолданыс әсері.

Отандық стандарт бойынша «Зиянды заттар классификациясы және ортақ қауіпсіздік талаптары», барлық өндіріс қалдықтары қауіптілігі бойынша 4 классқа жіктеледі: бірінші классқа – аса қауіпті, екінші классқа – жоғары қауіпті, үшінші классқа – орташа қауіпті, ал төртінші классқа – қауіптілігі аз қалдықтар жатады.

Егер де қалдықтарда сынап, калий хлорқышқылы, үшхлорлы сурьма, мышьяк оксиді және басқа да улы заттар болса, олар бірінші классқа жатқызылады. Хлорлы никель, хлорлы мыс болатын болса, екінші классқа жатады.

Жіктемелердің негізінде орталық жинақтау схемалары жасалады, оларды екінші ретті пайдалануға асыру және ол қалдықтардың қоршаған ортаға зиянды әсерін болдырмауы қарастырылады. Барлық қатты өндірістік қалдықтар 2 түрге бөлінеді: 1. улы қалдықтар; 2. улы емес қалдықтар. Улы қалдықтар өзі бірнеше топқа жіктеледі, олардың кейбіреулері төменде көрсетілген: құрамында мышьяғы бар органикалық емес қатты қалдықтар және шламдар, сынабы бар қалдықтар, құрамында: қорғасын, цинк, сурьма, висмут, кобальт және т.б. қалдықтар; құрамында фосфор және фтор бар қалдықтар мен шламдар, қолданысқа жарамайтын және тыйым салынған пестицидтер; гальваникалық өндіріс қалдықтары; мұнайхимия және мұнайөңдеудегі қалдықтар; хромқұрамды қалдықтар, шламдар, темір карбонильдері бар қалдықтар. Улы қалдықтарды жиюдың, жинақтаудың, зиянсыздандырудың және көмудің тәсілдері мен тәртібі химиялық заттардың қауіптілік класын ескере отырып жүзеге асырылуы тиіс, сонымен бірге жұмысшылардың қауіпсіздігін, қоршаған территорияның ластануын болдырмауды және қамтамасыз етуі керек. Құрамында улы заттары бар қатты қалдықтарды қоймада ұстауға, сонымен қатар өндіріс алаңдарында шламды жинағыштарды және шлам жиналуын орналастыруға рұқсат етілмейді. [11]

Тұрмыстық қалдықтарды жою әдістері. Тұрмыстық қатты қалдықтарды жою жолдарының бірі - органикалық тыңайтқыш компостқа айналдыру болса, екінші бір бағыты - айналмалы цилиндр барабандар (диаметрі 4 метр, ұзындығы 30-60 метр) көмегімен биологиялық қайта өңдеу. Үрдіс адамнан толық оқшауланған жағдайда өтеді.

Бұл әдістің ең қиындық тудыратын сатысы ТҚҚ сұрыптап, алдын ала өңдеуден өткізу. Себебі біздің елімізде халықтан тұрмыстық қалдықтарды алдын ала іріктеп, таза қалдықтарды бөлек жинайтын орын ескерілмеген, осының нәтижесінде ТҚҚ іріктейтін, екіншілік шикізатты: пленка, қағаз, түсті және қара металды, шыныны бөліп, тазалайтын қосымша завод салудың қажеттігі туындайды. Өкінішке орай тұрғындардың экологиялық мәдениеті төмендігінен тұрмыстық қалдықтар контейнерлеріне бояулар, люминисценциялық лампалар, батереялар т.б. ауыр металдар қалдығымен ластайтын заттар тасталады. Ол биологиялық қайта өңдеу өнімдерінің ластануына әкеледі.

Қалдықтардың жойылу мерзімінің ұзақтығы. Жер бетінде миллиардтаған тонна тұрмыстық қалдықтар мен қоқыс бар. Жылдан жылға артып келе жатқан қалдықтардың қоршаған орта мен адам денсаулығына қатер төндіруде. Онымен күресу үшін қалдық пен қоқыс өңдейтін зауыттар мен кәсіпорындар да көптеп ашылуда. Соған қарамастан қалдықтар көбеймесе, азаймай отыр. Бұған адамдардың өздері де кінәлі. Қоқысты арнайы жәшіктерге тастамайды немесе басқалай жолмен олардың көзін жоюға талпынбайды. Мұндай қалдықтар мен қоқыстар қанша уақытта өздігінен жойылатыны туралы мынадай қызықты мәліметтер келтіруді жөн көріп отырмыз.



Ас қалдықтары бір ай шамасында жойылады.



Жануарлар мен құстардың саңғырығы мен тезегі өздігінен жойылуы 15 күн кетеді



Газеттің өздігінен жойылу мерзімі 1 айдан 3 айға дейінгі уақытты алады екен.



Тауарға қапталатын картонның жойылуы үшін 3-4 ай керек көрінеді.



Табиғаттың өзі де қоқыс тастайтыны таңқалдыруы мүмкін. Алайда, шындығы сол. Міне, қараңыз. Қурап, үзіліп түскен жапырақ, құрғақ бұта 3-4 айға дейін жойылмайды.



Кеңсе қағаздары 2 жылда жойылады.



Тиісінше сақталмаған құрылыс тақтайларының жойылу мерзімі 10 жылға созылуы мүмкін.



Құрылысқа арналған темір арматуралары – 11-13 жылда ыдырайды.



Консерві
қалбырларының
жойылу мерзімі – 10
жыл.



Кірпіш пен бетоннан
тұратын қалдықтар
мен қоқыстың
жойылуы үшін 100
жыл кетеді.



Автокөлік
аккумуляторы -
жойылу мерзімі –
100 жыл.



Фольга – жойылу
мерзімі 100 жыл



Батарейка- жойылу
мерзімі 100 жыл



Машинаның
дөңгелегінің
шинасы – ыдырау
мерзімі 120-140 жыл



Жиі кездесетін, тіпті,
аяқтың астында
оралғы болып
жататын тұрмыстық
қалдықтардың бірі –
қаңылтырлы
банкілер жойылуы
үшін кем дегенде
500 жыл керек.



Шыны
қалдықтарының
жойылу мерзімі
1000 жылдан
асады. Тіпті, 12-15
ұрпақ ауысқанша
жойылмай жата
беруі мүмкін.

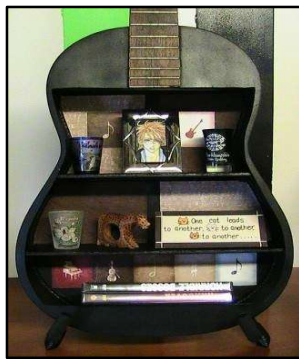
Қалдықтарды кәдеге жарату. Кез келген үйден істен шыққан, керексіз заттардың табылары анық. Сол керексіз заттарды далаға лақтырмай, пайдаға асырып көрдіңіз бе? Орайын тапқан адам күл-қоқыстың өзінен де өзге бірдеңе жасап шығарады. Ол үшін қиялға қанат бітіріп, ақылға жүгінсеңіз болғаны. Сіз жасап шығарған нәрсенің тұтынуға тиімді болғаны абзал. Әрине басқадан ерек, өзгеше бір нәрсе ойлап табамын десеңіз тіпті керемет. Осы орайда бізге Эдуард Мартине, Джейн Перкинс және Финч атты суретшілер көмекке келеді. Олар бізге қажетсіз дүниелерді қалай пайдалану керектігін көрсетеді. Баяғыда бір данышпан «Әлемді қоқысқа толдырып қайтесіз. Бұл әлем онсыз да лас» деген екен. Бұл сөздер біздің оймызға дәл келіп тұрған сияқты. Ендеше керексіз заттарды «керек» қылып үйренейік.



Пластмасса бөтелкесінен жасаған заттар



Роялдан жасалған сөре



Гитарадан жасалған сөре



Ескі рояльдан жасалған
субұрқақ

Қорытынды. Қоқыс біртіндеп өркениеттің монстрына айналады. Экономиканың қазіргі жағдайы мен күнделікті өмір мәдениетінің арқасында, адамдар әлі күнге дейін бұл адам жасаған ескерткіштері арасында ұзаққа созылмаушылықта өмір сүреді. Біздің елімізде тұрмыстық қоқыс мәселесі ең өзекті мәселе болып табылады. Халықтың санитарлық-гигиеналық ережелерге сәйкестігін, неғұрлым мұқият және үнемді қарым-қатынас жасау қажеттілігін, табиғи ресурстарды ұтымды пайдалануды түсіну маңызды.

Табиғатқа тән емес заттардың ыдырауы ондаған және жүздеген жылдар бойы жалғасып келе жатқаны белгілі: қағаз: 5-10 жыл; темір: 100 жыл; пластикалық пакет: 200 жыл; пластик: 500 жыл.

Адам биосфераның бөлігі болып табылады, оның жағдайының нашарлауы оған қауіпті. Өмір сүру ортаңызды зерттеу өте маңызды, оның қоршаған орта жағдайларын жақсартуға тырысыңыз. Егер біздің қаланың әрбір тұрғыны бұл туралы ойласа, басқа пластик бөтелкені салдары туралы ескертпес бұрын, табиғат әлдеқайда таза болады.

Осы жұмыстың нәтижесінде келесі іс-шаралар анықталды және өткізілді: 1. Мектеп алаңдары мен мектептің және тоғанның жанындағы саябақ аймағындағы қоқысты жинау бойынша ұйымдастырылған экологиялық рейдтер. 2. Тұрмыстық қоқыс қаупі туралы тұрғындар арасында насихат жүргізілді. 3. Өз сыныбымызбен экологиялық білім тарату барысында «Қоқыспен не істеуге болады?» тақырыбында экологиялық семинар өткізіп, талқылау.

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ҚАРА ҚОҢЫР ТОПЫРАҚТАРДЫҢ ҚҰНАРЛЫЛЫҒЫН ҚАЛПЫНА КЕЛТІРУГЕ ҚАТЫСАТЫН МИКРООГАНИЗМДЕР

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MICROORGANISMS INVOLVED IN THE RESTORATION OF FERTILITY OF DARK BROWN SOILS

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Аннотация. Жыл сайынғы көкөніс дақылдарын егу және вегетациясы кезеңінде агротехникалық өңдеу, суаратын судың бүліндіру әрекеті топырақтың құрылымдық агрегаттарының нашарлауына, гумус заттарының деградациясына, қоректік элементтердің шығарылуына және күңгірт қарақоңыр топырақтардың құнарлылығының төмендеуіне алып келеді. Жұмыста агроландшафттың күңгірт қара қоңыр топырақтарында топырақтүзілуүрдісіне қатысатын микроорганизмдердің (бактериялардың, актиномицеттер мен саңырауқұлақтардың) санын зерттейтін материалдар бар. Зерттеу нәтижелері қара қоңыр топырақтарда микроорганизмдерден бактериялардың жиі кездесетіндігін көрсетті. Сонымен қатар, минералды тыңайтқыштар енгізілген нұсқаларда микроорганизмдердің саны артады.

Жұмыстың мақсаты Іле Алатауының етегіндегі күңгірт қарақоңыр топырақтардағы микроорганизмдердің сандық және сапалық құрамын зерттеу.

Түйінді сөздер: қара қоңыр топырақ, агроландшафт, микроорганизм, бактерия, гумус, актиномицеттер, саңырауқұлақтар

Abstract. Annual sowing and agrotechnical treatment of vegetable crops during the growing season, the destructive action of Irrigation Water leads to the deterioration of the structural aggregates of the soil, the degradation of humus substances, the release of nutrient elements and a decrease in the fertility of dark brown soils. The work contains materials that study the number of microorganisms (bacteria, actinomycetes and fungi) involved in the formation of soil on matte dark brown soils of the agrolandscape. The results of the study showed that bacteria from microorganisms are more common on dark brown soils. In addition, with the introduction of mineral fertilizers, the number of microorganisms increases in the instructions. The purpose of the work is to study the quantitative and qualitative composition of microorganisms in dark karakonur soils at the foot of the Zailiyskiy Alatau.

Keywords: *dark brown soil, agrolandscape, microorganism, bacterium, humus, actinomycetes, fungi*

Жерді егістікке қарқынды пайдалану жағдайында, әсіресе суарған кезде топырақтар күшті антропогендік әрекетке ұшырайды және ең алдымен аумақты жан жақты жырту, тегістеуге ұшырайды. Топырақ химияландыру құралдарын, тыңайтқыштарды енгізу, суаруды шектен тыс мөлшерде жүргізу, техникалардың көп дүркін өңдеуі көзделетін, дақылдарды өсірудің түрлі жолдарының әрекетіне ұшырайды. Агроландшафтарда жоғарыда аталған кешенді іс шаралар топыраққа және топырақ үрдістеріне жағымды жақтарымен қатар жағымсыз жақтарымен де әсер ееді [1].

Топырақ түйіртпектілігі – бұл топырақ бөлшектенетін түйіртпектік бөлшектердің пішіні мен мөлшері $>0,25$ мм микроагрегаттар түрі [2].

Жоғарғы гумус қабаттарының түйіртпектілігі қоршаған ортаның жағымсыз факторларының әрекетіне топырақтың төзімділігі және потенциалдық құнарлылық сияқты топырақтың маңызды қасиеттерін айқындайды [3]. Топырақ түйіртпектілігін зерттеудің ғаламдық көмірбегі циклын реттемелеу, қоршаған ортаны қорғау, топырақ құнарлылығын қалпына келтіру, жыртылатын қабаттардағы гумус режимін оңтайластыру жағынан алғанда мәні өте зор [4, 5].

Топырақ түйіртпектілігі топырақтың маңызды физикалық қасиеті болып табылады, оған топырақтың су, ауа, жылу, тұз және қоректік режимдері байланысты. Топырақ құнарлылығын арттырудың физикалық әдістері топырақ түйіртпектілігі мен жайласуына әрекет ету арқылы жүзеге асырылады [6].

Топырақтың агрономиялық және мелиоративтік құнды түйіртпектік агрегаттары алғашқы механикалық элементарлық бөлшектер кешенінен тұратын, кесекті-түйіршікті, суға төзімді агрегаттар болып табылады. В.Р. Вильямс бойынша диаметрі 1 – 5 - 10 мм бөлшектер бағалы түйіртпектік агрегаттар болып табылады. Кесекті-түйіртпекті құрылым топырақта су өткізгіштіктің жасалуын қамтамасыз етеді, суға төзімді түйіртпектіліктопырақта судың капиллярлық қозғалу жылдамдығы мен биіктігін баяулатыды және топырақ бетінен судың булануын азайтады. Зерттеулер бойынша топырақтың кесекті-түйіршікті түйіртпектілігі топырақта су мен ауа арасындағы оңтайлы ара қатынастың жасалуына жағдай жасайды, топырақтың ауа өткізгіштігін жақсартады. Топырақтың суға төзімді құрылымы егістік жерлерді шайылу мен жел үрлеуінен қорғау құралы болып табылады [7].

Іле Алатауының тау етегіндегі күңгірт қара қоңыр топырақтардың түйіртпектілігі төмен, түйіртпекті агрегаттары суға төзімсіз және суарған кезде тез бұзылады. Тау етегіндегі суармалы жерлерде топырақ құнарлылығын төмендететін суару эрозиясы дамыған [8]. Суармалы егістік жағдайындағы тау етегіндегі күңгірт қара қоңыр топырақтарды олардың топырақ агрегаттарының суға төзімділігін жақсарту және құнарлылығын сақтау мақсатында зерттеу өзекті мәселе болып табылады.

Микроорганизмдер биологиялық, химиялық және физикалық әсер ету барысында тау жыныстарынан топырақ пайда болуына ықпал жасайды. Микроорганизмдер алғашқы топырақ түзу үрдісінде маңызды рөл атқарады. Микроорганизмдердің қатысуымен минералдардың бұзылуы тікелей және жанама болып келеді. Тікелей бұзған кезде микрофлора тау жыныстарына ферментативтік және микроб шырышы сияқты екі әдіспен әсер етеді [9]. Ең маңыздысы ферментативтік бұзу, соның нәтижесінде күкірт, темір, марганец және т.б. элементтер босап шығады. Топырақтүзуші жыныстарға жанама әсер етуге микроорганизмдердің зат алмасу өнімдері қатысады, олар күшті реагенттер болып табылады.. Оларға минералдық және органикалық қышқылдардан басқа, негізі шала тотығу қасиетімен сипатталатын, хелат түзуші заттар жатады. Кейбір микроорганизмдер күкіртті босатып шығарса, басқа біреулері темірді босатып шығарады.Топырақ – көптеген

микроорганизмдер үшін мекен етуге, көбеюге қолайлы орта. Топырақтың минералдық және органикалық құрамы, физика-химиялық жағдайы микроорганизмдердің саны мен құрамын реттейді. Олар бактериялар, саңырауқұлақтар, қарапайымдылар және бактериялар. Микрофлораның мөлшері топырақтың химиялық құрамына, ылғалдылығына, температурасына, рН, өсімдік жабынына, топырақ құнарлылығына және басқа да қасиеттеріне байланысты. Микрофлора топырақ құнарлылығына маңызды әсер етеді және өсімдіктердің қорегіне жетіспейтін заттарды сіңімді формасына алмастыруда үлкен рөл атқарады. Микроорганизм үрдістері өсімдіктердің бойының өсуіне немесе оған қысым кері әсер көрсетуі мүмкін. Сондықтан да топырақтардағы микробиологиялық үрдістерді зерттеу, ауыл шаруашылығында ерекше орын алады [10].

Жұмыстың мақсаты Іле Алатауының етегіндегі күңгірт қарақоңыр топырақтардағы микроорганизмдердің сандық және сапалық құрамын зерттеу.

Зерттеу нысаны. Зерттеу жұмысы Қазақ картоп және көкөніс шаруашылығы ғылыми зерттеу Институтының аумағындағы Ө.О.Оспанов атындағы Қазақ Топырақтану және агрохимия Институтының тәжірибе телімінде, минералдық және органикалық тыңайтқыштар енгізілген нұсқаларында және тың жерде жүргізілді. Осы аталған телімдерден топырақ үлгілері алынып, зертханада бактериялар, актиномицеттер және мицелийлі саңырауқұлақтар егіліп, микроорганизмдердің сандық және сапалық құрамы анықталды.

Зерттеу зертханалық жағдайда мына нұсқаларда жүргізілді:

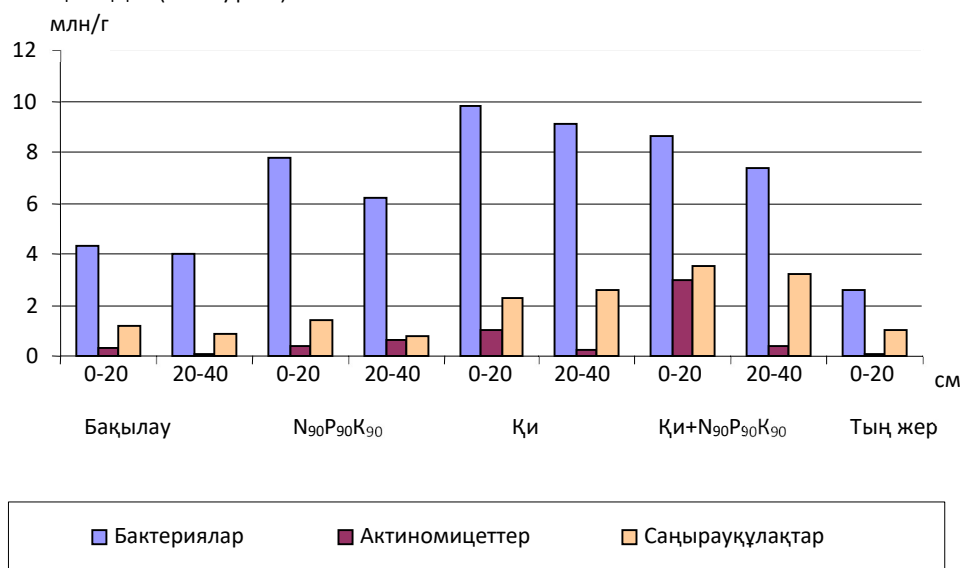
1. Бақылау
2. $N_{90}P_{90}K_{90}$
3. Қи
4. Қи + $N_{90}P_{90}K_{90}$
5. Тың жер

Зерттеу әдістері. Күңгірт қарақоңыр топырақ микрофлорасын анықтау екі жолмен жүргізілді: а) Топырақтардағы микрофлора Е.А. Мятликованың педоскоптардың жеңілдетілген әдісімен анықталды. Педоскоптарды зертхана жағдайында Іле Алатау етегіндегі күңгірт қарақоңыр топырақтардан алып келіп, жоғарыда келтірілген нұсқалар бойынша 500 мл-лік пластикалық стакандарға салдық. Тәжірибе теліміндегідей суды 3-4 күн аралығында бір реттен құйылып отырды. Педоскоптар топырақта 2,5 ай тұрды. Педоскоптар Грамм әдісімен боялды. Микроағзалар фотосуретке электронды микроскопқа (LEICA DMLS) жалғанған сандық видео камера (LEICA DC 300F) арқылы түсірілді. б) топырақтардағы микрофлораны анықтау үшін қоректік ортада топырақ тұндырмаларын егу әдісі арқылы анықталды: сапрофитті бактериялар – БПА ортасында, актиномицеттер – крахмал-аммиакты агар (КАА) ортасында және мицелийлі саңырауқұлақтар - Чапек-7 ортасында егілді. Микроағзалар колониясын алу үшін егілген Петри табақшаларын 26-28°C температурада термостатта бактериялар колониясы - 3 тәуліктен соң, саңырауқұлақтар – 7 тәуліктен соң, актиномицеттер - 7 тәуліктен соң есепке алынды. Егуді үш қайталанымда жүргіздік. Жалпы микробтар санын анықтау үшін 0,1 мл-ден $1:10^2, 1:10^3, 1:10^4$ араластырылған топырақ суспензиясын МПА (мясо-пептонный агар) қоректік ортасының бетіне егу жүргізілді. *Bacillus* туысының споратүзуші бактериялары, актиномицеттер, мицелиалды саңырауқұлақтар, рН мәні төмен МПА (мясо-пептонный агар (2%)), КАА (Крахмало-аммиачный агар (2%) актиномицеттер үшін. құрамы: аммоний сульфаты – 1г, K_2HPO_4 – 1г, NaCl – 1г, бор – 3; крахмал – 10 г, дист. су – 1, рН – 7,2), Чапек-3 (Чапек ортасы саңырауқұлақтар үшін (2% агара), тұз қышқылымен рН=5,0 дейін қышқылдандырылған. Құрамы: глюкоза – 30 г, K_2HPO_4 – 1г, $MgSO_4$ – 0,5г, KCl – 0,5г, $FeSO_4$ – 0,01 г, $NaNO_3$ – 3г) қатты қоректік орталарына топырақ суспензияларын егу әдісімен есептелді. Микроорганизмдер саны топырақтың 0-20, 20-40 см қабаттарында есептелді.

Микроорганизмдерді культивирлеуді 28°C темпeртурада термостта жүргізілді. Бақылау ретінде мелиорантсыз топырақ үш қайталанымда алынды.

Зерттеу нәтижелері. Іле Алатауының етегіндегі күңгірт қара қоңыр топырақтар 60-70 жыл бойы суару жағдайында ауыл шаруашылығы айналымына қарқынды қолданылып келеді. Осы Қазақ картоп және көкөніс шаруашылығы ғылыми-зерттеу институтының тәжірибе алаңдарында зерттеу жұмыстары жүргізілді. Күңгірт қара қоңыр топырақтардың түйіртпектілігі нашар. Осы топырақтарды зерттеген кезде суару жағдайында эрозия үрдістерінің анық байқалатыны анықталды.

Біздің зерттеу нысанымыздағы күңгірт қарақоңыр топырақтардың барлық телімдерінде саңырауқұлақтар мен актиномицеттерге қарағанда бактериялар саны анағұрлым жоғары болатындығы, олардың, әсіресе топырақтың жоғарғы қабаттарында шоғырланатыны анықталды (1 - сурет).

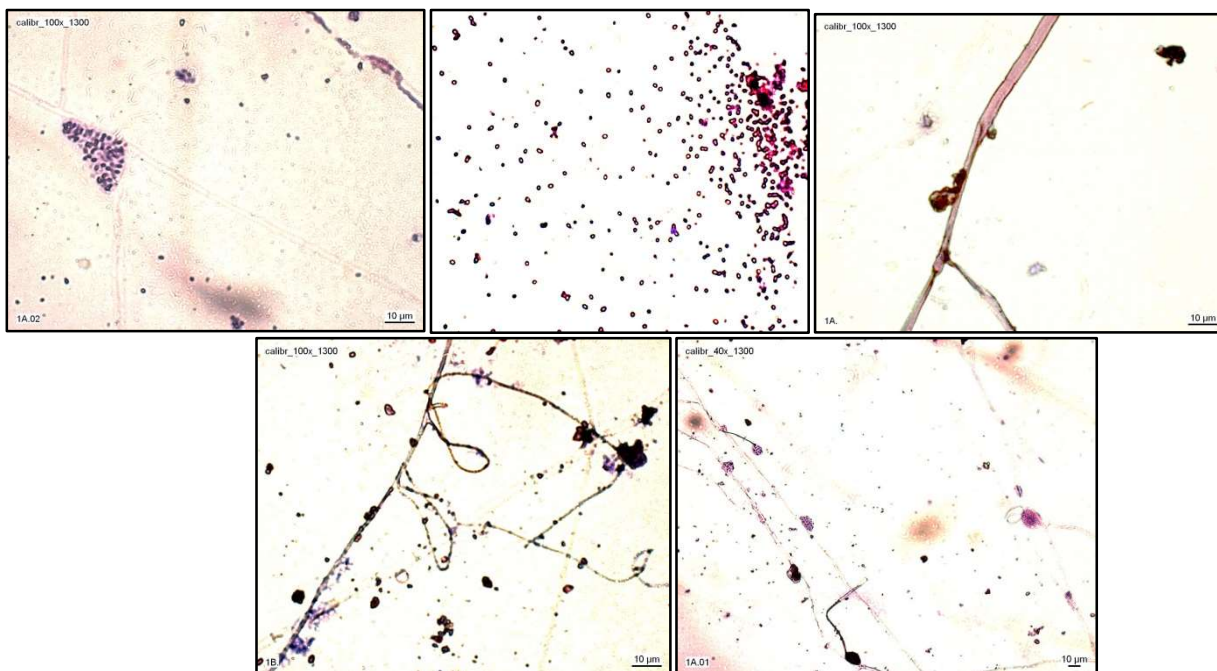


1 сурет - Күңгірт қарақоңыр топырақтардағы аэробты микроағзалар мөлшері

Педоскоптарда күңгірт қарақоңыр топырақтарға тән микрофлора орналасты. Тың жердегі күңгірт қарақоңыр топырақтарда (0-20 см тереңдікте) ірі таяқша тәрізді көбірек және майда таяқша тәрізді, домалақ дерлік бактериялар аз мөлшерде, V-тәрізді бактериялар, микобактериялар (*Mycobacterium* туысы) және қызғылт түсті және күлгін түсті бірлі-жарымды бактериялар жиналған. Мұнда актиномицеттердің мицелийлері көбірек кездеседі және олардың ыдыраған үзінділері байқалады. Сонымен қатар, педоскоптан пердеге бөлінген саңырауқұлақ мицелийлері мен *Miscor* туысындағы саңырауқұлақ спорангийлері, спорангийлерден төгілген эндоспоралары байқалады және *Alternaria* туысындағы ірі, жақсы пердеге бөлінген саңырауқұлақ мицелийлері көрінеді. Күңгірт қарақоңыр топырақтарда бактериялар мөлшері бір грамм топырақта 2,6 - 9,8 млн құрайды. Күңгірт қарақоңыр топырақтардағы тәжірибе теліміндегі нұсқаларға қарағанда тың жердегі бактериялар мөлшері аз кездесетіні байқалды. Өйткені, өңделген жерлерге қарағанда өңделмеген жерлерде бактериялар мөлшері біршама төмен болады. Тәжірибе телімінің өзінде, бақылау нұсқасымен салыстырғанда минералды және органикалық тыңайтқыш енгізілген нұсқаларда, әсіресе қи енгізілген нұсқасында бактериялар мөлшері артқанын байқалды. Себебі, топыраққа тыңайтқыш енгізгеннен соң, оның құнарлылығы арта түседі. Ал топырақ құнарлылығы жоғары болған сайын, ондағы микроағзалардың мөлшері де өте көп кездеседі. Құрамында азот бар тыңайтқыштар топырақтағы микроағзалардың дамуын тездетеді. Фосфор тыңайтқыштарының топырақтағы органикалық заттарды минералдайтын, аммонификациялайтын бактериялар мен актиномицеттердің саны артады.

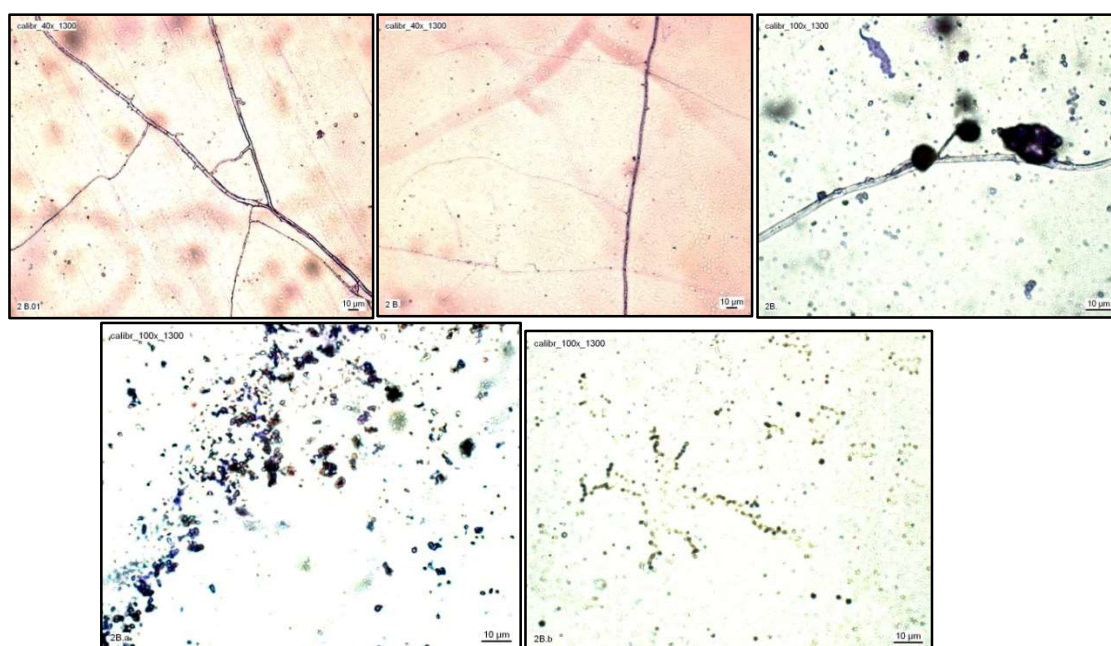
Аммонификациялайтын бактериялар оңай еритін, ал актиномицеттер – қиын еритін органикалық қосылыстарды минералдауға қатысады. Топырақ микрофлорасына әртүрлі деңгейде әсер ететін минералды тыңайтқыштарының түрлерінің ішінде калий тыңайтқышы әсер ету жағынан ең соңғы орынға ие. Топырақ микрофлорасының шамамен 30% - ын актиномицеттер құрайды. Бұл микроағзалар ылғалдылығы аз, құрғақ топырақтарда, әсіресе, жаздың ыстық айларында кеңінен тарайды. Олар минералдау үрдісіне қатысады, олардың көпшілігі өсімдік қалдықтарына бай топырақтарда кездеседі. Актиномицеттер топырақтағы өте қиын еритін органикалық заттарды минералдайтын ферментативті аппараттарға бай. Актиномицеттер теңіз деңгейінен әртүрлі деңгейдегі географиялық кеңдіктерде, топырақтарда, мұнайдың қайнар көздерінде және жанып тұрған газдарда таралған. Олар топырақтағы азоты бар және азоты жоқ органикалық заттарды ыдыратуға қатысады. Олар тек топырақтағы өсімдіктер мен жануарлардың қалдықтарын ыдыратумен қатар минералды заттарды босата отырып, гумустың түзілу және минерализациялану процесіне қатысады. Сонымен қатар актиномицеттердің тағы бір маңызды қасиеті әртүрлі ауру тудырушыларды жоятын, антибиотик құраушы қабілетіне ие, яғни топырақтағы биологиялық тепе-теңдікті сақтап тұруда маңызды рөлді атқарады. Күңгірт қарақоңыр топырақтарда актиномицеттер мөлшері тәжірибе телімінде 0,1-3,0 млн/г құраса, ал тың жерде оның саны тым аз (0,05 млн/г). Бұл көрсеткішті бактериялар мөлшерімен салыстырғанда анағұрлым төмен. Өйткені, көктемде және күзде топырақтың өңделген қабаттарында актиномицеттер саны артып, жаздың ыстық күндерінде азаяды. Жаз бойы спора түзбейтін бактериялар саны артып, ал актиномицеттер - азаяды. Бұл жақсы аэрацияның әсеріне байланысты. Тәжірибе телімінде қи енгізілген нұсқаларындағы топырақ қабатының 0-20 см тереңдігінде актиномицеттер мөлшері артқаны анықталды (1 - сурет).

Сонымен қатар топырақта кеңінен таралған микроағзалардың бірі - мицелийлі саңырауқұлақтар. Олар микрофлора көлемінің 1-3%-ын құрайды. Топырақ даму барысында саңырауқұлақтар топырақ түзілу үрдісінде маңызы бар мицелий түзеді. Саңырауқұлақтар топырақта қышқылды ортада өмір сүреді. Зерттеу нысанымыздағы топырақтарда саңырауқұлақтар мөлшері бактериялар мен актиномицеттер сияқты органикалық тыңайтқыш (қи) енгізілген нұсқаларында басым болатындығы анықталды. Олардың саны топырақтың төменгі (20 - 40 см) қабаттарына қарағанда, беткі қабаттарында көбірек (1,2 - 3,5 млн/г) кездеседі. Себебі қи енгізілген топырақтың беткі қабаты органикалық затқа бай болады. Тәжірибе теліміндегі күңгірт қарақоңыр топырақтардағы бақылау нұсқасында (0-20 см тереңдікте) ірі және майда таяқша тәрізді бактериялар кездеседі. *Micrococcus* туысынан кокктар кездеседі. Педоскоптың беткі қабаттарының барлығында актиномицеттердің мицелийлері көбірек байқалды. Саңырауқұлақтардың *Aspergillus*, *Alternaria* мен *Mucor* туыстары кездеседі. Сонымен қатар ілмекті аулағыш мицелийлі түрлері де бар (2-сурет).



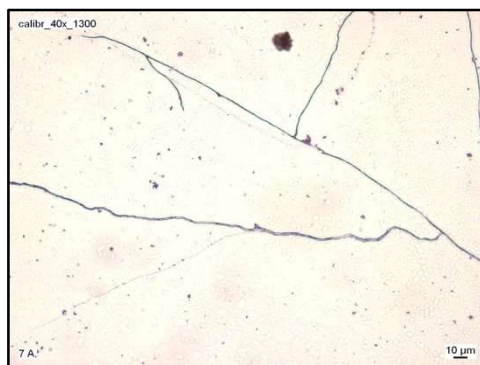
2-сурет – Бақылау нұсқасы (топырақтың 0-20 см қабатында педоскоп тігінен орналасқан)

Тәжірибе теліміндегі бактериялар 20-40 см тереңдіктерде де жоғары қабаттардағы сияқты көп. Мұнда бактерия жасушаларының тізбектелген түрлері, майда таяқша тәрізді, кездеседі. Сонымен қатар спора тасымалдайтын саңырауқұлақ гифтері бар. Саңырауқұлақ гифтері өте көп. Саңырауқұлақтар гетеротрофты организмдер болғандықтан, топырақтағы органикалық заттармен қоректенеді әрі ыдыратуға қатысады (3-сурет).



3-сурет - Бақылау нұсқасы (топырақтың 20-40 см қабатында педоскоп тігінен орналасқан)

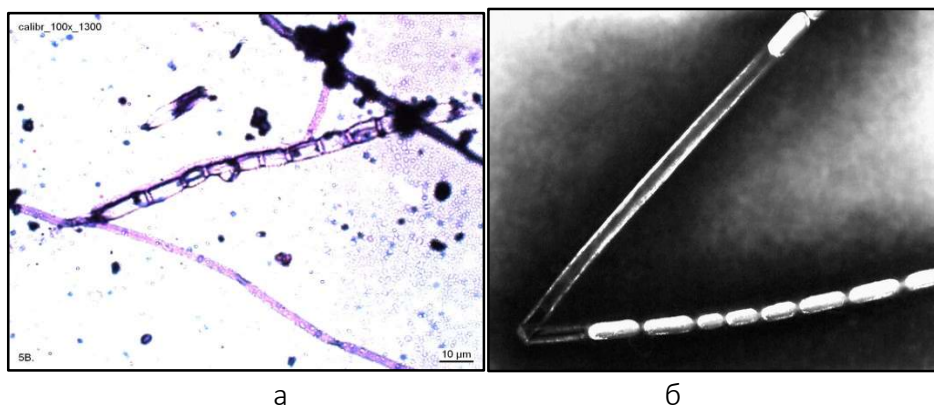
Тәжірибе теліміндегі күңгірт қарақоңыр топырақтардағы $N_{90}P_{90}K_{90}$ тыңайтқыш енгізілген нұсқасында (0 - 20 см тереңдікте) бактерия жасушаларының тізбектері, өте көп мөлшерде ұзын таяқша тәрізді бактериялар жиі кездеседі. Бұл телімдердің ерекшелігі, мұнда жоғарыда келтірілгендерден басқа, *Leptothrix* туысына жататын жіпшелі темір бактериялары байқалады. *Leptothrix ochracea* ол темір гидрототығын сіңірген, сол себептен оның түсі сарғыш болады. Олар, әдетте, көлденең перделер түзу нәтижесінде немесе талшықтары бар гондийлер пайда болуы нәтижесінде буынтақ-жасушалар түзу жолымен көбейеді. Жеке жасушалары да, гондийлер де өсе келе жаңа жіпшелер түзеді де жаңа субстратқа бекінеді. Тыңайтқыш енгізілген нұсқада темірдің мөлшері жоғары, оның себебі қышқыл минералды тыңайтқыштарды (суперфосфат, аммоний сульфаты, хлорлы калий) енгізу нәтижесінде топырақтағы темір жылжымалы формаға ауысып, өсімдік сіңіре алатын күйге көшеді (4-сурет) .



4-сурет - $N_{90}P_{90}K_{90}$ тыңайтқыш енгізілген нұсқасында *Leptothrix ochracea* (топырақтың 0 - 20 см қабаты)

Пердеге бөлінген саңырауқұлақ гифтері және актиномицеттердің мицелий үзінділері байқалады. Мұнда саңырауқұлақ гифтері өте көп және әртүрлі. Саңырауқұлақтардың *Aspergillus*, *Alternaria* пен *Mucor* туыстары кездеседі. Пердеге бөлінбеген актиномицетті мицелийлер анықталды. Ілмекті аулағыш мицелийлі түрлері де кездеседі. Тәжірибе теліміндегі күңгірт қарақоңыр топырақтардағы $N_{90}P_{90}K_{90}$ тыңайтқыш енгізілген нұсқасында 20-40 см тереңдікте бактерия жасушаларының тізбектері өте көп мөлшерде кездеседі. Топырақтың 0-20 см тереңдіктегідей мұнда да жоғарыдағыдай, *Leptothrix* туысына жататын жіпшелі темір бактериялары байқалады. Пердеге бөлінген саңырауқұлақ гифтері және актиномицеттердің мицелийлі үзінділері байқалады. Саңырауқұлақтардың *Alternaria* туыстары кездеседі.

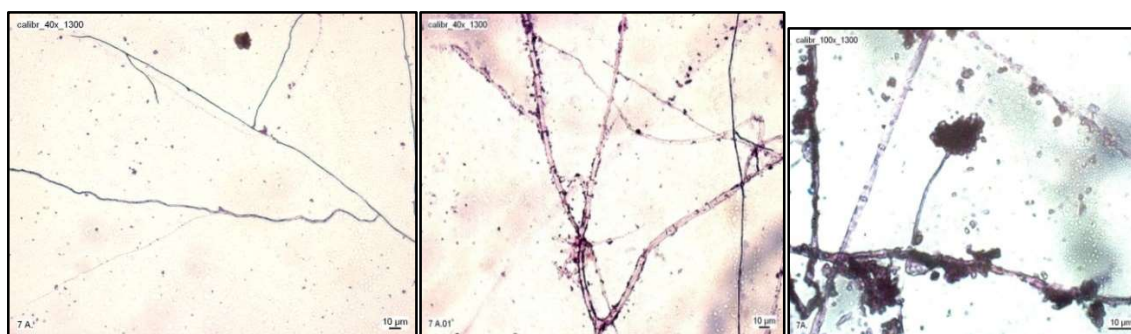
Тәжірибе теліміндегі күңгірт қарақоңыр топырақтардағы қи енгізілген нұсқасында 0-20 см тереңдікте, $N_{90}P_{90}K_{90}$ енгізілген нұқаларға қарағанда бактериялардың педоскопта жиналуы анағұрлым жоғары. Бактериялардың тізбектелген түрлері және *Leptothrix* туысына жататын жіпшелі темір бактериялары байқалады. Қышқыл тыңайтқыш енгізілген нұсқаларда темірдің жылжымалылығы артады да темір бактериялары темірдің еруі қиын формаларын жылжымалы формаларына айналдыруға қатысады (5-сурет).



5-сурет – Қи енгізілген нұсқа (топырақтың 0-20 см қабаты, а – біздің тәжірибе теліміндегі педоскоптан анықталған темір бактериясы; б - В.И. Лазуренконың деректері бойынша анықталған темір бактериясы)

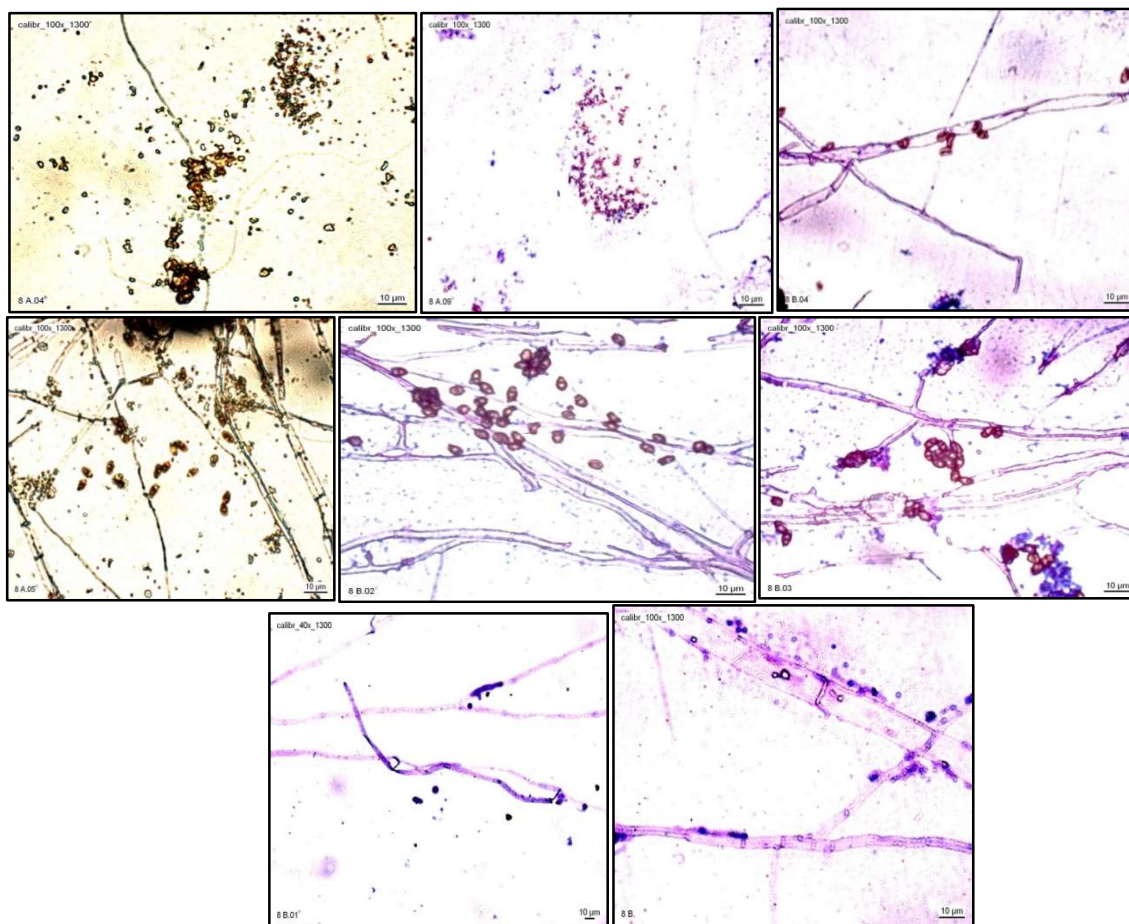
Септелген саңырауқұлақ гифтері және актиномицеттердің мицелийлі үзінділері көп байқалады. Саңырауқұлақтардың *Alternaria* туыстары кездеседі. Ал, 20-40 см тереңдіктегі бактериялардың жайғасуы топырақтың 0-20 см тереңдігіндегі бактерияларға қарағанда шамалы аз болып келеді. Актиномицеттердің мицелийлері мен пердеге бөлінген саңырауқұлақтардың гифтері кездеседі.

Күңгірт қарақоңыр топырақтардағы қи + N₉₀P₉₀K₉₀ енгізілген тәжірибе телімінде 0-20 см тереңдікте бактериялар, актиномицеттердің мицелийлері, пердеге бөлінген саңырауқұлақ гифтері және саңырауқұлақ гифтерінде орналасқан домалақ спорангийлер кездеседі. Бұл нұсқада органикалық заттардың мөлшері, ылғал мол, сондықтан гетеротрофты қоректенетін саңырауқұлақтар, бактериялар мен актиномицеттер органикалық заттарды ыдыратуға қатысады (6-сурет).



6-сурет - Қи + N₉₀P₉₀K₉₀ енгізілген нұсқа (топырақтың 0-20 см қабаты)

Ал, осы нұсқаның 20-40 см тереңдігінде бактериялар өте көп, бактериялардың ішінде сақина тәрізді тізбектері, жалпақ таспа тәрізді түрлері кездеседі. Актиномицеттердің мицелийлері, септелген саңырауқұлақ гифтер де кездеседі (7-сурет).



7-сурет - қи + N₉₀P₉₀K₉₀ енгізілген нұсқа (топырақтың 20-40см қабаты педоскоп тігінен орналасқан)

Қорытынды. Қорыта келгенде, топырақтың өңделген, өңделмегеніне байланысты тәжірибе телімдеріне қарағанда тың жердегі бактериялар, актиномицеттер және саңырауқұлақтар саны аз болып келеді. Себебі, бұл жерлерге тыңайтқыш енгізілмейді, суарылмайды, топырақ өңделмейді. Тәжірибе телімінде бақылау нұсқасына қарағанда органикалық және минералдық тыңайтқыштар енгізілген нұсқаларында барлық микроағзалар (бактериялар, актиномицеттер және саңырауқұлақтар, темір бактериялары), әсіресе, қи және қышқыл минералды тыңайтқыштар енгізілген нұсқаларында мөлшері артқан. Себебі, бұл нұсқада органикалық заттың мөлшері жоғары. Саңырауқұлақтар, актиномицеттер гетеротрофты қоректенетін болғандықтан, олар топырақтағы органикалық заттарын ыдыратып, топырақ құнарлылығын арттыруға қатысады. Зерттеуге алынған күңгірт қарақоңыр топырақтардағы микроағзалардың ішінде, бактериялар мөлшері барлық нұсқалар бойынша басымдылық көрсетті. Қышқыл минералды тыңайтқыштар енгізген кезде, топырақтың қышқылдығы артады да, темір бактериялары еруі қиын темір қосылыстарын, жылжымалы формаларға айналдыруға қатысады, нәтижесінде темір формалары өсімдік сіңіре алатын күйге ауысады.

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Research On Drought Resistance Mechanism of Wheat

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ABSTRACT

Soil drought affects 66% of Kazakhstan's arable land. Grain yields could drop by 37% by 2030 and 48% by 2050 as a result of the drought, according to scientific predictions. The amount of harvested crops could not be sufficient to meet demand because grain consumption is rising at the same time. The development of drought-tolerant wheat cultivars is a vital undertaking given the conditions in this country. In context of global warming, the issue of drought currently affects not only Kazakhstan but the entire world.

Keywords: Triticum aestivum, drought, nitrogen content, photosynthetic activity, sensors.

INTRODUCTION

One of the abiotic stress factors, causing significant damage to agriculture and crop production is drought. Several types of droughts are differentiated to meteorological, soil and hydrological drought.

Meteorological drought means insufficiency of precipitations associated with an increase of potential total evaporation, spreading on large areas for a long period.

Soil drought is a deficit of moisture in the soil (mostly in rhizosphere), which leads to the reduction of water flow into the plants. Sometimes, this type of drought might be called as agricultural drought, because soil drought is linked with reduced crop yields.

Hydrological drought is a term of broad meaning that is connected with negative anomalies in surface and ground waters. For instance, the groundwater level is lower than normal level or the level of water in lakes, decrease in the wetlands and river flow [1].

At each stage of ontogenesis of plant, the influence of drought appears differently. For example, in the stage of vegetation, drought causes damaging effect from the seed germination phase to the flowering stage. The GS 2 stage in the flowering period is considered as the more sensitive phase. On the step of germination, the drought appears to be the most dangerous, because the high temperature damages the development of spike bud on the top of the shoot. Researches showed that none of considerable changes in the height of plants or number of shoots occurred, but the biomass value decreased at high temperature.

The effect of drought during the reproductive stage of development in comparison with vegetative stages is most pronounced when growing wheat. It is connected with impact of high temperature on the number and weight of seed during the reproductive phase of development. Also, it is known that the reproductive tissues are less resistant to the drought conditions compared to vegetative tissues. By the influence of high temperature, the speed of reproductive development increases. Considerable damage on plants caused by conditions of drought during and after the period of flowering. On the cytogenetic level, the reduction in the number of nucleuses in cells indicate the sensitivity of plant reactions on drought.

According to data from the journal of American Meteorological Society "Journal of Applied Meteorology and Climatology", over the last 27 years, the area for the agricultural crops has significantly decreased over the world among crops such as wheat, the area of which is indicated as 161 million hectares (75% from total crop areas in the world), corn 124 million hectares (82%),

rice 102 million hectares (62%). The average decrease in crop yields, due to the effect of drought is 8% for wheat (0.29 ton/hectare), 7% for corn (0.24 tons) and 3% for rice (0.13 tons) [2].

The drought was forecasted in many regions of Kazakhstan in 2019. The company Vander Sat conducted space monitoring results showed 54% of Kazakhstan territories undergone the drought. There are North Kazakhstan region -32.4% of crops, Aktobe - 53.2%, Akmola - 62%, Kostanay - 69.8%, Karaganda - 62.5%, Pavlodar - 52.8%, East Kazakhstan region - 45, 7%. In 2020, Kostanay region was predicted to have the most of drought. According to the UN, 40% of Earth's land are affected by the influence of drought. Annual loses in the world from drought in agriculture alone amount over 40 billion USA dollars.

Drought tolerance and drought tolerance mechanisms of plants

As it is well known, there is a specific ecological group of plants that are resistant to drought. They are called as xerophytes. They have specific adaptive features of so-called xeromorphism, allowing economic spend of moisture without damages to the main physiological processes. When plants grow up in unfavorable conditions, they start to develop special structures, mainly directed to the absorption of sufficient water from outside, reduction of transpiration speed till the minimum, storage of water in organs for a long period of time. Adaptive features include the presence of thick cuticle, closing of stomata and decreasing in the number of stomata, reduction of transpiration surface areas, increased water storage, thick stems and leaves, shortened life cycles, deep root crops and well-growing roots at the soil surface, protective layer in the form of silver hairs for the protection from the wind and provide a reflective surface. For example, the sclerenchyma cells of plant *Peganum harmala* were present in the lower parts of roots that provide resistance to drought. In the plant *Tamarix aphylla*, the leaves are shortened in size, have thick cuticle and waxy layer. These important adaptive features help to preserve necessary amount of water and reduce the waste of water.

The main growth factors of many plants are natural sources such as water, light and mineral elements. Understanding and interpretation of important resistant mechanisms against drought and defining the plant reaction on optimal amount of important resources are necessary for the creation of strategical management of these mechanisms for increase of crop yields, in particular, of wheat [3].

Physiological mechanisms of tolerance to drought of wheat

Physiological reactions on the drought for wheat include the following processes: stomata closure, development of oxidative stress process, change of tissue wall integrity, production of metabolites, which are toxic and leads to death of plants, loss of turgor, regulation of osmosis, reduction of leaf water potential, decrease in stomata conduction for carbon dioxide, reduction of inner CO₂ concentration and decrease of total growth rate.

According to studies, there is a link within the various physiological response reactions in yields with their resistant functions in conditions of drought such as high relatively water content, potential water and membrane integrity.

The intensity of flow can be decreased in conditions of drought during the early filling of seed, which subsequently leads to the decline in the number of endosperm and metabolic activity. Scientists defined that cysteine proteinase performs the main signal function in plants, in growth, development and response reactions to various kinds of stress. Cysteine expresses in wheat leaves and its function start to activate in conditions of drought.

Conditions of drought stimulate changes in seed germination value, seed germination strength of seed; in membrane stability of different wheat genotypes. Drought inhibits the formation process of plant buds and index of stress tolerance to germination. Strength index of

seeds appears to be the most sensitive feature that is tolerant to the water deficit conditions, which subsequently causes the effect on seed germination, length of roots and shoots.

The following processes opens the mechanisms of wheat resistant to drought: reduction of stability of cell membrane, relative water content, early germination, decrease of leaf area, small size of plant, increase of dry mass and ratio between the roots and reactions of transpiration speed on the deficiency increase of atmospheric pressure [4].

Relative water content in plants under drought conditions

Relative water content is main parameter of water state in comparison with potential water in wheat leaves under drought conditions, which is used in selection of drought tolerant lines. Relative water content is connected with cell turgor, which is important indicator of water state in plants, demonstrating the balance between water supply in leaf tissues and transpiration rate. This index influences on ability of plants to regenerate after drought conditions and crop productivity and stability depend on that parameter. Relative water content parameter determines current water content in selected leaves of tissues relatively to maximum water content, which can be retain under full swelling. This is indicator of water deficit. The optimum of relative water content must be in range of 98 % in rigid and transparent leaves, and 40 % in dried and dying leaves. Relative water content index in majority of agricultural crops is approximately 60-70%.

The drought, which starts to impact during the late stages of growth of wheat development (for example, after 6 weeks of seedling appearance) has a more negative effect on water content in leaves, adsorption of nutrients and growth, than effect of drought on early stages of growth (after 3 weeks of seedlings appearance) of wheat development. Drought causes significant decreasing in chlorophyll content, membrane stability and relative water content on flowering stage. Decreasing of relative water content leads to the stomatal closure, which is subsequently leads to the decreasing of photosynthetic activity. With deficit of water the osmoregulation process is destroying. Followed by alternation in the beginning with plant drying, then the water intakes again. By the process of osmoregulation, the effectivity of water usage by wheat is increasing again during drought. Consequently, if relative water content is high by high osmoregulation process, this method can be used for increasing the drought tolerance of wheat.

This process allows implement the cell expansion and plant growth in water deficit conditions. Also, osmoregulation process allows to stomata stay half-open and keep fixing carbon dioxide in drought conditions. Storage of osmolytes allows to cell control their degradation and integrity of membrane structure, for providing tolerance in water deficit conditions. Besides plants, which are under the effect of drought conditions, their osmoregulation process can be achieved by storage of low molecular organic solutions. For instance, wheat can accumulate several inorganic and organic solutions in their cytozols, for minimizing their osmotic potential to support cellular turgor [5].

Wheat genotypes, which are resistant to drought demonstrate high turgor potential and relative water content index, consequently it confirms insignificant influence of deficit water on cell protoplasmic structures, in comparison with sensitive genotypes. Therefore, these resistant genotypes indicate high positive relation between relative water content and intensity of photosynthesis.

Maintaining of turgor in leaves is important mechanism of drought tolerance, which play main role in stomata regulation and photosynthetic activity in water deficit conditions.

One of the adaptive features, which allows to control the loss of water, and is connected with epidermal conduction, this is the presence of epicuticular wax layer on the surface of plant leaves, which is organic cuticle substance, covering external membrane of plant tissues. It was investigated that epicuticular wax can be main feature of drought tolerant wheat genotypes.

Leaves with wax layer and dense trichomes (outgrowths on plants, formed by cells of epidermis) prevent from water loss and thereby protect from the drought long time period [6].

Chlorophyll content and photosynthetic activity under drought conditions

As stated above, photosynthetic intensity directly correlates with relative water content in plant leaves. Main photochemical reactions of photosynthesis occur with the presence of chlorophyll. Depending on the wheat varieties and different ecological factors, ratio between chlorophyll a and b is 3:1. The highest chlorophyll content in plants is observed on the flowering stage. In drought conditions there is considerable decreasing of the chlorophyll content parameter in wheat, and respectively the intensity of photosynthesis is decreasing too.

The decreasing of chlorophyll content is also connected with the physiological age of leaves. For example, in young leaves chlorophyll content index is significantly high because of enzyme involvement in chlorophyll synthesis reaction and is decreasing on 13-15 % in old leaves due to activation of chlorophyllase enzyme and inactivation of the enzyme in water deficit conditions.

It is well known, that during grain filling stage the drought accelerates the process of wheat senescence and enhances mobilization of carbohydrates again.

The first sign of senescence process in plants is a breakdown of chlorophyll molecules, which is in result leads to the deceleration of photosynthetic activity. Other studies have proven that if take wheat lines and create for them conditions with the plenty of water, then in chlorophyll content will not be considerable changes among sensitive and tolerant wheat genotypes, as on vegetative stage, also on flowering stage. However, on this stage the chlorophyll content was lower.

The high chlorophyll content leads to the good harvest in drought conditions. In these conditions were observed wheat lines, in which the chlorophyll content was high on the stage of grain filling. Also, the high functional stability of thylakoid membrane proteins and high antioxidant ability increases drought tolerance in wheat lines.

Photosynthesis is one of the main metabolic processes, which influences considerably on grain yield. These parameters, as chlorophyll fluorescence, overall photosynthetic activity, and chlorophyll content are used for monitoring of wheat ability to adapt in abiotic stress factors, for example, drought and high temperature. Since, the chlorophyll fluorescence exhibits correlation dependence with drought tolerance, this is perspective feature for selection.

There are two factors, which impact on the photosynthetic activity, as: temperature and water balance, because they influence on physiological processes, consequently their effect impacts on the photosynthetic activity. First of all, it is necessary to discuss what specific factors the functioning of photosynthesis depends on. These factors include: light intensity, concentration of carbon dioxide, water balance of plant and the plant type C3 or C4. All the above consequences of these processes negatively influence of photosynthesis and respiration [7].

One of the main reasons of decreasing in photosynthetic activity is stomata closure, which is connected with the decreasing of turgor in leaves or with low level of moisture, however, water content in soil considerably influences of stomata closure, rather than water content in leaves. Inhibition of photosynthesis is usually preceded by stomata closure; it means that in the places of assimilation in chloroplasts less carbon dioxide is available. However, photosynthesis can be limited because of carboxylation efficiency decreasing, regeneration of RuBisCo enzyme or chloroplasts activity decreasing. In the result, metabolic disruptions of photosynthetic activity can be connected with following reasons: imbalance between light absorption and its usage; decreasing of RuBisCo activity; destroying of chloroplasts membrane; degradation of chloroplasts structure and photosynthetic apparatus; chlorophyll photooxidation; destruction of chlorophyll substrate; inhibition of chlorophyll biosynthesis and chlorophyllase activity increasing. Stomata

closure can be element of tolerance mechanism to the drought, because the closure helps to the plants save water in drought conditions.

On the other hand, stomata closure leads to the decline of carbon dioxide availability for photosynthetic metabolism of carbon, by that reduces assimilation rate of carbon dioxide and stops the process of dry substance accumulation.

With increasing temperature, a stable water content is maintained in the tissues of plants, due to a sufficient amount of moisture. But, in drought conditions the moisture deficit is observed. Consequently, under drought the transpiration is increased and it leads to the declining of water potential in plants. Consequences are changing of osmolytes number and optimization of other physiological processes. Researchers proposed that transpiration efficiency is affected by wheat cultivar and drought conditions. Therefore, the choosing of wheat variety with high transpiration efficiency rate is essential for obtaining drought tolerant wheat lines [8].

Impact of nitrogen in the regulation of drought tolerance

The nitrogen is necessary element of nutrition that accounts for most of all macronutrients, as a result its deficit leads to the stasis of plant growth. It is well known, that nitrogen is a component of amino acids and is part of proteins. In turn, proteins form protoplast and therefore, they are component of any kind of membrane. Nitrogen is included in composition of nucleic acids, phospholipids, ATP, ADP, chlorophyll and other compounds. The important role of nitrogen is regulatory function, because proteins contain nitrogen, and enzymes by their structure are proteins, that is why the limiting amount of nitrogen in plants influences on the chemical reaction rate, and it follows that nitrogen effects on physiological processes rate. Besides, the lack of nitrogen is connected with photosynthesis process, as the deficit of nitrogen inhibits the growth of shoots and photosynthetic surface of plants starts to narrow.

The deficiency of nitrogen with the lack of water are main reason of wheat yield decline and subsequently they impact on relative water content in leaves, chlorophyll fluorescence and on the whole photosynthesis process. All these factors lead to the early senescence process, limited grain weight and low harvest of wheat.

The researching of nitrogen influence on physiological activity and characteristics of crop productivity will provide with useful information for wheat growing under stressful drought conditions.

The destroying of photosynthesis process during the drought is connected with drastic change of nitrogen amount, it means that its availability is limited. There are a majority of research works, which were about this topic, however, some of them contradict to each other. For instance, presence and availability of nitrogen balanced consequences after drought in plants [9].

It contradicts to the following plants, which were pollinated with nitrogen start to react on drought conditions faster, due to stomatal closure and inhibition of photosynthesis process. It was noted that even in different wheat cultivars under influence of drought the physiological functions will not change at different usage of nitrogen.

Such different assumptions can be due to different: types of plants, specific area, amount of nitrogen, stress levels because of drought and also growth stages of agricultural crops.

In cases, when there is enough amount of water and nitrogen, plant's reaction to the drought can vary depending on growth stage of plants [7].

The wheat depends on several factors in drought conditions: at the tillering and shooting stages, the level of resistance to drought depends on the intensity of the drought itself and also on the presence of nitrogen. It was proven that plants, which obtained more nitrogen, in the result demonstrated high results in stomata activity and membrane stability, in comparison with the plants, which received less nitrogen at same drought conditions [10].

Sufficient amount of nitrogen positively influences on the photosynthetic activity and opening-closing of stomata in deficiency of water conditions and nitrogen, it is connected with that big part of nitrogen is active in light adsorbing in green zone for photosynthesis stimulation.

In studies have been shown that at high nitrogen content in plants the activity of superoxide dismutase (SOD) and ascorbate peroxidase (APO) is high and the low amount of malondialdehyde (MDA) leads to an improvement in redox status for the purification from damage of reactive oxygen species (ROS).

There is a process of nitrogen recirculation in drought conditions. For example, catabolism of purine nucleotides and nucleic acids performs auxiliary function in nutrients recirculation, providing growth and development of plants.

For example, during the oxidation of xanthine (purine catabolite) to glyoxylate, three molecules of carbon dioxide and four molecules of ammonia are released. Also, with the depletion of nutrients, purine catabolism begins.

During the deficiency of nitrogen in wheat, but with the supplying of xanthine and allantoin (purine catabolites) the process of photosynthesis and plant growth were observed. Also, in plants capable of re-adsorbing nitrates, growth may be maintained.

The accumulation of allantoin in wheat provides a protection of plants due to the production of ABA [11].

It is known that storage of allantoin at water deficiency and limitation of carbon skeleton for assimilation to organic nitrogen prevents the loss of nitrogen in the form of ammonia gas.

With the correct supply of nitrogen in the form of fertilizer, there is an increase in the efficiency of water-use by crops. Physiological, biochemical, molecular mechanisms control the water consumption and efficient use of water with nitrogen fertilizer. In many of developing countries even under drought conditions the grain yields achieved high harvest due to high dosage of nitrogen-containing fertilizers.

Material and methods

The objects of research were the cultivars of soft spring wheat Kazakhstanskaya-10, Erythrosperrum, as well as mutant wheat lines (M7) E-152 and E-159, obtained on the basis of irradiation by 100 γ -ray doses of Erythrosperrum cultivar seeds.

The wheat cultivar Kazakhstanskaya-10 (Kaz-10) was obtained at the Kazakh Research Institute of Farming and at the Semipalatinsk Agricultural Experimental Station by individual selection from a hybrid combination of cultivars "Priboy" and "Strela". It was included in the State Register in the Ural 9 and West Siberian 10 regions in 1990.

This cultivar has the following characteristics: spindle-shaped spike, medium length and density. Spikelet scales are ovoid, with pronounced nerves. The tooth of the spikelet scales is short, coracoid, a shoulder of medium size, from straight to bevel. The keel is strongly pronounced in length. The grain is medium-sized, the mass of 1000 grains is 32-39 g, round, red, and the groove is shallow. The cultivar belongs to the variety Lutescens.

Also, it has the following economic and biological characteristics: the baking quality of the grain is good, the variety is classified as valuable wheat. Bakery score from 3.9 to 4.6 points. The duration of the growing season is 66-90 days. The variety is highly productive. The maximum yield is 58.0 c / ha. The cultivar resistant to lodging, shedding, sprouting on the root, a large extent affected by smut, leaf diseases - in an average degree.

Erythrosperrum is a cultivar of soft wheat with a white spinous spike and red grain. One of the most common on the globe. Spring wheat cultivars and winter wheat the Erythrosperrum cultivar are cultivated in the USSR. The spike is prismatic, spikelet lanceolate scales, mild nerves. The tooth of the spikelet scales is short, sharp, extending to the apex. Awn is short, diverging. The grain is large, red, the shape is semi-elongated, and the groove is medium.

The average yield of the Erythrospermum cultivar (2011-2015) amounted to 2.81 tons / ha in the competitive variety testing, the maximum yield obtained in 2001 was 6.77 tons / ha. It is belonging to the group of medium late mature varieties. The growing season is 80 - 108 days. Erythrospermum has a high drought tolerance. The cultivar resistant to lodging, shedding and seed germination on the root.

The cultivar is tolerant to brown and stem rusts, susceptible to smut and dust smut, has a low susceptibility to powdery mildew, resistant to carbohydrate-protein depletion of seeds. The quality of grain refers to strong wheat, protein content of 15.17%, gluten 28-31%.

In the research work, biophysical, physiological methods were used, in particular, N-sensors immersed in the soil columns and converting the chemical signal (nitrogen concentration) into an electrical signal detected by the GP2-Logger sensor were used to determine the nitrogen concentration in the soil.

A cost-effective ion selective sensor to measure the nitrate content of the soil water solution was used in this work. The first step of this method is preparation of chemical cocktails, where nitrate tip backfilling solution and reference tip backfilling solution were used. Next step is preparation of sensors, which includes next processes: pipet tips salinizing pre-treatment, membrane casting process, preparation of the electrode wiring. After that, it is necessary to do pre-building and backfilling of sensors and prepare the calibration solutions. Calibration of the sensors: Connect 5 to 10 sensors to the channels of a GP2 data logger. Leave them in the 265 mM calibration solution for about 5 to 10 minutes. Check the signal quality/stability. Over noisy sensors, need either to be throw away or need more time hydrating in 265 mM

KNO₃ solution. Stop the GP2 recording. Remove the NO₃ sensors and carefully clean them using some blue roll paper. Put the sensors in the 72 mM KNO₃ solution and start the GP2 recording. Leave the sensors in the second solution for 5 to 10 minutes. Repeat this process in the 20-, 6- and 1.9-mM solution, and put the sensors back into the 265 mM solution. The measured electrical potential should be close to the one measured at the beginning of the calibration. A good nitrate selective sensor should display a 40-mV difference between each calibration solution. A noisy signal (+/- 5 mV) is tolerated if the mean signal is stable and shows a good nitrate selectivity.

Physiological parameters, such as water retention capacity and chlorophyll content were determined by the relative water content in the leaves and the mini SPAD device.

All experiments were carried by three replications and evaluated by statistical analysis.

Results and discussion

According to long-term forecasts calculated jointly by experts from the Organization for Economic Cooperation and Development (OECD) and the FAO, wheat production is projected to reach 806 million tons by 2020, and 950 million tons in 2050. For the same period, according to UN forecasts, the population will increase about 30-35%. The increasing in wheat production should occur due to increasing of the yield new varieties of wheat. Worldwide, wheat varieties are created mainly by classical hybridization and selection, and the methods of molecular genetics, bioengineering, biotechnology, physiological and biochemical tests contribute to some acceleration of the selection process, the creation of new source genetic material for wheat selection and evaluation, and the selection of valuable hybrid populations and wheat lines. In real practice, the expected forecasts of grain yields and the resulting grain yields in specific geographical areas differ due to the influence of adverse climatic conditions. For Kazakhstan, one of such unfavorable factors that reduce the yield of grain crops is drought. Therefore, for breeders of Kazakhstan, obtaining drought-resistant plant varieties is relevant.

An analysis of data on average annual rainfall and moisture condition was carried out from April to May for the last 10 years, in the territory of Almaty region of Southeast Kazakhstan.

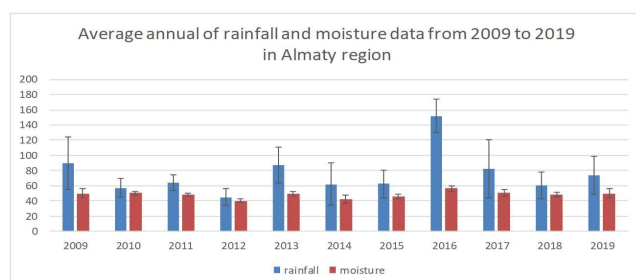


Figure 1. Average annual of rainfall and moisture data from 2009 to 2019 in Almaty region.

As shown in figure 1, the parameters of average annual rainfall remain stable throughout the entire period within 40-60%. Annual rainfall data fluctuates sharply. The maximum average annual rainfall was in 2016 and amounted to about 160 mm, the minimum indicator was observed in 2012. The driest years according to the average annual rainfall and humidity are 2010, 2012, 2014, and 2018.

The level of rainfall sharply increases in May 2012 from 32 mm to 68 mm and gradually decreases the following months, and in August there is no rainfall. The percentage of moisture decreases slightly in the month of May from 45% to 32%. In May and June of the same year, at the stage of formation of a spike, stem and at the stage of the beginning of flowering of wheat, the level of rainfall remains high. However, at the stage of grain filling and ripening, the level of rainfall drops sharply to 20 mm, and in August decreases to 0. Drought in recent months has sharply led to a decline in yield.

Rainfall level for 2014 is critically low, there is a sharp decline in April from 140 mm to 60 mm in May i.e., at the stage of formation of the spike and stem, a sharp decline in the level of rainfall and the percentage of moisture begins. This leads to a lack of water at the stages of flowering and ripening of wheat. The month of August 2014 shows the lowest rainfall and percentage of moisture.

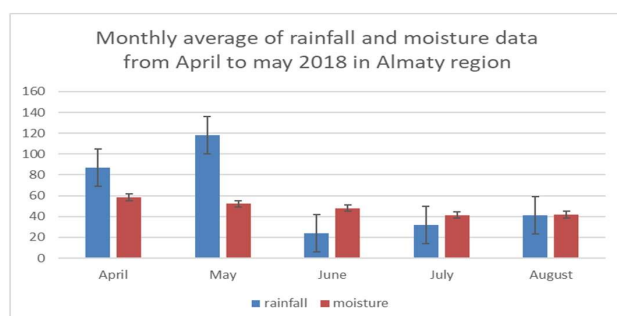


Figure 2. Monthly average of rainfall and moisture data from April to May 2018 in Almaty region

As shown in figure 2, there is a sharp increase of rainfall in the month of May, then a sharp decline in June from 120 mm to 22 mm, as well as a slight increase in rainfall in July and August 2018 to 44 mm. The percentage of moisture shows a gradual decline from 58% to 40%, and reaches the same level in August with the average monthly rainfall. At the stage of spike formation, rainfall and moisture indicators are normal. However, the following months, during the flowering, grain filling and ripening stages, an acute shortage of water under drought conditions is demonstrated.

Analyzing all the monthly average and annual average of rainfall and moisture data, we can conclude that the most critical and driest years were 2014 and 2018. As the data of the diagrams show, the greatest decline in the level of rainfall and moisture occurs in June-July 2018, at the

initial stage of flowering and filling of grain. Significant damage to plants is caused by drought conditions during and after the flowering period. Plants show their sensitivity by decreasing the number of nuclei.

Determination of the relative water content in wheat leaves under drought conditions

The relative water content in wheat leaves under drought conditions is one of the indicators of drought tolerance of plants. To determine the relative water content, leaf samples of different varieties of wheat were weighed and the wet weight of the leaves was determined, then simulating drought, the leaves were placed in a chamber and stored for several hours at a temperature of 84⁰ C, and then the dry biomass of the samples was weighed. After saturation with water, and reaching turgor, the leaves were weighed again. After carrying out all the procedures according to the formula, the relative water content in the leaves was calculated.

The RWC= (fresh weight – dry weight) / (turgid weight – dry weight) × 100

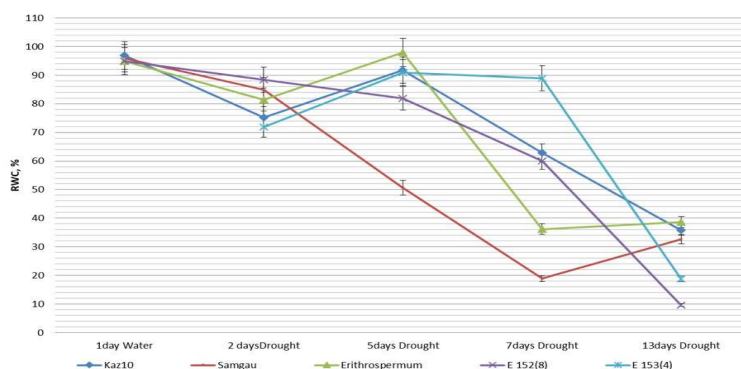


Figure 3. Relative water content in wheat leaves under drought conditions

The first two days in all wheat cultivars there is a sharp decline in the water content in the leaves, from about 95% to 80% and below. The second interval between 2 and 5 days there is a sharp jump up in 2 cultivars, in Erythrospermum, Kaz-10, and mutant E-153 (4) to 90%. However, in the cultivar Samgau and the mutant line E-152, a decrease in the water content in leaves to 20-30% continues. Between 5 and 7 days, a decrease in water level is observed in all varieties, the highest water content in the mutant E-153 wheat line (4), then in the Kaz10 variety, and the lowest in the Samgau and Erythrospermum varieties. The mutant line E-152 shows the average level of water content for the whole period of drought. The period between 7 and 13 days is the driest for the variety Kaz-10 and the mutant lines E-152, E-153 (4). But, in the varieties of Erythrospermum and Samgau, the percentage of water content in the last days of drought increases by 10%, which suggests the start of the adaptation mechanism to drought.

Thus, according to the physiological parameter, the relative water content in the leaves, we can conclude that the wheat varieties Erythrospermum and Samgau showed the highest drought tolerance. Among the other varieties and lines, it can be noted that the mutant line E-152 showed insignificant and gradual drops in the water content in the leaves, compared with other varieties in which there were sharp drops and rises in percentage of the relative water content. Also, the highest water content for 7 days was maintained in the variety Kaz-10.

Determination of nitrogen content in the soil available for assimilation by plants using sensors

The experiment was conducted under controlled conditions in a greenhouse for one month. Used N-sensors immersed in soil columns, which convert the chemical signal (nitrogen concentration in 3 soil layers) into an electrical signal detected by the GP2-Logger sensor.

In the upper row are plants of local varieties of wheat tolerant (Kaz-10) and drought sensitive, in the lower row are the mutant line (E-152, M7) and its parent variety (*Erythrospermum standard*) grown in soil columns with sensors

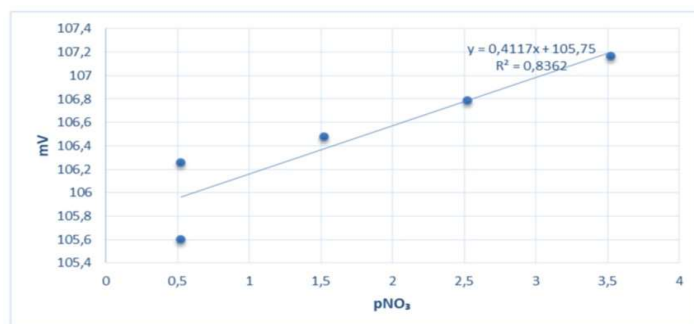


Figure 4. Nitrogen content in the upper soil level of Kaz-10 cultivar before drought

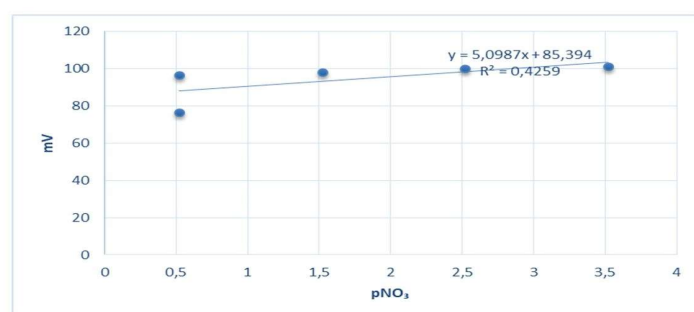


Figure 5. Nitrogen content in the upper soil level of Kaz-10 cultivar during drought

The nitrogen content in the upper layers of the soil during the cultivation of the variety Kaz-10 before drought is greater than during drought. For example, at an ion nitrate concentration of 0.5 before drought, the nitrogen content is approximately 105-106 mM, during a drought 90-100 mM. During drought, the nitrogen content is approximately kept at the same level, but before the drought, the nitrogen content varies significantly in the range of 76-100 mM.

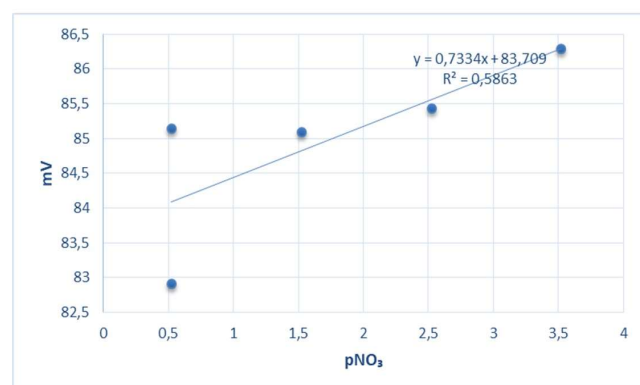


Figure 6. Nitrogen content in the middle soil level of Kaz-10 cultivar before drought

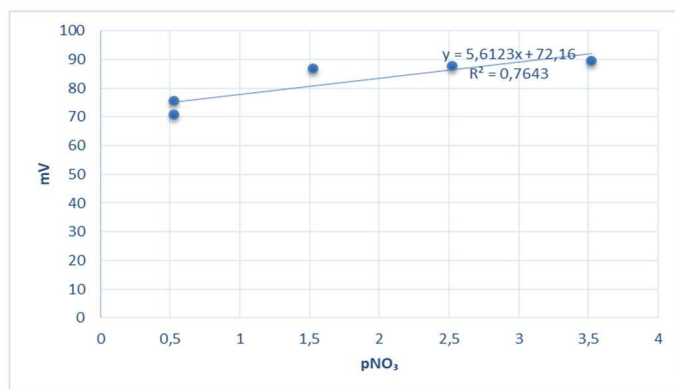


Figure 7. Nitrogen content in the middle soil level of Kaz-10 cultivar during drought

The nitrogen content in the middle layers of the soil during the cultivation of the variety Kaz-10 during drought is greater than before drought. Also, the nitrogen content in the soil before the drought does not differ much, they remain in the range of 83-86 mM, during the drought from 70 to 90 mM.

As can be seen from the figures 10 and 11, plants absorb nitrogen from the middle layers of the soil to a greater extent at the beginning of the drought and spend it economically during the entire dry period. This is evidenced by the concentration of nitrogen in nitrate form at the beginning of the drought, which corresponds to 75 mM and its slight increase by 1.2 times at the end of the month, when the experimentally simulated drought (90 mM) ended.

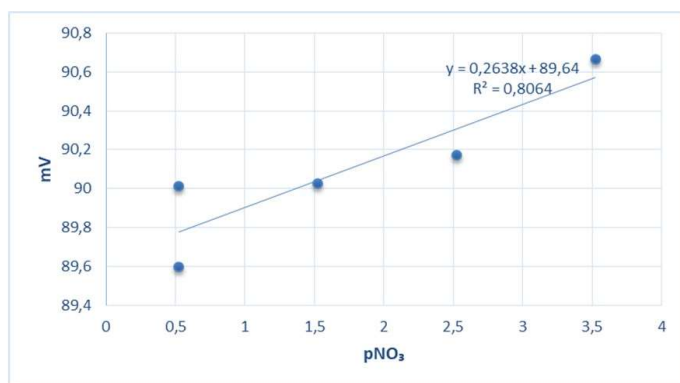


Figure 8 Nitrogen content in the lower soil level of Kaz-10 cultivar before drought

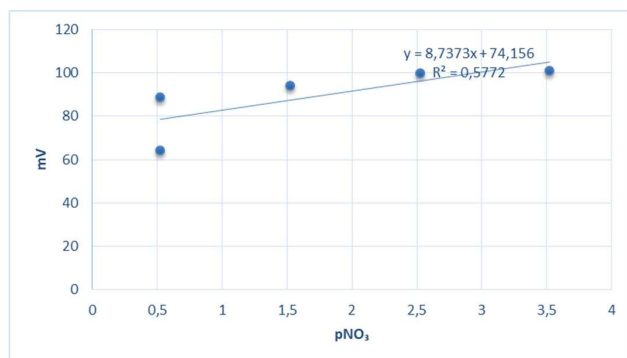


Figure 9. Nitrogen content in the lower soil level of Kaz-10 cultivar during drought

The nitrogen content in the lower layers of the soil during the cultivation of the variety Kaz-10 during a drought is greater than before the drought. The maximum nitrogen content during

drought reaches 100 mM, before drought this parameter is 96.5 mM. Also, the readings of the sensors for the variety Kaz-10 before drought do not differ significantly and range from 89.6 to 90.65 mM. However, during drought, the concentration of nitrate ions varies significantly from 60 mM to 100 mM. At a nitrate concentration of pNO_3 3.5 ions, the nitrogen content in the lower layers of the soil increases sharply both before drought and during drought.

As a result, when growing the variety Kaz-10 according to the results of the nitrogen content in three soil layers to a depth of 1 meter, it was found that the nitrogen concentration was high during drought in the middle and lower soil layers, i.e. plant roots absorbed nitrate ions mainly from the upper layers of the soil. In experiments, before drought, plants consumed nitrogen less intensely than during the dry period. This is evidenced by the readings of the sensors on the content of average nitrogen values in the thickness of the soil 1 meter deep, comprising 80-100 mM, and a decrease in the concentration of nitrogen in the soil during drought, leaving 60-100 mM.

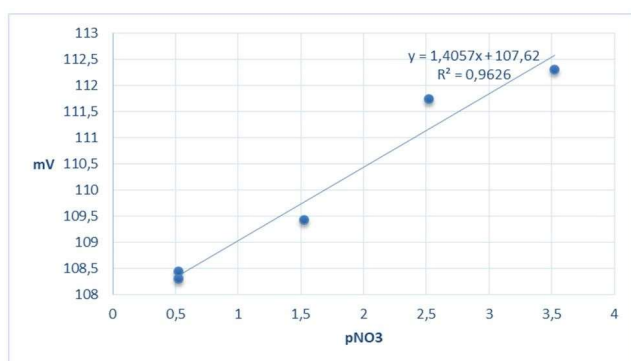


Figure 10. Nitrogen content in the upper soil level of Erythrospermum cultivar before drought

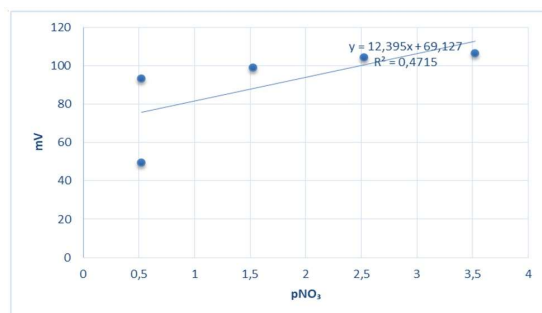


Figure 11. Nitrogen content in the upper soil level of Erythrospermum cultivar during drought

The nitrogen content in the upper layers of the soil during the cultivation of the variety Erythrospermum is much higher before drought than during drought. A significant difference can be seen in the minimum nitrogen content in the upper layers of the soil during a drought of about 50 mM, before a drought of at least 108 mM. Also, the fifth sensor, located at an average level of the soil column, during drought showed the lowest nitrogen content, corresponding to 50 mM.

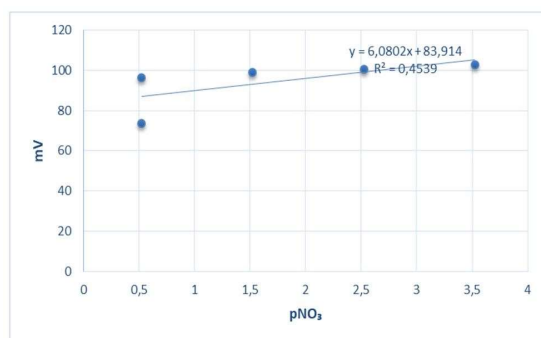


Figure 12. Nitrogen content in the middle soil level of Erythrospermum cultivar before drought

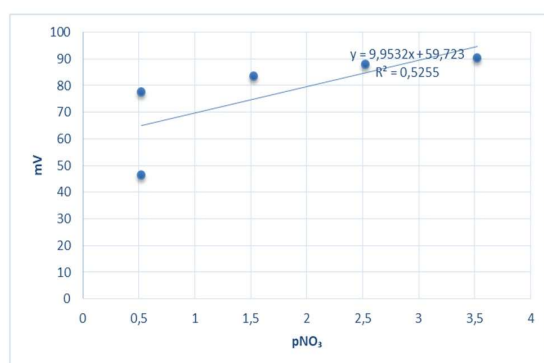


Figure 13. Nitrogen content in the middle soil level of Erythrospermum cultivar during drought

The nitrogen content in the middle layers of the soil during the cultivation of the variety Erythrospermum before drought is greater than during drought. Before drought, nitrogen reaches a level of 100 mM, during a drought 90 mM. Two graphs show that nitrogen concentrations vary widely, for example, before drought, reach a level of 70 to 100 mM, and during a drought, from 45 to 90 mM.

The maximum nitrogen content in the lower layers of the soil is the same both before drought and during drought. However, their minimum is different, before drought it is about 91 mM, and during drought it is 80 mM. Values of nitrogen before drought range from 91 to 100 mM, during drought from 80 to 100 mM. Before drought, when the concentration of nitrogen nitrate ions reaches 2.5, there is a sharp increase in nitrogen content from 96 to 98 mM.

As a result, according to all the graphs in three soil layers during the cultivation of the variety *Erythrospermum*, the nitrogen content is the highest until drought in the upper and middle soil layers. In the lower soil layers, the nitrogen content is the same before drought and during drought. The limits of nitrogen content before drought are from 70 to 100 mM, during drought from 40 to 100 mM. Thus, the roots of plants of the Erythrospermum variety absorb nitrogen mainly in the lower soil layers under normal conditions, but during drought, nitrate ions are absorbed mainly in the upper and middle soil layers.

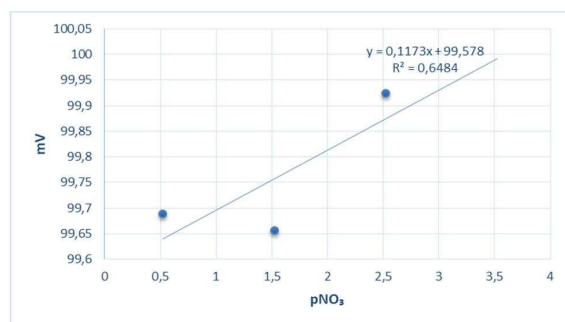


Figure 14. Nitrogen content in the upper soil level of mutant line E-152 of wheat before drought

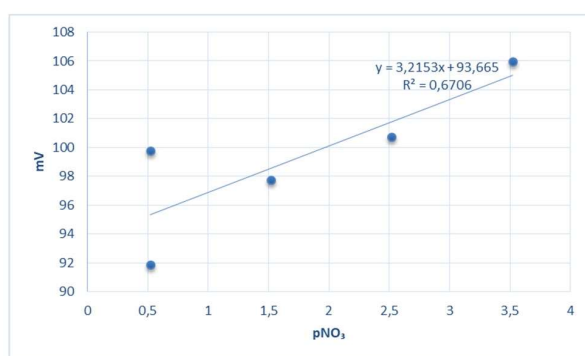


Figure 15. Nitrogen content in the upper soil level of mutant line E-152 of wheat during drought

The nitrogen content in the upper layers of the soil during the cultivation of the E-152 line is higher during drought than before drought. During drought, the maximum nitrogen content reaches 106 mM, and about 99 mM before drought.

The nitrogen content in the middle layers of the soil during the cultivation of the E-152 mutant line is higher before drought than during drought. The minimum level of nitrogen before drought is 102.1 mM, during a drought 79 mM. Also, approximately in the middle of the dry period, there is a sharp increase in the level of nitrogen in the middle layers of the soil. In addition, the limits for nitrogen content during a drought fluctuate significantly compared to values before a drought.

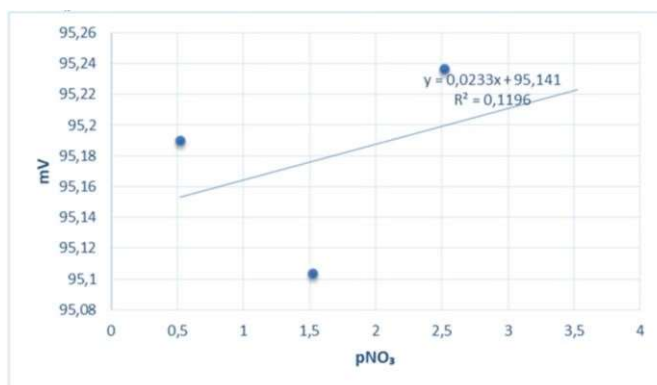


Figure 16. Nitrogen content in the lower soil level of mutant line E-152 of wheat before drought

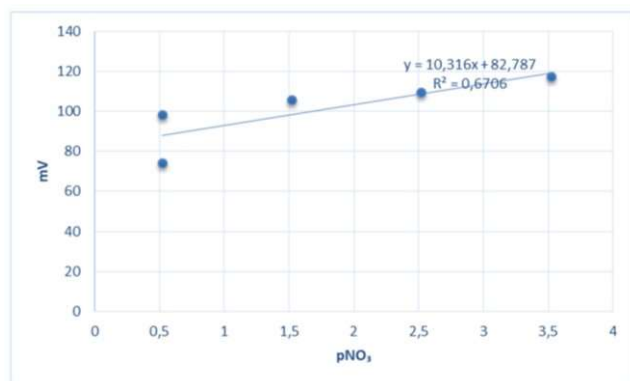


Figure 17. Nitrogen content in the lower soil level of mutant line E-152 of wheat during drought

The nitrogen content during the cultivation of the E-152 mutant line in the lower soil layers is much higher during drought than before drought. In the middle of the dry period in the lower layers of the soil, an increase in the concentration of ion nitrate is observed up to 95.24 mM. During drought, a gradual increase in nitrogen levels occurs.

As a result, in the upper and lower layers of the soil during the cultivation of the E-152 mutant line, a high level of nitrogen is observed during drought, compared to drought. Also, there was a high nitrogen content in the middle layers of the soil before drought. The limits of the nitrogen content before drought in the thickness of the soil 1 meter deep is 95-102 mM, during the drought 70-120 mM.

Analyzing all the results, we can conclude that the nitrogen content in the soil when grown in almost all varieties of wheat and the mutant wheat line is higher during drought, and not before drought. However, in the variety *Erythrospermum*, the nitrogen content in the soil is higher before drought. Also, the nitrogen content in all soil layers varies depending on the variety and line of wheat, however, mainly in the middle layers of the soil there was a high level of nitrogen. In addition, most often, the limits of the nitrogen content in the soil were between 70 and 100 mM. Most varieties and lines of wheat at the point of concentration of nitrate ions of 1.52.5, significant jumps occurred to increase the level of nitrogen.

Thus, in drought tolerant varieties, nitrogen absorption occurs mainly in the upper layers of the soil. Drought-resistant varieties and the E-152 mutant line during the entire dry period absorb nitrogen from the soil to a small extent and use the internal reserves of nitrogen absorbed during the non-dry period and in a bound state.

Determination of chlorophyll content in the leaves

One of the physiological parameters related to resistance to abiotic stress factors is level of photosynthesis and also chlorophyll content. Chlorophyll content is one indicator of plant health and can be used to optimize the timing and quantity added fertilizer to provide the largest crop yields.

For this work was used easy measurements of the chlorophyll content of plant leaves by the SPAD-502Plus in figure 8 (Konica Minolta, Osaka, Japan).

The content of chlorophyll in the leaves of Kaz-10 wheat throughout the 30 days of growing plants under drought conditions gradually increased, ranging from 30 to

70 $\mu\text{mol per m}^2$. However, after 7 days of cultivation, this indicator dropped sharply from 35 to 25 $\mu\text{mol per m}^2$. Also, on day 21, the chlorophyll content slightly decreased by about 5-7 $\mu\text{mol per m}^2$. Compared to the control, the first 3 days the experimental indicators were approximately the same, however, on the 7th day, in the control samples there was a sharp increase in the

chlorophyll content to 40 $\mu\text{mol per m}^2$ with a subsequent decrease until the end of the experiment.

Both in the control and in the experimental samples of the *Erythrospermum* cultivar, a high content of chlorophyll in the leaves was observed for 30 days. *Erythrospermum* has a slightly low chlorophyll level in the first two weeks, however, on day 21 there is an increase in chlorophyll level compared to the control, in which a decrease in chlorophyll level from 30 to about 10 $\mu\text{mol per m}^2$ is noticeable.

The dynamics of changes in the level of chlorophyll during the first week of the experiment was approximately the same both in the control samples and in the experimental samples of leaves of the mutant line E-152 (8). A slight decrease in chlorophyll content was observed in both cases on day 14 of mutant cultivation under drought conditions. However, on the 21st day of cultivation in control samples of wheat leaves, there is a sharp decline from 35 to 20 $\mu\text{mol per m}^2$, and in experimental samples of the E-152 line (8), a decrease of about 10 $\mu\text{mol per m}^2$ is observed. If the chlorophyll content within 21 days of plant growth is approximately at the same level, but on day 26 there is a sharp increase in the chlorophyll content at E-152 (8) and reaches a maximum of 70 $\mu\text{mol per m}^2$. On day 30 of the simulated drought in the mutant line E-152 (8), the level of chlorophyll in the leaves again falls to the average value.

In the mutant wheat line E-153 (4), in the experimental samples of leaves and in the control, the content of chlorophyll in the leaves was approximately the same during the first week. In the second week, the pigment level sharply decreases from 40 to about 20 $\mu\text{mol per m}^2$, a decrease in the concentration of chlorophyll also occurs in control samples, but only slightly - a decrease of only 10 $\mu\text{mol per m}^2$. And at the end of the drought period, the chlorophyll content at E-153 (4) drops to 35

$\mu\text{mol per m}^2$, and in the control samples it remains at 40 $\mu\text{mol per m}^2$.

CONCLUSION

For the studied wheat samples, it was shown that nitrogen assimilation by plants under drought conditions occurs mainly in the upper soil layer, however, for the Kaz-10 variety (drought tolerant variety, control) and for the mutant wheat line E152, nitrogen consumption is also observed in the lower soil layer. This confirms field phenological studies, and physiological and molecular studies, that the mutant line E-152 can tolerate air and soil drought for a long time.

An analysis of the results of the relative water content in plant leaves and the chlorophyll content in leaves of wheat grown under drought conditions showed that the mutant line E-152 was relatively at the same level in drought resistance compared to the control drought tolerant cultivar Kaz-10.

The experimental results confirm the studies of many scientists that the nitrogen content in the nitrate and ammonium form in the plant, the chlorophyll content in the leaves, as well as high parameters of water-holding ability correlate with the level of plant resistance to drought. Molecular studies confirm the expression of genes associated with drought tolerance. According to experimental data, the mutant line E-152 (M7), obtained as a result of gamma irradiation of the standard variety *Erythrospermum*, is drought tolerant and can be recommended for use in breeding programs for creating drought tolerant cultivars of soft wheat.

The maximum relative water content was obtained for the variety *Erythrospermum* (standard). However, after 7 days without watering, the RWCs of the four genotypes were reduced, only the variety Kazakhstan-10 (drought tolerance standard) maintained a relatively high-water content index. By the 13th day of the drought, water uptake was minimal for the mutant line E-152 (8). The other mutant line E-153 (4) was more resistant to water scarcity than the first mutant line, and more sensitive than the *Erythrospermum* variety (standard).

Experimental data show that the content of chlorophyll in the leaves of the mutant line E-153 (4) was less than in plants grown with watering (control option). However, it was higher than for this parameter in the leaves of another mutant line E152 (8). The chlorophyll content, which correlates with the nitrogen content in the leaf, is almost constant and has been stable for 2 weeks for the *Erythrospermum* variety (standard) compared to the control varieties Kaz-10.

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Economic Sciences

МЕДИКО-ЭКОНОМИЧЕСКАЯ ОЦЕНКА ОРГАНИЗАЦИИ СЛУЖБЫ ЭКСТРЕННОЙ СОСУДИСТОЙ ХИРУРГИИ

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Аннотация

В данной статье осуществляется медико-экономическая оценка организации службы экстренной сосудистой хирургии с целью анализа её эффективности и качества предоставляемых услуг. Рассматриваются теоретические основы медико-экономического анализа, включая основные методы и подходы, применимые к оценке медицинских услуг. Анализируется международный и национальный опыт организации служб экстренной сосудистой хирургии, выявляются основные проблемы и вызовы. Описывается разработанная методика медико-экономической оценки, включающая критерии и показатели эффективности, а также предлагаются рекомендации по оптимизации работы служб. Результаты исследования представляют практический интерес для специалистов в области здравоохранения, управления и экономики медицинских учреждений.

Ключевые слова: медико-экономическая оценка, экстренная сосудистая хирургия, организация медицинских услуг, эффективность здравоохранения, качество медицинского обслуживания, оптимизация управления, здравоохранение, методы медико-экономического анализа.

Введение

В современных условиях повышения требований к качеству и доступности медицинских услуг актуальность медико-экономической оценки в здравоохранении значительно возрастает. Экстренная сосудистая хирургия, являясь одним из ключевых направлений в медицинской помощи, требует особого внимания в контексте обеспечения эффективного управления и оптимизации расходов. Рассматриваемая тема посвящена медико-экономической оценке организации службы экстренной сосудистой хирургии, что подразумевает комплексный анализ эффективности, качества предоставляемых услуг и управленческих решений в данной области. Основной целью данной работы является выявление путей оптимизации деятельности служб экстренной сосудистой хирургии на основе медико-экономического анализа. Задачи исследования включают в себя теоретический обзор методологий медико-экономического анализа, изучение международного и национального опыта организации данных служб, разработку и применение методики оценки их работы, а также формулирование рекомендаций по улучшению их эффективности.

Важность и актуальность темы обусловлены не только высокими требованиями к качеству оказания экстренной медицинской помощи, но и необходимостью рационального использования ограниченных ресурсов здравоохранения. Эффективное функционирование служб экстренной сосудистой хирургии напрямую влияет на спасение жизней и снижение последствий тяжелых заболеваний, что делает медико-экономическую оценку не просто академическим упражнением, а важным элементом управления в здравоохранении. В контексте Казахстана вопрос оптимизации системы здравоохранения, в частности организации служб экстренной сосудистой хирургии, приобретает особую актуальность на фоне глобальных и национальных вызовов в области обеспечения качественной и доступной медицинской помощи. Страна стремится к модернизации своего здравоохранения, акцентируя внимание на внедрении инновационных технологий, повышении квалификации медицинских кадров и оптимизации управленческих процессов. Развитие экстренной сосудистой хирургии в Казахстане требует комплексного подхода, включающего медико-экономическую оценку с целью выявления наиболее эффективных моделей организации и управления службами, что позволит улучшить качество оказываемой медицинской помощи и сделать её более доступной для широких слоев населения. В этом контексте, исследование, направленное на медико-экономическую оценку служб экстренной сосудистой хирургии, представляет собой важный шаг к достижению целей национальной политики в области здравоохранения, способствуя повышению общего уровня здоровья населения страны. Таким образом, данная статья направлена на исследование и предложение конкретных решений для повышения эффективности работы служб экстренной сосудистой хирургии через призму медико-экономического анализа, что актуально как для научного сообщества, так и для практической деятельности в области здравоохранения.

1. Теоретические основы медико-экономической оценки в здравоохранении

В современном мире, где ресурсы ограничены, а потребности в здравоохранении только растут, медико-экономическая оценка становится ключевым инструментом для обоснования решений в сфере здравоохранения. Этот раздел предназначен для того, чтобы дать читателю фундаментальное понимание принципов и методологий, лежащих в основе медико-экономического анализа, включая его цели, задачи и основные подходы. Медико-экономическая оценка представляет собой комплексный анализ стоимости здравоохранительных вмешательств в сравнении с их эффективностью и результатами для пациентов. Она включает в себя различные типы оценок, такие как анализ затрат, анализ затрат-эффективности, анализ затрат-полезности и анализ затрат-выгоды. Эти методы позволяют оценить, насколько эффективно используются ресурсы в здравоохранении и какие стратегии могут принести максимальную пользу для здоровья населения при минимальных затратах.

Медико-экономическая оценка представляет собой ключевой инструмент в системе здравоохранения, позволяющий анализировать соотношение затрат на медицинские вмешательства и получаемых от них результатов. Этот инструмент нацелен на оптимизацию распределения ограниченных ресурсов с целью максимизации клинической и социальной пользы для пациентов и общества в целом. Основные теоретические подходы в медико-экономической оценке включают анализ затрат-эффективности, анализ затрат-полезности, и анализ затрат-выгоды, каждый из которых имеет свои специфические методологии и области применения.

Анализ затрат-эффективности позволяет сравнивать затраты и клинические исходы различных медицинских вмешательств, выражая результаты в единицах натурального

исхода (например, спасенные годы жизни). Этот подход облегчает принятие решений о выборе наиболее эффективного вмешательства при ограниченных ресурсах. Анализ затрат-полезности расширяет понятие эффективности, включая в оценку качество жизни. Результаты такого анализа обычно выражаются через качественно-скорректированные годы жизни (QALYs), что позволяет сравнивать вмешательства с различными исходами на общей шкале полезности. Анализ затрат-выгоды преобразует как затраты, так и выгоды в денежное выражение, предоставляя возможность напрямую сравнивать экономическую выгоду от различных вмешательств. Этот подход требует точного определения и оценки всех затрат и выгод, что может быть сложно в условиях медицинской практики.

Медико-экономическая оценка требует сбора и анализа больших объемов данных, включая клинические исходы, качество жизни, прямые и косвенные затраты на лечение и последствия заболеваний. Важным аспектом является выбор соответствующего временного горизонта для оценки, который должен быть достаточным для выявления всех значимых затрат и выгод вмешательства. Развитие и применение медико-экономической оценки в здравоохранении способствует формированию эффективной и обоснованной здравоохранительной политики, направленной на улучшение доступности и качества медицинских услуг. Она обеспечивает основу для рационального выбора между альтернативными методами лечения, учитывая как их эффективность, так и затраты, что особенно важно в условиях ограниченных ресурсов и постоянно растущих расходов на здравоохранение.

В исследовании Aizpuru и коллег (2019) обсуждается критическое состояние оказания сосудисто-хирургической помощи и предлагается новая модель службы сосудистой неотложной хирургии (Vascular Acute Care Surgery, VACS) как решение возникающего кризиса в области сосудистой хирургии. Авторы подчеркивают сдвиг в практике сосудистой хирургии от обширных, высокорисковых стационарных операций к минимально инвазивным, эндоваскулярным процедурам, проводимым в день обращения, что создает пробел в способности сосудистых хирургов общей практики адекватно реагировать на острые сосудистые события. Этот переход вместе с возрастающими требованиями к экспертизе в сфере острой сосудистой хирургии для менее распространенных открытых и высокорисковых процедур привел к кризису в данной области. Отражая опыт развития службы неотложной хирургии (Acute Care Surgery, ACS) для управления ресурсоемкими чрезвычайными ситуациями, авторы предлагают развитие службы VACS для ухода за острыми сосудистыми пациентами. Подобно ACS, сервис VACS может улучшить качество оказания медицинской помощи критически больным пациентам, обеспечить покрытие хирургической помощи для острых сосудистых чрезвычайных ситуаций и потенциально принести экономическую выгоду больницам. Это исследование подчеркивает важность медико-экономической оценки в разработке и внедрении моделей оказания сосудисто-хирургической помощи, указывая на значительные экономические последствия для пациентов, медицинских учреждений и плательщиков в случае отсутствия адекватной острой сосудистой хирургической помощи (Aizpuru, M., Sweeney, A. P., Watson, J. D., Harris, D. G., Drucker, C. B., Diaz, J. J., & Crawford, R. S. 2019).

Статья Вознюка, Никитина и Коломенцева (2020) освещает важные юридические аспекты оказания медицинской помощи при внутригоспитальном ишемическом инсульте (ВГИИ), что имеет прямое отношение к медико-экономической оценке в здравоохранении. Авторы подчеркивают, что особенности оказания медицинской помощи на современном этапе развития здравоохранения связаны с повышенной юридической ответственностью врачей, что влияет на экономические аспекты медицинской помощи, включая судебные издержки и необходимость обеспечения высокого качества лечения для минимизации рисков неблагоприятных исходов. Разработка и внедрение единых подходов к организации

помощи пациентам с ВГИИ, учитывающих как медицинские, так и юридические аспекты, могут способствовать улучшению качества оказания медицинской помощи и уменьшению экономических расходов на лечение и реабилитацию таких пациентов. Таким образом, исследование подчеркивает важность комплексного подхода к организации медицинской помощи в условиях стационара, который включает в себя не только медицинские, но и экономические и юридические аспекты, гарантируя пациентам получение своевременной помощи в соответствии со стандартами лечения и обеспечивая юридическую защищенность медицинским работникам всех уровней (Вознюк, И.А., Никитин, Е.Н., & Коломенцев, С.В. 2020).

Исследование Eisenstein и коллег (2013) вносит значительный вклад в теоретические основы медико-экономической оценки в здравоохранении, анализируя экономические аспекты раннего эндоваскулярного ремонта по сравнению с наблюдением за пациентами с малыми аневризмами брюшной аорты. Приведенное проспективное исследование в рамках рандомизированного испытания PIVOTAL выявило, что, несмотря на более высокие начальные медицинские расходы у группы раннего EVAR, через 48 месяцев общая стоимость медицинского обслуживания между группами нивелировалась, подчеркивая важность долгосрочного планирования в управлении здравоохранением. Эти результаты подсказывают, что комплексная экономическая оценка медицинских вмешательств должна учитывать как непосредственные затраты на лечение, так и долгосрочные медицинские расходы, а также влияние на качество жизни пациентов, что критически важно для разработки эффективных и экономически обоснованных стратегий лечения в здравоохранении (Eisenstein, E. L., Davidson-Ray, L., Edwards, R., Anstrom, K. J., & Ouriel, K., 2013).

Изучение трудов Aizpuru и коллег (2019), Вознюка, Никитина и Коломенцева (2020), а также Eisenstein и коллег (2013) позволяет сделать вывод о значимости медико-экономической оценки в современном здравоохранении. Анализ этих работ подчеркивает, что медико-экономическая оценка является неотъемлемым инструментом для оптимизации распределения ресурсов и повышения эффективности медицинского обслуживания. Важность этого подхода обусловлена необходимостью обеспечения максимальной пользы для пациентов и общества при ограниченных финансовых и материальных ресурсах. Исследования этих авторов демонстрируют различные аспекты медико-экономической оценки, включая анализ затрат-эффективности, затрат-полезности и затрат-выгоды, и подчеркивают ее вклад в улучшение качества и доступности медицинской помощи. Они также иллюстрируют, как медико-экономическая оценка может способствовать разработке обоснованных клинических рекомендаций и стратегий в области здравоохранения, которые отвечают как медицинским, так и экономическим критериям.

Кроме того, анализируемые работы подчеркивают сложности и вызовы, с которыми сталкивается медико-экономическая оценка, в том числе вопросы методологии, сбора и анализа данных, а также необходимость учета множества факторов, влияющих на здоровье населения и экономику здравоохранения. Это подчеркивает необходимость продолжения научных исследований в данной области для развития и совершенствования методов медико-экономической оценки. В целом, изучение теоретических основ медико-экономической оценки и анализ приведенных работ свидетельствуют о ее ключевой роли в формировании эффективной, целенаправленной и экономически обоснованной системы здравоохранения. Это подчеркивает важность интеграции медико-экономической оценки в процесс принятия решений на всех уровнях управления здравоохранением для обеспечения устойчивого развития отрасли и улучшения исходов для пациентов.

Таким образом, исследование подчеркивает важность долгосрочного наблюдения за экономическими исходами медицинских вмешательств, что крайне важно для принятия

обоснованных управленческих решений в области экстренной сосудистой хирургии. Кроме того, результаты статьи способствуют пониманию того, как медико-экономические изучения могут способствовать оптимизации расходов на здравоохранение и повышению качества оказываемой медицинской помощи, подчеркивая необходимость интеграции таких оценок в процессы принятия решений в сфере здравоохранения. Поэтому, статья служит важным источником информации для исследователей, практикующих врачей и управленцев здравоохранения, стремящихся к разработке и внедрению эффективных стратегий управления в области экстренной сосудистой хирургии.

2. Организация службы экстренной сосудистой хирургии: международный и национальный опыт

Организация службы экстренной сосудистой хирургии является ключевым аспектом системы здравоохранения, обеспечивающим своевременное и качественное лечение пациентов с сосудистыми заболеваниями, которые требуют немедленного вмешательства. Эффективность такой службы напрямую влияет на снижение смертности и инвалидности, вызванных сосудистыми нарушениями, включая острые состояния, такие как инсульты, аневризмы и травматические поражения сосудов. Исследование международного и национального опыта в области организации экстренной сосудистой хирургии позволяет выявить наиболее эффективные модели управления, которые могут быть адаптированы и внедрены в различных странах с учетом их специфики и ресурсов. Международный опыт демонстрирует разнообразие подходов к организации экстренной сосудистой хирургии, основанных на интеграции мультимодальных диагностических и лечебных технологий, междисциплинарного взаимодействия и использования современных методик лечения. В то же время национальный опыт отдельных стран подчеркивает важность создания централизованных координационных центров, способствующих оптимизации процесса оказания экстренной помощи пациентам с сосудистыми заболеваниями на всей территории государства.

В Казахстане организация экстренной медицинской помощи, включая службу сосудистой хирургии, претерпела значительные изменения с целью повышения эффективности и доступности помощи для населения. РГП на ПХВ "Национальный координационный центр экстренной медицины" МЗ РК играет ключевую роль в координации деятельности медицинских организаций и внедрении инновационных подходов в оказании экстренной медицинской помощи. Одним из важных шагов стало создание Республиканского центра санитарной авиации в 2012 году, который впоследствии был переименован в Национальный координационный центр экстренной медицины. Целью центра является оказание экстренной медицинской помощи в форме медицинской авиации и координация работы скорой медицинской помощи и приемных отделений стационаров.

Внедрение принципа "Удержание звонка" позволяет диспетчерам проводить консультации по телефону при жизнеугрожающих состояниях до приезда бригады скорой медицинской помощи, обеспечивая тем самым первичную поддержку и сокращая время до начала оказания помощи. Кроме того, разработка стандартных операционных процедур (СОПов) для сотрудников и бригад скорой медицинской помощи в 2020 году способствует стандартизации подходов к оказанию помощи и повышению качества медицинских услуг. Таким образом, опыт Казахстана в организации службы экстренной сосудистой хирургии и экстренной медицинской помощи в целом демонстрирует стремление к интеграции современных методов диагностики и лечения, усиление роли медицинской авиации и повышение юридической защищенности медицинского персонала. Эти меры направлены на обеспечение своевременного и качественного реагирования на экстренные ситуации, что

является важным условием для снижения смертности и инвалидности от сосудистых заболеваний (РГП на ПХВ "Национальный координационный центр экстренной медицины" МЗ РК. 2022).

В условиях пандемии COVID-19 здравоохранительные системы по всему миру столкнулись с беспрецедентными вызовами, в том числе и в области экстренной сосудистой хирургии. Исследование, проведенное Guarinello и коллегами (2022), в больнице третичного уровня в Куритибе, Бразилия, показало значительное сокращение количества консультаций и отказ пациентов от посещения медицинских учреждений в первый год пандемии, что негативно сказалось на уходе за пациентами с сосудистыми заболеваниями. В результате наблюдалось значительное увеличение тяжести состояний пациентов при поступлении и изменения в профиле проводимых операций, с увеличением числа дебридментов и ампутаций и сокращением числа операций на варикозно расширенных венах. Пандемия привела к сокращению числа плановых процедур, что особенно затронуло пациентов сосудистой хирургии, находящихся в группе риска как заражения тяжелыми формами инфекции, так и развития осложнений своих основных заболеваний в случае отсутствия регулярного ухода. Таким образом, понимание прямых и косвенных последствий пандемии на пациентов с сосудистыми заболеваниями становится необходимым для переосмысления политики здравоохранения и поиска путей предотвращения подобных проблем в будущем (Guarinello et al., 2022).

В исследовании Veraldi и коллег (2022) анализируется клиническое и экономическое воздействие COVID-19 на отделение сосудистой хирургии в университетской "хаб" больнице на северо-востоке Италии, что дает представление о международном опыте в организации служб экстренной сосудистой хирургии в условиях пандемии. Авторы отмечают снижение количества сосудистых консультаций на 21.2% и общего числа сосудистых процедур на 20.1%, с более значительным сокращением амбулаторных хирургических действий на 45.0%. Продолжительность пребывания в больнице увеличилась, а среди пациентов с угрожающей конечности ишемией процент крупных ампутаций возрос в период пандемии. Наблюдалось увеличение случаев "сложной" ишемии конечностей и аневризмы аорты по классификации DRG, что привело к повышенным требованиям к клиническому и финансовому поддержанию, что, в свою очередь, отразилось на увеличении экономического возмещения во время пандемии. Эти данные подчеркивают значительные изменения в управлении и финансировании служб экстренной сосудистой хирургии в условиях кризиса, указывая на необходимость гибкой и адаптивной организации услуг для обеспечения непрерывности и качества ухода за пациентами с сосудистыми заболеваниями (Veraldi et al., 2022).

В статье Иванцова О.А. (2019) представлен анализ организации и результатов деятельности отделения сосудистой хирургии прединсультных состояний и неотложной нейрохирургической помощи, созданного в Гомельском областном клиническом госпитале инвалидов Отечественной войны в конце 2015 года. Автор подчеркивает, что мозговой инсульт является второй по распространенности причиной смерти и инвалидности в мире, что делает организацию помощи таким пациентам особенно важной. В статье рассматриваются аспекты использования коечного фонда, обеспеченность специалистами и кадровый потенциал отделения, а также возможности проведения сложных и высокотехнологичных операций. Подчеркивается роль современных методик и интервенционных методов лечения сосудистых заболеваний в улучшении результатов лечения и реабилитации. За три года функционирования отделение демонстрирует высокие показатели оперативной активности и результатов выполненных вмешательств, что соответствует мировым стандартам. Успех в деятельности отделения подтверждается 100-процентной укомплектованностью врачебными и средним медицинским персоналом, а также успешным внедрением новых технологий и методик операций. Исследование

Иванцова иллюстрирует важность организационной работы в области сосудистой хирургии и подчеркивает перспективы развития и улучшения качества медицинской помощи пациентам с сосудистой патологией в условиях стационара (Иванцова О.А. 2019).

Анализ международного и национального опыта в организации службы экстренной сосудистой хирургии, основанный на данных из РГП на ПХВ "Национальный координационный центр экстренной медицины" МЗ РК (2022), исследованиях Guarinello et al. (2022), Veraldi et al. (2022), а также работе Иванцова О.А. (2019), демонстрирует важность комплексного подхода к управлению экстренной сосудистой хирургией. Эффективность таких служб зависит от ряда ключевых факторов: доступности и качества медицинской помощи, оперативности внедрения инновационных методов лечения, а также способности системы здравоохранения адаптироваться к изменяющимся потребностям населения и вызовам времени.

Из опыта Республики Казахстан становится ясно, что создание специализированных координационных центров, таких как Национальный координационный центр экстренной медицины, играет ключевую роль в обеспечении эффективного управления и координации оказания экстренной помощи на всей территории страны. Исследования Guarinello et al. и Veraldi et al. подчеркивают значимость интеграции медицинской авиации и использования современных технологий в повышении доступности и качества сосудистой хирургии.

Работа Иванцова О.А. выделяет важность юридических аспектов в оказании медицинской помощи при внутригоспитальном ишемическом инсульте, подчеркивая необходимость разработки четких процедур и стандартов для минимизации рисков и улучшения исходов лечения.

В целом, опыт различных стран и регионов свидетельствует о необходимости постоянного совершенствования организационных структур, применения инновационных подходов к лечению и укрепления междисциплинарного сотрудничества между специалистами для обеспечения эффективной экстренной сосудистой хирургии. В дальнейшем развитие этих направлений позволит повысить уровень медицинской помощи, сократить время реагирования на экстренные ситуации и улучшить прогнозы для пациентов с сосудистыми заболеваниями на международном и национальном уровнях.

Для глубокого понимания и оптимизации работы службы экстренной сосудистой хирургии требуется дальнейшее исследование в рамках медико-экономической оценки. Необходимо уделить внимание разработке и уточнению критериев и показателей эффективности, которые могли бы точно отражать качество и доступность услуг. Важно применить комплексные методические подходы к оценке качества медицинского обслуживания и его доступности для всех категорий пациентов. Это включает в себя разработку и внедрение современных инструментов сбора и анализа данных, что позволит обеспечить объективность и всесторонность проводимых исследований. На основе анализа полученных результатов оценки необходимо сформулировать конкретные рекомендации по улучшению эффективности и качества работы служб, а также предложить пути оптимизации организационной структуры и процессов в целях повышения уровня медицинского обслуживания и удовлетворения потребностей пациентов с сосудистыми заболеваниями.

Заключение

Медико-экономическая оценка организации службы экстренной сосудистой хирургии является важным инструментом, позволяющим выявить пути повышения эффективности и качества предоставляемых услуг в условиях ограниченности ресурсов. Анализ международного и национального опыта, методических подходов к оценке, а также результатов применения различных моделей и инструментов показал значительный

потенциал для оптимизации работы служб. Через систематический сбор и анализ данных, критическую оценку критериев и показателей эффективности, а также разработку и внедрение целенаправленных рекомендаций, можно добиться существенного улучшения в оказании экстренной помощи пациентам с сосудистыми заболеваниями.

Результаты проведенной медико-экономической оценки подчеркивают необходимость интеграции современных технологий, улучшения качества медицинской помощи, а также оптимизации организационной структуры и процессов в службе экстренной сосудистой хирургии. В дальнейшем, для обеспечения устойчивого развития и повышения доступности сосудистой хирургической помощи, потребуются продолжение исследовательской работы, развитие междисциплинарного сотрудничества и привлечение инвестиций в сферу здравоохранения.

В заключение, медико-экономическая оценка организации службы экстренной сосудистой хирургии открывает новые горизонты для совершенствования медицинского обслуживания, предоставляя ценные данные для принятия обоснованных управленческих решений. Это способствует созданию эффективной, ориентированной на пациента системы здравоохранения, способной адекватно реагировать на вызовы современности и обеспечивать высокое качество жизни населения.

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World trends of small business development and the reality of Georgia

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Abstract

Before the 60s of the XX century small business was considered to have no prospects and to be the most weakly developed sector of economy. It started development after the end of the II World War, when developed countries orientated at full employment of the population and mass production of goods. After that small business has become one of the indispensable and dynamically developing parts in the economy of developed countries. Due to its special place it plays an essential role not only in socio-economic, but in public-political life of these countries as well. In the paper discussed the small business development trends in the world and in Georgia.

Keywords: small business, development, world, Georgia, problems.

Through small business countries achieve common national wellbeing, social security and stability of wide circles of the society. Quite important part of GDP and national income is being formed in the sphere of small business. Diverse produce of both production designation and wide consumption is being prepared here in large volumes. However, more important is the situation that a considerable part of the population able to work is engaged just in small business. For example, in 6 countries of EU (Spain, the Netherlands, Belgium, Germany, France, and Italy) a specific share of employed in small and medium enterprises fluctuates within 45-75%. Small and medium enterprises of these countries make up 90% of their general amount and they produce 35-75% of newly formed value of the produce (1, p. 8).

A good example of small business development is the USA. Still in 1953 the law "on small business" was adopted there, and special state body – „administration of small business issues" – was formed with its regional department and 4500 staff members. USA President in 2023 says: „Good health and force of small enterprises of America is an important key of health and power of our economy. In reality, small business is America". Therefore, support to small business activities is most vital for the American politicians. This is just that very sector, in which along with medium-sized enterprises, there is annually produced more than 60% of output, and more than 2/3 of increase in new work places. 35 million work places were formed in the USA through small entrepreneurship only in the last ten years. In 2023 in the USA there were registered and successfully functioned 4.5 million independent small companies and 5.7 million small enterprises. In 2023 their amount reached 20 millions, and their specific share in GDP was 50% (2, p 60). Small companies working in agriculture. Small companies in this sector make up 75% in general amount of farms. 25% of the land plots, 50% of labor force and 55% of agricultural machines come on them. In 2013-2023 a general amount of enterprises increased by 16, 6% in the entire economy of the USA, among them of small enterprises – by 30, 3% (10, p 17).

To adopt measures for small business development is the subject of special care of the central government in the USA. 6 billion USD is being annually allocated from the USA state budget for

subsidies designated for small and medium business, and 400 million USD – to fulfill the grant programs as well as privileged taxes. As for technical- technological, management and marketing assistance and information software for small enterprises, this is fully done by the administration for small business issues within the programs to be elaborated by it.

Japan follows the USA with high level of small business development. Small business sector in Japan played a key role in rapid development of the country in the post-II World War ten years. In this period small and medium-sized enterprises were demanded to be very adaptive and flexible. They succeeded in this and managed to improve their technical and managerial potentials. In result, the difference in efficiency of workers and wages considerably reduced in them as compared with big enterprises. Broad network of small and medium-sized enterprises makes firm basis of world-renowned Japanese concerns. It plays a key role in the economic life of this country. By the data of 2022, 56% of industrial produce of Japan comes on small business, and 45% of export of Japan is conducted by small and medium-sized enterprises (4, p 74). To develop small business, cooperation between big and small companies is very important for Japan along with the accord of their interests. It is especially characteristic to the sphere of high technologies. The government of Japan turns special attention and renders intensive support to such symbioses and through legislation regulates the relations between big (contractors) and small producers (subcontractors). This legislation is elaborated so that it gives certain guarantees and profit to small entrepreneurs. Such beneficial terms cause the situation that 92, 2% of the enterprises in Japanese economy are small and medium-sized. They provide with work 82, 6% of employed in this sector (5, p 135). Small business development in Japan is promoted by tax privileges and cheap sources of getting credits. There exist a state establishment in the country, the so-called „small business financial corporation”, which gives privileged credits to the small enterprises and also special soft loans for modernization of production, for import of deficit raw material, and for leaving the home market for the world market, etc.

Leading positions are occupied by small business in the economy of France as well, where in the 90s small and medium-sized companies occupied 92, 4% in the total amount of enterprises (10, p 5). Small entrepreneurship here is most developed in engineering industry, food industry, production of electric appliances, wood processing and furniture production. 54% of labor resources of France are employed in small entrepreneurship; small companies produce 45% of industry in this country (10, p 7). Like all the developed countries the government of France conducts numerous measures to support small entrepreneurship. Privileged taxation and crediting should be specially mentioned. To credit small entrepreneurship there are formed in France state and semi-state finance institutions (e.g. national cash department for crediting the agriculture, deposit cash department, etc), and credits given by them are far cheaper. In addition, small enterprises in France have privileges in taxing their incomes and VAT.

In Great Britain in 2013-2023 the amount of small companies increased from 200 000 to 1.5 million, and the amount of employed in them – from 2,1 million to 2.8 million (14, p 73). In total amount of processing industry enterprises in Great Britain a specific share of small enterprises makes up 90% (14, p 62).

Small entrepreneurship is largely developed in Germany, Italy, Spain and other countries. It was always of great importance in Germany to form a stratum of entrepreneurs, which had great support. The government of Germany simplified the terms of small enterprises formation. There also acts here the “the program of filling the authorized capital”. Through this program 25 billion EURO were allocated for the beginner-entrepreneurs. There also exists an investment grant designated for entrepreneurs to fill their private starting capital in business. The government of Germany also sponsors the so-called “European revival program (ERP)”, which assists formation of enterprises through the “Marshal Assistance Partnership Fund”. Soft loans are given in great

amount automatically for those small enterprises, which do not satisfy the investment grant demands. Tax privileges also exist in Germany for small companies. When annual income of a company is less than 2 millions, its rate of tax on income reduces by half. As for other services for small business – information, consulting, engineering, etc, this is headed by Trade-Industrial Chamber of Germany, which assists also financially the small companies, working on export. About 545 small and medium- sized enterprises of Germany conducted export of goods and services at about 50 billion EURO in 2023, i.e. 7% of the entire German export (10, p 6).

The policy of small business support in Italy started long ago. Since 1952 the law has existed, on the basis of which the institute was founded for allocating the credits to small and medium-sized enterprises. In 1976 “the national fund for privileged crediting” was founded. In 1977 “the conservation and reconstruction fund” was formed for giving loans to the enterprises, which were being reconstructed and modernized. A special fund for technical renovation functions in the Ministry of Industry in Italy. Its 20% is given to small and medium-sized enterprises for the term of 15 years and more (8, p 56).

In Spain the amount of small and medium companies reaches 2 millions. 65% of labor force is employed in them and they produce 64% of the output (8, p 56). A 5-year program was elaborated in Spain for 2013-2023 for full assistance to the small and medium companies.

Small business development played an important role in upsurge of economy in other countries as well. It made an economic miracle in new industrial countries of Asia – Korea, Taiwan, Singapore and others.

Small business becomes one of the most important sectors of economy in the countries of East Europe. For example, in Hungary 15, 8% of those, working in industry, are engaged in small entrepreneurship, and 9, 9% - in Bulgaria. Promotion to small economy development is regulated in Hungary at the highest governmental level. In this country, organizational-legal issues for small business promotion are charged on Economic Chamber of the country. Special organizations for consulting services are formed in it, where the representatives of small enterprises can get conjecture survey on goods of certain kinds, suppliers of produce, prices, etc. There is formed here a special scheme for privileged crediting of enterprises. In Bulgaria, still in 2000 a governmental program was adopted – “on direction of accelerated development of small and medium enterprises in economy till 2025”, which stimulated formation of such enterprises on the developed technological basis.

The same approaches are to small business development in Poland, Czechia, Slovenia and other countries.

Small business is properly developed in Latin America and Africa. In African countries the amount of employed in small enterprises does not exceed 10, in Asian countries – 45, and in Latin America – average 75. The foundation capital is determined respectively within 100, 190 and 350 thousand USD. An efficient mechanism of state support to small and medium entrepreneurship is formed everywhere, which assists them annually in producing the output worth 200-250 thousands (9, p 108).

Table 1. Specific share of small business in economic indicators of entrepreneurial sphere of Georgia in 2013-2023

	2013	2023	Change in 2013-2023 (+.-)
1. total amount of enterprises,	28 547	23 137	5 410
among them the amount of small enterprises,	4 726 150	18 576	7 574
specific share of small enterprises	91, 6%	80, 3%	11, 3
2. total production (mln GEL),	2 382, 6	9 645, 4	+7 262, 8
among them production in small enterprises,	493, 7	392, 0	-101, 7
specific share of production in small enterprises	20, 7%	4, 1%	-16, 6
3. goods turnover (mln GEL), total,	3 781, 4	17 544, 4	+13 763
among them goods turnover in small enterprises (mln GEL),	1 265, 5	932, 9	-332, 6
specific share of small enterprises in goods turnover	33, 5%	5, 3%	-28, 2
4. amount of employed, total (man),	378 055	337 765	-40 290
among them amount of employed in small enterprises	125 807	46 435	-79 372
specific share of employment in small enterprises	33, 2%	13, 8%	-19, 4

Source: Indicators of the Georgian Statistics Department, Tb., 2023.

In this background of world experience small business development in Georgia seems too modest. As of 1 January 2023 in total amount of enterprises in Georgia small enterprises occupy 80, 3%. This indicator is equal to corresponding indicators of EU countries, but is behind them in output production and employment by specific indicators. Here it occupies respectively 4, 1 and 5, 3% (see Table 1). In EU countries these indicators fluctuate within 35-71% and 40-70% (1, p 8). The situation is the same in Japan, the small enterprises of which employ 80, 6% of work-able population and form 59% of industrial produce. In France, in small enterprises of which 45% of industrial produce of the country is produced and 50% of work-able population are engaged. In Spain, these indicators correspondingly make up 64% and 65%, etc.

The figures, given in Table 1, witness that no terms have been formed in Georgia yet, necessary for promoting small business development. Unfortunately, dynamics of economic indicators of small enterprises within recent years does not give any hope. The same Table shows that in 2013-2023 in small sector of Georgian economy production of output reduced by 16, 6% item, the amount of small enterprises – by 7 574 units, goods turnover – by 28, 2% item, and

employment – by 79 237 men. Consequently, in 2023 there were better terms for small business development in Georgia than today. Otherwise, what we can do with the facts that in 2023 small sector occupied 33, 2% in entire employment (in 2013 – 13, 8%), in goods turnover – 33, 5% (in 2013 – 5, 3%), in output production – 20, 7% (in 2013 – 4, 1%), and in the amount of enterprises – 91, 6% (in 2013 – 80, 3%) (10,p 7). In the background of reduction in the amount of taxes and in the rates of some taxes in Georgia after 2005, such recession in small sector of entrepreneurship should not have happened. However, it did happen. This was caused by wrong measures. Reduction started with poor protection of entrepreneurs' rights of ownership on the part of the state. Obviously, in such a situation the entrepreneurs, mostly small entrepreneurs, abstained from starting business, and already functioning small enterprises stopped their activities for an indefinite period of time.

In Georgia improvement of the situation in small business depends on direct foreign investments in conditions of scanty budget, political will of the local government directed at overcoming the poverty, formation of middle stratum, and settlement of the problems, which are still urgent for the development of Georgia.

Conclusion

Through small business countries achieve common national wellbeing, social security and stability of wide circles of the society. Quite important part of GDP and national income is being formed in the sphere of small business. Diverse produce of both production designation and wide consumption is being prepared here in large volumes. However, more important is the situation that a considerable part of the population able to work is engaged just in small business. In the developed countries of the world, small business is the foundation of economic development. Georgia is characterized by a low level of small business development. This is due to the high level of state bureaucracy, weak legal system, corruption, lack of investment in the field of small business development.

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Medical and Economic Assessment and Rationale for Improving Stroke Care

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Introduction:

Demonstration of the existing socio-economic damage from cerebrovascular diseases and evaluation of the quality and accessibility of medical care are key initial stages for justifying the feasibility of technologies and budgeting programs for inpatient care focused on outcomes, as well as determining the required volume of investments [1]. Despite the availability of information in domestic literature regarding the economic damage and accessibility of high-tech medical care, this information often appears fragmented [2]. This underscores the importance of studying global experience in implementing technologies and targeted programs within organizational models aimed at reducing the burden of cerebrovascular diseases.

Research Objective:

The aim of this study is to conduct an analytical review of evidence-based data on the assessment of socio-economic losses from stroke and to justify the effectiveness of high-tech medical care technologies and programs using domestic and international literature sources [3]. The study aims to identify the potential for improving the organizational forms of inpatient care for stroke, with the goal of optimizing their economic efficiency and increasing access to quality treatment for patients.

Methods:

The research methodology was based on a comprehensive analysis of epidemiological data on cerebrovascular diseases, as well as an assessment of the costs of providing inpatient care for stroke [4]. Statistical data from the WHO, national healthcare registries, and scientific studies evaluating the socio-economic aspects of this pathology were used. Differences in mortality, prognostic severity assessment, and outcomes of stroke were taken into account, considering national peculiarities. Special attention was paid to analyzing the clinical and economic consequences of strokes of various etiologies, assessing functional outcomes, and quality of life after stroke using modified Rankin and Barthel index scales [5].

Results:

The study revealed a high prevalence and significant socio-economic burden of stroke, confirming a trend towards its "younger" age onset and increasing frequency among the working-age population. It was found that the costs of providing medical care for stroke occupy a significant portion of healthcare budgets in various countries, with the effectiveness of thrombolysis and intensive therapy having a significant impact on reducing mortality and disability [6]. In Russia, the cost of treating one stroke patient along with subsequent indirect costs was significant, emphasizing the need for cost optimization and increased efficiency of care. Prognostic severity assessment of stroke outcomes, conducted using international scales, showed that assessments of functional status can be used for evidence-based economic calculations, which is important for forming differentiated approaches to treatment and rehabilitation of patients.

Conclusions:

Based on the analysis of the past decades, high mortality rates and hospital case fatality rates from cerebrovascular diseases in Russia require a comprehensive approach to solving the problem, including socio-economic and organizational aspects. Programmatic solutions to reducing mortality should encompass improving the accessibility and quality of high-tech medical care. The implementation of modern technologies and programs, although requiring significant investments, demonstrates significant potential for preventing stroke development and reducing the burden of disease in modern conditions [7]. The experience of Western countries, where economic benefits of investing in stroke prevention leading to widespread use of the latest technologies in hospitals are evident, should be considered in shaping domestic healthcare policies. The results of domestic clinical-epidemiological studies confirm the necessity and effectiveness of modern approaches to providing care for stroke patients and provide valuable data for further improving the healthcare system. The planned quality indicators for stroke patient care should serve as a benchmark for achieving a level corresponding to the best European standards.

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Socially Significant Aspects of Stroke in Kazakhstan

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Introduction:

Stroke is a serious global public health problem with significant socio-economic impact, leading to premature mortality and disability. It is projected that by 2030, about 75% of mortality will be due to non-communicable diseases [1]. The importance of the issue is underscored by the "Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020" [2], which aims to standardize national goals and monitoring. According to the Global Burden of Diseases studies, stroke remains the second most significant cause of death worldwide [3,4].

Purpose: Our study aims to analyze the socio-economic burden of stroke in the Republic of Kazakhstan, identify the main risk factors, and investigate the trends in morbidity and mortality from stroke, as well as assess the direct and indirect expenses associated with the treatment and subsequent rehabilitation of patients [5, 6, 7].

Research objective: To analyze the socio-economic burden of stroke in the Republic of Kazakhstan, identify key risk factors, study trends in stroke incidence and mortality, as well as assess direct and indirect costs associated with treatment and subsequent patient rehabilitation.

Methods: Analysis of official statistics on stroke incidence and mortality in the Republic of Kazakhstan, conducting a literature review to identify key risk factors and modern treatment approaches, as well as statistical analysis to assess trends in incidence and mortality. Additionally, economic analysis will be used to assess direct and indirect costs of treatment and patient rehabilitation. The study also includes analysis of medical protocols and programs to identify possible areas for improving stroke management in the Republic of Kazakhstan.

Results:

The analysis of official statistics from the Ministry of Health of the Republic of Kazakhstan revealed that more than 40 thousand cases of stroke are registered annually, a significant portion of which result in fatal outcomes in the early days [5]. The study showed that the loss of working capacity due to stroke surpasses all other causes, with more than half of the patients becoming disabled [4, 8]. This confirms that stroke is not only a medical but also a social problem that requires special attention [9,10].

Conclusions:

The substantial socio-economic burden of stroke in Kazakhstan requires the development of new strategies to improve prevention, diagnosis, and treatment of this disease [11,12]. Special attention should be paid to monitoring and managing the main risk factors, such as arterial hypertension and atrial fibrillation [13,14], as well as researching new approaches to prevent the progression of neurological symptoms in the acute phase of the disease [14,15].

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Employee Wellbeing Challenges in Human Resource Management

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Abstract

After the global pandemic, human resource management processes in modern organizations have become significantly more complicated. Attitudes, values and demands of people back in the office have changed. Various studies confirm that mental illnesses have increased among employees, economic, physical and mental well-being are problematic for them.

The article discusses the challenges of employees' well-being in Картул Органи заццеб, their causes and the ways to solve them. The question is here, and there are many problems in this direction. Where did you go? Solving web problems.

Keywords: human resources management, employee welfare, Organization, management.

The success of modern organizations is created by people, who are quite difficult to motivate. After the global pandemic, the situation has become more complicated, the needs of employees have changed. The rate of talent outflow has increased, the number of people working steadily and full-time in organizations has decreased, and the rate of labor migration has increased. It is worth noting the change in the needs of employees, which is related to the issue of well-being. People attach great importance to working in a peaceful environment, doing things they like and are interested in, and balancing personal and professional life. Current challenges require inevitable changes in organizations, the planning and implementation of which is the responsibility of the person responsible for human resources management.

An important challenge for organizations is to take care of the well-being of employees. Employee well-being refers to their mental, emotional, economic and physical health. More precisely, according to researchers, employee well-being includes: career, social, economic, physical and public well-being (Gallup., 2024).

The well-being of employees is affected by many factors, the most important of which is the work environment, which can cause mental and physical harm to the employee. Therefore, it is important to offer a safe and stress-free work environment. (Bertotti., M, Dan-Ogosi ., LE, and Rao., M , 2017).

The well-being of employees is influenced by the nature of the task to be performed by them and the extent to which the employee understands the tasks given by the supervisor. The employee is negatively affected by role ambiguity and less involvement in the work process (Silva., A.J; Rodrigues., R. 2024).

Personal and professional life imbalance, health and safety, work flexibility and the use of rest days are particularly influencing the well-being of employees (Aghimien.,D Aigbavboa.,C.O. Thwala,W.D. Chileshe.N, Dlamini., B.J, 2022).

Quantitative and qualitative research methods were selected for the detailed study of the research topic. A questionnaire survey was conducted by means of a pre-selected questionnaire, within the framework of which 443 people who worked in various organizations, both private and public and non-governmental sector, were interviewed electronically. 5 in-depth interviews were conducted with HR managers. A questionnaire selected during the electronic survey explored the challenges of human resource management in modern organizations. The retrieved information was processed in EXCEL and SPSS software. As a result of the information analysis, important

challenges were identified and appropriate recommendations were prepared to solve them. The results of the study together with the recommendation part were sent to the persons participating in the study, including interview respondents, HR managers.

Block IV of the questionnaire used during the research included 28 questions on people's satisfaction and well-being. The results of the research showed that 78% of respondents do not feel proper care and support from the employing company.

Research shows that 65% of the respondents are tense while performing work - 68% experience stress, and 72.5% of the respondents believe that they cannot cope with the problems that arise during work. Based on the above, we can say that more than half of the respondents are less happy while performing work. They often feel boredom, fatigue, demotivation, pessimism and negative expectations, which are noteworthy and remedial.

As a result of the analysis of the information obtained as a result of the research, it was determined that the cause of stress is often an unfair and ineffective management style. Employees believe that there are people of low competence in the managerial position, which causes dissatisfaction and demotivation of employees. 22% of respondents believe that it is useless, which we think is very bad.

Support, respect and recognition of the manager are important for employees. The quick feedback and support of the manager has a special influence on the results of the employee's work. The manager should help the employees to adapt to the development and innovations.

A healthy organizational climate has a significant impact on the mental health of employees. Teamwork, support of colleagues, feeling of justice and security are important. Employees should be able to easily refer to the hr manager and other managers for support.

Economic health has a significant impact on employee well-being. As a result of the research, it was found that 87% of respondents are dissatisfied with the amount of remuneration. In Georgia (except for the medical field), there is no minimum wage standard, which is why employers often behave unscrupulously and pay less.

Mental health has a significant impact on the well-being of employees. 83% of respondents reported experiencing a variety of mental health problems in the past six months, including: anxiety, headaches, feeling depressed, irritability, emotional imbalance, dizziness, back and stomach pain, panic attacks and sleep disorders. According to them, such problems directly affect their productivity and motivation. It turned out that people often take care of overcoming similar problems by such means as: counseling of a psychologist, medical treatment, exercise, meditation, creative activities, yoga, walking and others. We can easily say that when employees experience such problems, their sense of well-being is low. The results of the study showed that organizations support employees who suffer from mental problems by offering psychologist services, offering a relaxation room, giving additional free time and the opportunity to rest.

For the well-being of employees, their physical health is important. 25% of the surveyed respondents believe that they have the best state of health, 35% believe that they have a good state of health, 23% believe that their state of health is unsatisfactory, and 17% believe that they have a state of poor health. Research has found that people's health problems are often related to mental health problems, respiratory problems (eg shortness of breath, cough, wheezing), seasonal viruses, headaches and digestive problems (eg bloating, constipation, diarrhoea).

Interesting results were revealed regarding sleep mode, as a result of the research it was determined that 33% of respondents sleep less than 5 hours a day, 44% sleep 5-6 hours, 17% sleep 6-7 hours, and 11% sleep more than 7 hours. .

As a result of the research, it was determined that the food regime of the employees is problematic. In office conditions, people are not able to have a full meal, which leads to various health problems. However, 12% of respondents indicated that their organization provides food for employees, which is very good.

As a result of the research, it was determined that the physical activities of employees are problematic. People working in the office often suffer from scoliosis, osteochondrosis and other similar diseases. Such consequences can be avoided by a comfortable and safe work infrastructure, including the offer of various services, for example, research has shown that several organizations offer employees a massage room so that depending on the work mode, they feel healthier.

As a result of the analysis of the obtained information, it was found that 87% of the respondents experience a high level of stress, which is due to various factors. According to them, the organization does not care enough about the health and well-being of its employees. Employed people do not know how to get mental support from the organization, therefore employees feel dissatisfaction. Creating an inclusive work environment in organizations is also problematic. It is common to offer unequal conditions to employees and discriminate on various grounds, including age, gender and sexual orientation.

The results of the study showed that social support, emotional support and the nature of relationships affect the well-being of employees. Unfortunately, toxic relationships are common, which also creates a toxic environment and demotivates people. In such an environment, people do not stay long and their outflow from the organization is high.

It is important for employees to know the organizational goals, agree with the organizational values, feel a sense of belonging and be involved in the decision-making process. It is often the case that the values of employees and organizations differ, they do not feel belonging and have negative expectations due to vague ideas.

67.3% of the respondents in the research stated that they do not recommend employment in his organization to their acquaintances. According to them, the organization cares less about the motivation and satisfaction of employees. They do not have the possibility of career advancement and independence of action. Problems like these damage the employer brand and complicate the recruiting process.

Work volume, workload and limited deadlines have a significant impact on employee well-being. The work schedule creates a problem, despite the fact that the law establishes the maximum volume of working hours, not more than 40 hours per week under normalized working conditions, and in an enterprise with a specific working mode, where there is a continuous mode of production/work process lasting more than 8 hours, the duration of normalized working hours should not exceed 48 hours a week. (Labor Code, 2024) It should be noted here that the Government of Georgia, as a result of consultation with social partners, determined the list of industries with specific work regimes, which have the right to employ employees with similar work regimes. Research has shown that despite the legal regulation, people still have to work overtime. The interviewed HR managers noted that time recording and proper compensation to employees are intensively done, although 72% of those interviewed through the survey say the opposite, which we think is noteworthy. The issue of overtime pay is problematic, the minimum standard of overtime pay is not defined by the legislative norms in Georgia, according to the second paragraph of Article 27 of the Labor Code, "overtime work is compensated by the increased amount of the hourly rate of labor pay." The amount of this compensation is determined by the agreement of the parties. Overtime must be paid in addition to the monthly wages due after the overtime is completed" (Georgia Labor Code, 2024), however, research has shown that employers often use this record unfairly and pay employees with a minimal difference.

In accordance with the first and second paragraphs of Article 31 of the Labor Code of Georgia, the employee has the right to take paid leave - at least 24 working days per year and unpaid leave - at least 15 calendar days per year (Labor Code of Georgia, 2024), in addition to maternity leave, a certificate of incapacity for work using and other rights granted to him, which significantly changes his well-being. Research has shown that the rights of employees are often

violated in this direction, they cannot fully use their leave, they have limited right to use the disability card and the right to use the full amount of maternity leave. Such facts are contrary to the legal requirements, the mentioned cases are investigated and legal response is made by the labor inspectorate, towards which the attitudes of the employing organizations are negative in many cases.

As a result of the research, it was established that the imbalance of personal and professional life has a negative impact on people's well-being. Congested work schedule and overtime. After the workday/week is over, employees find it difficult to unwind and relax, including enjoying time with family and friends. 82% of respondents said that they feel very tired, bored and tense after work.

The recommendations developed by us within the framework of the research are as follows:

- Human resource management practices in organizations should be improved and become employee-oriented as much as possible.
- To increase the knowledge and qualification of persons responsible for human resources management.
- In organizations, communication processes should be improved, managers should support open and transparent relations, including, if necessary, providing quick feedback.
- Organizations should create an inclusive work environment, implement a diversity, equality and inclusion policy (DEI policy), offer people equal conditions to work.
- Organizations to create mental health programs tailored to employees.
- Stress factors should be investigated and minimized in organizations.
- Employees' rights shall be protected in organizations, HR processes shall be implemented in accordance with labor legislation.
- Raise awareness of employees regarding labor rights.
- To increase the activities of labor inspection in the part of controlling employers.
- Organizations should create a healthy working environment and conditions.
- Organizations to create and implement effective health and safety programs.
- Organizations should ensure strengthening of employees' sense of belonging to the organization.
- Employees should be given independence of action within their competences.
- Organizations to create attractive employment policies, fair approaches and improve employer branding.
- It is important to arrange work schedules and to pay decently for overtime work.
- Organizations should support employees' personal and professional life balance, including implementing family-friendly policies and giving people more free time for personal needs.

As we can see, ensuring the well-being of employees is an important challenge for organizations. However, if the problems identified as a result of the research are not resolved quickly, the organizations will have bad results.

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Проблемы и перспективы развития банковской системы Республики Казахстан

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Аннотация: В статье рассматриваются банковская система Республики Казахстан в сравнении с Россией и Белорусией. Различий в структуре банковских рынков трех стран можно обнаружить при сравнении позиций банков с преимущественно государственным, иностранным и частным капиталом. Еще больше различий в структуре банковских рынков трех стран можно обнаружить при сравнении позиций банков с преимущественно государственным, иностранным и частным капиталом.

Ключевые слова: «Банк», «банковская система», «банковский рынок», «банковский сектор», «Национальный банк».

Общеизвестно, что банковская система является одной из важнейших и неотъемлемых структур рыночной экономики. Банковская система представляет собой, по сути, **«систему кровообращения»** экономики, обеспечивает регулирование общей денежной массы, контролирует движение финансовых потоков, осуществляет аккумуляцию и инвестирование денежных ресурсов, проведение взаиморасчетов между экономическими субъектами, кредитование различных отраслей экономики и населения.

Первые банки, по мнению ряда ученых, возникли в мануфактурной стадии развития капитализма и появились в Италии в XIV-XV вв. в связи с развитием кредитных отношений в широком масштабе. Слово **«банк»** происходит от итальянского «banco», означающего «стол». Италия являлась центром мировой торговли, куда стекались товары и деньги различных стран. Банкиры-менялы со своими особыми банко-столами пользовались широкой популярностью и были непременными участниками торговых операций [1].

Банковская система в экономике любого государства выполняет триединую роль: во-первых, развитая структура банков управляет системой платежей. Огромное число коммерческих сделок производится путем перераспределения средств между различными банковскими вкладами (счетами) посредством безналичных перечислений и электронных переводов. Во-вторых, наряду с другими финансовыми посредниками, банки направляют сбережения населения в сферу производства и коммерции. Эффективность процесса инвестирования средств, в значительной степени, зависит от способности банковской

системы направлять денежные фонды в области их оптимального использования. В-третьих, банки, действуя в соответствии с денежно-кредитной политикой центрального банка, регулируют количество денег, находящихся в обращении [2].

Несмотря на общее прошлое, банковские рынки трех крупнейших стран СНГ существенно отличаются друг от друга по многим аспектам – от уровня конкуренции, структуры и прозрачности сектора до специфики регулятивной среды. А также – антикризисными мерами регуляторов.

Среди банковских рынков Казахстана, России и Беларуси, трех крупнейших стран СНГ по уровню ВВП на душу населения, российский рынок выделяется большим количеством игроков и относительно низкими барьерами входа при существенном количестве ежегодно отзывааемых банковских лицензий. В банковском секторе Республики Беларусь значимую роль играют государственные банки, способствующие реализации государственной политики, в том числе за счет выдачи директивных кредитов. В Казахстане наиболее сильны позиции частного банковского бизнеса. Финансовая инфраструктура Казахстана и Беларуси в многом формируется иностранными организациями, такими как международные рейтинговые агентства и аудиторские компании, в то время как в России рынок рейтинговых и аудиторских услуг в большей степени представлен национальными игроками.

Общим стремлением для трех стран является внедрение рекомендованных Базельским комитетом по банковскому надзору подходов к регулированию, в том числе его последних рекомендаций, призывающих не допустить остановку кредитования реального сектора в период пандемии.

Несмотря на более чем десятикратное различие в количестве игроков на банковских рынках трех стран (менее 30 организаций в Казахстане и Беларуси и почти 400 - в России), структура этих рынков, при первом рассмотрении, кажется похожей: на 1 января 2022 г. В каждой из трех стран около трети активов всей банковской системы аккумулирует один крупнейший банк, а доля пяти крупнейших банков колеблется от 63% до 73%. Если расширить оценку с пяти до десяти крупнейших участников рынка, то выявляется страна-«антилидер» по уровню концентрации: топ-10 банков покрывают 93% всех активов банковского сектора Беларуси при 80%-85% в Казахстане и России. Это наблюдение еще раз подтверждается сравнением значений индекса Херфиндаля-Хиршмана – это индекс, который оценивает позиции каждого участника банковского рынка и степень концентрации рынка. Согласно значению индекса, рынок Беларуси можно отнести к высококонцентрированному, в то время как рынки Казахстана и России характеризуются, скорее, умеренной концентрацией. При этом наиболее благоприятная, с точки зрения конкуренции, среда отличает банковскую систему Казахстана.

Еще больше различий в структуре банковских рынков трех стран можно обнаружить при сравнении позиций банков с преимущественно государственным, иностранным и частным капиталом. Так, например, в Казахстане и Беларуси достаточно значимую долю (около трети и около пятой части всего рынка соответственно) занимают иностранные банки. При этом без учета присутствия российских дочек доля рынка, приходящаяся на банки с иностранным капиталом, во всех трех странах составляет около 9-10%.

Почти три четверти всего банковского рынка Казахстана приходится на частные банки, что сильно контрастирует с белорусским и российским рынками, где наиболее значимыми конкурентными преимуществами обладают банки с государственным участием. При этом даже, если применить менее формальный подход и пере классифицировать крупнейший частный банк Казахстана в государственный, позиции частного банковского сектора в стране все равно будут устойчивее России и Беларуси.

Говоря о значимых позициях на рынке Беларуси банков с государственным капиталом (более 60% банковского сектора), стоит отметить, что достигнуты они были, во

многим, благодаря претворению в жизнь государственных программ и мероприятий по так называемому директивному кредитованию двумя крупнейшими банками страны. Задолженность по таким кредитам на 1 января 2022 г. составляла около половины выданных кредитов клиентам Беларусбанка и Белагропромбанка и около 17% активов всей банковской системы. В настоящее время страна идет по пути сокращения ежегодных лимитов директивного кредитования, однако полностью не отказывается от этого инструмента.

Общее историческое прошлое трех стран, в том числе в части банковского законодательства, как и сходное стремление к внедрению рекомендаций Базельского комитета по банковскому надзору, делают современные подходы национальных банков во многом схожими и сопоставимыми. Тем не менее, у каждой страны есть своя специфика.

Если сравнивать с белорусской банковской практикой белорусский регулятор проводит наиболее жесткую политику в части требований к нормативам достаточности капитала. Так, основные нормативы, как правило, установлены на уровне на 0,5-2 п.п. выше аналогичных нормативов в Казахстане и в России. Помимо этого, Беларусь – единственная из трех стран, где введенные по Базельским рекомендациям буферы капитала используются в регулировании напрямую, то есть нарушение нормативов с учетом буферов способно привести к ограничению деятельности вплоть до отзыва лицензий. При этом в Казахстане, как и в России, такое нарушение грозит только невозможностью распределения прибыли.

Минимальный размер капитала для осуществления банковской деятельности, наименьшие барьеры для входа установлены на российском рынке: для создания банковской организации в Казахстане и Беларуси потребуется почти в два раза больше капитала, чем для создания банка с универсальной лицензией в России, и почти в шесть раз больше, чем для создания банка с базовой лицензией в России.

Существуют отличия и в использовании базельских нормативов чистого стабильного фондирования (NSFR) и краткосрочной ликвидности (LCR). Оба норматива внедрены в каждой из трех стран на уровне 100% (за исключением переходного периода по LCR в Казахстане, который должен достигнуть 100% к июлю 2021 г.). Отличительной чертой каждого рынка является распространение базельских нормативов на отдельных участников банковской системы и сохранение национальных подходов к оценке ликвидности. В России NSFR и LCR распространяются только на системно значимые кредитные организации, все остальные банки обязаны продолжать соблюдать национальные нормативы. В Казахстане и в Беларуси NSFR и LCR введены для всех банков, при этом казахстанский регулятор продолжает параллельно использовать ряд национальных нормативов ликвидности, а в Беларуси новые нормативы полностью заменили старый подход.

Несмотря на более лояльные требования к капиталу и отдельным нормативам, в России крайние регулятивные меры в виде отзыва лицензий на осуществление банковской деятельности применяются регулятором чаще, чем национальными банками Казахстана и Беларуси. За последние пять лет в Беларуси всего пять организаций лишились права заниматься банковской деятельностью, при этом все - за период до 2022 года. В Казахстане отзывы лицензий происходили с большей регулярностью, однако в 2019 г. также не было отмечено ни одного случая.

Однако оценивать активность по «чистке» банковского рынка лучше не по абсолютному числу отозванных лицензий (из-за несопоставимости числа участников рынка), а по тому, какая часть банков за пятилетний период потеряла право заниматься профильной деятельностью. Так, в Казахстане вынужденно прекратил свою деятельность каждый седьмой банк, в Беларуси – каждый пятый, в России – каждый третий.

Для отзыва лицензий в России причины достаточно многообразны, как правило, это проведение высокорискованной кредитной политики, нарушении «антиотмывочного законодательства» или проблемы с капиталом. Именно недостаток капитала послужил

причиной отзыва большинства лицензий в Беларуси. В Казахстане, помимо недостаточной капитализации, лицензии отзывались за нарушение пруденциальных нормативов и невыполнение платежных обязательств перед контрагентами. При этом Национальный Банк Казахстана может предварительно приостанавливать отдельные виды банковских лицензий, с обязательной публикацией таких решений на своем сайте. Инструментарий Банка России тоже включает санкции в виде запрета на привлечение средств клиентов, однако до 2020 г. такие решения принимались конфиденциально.

Важной особенностью национальных рынков являются различия в подходах к исполнению обязательств перед вкладчиками после отзыва лицензии. Обязательному возмещению подлежит сумма депозитов России, не превышающая 1,4 млн рублей, в Казахстане – 20 млн тенге, что почти в два раза больше. В Беларуси возмещению подлежит вся сумма вклада, какой бы она не была, включая начисленные проценты.

Наибольшим опытом в применении санации в банковской сфере обладает Россия: в российской банковской истории санации проводились и частными лицами, и кредитными организациями, и непосредственно государством. В Казахстане санация осуществляется средствами и под надзором государства, и только после оздоровления банк может быть продан новому частному инвестору. Законодательство Беларуси не предусматривает применение к банкам механизма санации – вероятно, в числе прочего потому, что частный банковский сектор в стране существенно уступает в позициях государственному, а поддержка государственных банков оказывается иными методами, от прямых вливаний в капитал до выкупа специально созданными для этого структурами проблемных активов. Тем не менее, в ближайшем будущем ситуация должна измениться, так как Национальный банк Республики Беларусь объявил о разработке, с технической помощью Всемирного банка, национального института санации проблемных банков.

За последнее десятилетие банковские рынки трех стран достигли существенного прогресса в области прозрачности финансовой и иной значимой информации о деятельности и состоянии отдельных участников рынка. С наибольшей регулярностью и максимальным охватом разных сфер банковской деятельности раскрывается информация банками России, в Казахстане и Беларуси набор информации, публикуемой ежемесячно, ограничен, а ряд форм регуляторной отчетности не раскрывается для неограниченного круга лиц.

Большинство банков Казахстана и Беларуси, в том числе небольшие по размеру активов организации, проходят аудиторские проверки в крупных международных компаниях: в «большой четверке» или BDO. Самым популярным поставщиком банковских аудиторских услуг в Беларуси стала компания BDO, а в Казахстане – компания EY (по числу аудиторских заключений, выданных по отчетности за 2021 год). В России среди крупных банков также наибольшим спросом пользовались услуги EY, но в целом из-за высокой популярности услуг местных организаций позиции «четверки» и BDO ограничивались одной пятой банковского рынка (по числу аудиторских заключений, выданных по отчетности за 2021 год).

В условиях пандемии стабильность банковского сектора каждой страны находится под угрозой. Резкое снижение доходов заемщиков не может не сказываться на их платежной дисциплине. В обычное время банки отражают повышенный уровень риска и, соответственно, повышенные резервы по таким кредитам в отчетности, начисляя по такой задолженности штрафы и обращая взыскание на предметы залога. Во время кризиса подобный подход чреват полной остановкой процессов кредитования при резком снижении банковских капиталов.

В этих условиях Базельский комитет считает приоритетом предоставление банками кредитных ресурсов реальному сектору экономики, что может происходить как за счет

прямой поддержки государства в виде гарантий или льготных средств, так и за счет технических изменений в расчете уровня требований к нормативному капиталу. Национальные регуляторы Казахстана, России и Беларуси, тем или иным образом, следуют этому пути.

Применением широкого спектра мер поддержки различных сфер экономики заявили банки России, в том числе банковского сектора. В их числе как технические меры, в том числе, включение операций в иностранных валютах при расчете нормативов по ретроспективному курсу и право оценки ценных бумаг по справедливой стоимости на ретроспективную дату, так прямые меры. К прямым мером можно привести пример как расширение программы льготного кредитования кампаний малого и среднего бизнеса, запущенные и анонсированные механизмы поддержки ликвидности. Из нормативных требований в России были смягчены условия предоставления безотзывных кредитных линий в рамках соблюдения LCR. Белорусский регулятор на 10 п.п. смягчил требования к максимальному размеру риска на одного должника до 35% и зафиксировал минимальный размер нормативного капитала банков на

Таблица 1 - Активы банка второго уровня

№	01.01. 2022	01.02. 2022	01.03. 2022	01.04. 2022	01.05. 2022	01.06. 2022	01.07. 2022	01.08. 2022	01.09. 2022	01.10. 2022	01.11. 2022	01.12. 2022
Народн ый Банк	11631.9	11309.7	12179.3	12267.6	12764.4	12443.6	13188.2	13305	13355	13590	13473	13772.6
Bereke Bank	4221.6	4191	3702.4	2874.3	2083.3	2007.1	2000.3	1886	2622	1604	1586	1583.4
Kaspi Bank	3602.1	3530.5	3715.7	3626.8	3789	3929.7	4102.2	4380	4396	4519	4639	4757.2
Отбасы Банк	2804.2	2770.3	2873.3	3197.1	3078.7	3100.9	3078.4	3104	3192	3249	3275	3356.3
Jusan Bank	2609.2	2488.7	2505.8	2455.1	2406.7	2362.9	2508.4	2531	2506	2621	2614	2642.7
Forte Bank	2483.2	2418.7	2522.8	2650.9	2640.3	2681.7	2874.9	2830	2783	2698	2806	2764.2
Банк Центр Кредит	2070.3	2086.9	2185	2284.6	2483.6	2703	3017.7	3214	3372	3598	3760	3906.9
Евразий ский Банк	1418.2	1450.5	1501.8	1413.9	1446.2	1497.4	1751.3	1975	2040	2212	2303	2305.1
Bank RBK	1270.1	1280.1	1303.8	1345.4	1334.3	1318.4	1503.7	1531	1652	1785	1861	1936.7
Ситиба нк Казахст ана	1101.6	1082.3	1276.4	1359.8	1277	1195.5	1199.1	1350	1298	1413	1568	1408.8
Альфа Банк	905.8	926.9	908.6	901.4	439.6	245.5	217.8	177	131	-	-	-
Altyn Bank	643.2	637.1	682.3	742.6	785.5	811.4	836.5	899	936	974	929	992.7
Банк ВТБ	506.4	474	349.6	178.4	169.9	195.3	188.4	185	199	200	204	187.7
Home Credit Bank	475.3	481.3	507.5	503.5	479.3	643.5	495	564	611	547	545	555.8
Нурбан к	462.7	445.5	453.1	430.9	434	408.4	441.8	470	477	472	467	460.4
Банк Китая в КЗ	454.5	457.9	507.3	538.9	550.8	456	550.8	571	536	554	590	548.8
Банк Фридо м Финанс	398.1	378.9	402.5	423.5	441.6	473.2	589.5	636	742	943	1035	1128.9
ТПБ Китая	260.9	257.4	292.2	250.5	288	287.6	324.4	347	297	377	323	324.6
КЗИ Банк	132.8	138.2	147.1	141.2	158	160.4	143.8	169	167	161	174	171.4
Шинхан Банк	79.3	86.9	94.5	100.9	94	95.8	118.3	121	119	120	120	142.4
Al Hilal	63.8	58.5	64.5	58.6	59.5	60.7	72.6	61	61	64	66	85.1
Заман Банк	26.6	24.5	24.3	24.3	24.7	24.6	24.7	25	25	24	23	25.1

Народный банк продемонстрировал наибольший рост валютного баланса, увеличившись на 2 140,8 млрд тенге и достигнув 13 772,6 млрд тенге, сохранив свое лидерство среди пяти крупнейших игроков. Ранее известный как "Сбербанк", ныне банк "Береке", который ранее занимал вторую позицию по размеру активов, к 1 декабря опустился на девятое место со снижением на 2 638,2 млрд тенге до 1 583,4 млрд тенге из-за

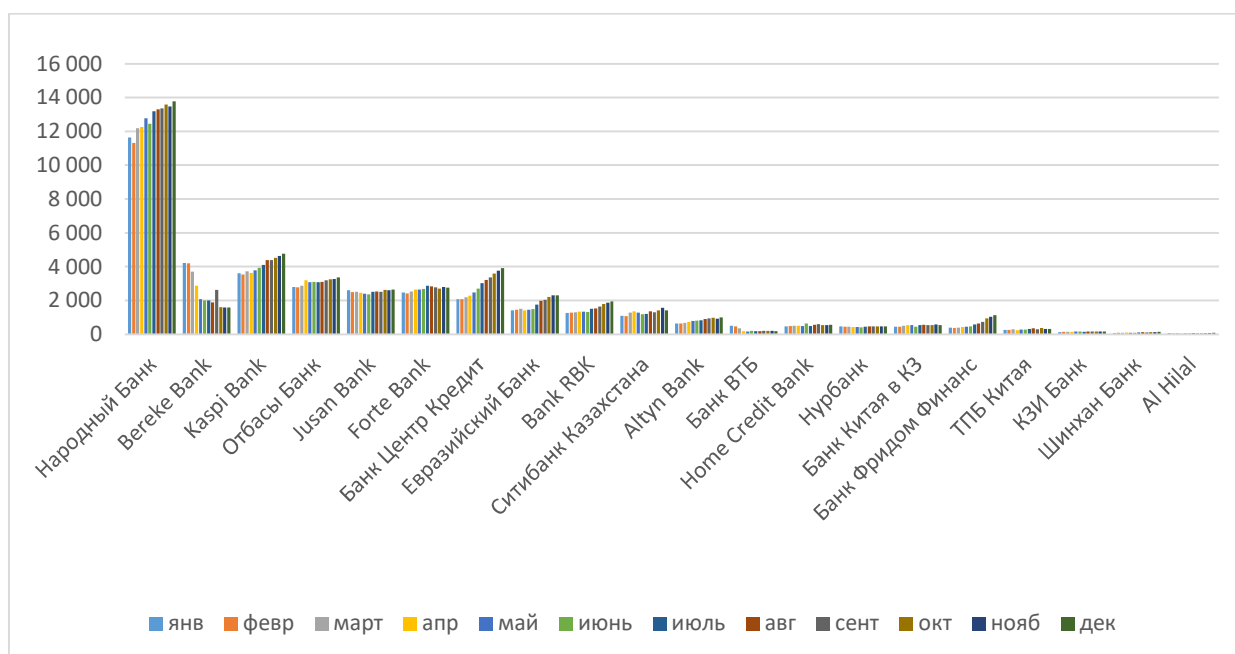
массового оттока средств со счетов клиентов. В свете своего спада Kaspi Bank вырвался вперед в первом квартале, увеличив свои активы на 1 155,1 млрд тенге до 4 757,2 млрд тенге. Кроме того, банк ЦентрКредит, ранее занимавший седьмую позицию, поднялся на третье место после слияния с банком "Эко Центр", увеличив свои активы на 1 836,7 млрд тенге до 3 906,9 млрд тенге.

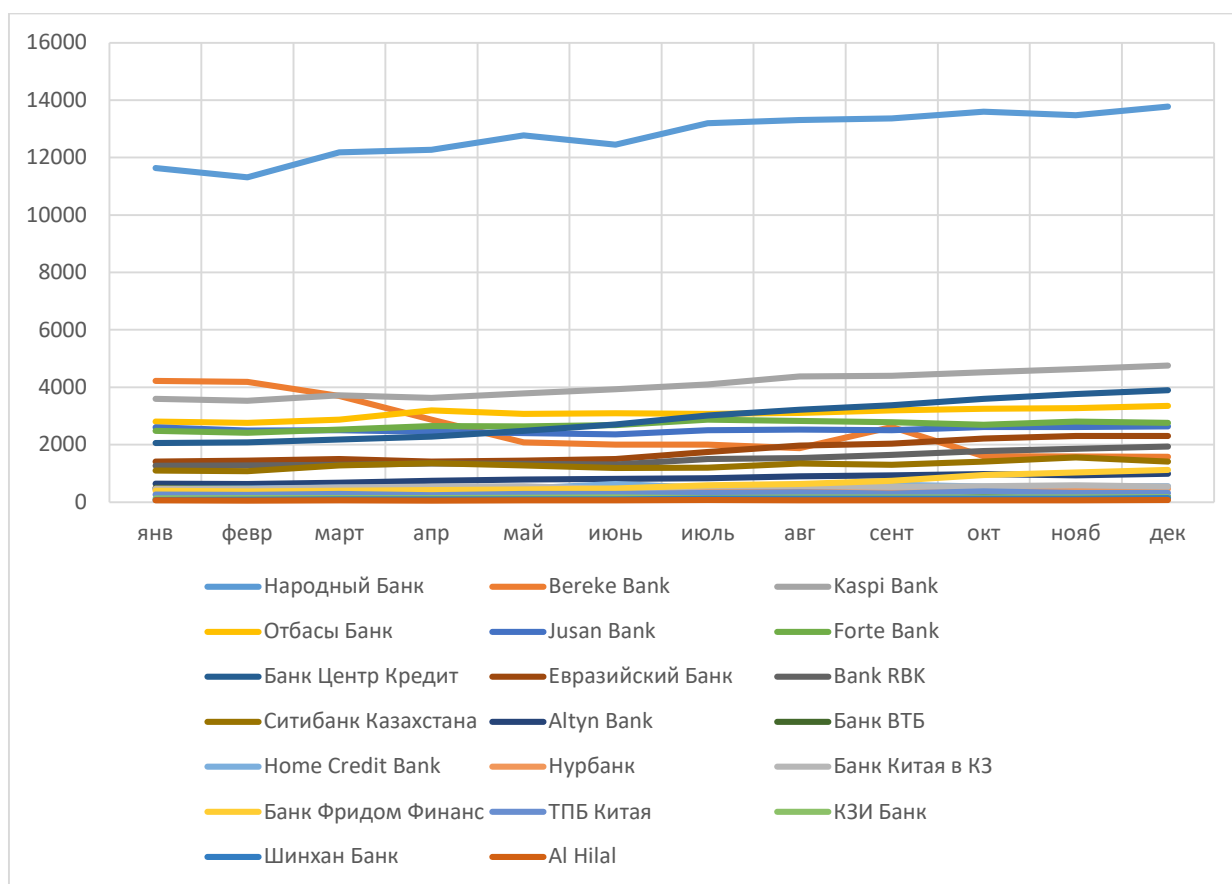
Вслед за ними на четвертом месте прочно закрепился Отбас Банк, который вырос на 552,1 млрд тенге (до 3 356,3 млрд тенге).

ForteBank с активами в размере 2 764,2 млрд тенге (рост на 281 млрд тенге с начала года) замкнул пятерку лидеров банковского сектора, вытеснив в марте Jusan Bank, который за первые 11 месяцев 2022 года вырос всего на 33,5 млрд тенге, достигнув 2 642,7 млрд тенге.

На долю пяти крупнейших банков приходится 2/3 всех банковских активов, или 66,3%.

По данным регулятора на 1 декабря, банковский сектор в целом располагал значительным резервом высоколиквидных активов, составляющим 13,1 трлн тенге, что составляет 30,5% от валютного баланса.





Народный Банк	6231,1	6033,1	6312,5	6481	6881,2	7154,9	7450	7521	7579	7642
Bereke Bank	2635	2738,3	2441,5	2329	1593	1543,9	1486,8	1370	1308	1251
Kaspi Bank	2558,5	2533,5	2590	2530,1	2546,1	2571	2649,9	2812	2927	3003
Отбасы Банк	2088,4	2203,2	2272,8	2239,1	2398,5	2470,8	2499,3	2571	2657	2747
Банк Центр Кредит	1249,3	1231,7	1236,4	1313	1449,5	1573,3	1631,2	1678	1805	1964
Jusan Bank	1065,6	1050,6	1069,3	1086,6	1078,8	1089,4	1145,5	1130	1133	1142
Forte bank	967,8	913,4	915,8	1016,1	947,5	984,2	1078,4	1082	1080	1086
Евразийский банк	720,8	725,9	754,8	801,9	872,2	888,9	948,5	984	1011	1055
Bank RBK	666,3	635,4	670	669,4	746,6	740,7	786,4	778	794	865
Альфа банк	559	534,8	564,4	552,6	356,1	189,9	156,4	123	4	0
Home Credit Bank	375,1	372,8	378,5	400,3	390,2	383,6	398,6	406	415	180
Нурбанк	281	272,3	280,5	265,2	262,7	246,8	275,2	262	262	261
Altyn bank	267,1	256	285,3	293,5	319,2	325,1	293,1	296	300	310
Банк ВТБ	212,4	218,2	174,9	146,2	137,7	124,5	116,7	110	107	
Ситибанк Казахстан	95	96,5	109	86,6	78,3	90,2	86,7	97	87	

Национальный банк Казахстана 10 марта повысил ставку с 9,25% до 12,0%, понизив ее 4 апреля до 9,5%. В феврале национальные регуляторы России и Беларуси практически синхронно понизили ключевую ставку на 0,25п.п.

Все страны пошли по пути смягчения резервирования по реструктурированным вследствие кризиса кредитам и предоставления «кредитных каникул» при выполнении определенных условий. В ситуации кризиса стало особенно заметно различное понимание национальными регуляторами сущности «надбавок» к коэффициентам достаточности

капитала. Банк России, не меняя официальных требований к нормативам, напомнил о том, что банки могут использовать величину надбавки для кредитования экономики, откладывая выплаты топ-менеджменту. В Беларуси, где выполнение нормативов с надбавками является обязательным, регулятору пришлось снизить величину одного из буферов (до 31 декабря 2021 года значение консервационного буфера капитала будет составлять 2,25 п.п. вместо 2,5 п.п.), что привело к смягчению нормативов. Перечень мер поддержки финансовой сферы Национальным банком Казахстана пока ограничен действиями, призванными смягчить условия кредитования физических лиц и малого и среднего бизнеса [3].

Таким образом, Республика Казахстан имеет двухуровневую банковскую систему, представленную Национальным банком и сетью государственных, частных, акционерных, совместных и иностранных банков, или так называемых банков второго уровня. Взаимоотношения между банками построены в двух плоскостях: по вертикали и горизонтали. По вертикали – отношения подчинения между Центральным банком (Национальным банком) как руководящим, управляющим и низовыми звеньями – коммерческими и специализированными банками. По горизонтали – отношения равноправного партнерства между различными банками.

За 30-ти летний опыт независимого в Казахстана в банковской системе совершенствуются с каждым годом. Если сравнивать с другими странами СНГ банковская система Республики Казахстан считается передовой и развит цифровой банкинг.

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Financial Risks in the Aluminum Industry: A Brief Review

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Abstract

The assessment of potential financial risks within the globally strategic aluminum industry holds significant importance. The research comprehensively analyzed the general financial risks associated with the aluminum sector from various perspectives, considering factors such as price fluctuation, accessibility of raw materials, sustainability considerations, and technological advancements as primary directional criteria. The findings of the study elucidated key requirements aimed at ensuring the financial stability of the aluminum industry within the analyzed context.

Keywords: financial risks, aluminum industry, price, sustainability, supply chain, technology.

1. Introduction

The aluminum sector plays a critical role globally, holding a central position owing to its diverse contributions across various industries worldwide. Its strategic significance is highlighted by its extensive use in a range of sectors such as transportation, construction, aerospace, automotive, packaging, and electronics. As advancements in technology and material science progress, the versatility and necessity of aluminum are becoming more evident. This dynamic environment not only reinforces aluminum's position as a fundamental element of contemporary industrial practices but also emphasizes its evolving strategic importance as fresh prospects for its application arise, influencing global economic and technological trends. Aluminum's notable combination of high strength relative to its weight, along with its excellent thermal conductivity and resistance to corrosion, make it a highly desirable material for numerous applications. This versatility has led to its widespread use in industries such as transportation, electrical engineering, packaging, architecture, and food production (Ashkenazi, 2019).

Risk constitutes a foundational element within economic frameworks, influencing the trajectory of global business environments. Despite attempts to alleviate its effects, the business landscape continues to be intrinsically susceptible to the uncertainties posed by diverse risk factors. Financial risk refers to the possibility of encountering monetary losses in an investment or business venture. Among the prominent types of financial risks are credit risk, liquidity risk, and operational risk, each presenting distinct challenges and considerations (Hayes, 2023). In numerous nations, the financial sector serves as a vital source of funding for real economy firms, including those in industrial and service sectors that have limited internal capital. Consequently, it is reasonable to expect that the risk and return profiles of these real economy firms would be significantly influenced by the fluctuations in the financial sector, particularly its profitability and stability (Chiu, Pena, & Wang, 2015).

The aluminum industry, strategically significant due to its extensive production and supply chains, is also exposed to considerable financial risks. Hence, comprehending and analyzing the

nature of these financial risks within the aluminum industry holds paramount importance. Within the intricate web of the aluminum industry, factors such as fluctuating commodity prices, currency exchange rate fluctuations, and geopolitical tensions can markedly affect financial stability. Additionally, operational challenges such as disruptions in the supply chain or technological shifts serve to compound the intricacies of financial risk management within this sector. Consequently, a comprehensive understanding of these dynamics is imperative for stakeholders to implement effective risk mitigation strategies and ensure long-term growth and resilience.

2. Material and Methods

There are many scientific studies on the theoretical-practical basis of financial risks, which have the same principles in micro-economic institutions with macro-economic features, from heavy industrial enterprises to light industries. Silva, Kimura, & Sobreiro (2017) analyzed 266 research articles that included extensive systematic reviews of financial risks in their research paper. Due to the specialized characteristics of the aluminum sector, accessing relevant information requires recourse to specialized channels. Prominent actors in this domain comprise international bodies, research institutions, and significant corporate entities. Particularly noteworthy are institutions like the International Aluminum Institute (IAI, 2024) and the Aluminum Association (AA, 2021), which serve as dedicated repositories of knowledge spanning the diverse dimensions of the global aluminum industry, including its financial health, risk assessments, investment prospects, and broader thematic considerations. Numerous investigations have been undertaken within the global scientific community to evaluate various aspects, including the overall performance, financial health, and sustainability of the aluminum industry (King, 2001; Blomberg, 2007; Nordheim & Barrasso, 2007; Sverdrup, Ragnarsdottir, & Koca, 2015; Kurbonov & Pinter, 2023). A number of important scientific works have been written in the Azerbaijani context of the topic (Safarli, 2021; Safarov & Hasanov, 2024; Hasanov & Safarli, 2024; Səfərli, 2022; Hasanov, 2023).

This research investigates the financial risks impacting the aluminum industry, employing a comprehensive approach that integrates traditional theoretical financial methodologies for data collection and analysis. Data collection involved acquiring pertinent industrial and financial data from credible sources such as the International Aluminium Institute and corporate annual reports, meticulously scrutinized to uphold accuracy. Additionally, qualitative data was gathered through semi-structured interviews with key industry stakeholders, including producers, analysts, and policymakers, aimed at capturing diverse industry perspectives. Ethical considerations were rigorously observed throughout the research process, ensuring the provision of informed consent and maintaining confidentiality for interview participants. This succinct methodology aimed to deepen understanding of financial risks within the aluminum sector, offering valuable insights for stakeholders and enriching the existing knowledge base in this field.

3. Results

The distinctive characteristics of the aluminum industry have influenced its singular financial assessments. The aluminum industry, serving as a cornerstone across a diverse range of applications, faces a distinctive set of financial uncertainties. Despite its substantial growth potential and prospects for profitability, effectively addressing these risks is paramount for companies striving to maintain enduring sustainability. This underscores the importance of acquiring a thorough understanding and implementing proactive measures to mitigate the intricacies inherent in the financial landscape of the aluminum sector. Thus, strategic decision-making and robust risk management practices emerge as essential elements for companies operating within this industry to navigate challenges and capitalize on opportunities amid the ever-

changing market dynamics. Several conceivable financial risk domains can be pinpointed for the aluminum industry.

3.1. Price fluctuation.

The pricing dynamics of aluminum exhibit significant instability, influenced by various factors including shifts in global economic conditions, fluctuations in the balance of supply and demand, variations in energy costs, and geopolitical events. A sudden downturn in the economy can lead to reduced demand, resulting in price declines and impacting the revenue streams of companies in the industry. Conversely, unanticipated disruptions in the supply chain or trade conflicts can drive prices upward, putting pressure on profit margins within the sector.

The enhanced financial attributes of non-ferrous metals resulting from financialization, combined with increased uncertainty, contribute to the intricacy of the stock market within the non-ferrous metal industry. However, to date, no research has thoroughly investigated the relationships among these three factors within a unified framework (Zhu, et al., 2021). Price fluctuations in the aluminum market can pose significant financial assessments and risks. Consequently, aluminum companies may incur substantial losses when the disparity between supply and final product sales within the production process shifts unfavorably. In the most favorable scenario, the sale of manufactured goods may be halted, thereby adversely affecting profitability.

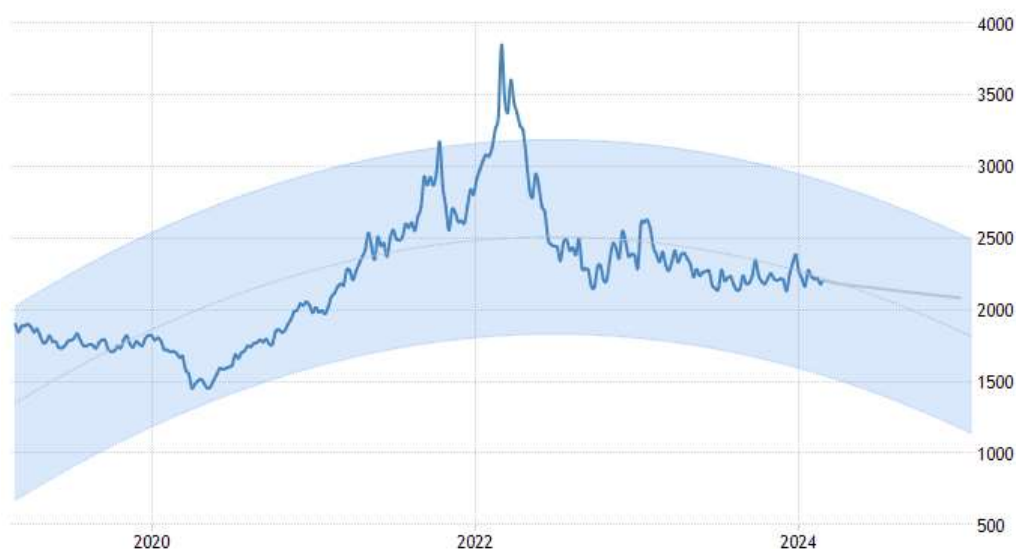


Figure 1. Price fluctuation in the aluminium market (2020-2024). Source: Trading Economics.

As depicted in Figure 1, in 2022, the price of one ton of aluminum approached \$4,000, a stark contrast to the \$2,000 recorded in 2021, attributable to prevailing global political and economic circumstances. Since the commencement of 2024, aluminum has witnessed a decrease of 181 USD/Tonne or 7.59%, as per trading on a contract for difference (CFD) tied to the commodity's benchmark market. Analysts' forecasts, based on Trading Economics global macro models, suggest that aluminum is expected to reach 2182.64 USD/Tonne by the end of the current quarter. Looking further ahead, it is projected to trade at 2082.65 USD/Tonne within the span of the next 12 months (Trading Economics, 2024).

3.2. Raw Material Accessibility

The production of aluminum is significantly reliant on the accessibility and cost-effectiveness of raw materials, which profoundly influences the price of aluminum output. Any disruptions or price escalations within these markets can exert a considerable impact on production costs and profitability for participating companies. Moreover, the concentrated geographical distribution of these resources across a limited number of countries raises concerns about potential

vulnerabilities in the supply chain. The primary constituents contributing to the production expenses of aluminum predominantly include:

- Bauxite
- Aluminum oxide
- Carbon anode blocks
- Fluoride.

The financial viability of aluminum enterprises is profoundly impacted by a range of factors encompassing the quality, procurement, and transportation logistics of essential materials. In this context, the aluminum supply chain emerges as a critical determinant in assessing and managing financial risks. Consequently, there exists a pressing imperative to meticulously optimize the intricate processes governing the procurement and delivery of raw materials to ameliorate the inherent financial vulnerabilities associated with aluminum production. Information regarding the prices of primary aluminum production and its constituent raw materials is readily accessible through the London Metal Exchange (LME, 2024). This platform serves as a prominent marketplace where market participants can obtain real-time data and insights into the dynamic fluctuations of prices for aluminum and its key inputs.

3.3. Sustainability considerations and technological progress.

Incorporating the aluminum industry into a future characterized by green and sustainable practices is paramount. The imperative to transition towards sustainability within the aluminum sector, notorious for its high CO₂ emissions, has emerged as a significant global political-economic concern. Science and technology enterprises are earnestly dedicated to addressing this challenge, seeking innovative solutions to mitigate environmental impact and foster sustainability within the industry.

The environmentally concerning nature of aluminum production, given its resource-intensive processes, underscores the imperative for sustainability considerations and technological advancements. Heightened demands for sustainable practices and carbon footprint reduction may result in increased financial investments by firms, particularly in cleaner technologies. Consequently, companies are compelled to delicately navigate the intersection of financial efficiency and environmental responsibility. The aluminum industry is continuously evolving, with advancements in production techniques and the introduction of alternative materials. Firms must remain vigilant regarding these advancements to maintain their competitive advantage. Failing to embrace new technologies and adapt to evolving market demands can lead to financial setbacks and a decline in market share.

The adoption of environmentally friendly practices within the aluminum industry, particularly in production technology, not only impacts environmental considerations but also significantly influences the business landscape and financial appraisal. Contemporary aluminum manufacturing predominantly employs smelting techniques using raw materials, highlighting the imperative for decarbonization strategies to address direct emissions arising from the breakdown of carbon anodes and electricity generation. Affordable decarbonization avenues encompass the adoption of inert anodes or the shift towards renewable energy sources. Nonetheless, the viability of leveraging carbon offsets to offset anode emissions is ambiguous owing to disparities in quality and anticipated future scarcities (Attwood, 2021).

Production costs of net-zero primary aluminum, versus business-as-usual, 2020

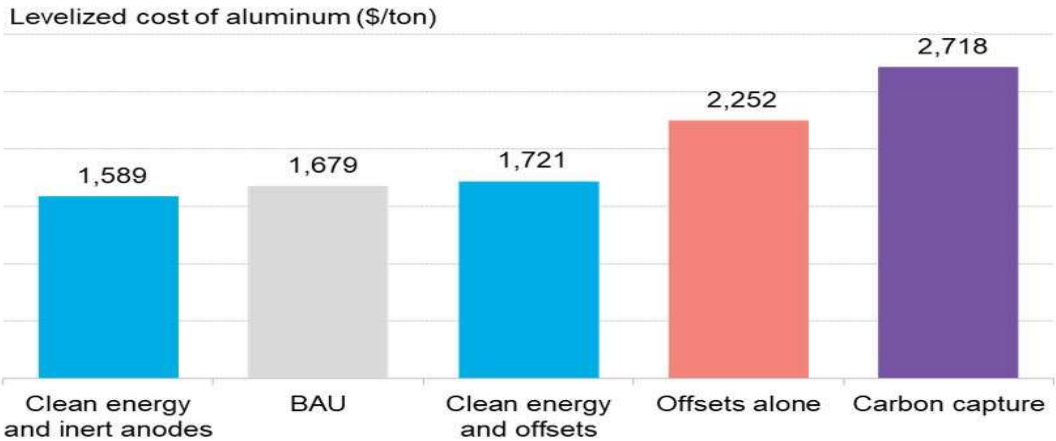


Figure 2. Green aluminum production costs. Source: BloombergNEF.

Figure 2 demonstrates a substantial reduction in production costs for non-zero primary aluminum in comparison to conventional business-as-usual practices. Notably, the most economically efficient method entails the utilization of clean energy in conjunction with inert anodes, priced at \$1,589 per ton, followed by clean energy combined with offsets, carbon capture alongside offsets, and lastly, business-as-usual methods, delineating a descending hierarchy of cost-effectiveness.

Consequently, adhering to green standards in aluminum production has become a fundamental requirement in the modern global business arena. Entities failing to meet these standards risk expulsion from the market. Conversely, those aligning with green standards and possessing technological advantages are poised to establish sustainable and lucrative business operations over the long term.

Conclusion

This article explained the intricate financial landscape of the aluminum industry, highlighting its susceptibility to various factors such as price volatility, raw material availability, sustainability imperatives, and technological advancements. The elucidation of price fluctuations driven by global economic conditions, supply and demand dynamics, energy costs, and other factors underscores the substantial financial risks faced by industry participants. Furthermore, the accessibility and cost-effectiveness of raw materials were emphasized as pivotal determinants of production costs and overall profitability, with concerns stemming from the industry's reliance on geographically concentrated resources. Moreover, the necessity for companies to strategically balance environmental responsibility with financial viability and proactively embrace technological innovations has been underscored as imperative for ensuring long-term financial stability and seizing emerging market opportunities.

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DÖVLƏT İDARƏETMƏSİNDƏ NƏZARƏTİNİN TƏŞKİLİNİN MÜASİR METODLARINDAN İSTİFADƏ MEXANİZMİ

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Abstrakt. Bu məqalə dövlət idarəçiliyində nəzarətin təşkili üçün müasir metodlardan istifadə mexanizmini araşdırır. Bugünkü sürətlə inkişaf edən idarəetmə mənzərəsində effektiv nəzarət hesabatlılığın, şəffaflığın və dövlət sektoru subyektlərinin səmərəli fəaliyyətinin təmin edilməsində mühüm rol oynayır. Müasir metodların qəbulu texnologiya integrasiyası, riskə əsaslanan nəzarət, fəaliyyətin idarə edilməsi, şəffaflıq təşəbbüsləri, potensialın yaradılması, adaptiv idarəetmə yanaşmaları və birgə nəzarət mexanizmləri daxil olmaqla bir sıra strategiyaları əhatə edir. Bu üsullar dövlət idarəçiliyində nəzarət proseslərini artırmaq üçün rəqəmsal texnologiya, məlumat analitikası və maraqlı tərəflərin cəlb edilməsi sahəsində irəliləyişlərdən istifadə edir. Müasir nəzarət metodları ilə əlaqəli prinsip və təcrübələri tədqiq etməklə, bu sənəd hökumətlərin müasir idarəetmə mühitlərinin çağırışlarına cavab vermək üçün öz nəzarət çərçivələrini necə uyğunlaşdırma və optimallaşdırma biləcəyinə dair anlayışlar təqdim etmək məqsədi daşıyır.

Açar sözlər: şəffaflıq, səmərəlilik, rəqəmsallaşma, nəzarət, idarəetmə, müasir üsullar

Müasir idarəetmə strukturlarında hesabatlılığın, şəffaflığın və dövlət xidmətlərinin səmərəli çatdırılmasının təmin edilməsi üçün dövlət idarəçiliyi subyektlərinə effektiv nəzarət mühüm əhəmiyyət kəsb edir. Bu məqalə dövlət idarəçiliyi sahəsində nəzarəti təşkil etmək üçün müasir metodlardan istifadə etmək üçün istifadə olunan çoxşaxəli mexanizmləri araşdırır. İdarəetmə təcrübələrinin inkişaf edən mənzərəsini tədqiq etməklə, bu tədqiqat dövlət sektoru əməliyyatlarının dürüstlüyünün və effektivliyinin gücləndirilməsində nəzarətin əsas rolunu aydınlaşdırmağa çalışır.

Məqalədə bütün dünyada hökumətlər tərəfindən qəbul edilən müasir nəzarət metodlarının hərtərəfli icmalı təqdim olunur. Buraya rəqəmsal monitoring sistemləri, məlumat analitikası və kommunikasiya vasitələri kimi texnoloji nailiyyətlərin təhlili daxildir ki, bu da dövlət idarəçiliyində nəzarət proseslərində inqilab yaradıb. Bundan əlavə, o, riskə əsaslanan nəzarət strategiyalarının, fəaliyyətin idarə edilməsi çərçivələrinin, şəffaflıq təşəbbüslərinin və nəzarət mexanizmlərinin effektivliyinin artırılmasına yönəlmiş potensialın yaradılması proqramlarının həyata keçirilməsini araşdırır. Nəzəri çərçivələrə və empirik sübutlara əsaslanaraq, məqalə dövlət idarəçiliyində müasir nəzarət metodlarının əsasını təşkil edən əsas prinsip və təcrübələri işıqlandırır. O, effektiv nəzarət mədəniyyətinin inkişaf etdirilməsində şəffaflığın, hesabatlılığın və maraqlı tərəflərin cəlb edilməsinin vacibliyini araşdırır. Bundan əlavə, o, hökumətlərə yaranan çağırışlara və dəyişən şəraitə çevik reaksiya verməyə imkan verən adaptiv idarəetmə yanaşmalarının əhəmiyyətini vurğulayır. Məqalədə dövlət idarəçiliyində müasir nəzarət metodlarının tətbiqi ilə bağlı problemlər və imkanlar müəyyən edilir və həll edilir. O, məlumatların məxfiliyi ilə bağlı narahatlıqlar, resurs məhdudiyyətləri, dəyişikliklərə institusional müqavimət və nəzarət proseslərində qurumlararası əməkdaşlığa ehtiyac kimi məsələləri araşdırır. Bundan əlavə, o, bu çətinliklərin öhdəsindən gəlmək və dövlət sektoru qurumlarının davamlılığını və cavabdehliyini artırmaq üçün müasir metodlardan istifadənin potensial faydalarını araşdırır. Müxtəlif yurisdiksiyalardan nümunə araşdırmalarının və ən yaxşı təcrübələrin təhlili vasitəsilə

məqalə dövlət idarəçiliyində müasir nəzarət metodlarının tətbiqi ilə bağlı praktiki fikirlər təklif edir. O, nəzarət mexanizmlərini gücləndirmək, xidmətlərin göstərilməsini təkmilləşdirmək və ictimai etimadı artırmaq üçün hökumətlər tərəfindən həyata keçirilən uğurlu təşəbbüsləri araşdırır. Məqalə real dünya nümunələrini nümayiş etdirməklə siyasətçilər, praktiklər və tədqiqatçılar arasında innovasiyaları və bilik mübadiləsini ruhlandırmağa çalışır. (Mark Wilson, 2016: 92)

Yekun olaraq, bu məqalə müasir idarəetmə mühitinin mürəkkəbliklərini və tələblərini həll etmək üçün dövlət idarəçiliyində nəzarətin təşkili üçün müasir metodların tətbiqinin vacibliyini vurğulayır. Nəzarətə fəal və adaptiv yanaşmanı qəbul etməklə hökumətlər hesabatlılığı, şəffaflığı və dövlət sektoru əməliyyatlarının ümumi effektivliyini artırır, nəticədə ictimai məqsədlərə və ictimai rifaha nail olmağa töhfə verə bilər. (Alexandra Garcia, 2022: 106)

Dövlət idarəçiliyində nəzarətin təşkili üçün müasir metodların tətbiqi müasir idarəetmə çərçivələrinə xas olan saysız-hesabsız mürəkkəblikləri və imkanları açır. Dövlət idarəçiliyində hesabatlılığın və şəffaflığın artırılması müasir nəzarət metodlarının təməl məqsədidir. Bu, dövlət qurumlarının öz hərəkətlərinə və qərarlarına görə məsuliyyət daşmasını təmin edən mexanizmlərin yaradılmasını, eyni zamanda ictimaiyyət üçün məlumatın açıqlığını və əlçatanlığını təşviq etməyi nəzərdə tutur. Müasir nəzarət metodları dövlət idarəçiliyində hesabatlılığı və şəffaflığı artırmaq üçün texnologiyadan istifadə edir. Rəqəmsal monitoring sistemləri, məsələn, hökumətin fəaliyyətlərini, xərclərini və performans göstəricilərini real vaxt rejimində izləməyə imkan verir. Bu, maraqlı tərəflərə hökumətin əməliyyatları haqqında vaxtında və dəqiq məlumat əldə etmək imkanı verməklə daha çox şəffaflığa kömək edir. Digər aspekt qərar qəbul etmə proseslərini məlumatlandırmaq üçün məlumat analitikasından istifadəni əhatə edir. Hökumətin fəaliyyəti, resurs bölgüsü və xidmətlərin göstərilməsi ilə bağlı məlumatları toplamaq və təhlil etməklə, qərar qəbul edənlər təkmilləşdirmə üçün sahələri müəyyən edə və resursdan istifadəni optimallaşdırma bilərlər. Məlumat əsaslanan bu yanaşma sübuta əsaslanan qərar qəbul etməyə imkan verməklə və obyektiv ölçülərə əsaslanan performans qiymətləndirmələrini asanlaşdırmaqla hesabatlılığı təşviq edir. Müasir nəzarət metodları çox vaxt şəffaflığı və hesabatlılığı təmin etmək üçün ictimai hesabat mexanizmlərini özündə birləşdirir. Hökumətlər öz fəaliyyətləri, büdcələri və nəticələri haqqında təfərrüatlı hesabatlar dərc edə bilər və bu məlumatı vətəndaşlar və digər maraqlı tərəflər üçün əlçatan edir. Müntəzəm hesabatlar vasitəsilə şəffaflığı təşviq etməklə hökumətlər hesabatlılığa sadıqlıqlarını nümayiş etdirir və ictimai nəzarət və rəy üçün imkanlar təqdim edirlər. Effektiv nəzarət maraqlı tərəflərin qərarların qəbulu prosesinə cəlb edilməsini və hökumətin fəaliyyətinə onların töhfəsini almasını nəzərdə tutur. Vətəndaşlardan, vətəndaş cəmiyyəti təşkilatlarından və digər maraqlı tərəflərdən rəy almaqla hökumətlər öz fəaliyyətlərinin ictimai gözləntilərə və prioritetlərə uyğun olmasını təmin edə bilərlər. Bu iştirakçı yanaşma hökumət qurumlarını xidmət etdikləri icmalar qarşısında hesabatlı tutmaqla və açıq dialog və əməkdaşlıq vasitəsilə şəffaflığı təşviq etməklə hesabatlılığı gücləndirir. Şəffaflıq və hesabatlılıq səylərinə çox vaxt dövlət resurslarından sui-istifadənin və dövlət qurumlarında qeyri-etik davranışın qarşısını almaq üçün antikorrupsiya tədbirlərinin həyata keçirilməsi daxildir. Bu, korrupsiyaya qarşı mübarizə agentliklərinin, məlumat verənlərin müdafiəsi mexanizmlərinin və dövlət məmurları üçün davranış kodeksinin yaradılmasını əhatə edə bilər. Ciddi etik standartları tətbiq etməklə və korrupsiyaya qarşı mübarizə aparmaqla hökumətlər hesabatlılığa sadıqlıqlarını nümayiş etdirirlər və vətəndaşlar və maraqlı tərəflər arasında etimad yaradırlar. Dövlət idarəçiliyində nəzarətin təşkilinin müasir metodları texnologiyadan istifadə, məlumatlara əsaslanan qərarların qəbulu, ictimai hesabat mexanizmləri, maraqlı tərəflərin cəlb edilməsi və korrupsiyaya qarşı mübarizə tədbirləri vasitəsilə hesabatlılığı və şəffaflığı artırmaq məqsədi daşıyır. Açıqlıq, dürüstlük və cavabdehlik mədəniyyətini inkişaf etdirməklə, bu üsullar ictimai etimadın yaradılmasına, hökumətin fəaliyyətinin yaxşılaşdırılmasına və son nəticədə dövlət idarəçiliyinin ümumi effektivliyinin artırılmasına töhfə verir. (Sarah Brown, 2017: 53)

Dövlət idarəçiliyində xidmətlərin göstərilməsi və səmərəliliyinin artırılması müasir nəzarət metodlarının əsas məqsədidir. Resursların bölüşdürülməsini optimallaşdırmaq, prosesləri sadələşdirmək və təşkilati effektivliyi artırmaqla bu üsullar dövlət qurumlarının vətəndaşlara yüksək keyfiyyətli xidmətlərin vaxtında və sərfəli şəkildə çatdırılmasını təmin etmək məqsədi daşıyır. Müasir nəzarət metodları çox vaxt ictimai sektor qurumlarının fəaliyyətinin monitorinqi və qiymətləndirilməsi üçün performansın idarə edilməsi çərçivələrinin həyata keçirilməsini nəzərdə tutur. Bu çərçivələr hökumətlərə xidmətlərin göstərilməsinin effektivliyini və səmərəliliyini qiymətləndirməyə imkan verən aydın fəaliyyət göstəricilərini, hədəfləri və hesabatlılıq mexanizmlərini müəyyən edir. Performans məqsədlərini təyin etməklə və nəticələri ölçməklə qərar qəbul edənlər xidmətin keyfiyyətini və səmərəliliyini artırmaq üçün təkmilləşdirilməli sahələri müəyyən edə və müvafiq olaraq resursları ayıra bilirlər. Riskə əsaslanan nəzarət strategiyaları ən yüksək səmərəsizlik və ya uğursuzluq riski olan sahələrdə müdaxilələrə üstünlük verir. Potensial riskləri erkən müəyyən edərək və azaldaraq hökumətlər xidmətin dayandırılmasının qarşısını ala, tullantıları azalda və resurslardan istifadəni optimallaşdırırlar. Nəzarətə bu proaktiv yanaşma resursların ən aktual ehtiyacları və problemləri həll etmək üçün strateji şəkildə bölüşdürülməsini təmin etməklə xidmətlərin göstərilməsini artırır. Müasir nəzarət metodları xidmətlərin göstərilməsinin səmərəliliyini artırmaq üçün inzibati proseslərin sadələşdirilməsini və lazımsız bürokratiyanın aradan qaldırılmasını vurğulayır. Bu, emal vaxtlarını azaltmaq və səhvləri minimuma endirmək üçün iş axınlarının yenidən dizaynını, sənədləşmə işlərinin rəqəmləşdirilməsini və gündəlik tapşırıqların avtomatlaşdırılmasını əhatə edə bilər. Prosedurları sadələşdirmək və texnologiyadan istifadə etməklə hökumətlər əməliyyat səmərəliliyini artırır, inzibati xərcləri azalda və vətəndaşlara xidmətlərin çatdırılmasını sürətləndirə bilər. Effektiv nəzarət vətəndaşların ehtiyac və üstünlüklərini prioritetləşdirən xidmətlərin göstərilməsi üçün vətəndaş mərkəzli yanaşmaların qəbulunu nəzərdə tutur. Müasir metodlar vətəndaşların rəyini öyrənməyin, onların qərar qəbul etmə proseslərinə daxil edilməsinin və xidmətlərin onların gözləntilərinə uyğunlaşdırılmasının vacibliyini vurğulayır. Vətəndaşların məmnunluğuna və cəlb olunmasına diqqət yetirməklə hökumətlər xidmət keyfiyyətini yaxşılaşdırır, istifadəçi təcrübəsini artırır və dövlət qurumlarında inam və inam yarada bilər. Dövlət-özəl tərəfdaşlıq vasitəsilə özəl sektorla əməkdaşlıq, həmçinin dövlət idarəçiliyində xidmətlərin göstərilməsi və səmərəliliyini artırır. Özəl sektorun təcrübəsindən, resurslarından və innovasiyalarından istifadə etməklə hökumətlər vətəndaşlara təklif olunan xidmətlərin keyfiyyətini və müxtəlifliyini artırır, eyni zamanda xərcləri optimallaşdırır və riskləri azalda bilər. Dövlət-özəl tərəfdaşlıqlar hökumətlərə özəl sektorun səmərəliliyindən və təcrübəsindən istifadə etməyə imkan verir ki, bu da xidmətin göstərilməsinin daha səmərəli və effektiv nəticələrinə gətirib çıxarır. Dövlət sektoru işçilərinin bacarıqlarının artırılmasına sərmayə qoyulması xidmətlərin göstərilməsi və səmərəliliyinin yaxşılaşdırılması üçün vacibdir. Müasir nəzarət metodları dövlət məmurlarını öz rollarını səmərəli şəkildə yerinə yetirmək üçün lazım olan bacarıq, bilik və alətlərlə təchiz etmək üçün təlim və peşəkar inkişaf proqramlarını vurğulayır. Bacarıqlı və motivasiyalı işçi qüvvəsi yaratmaqla hökumətlər xidmət keyfiyyətini, məhsuldarlığı və dövlət idarəçiliyində innovasiyaları artırır. Nəticə etibarilə, dövlət idarəçiliyində nəzarətin təşkilinin müasir üsulları fəaliyyətin idarə edilməsi çərçivələrini tətbiq etməklə, riskə əsaslanan nəzarət strategiyalarını qəbul etməklə, inzibati prosesləri rasionallaşdırmaqla, vətəndaş mərkəzli yanaşmaları əhatə etməklə, dövlət-özəl tərəfdaşlığı inkişaf etdirməklə və sərmayə qoymaqla xidmətlərin göstərilməsinin və səmərəliliyinin artırılmasına kömək edir. potensialın gücləndirilməsi. Səmərəliliyi, effektivliyi və vətəndaş məmnunluğunu prioritetləşdirməklə, bu üsullar hökumətlərə getdikcə daha mürəkkəb və dinamik mühitdə vətəndaşların ehtiyac və gözləntilərinə cavab verən yüksək keyfiyyətli xidmətlər təqdim etməyə imkan verir. (John Doe, 2020: 86)

Azərbaycan kontekstində dövlət idarəçiliyində yaranan problemlərin həlli mövzusunun təhlili ölkədə idarəetmə praktikasını formalaşdıran unikal sosial-iqtisadi, siyasi və institusional

amilləri dərk etməyi əhatə edir. Azərbaycan, bir çox ölkələr kimi, idarəetmə proseslərini yenidən formalaşdıran sürətli texnoloji irəliləyişlərin şahidi olur. Rəqəmsallaşmanın tətbiqi və dövlət idarəçiliyində texnologiyadan istifadə səmərəliliyi, şəffaflığı və xidmətlərin çatdırılmasını artırır. Bununla belə, hökumət rəsmiləri və vətəndaşlar arasında rəqəmsal infrastruktur, kibertəhlükəsizlik və rəqəmsal savadlılıqla bağlı problemlərin həlli texnoloji innovasiyaların faydalarını maksimum dərəcədə artırmaq üçün çox vacibdir. Azərbaycan iqtisadiyyatı əsasən olaraq neft-qaz sektorundan asılı olub. Bununla belə, uzunmüddətli davamlılığı və dayanıqlılığı təmin etmək üçün iqtisadiyyatın diversifikasiyasına ehtiyacın artan etirafı var. Dövlət idarəçiliyi qeyri-neft sektorlarında sahibkarlığı, innovasiyaları və investisiyaları təşviq edən siyasətləri həyata keçirməklə iqtisadiyyatın şaxələndirilməsi səylərinin asanlaşdırılmasında mühüm rol oynayır. İqtisadiyyatın şaxələndirilməsi ilə bağlı yaranan problemlərin həlli proaktiv planlaşdırma, potensialın yaradılması və dövlət sektorunda maraqlı tərəflərin əməkdaşlığını tələb edir. Şəffaflıq və hesabatlılıq effektiv idarəetmənin vacib komponentləridir. Azərbaycan elektron hökumət platformalarının tətbiqi və antikorrupsiya tədbirləri kimi təşəbbüslər vasitəsilə şəffaflığın artırılmasında irəliləyiş əldə etsə də, xüsusilə dövlət satınalmaları, resursların bölüşdürülməsi və qərar qəbul etmə prosesləri kontekstində hesabatlılığın təmin edilməsində problemlər qalmaqdadır. Nəzarətə cavabdeh olan institutların gücləndirilməsi və dövlət idarəçiliyində şəffaflığın artırılması üçün tədbirlərin həyata keçirilməsi bu problemlərin həlli üçün vacibdir. Azərbaycan urbanizasiya, miqrasiya və əhalinin qocalması da daxil olmaqla demoqrafik dəyişiklikləri yaşayır. Bu demoqrafik dəyişikliklər şəhərsalma, səhiyyə, sosial xidmətlər və infrastrukturun inkişafı kimi sahələrdə dövlət idarəçiliyi üçün problemlər yaradır. Yaranan demoqrafik problemlərin həlli üçün strateji planlaşdırma, insan kapitalına investisiya qoyuluşu və inklüziv və davamlı inkişafı təşviq edən siyasətlərin qəbulu tələb olunur. Ekoloji davamlılıq global miqyasda, o cümlədən Azərbaycanda getdikcə daha vacib məsələyə çevrilir. İqlim dəyişikliyi, çirklənmə və təbii sərvətlərin idarə edilməsi kimi yaranan ekoloji problemlərin həlli dövlət qurumları arasında proaktiv tədbirlər və əlaqələndirilmiş fəaliyyət tələb edir. Ekoloji mülahizələrin siyasətin müəyyən edilməsi proseslərinə inteqrasiyası, bərpa olunan enerji mənbələrinin təşviqi və ekoloji risklərin azaldılması üçün tədbirlərin həyata keçirilməsi Azərbaycanda davamlı inkişafın təmin edilməsi üçün vacibdir. Azərbaycan strateji cəhətdən Avropa və Asiyanın kəsişməsində yerləşərək regional inteqrasiyanı ölkə üçün əsas prioritet təşkil edir. Qonşu ölkələr və regional təşkilatlarla əməkdaşlığın gücləndirilməsi ticarət, investisiya və iqtisadi inkişaf imkanlarını artırır. Bununla belə, regional münaqişələr, geosiyasi gərginliklər və infrastrukturun inkişafı ilə bağlı yaranan problemlərin həlli diplomatik səylər, münaqişələrin həlli mexanizmləri və regional əlaqə layihələrinə investisiyalar tələb edir. Yekun olaraq, Azərbaycanda dövlət idarəçiliyində yaranan problemlərin həlli proaktiv tədbirlər, strateji planlaşdırma və dövlət qurumları, vətəndaş cəmiyyəti və özəl sektor arasında birgə səylər tələb edir. Texnoloji yeniliklərdən istifadə etməklə, iqtisadiyyatın şaxələndirilməsini təşviq etməklə, şəffaflığı və hesabatlılığı gücləndirməklə, demoqrafik dəyişiklikləri həll etməklə, ekoloji dayanıqlığı təşviq etməklə və regional inteqrasiyanı təşviq etməklə Azərbaycan daim dəyişən global mənzərədə idarəetmənin mürəkkəbliliklərini idarə edə bilər. (Nigar Quliyeva, 2020: 144)

İstər Azərbaycanda, istərsə də global miqyasda dövlət idarəçiliyində yaranan problemlərin həlli idarəetmənin effektivliyinin yüksəldilməsinə, davamlı inkişafa və ictimai nəticələrin yaxşılaşdırılmasına gətirib çıxarır. Texnoloji tərəqqi, iqtisadiyyatın şaxələndirilməsi, şəffaflıq, demoqrafik dəyişikliklər, ekoloji davamlılıq və regional inteqrasiya kimi problemlərlə fəal şəkildə üzləşməklə ölkələr aşağıdakı nəticələrə nail ola bilərlər:

1. Effektiv idarəetmə: Müasir nəzarət metodlarının tətbiqi və texnologiyadan istifadə hökumətlərə inzibati prosesləri sadələşdirməyə, resursları səmərəli şəkildə bölüşdürməyə və xidmətləri səmərəli şəkildə çatdırmağa, beləliklə də vətəndaşların inkişaf edən ehtiyaclarını ödəməyə imkan verir.

2. İqtisadi artım və dayanıqlılıq: İqtisadiyyatın şaxələndirilməsinə üstünlük verilməsi qeyri-sabit sektorlardan asılılığı azaldır, innovasiyaları və sahibkarlığı təşviq edir və davamlı iqtisadi artımı təşviq edir, xarici şoklara davamlılığı təmin edir və uzunmüddətli rifaha töhfə verir.

3. Şəffaflıq və hesabatlılıq: Şəffaflıq və hesabatlılıq mexanizmlərinin gücləndirilməsi ictimai etimadı artırır, korrupsiyanı azaldır və hökumət institutlarının legitimliyini artırır, bununla da yaxşı idarəetmə təcrübələrini təşviq edir və ictimai resurslardan səmərəli istifadəni təmin edir.

4. İnküziv və davamlı inkişaf: İnküziv siyasətlər və davamlı inkişaf strategiyaları vasitəsilə demoqrafik dəyişikliklərin və ekoloji problemlərin həlli iqtisadi artımın cəmiyyətin bütün təbəqələrinin faydalanmasını təmin edir, eyni zamanda təbii ehtiyatları qoruyur və gələcək nəsillər üçün ətraf mühiti qoruyur.

5. Qlobal əməkdaşlıq və sabitlik: Regional və beynəlxalq əməkdaşlıq təşəbbüslərində iştirak sabitliyi möhkəmləndirir, sülhü təşviq edir və ticarət, investisiya və əməkdaşlıq üçün yeni imkanlar açır və bununla da qlobal rifah və təhlükəsizliyə töhfə verir.

Bütövlükdə, dövlət idarəçiliyində yaranan problemləri həll etməklə həm Azərbaycan, həm də bütövlükdə dünya vətəndaşların yaxşılaşdırılmış həyat standartlarından, sosial-iqtisadi tərəqqi üçün daha geniş imkanlardan və nəsillər üçün daha parlaq gələcəyə malik olduğu daha möhkəm, inküziv və davamlı cəmiyyətlər qura bilər. (İsmayıl Hacıyev, 2019: 214)

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(Nigar Quliyeva, 2020: 144)

REGIONAL POTENSIALIN ÜZƏ ÇIXARILMASI: AZƏRBAYCANDA ŞƏHƏRİN INKIŞAFI ÜÇÜN. SOSIAL-IQTISADI IDARƏETMƏ STRATEGİYALARINA BAXIŞ

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Abstrakt. Azərbaycanda urbanizasiya sürətləndikcə, müxtəlif regionlarda şəhərin davamlı inkişafı üçün sosial-iqtisadi proseslərin effektiv idarə olunması əsas məsələyə çevrilir. Bu məqalə Azərbaycanın şəhər landşaftında sosial-iqtisadi tərəqqi üçün regional potensialın üzə çıxarılması ilə bağlı strategiyaları və çağırışları araşdırır. Hərtərəfli təhlil vasitəsilə şəhərin inkişafının mürəkkəb dinamikasını və hər bir regionun özünəməxsus sosial-iqtisadi xüsusiyyətlərini nəzərə almaq üçün fərdiləşdirilmiş idarəetmə yanaşmalarının vacibliyini vurğulayır:

İqtisadi fəaliyyətlərin şaxələndirilməsi: Yeni investisiyalar cəlb etmək və müxtəlif sektorlarda iş yerləri yaratmaq üçün ənənəvi sənayelərdən kənara çıxmaq.

İnfrastruktura investisiya: Regional şəhərləri birləşdirmək və onların rəqabət qabiliyyətini artırmaq üçün nəqliyyat, enerji və kommunikasiya şəbəkələrinin təkmilləşdirilməsi.

İnsan kapitalının artırılması: Regional işçi qüvvəsini lazım olan bacarıqlarla təchiz etmək üçün keyfiyyətli təhsil və təlimin təmin edilməsi.

Yaxşı idarəetmənin təşviqi: Qərarların qəbulu proseslərində şəffaflığın, hesabatlılığın və vətəndaşların iştirakının təmin edilməsi.

Texnologiyadan istifadə: Məlumat əsaslanan planlaşdırma, səmərəli xidmət göstərilməsi və vətəndaşların cəlb edilməsi üçün rəqəmsal alətlərdən istifadə.

Sosial-iqtisadi idarəetmənin çoxşaxəli ölçülərinə işıq salmaqla məqalənin məqsədi siyasətçilərə, şəhərsalmada iştirak edən şəxslərə və maraqlı tərəflərə şəhər inkişafının mürəkkəbliklərində naviqasiya etmək və dayanıqlı sosial-iqtisadi tərəqqiyə təkan vermək üçün Azərbaycan regionlarının tam potensialını açmaq üçün dəyərli perspektivlər təqdim etməkdir. Və, bu strategiyaların hər bir regionun spesifik ehtiyaclarına və kontekstlərinə uyğunlaşdırılmasının vacibliyini vurğulamaqdır.

Açar sözlər: şəhər inkişafı, sosial-iqtisadi idarəetmə, regional potensial, şəhər planlaşdırması, davamlı inkişaf, iqtisadi dayanıqlıq, infrastrukturun təkmilləşdirilməsi, inklüziv artım

Azərbaycanın şəhər landşaftının siması tez-tez enerji və imkanlarla dolu dinamik paytaxt Bakını xatırladır. Bununla belə, ölkənin əsl potensialı səs-küylü metropolundan kənarda, onun bölgə şəhərlərindədir. Hər biri özünəməxsus güclü tərəfləri və çətinlikləri olan bu şəhərlər Azərbaycanda balanslaşdırılmış və inklüziv inkişafı təşviq etmək üçün açardır. Unikal güclü və çətinliklərlə dolu olan bu regional qovşaqlar həlledici yol kəsişməsi ilə üz-üzədir. İqtisadiyyatın diversifikasiyası, iş yerlərinin yaradılması və həyat səviyyəsinin yüksəldilməsi üçün böyük potensial təklif etsələr də, onlar iqtisadi imkanlardakı məhdudiyyətlər, qeyri-adekvat infrastruktur və ixtisaslı işçi qüvvəsi çatışmazlığı ilə mübarizə aparırlar. Bu maneələr inkişafda mövcud olan regional qeyri-bərabərliklə birləşərək qeyri-bərabər oyun sahələri yaradır və bərabərsizlikləri daha da gücləndirir.(3)

Bu məqalə bu regional şəhərlərin inkişafına təkan verməkdə effektiv sosial-iqtisadi idarəetmə strategiyalarının kritik rolunu araşdırır. Həmçinin şəhərlərin qarşılaşdığı əsas problemlər

təhlil edilir, bu regionların gələcək imkanları üzə çıxarılır. Beynəlxalq təcrübə və ən yaxşı təcrübələrin nəticələrindən istifadə etməklə, Azərbaycanın unikal kontekstinə uyğunlaşdırılmış davamlı şəhər artımına aparan yolları işıqlandırır. Şəhərlər iqtisadi fəaliyyətin və mədəni mübadilənin episentri kimi meydana çıxdıqca, infrastrukturun təkmilləşdirilməsi, inklüziv inkişaf və iqtisadi dayanıqlılıq arasında nüanslı qarşılıqlı əlaqənin başa düşülməsi mühüm əhəmiyyət kəsb edir. (6)

Avropa və Asiyanın qovşağında yerləşən Azərbaycan zəngin tarixə, mədəniyyətə və təbii sərvətlərə sahibdir. Bununla belə, onun müxtəlif regionlarında davamlı inkişafın təmin edilməsi mühüm problem olaraq qalır. Aşağıda hazırki Azərbaycanın sosial-iqtisadi mənzərəsi araşdırılır, onun şəhərlərinin unikal potensialı və bunun üzə çıxarılması üçün effektiv həll yolları təklif edilir. (9)

Neftdən kənar iqtisadi mənzərənin şaxələndirilməsi:

Azərbaycanın neft və qaz ehtiyatları onun son iqtisadi artımına təkan versə də, bu asılılıq regional bərabərsizlikləri də gücləndirib. Paytaxt Bakı iqtisadi və mədəni mərkəz kimi çiçəklənib, əhəmiyyətli investisiyalar cəlb edib və digər regionlarla müqayisədə daha yüksək həyat səviyyəsinə malikdir. Paytaxtdan kənarda olan şəhərlər isə çox vaxt məhdud iqtisadi imkanlarla mübarizə aparır, onların böyüməsinə və inkişafına mane olur. Bakının kölgəsindən kənarda Azərbaycanın digər şəhərləri inkişaf üçün böyük potensiala malikdir və hər biri özünəməxsus güclü xüsusiyyətləri ilə fərqlənir:

Gəncə: Azərbaycanın ikinci ən böyük şəhəri olan Gəncə əsrlər boyu zəngin irsə malik tarixi və mədəniyyət mərkəzidir. Tez-tez "Şimal Paytaxtı" adlandırılan Gəncə yaxşı inkişaf etmiş sənaye sektoruna, xüsusən də alüminium istehsalı və qida emalına malikdir. Bununla belə, şəhər məhdud infrastrukturun inkişafı və inkişaf etməkdə olan sektorlarda ixtisaslı işçi qüvvəsinə ehtiyac kimi problemlərlə də üzləşir.

Sumqayıt: Xəzər dənizinin sahilində strateji mövqedə yerləşən Sumqayıt əsas sənaye mərkəzidir və bir neçə iri kimya və neft emalı zavodlarına ev sahibliyi edir. Sənaye əhəmiyyətinə baxmayaraq, Sumqayıt sənaye keçmişindən qaynaqlanan ekoloji problemlərlə mübarizə aparır. Şəhər davamlı inkişafa və ətraf mühitin bərpasına diqqət yetirərək innovasiya və yaşıl texnologiyalar mərkəzi olmaq imkanı təqdim edir.

Naxçıvan: Azərbaycanın tərkibində muxtar respublika kimi Naxçıvan Ermənistan, İran və Türkiyə ilə həmsərhəd olan unikal mövqeyə malikdir. Bərəkətli torpaqları və güclü kənd təsərrüfatı ənənələri olan Naxçıvanın iqtisadiyyatı ilk növbədə kənd təsərrüfatına əsaslanır. Lakin Ermənistanla davam edən münaqişə onun inkişaf potensialına mane olub. Strateji mövqeyindən və kənd təsərrüfatının güclü tərəflərindən istifadə etməklə Naxçıvan davamlı kənd təsərrüfatı, turizm və transsərhəd ticarət tərəfdaşlıqlarının təşviqi ilə bağlı unikal iqtisadi zonaya çevrilə bilər.

Çətinliklər və imkanlar:

Regional şəhərlər iqtisadiyyatın şaxələndirilməsi, iş yerlərinin yaradılması və yaşayış səviyyəsinin yüksəldilməsi üçün böyük potensial təklif etsə də, onlar bir sıra problemlərlə də mübarizə aparırlar. Məhdud iqtisadi imkanlar, qeyri-adekvat infrastruktur və ixtisaslı işçi qüvvəsi çatışmazlığı onların tərəqqisinə mane olur. Bundan əlavə, inkişafda regional bərabərsizliklər qeyri-bərabər oyun sahələri yaradır və mövcud bərabərsizlikləri gücləndirir.

Bu çətinliklərə baxmayaraq, imkanlar çoxdur. Azərbaycanın İpək Yolu boyunca strateji mövqedə yerləşməsi və Xəzər dənizinə yaxınlığı ticarət və investisiyalar üçün unikal üstünlüklər verir. Bundan başqa, hökumətin Qarabağ bölgəsində münaqişədən sonra yenidənqurma işlərinə diqqət yetirməsi bu mühüm sahədə inklüziv və davamlı inkişaf üçün imkan yaradır. (1)

Sosial-iqtisadi idarəetmə Strategiyaları:

Regional şəhərlərin potensialını açmaq çox yönlü yanaşma tələb edir, əsas sosial-iqtisadi idarəetmə strategiyalarına diqqət yetirir:

İqtisadi Fəaliyyətlərin Diversifikasiyası: Neft və qaz kimi ənənəvi sənayelərdən kənara çıxaraq, regional şəhərlər turizm, kənd təsərrüfatı və istehsal kimi müxtəlif sektorlara investisiya cəlb

etməlidir. Buna Dünya Bankının “Azərbaycan: Daha Diversifikasiyalı və İnküziv İqtisadiyyata Doğru” (Dünya Bankı, 2020) hesabatında qeyd olunduğu kimi, məqsədyönlü təşviqlər, infrastrukturun inkişafı və bacarıqların öyrədilməsi proqramları vasitəsilə nail olmaq olar.

İnfrastruktura sərmayə qoyuluşu: Avtomobil yolları, dəmir yolları və hava limanları daxil olmaqla nəqliyyat şəbəkələrinin təkmilləşdirilməsi regional şəhərləri milli və beynəlxalq bazarlarla əlaqələndirmək üçün çox vacibdir. Bundan əlavə, enerji və kommunikasiya infrastrukturuna sərmayə qoyuluşu rəqabətli biznes mühitinin təşviqi üçün vacibdir. Asiya İnkişaf Bankının “Azərbaycan: İntegrasiya edilmiş Regional İnkişaf Proqramı” (Asiya İnkişaf Bankı, 2019) bu cür investisiyalar üçün çərçivə təmin edir.

İnsan Kapitalının Artırılması: Regional işçi qüvvəsinin lazımi bacarıqlarla təchiz edilməsi biznesləri cəlb etmək və saxlamaq üçün mühüm əhəmiyyət kəsb edir. Keyfiyyətli təhsil və təlim proqramlarına, xüsusən də STEM sahələrinə və rəqəmsal savadlılığa sərmayə qoymaq işçi qüvvəsinin müasir iqtisadiyyatın tələblərinə hazırlamaq üçün çox vacibdir. Avropa İttifaqının “EU4Azərbaycan: Gələcək üçün Bacarıqların İnkişafı” proqramı (Avropa İttifaqı, 2023) bu cür təşəbbüslər üçün model təklif edir.

Yaxşı İdarəçiliyin Təşviqi: Şəffaf, hesabatlı və vətəndaşların iştirakına əsaslanan idarəetmə resursların səmərəli bölüşdürülməsi, investisiyaların cəlb edilməsi və ictimai etimadın gücləndirilməsi üçün vacibdir. Birləşmiş Millətlər Təşkilatının İnkişaf Proqramının “Azərbaycanda Yerli İdarəetmə və Mərkəzsizləşdirmə” hesabatında (UNDP, 2022) vurğulandığı kimi, qərar qəbul etmə proseslərinin mərkəzsizləşdirilməsi və yerli icmaların səlahiyyətlərinin artırılması regional inkişafı daha da gücləndirə bilər.

Texnologiyadan istifadə: Məlumat əsaslanan planlaşdırma, səmərəli xidmət göstərilməsi və vətəndaşların cəlb edilməsi üçün rəqəmsal alətlərdən istifadə idarəetməni əhəmiyyətli dərəcədə təkmilləşdirə və regional şəhərləri gücləndirə bilər. Ağıllı şəhər təşəbbüslərinə sərmayə qoymaq, Dünya Bankının “Ağıllı Şəhərlər: Azərbaycanda Davamlı Şəhər İnkişafı imkanları” (Dünya Bankı, 2021) araşdırmasında göstərildiyi kimi, resursların bölüşdürülməsini optimallaşdırır, dövlət xidmətlərini yaxşılaşdırır və ümumi həyat keyfiyyətini yüksəldə bilər.

Təsir və Təvsiyələr:

Bu strategiyaların həyata keçirilməsi Azərbaycanın regional şəhərlərinə transformativ təsir göstərə bilər. İqtisadi diversifikasiya aşağıdakılara səbəb ola bilər:

İş yerlərinin yaradılması: Azərbaycanda və digər inkişaf etməkdə olan ölkələrdə layiqli iş yerlərinin yaradılması üçün iqtisadiyyatın şaxələndirilməsi mühüm əhəmiyyət kəsb edir.

Yoxsulluğun azaldılması: Dünya Bankının “Azərbaycanda yoxsulluğun azaldılması” hesabatında (Dünya Bankı, 2018) qeyd edildiyi kimi, diversifikasiya təcrid olunmuş əhali üçün yeni gəlir imkanları yaratmaqla yoxsulluğun azaldılmasına töhfə verə bilər.

Təkmilləşdirilmiş yaşayış standartları: Diversifikasiya ilə əsaslanan iqtisadi artım əsas xidmətlərə, infrastrukturaya və təhsilə daha yaxşı çıxışa gətirib çıxara bilər və nəticədə bütün vətəndaşlar üçün həyat standartlarını yaxşılaşdırır.

Bununla belə, hər kəsə uyğun bir yanaşma işləməyəcək. Hər bir regionun özünəməxsus güclü, zəif tərəfləri, imkanları və təhdidləri (SWOT) təhlili var. Strategiyaların hər bir şəhərin xüsusi kontekstinə uyğunlaşdırılması optimal nəticələrə nail olmaq üçün çox vacibdir. Bundan əlavə, effektiv icra və davamlı tərəqqi üçün milli və yerli hökumətlər, özəl sektor və vətəndaş cəmiyyəti arasında güclü əməkdaşlıq vacibdir.(2)

Azərbaycanın regional şəhərlərinin potensialının üzə çıxarılması təkcə iqtisadi deyil, həm də sosial və siyasi bir imperativdir. Bu, şəhər və kənd icmaları arasındakı uçurumu aradan qaldırmaq, daha inküziv və bərabərhüquqlu bir milləti inkişaf etdirmək şansını təmsil edir. Hər bir regionun spesifik ehtiyaclarına uyğunlaşdırılmış effektiv sosial-iqtisadi idarəetmə strategiyalarını qəbul etməklə Azərbaycan transformativ bir yola çıxar bilər.(8)

Diversifikasiyaya sərmayə qoymaq neft və qazdan kənarda çiçəklənən ekosistem yarada, iş yerlərinin yaradılmasına və yoxsulluğun azaldılmasına kömək edə bilər. İnfrastrukturun təkmilləşdirilməsi yeni iqtisadi imkanlar açar, regional şəhərləri milli və beynəlxalq bazarlarla birləşdirir və əsas xidmətlərə çıxışı yaxşılaşdırır. Keyfiyyətli təhsil və təlim proqramları vasitəsilə insan kapitalının artırılması işçi qüvvəsini müasir iqtisadiyyatda inkişaf etmək, biznesi cəlb etmək və davamlı artıma təkan vermək üçün lazım olan bacarıqlarla təchiz edə bilər. Şəffaflıq, hesabatlılıq və vətəndaşların iştirakı ilə yaxşı idarəçiliyin təşviqi ictimai etimadı gücləndirir, resursların səmərəli bölüşdürülməsini təmin edir və yerli icmalara öz müqəddəratlarının formalaşmasında mühüm rol oynamağa səlahiyyət verə bilər. Nəhayət, texnologiyadan istifadə məlumatlara əsaslanan planlaşdırma, səmərəli xidmət göstərilməsi və vətəndaşların cəlb edilməsi üçün maraqlı imkanlar təqdim edərək, daha ağıllı və daha davamlı şəhərlərə yol açır.(4)

Ancaq bu məsələ kollektiv səy tələb edir. Milli və yerli hökumətlər, özəl sektor, vətəndaş cəmiyyəti təşkilatları və akademik dairələr arasında güclü əməkdaşlıq effektiv icra və davamlı tərəqqi üçün çox vacibdir. Uyğunlaşmaq və təcrübələrdən öyrənmək istəyi ilə birlikdə həyata keçirilən strategiyaların davamlı monitorinqi və qiymətləndirilməsi regional inkişafın mürəkkəbliliklərini idarə etmək üçün vacib olacaqdır.(5)

Nəhayət, bu işin uğuru təkcə iqtisadi göstəricilərlə deyil, onun sadə vətəndaşların həyatına təsiri ilə də ölçüləcək. Regional şəhərləri iqtisadi fəaliyyətin, sosial inklüzivliyin və davamlı inkişafın canlı mərkəzlərinə çevirməklə Azərbaycan bütün vətəndaşları üçün daha parlaq gələcək qura, hər bir regionun çiçəklənməsini və firavan və bərabərhüquqlu millətə töhfə verməsini təmin edə bilər.

Bu məsələ təkcə paytaxtı ilə müəyyən edilmiş bir xalq kimi deyil, hər bir bölgənin çiçəkləndiyi, böyümənin, imkanların və paylaşılan rifahın kollektivliyinə töhfə verən bir ölkə kimi Azərbaycanın tarixini yenidən yazmaq potensialına malikdir. Azərbaycan özünün regional şəhərlərinin potensialından istifadə etməklə heç kimi geridə qoymadan tərəqqi və inkişaf vədlərinin xalqın hər bir guşəsinə çatdığı gələcəyi açar.(7)

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Developing a business transformation strategy for an oil sales company in a new sustainable environment in the Republic of Kazakhstan

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Introduction

The survival and transition of traditional gas stations in Kazakhstan's dynamic market economy are of paramount importance. As the world grapples with fluctuating oil prices, the emergence of sophisticated competitors, and stricter regulations, these establishments are compelled to adapt swiftly to maintain viability. This research elucidates the essential strategies that enable these stations to thrive amidst such challenges. By focusing on the resilience and transformation through innovation and the embrace of alternative energies, the study addresses a critical gap in the understanding of Kazakhstan's petroleum retail sector.

The research question guiding this inquiry is how traditional gas stations in Kazakhstan can maintain their competitiveness and undergo a transformation in a market economy characterized by increasing competition. To investigate this, the study delves into strategic approaches for resilience, highlighting operational efficiency, superior customer service, and marketing innovations as vital components.

This article aims to study how traditional gas stations in Kazakhstan respond to various current impacts, survive in the increasingly fierce competition, and achieve transformation in the current market economy environment. Also in the increasingly fierce market competition, it provides suggestions for the future development of small and medium-sized refined oil retailers. Hopefully this paper also explores the possibility of realizing a new ecosystem of "people-vehicles-life" and provide a new way of life for local people.

Literature review

The theoretical aspects of business transformation strategy encompass a broad range of concepts, models, and frameworks that guide how organizations can effectively change their structures, processes, offerings, or operations to adapt to new market conditions, technologies, and challenges. Here are several key theoretical aspects:

1. Change Management Theories

Kurt Lewin's Change Model: This model proposes three stages of change: unfreezing(preparing for change), changing (implementing change), and refreezing (solidifying the change) [1].

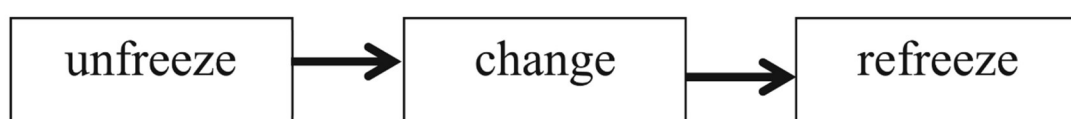


Figure 1. Kurt Lewin model of change [1]

ADKAR Model: This model by Prosci focuses on individual change, with the steps being Awareness, Desire, Knowledge, Ability, and Reinforcement [2].

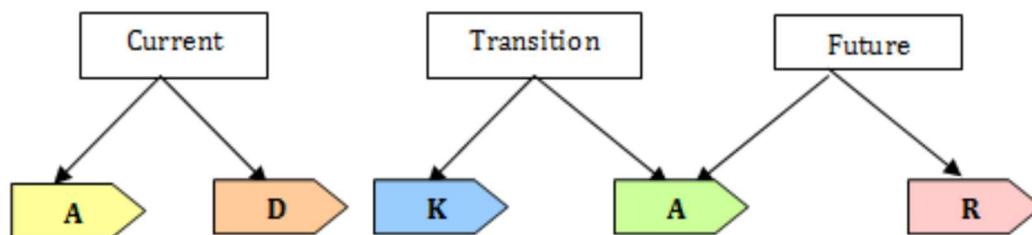


Figure 2. ADKAR harmonization with and current transaction and future states [2]

Kotter's 8-Step Change Model: This model provides a methodical process to lead transformative efforts, including creating a sense of urgency, forming a powerful coalition, and embedding new approaches in the culture.

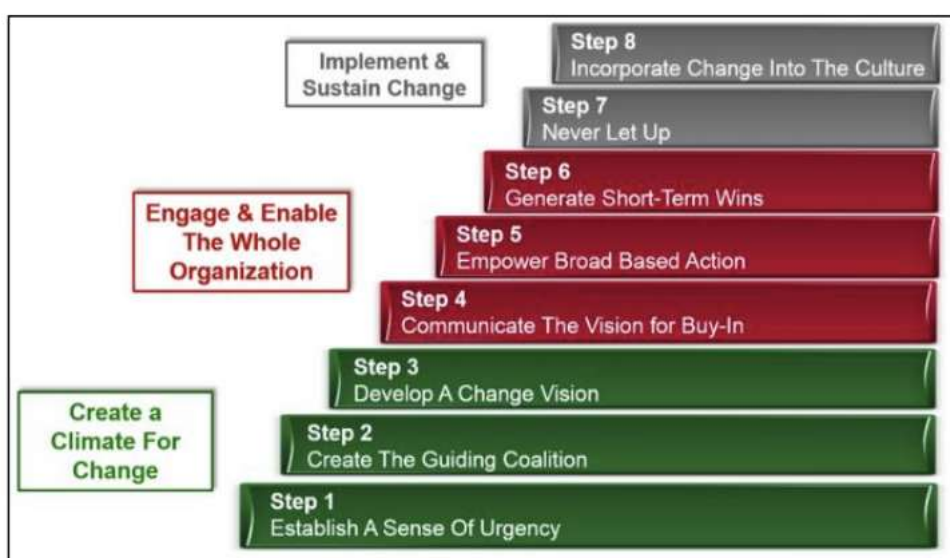


Figure 3. Kotter's (2012) 8-Step Change Model [3]

Strategic Management Theories.

Porter's Five Forces: Porter's framework for analyzing competition within an industry and strategy development.

Business transformation strategies were being heavily influenced by several overarching trends. The acceleration of digital technology, changing consumer behaviors, globalization, and an increased focus on sustainability are among the key drivers reshaping businesses. Below are some of the current trends and examples of how organizations are applying these trends in their transformation strategies:

1. Digital Transformation

Digital transformation remains a top priority as organizations look to leverage digital technologies to improve processes, engage with customers, and create new value propositions. For example, Retail companies, such as Walmart and Target, have continued to evolve their omnichannel strategies, integrating their in-store and online experiences with advanced inventory management systems and customer engagement tools. Walmart's Intelligent Research Lab (IRI) is designed to test real-world applications of AI in a fully functional Walmart that spans 50,000 square feet and sells more than 30,000 items. Through cameras, sensors and predictive analytics

that estimate demand, Walmart's goal is to automate much of the restocking process. Artificial intelligence is also used to notify employees when new checkout lines grow too long and if additional registers need to be opened, as well as when the supply of shopping carts runs low [4].

2. Remote and Hybrid Work Models

The shift toward remote and hybrid work models has become more permanent for many organizations, leading to changes in workspace design, collaboration technologies, and management practices. Companies like Salesforce, which specializes in customer relationship management (CRM), also said it will never return to the traditional 9am to 5pm schedule and will instead offer three new options for employees: at the office, flexibly and completely remotely. The employee health surveys that Salesforce has conducted since the start of the pandemic are the basis for the policy change. For tasks that are more difficult to accomplish via video chat, such as presentations, meeting clients, and team collaboration, the flexible option allows employees to work face-to-face up to three days a week. The company also announced that the majority of its employees worldwide will have flexible working hours. The fully remote option will only be available to workers who do jobs that don't require them to be physically present at the office, or who don't live near one of the company's offices. Finally, only a fraction of their 49,000 workers spends 4-5 days a week in the office. Salesforce offices will change due to a change in the way employees work. Existing offices will be converted into "community centers" in the future, removing old office blocks to make room for collaboration and rest areas. After the pandemic, Twitter employees performing tasks that do not require their inperson presence are still allowed to work remotely [5].

3. Artificial Intelligence and Automation

The adoption of AI and automation technologies is streamlining operations, enhancing decision-making, and enabling personalized customer experiences. General Electric has been using AI and machine learning technologies to transition into a more data-driven organization [6].

Methodology

The study uses quantitative methods for descriptive analysis of gas station industry of the Republic of Kazakhstan. Secondary data from official sources was used for evaluation. Also comparative analysis method, induction and descriptive statistics were used for detailed assessment.

Results and discussion

We will analyze the current business environment in Kazakhstan from the following aspects:

(1) Economic development in the past five years.

The GDP growth: The World Bank expects Kazakhstan's GDP growth to be 3.5% in 2023 and 4% in 2024. The authorities expect GDP to rise to 4-4.2% over the next three years.

Year	GDP, Billion dollar	Rate of increase	Population	Rate of increase	Urbanization rate
2018	179.3	8%	18157337	1.1%	57.4%
2019	181.7	1.3%	18395567	1.3%	57.5%
2020	171.1	-5.8%	18632169	1.3%	57.7%
2021	190.8	11.5%	19177128	2.9%	57.8%
2022	195.6	2.5%	19691858	2.7%	58.1%
2023	225.5	5.1%	20000000	1.6%	

Table 1. The GDP comparison in Kazakhstan

Population and urbanization: In recent years, the population of Kazakhstan has increased at a rate of more than 2%, and the urbanization rate is 58.1%. In nov.14 2023, Kazakhstan has a population exceeding 20 million, In the past 10 years, the urbanization speed has accelerated, but the trend is concentrated in large cities.

At the end of 2019, the National Plan for Infrastructure Development (2020-2025) was approved. Road construction: Priority is given to the reconstruction of the following roads: the Dual Western Road, Almaty - Astana - Petropavl - Kurgan, Astana - Kostana - Chelyabinsk, Aktobe - Atra-Astrakhan, Atra-Uralsk, Tardikurgan - Ustekamenogorsk and Ushlал - Dostek-China. Up to 95% of local roads will be improved by 2025.

international expressway	Trend	Length (km)
M32	Russian border -Urals -Aktobek-Olda-Chimkent	2059.6
M36	Russian border-Kustana- Astana- Karaganda- Almaty	2047.1
M38	Russian border -Pavlo da Semii -Maykapshagay - China border	1081
M39	The border of Kyrgyzstan – Lugovoy	24.1
M51	Russian border -Petropavur -Russian border	190

Table 2. Key expressways in Kazakhstan



Figure 4. Roadmap of key expressways in Kazakhstan

Port construction: Kazakhstan has three ports on the Caspian Sea: Aktau, Kurk and Bottino. In order to expand logistics capacity along the Trans-Caspian International Transport Route (TITR), Kazakhstan is strengthening port construction, especially the construction of a new terminal at the port of Kurk [7].

Airport construction: By 2025, the number of airports with automated control systems will increase from 3 to 15, and the number of ICAO certified airports will increase from 16 to 19.

(2) The adjustment of the refined oil product policy:

The Order on Determining the Maximum Retail Price of Refined Oil Products under State Price Control shall be amended and implemented as of April 12, 2023. From April 12, 2023, the government will limit the retail and wholesale prices of gasoline and diesel in the market: the retail price of AI-92 and AI-93 gasoline will increase from 182-187 tenge per liter to 205 tenge; The retail price of diesel is 295 tenge per litre.

Promulgated the Order on Determining the Maximum Wholesale Price of State-Controlled Refined Oil Products Sold to Gas Stations. New wholesale prices for gasoline and diesel were set at 214,584 tenge/ton for gasoline and 284,350 tenge/ton for diesel.

The disparity in fuel prices with neighboring countries reinforces the "shadow" market and has a negative impact on national economies and interests, and maintaining low oil prices is not conducive to attracting investment in the oil and gas industry and its development for geological exploration and replenishment of the resource base.

The price limit actually increased wholesale and retail prices, and the gross profit of wholesalers and terminal retail networks had varying degrees of support. It will help to level the gasoline and diesel price gap with neighboring countries and crack down on the smuggling of refined oil products in border areas.

(3) Car ownership situation

As of July 1, 2023, there were 4.95 million registered vehicles in Kazakhstan, Among them, light cars accounted for 87.9 percent, trucks 10 percent, and buses 2.1 percent, and private cars over 20 years old accounted for 51%, and the number of private car sales has risen steadily in recent years [8].

Kazakhstan has taken several measures to encourage motorists to buy electric vehicles, such as zero duty on the customs value of trams from 2020, and from May 13, 2021, all owners of electric vehicles are exempt from paying return charges and annual transport taxes. From May 24, 2023, Kazakh citizens will be able to buy an electric car from abroad for personal use, and will be exempt from duties and other taxes.

In the end of 2023, The number of electric cars, trucks and buses in Kazakhstan has increased by 12.5 times a year. At present, there are nearly 7,700 electric cars in Kazakhstan. There were 7,680 electric vehicles in Kazakhstan on December 1, 2023, according to the National Bureau of Statistics on January 23. By contrast, in December 2022, there were only 570 electric vehicles in the country [8].

Conclusion

A synthesis of the study's outcomes revealed a direct correlation between the employment of modern technologies and the long-term feasibility of these gas stations. The incorporation of technological enhancements in service delivery, alongside the integration of alternative energy solutions, positions these entities to meet future demands. It is the confluence of governmental support, innovative service models, and technological integration that will likely delineate the trajectory of traditional gas stations in Kazakhstan.

By confronting the research questions posited at the outset, this inquiry provides a definitive answer to the quandary of survival and evolution in the current market milieu. It affirms that the traditional gas stations can endure and flourish—if they embrace transformation, target operational excellence, and align with forthcoming energy trends.

In encapsulating the main discoveries and conclusions of this research, it is evident that while challenges are manifold, traditional gas stations in Kazakhstan possess the potential to transform and prosper. The study's contributions and limitations also pave the way for further research avenues, particularly in exploring the depths of technological influence and policy impact on these stations' future. The findings engender a robust discourse for industry stakeholders, suggesting a

path laden with innovation, strategic agility, and an unwavering focus on the customer as the cornerstones for longevity in the petroleum retail sector.

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СТРАТЕГИЧЕСКОЕ УПРАВЛЕНИЕ БОЛЬНИЦАМИ НА ОСНОВЕ ВНЕДРЕНИЯ МЕЖДУНАРОДНЫХ СТАНДАРТОВ КАЧЕСТВА

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Аннотация

В данной статье рассматриваются теоретические вопросы и практические моменты по стратегическому управлению больницами и описываются международные стандарты аккредитации JCI с целью помочь руководителям и менеджерам достичь своей миссии и стратегических намерений. Многие направления в стратегическом управлении недостаточно изучены в контексте больниц, но существуют многочисленные исследования, касающиеся отдельных аспектов работы больниц.

Ключевые слова: стратегическое управление, управление больницей, качество медицинских услуг, безопасность пациента, международные стандарты качества.

STRATEGIC MANAGEMENT OF HOSPITALS BASED ON IMPLEMENTATION OF INTERNATIONAL QUALITY STANDARDS

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Abstract

This article discusses theoretical issues and practical points on strategic management of hospitals and describes the JCI international accreditation standards to help executives and managers achieve their mission and strategic intentions. Many areas in strategic management are under-researched in the context of hospitals, but there are numerous studies dealing with particular aspects of hospital performance.

Key words: strategic management, hospital management, quality of medical services, patient safety, international quality standards.

Исследование вопросов стратегического управления является обширной и многогранной областью, имеет долгую историю развития и многочисленные трактовки. В научных трудах многих авторов и представителей научных школ (И.Ансофф, Г.Минцберг, М.Портер, Р.Аккоф, А. Томпсон, О.Виханский, А.Чандлер, К.Эндрюс, Б.Хендерсон, Р.Кристенсен и др.) рассмотрены методологические приоритеты в каждом из направлений стратегического управления.

Стратегическое управление особенно важно в эпоху быстрых перемен, когда оно требует четкого и концептуального планирования и вклада в корпоративное развитие [1].

Стратегическое управление не является чем-то неизменным, представляет собой набор концепций, процессов, процедур, инструментов, методов и практик, стратегически адаптируя и применяя их для достижения желаемых результатов [2].

Стратегическое управление, это процесс, в котором высшее руководство устанавливает долгосрочные цели для устойчивого развития и обеспечения конкурентного преимущества в условиях постоянного изменения факторов окружающей деловой среды [3]. Результаты текущих исследований в области организации и менеджмента показывают, что менеджеры и их управленческие познания являются ключевыми факторами в определении возможностей и реконфигурации ресурсов для усиления конкурентных преимуществ организации [4, 5, 6].

Стратегическое управление - это динамический процесс, который включает в себя принятие и реализацию решений по улучшению деятельности организации в меняющихся условиях [7]. Оно включает в себя эффективное использование ресурсов для максимизации прибыли и роста, уделяя особое внимание командной работе и индивидуальному вкладу [8]. Этот процесс объединяет различные функциональные области, такие как менеджмент, маркетинг, финансы и операции для достижения организационных целей [9]. Он включает в себя сканирование окружающей среды, формулирование стратегии, ее реализацию и оценку [10]. В целом, стратегическое управление заключается в разработке и выполнении целостного плана действий для достижения желаемых результатов. Дж.Бойн [11] распространяет это обсуждение на государственный сектор, подчеркивая необходимость синтеза стратегических моделей и публичности для повышения эффективности. Все эти исследования в совокупности подчеркивают важность стратегического управления как в частных, так и в государственных организациях, а также необходимость постоянных исследований и разработок в этой области.

Стратегическое управление имеет решающее значение для достижения долгосрочных целей больниц и координации их с другими организациями здравоохранения [12]. Однако, это не практикуется широко, и для того, чтобы ориентироваться в беспокойной среде здравоохранения, поэтому необходим интегративный подход [13]. Больницы, также переходят от традиционной производственной ориентации к более активной маркетинговой позиции [14]. Стратегическая роль организационных знаний также важна, о чем свидетельствует совместная программа по созданию систем измерения эффективности в больницах [15].

Стратегическое управление занимается выбором и реализацией стратегии. В управлении больницами позволяет понять реальную цель и долгосрочные цели больницы. Стратегическое управление - это инструмент, а не решение, которое помогает руководителям выявлять коренные причины серьезных проблем в больнице.

Можно отметить, отсутствие практики стратегического управления среди специалистов по стратегии развития деятельности больниц и предложить интегративный подход к стратегическому управлению для лучшей работы в нестабильной среде и предложить учиться на ошибках бизнеса в корпоративном секторе.

Исторически сложилось так, что конкуренция ужесточила систему здравоохранения, несмотря на то, что управленцы в больницах создавали и внедряли инновационные подходы и методы для выживания. Существуют размышления о предыдущих достижениях стратегического управления, которые показывают, что многие исследования не интегрировали прогресс фрагментированных исследований больниц. Исследования показали, что управление больницами отличается от других видов бизнеса [16].

Стратегическое благополучие и стратегический успех является основной целью больниц. Больницы должны искать инновационные решения для лучшего лечения болезней и эффективного и результативного обслуживания пациентов. Ученые начали определять больницы за пределами их экономического функционирования и стало разумным связать управленческое мышление, познание и стратегическое поведение. Даманпур и Эван [17] заявили, что инновации в здравоохранении помогают менеджерам больниц и практикующим врачам лучше справляться с нормативными и социальными изменениями и неопределенностью за счет внедрения новых технологий и обеспечения организационной гибкости. Более того, инновации в секторе здравоохранения должны помочь медицинским работникам работать максимально эффективно с точки зрения экономической эффективности и качества медицинской помощи [18, 19].

В настоящее время больницы в Казахстане предпринимают усилия по составлению отчетов о работе, используя показатели качества процессов и результатов в соответствии с требованиями Национальной аккредитации и Объединенной комиссии по международной аккредитации (Joint Commission International, JCI). Аккредитованы международными стандартами JCI 9 больниц и они получили золотую печать одобрения из более, чем 1000 организаций здравоохранения по всему миру [20].

Международные больничные стандарты JCI призваны способствовать постоянному, систематическому и общему улучшению повседневной работы и результатов лечения пациентов в масштабах всей организации. Все проблемы, указанные в отчетах, должны будут удовлетворительно решены, а полное соответствие каждому установленному стандарту демонстрируется во время аккредитационного аудита. Поэтому больницам рекомендуется немедленно сосредоточить внимание на стандартах с измеряемыми элементами, оцененными как «Не соответствует» и «Частично соответствует», и выполнить действия, необходимые для достижения полного соответствия. JCI обеспечивает мониторинг больниц на предмет соответствия всем стандартам больниц JCI на постоянной основе в течение трехлетнего цикла аккредитации. Деятельность по мониторингу соответствия не ограничивается документированием и записью обзоров, анализа отчетов по мониторингу данных, интервью с руководством и интервью с персоналом. Мониторинг осуществляется как на месте, так и за его пределами. JCI по своему усмотрению может проводить оценку соответствия стандартам на месте без предварительного уведомления.

Наличие сертификата аккредитации международных стандартов JCI в больницах Казахстана может стать ключевым элементом стратегического управления, поскольку позволит повышать качество медицинской помощи и безопасность пациентов, а также повышать конкурентоспособность. Стратегическое управление больницами включает: целеполагание и стратегическое планирование; управление качеством и безопасностью; обучение и развитие персонала; использование технологий и инноваций; финансовое управление; маркетинг и позиционирование; контроль и оценка результатов. Таким образом, интеграция международных стандартов JCI в стратегическое управление больницами позволит медицинским услугам стать более безопасными, эффективными и доступными для пациентов и усилят позиции организации.

Международная аккредитация JCI признается во всем мире как один из наиболее престижных «золотых» стандартов качества в области здравоохранения. Стандарты JCI постоянно обновляются и развиваются, отражая современные требования к здравоохранению и лучшие практики в мировом масштабе. Это стимулирует больницы к внедрению инноваций, постоянному улучшению процессов и культуре непрерывного обучения. Внедрение стандартов JCI позволяет стандартизировать внутренние процессы и процедуры в больницах, что приводит к снижению инцидентов. Внедрение этих стандартов помогает больницам обеспечивать соответствие требованиям государственных и

международных регуляторов. Больницы, аккредитованные международными стандартами JCI имеют отличную репутацию в глазах пациентов, страховых компаний и туристов. Это позволяет им укрепить позиции на рынке здравоохранения и привлечь новых пациентов и инвестиции.

Таким образом, стандарты JCI играют важную роль в стратегическом управлении больницами, помогая им достигать высоких стандартов качества, обеспечивать безопасность пациентов и повышать их конкурентоспособность.

Данная статья позволит открыть перед исследователями стратегического управления возможности для изучения потенциальной выгоды внедрения международных стандартов эмпирически устанавливая взаимосвязь между стратегическим управлением, стратегической эффективностью, качеством медицинской помощи и безопасностью пациентов.

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TUMORS OF THE CENTRAL NERVOUS SYSTEM: CURRENT ISSUES AND THEIR SOLUTIONS

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Annotation: This scientific and analytical work presents modern global and local-regional data on morbidity, mortality, lethality rates and five-year survival rates of such a common oncological pathology as tumors of the central nervous system. The issues of etiology and pathogenesis, features of distribution, clinical manifestations, modern principles of diagnosis and treatment, and prognosis are covered in detail. The features and innovations of the new classification of central nervous system tumors have been thoroughly studied and reflected. The epidemiological characteristics of this pathology in our republic are presented in the context of regions of the country.

Key words: oncology, tumors of the central nervous system, biomarkers, classification, epidemiology, morbidity, mortality, lethality, five-year survival rate, prognosis.

Primary tumors of the central nervous system (CNS) include a heterogeneous group of benign and malignant neoplasms that develop from cellular elements of the nervous system and

other tissues (meninges, blood vessels, connective tissue) located in the cranial cavity and inside the spinal canal [1,2].

Symptoms for CNS tumors are varied. Headache most often comes to the fore. With an increase in intracranial pressure, the pain becomes intense, diffuse, constant, intensifies in attacks and is accompanied by nausea and vomiting. Among supratentorial tumors, early headaches are accompanied by frontal and temporal tumors. Vomiting due to brain tumors is characterized by features typical of so-called “cerebral vomiting.” In most cases, vomiting occurs during a severe headache attack. According to the nature of subjective perception, dizziness can be visual and tactile. In the first case, it is perceived by patients as visual rotation or movement of the environment. In the second case, dizziness is perceived as a tactile or proprioceptive sensation of rotation or movement of objects with which the patient is in contact, and can persist with closed eyes. Tactile dizziness also includes lateropulsion, i.e. feeling of attraction aside. With subtentorial tumors, specific symptoms that may alert a medical professional usually occur after the development of other symptoms of increased intracranial pressure. It is felt in the form of “taking off into the air,” rotation of the environment, or the patient himself. With supratentorial neoplasms, objects “dance,” which is called “death of the world syndrome.” Convulsive seizures in most cases follow a general pattern and, often, as the first sign of the disease, develop long before the development of hypertension syndrome. They are most often observed in slow-growing benign tumors [1].

General syndromes and specific symptoms for tumors of the CNS include: 1) hypertension syndrome associated with increased intracranial pressure (increased intracranial pressure occurs as a result of an increase in brain volume and impaired hemo- and liquor dynamics; headache, vomiting, dizziness, mental epileptic seizures are observed, congestive optic discs); 2) focal neurological symptoms (epileptic seizures of various types are observed, impaired coordination of movements in the form of frontal ataxia (disorders of standing and walking), isolated disturbance of the innervation of the facial muscles of the central type, impaired sense of smell, impaired function of the optic nerves); 3) occlusive hydrocephalus (closed form of hydrocephalus occurs with occlusion of the foramen of Monroe, the aqueduct of Sylvius, the 4th ventricle, the foramen of Magendie or Luschka; the causes are complete or partial occlusion of the cerebrospinal fluid tract, impaired resorption of cerebrospinal fluid, and in case of tumors of the lateral ventricles - hyperproduction of cerebrospinal fluid) ; 4) dislocation syndrome - caused by compression of the brain by a tumor, hemorrhage or other focal process, which leads to the appearance of secondary symptoms of brain damage at a distance from the pathological focus; with an increase in intracranial pressure, the brain matter is squeezed into various cracks formed by dense processes of the dura mater (large falciform process, cerebellar tentorium), partitioning the cranial cavity into different floors and separating parts of the brain from each other, as well as into the foramen magnum); 5) with tumors of the spinal canal, paresis, paralysis of the upper and lower extremities, paresthesia, hyperesthesia, dysfunction of internal organs, pain along the spinal column or at the site of the tumor, and pathological neurological symptoms occur [1].

Physical examination includes: 1) assessment of neurological status: the presence of complaints of headache, nausea and vomiting, dizziness, seizures, cerebral syndromes and focal neurological symptoms; 2) general somatic status according to the Karnofsky scale and status according to the Glasgow scale. Laboratory tests include: 1) general clinical and specific laboratory tests to assess the somatic status and identify pathologies of internal organs according to indications; 2) histological, immunohistochemical and molecular genetic examination of biopsy and surgical material according to indications; 3) to clarify the prognosis, patients with anaplastic astrocytoma and glioblastoma undergo a molecular genetic study of mutations in the IDH1 and IDH2 genes in biopsy (surgical) material, determination of methylation of the MGMT gene in biopsy (surgical) material, for oligodendroglioma (Grade II-III) and oligoastrocytoma (Grade II-III) –

molecular genetic study of 1p/19q translocation in biopsy (surgical) material. When conducting instrumental studies, a clinical diagnosis is made on the basis of magnetic resonance imaging (MRI) data of the brain or spinal cord with contrast enhancement, when a space-occupying formation - a tumor - is detected. In cases where MRI is contraindicated, the diagnosis is made on the basis of computed tomography (CT) with contrast. If necessary, CT or magnetic resonance (MR) angiography, MR tractography, functional MRI, positron emission tomography (PET) - PET/CT can be performed. PET/CT examination of the brain using the radiopharmaceutical drug ^{11}C methionine is used to determine the malignancy of the primary tumor and to differentiate tumor recurrence from radiation necrosis. CT examination of the brain with contrast is also used to diagnose early postoperative complications [1].

Risk factors for CNS tumors include [3,4,5]:

1. Exposure to ionizing radiation. People at risk of developing brain cancer due to radiation include people who work in nuclear energy or radiology, and patients who have undergone radiation therapy. Radiation increases the risk of meningiomas and malignant gliomas.

2. Exposure to chemicals in the workplace for people working in hazardous industries, especially those associated with the production of plastics, as well as in such areas as the oil refining and electrical industries, etc. At the same time, the question of the role of such common forms of radiation as electromagnetic fields, radio emissions from mobile phones and microwave ovens in inducing the growth of brain tumors remains controversial.

3. Genetic causes of brain cancer. About 5-10% of brain tumors are caused by a genetic factor. Risk factors in this group also include some syndromes (congenital conditions) caused by disturbances in the structure of certain genes: neurofibromatosis types 1 and 2 (disorders of the NF1 and NF2 genes, respectively); Turco syndrome (changes in the APC gene); Gorlin syndrome or basal cell nevus syndrome (PTCH gene disorder); tuberous sclerosis, or Bourneville disease (damage to the TSC1 and TSC2 genes); Li-Fraumeni syndrome (damage to the TP53 gene). Most of the genetic changes that lead to brain tumors are not hereditary. Viruses, hormonal imbalances and toxins negatively affect the structure of DNA and can trigger the development of brain cancer.

4. Age - the risk of a brain tumor increases with age, especially in people 45 years of age and older; At the same time, some brain tumors, such as medulloblastomas or benign cerebellar astrocytomas, develop mainly only in children.

5. Other risk factors: 1) gender (tumors of the CNS are more common in men than in women; except for meningiomas); 2) general somatic health (in people with a weakened immune system - HIV, AIDS, after organ transplantation, bone marrow transplantation, the risk of developing cancer, including CNS tumors, increases); 3) race - CNS tumors are more often detected in white-skinned people than in dark-skinned people.

As noted by Vienne-Jumeau A. et al. [6], Primary CNS tumors in adults are rare, but the morbidity is increasing in some European countries. Several environmental exposures have been investigated as potential risk factors, but scientific evidence is still lacking for most of them. The authors examined environmental factors potentially involved in brain tumor carcinogenesis: the potential association between primary CNS tumors and ionizing radiation, certain toxic agents (N-nitroso compounds, pesticides), air pollution, and radiofrequency electromagnetic waves. Ionizing radiation to the brain, especially in childhood, is a generally recognized risk factor for the development of brain tumors. Exposure to environmental toxins is poorly understood, and data provide conflicting evidence regarding N-nitroso compounds or pesticides as risk factors for brain tumors, even with prenatal exposure. Results from large prospective studies regarding environmental pollution and brain tumor risk are inconsistent. The effect of mobile phones on brain tumor risk for glioma and meningioma in adults has not been established, but the association with acoustic neuroma is emerging as robust. The effect of mobile phones on children has not yet been studied.

According to American researchers Ostrom Q.T. et al. [7], primary brain tumors account for approximately 1% of new cancer cases and approximately 2% of cancer deaths in the United States; however, they are the most common solid tumors in children. These tumors are highly heterogeneous and can be broadly classified into malignant and benign, and the incidence of specific histologies varies by age, sex, and race/ethnicity. Epidemiological studies have identified numerous potential risk factors, and to date the only confirmed association with CNS tumors is exposure to ionizing radiation (which increases the risk in both adults and children) and a history of allergies (which reduces the risk in adults). Studies of genetic risk factors have identified 32 germline variants associated with an increased risk of developing these tumors in adults (25 in glioma, 2 in meningioma, 3 in pituitary adenoma, and 2 in primary CNS lymphoma). Further studies are currently being conducted in other histological subtypes, as well as in various pediatric brain tumors. Although identifying risk factors for these tumors is difficult due to their rarity, many existing datasets can be used for future discoveries through interinstitutional collaborations. Many institutions continue to develop large clinical databases, including prediagnostic risk factor data, and developments in the molecular characterization of tumor subtypes continue to allow the study of more refined phenotypes.

Alegria-Loyola M.A. et al. [8], in their work, indicate that recent advances in the study of the underlying oncogenic mechanisms of these tumors have led to the creation of new classification systems, which, in turn, can improve the diagnostic approach and therapeutic planning. Most of these neoplasms occur sporadically, and several risk factors have been found to be associated with their development, not only exposure to ionizing radiation or electromagnetic fields, but also the presence of comorbidities such as diabetes, hypertension and Parkinson's disease. A relatively small proportion of primary CNS tumors arise against the background of hereditary syndromes.

In addition, there are publications such as the work of Fallahi P. et al. [9]. In it, the authors note that the scientific literature suggests a connection between military profession and the development of brain tumors; however, no Italian study has examined the impact of this work on the morbidity of CNS tumors. In this study, information was obtained from patients recruited from the neurosurgical department of the University Hospital of Pisa, Italy, from 1990 to 1999. The study was conducted on a case-control basis. 161 newly diagnosed cases of brain tumors (glioma and meningioma, histologically confirmed), as well as 483 control patients (with other non-neoplastic neurological diseases such as trauma, hemorrhagic brain diseases, aneurysm, etc.) were recruited by matching cases and controls (1:3), by age (± 5 years) and gender. Cases and controls were interviewed at the Neurosurgical Department of the University Hospital of Pisa, Italy, and the professional histories of cases and controls were compared. Cases and controls showed a statistically significant difference based on their profession (military vs. non-military). A statistically significant association was observed between brain tumors and military profession among the patients studied ($p = 0.013$). The researchers say further research is needed in this population to determine the reasons for the increased risk of developing CNS tumors. In addition, subsequent re-evaluation of other patients collected in recent years will be required to assess the trend of this association.

Ostrom Q.T. et al. presented a "CBTRUS statistical report: Primary brain and other central nervous system tumors diagnosed in the United States in 2013-2017" [10]. The authors note that the Central Brain Tumor Registry of the United States (CBTRUS), created in collaboration with the Centers for Disease Control and the National Cancer Institute (NCI), is the largest population-based registry focused exclusively on the CNS in the United States (US) and represents representing the entire population of the US. This report contains the most recent population-based data on primary brain tumors (malignant and benign) and supersedes all previous CBTRUS reports in terms of completeness and accuracy. All rates (morbidity and mortality) are age-adjusted using the standard US population for 2000 and are presented per 100 thousand population. The age-

adjusted annual incidence rate (AAAIR) for all CNS tumors was 23.79 (malignant AAAIR = 7.08, benign AAAIR = 16.71). The rate was higher for women compared to men (26.31 vs. 21.09), blacks compared to whites (23.88 vs. 23.83), and non-Hispanics compared to Hispanics (24.23 vs. 21.48). The most common malignant tumor of the brain and other CNS tumors was glioblastoma (14.5% of all tumors), and the most common non-malignant tumor was meningioma (38.3% of all tumors). Glioblastoma was more common in men, and meningioma was more common in women. In children and adolescents (ages 0-19 years), the incidence of all primary brain tumors and other CNS tumors was 6.14. Between 2013 and 2017, 81,246 deaths were reported from malignant brain tumors and other CNS tumors. This corresponds to an average annual mortality rate of 4.42. The five-year relative survival rate after diagnosis of malignant brain tumors and other CNS tumors was 23.5%, and for benign brain tumors and other CNS tumors it was 82.4%.

A very interesting and extraordinary work was published by Frandsen C.L.B. et al. [11]. The purpose of the study was to examine the association between fertility drugs and CNS tumors. This cohort study was based on the Danish Infertility Cohort and included 148,016 infertile women living in Denmark (1995-2017). The study cohort was linked to national registries to obtain information on specific fertility medication use, cancer diagnoses, covariates, emigration, and vital status. Cox proportional hazards regression models were used to calculate hazard ratios (HR) and 95% confidence intervals (CI) for all CNS tumors and separately for gliomas, meningiomas, and various benign tumors of the brain and other parts of the CNS. During an average of 11.3 years of follow-up, 328 women were diagnosed with CNS tumors. No significant association was observed between the use of the fertility drugs clomiphene citrate, gonadotropins, gonadotropin-releasing hormone and progesterone receptor modulators and CNS tumors. However, use of human chorionic gonadotropin was associated with a reduced incidence of meningiomas (RR 0.49, 95% CI 0.28-0.87). No clear associations with CNS tumors were observed as a function of time since first use or cumulative dose of any of the fertility drugs. As a result, the authors concluded that no association was observed between the use of most types of fertility drugs and CNS tumors. However, as the researchers point out, the findings only apply to premenopausal women and additional studies with a longer follow-up period are needed.

The new 2021 World Health Organization (WHO) classification of CNS tumors has opened up a number of possibilities when interpreting clinical data. Louis D.N. et al. [12] note that the fifth edition of the WHO Classification of CNS Tumors, published in 2021, is the sixth version of the international standard for the classification of tumors of the brain and spinal cord. Building on the updated 2016 fourth edition and the work of the Consortium to Aware Molecular and Practical Approaches to CNS Tumor Taxonomy, the 2021 fifth edition introduces major changes that enhance the role of molecular diagnostics in the classification of CNS tumors. At the same time, it remains faithful to other established approaches to tumor diagnosis, such as histology and immunohistochemistry. In doing so, the fifth edition establishes some different approaches to both the nomenclature and classification of CNS tumors, and also emphasizes the importance of comprehensive diagnosis and multilevel reporting. New tumor types and subtypes are being introduced, some of which are based on new diagnostic technologies such as DNA methylome profiling.

As Gritsch S. [13] et al. point out, the 2016 revised fourth edition of the WHO classification of tumors of the CNS4 incorporated molecular features with histological classification, which revolutionized the way primary tumors of the brain and spinal cord are conceptualized, and also provided new insights into their treatment and prognosis. The 2021 revised fifth edition of the WHO classification further includes molecular changes for the classification of CNS tumors, updating the current understanding of the pathophysiology of many of these diseases. The authors review changes in the new classification of the most common primary adult tumors, gliomas (including astrocytomas, oligodendrogliomas, and ependymomas) and meningiomas,

highlighting key genomic changes for each classification group to help clinicians interpret them when considering treatment options, including clinical trials and targeted therapies, and to discuss the prognosis of these tumors with their patients.

Kurokawa R. et al. [14] emphasize that the new WHO CNS5 classification describes in detail numerous recently identified tumor types, including those for which limited information is available on neuroimaging characteristics. The authors describe the major changes made to WHO CNS5, including revisions to tumor nomenclature. For example, WHO stage IV tumors in the fourth edition are equivalent to WHO stage IV CNS tumors in the fifth edition, and diffuse midline glioma, H3 K27M mutant, is equivalent to midline glioma, altered H3 K27. Regarding tumor typing, glioblastoma with isocitrate dehydrogenase (IDH) mutation was modified to astrocytoma with IDH mutation. Tumor classifications now classify IDH-mutant astrocytomas based on the presence or absence of a homozygous CDKN2A/B deletion. In addition, the molecular mechanisms of tumorigenesis as well as the clinical and imaging features of tumor types recently identified in WHO CNS5 are summarized. Given that WHO CNS5 has become the basis of daily practice, radiologists should be familiar with this new edition of the WHO CNS tumor classification system.

Meredith D.M., Alexandrescu S. [15] note that the 5th edition of the WHO classification of CNS tumors presents new concepts and updated recommendations regarding the diagnostic criteria for CNS tumors. Embryonal tumors of the CNS and nonmeningothelial mesenchymal tumors of the CNS can present challenges to practicing pathologists because histologic features are not always subject specific and integration of microscopic and molecular data is required. This review of embryonal and nonmeningothelial mesenchymal tumors of the CNS aims to provide updated information with an emphasis on WHO changes and additions, as well as recent discoveries of diagnostic, prognostic, and therapeutic implications. Tauziède-Espariat A. et al. [16] suggest that this version of the classification of CNS tumors aligned the terminology of mesenchymal tumors with their soft tissue counterparts. New tumor types were added, such as “FET-CREB fusion-positive intracranial mesenchymal tumor,” “CIC-rearranged sarcoma,” and “Primary intracranial sarcoma, DICER1 mutant.” Other tumors (such as rhabdomyosarcoma) have remained in the current WHO classification because these tumor types may exhibit CNS specificity compared to their soft tissue counterparts. Pizzimenti C. et al. are unanimous with previous colleagues [17]. In their literature review, they summarized the clinical, histopathological and molecular features of CNS tumors with BCOR internal tandem duplication, intracranial mesenchymal tumors with FET/CREB fusion, CNS CIC rearrangement sarcomas and primary intracranial sarcoma with DICER1 mutant, according to the 2021 WHO classification of CNS tumors.

Now, regarding the various morphological forms of CNS tumors. Zhao Z. et al. [18] provide evidence that diffuse gliomas are the most common and lethal primary tumors of the CNS. The authors emphasize that the latest 2021 WHO classification of CNS tumors has significantly changed the approach to diagnosis and decision-making. As part of the Chinese Glioma Genome Atlas project, the researchers' goal was to provide genomic profiling of gliomas in a Chinese cohort. Over the past decade, 286 gliomas of varying degrees of malignancy have been collected. The Illumina HiSeq platform generated more than 75.8 million high-quality paired-end 150-bp reads per sample, for a total of 43.4 billion reads. Colleagues also collected clinical and pathological information from each patient and used it to annotate their genetic data. All patients were diagnosed and classified by a neurologist according to the new classification. This dataset provides important reference information for researchers and will significantly advance the understanding of glioma.

Next, about germ cell tumors. As indicated by Kong Z. et al. [19], germ cell tumors of the CNS are fairly rare intracranial tumors that are mainly found in pediatrics, with significant differences in incidence depending on region and gender. Histologically, germ cell tumors of the CNS can be

divided into germinomas and nongerm cell tumors. The molecular pathology of CNS germ cell tumors, especially germinomas, is mainly based on the presence of isochromosome 12p, gain of KIT gene function, and a globally low DNA methylation profile. Diagnosis and differential diagnosis are made using imaging, detection of tumor markers, surgical biopsy, and cerebrospinal fluid cytology. Germinomas are often treated with whole-ventricular radiation therapy or neoadjuvant chemotherapy combined with reduced-dose whole-ventricular radiation therapy, whereas non-germ cell tumors are primarily treated with chemotherapy, surgical resection, and radiation therapy (individually or in combination), depending on the composition tumors. Since the main patient population is children, increasing overall survival and reducing treatment side effects should be the main goals of future research.

As noted by Marker D.F., Pearce T.M. [20], germ cell tumors of the CNS arise predominantly in the middle parts of the CNS and affect young patients in the first to third decades of life. It is believed that CNS damage is a consequence of residual primordial germ cells with incomplete embryological migration. Clinically, germ cell tumors of the CNS manifest themselves as symptoms of ventricular obstruction or compression of the affected brain structures. Histologically, these tumors are similar to their gonadal and extragonadal counterparts. Diagnosis depends largely on morphology and immunohistochemical findings and may be complicated by the limited number of tumor samples. Currently, the role of molecular research is limited. Treatment of these lesions is difficult due to the involvement of deep and vital brain structures, so accurate pathological diagnosis is necessary for proper therapy. Diagnosis should include history, imaging studies, and evaluation of tumor markers in serum and cerebrospinal fluid. Current therapeutic strategies, including radiation therapy with or without chemotherapy, are highly effective, despite localization difficulties that often prevent complete total resection.

Very rare - primary melanocytic tumors of the CNS are described by Küsters-Vandeveld H.V. et al. [21]. As the authors point out, primary melanocytic tumors of the CNS represent a spectrum of rare tumors. They can be benign or malignant and occur in both adults and children, the latter often occurring in the setting of neurocutaneous melanosis. Until recently, the genetic changes in these tumors were largely unknown. This is in contrast to cutaneous and uveal melanomas, which are known to harbor a variety of oncogenic mutations that could be targeted for treatment with small molecule inhibitors in advanced stages. New insights into the molecular alterations underlying primary melanocytic CNS tumors have recently emerged, including various oncogenic mutations in tumors from adult patients (especially GNAQ, GNA11) and children (especially NRAS).

Also rare forms (only 4 cases), such as secondary INI1-deficient rhabdoid tumors of the CNS, are described by Nobusawa S. et al. [22]. The authors point out that atypical teratoid/rhabdoid tumors (AT/RT) are rare, highly malignant neoplasms of the CNS that occur predominantly in young children and are characterized by the presence of rhabdoid cells and inactivation of INI1 or (extremely rarely) BRG1. The vast majority of AT/RTs are recognized as primary tumors; however, rare RT/RT or INI1-deficient RT have been reported arising from other primary tumors. To better characterize secondary PT, the investigators performed histological and molecular analyzes of four PT arising from pleomorphic xanthoastrocytoma (PXA), anaplastic PXA, low-grade astrocytoma, or ependymoma. Histologically, although conventional AT/RTs are not typically composed primarily of rhabdoid cells, three secondary RTs were composed primarily of rhabdoid cells, two of which, arising from (anaplastic) PXA, exhibited marked nuclear pleomorphism reminiscent of those in precursor lesions. Regarding INI1 changes, although mutations including small indels are common in conventional AT/RT, only one secondary RT had a mutation. Moreover, along with previously reported cases, biallelic inactivation of INI1 in secondary RT was mainly due to biallelic focal and/or broad deletions. Although traditional AT/RTs have stable chromosomal profiles, e.g. the frequency of copy number changes involving chromosomes other than chromosome 22 is surprisingly low, comparative genomic array hybridization analysis has revealed numerous copy number changes

in secondary RT.

The so-called ghost tumors of the CNS, which are indicated by Frassanito P. et al. [23] are also very rare tumors of the CNS. As the authors note, a ghost tumor (GhT) is a mass with radiographic features consistent with a tumor diagnosis that, upon further investigation, is not a tumor, although definitions in the literature are inconsistent and the incidence of GhT remains uncertain. A review of the relevant literature was conducted to identify pediatric patients in whom an initial misdiagnosis of a mass was described. An analysis of the differential features of the final diagnosis and related clinical and radiological issues was carried out. Based on the study, GhT was classified as follows: GhT I – lesions that disappear spontaneously during observation, also known as “vanishing tumors”; GhT II, non-neoplastic tumor-like mass lesions, also known as “tumor-like lesions”; GhT III, anatomical variants of normal structures that mimic a tumor, also called “false tumors.” The most misleading conditions and critical points in the differential diagnosis of these cases are discussed. The following conclusions are drawn: GhT is a phenomenon with significant implications for treatment and outcomes. In this context, the integration of clinical and radiological data is critical for a thorough differential diagnosis and a consistent diagnostic approach, which is necessary to make adequate treatment decisions. A thorough x-ray examination is required. Atypical radiological images should raise a high level of suspicion, including incidental lesions, which are increasingly encountered in daily practice as a result of increased access to radiological testing, increased imaging sensitivity and exposure to defensive medicine. If necessary, watchful waiting should be considered.

A very pressing issue, which is also covered in literary sources, is the presence of CNS tumors during pregnancy. Eckenstein M., Thomas A.A. note [24] that CNS tumors, which typically affect the very young or very old but span a spectrum of disease, can occur in any age group. Women of reproductive age are more likely to suffer from benign tumors, including pituitary adenomas and meningiomas, as well as aggressive intracranial malignancies, such as brain metastases and glioblastoma, which are rare during pregnancy. Definitive treatment of CNS tumors may involve multimodal therapy including surgery, radiation therapy, and chemotherapy, and each of these treatments carries risks for the mother and developing fetus. CNS tumors often present with complex and painful symptoms, such as headache and seizures, which must be monitored throughout pregnancy. Decisions about timing of treatment during pregnancy or delaying treatment until delivery, continuation or elective termination of pregnancy, and future family planning and fertility are complex and require a multidisciplinary health care team to assess the consequences for both mother and child. There are no guidelines or consensus recommendations for the treatment of brain tumors during pregnancy, so individual treatment decisions are made by the treating team based on experimental data, extrapolation of recommendations for nonpregnant patients, and patient values and preferences.

Now let's discuss the aspects of diagnosing CNS tumors. EANO recommendations for the diagnosis and treatment of diffuse adult gliomas are given by Weller M. et al. [25]. The authors point out that in response to major changes in diagnostic algorithms and the publication of mature results from various large clinical trials, the European Association of Neuro-Oncology (EANO) has recognized the need to provide updated recommendations for the diagnosis and treatment of adult patients with diffuse gliomas. Through these evidence-based guidelines, the EANO Task Force provides recommendations for the diagnosis, treatment, and follow-up of adult patients with diffuse gliomas. The diagnostic component is based on the updated WHO classification of CNS tumors and subsequent recommendations from the Consortium to Inform Molecular and Practical Approaches to CNS Tumor Taxonomy - not formally WHO (cIMPACT-NOW). Regarding therapy, the authors formulated recommendations based on the results of recent practice-changing clinical trials and also provided recommendations for neuropathological and neuroradiological evaluation. In these guidelines, our colleagues defined the role of the primary

treatment modalities of surgery, radiation therapy, and systemic pharmacotherapy, embracing current advances and recognizing that unnecessary interventions and costs should be avoided. This document is intended to be a reference resource for professionals involved in the management of adult patients with diffuse gliomas, patients and caregivers, and healthcare professionals.

Advances in diagnostic immunohistochemistry of primary CNS tumors were presented by Meredith D.M. [26]. The author notes that as genomic characterization becomes increasingly necessary for the accurate diagnosis of CNS tumors, the identification of rapidly detectable biomarkers is equally important to avoid excessive costs and delays in initiating therapy. A colleague describes new immunohistochemical markers that can be used to determine mutation status, activation of signaling pathways, druggable targets, and cellular origin in many different tumor types. In particular, recently added to the WHO classification of CNS tumors are gliomas with IDH mutation, diffuse midline glioma, epithelioid glioblastoma, angiocentric glioma, ependymoma with RELA rearrangement, embryonal tumors (medulloblastoma, atypical teratoid/rhabdoid glioma), pineoblastoma, embryonal tumor with multilayered rosettes and other genetically defined high-grade neuroepithelial tumors and meningiomas associated with germline changes.

Sledzińska P. et al. [27] in their study describe prognostic and predictive biomarkers of gliomas. The authors note that gliomas are the most common tumors of the CNS. New technologies, including genetic testing and advanced statistical methods, are revolutionizing the therapeutic approach to patients and opening up new treatment options. Moreover, the 2021 WHO classification of CNS tumors fundamentally changed the classification of gliomas and included multiple molecular biomarkers. In adult patients, IDH mutations are a positive prognostic marker and have the greatest prognostic significance. However, CDKN2A deletion in IDH-mutant astrocytomas is a marker of higher grade of malignancy. Moreover, the presence of TERT promoter mutations, EGFR alterations, or a combination of chromosome 7 gain and chromosome 10 loss converts IDH-wild-type astrocytoma to glioblastoma. In pediatric patients, changes in H3F3A are the most important markers predicting worse outcome. MGMT promoter methylation has the greatest clinical significance in predicting responses to temozolomide (TMZ). Conversely, mismatch repair defects cause a hypermutation phenotype predictive of poor response to TMZ. Finally, the authors discuss liquid biopsy as a promising diagnostic and prognostic tool, but further work is needed to translate these new technologies into clinical practice.

The importance of the family of disintegrins and metalloproteinases (ADAM) in malignant tumors of the CNS is discussed by Łukaszewicz-Zajac M. et al. [28]. The authors point out that despite significant advances in diagnostic methods in medicine, CNS tumors, especially the most common of them, gliomas, remain incurable with similar morbidity and mortality rates. A growing body of literature suggests that extracellular matrix degradation by matrix metalloproteinases (MMP) may be involved in the pathogenesis of CNS tumors. However, a subfamily of MMP known as disintegrin and metalloproteinase (ADAM) proteins are unique due to both adhesive and proteolytic activities. The authors note that ADAM12, ADAMTS4 and 5 have already been proven to be involved in the proliferation and invasion of glioma cells. In addition, ADAM8 and ADAM19 correlate with glioma cell invasiveness and unfavorable survival, while ADAM9, -10 and -17 are associated with tumor stage and histological type of gliomas, and can be used as prognostic factors. Finally, colleagues conclude that several ADAM may serve as potential diagnostic and prognostic biomarkers, as well as therapeutic targets, for CNS malignancies. However, future studies on the biology of ADAM should be conducted to elucidate new strategies for tumor diagnosis and treatment of patients with these malignancies.

Khan I.N. et al. [29] also talk about modern new biomarkers of CNS tumors and the possibilities of their diagnostic, prognostic, and therapeutic use. In their work, the authors note

that recent investments in research related to the discovery of specific tumor biomarkers important for effective diagnosis and prognosis are beginning to bear fruit. Key biomarkers have the potential to outweigh traditional radiological or pathological methods, providing specificity for early detection when combined with tumor molecular profiling and clinical associations. Few biomarkers have been approved by regulatory authorities for the treatment of CNS tumors, despite the evaluation of a large number of CNS tumor-related markers in clinical trials. Traditional CNS tumor biomarkers include 1p/19q co-deletion, O6-methylguanine-DNA methyltransferase methylation, and IDH1/IDH2 mutations. Recently tested CNS tumor biomarkers include VEGFR-2, EGFRvIII, IL2, PDGFR, MMP, BRAF, STAT3, PTEN, TERT, AKT, NF2, and BCL2. Additional studies have identified more and more novel microRNA, circular RNA, and long noncoding RNA as promising biomarkers. Microvesicle studies point to exosomes as promising, less invasive biomarkers that can be isolated from the serum of cancer patients. In addition, cancer stem cell-related (CSC) molecules such as CD133, SOX2, and Nestin, used as CNS tumor biomarkers, can provide effective monitoring of cancer progression and/or surveillance for the emergence of new drug-resistant cells. Established protocols using new molecular markers in diagnosis, prognosis and drug development will usher in a new era of precision and personalized neuro-oncology. It is expected that the presented data will help optimize the process of biomarker research and development.

The visualization of primary CNS tumors before and after treatment in the molecular and genetic epoch is discussed by Ahn S.S. and Cha S. [30]. They point out that recent advances in the molecular and genetic characterization of CNS tumors have opened a new page in the classification, diagnosis, and prognostic evaluation of tumors. In this emerging and rapidly evolving era of molecular genetics, imaging plays a critical role in preoperative diagnosis and surgical planning, molecular marker prediction, targeted treatment planning, and posttherapeutic evaluation of CNS tumors. The authors provide an overview of modern imaging methods related to the molecular genetic classification of CNS tumors. Researchers have emphasized correlations between imaging features and specific molecular genetic markers and post-therapy imaging used for therapeutic evaluation.

Also, modern advances in the field of imaging of CNS tumors are reported by Huang R.Y., Pope W.B. [31]. In this article, the authors review recent advances in the use of standard and advanced imaging techniques for the diagnosis and treatment of CNS tumors, including glioma and brain metastases. With the recent shift from a histological approach to classifying CNS tumors to an approach that integrates histology with molecular information about the tumor, imaging approaches for CNS tumors have also been adapted to this new framework. Several challenges associated with the diagnosis and treatment of CNS tumors, such as tumor differentiation from treatment-related imaging changes, require further progress to bring advanced imaging techniques to clinical use.

An interesting and advanced method for molecular pathological profiling of selected CNS tumors using MLPA is described by Dolinová I. et al. [32]. The authors note that modern progress and growing knowledge about the genetic causes of cancer are opening up new possibilities for its treatment. However, it is necessary to combine the results obtained using classical pathological methods with sensitive, multiplex molecular pathological methods. A method that meets the necessary criteria is MLPA, based on a multiplex PCR reaction. This method detects both changes in gene copy number and DNA methylation, and, equally important, point mutations. The MLPA reaction is applicable even to highly fragmented DNA. At the same time, it is a reliable method that can be used on standard thermal cyclers: the fluorescent label on the tip requires automatic sequencers. Up to 50 genetic markers can be tested in one reaction, allowing diagnostic and prognostic conclusions to be drawn. All these features lead to the routine use of MLPA analysis not only in diagnosis but also in cancer research.

The current role and future potential of detecting circulating tumor DNA (ctDNA) in the

cerebrospinal fluid for the diagnosis and treatment of pediatric CNS tumors is presented by Miller A.M., Karajannis M.A. [33]. The authors point out to clinicians that most CNS tumors in children are located in distinct anatomical regions, making surgical resection, and in some cases even biopsy, risky or impossible. This diagnostic difficulty, coupled with the move toward molecular classification for diagnosis, has highlighted the urgent need to develop minimally invasive ways to obtain diagnostic information. In non-CNS solid tumors, detection of ctDNA in plasma and other body fluids has become part of routine practice and clinical trial design to guide molecular targeted therapy selection and longitudinal monitoring. However, in primary CNS tumors, detection of ctDNA in plasma is challenging. This is likely due, at least in part, to anatomical factors such as the blood-brain barrier. Because of the proximity of primary CNS tumors to the cerebrospinal fluid (CSF) space, researchers have turned to CSF as a rich alternative source of ctDNA. Although numerous studies have now demonstrated the feasibility of detecting CSF ctDNA in various types of pediatric CNS tumors, the optimal role and utility of CSF ctDNA in the clinical setting has not been established. Additionally, this work explores the promising opportunities that lie ahead for the integration of CSF ctDNA liquid biopsy into clinical care and clinical trial design.

Speaking about the treatment of CNS tumors, it is multifaceted and corresponds to accepted protocols. For example, Redjal N. et al. [34], in their work on guidelines for the treatment of CNS tumors, emphasize that evidence-based clinical practice guidelines for the treatment of CNS tumors continue to be developed and updated through the work of the Joint Tumor Section of the Congress of Neurological Surgeons and the American Neurological Association. The guidelines are created using the most current and clinically relevant evidence using systematic methodologies that categorize the available evidence and provide recommendations for clinical practice. This update summarizes the Tumor Section recommendations developed over the past 5 years for non-functioning pituitary adenomas, low-grade gliomas, vestibular schwannomas, and metastatic brain tumors.

The modern role of radiation therapy in the treatment of malignant tumors of the CNS is discussed by Farooqi A. et al. [35]. The researchers note that the current WHO classification of CNS tumors has undergone significant restructuring, and for the first time, gliomas are classified according to both molecular and histological parameters that determine the treatment of glioma. Radiation for intermediate-risk meningiomas improves progression-free survival compared with historical controls, and studies of atypical meningiomas are ongoing. For brain metastases, the use of stereotactic radiosurgery has entered clinical practice for a larger number of lesions. In addition, whole-brain irradiation while sparing the hippocampus holds promise for preserving neurocognitive function. This work summarizes the evolving role of radiation therapy in the treatment of CNS malignancies.

The role of partial therapy in the treatment of tumors of the skull base and CNS tumors is revealed in their study by Diehl C.D. et al. [36]. The authors point to the fact that radiation therapy is the basis of interdisciplinary treatment of tumors of the skull base and brain. Technical innovations over the past two decades have allowed for more precise treatment with better preservation of adjacent healthy tissue to prevent treatment-related side effects that affect patients' quality of life. Proton and charged ion particle therapy provides favorable kinetics with a sharp accumulation of dose at a well-defined depth (Bragg peak) and a sharp decline in radiation beyond this maximum. This review highlights the role of particle therapy in the treatment of primary brain tumors and skull base tumors.

The effectiveness of therapeutic targeting of membrane-bound proteins in CNS tumors was reported by Roy P.K. et al. [37]. Colleagues draw attention to the fact that the activity of the most complex system, which is the CNS, is deeply regulated by a huge number of membrane-associated proteins (MAP). A slight change stimulates huge chemical changes, and the induced reaction is organized by MAP, which acts as a receptor for that chemical or a channel that allows for the flow

of ions. Small changes in the activity or expression of these MAP lead to serious consequences such as cognitive impairment, memory loss, or cancer. CNS tumors are heterogeneous in nature and difficult to treat due to random mutations in MAP; for example, overexpression of EGFRvIII/TGF β R/VEGFR, alteration of adhesion molecules α 5 β 3, integrin/SEMA3A, imbalance of ion channel proteins, etc. Extensive research is currently being carried out to develop new therapeutic approaches using these proteins, such as targeted cytotoxic radiotherapy, drug delivery, and prodrug activation, blocking receptors such as GluA1, development of a viral vector against a cell surface receptor. The combinatorial approach of these strategies along with the traditional one may turn out to be more promising.

The pharmacokinetic properties of anticancer drugs for the treatment of CNS tumors are covered in detail in their work by Jacus M.O. et al. [38]. The authors emphasize that despite significant improvements in outcomes for patients with hematologic malignancies and solid tumors over the past 10 years, patients with primary or metastatic brain tumors continue to have a poor prognosis. The primary reason for this is the inability of many chemotherapy drugs to enter the brain and brain tumors in concentrations high enough to produce antitumor effects due to unique barriers and efflux transporters. Several studies have recently been published examining the CNS pharmacokinetics of various anticancer drugs in patients with primary and metastatic brain tumors. To summarize recent advances in the field, this review critically examines studies published over the past 9 years examining the brain and cerebrospinal fluid penetration of clinically available anticancer agents in patients with CNS tumors. Researchers note that despite advances in the treatment of many types of cancer, CNS tumors continue to be one of the most difficult to treat malignancies, accounting for a significant portion of cancer deaths in adults and children. Between 1995 and 2011, 5-year survival rates ranged from ~5% for patients with glioblastoma to ~83% for patients with ependymal tumors, with little change in survival over this time period. In children under 19 years of age, malignant brain tumors are the leading cause of cancer death. Five-year survival rates for pediatric CNS tumors vary widely depending on tumor type: patients with glioblastoma tumors have an 18% survival rate, compared with patients with pilocytic astrocytoma, who have a 97% survival rate. In addition to primary CNS tumors, the incidence of CNS metastases in patients with hematologic malignancies and solid tumors is increasing, and treatment options for these patients remain limited. The morbidity and poor prognosis of patients with primary CNS tumors and CNS metastases highlight the need to develop new and more successful treatments. It is critical that researchers in drug development for these indications utilize knowledge of the unique pharmacokinetic properties required for drug penetration into the CNS, as well as the biological properties of the disease. Although many studies have been published describing the pharmacokinetics of drugs used to treat brain tumors in the CNS, interpretation of the results can be controversial due to differences in study designs and methodologies. Therefore, the purpose of this review is to provide a comprehensive and critical assessment of pharmacokinetic studies conducted from 2006 to the present that have examined the CNS distribution of drugs used to treat primary CNS tumors or CNS metastases.

I would also like to dwell on the work of Gatson N.T.N. [39], dedicated to the treatment of CNS tumors during pregnancy. This article discusses current recommendations and special considerations for the treatment of CNS tumors in pregnant women and provides case examples to highlight important clinical concepts. The researchers note that given that nearly 60% of all intracranial and spinal tumors, including both primary and metastatic tumors, malignant or benign, are diagnosed in women, it is fair to draw attention to the unique management considerations that relate to women during specific phases of their lives, such as pregnancy. The pregnancy phase is characterized by changes in hormonal, immunological and other physiological reactions. Although substantial evidence supports the influence of pregnancy on tumor tumorigenicity, the cumulative effect of the pregnancy state on brain tumor biology remains

elusive. Moreover, as innovative cancer treatments and surveillance technologies develop, healthcare providers must consider new potential risks to safely maintain a pregnancy. The authors emphasize that informed neuro-oncology practice regarding safer surgical, radiation, medical, device, and imaging modalities is critical to maintaining pregnancy and fertility in cancer patients. Expanding this knowledge depends on advocacy and commitment to developing equitable and interdisciplinary research in this area. It also requires a focus on patient-reported outcomes and patient-centered conversations to provide the best care for pregnant women with CNS tumors.

Now, as for this pathology in our country. The morbidity of CNS tumors in the Republic of Kazakhstan in 2022 was 4.2 (4.1 - men; 4.3 - women) per 100 thousand population with a growth rate compared to the previous year of 4.5% (4.0 - in 2021 year), which in absolute numbers amounted to 815 people (765 cases in 2021), taking 16th rank. The share of cases diagnosed for the first time in life, recorded by oncology organizations, was 2.3%, the same as a year earlier. At the same time, 387 people fell ill among men (specific gravity - 2.6%, rank 12), women - 428 (specific gravity - 2.1%, rank 14). Despite the fact that more women fell ill, the share and ranking of places turned out to be lower. This is, of course, due to the high morbidity of breast cancer in the female population (5171 people) and oncogynecological pathology - cervical cancer (1934 women), uterine cancer (1315 cases) and ovarian cancer (1201 women [40]).

The morbidity of CNS tumors was found to be higher than the national average in 9 regions of the country: Zhetysay - 7.4 (maximum); Aktobe - 6.2; Almaty city - 5.4; Pavlodar - 5.0; Karaganda - 4.8; Kostanay - 4.7; North Kazakhstan - 4.6; Zhambyl - 4.5 and Akmola - 4.3. In parity with the republican average - Astana. The indicator is also lower than the national average in 9 regions: in Shymkent city - 2.2 (the lowest level); Turkestan - 2.3; West Kazakhstan - 2.8; Abay - 3.1; Mangystau - 3.5; Almaty and Kyzylorda - 3.8; East Kazakhstan and Atyrau - 4.1 regions per 100 thousand population.

The mortality rate from this pathology was 1.6 (men - 1.9; women - 1.4) per 100 thousand population. In the structure of causes of mortality for people of both sexes in 2022, this pathology ranks 13th, amounting to 2.4%, and in absolute numbers - 319 people. Of these: 182 are men (share: 2.6%, 12th place); 137 - women (share - 2.2%, 13th place).

The regions where the mortality rate from CNS tumors is higher than the national average (1.6 per 100 thousand population) include: North Kazakhstan - 3.2 (maximum level); East Kazakhstan - 3.0; Pavlodar - 2.4; Kostanay - 2.2; Karaganda - 2.1; Zhetysay and Almaty city - 2.0; Akmola and Astana - 1.9; Zhambyl and West Kazakhstan - 1.8. The lowest indicators were noted in Kyzylorda - 0.6 (minimum level); Shymkent city - 0.7; Mangystau - 0.9; Almaty - 1.0; Turkestan and Aktobe - 1.1; Abay and Atyrau regions - 1.5 regions per 100 thousand population [40].

The number of deaths from malignant tumors of the CNS that were not registered with oncology organizations and were diagnosed posthumously in the Republic of Kazakhstan was 15 people; at the same time, the share was 1.8% and 6th ranking place.

At the same time, the one-year mortality rate was 18.2%, taking, together with malignant tumors of connective and soft tissues, 11th ranking place in this indicator. The ratio between one-year mortality and neglect (stage IV) was 11.3 in 2022 and this is the highest figure among all nosological forms of malignant neoplasms in our country. At the same time, let us recall that the furthest distance from "1" is the worst ratio between the indicators of one-year mortality and neglect. In other words, this is the worst indicator, and the closest "competitor" - esophageal cancer - lagged behind by more than 2 times (the ratio between one-year mortality and neglect is 5.2).

The regions where the proportion of patients with early stage I of the pathology in question is above the national average (6.3% - 6th rank among the worst indicators) include the following regions: Astana city - 39.6%; (maximum indicator); North Kazakhstan - 20.0%; Aktobe - 14.0% and

Almaty city - 8.9%.

The lowest rates of early diagnosis were stated in: Abay, Almaty, East Kazakhstan, West Kazakhstan, Zhambyl, Zhetysay, Mangistau, Kyzylorda, Kostanay, Turkestan and Shymkent city - 0.0% (i.e., not a single patient with tumors of the CNS detected at stage I of the disease); Pavlodar - 2.8%; Karaganda - 3.2%; Atyrau - 3.6% and Akmola - 5.9% regions of the country [40].

Unfortunately, for a number of reasons, which include objective reasons, only every fourth patient with malignant neoplasms of the CNS is detected in the early (I-II) stages of this pathology.

The regions where the proportion of patients with CNS tumors detected at stages I-II is above the national average (23.3% - 4th rank "from the bottom") include the following regions. There are 3 regions in the top three uncontested leaders: Aktobe - 86.0% (the maximum value in the republic); Shymkent city - 84.0% and Pavlodar - 72.2%. Next, by a large margin, are: Astana city - 41.5%; North Kazakhstan - 36.0%; Karaganda - 29.0% of the region and Almaty city - 28.6%. At the same time, not a single patient was identified at the early stages in: Abay, Almaty, Zhambyl, Zhetysay, Mangistau, Kyzylorda and Kostanay regions - 0.0%. Low rates of early diagnosis were also stated: in Turkestan - 2.1%; East Kazakhstan - 4.0%; West Kazakhstan - 6.3%; Atyrau - 7.1% and Akmola - 8.8% regions of our republic [40].

As is clearly seen from the above data across the country, there is a very wide range in early diagnosis indicators, from very good to depressing. Of course, it is necessary to take into account migration processes and other factors influencing early diagnosis rates, but nevertheless, the results speak for themselves.

The proportion of stage IV CNS tumors among all nosological forms of malignant neoplasms was 3.8%. Despite the fact that this is only the 24th ranking place for this indicator, there are no illusions in this regard, since in the early (I-II) stages, as noted above, 23.3% of patients were identified. The overwhelming number of patients with CNS tumors were identified at locally advanced stage III of the disease with locoregional involvement, amounting to 72.9%.

As for the average republican indicator of the share of stage IV, the Karaganda region stands out against this background, where this parameter was 35.5%. This is followed by the following regions: Pavlodar - 5.6%; Turkestan - 4.3%; Shymkent city - 4.0%; Astana city - 1.9%; Aktobe - 1.8%; Almaty city - 0.9%. In the remaining 12 areas, advanced stage IV was not detected [40].

Statistical data on patients diagnosed with malignant neoplasm who have been under observation for 5 years or more and continue to be observed in 2022 showed that the number of patients under the supervision of oncological organizations in Kazakhstan for more than five years continued to grow and at the end of the reporting year amounted to 110790 people, with an increase of 6.6% (2021 - 103,935 people, +4.4%) (form No. 7). The share of this category of patients or five-year survival rate for malignant neoplasms with an upward trend is 55.3% (55.0% in 2021).

We cannot ignore such an important clinical aspect as the coverage in the Republic of Kazakhstan of special treatment for patients diagnosed with a malignant neoplasm of the CNS for the first time in their lives. At the end of 2022, the absolute number of people who completed specialized treatment was 334 people, with even more continuing treatment - 344 patients. The following results were obtained in percentage terms by methods and types of treatment. Only 19.8% of patients received surgical treatment, only radiation - 16.8%, only medication - 4.8%, combined - 31.4%, complex - 21.9% and chemo-radiation - 2.1%.

Further regarding the five-year survival rate of patients. As for CNS tumors, at the end of 2022, 4,730 people were registered at the dispensary, or 24.3 per 100 thousand population. At the end of 2021 - 4487 patients or 23.5 per 100 thousand population, respectively.

At the same time, the mortality rate of the observed contingents in 2022 decreased compared to the previous year and amounted to 6.7% in 2022 (8.1% in 2021).

The five-year survival rate of patients with CNS tumors was 55.6% in 2022 and 54.2% in 2021

[40].

Summarizing the above, we can conclude that malignant neoplasms of the CNS occupy a significant place among all existing malignant tumors of other localizations. At the same time, despite the small percentage of patients detected at stage IV, taking into account a number of factors, early diagnostic indicators do not allow oncologists to “sleep peacefully”, since locally advanced stage III, which significantly predominates over all stages, in addition to its prevalence itself, gives a large number of complications in connection with the location of vital centers and tissue structures near the primary focus and locoregional metastases. The variability and veiling of symptoms, its similarity with various non-core processes, leads to neglect of the disease. All this requires both oncologists and, first of all, primary health care workers and, of course, neurologists to increase the level of oncological alertness, inform the population about early symptoms that may indicate this pathology or the onset of proliferative changes and carrying out high-tech diagnostic measures and, as a result, timely treatment. People at risk due to a genetic factor are recommended to visit a neurologist annually and, if necessary, undergo examination.

The new version of the WHO CNS5 Tumor Classification has opened up a number of possibilities for the interpretation of clinical data, as well as major changes that increase the role of molecular diagnostics in the classification of CNS tumors and discoveries of diagnostic, prognostic and therapeutic value by informing specialists about molecular and practical approaches to CNS tumor taxonomy. The molecular mechanisms of oncogenesis have been systematized. Both updated recommendations regarding diagnostic criteria for CNS tumors and new tumor types and subtypes are presented, some of which are based on new diagnostic technologies such as DNA methyloma profiling.

An epidemiological assessment of the situation with tumors of the central nervous system in our country suggests that there are sometimes significant differences between regions not only in morbidity 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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Technical Sciences

SMARTPHONE USER AUTHENTICATION MODEL BASED ON INDIVIDUAL BEHAVIOR

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Keywords: authentication, behavioral biometrics, smartphone, information security, user identification, model, user.

Abstract

The present article introduces the development of an innovative smartphone user authentication model based on their individual behavior. The developed model takes into account parameters such as text input, typing speed, device grip style, angular velocity and acceleration, and motion dynamics. The model proposed in this study aims to increase the level of security of mobile devices by leveraging the uniqueness and inimitability of users' behavioral characteristics. It offers an effective mechanism for identifying smartphone users, eliminating the possibility of unauthorized access to personal data.

Modern authentication methods, such as pin codes, patterns and biometrics, have their limitations and vulnerabilities that can be used by attackers to gain unauthorized access to mobile devices. In this context, the development of an authentication model based on user behavioral characteristics is a promising direction in the field of information security.

According to source [1], over the past ten years, the number of malware attacks has increased across all mobile platforms: up to 812.67 malware in 2018, in addition to these, the number of stolen or lost smartphones has increased over the past few years. Thus, protecting this device becomes a necessity.

Existing traditional authentication methods, which are mainly PINs and passwords, face significant shortcomings while remaining vulnerable to various types of attacks, as mentioned in recent literature [2]. As such, they are neither particularly suitable for use, since they are regularly forgotten, nor completely safe, since they are vulnerable enough to be guessed or stolen. This fact also creates a usability problem, as 70% of smartphone users find PINs and passwords very annoying and prefer not to use them, as reported by H. M. Wood [3].

A study by Takoua Guiga [4] states that one of the main advantages of behavioral biometrics is its dependence on the user's actions and habits, making it an ideal candidate for transparent user authentication.

According to N. L. Clarke [5], transparent authentication can be achieved using any authentication approach that provides a sample needed for verification.

Consequently, to improve the security of the smartphone as a personal device, researchers have expanded their interest in developing more effective authentication mechanisms based on biometric methods, considering them unique to one person and virtually impossible to compromise. We are talking about the use of various data based on measurements and

characteristics of parts of the user's body, called physiological modalities, such as facial recognition, fingerprints, hand geometry, iris recognition, etc.

The proposed model is based on the analysis of unique behavioral patterns of smartphone users. To do this, data is collected about specific user actions, such as text input method, typing speed, manner of holding the device, angular velocity and acceleration, motion dynamics and other parameters that can be used to identify a specific user.

Characteristics of the user behavior based authentication model:

1.Data collection: The model collects information about the user's behavioral characteristics, such as:

- Time spent entering text. The more time spent on input, the greater the impact of this factor on the overall result.

- Typing speed. The faster the text is typed, the faster the input ends and the less influence this factor has on the overall result.

- Angular velocity of the device. This factor describes the rate at which the angle of the device changes, which can affect the accuracy and speed of input.

- Device acceleration. Acceleration can affect the stability of the device's hold and therefore the quality of input.

- Rotation angle of the device. This measure describes the angle between the start and end position of the device, which can also affect the text input process.

- Dynamics of movement. This component takes into account the overall dynamics of the device's movement during text entry, which affects the overall efficiency of the process.

2. Taking into account all these factors, formula (1) evaluates their influence on the result of text input, allowing one to take into account various aspects of user behavior and device movements when assessing the quality and speed of input.

$$F = (T + S) * M * (V + A) * (W + A) * D \quad (1)$$

Where:

T - time spent entering text;

S - typing speed;

M is a coefficient that takes into account the manner in which the device is held;

V is the angular velocity of the device;

A - device acceleration;

W - angle of rotation of the device;

D - motion dynamics.

3. Data processing: The received data is analyzed and processed using machine learning and statistical analysis methods to identify unique user behavioral patterns.

4. User identification: Based on the results obtained, the model identifies the user by comparing current behavioral characteristics with previously established patterns.

Results

A model for student verification has been developed, characterized by decision-making based on behavioral data collected while using a personal mobile device.

A mathematical formula that takes into account text input data, typing speed, manner of holding the device, angular velocity and acceleration, and motion dynamics. Taking all these factors into account, the formula evaluates their impact on the result of text input, allowing you

to take into account various aspects of user behavior and device movements when assessing the quality and speed of input.

The experiments performed showed the high efficiency of the proposed model. The accuracy of user identification based on his behavior was more than 95%, which indicates a high level of reliability of this approach. In addition, the model has shown resistance to various types of attacks aimed at bypassing the authentication system.

Conclusion

The developed model for smartphone user authentication based on his behavior is a promising solution for ensuring the security of mobile devices. Its implementation will increase the level of protection of users' personal data and reduce the risk of unauthorized access to mobile devices. Further research is aimed at improving the accuracy of the model and expanding its functionality for various types of mobile devices.

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Investigation of the hydraulic shock method of water lifting from watercourses

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Abstract: The most affordable type of water supply, which does not require high costs, are terrestrial water sources - natural and artificial, most of which can use kinetic energy of moving water as an energy source to drive alternative pumping units operating on energy-saving and environmentally friendly water lifting technology, allowing to increase the efficiency of mechanization of water supply for household and household needs of the agricultural consumer.

KEYWORDS: ANALYSIS, THEORETICAL STUDY, TECHNOLOGICAL PROCESS OF WATER LIFTING, WATERCOURSE, PARAMETER, HYDRAULIC RAM PUMPING UNIT, NON-TRADITIONAL ENERGY SOURCES

Introduction

Currently, all over the world, including in Kazakhstan, due to the shortage of a traditional energy source (fuel), in the fuel and energy system and in order to save it for future generations, as well as reduce the rate of environmental degradation, they are coming to use renewable energy sources (wind, water and biogas).

Due to the lack of alternative pumping units on the market, agricultural and other consumers located in the areas of watercourses are forced to use traditional centrifugal pumping units powered by internal combustion engines, which require high operating costs, including expensive fuel.

The problem of effective water supply using natural energy resources of water in modern conditions is promising and relevant, the solution of which is rationally carried out from shallow watercourses by a pumping unit using a hydraulic shock method of water lifting. The design of which, according to the technical solution, is simple and reliable in operation and does not worsen the ecology of the environment.

Method of research.

Carried out taking into account the developed schematic diagram of the pumping unit, the research methodology of which consisted in using the law of continuity of the flow of water in the receiving part and the feed pipeline, using the Bernoulli equation for the inlet and outlet sections

of the receiving part and the feed pipeline and the theory of Zhukovsky N. E. on direct hydraulic shock in a closed water pipeline [1].

The research was aimed at determining the analytical dependence between the input and output parameters of a pumping unit during the technological process of its steady-state operation. On the basis of which its main technological parameters are determined: pressure, supply, useful and expended power and efficiency.

Pressure of the pumping unit:

$$H_{\text{Hy}} = H_{\text{r}} + \frac{1}{2g} \cdot (v^2 - v_{\text{п}}^2) + \frac{1}{g} \cdot (v - v_3) \cdot \frac{2L_{\text{TP}}}{t_{3\phi}} - (hv_{\text{п}} + hv_{\text{кл}}), \text{ m}, \quad (1)$$

$$H_{\text{H}} = H_{\text{r}} + \frac{1}{2g} \cdot (v^2 - v_{\text{п}}^2) - hv_{\text{п}}, \text{ m}, \quad (2)$$

$$hv_{\text{п}} = \sum_{i=1}^n \zeta_i \cdot \frac{v_{mi}^2}{2g} + \sum_{i=1}^n \lambda_{tpi} \cdot \frac{L_{\text{TP}}}{d_i} \cdot \frac{v_{di}^2}{2g}, \text{ m}, \quad (3)$$

ζ_i - the coefficient of local resistance in the receiving part and feed line;

v_{mi} - water velocity in places creating local resistance, m/s;

v_{di} - water velocity in pipelines of different diameters, m/s;

λ_{tpi} - coefficient of friction in pipelines;

L_{TP} - the length of the pipeline of different diameters, m;

H_{ry} - the pressure created in the pumping unit from the use of hydraulic shock, [3]:

$$H_{\text{ry}} = \frac{1}{g} \cdot (v - v_3) \frac{2L_{\text{TP}}}{t_{3\phi}}, \text{ m}, \quad (4)$$

v_3 - the average velocity of water in the feed line when the shock valve is closed ($v_3=f(t_{3\phi})$), m/s;

$t_{3\phi}$ - the actual closing time of the impact valve (according to experimental data in open pipelines $t_3=0.1 \dots 0.3\text{s}$), s;

L_{TP} - the total length of the feed pipeline, m;

$hv_{\text{кл}}$ - pressure loss in the discharge valve of the pumping unit, m:

$$hv_{\text{кл}} = \zeta_{\text{кл}} \cdot \frac{v_{\text{кл}}^2}{2g}, \text{ m}, \quad (5)$$

$\zeta_{\text{кл}}$ - coefficient of local resistance in the discharge valve;

$v_{\text{кл}}$ - water velocity in the flow section of the discharge valve seat, m/s.

Pumping unit supply:

$$Q_{\text{Hy}} = Q - Q_{\text{сб}} = \frac{\pi}{4} \cdot (v \cdot d^2 - v_{\text{сб}} \cdot d_{\text{сб}}^2 \cdot K), \text{ m}^3/\text{s}, \quad (6)$$

$Q, Q_{\text{сб}}$ - the total water consumption of the pumping unit and for discharge through the through hole of the shock valve seat, m³/s;

$v, v_{\text{сб}}$ - water velocity in the feed pipe and in the through hole of the shock valve seat, m/s;

$d, d_{\text{сб}}$ - internal dimensions of the feed pipe and the opening of the shock valve seat, m;

K - the utilization factor of the through-section area of the shock valve seat.

Useful and expended power:

$$N_{\pi} = \rho \cdot g \cdot Q_{\text{HY}} \cdot H_{\text{HY}}, \text{ W}, \quad (7)$$

H_{HY} – the pressure of the pumping unit is determined by the formula (1), m

$$N_3 = \rho \cdot g \cdot Q \cdot (H_r + \frac{v_{\pi}^2}{2g}), \text{ W}, \quad (8)$$

N_{π} , N_{HY} – useful and expended power of the pumping unit, W;

H_r – geometric pressure, m;

u_{π} – water velocity in the receiving part of the pipeline (in the watercourse), m/s.

Efficiency of the pumping unit:

$$\eta_{\text{HY}} = \frac{Q_{\text{HY}} \cdot H_{\text{HY}}}{Q \cdot (H_r + \frac{v_{\pi}^2}{2g})}. \quad (9)$$

The obtained theoretical foundations served as the basis for determining the parameters of the pumping unit, manufacturing an experimental sample and conducting experimental studies on a specially prepared stand simulating a watercourse: water velocity - 1 ... 5 m/s, pressure - 0.5 ... 10, water flow - 0 ... 0.020 m³/s, providing the necessary technological modes when experimental studies.

The purpose of experimental research is to study the technological process of lifting water from watercourses by a hydraulic shock method, choosing rational options for the receiving part of the feed pipeline and the hydraulic shock valve, determining pressure losses and the coefficient of local resistance in the shock valve, the optimal length of the feed pipeline, verifying the reliability of theoretical dependencies and determining the main parameters of the pumping unit.

Results of research.

The main technological and technical parameters of a hydraulic ram pumping unit are the following: the water velocity in the intake filter, the internal diameters of the intake filter, the intake pipeline, the diameters of the passable sections of the shock and discharge valves, the diameter of the pipeline (sleeve), the length of the submersible pipeline, the weight of the load for switching the shock valve m.

The speed of water movement in the intake filter is determined by the empirical formula (3), at the optimal value of which siltation, as well as the formation of sludge and ice, is prevented [2]:

$$v_{\pi} \geq (t_{\text{H}})^{0,66}, \text{ m/c}, \quad (10)$$

t_{H} - estimated minimum outdoor air temperature, °C.

$t_{\text{H}} = 5 \dots 10 \text{ }^{\circ}\text{C}$, $v_{\pi} \geq (5 \dots 10)^{0,66} \approx 1,1 \dots 1,15 \text{ m/s}$.

We accept the calculated value $v_{\pi} = 1,5 \text{ m/s}$.

The internal diameters of the receiving filter and the receiving pipeline are determined from the equation of fluid flow through the flow section known in hydrodynamics:

$$d_{\phi} = \sqrt{\frac{4 \cdot Q_{\text{B}}}{\mu \cdot \pi \cdot v_{\pi}}}, \text{ m} \quad (11)$$

$$d_{\phi} = \sqrt{\frac{4 \cdot 0,006}{0,75 \cdot 3,14 \cdot 1,5}} = 0,0824 \text{ m.}$$

The inner diameter of the receiving pipeline d_{tr} is determined by the formula:

$$d_{tp} = \sqrt{\frac{4 \cdot Q_B}{\pi \cdot v_n}} = \sqrt{\frac{4 \cdot 0,006}{3,14 \cdot 1,5}} = 0,06 \text{ m,} \quad (12)$$

v_n - the water velocity in the intake filter is 1.2 ... 3 m/s, we take the average value of $v_n = 1.5$ m/s.

We accept a pipeline according to GOST- 3262 -75 , size 75 3.5 mm with an internal diameter $d = 68$ mm.

The diameter of the sleeve is determined based on the formula for determining the water supply:

$$d_p = \sqrt{\frac{4 \cdot Q}{\pi \cdot v}} = \sqrt{\frac{4 \cdot 0,001}{3,14 \cdot 1,5}} = 0,029 \text{ mm,} \quad (13)$$

$$Q = \frac{3,6}{3600} = 0,001 \frac{\text{m}^3}{\text{s}} - \text{pumping unit feed, } \frac{\text{m}^3}{\text{s}};$$

v - the speed of water movement at the inlet of the submersible pipeline, m/s, (We accept 1.5 m/s).

We accept a sleeve close in design diameter $d_p = 32$ mm.

We determine the actual speed of water movement in the pressure hose:

$$v_{\phi} = \sqrt{\frac{4 \cdot Q}{\pi \cdot d_p^2}} = \sqrt{\frac{4 \cdot 0,001}{3,14 \cdot 0,032^2}} = 1,33 \text{ m/s.} \quad (14)$$

The diameters of the impact valve and the discharge valve, are determined by the formula (11), taking the velocity of water movement equal in the submersible pipeline:

$$d_{yk} = \sqrt{\frac{4 \cdot Q_B}{\pi \cdot v_n}} = \sqrt{\frac{4 \cdot 0,006}{3,14 \cdot 1,5}} = 0,07 \text{ m;}$$

We accept a diameter equal to the diameter of the submersible pipeline $d_{yk} = d_{tp} = 68$ mm.

In the discharge valve $v_n = 1,5 \dots 3$ m/s, accept $v_n = 3$ m/s:

$$d_{hk} = \sqrt{\frac{4 \cdot Q}{\pi \cdot v_n}} = \sqrt{\frac{4 \cdot 0,001}{3,14 \cdot 3}} = 0,02 \text{ m.}$$

The length of the submersible pipeline of the pumping unit is determined from the basic equation of the hydraulic shock process used in the technological process of water lifting, according to the following formula:

$$L_{ntp} = \frac{H_y \cdot g \cdot t_{3\phi}}{2 \cdot (v - v_3)}, \text{ m,} \quad (15)$$

H_y - the pressure in the pumping unit, which creates the effect of a water hammer, m ($H_y = H_p = 10$ m);

$t_{3\phi}$ - the actual closing time of the impact valve, s ($t_{3\phi} = 0,2 \dots 0,8$ c, according to experimental data);

u, u_3 - the maximum water velocity in the submersible pipeline of the pumping unit and at the time of closing the shock valve, m/s, ($u = 2,62 \frac{m}{c}$, $u_3 = 0$).

$$L_{птр} = \frac{10 \cdot 9,81 \cdot 0,5}{2 \cdot (2,62 - 0)} = 9,36 \text{ м}, \text{ We accept } L_{птр} = 9 \text{ м}.$$

The weight of the counterweight load for switching the impact valve is determined from the condition of equality of forces acting on the impact valve from the pressure force of moving water and from the weight force of the counterweight load, according to the following formulas:

$$m_{min} = \frac{v_{кл}^2 \cdot \rho}{8g} \pi \cdot D_{кл}^2 \cdot \frac{h_b}{h_r}, kg \quad (16)$$

$$m_{max} = \frac{\pi \cdot \rho}{8 \cdot g} \cdot (v_{кл}^2 \cdot D_{кл}^2 + v_d^2 \cdot D_d^2) \cdot \frac{h_b}{h_r}, kg \quad (17)$$

m_{min}, m_{max} - the weight of the counterweight load is minimum without a hemispherical disk and maximum with a hemispherical disk, kg;

$u_{кл}, u_d$ - the maximum velocity of water flowing around the impact valve and the hemispherical disk, respectively, m/s;

$D_{кл}, D_d$ - the diameters of the impact valve and the hemispherical disc of the counterweight, which perceive the pressure of water movement, m;

h_b, h_r - the distance from the axis of rotation of the counterweight, respectively, to the center of gravity of the load, m.

$$u_{кл} = \frac{3}{4} v = 1,97 \text{ м/с}, D_{кл} = 0,085 \text{ м}, h_b = 0,08 \text{ м и } h_r = 0,1 \text{ м}, D_{кл} = 0,085 \text{ м},$$

$$m_{min} = \frac{1,97^2 \cdot 1000}{8 \cdot 9,81} \cdot 3,14 \cdot 0,085^2 \cdot \frac{0,08}{0,1} = 0,897 \text{ кг},$$

$$u_{кл} = \frac{3}{4} v = 1,97 \text{ м/с}, u_d = u = 2,62 \text{ м/с}, D_{кл} = 0,085 \text{ м},$$

$$D_d = 0,094, h_b = 0,08 \text{ м и } h_r = 0,1 \text{ м},$$

$$m_{max} = \frac{3,14 \cdot 1000}{8 \cdot 9,81} \cdot (1,97^2 \cdot 0,085^2 + 2,62^2 \cdot 0,094^2) \cdot \frac{0,08}{0,1} = 2,85 \text{ кг},$$

Экспериментальные исследования гидротаранной насосной установки.

According to the developed design and technological scheme of the hydraulic ram pumping unit, experimental studies were carried out on a specially prepared stand, the pressure of which was created within 0.5; 1.0; 1.5; 2.0; 5.0 m of the water column.

According to the experimental data obtained, the parameters of the pumping unit were calculated using the following formulas.

Water supply and flow rate of the pumping unit:

$$Q_i = \frac{\sum_{i=1}^m V_i}{\sum_{i=1}^m t_{3i}}, m^3/s, \quad (18)$$

V_i – the amount of water raised or consumed per experience, m^3 ;

t_{3i} – the measurement time of the raised or consumed volume of water, s.

Pressure of the pumping unit:

$$H_{\text{HY}} = H_{\text{M}} \pm h_{\text{M}} , \text{ m}, \quad (19)$$

H_{M} – pressure gauge readings in the discharge pipe, m;

h_{M} – the height of the axis of the model pressure gauge relative to the axis of the discharge pipe, m.

Useful power and efficiency of the pumping unit:

$$N_{\text{II}} = \rho \cdot g \cdot Q_{\text{HY}} \cdot H_{\text{HY}} = \rho \cdot g \cdot Q_{\text{HY}} \cdot (H_{\text{M}} \pm h_{\text{M}}) , \quad (20)$$

$$\eta_{\text{HY}} = \frac{N_{\text{II}}}{N_3} = \frac{Q_{\text{HY}} \cdot H_{\text{HY}}}{Q \cdot H_{\text{B}}} .$$

Pressure losses in the shock valve and the body of the shock valve of the pumping unit:

$$h v_i = \left(\frac{1}{m} \cdot \sum_{i=1}^m P_{\text{BX } i} - \frac{1}{m} \cdot \sum_{i=1}^m P_{\text{BIX } i} \right) \cdot \frac{1}{\rho g} , \text{ m}, \quad (21)$$

Coefficient of local resistance in the impact valve and the body of the impact valve:

$$\zeta_i = \frac{2ghv_i}{v_i^2} = \frac{\pi^2 \cdot g \cdot d_i^4 \cdot hv_i^*}{8 \cdot Q_i^2} , \quad (22)$$

Rational variants of the main components of the pumping unit were experimentally selected: the receiving part of the feed pipeline is Z-shaped, telescopic connection and with a confusor receiving filter; the hydraulic shock valve is of a disc type with a hemispherical disk on a hinged counterweight and with a balanced axially regulating load.

Conclusion.

During an experimental study of the technological process of the hydraulic shock method of water lifting, it was found that the pressure losses in the feed pipeline mainly consisted of local losses in the shock valve, which, with a head of the watercourse $H_{\text{B}} = 0.5 \dots 5$ m and a flow rate of water through it $H_{\text{B}} = 0.007 \dots 0.020$ m³/s, amounted to $h v = 0.6 \dots 2.7$ m. The coefficients of local resistance are taken according to the average values equal to for the impact valve $\zeta_{\text{cl}}=4.86$, for the body of the impact valve $\zeta_{\text{c}}=3.73$, for water flow rate $0.003 \dots 0.006$ m³/s and the head of the watercourse $0.5 \dots 1.5$ m, and $\zeta_{\text{cl}}=2.27$ and $\zeta_{\text{c}}=2.36$ for water flow over 0.006 m³/s to 0.020 m³/s and head in a watercourse over 1.5 m to 5 m.

Studies have shown that the magnitude of the hydraulic shock head of the Ngu depends mainly on the pressure of the Nv watercourse, as well as on the length of the supply pipeline Ltr and the switching frequency of the shock valve n, with which the hydraulic shock head increases. Thus, with an increase in the head of the Nv watercourse from 0.78 to 5.33 m, the Ngu increases: from 15.7 m to 35.3 m at $L_{\text{tr}} = 3.5$ m; from 18.9 m to 32 m at $L_{\text{tr}} = 5$ m; from 14.8 m to 37.2 m at $L_{\text{tr}} = 7$ m and from 16.4 m to 36.6 m at $L_{\text{tr}} = 10$ m. With an increase in the water pressure, the switching frequency of the shock valve increases with its constant parameters: from 95.3 min^{-1} to 146 min^{-1} at $L_{\text{tr}} = 3.5$ m; from 65.3 min^{-1} to 127.8 min^{-1} at $L_{\text{tr}} = 5$ m; from 58.3 min^{-1} to 144 min^{-1} at $L_{\text{tr}} = 7$ m and from 50.7 min^{-1} to 125.3 min^{-1} at $L_{\text{tr}} = 10$ m, and the switching frequency increases with decreasing length of the feed pipeline. The actual closing time of the impact valve is from $0.1 \dots 0.3$ s, and the cycle time is $0.7 \dots 1$ s. When evaluating the technological process for the supply of a pumping unit, the optimal length zone of the feed pipeline is within $5 \dots 8$ m.

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ЭКОНОМИЧЕСКИЙ УЩЕРБ ПРИ ПОДОДЕРМАТИТЕ КОРОВ

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ECONOMIC DAMAGE WHEN COWS ARE PODODERMATED

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Аннотация. Исследовательская работа против пододерматита коров проводилась в частных животноводческих хозяйствах Масаллинского района Азербайджана. С этой целью исследованиям подвергнуто 64 голов крупного рогатого скота. Путем клинического осмотра, пальпации копыт определен характер опирания животного конечностью, наличие и степень хромоты.

Вследствие пододерматита коров хозяйству причиняется существенный экономический ущерб, которая складывается из снижения продуктивности животных, преждевременной выбраковки, вынужденного убоя, падежа, а также затрат на лечебно-профилактические мероприятия. Установлено, что при пододерматите коров экономический ущерб вследствие снижения мясной и молочной продуктивности коров составляет, в среднем 735 манат на голову.

Ключевые слова: пододерматит коров, хозяйство, нафталанская нефть, ущерб, продуктивность

Annotation. Research work against cow pododermatitis was carried out in private livestock farms in the Masalli region of Azerbaijan. For this purpose, 64 heads of cattle were subjected to research. Through a clinical examination and palpation of the hooves, the nature of the animal's limb support, the presence and degree of lameness were determined. As a result of cow pododermatitis, significant economic damage is caused to the farm, which consists of a decrease in animal productivity, premature culling, forced slaughter, mortality, as well as the cost of treatment and preventive measures. It has been established that with pododermatitis of cows, the economic loss due to a decrease in the meat and milk productivity of cows amounts to an average of 735 manats per head.

Key words: cow pododermatitis, farm, naftalan oil, damage, productivity

В связи с концентрацией, специализацией и интенсификацией животноводства возникает необходимость постоянного и систематического ветеринарного контроля за состоянием здоровья животных, своевременное проведение комплекса профилактических мероприятий, предупреждающих возникновения заболеваний животных и обеспечивающих высокую их продуктивность. Рост поголовья животных с улучшением продуктивных качеств, создание и разведение здоровых высокопродуктивных пород скота имеет важное значение при обеспечении населения продуктами питания [1, 2]. Несоблюдение условий

содержания животных, нерациональное кормление, содержание большого количества животных на малой площади и ряд других факторов способствуют развитию многих заболеваний у крупного рогатого скота. К числу таких заболеваний относятся болезни копыт, в частности пододерматит коров, который составляет большой процент среди заболеваний конечностей. При пододерматите у животного наблюдается нарушение двигательной активности, ухудшение общего состояния, снижение мясной и молочной продуктивности, при котором хозяйству причиняется существенный экономический ущерб, складывающийся из снижения молочной и мясной продуктивности скота, снижения репродуктивной функции, потери племенной ценности животных и преждевременной их выбраковки [3, 4].

Причиной развития пододерматита коров является контакт с внешней средой, сырость животноводческих помещений, повышенная влажность, неправильная расчистка и повреждение копыт, а также нарушение ветеринарно-санитарных требований. При пододерматите животное долгое время находится в лежащем состоянии, отмечается воспалительный процесс в копытах, припухлость кожи венчика, мякиша и межкопытной щели, а также флегмоны в области венчика. Иногда болезнь сопровождается гнойно-воспалительным процессом, которая приводит к нарушению двигательной активности животных. При клиническом осмотре у больных животных отмечаются патологические очаги, истончение рогового слоя копыт, наличие обильного гнойного экссудата с примесью крови и выраженным зловонным запахом. Животное с трудом опирается на больную конечность, держа ее полусогнутой в суставе. При пальпации копыт ощущается повышение местной температуры, припухлость и сильная болезненность.

Пододерматит причиняет животноводческим хозяйствам существенный экономический ущерб. Среднесуточный удой молока снижается от 26 до 40 %, наблюдается преждевременная выбраковка животных, которая достигает 56-60 % [5, 6].

Проведение лечебно-профилактических мероприятий позволяет предотвратить не только причиненный экономический ущерб, но и способствует достижению высокой эффективности производства, которая в значительной степени зависит от применения доступных и высокоэффективных химиопрепаратов [7, 8].

Целью наших исследований является определение экономического ущерба, причиненного животноводческим хозяйствам при пододерматите коров вследствие снижения молочной и мясной продуктивности.

Оздоровительные мероприятия при пододерматите коров проводились в частных животноводческих хозяйствах Масаллинского района Азербайджанской Республики. Путем клинического осмотра копыт 64 голов коров определен характер опирания животного конечностью, а также наличие и степень хромоты.

У 24,4% животных отмечалась хромота в различной степени с воспалительным процессом (абсцесс) конечностей.

Экономический ущерб при пододерматите коров вычисляется с учетом показателей ущерба. Следовательно, ущерб, причиненный животноводческим хозяйствам, определяется по нижеследующим данным:

$$Y = Y_1 + Y_2$$

Y - ущерб при пододерматите коров вследствие снижения мясной и молочной продуктивности:

где Y_1 - снижение молочной продуктивности

Y_2 - снижение мясной продуктивности

Если за один лактационный период у здоровой коровы количество доенного молока составляет 3000 литров, то при болезнях копыт оно снижается на 15%. Количество молока коров уменьшается на 450 литров.

При стоимости одного литра молока 0,70-0,80 манат, ущерб, причиненный хозяйству, составляет $450 \text{ л} \times 0,70 \text{ м} = 315 \text{ манат}$

Живая масса коров при болезнях копыт уменьшается, в среднем, на 15-20%. При живой массе животного, приблизительно равной 300 кг, оно снижается, в среднем на 60 кг.

Если стоимость одного килограмма мяса равна 7 манат, то ущерб, причиненный хозяйству, составляет 420 манат.

Таким образом, установлено что экономический ущерб при пододерматите коров в результате снижения мясной и молочной продуктивности коров, составляет, в среднем, 735 манат на одну голову.

Для предотвращения пододерматита коров необходимо строгое соблюдение санитарно-гигиенических норм, создание научно-обоснованных условий содержания, кормления, а также эксплуатации животных. Своевременное выявление животных с неправильной постановкой конечности и деформированными копытцами, а также проведение лечебно-профилактических мероприятий против пододерматита способствует росту продуктивности скота и сокращению потерь в животноводстве.

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ОЦЕНКА ВОСПРОИЗВОДИТЕЛЬНОЙ СПОСОБНОСТИ БЫКОВ-ПРОИЗВОДИТЕЛЕЙ И ЕЁ КОРРЕКЦИЯ

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Ключевые слова: быки-производители, воспроизводительная способность, Е-селен, электровибромассажёр.

Введение

Разведение племенных быков в Казахстане имеет стратегическое значение для развития животноводства. Сельхозформирования активно работают над улучшением породы скота, чтобы получить высококачественную продукцию.

Применение племенных быков-производителей в Казахстане является важным направлением развития сельского хозяйства и способствует повышению количества высокопродуктивных животных.

Одним из резервов повышения продуктивности скота является реализация генетического потенциала на основе рационального использования физиологических особенностей животных в определенных технологических условиях [1, 2].

Современная ветеринарная наука решает проблему повышения репродуктивных способностей производителей сельскохозяйственных животных при помощи биологически активных препаратов- витаминов, макро- и микроэлементов, растительных препаратов, а также используя физиологические методы – дозированный прямой контакт самцов-производителей с половозрелыми самками животных в состоянии охоты.

Известны различные способы повышения воспроизводительной функции быков-производителей. По механизму воздействия их можно подразделить на три группы:

- 1) гормональная стимуляция,
- 2) неспецифическое воздействие (витамины, адаптогены, минеральные комплексы, иммуностимуляторы и.д.),
- 3) физические воздействия (массаж, УВЧ-воздействие, электростимуляция половой системы и т.д.).

К способам увеличения количества и улучшения качества спермы у быков-производителей относят применение комплекса биопрепаратов: ФСГ-супер, простагландин F-2 α -эстрофана, сурфагона, иммуномодулятора биоинфузина и витаминного препарата - тетравита [3]. Способ предполагает проведение последовательных инъекций перечисленных препаратов быкам-производителям через различные интервалы времени.

Эффективные дозы всех указанных гормональных, витаминных и иммуностимулирующих препаратов дороги, а множественные инъекции стрессируют животных, трудоемки и нетехнологичны. Для оценки состояния животных, прогнозирования продуктивности, проведения селекционной работы часто используются показатели крови, изменения которых определяются не только периодами развития животных, но и природно-видовыми признаками, конкретными условиями производства, окружающей среды. Поэтому изучение закономерностей индивидуального развития животных, особенно племенных, позволяет управлять физиологическими процессами в определенном возрасте [4, 5].

В этом направлении заслуживает внимания оценка обмена веществ, связанных с гормональным статусом организма, что позволяет выявить физиологические и биохимические механизмы его роста и развития, определить продуктивные свойства, репродуктивную способность, качество продукции и др. [6]. Эти аспекты имеют отличительные черты у разных пород крупного рогатого скота [7].

Известен метод применения УВЧ-терапии быков-производителей при артрозе и низких показателях качества спермы. Суть метода заключается в том, что быкам, больным в начальной стадии артрозом, сочетанным с паранхиматозным простатитом, везикулитом и бульбоуретральным аденитом, проводили УВЧ-терапию аппаратом «Вета» методом ректального наложения электродов, при этом напряженность электрического поля УВЧ составляла от 20 до 30 Вт, экспозиция 15 минут, курс- 8-10 сеансов. После 4-5 сеансов УВЧ-терапии при ректальном исследовании установлено значительное снижение припухлости пузырьковидных и бульбоуретральных желез. После курса процедур было зафиксировано увеличение объема эякулята, достоверное улучшение показателей крови. Было выявлено анальгезирующее действие электрического поля УВЧ при ректальном расположении электродов [8].

В связи с этим целью исследований было коррекция репродуктивной способности быков-производителей путем клинико-эхографического, лабораторного исследования половых органов, применения витаминно-микроэлементных препаратов и вибромассажера.

Материалы и методы исследования

Исследования проводили в АО «Асыл тулик», Акмолинской области на быках казахской белоголовой, герефордской, аулиекольской, голштинской и симментальской пород молочного и мясного направления продуктивности.

Материалы исследования: быки-производители, сперма, средства для проведения клинических исследований, оценка качества спермы (УЗИ, микроскоп, фотометр), автоматический биохимический анализатор «BioChem FC-200», электро-вибромассажер производства СКБ зооветеринарного приборостроения «СОЮЗВЕТНАБ» МСХ СССР.

Исследовали качество спермы с помощью макроскопических методов определяли объем, запах, цвет, консистенцию спермы. Микроскопическими методами применяя технологию «CASA» устанавливали подвижность, концентрацию спермиев, процент живых и мертвых спермиев, процент нормальных и патологических спермий.

Биохимический анализ крови-определяли с помощью автоматического анализатора «BioChem FC-200» [9].

Клинико-эхографическое исследование половых органов быков проводилось ультразвуковым сканером EMP 9 VET с использованием конвекторного датчика частотой 2.5 MHz.

Исследование половых рефлексов быков-производителей проводилось по методике отраженной в методических указаниях по диспансеризации быков[10].

Основные результаты исследований

В АО «Асыл тулик» оценка качества получаемой спермы быков-производителей в зависимости от направления продуктивности и их возраста проводилось на быках казахской белоголовой (n=11), симментальской (n=4) аулиекольской (n=2), герефордской (n=2), голштино-фризской (n=4) пород. Результаты исследований отражены в таблице 1.

Таблица 1. Качество спермы быков-производителей по направлению продуктивности в АО «Асыл тулик»

Порода	Объем(мл)	Подвижность (балл)	Концентрация мл/млрд
Казахская-белоголовая (n=11)	2,84±0,4	8±0,03	0,7±0,14
Аулиеколь (n=2)	3,15±0,35	8±0,04	0,7±0,14
Герефорд (n=2)	2,65±0,21	8±0,06	0,8±0,14
Симментал (n=4)	3,025±0,7	8±0,04	0,7±0,17
Голштин (n=4)	2,3±0,17	8±0,09	0,7±0,09

По результатам таблицы 1 видно что по показателям объема спермы больше было у быков аулиекольской, по подвижности быки казахской-белоголовой, а по концентрации спермиев у быков герефордской породы.

После проведенной оценки воспроизводительной способности быков производителей по качеству спермы животных разделили на 4 группы. I группа – с высокой воспроизводительной способностью; II группа – с хорошей воспроизводительной способностью; III группа – с пониженной воспроизводительной способностью; IV группа – неспособные к воспроизводству. Результаты исследований отражены в таблице 2.

Таблица 2 – Оценка воспроизводительной способности быков-производителей на основе исследования качество спермы

Группы	Показатели			Породы				
	Объем (мл)	Концентрация 1 мл,млрд	Подвижность спермиев	Каз.бел /n=11	Голштин /n=4	Симментал /n=4	Герефорд /n=2	Аулиеколь /n=2
I	Не менее 3 мл	Не менее 0,9	Более 8	1 (8,3%)	-	-	-	-
II	Не менее 2 мл	Более 0,8	Не более 8	6 (50%)	4 (100%)	2(50%)	1 (50%)	1 (50%)
III	Менее 2 мл	Не менее 0,8	Не менее 7	2 (16,7%)	-	2(50%)	1 (50%)	1 (50%)
IV	Асперматизм	Менее 0,8	Менее 7	3(25%)	-	-	-	-

В результате исследований качества спермы быков производителей были определено процентное соотношение групп по показателям объема, концентрации и подвижности спермиев. Лучшие показатели были определены у быков голштинской породы они отнесены к группе с хорошей воспроизводительной способностью ко II-группе. К группе с высокой и хорошей воспроизводительной способностью отнесены также 58,3% быков

казахской-белоголовой породы, 50% симментальской, герефордской и аулиекольской пород.

На основании оценки воспроизводительной способности быков было проведено исследование биохимического состава крови у животных III/IV группы. Результаты исследований отражены в таблице 3.

Таблица 3. Результаты лабораторного биохимического анализа крови быков

Проба	Состав				
	Альбумин, г/л (35-50 г/л)	Кальций, моль/л (2,15-2,5)	Магний, моль/л (0,8-1 моль/л)	Фосфор, моль/л (0,87-1,45 г/моль)	Общий белок, г/л (65-85 г/л)
1	35,9	2,38	0,80	0,50	84
2	27,3	2,35	0,74	0,45	90
3	23,8	2,15	0,82	0,35	80
4	26,7	2,31	0,82	0,42	84
5	29,3	1,95	0,82	0,32	96

Данные таблицы 3 показывают что содержание альбумина оказалось ниже нормы у 80% быков(n=4), а из 5 быков, содержания кальция и магния ниже нормы у 20%(n=1), содержания фосфора у всех быков было в 2 раза ниже нормы. Содержание общего белка выше нормы было 40%(n=2).

Ультразвуковое исследование семенников у быков выявило гомогенную гипозохогенную структуру семенников средней плотности. В семенниках при внешнем вращении регистрировалась продольная полоса усиленных эхосигналов, исходящих от срединных линейных структур. Область эхограммы, соответствующая придаткам быков, имела среднюю плотность. Изменений в средостении и в придатках нет. По периферии придатков патологического выпота в общей влагалищной оболочке не выявлено.

В ходе исследования отслеживались половые рефлекс быков-производителей. Результаты исследований отражены в таблице 4.

Таблица 4. Результаты исследования быков по качеству спермы и проявлению половых рефлексов

Показатели	Породы	I	II	III	IV
Объем	герефорд		2		
	каз.бел	5	6		
	симментал	2	2		
	аулиеколь	1	1		
	гольштин		4		
Всего	23	8	15		
Концентрация	герефорд	1			1
	каз.бел	2		2	7
	симментал	1			3
	аулиеколь			1	1
	гольштин			1	3
Всего	23	4		4	15
Подвижность	герефорд			2	
	каз.бел			11	
	симментал		1	3	
	аулиеколь	1	1		
	гольштин		2	2	
Всего	23	1	4	18	
Обнимательный рефлекс	герефорд			1	1
	каз.бел			9	3
	симментал			3	1
	аулиеколь			2	
	гольштин			4	
Всего	23			19	4
Совокупительный рефлекс	герефорд	1		1	
	каз.бел	3	4	4	
	симментал	1	2	1	
	аулиеколь	1	1		
	гольштин	1	2	1	
Всего	23	7	9	7	

Исследование воспроизводительной способности быков-производителей показало, что по объему спермы 8 быков относятся к I группе, а остальные 15 ко II, по концентрации 4 быка к I ещё 4 к III а остальные 15 к IV группе, по подвижности к I группе 1 бык, к II группе 4, а к III группе 18 быков.

Быки получали ректальный массаж с помощью электро-механического вибромассажера один раз в 2 дня 20-30 мин[11]. Курс 8 сеансов. Также быкам внутримышечно вводили препарат Е-селен по 12 мл на каждого быка (табл.-5)

Таблица 5. Результаты применения вибромассажера быкам с пониженной и неспособной воспроизводительной способностью

Быки	До исследований			После исследований		
	Объем (мл)	Подвижность (балл)	Концентрация 1 мл (млрд.)	Объем (мл)	Подвижность (балл)	Концентрация 1 мл (млрд.)
Алтай	3,0±0,06	4±0,04	0,8±0,02	4,0±0,05	4±0,05	0,8±0,04
Арыстан	3,4±0,05	4±0,06	0,4±0,01	4,5±0,04	4±0,06	0,4±0,02
Асыл	3,0±0,07	4±0,03	0,4±0,03	3,5±0,06	4±0,04	0,4±0,03
Ертис	3,0±0,05	4±0,04	0,4±0,02	4,0±0,07	4±0,06	0,4±0,01
Колос	3,5±0,08	4±0,05	0,4±0,03	4,2±0,05	6±0,03	0,8±0,02

По результатам применения вибромассажера наблюдалось увеличение объема спермы на 16-33% у всех опытных быков. При этом показатели подвижности, концентрации сперма данных быков-производителей не изменились.

Заключение

Результаты исследования воспроизводительной способности быков производителей показал лучшие показатели у быков голштинской породы которые отнесены к II группе с хорошей воспроизводительной способностью. К этой группе отнесены 58,3% быков казахской-белоголовой и 50% симментальской, герефордской и аулиекольской породы.

Исследования биохимических показателей крови быков с пониженной воспроизводительной способностью и неспособных к воспроизводству показало низкое содержание альбумина у 80% исследованных животных. Низкое содержание фосфора, кальция и магния при повышенном содержании общего белка у 40% быков.

Применение электромеханического вибромассажера 20-30 мин 1 раз в 2 дня, курс 8 сеансов позволило увеличить объем спермы быков на 16-33%.

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Pedagogical Sciences

CREATING TASKS TO ASSESS THE LEVEL OF KNOWLEDGE IN COMPUTER SCIENCE USING ARTIFICIAL INTELLIGENCE

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Abstract

The article is devoted to the application of artificial intelligence methods to assess students' knowledge in the field of computer science. Traditional and innovative approaches to assessment, such as adaptive testing and virtual modeling, are considered. The possibilities of machine learning for an objective assessment of various competencies are described. Ethical aspects and the need for professional development of teachers are also touched upon. The article concludes that the effective use of artificial intelligence in creating assessment tasks makes it possible to improve the quality and personalize the educational process.

Keywords: *artificial intelligence, education, knowledge assessment, computer science, assessment tasks, assessment methods, traditional assessment methods, innovative approaches to assessment*

Artificial intelligence is an interdisciplinary field of research aimed at creating intelligent systems capable of thinking and making decisions in the same way as human intelligence [1]. Currently, educational platforms are being developed, equipped with interactive learning systems based on artificial intelligence technologies, chatbots to help in learning the material, as well as tools for monitoring and analyzing student academic performance. Such use of artificial intelligence in the field of education has prospects for increasing its effectiveness and individualization.

Traditional forms of control, such as tests and abstracts, do not always allow a comprehensive assessment of all types of necessary competencies. In this regard, it is relevant to search for innovative approaches to the assessment of knowledge using the achievements of artificial intelligence[2]. The development of artificial intelligence technologies and their impact on learning processes and evaluation of learning outcomes are the key aspects that most attract the attention of researchers and practitioners. Automated assessment systems, adaptive testing based on artificial intelligence and other innovative approaches to education assessment are modern solutions aimed at improving the quality of education and increasing the effectiveness of the educational process. This indicates the relevance of the topic of the use of artificial intelligence in the assessment of education in terms of the rapid development of information technologies and their impact on modern education.

The most common approach to assessing the level of students' knowledge in the field of computer science is traditionally tests in the format of multiple-choice assignments, assignments, etc. This approach allows an objective assessment of the studied theoretical material. Another widely used method is writing in the form of an essay or essay on a specific topic. This type of assessment allows you to evaluate the ability to structure and present information in writing. The advantage of traditional approaches is the simplicity of their implementation and the possibility of an objective assessment of individual elements of knowledge[3]. However, they do not take into account the practice-oriented nature of the discipline and do not allow a computer science specialist to comprehensively assess all types of necessary competencies, for example, solving practical problems, working with digital data, using information technologies[4].

The development of artificial intelligence has opened up new possibilities for assessing competencies in a variety of professional fields. One of the most promising applications of AI is in creating interactive tasks that utilize virtual and advanced modeling techniques. Through virtual reality and simulation, AI can generate realistic scenarios and conditions to evaluate practical skills. Complex tasks can be modeled to closely mirror real-world job responsibilities. Learners are then able to demonstrate their competency through their performance and decisions within these simulated environments[5].

By developing virtual workspaces and scenarios, competency assessment moves beyond traditional written or verbal tests. Interactive simulations allow for a holistic evaluation of how learners apply their knowledge and skills in practical, job-relevant contexts. Rather than isolating specific facts or theories, virtual modeling assesses how learners integrate and perform competencies as they would be required to do in professional practice. This provides a more comprehensive picture of an individual's qualification for a given role.

Another beneficial use of AI is employing machine learning algorithms to analyze metrics captured during interactive simulations. Large datasets on learner performance and outcomes can be mined to gain valuable insights. Pattern recognition through machine learning helps identify core competencies and their components that are most predictive of success. It also enables more objective scoring by flagging anomalies or biases in individual assessments. Over time, assessment models are refined using predictive analytics to more accurately evaluate competency levels.

Adaptive testing powered by AI is also beneficial for customized learning paths. By analyzing performance data, systems can select optimally challenging next steps for each learner. Tests and simulations can be tailored to pinpoint strengths or gaps for targeted improvement. With individualization, both assessment and subsequent training are optimized based on prior results. This facilitates efficient competency development aligned with proficiency standards.

In summary, AI shows great potential in advancing competency assessment practices, particularly through interactive virtual modeling. When combined with machine learning and adaptive methodologies, competency evaluation can approach unparalleled levels of relevance, rigor, and insight to optimize professional training and certification. Data-driven assessment powered by artificial intelligence is poised to transform the field.

One of the promising areas is the use of large amounts of data on the results of various tasks to assess the level of formation of different competencies. At the same time, clustering, classification and correlation analysis methods are used to isolate samples. Based on deep learning, neural network models are being developed that allow students to obtain the results of completing tasks at the entrance, and at the exit to form an assessment of the level of mastery of a specific type of competence[6]. At the same time, the models independently identify the most significant features characterizing this competence. The use of neural networks makes it possible to automate the process of analyzing large amounts of data received from students while performing test and practical tasks. This allows us to quantify the dynamics of the formation of professional skills and competencies in the learning process, as well as to identify the individual

characteristics of each student. The advantage of these approaches is the objectivity and accuracy of the assessment, as well as the possibility of a comprehensive assessment of all types of not only knowledge, but also competencies. This will make it possible to meet the requirements of the labor market as much as possible[7].

The introduction of artificial intelligence into the process of developing tasks to assess the level of knowledge in computer science, in addition to positive aspects, is also associated with a number of difficulties and limitations.

One of the main problems that arise when introducing artificial intelligence technologies into the educational process are issues of ethics and protection of students' personal data. There is a real threat of confidential information leaking and falling into the hands of third parties. This requires the development of clear regulatory requirements for the use of intelligent systems in education, regulating the processing and storage of personal data of students.

In addition, it is necessary to eliminate the possibility of discrimination in the work of training systems. For the full integration of artificial intelligence, a significant level of competence of the teaching staff in this field is required. This involves the development of effective professional development programs that form the skills of working with artificial intelligence tools and the ability to use students' opportunities to develop their critical thinking[8].

An equally important task is to ensure the compatibility and interaction of various software tools used in the educational process to prevent technical failures and failures in the operation of neural networks. Thus, the use of artificial intelligence in the assessment of knowledge in computer science allows you to automate the process of checking assignments and provide students with additional feedback. The results of such a review can be useful in developing computer science knowledge assessment tasks using artificial intelligence for several reasons:

Identifying best practices: research can identify the most effective methods and approaches to using artificial intelligence in education, helping to identify best practices for creating computer science knowledge assessment tasks.

Identifying problems and challenges: The results of the review can also reveal the problems, challenges and limitations that researchers and practitioners face when using artificial intelligence in education. This allows you to take these aspects into account when developing tasks.

Inspiration for new research: The analysis of existing research can inspire new research projects and research aimed at improving knowledge assessment methods using artificial intelligence[9].

Thus, a systematic review of empirical research on the use of artificial intelligence in higher online education can provide valuable scientific data and recommendations that can be used in the development of computer science knowledge assessment tasks using artificial intelligence. The development of tasks for the assessment of knowledge in computer science using artificial intelligence opens up new opportunities for improving the learning and assessment processes of students. The effective use of artificial intelligence in creating tasks allows you to personalize the educational process, improve the quality of knowledge assessment and make learning more effective and exciting for students.

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MODERN TRENDS IN EDUCATION

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Annotation. The article examines the main trends in the development of education systems in different countries and proposes a version of the main trends in the education system of Kazakhstan. The most important aspect of the development of a high-quality learning process is a favorable environment for the educational process, in which not only students, but also teachers actively participate. The main trend in education is a comfortable state for all participants in the learning process. The teaching staff should experience a favorable state of health in the process of educational activities and motivate students to be creative by their example. Maintaining positive emotions and a state of confidence among students in their actions will contribute to a favorable atmosphere in the classroom. The constant desire for self-improvement and mastery of new technologies among teachers should be supported and encouraged by the administration of the educational institution.

Keywords: education trends, artificial intelligence, educational environment, emotional well-being

Introduction

Currently, all educational institutions are faced with the problem of the need to move from teaching to learning. There is a need for transformation not only of the educational process, but also of the acting transmitter of accumulated knowledge and skills - the teacher. The pace of introduction of new technologies has destroyed the monopoly of teachers on knowledge. Any student has the opportunity to find any course with a wide variety of delivery methods and techniques.

The knowledge gained in the learning process is information based on a set of facts and the possibilities of their application in a specific area. Skills can be acquired, applied and interpreted throughout life. In order to increase the interest of students in studying the disciplines of their chosen training programs, it is necessary to apply modern teaching methods and completely new pedagogical techniques. The most relevant trend is the STEAM program.

STEM (science, technology, engineering, math) is a training program that combines classes in natural sciences, technology, engineering and mathematics. Sometimes the letter A (arts) is added to the abbreviation - art, humanities. The approach of this education trend is based on a combination of theoretical and applied skills. For example, adding art activities to science and math lessons can help all students gain a better understanding of STEM subjects. And it improves creativity—a useful skill for any academic subject [1]. Additionally, the STEAM curriculum provides students with a more well-rounded and hands-on education than STEM alone [2].

If we analyze research on the level of information perception using various methods, we can conclude that the most effective methods are performing practical exercises (75% of the information is absorbed) and performing independent tasks and explaining to others, when up to 80% of the information is absorbed. This means that such a method of conducting classes as the “Flipped Classroom” gives a greater effect. Using STEM to study a traditionally difficult subject like physics allows you to understand Newton's laws much faster. If a child himself turns on animation and edits a film about a falling apple, then the understanding of the law of universal gravitation need not be explained to him; he independently discovers this law for himself.

It is generally accepted that the acronym STEM existed before the early 2000s. Although the existence of the acronym does not help attract students' attention to learning, it is symbolic and helps draw attention to STEM education efforts. Most of the publications in the field of STEM education research were contributed by authors from the United States, where STEM and STEAM education can be considered to have originated. Australia, Canada and Taiwan can be considered the next active supporters of the new system. At the same time, authors in some countries and regions of Asia have become very active in this field over the past few years. The results show that research in the field of STEM education is becoming increasingly important at the international level, which means that Kazakhstan needs to develop this area.

Another trend in education that cannot be ignored is the use of artificial intelligence (AI) in education. 2022 can be considered the beginning of the use of LLMs (Large Language Models) such as ChatGPT and Bard. Artificial intelligence tools and technologies not only increase speed in efficiently collecting information, but also become an integral part in the routine work of a secondary school teacher and a higher education teacher.

Artificial intelligence is an interdisciplinary field that draws broadly from computer science, data science, science, humanities, mathematics, social science, and other disciplines.

There are many subject areas of AI technology. These subject areas are closely interconnected and rapidly evolving, so it is difficult to capture the relevance of all such technical areas on a single map.

AI research covers aspects such as “learning, recognition and prediction”, “inference, knowledge and language” and “identification, search and creation”. AI in education offers unique perspectives by enabling the creation of personalized curricula tailored to each student's needs, as well as the development of problem-solving, critical thinking, and creative learning skills.

Promising artificial intelligence technologies in education can be used:

- for automatic generation of tasks with a given psychometric complexity;
- for other purposes aimed at qualitative improvements in the educational process and the activities of educational organizations.

The combination of the described artificial intelligence technologies can be used for autonomous learning without the intervention of a teacher through an artificial intelligence tutor [3]. Computer vision technologies make it possible to convert the student's input information into machine-readable form. Machine learning and data analysis technologies make it possible to formulate a student's personal educational trajectory and conduct assessments.

AI agents are used by teachers and scientists:

- in creating educational cases, test tasks, tasks on a specific topic;
- for the development of interactive educational applications, interactive simulators and 11 virtual laboratories;
- in the creation of interactive educational materials, in the modernization of training sessions;
- providing individualized support to students;
- to adapt the educational process for students with special needs;
- to optimize class schedules, resources and classrooms;
- to analyze students' performance based on their activity and results, providing recommendations to improve their educational experience;
- to search and study new reliable information in the process of conducting research work.

Currently, advanced technologies in the field of artificial intelligence are not only changing our lives, but also influencing education in general. Artificial intelligence has become an integral part of the education sector, providing new opportunities to improve the learning process and contributing to the development of students' intellectual activity [5].

The implementation of these trends is possible both in schools or universities, and in online courses. If you want to implement them, and also effectively use the opportunities of digital education, use SkillSpace. This is a platform for creating and promoting online schools. Here you can start any training - from programming courses to personal growth training. And thanks to simple templates and convenient tools, this can be done even without experience [6].

Materials and methods

Research work to determine educational trends was carried out using statistical analysis of publications and, to a greater extent, the survey method using 3KL (Russian Moodle) - an e-learning environment that allows you to create training courses and organize the educational process. Thus, a survey was conducted during a professional development training seminar. The number of participants was 200 people, of different ages, with different teaching experience and languages of instruction. The number of survey participants from 12 universities in Kazakhstan in all regions of the country.

Results and discussion

As a result of working with groups of higher education teachers in the context of conducting advanced training courses "Digitalization in Education of Kazakhstan", such tendencies and trends as gamification (gamification) and blockchain were identified.

The emergence of online learning, technology education, and gamification also opens up many opportunities for educators and their institutions. The introduction of artificial intelligence, big data, cloud technologies, Internet of Things, mobile learning and virtual reality can potentially enrich gamified learning [7]. Исследования показывают, что геймификация вырабатывает дофамин в вашем мозгу, что делает обучение более приятным и полезным, а также полезным. Благодаря использованию баллов, наград и таблиц лидеров учащиеся становятся более вовлеченными в урок и с большей вероятностью захотят участвовать в нем в будущем [8].

Gamification increases the chances of practical application of educational concepts because it encourages students to use their imagination to solve problems or complete tasks. Gamified practices turn teachers into trainers who provide detailed insight into the real-life application of the subject [9].

It turned out that the use of games in the learning process was and is currently used almost everywhere in elementary school, and the need for blockchain appeared precisely thanks to digitalization. Blockchain technology is a mechanism for recording information to authorize and preserve intellectual property. Blockchain makes the system difficult to change, hack, or manipulate, which is vital for security and maintaining the integrity of individual certificates. Questioning is the simplest method of monitoring the educational system and therefore its implementation has become a source of assessment of modern higher education teachers. The main and first question of the questionnaire was the question: Do you have your own digital portfolio? Analysis of the responses allows us to conclude that the level of mastery of digital technologies is insufficient. The breakdown by educational programs demonstrated the leadership of teachers, primarily those who speak foreign languages (translation studies, foreign language teachers).

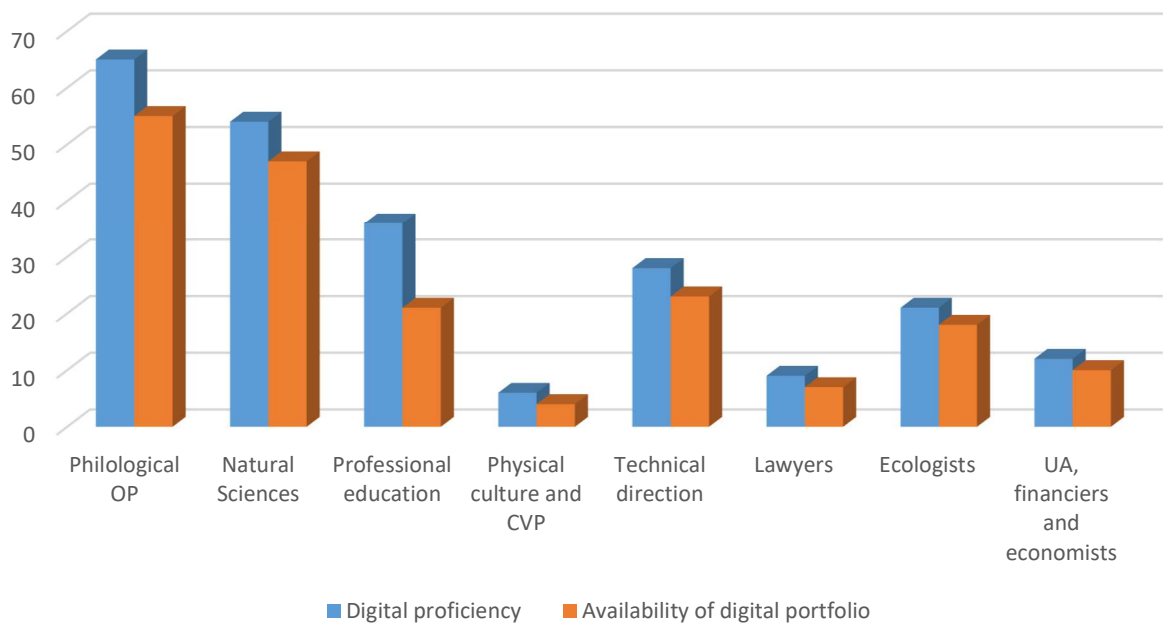


Figure 1 – Results of a survey among representatives of different educational programs

The breakdown by age group allows us to draw a conclusion about the promising preferences of young teachers and their understanding of modern trends. When asked the same question about the digital portfolio, the youngest audience became the leaders, which looks quite harmonious. What was surprising was the low percentage in the middle group of teachers, which suggests a certain “classical ossification.”

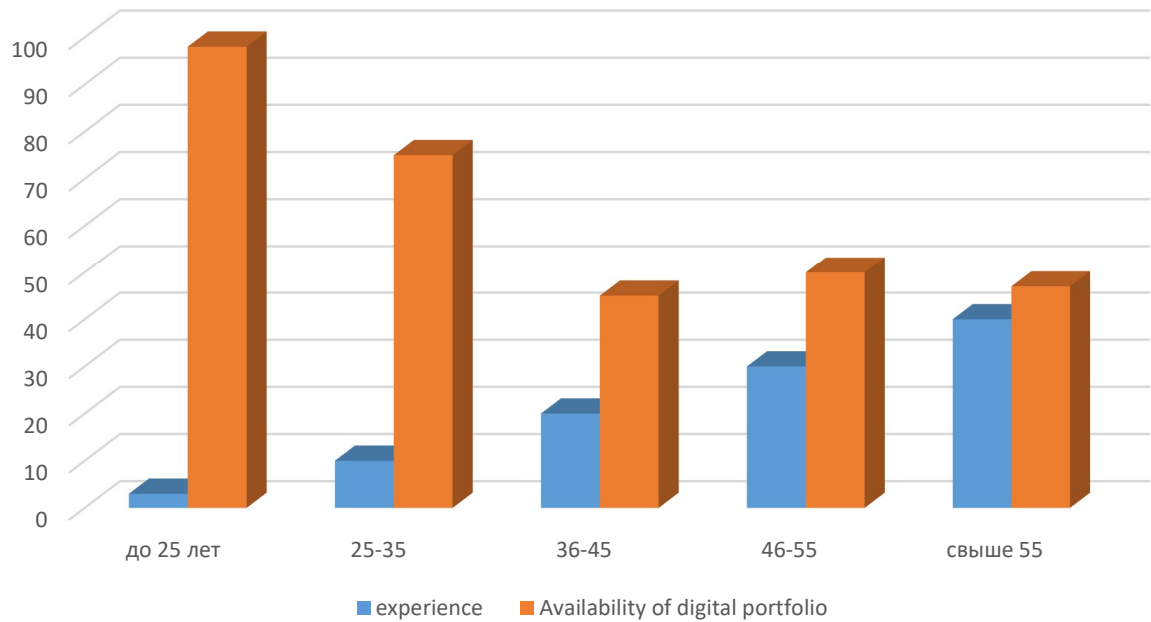


Figure 2 – Availability of digital portfolio by age group

Conclusion

Integrating digital technologies into modern education not only enriches the learning experience and promotes more effective learning, but also develops the skills necessary to successfully adapt to the digital age. This helps graduates be prepared for a rapidly changing world and solve complex problems using modern tools [10].

A person who not only has the professional knowledge of a teacher, but also has modern skills in using digital technologies and corresponds to modern trends in education is required to guide, show and support the student in the learning process.

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浅谈语言教学中提升外国学生自学语言能力的有效途径

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摘要: 在汉语教学中怎样提升外国学生自学语言能力是摆在语言教学工作面前的重大问题。目前汉语教师队伍当中存在这样一种不太正常的偏见，他们认为汉语教学法的学习和研究是个别教授教学法老师的需要和任务，跟我们无关。其实汉语教学法与汉语教学密不可分。汉语教学法的研究成果理应始终贯穿于汉语教学实践的全过程。每位从事汉语教学工作的教师应当是汉语教学法研究成果和汉语教学方法的践行者。汉语教学法的研究成果以及在汉语教学实践当中总结出来的行之有效的教学方法对教学实践应该起指导作用。

关键词: 汉语 教学法 提升 难点 存在 问题 比较

Talking about effective ways to improve foreign students' self-study language ability in language teaching

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Abstract: At present, there is such an abnormal prejudice among Chinese teachers. They think that the study and research of Chinese teaching methods are the needs and tasks of individual teaching method teachers, and have nothing to do with us. In fact, Chinese teaching methods are inseparable from Chinese teaching. The research results of Chinese teaching methods should always run through the whole process of Chinese teaching practice. Every teacher engaged in Chinese teaching should be a practitioner of the research results of Chinese teaching methods and Chinese teaching methods. The research results of Chinese teaching methods and the effective teaching methods summed up in Chinese teaching practice should play a guiding role in teaching practice.

Key words: Difficulties Existing Problems Comparison of Chinese Teaching Method Improvement

目前哈萨克斯坦高校汉语教学已经历了一段时间并取得了一些可喜的成绩。同时，在哈萨克斯坦本土汉语教学中也存在一系列问题有待研究解决。笔者曾经针对此类问题也有过一些研究探讨并写过一些文章。笔者合作撰写的学术论文于2010年在中国昌吉学院学报上刊登[1]。本文以实地调查的形式对哈萨克斯坦汉语教学的实际情况进行了全面的介绍。重点介绍哈国汉语教学的过去和现在，全面分析了当地汉语师资的特点及存在问题和汉语教材的发展趋势，有针对性地提出了切实改进汉语教学状况和扩展推广汉语途径的思路和建议。这篇论文的发表当时在中国国内和国外引起了比较大的反响并得到了汉语教学领域里同行们的一致好评。笔者曾经在中国国内的高等院校从事多年的汉语教学工作并先后担任汉语教研室负责人、中国语言系负责人等职务，从事汉语教学工作的同时还能直接参与教学管理工作。在长期从事汉语教学和管理工作的过程中，在汉语教学实践中存在的问题以及教学过程中遇到的一系列难题引起了笔者的关注，因此，笔者对教学中存在的现实（实际）问题的原因及其解决方法进行了思考和研究。笔者认为上述教学问题的产生有以下几个方面诸多原因，下面对产生上述问题的，客观和主观原因以及解决的方法提出欠缺不全的看法，仅供给大家参考。

我们认为汉语教学法的学习和研究是所有汉语教师的重要任务并且极其必要的。汉语教学法与汉语教学工作是密不可分的。汉语教学法的研究成果理应始终贯穿到汉语教学实践的全过程。每位从事汉语教学工作的教师应当是汉语教学法研究成果和汉语教学方法的积极的践行者。汉语教学法的研究成果以及在汉语教学实践当中总结出来的行之有效的教学方法对教学实践应该起指导作用。所以，我们在汉语课堂教学当中不能把汉语教学法的研究理论知识作为指导，片面地强调实践训练，这样必然会降低学生的学习兴趣。研究对外汉语教学理论的李珠和姜丽萍教授认为：“学生目的语能力的形成是以言语技能训练为前提的，因此许多教师认为在课堂上进行大量听、说、读、写的技能训练，学生就可以进行交际了，过分看重技能的训练”[1，49页]。教授们认为没有以理论知识为指导的实践教学不会取得预期的教学效果。两位教授还认为只有当知识转化为能力的时候，学生才能真正地运用。所以，我们认为汉语教师在课堂教学中进行大量的技能训练的同时，还要让学生正确地掌握语言的基本原理、基本知识。对学生有一个正确的引导，教学生将语言的原理和规律运用自如，才能培养学生的自学成才能力。下面我们举个具体例子来论证我们的观点。汉字的结构中首要部位是偏旁和部首。教师给学生讲解汉字基本知识是力所能及地讲述汉字偏旁的特点及其在学习和有效掌握汉字方面所起作用。比如：两点水，由两点水构成的汉字包含的意义与冷、冻、冰有关；由三点水构成的汉字包含的意义多与流动的液体：海、江、湖、潮、洒有关等。这样学生容易掌握汉字的基本特点，当学生熟练掌握有关汉字的知识就可以完全脱离教师的帮助，可以独立学习和掌握汉字。因为学生学习汉语的时间短，四年内不可能掌握所有汉语知识，教师通过自己掌握的教学方法指导学生的学习活动，对学生起一定的引导作用，而不是灌输作用，这样不仅减轻教师的教学负担，也可以提高学生的自学能力。下面我们谈谈汉语教师队伍中学习和运用教学法知识方面客观存在的一些问题以及解决的办法。

1. 目前哈国高校中对汉语教学法课程的重视不够。目前进行汉语教学的高校在汉语课程的设置过程中根本没有开设汉语教学法这门课程。管理层都认为开设汉语教学法课程对汉语教学质量的影响不大。所以，几乎所有高校内从事汉语教学的部门都没有开设汉语教学法课程。但中国国内的高校与其不一样，国内凡是有关汉语教学的课程中都有汉语教学法这门课程。有专门的教师讲授这门课程并有汉语教学法课程的全套教材以及配套的辅助教材。所以，在此我们建议在开设汉语课程的高校中领导应高度重视汉语教学法的重要性，理应开设汉语教学法课程。配备专门的具有教学经验并有过研究成果的汉语教师来承担这门课的教学任务。

2. 目前高校中从事汉语教学的教师来源五花八门。在开展汉语教学的高校中从事汉语教学的教师队伍不够健全。出现这种情况原因我们认为有以下几个方面。一、汉语

教师的来源不同，有的教师曾经从没从事过汉语教学，从别的行业直接转到教师行业。所以，这类教师不懂汉语教学的方法和技巧。有的教师虽然在高校一直从事汉语教学工作，但他们曾经修学的专业不是汉语专业，也就是存在专业不对口的问题。我们认为针对这类教师们提出学习和研究汉语教学法的严格要求。这样做的原因很清楚，诸如讲授汉语课的教师对汉语教学方法和知识一窍不通，那他们没有资格去讲授汉语课。解决的有效办法：对其提供学习和探讨汉语教学法的学习深造的机会，使他们及时地掌握汉语教学的有效方法。与此同时，在教研室范围内定期地对教师组织长期或短期的培训班，邀请有经验的汉语教师讲述自己所掌握的有普及价值的教学方法以及结合汉语教学的实际情况介绍自己的汉语教学经验。

3. 从事汉语教学工作的教师必须具备汉语教师应有的汉语教学资格。汉语教师应有义务参加由教研室组织的汉语教学法经验的培训，经过培训理应获得高校汉语教师资格证。从而不断提升汉语教师的教学效果。

我们认为在汉语教学过程中一定要注意以下三点问题。这些问题对教师的教学效果会产生一定的影响，而且这些问题一般会贯穿到汉语教学的整个过程。

关于汉语词语教学与汉字结构和语音结构的关系，教学法研究专家就针对对外汉语教学法面临的问题有新的看法。对外汉语教学法研究者姜欧在自己撰写的研究论文中阐述了自己较新颖的研究观点：“运用普遍联系的方法对词汇教学进行多侧面研究，从宏观着眼、微观入手分析词汇教学与整个对外汉语教学的关系，以及词汇教学同语法教学、语音教学、文字教学的关系”[2,117 页]。

一、汉字的结构问题。

1. 汉字的偏旁。汉语在世界众多语言的当中属于孤独语。所以，汉语具有不同于其他语言的独一无二的语音、文字结构和笔画笔顺等特点。其中汉字的结构对汉语初学者来说尤其重要。汉字与其它语言字母不同，汉字是形象字。是一种保留其根本性结构特点的古老字母。一般在汉语文字里大多数情况下一个字就是一个词语。所以，汉字比起其它的语言文字较多。在学习汉语过程中学习汉字掌握汉字尤为重要。那么我们怎样才能较快较好的学习，认识和掌握汉字呢？围绕这个问题的研究和探索过程中我们发现，若想更多的学习和掌握汉字要从汉字的结构入手最为重要。一般的汉字分为两个部分即偏和旁。

偏旁是对合体字进行第一次切分后得到的两个部分。从前程合体字的左方为（偏），右方为(旁)；现在把合体字的组成部分统称为“偏旁”。位于字的左边，叫“左偏旁”，位于字的右边，叫“右偏旁”。对汉语的初学者来说，尽量多一点掌握汉字偏旁对其学习掌握汉字产生很大的便利。也就是说记汉字变得容易而且不会轻易忘记。除此之外，学习偏旁有助于提高汉语学习者明白汉语词汇意义的能力。比如：两点水，由两点水组成的词语包含的意义与冷、冻、冰相关。汉语初学者一看由两点水组成的汉字就立即明白这个汉语词汇的相关意义。例如：三点水、女字旁、木字旁、提手旁、口字旁等。例如： 冫 两点水： 次、冷、准 1. 止 止字旁： 武 2. 冫 秃宝盖： 军、写、冠 3. 户 户字旁： 扇 4. 十 十字儿： 华 5. 礻 示字旁： 祖 6. 讠 言字旁： 论、计 7. 王 王字旁： 琅、8. 刂 立刀旁： 制、别、剑 9. 木 木字旁： 村、杜、极 10. 八 八字旁： 谷、分、公 11. 车 车字旁： 辆、输、轻等等。

二. 汉字的笔画问题。在学习汉语过程中怎样才能正确掌握汉字的笔画也是摆在我们面前的很重要的问题。因为汉字绝不是不同笔画的随便组合，而且其笔画的组合有一定的规律。什么样的汉字有什么样的笔画组成其有一定的科学性和规律性。掌握其组合的科学性和规律性对正确和更多地学习认识和记忆汉字有很大的帮助。正确掌握汉字的笔画能够有效克服我们在汉字记忆方面的障碍。提高我们对于汉字的记忆能力。提高我们认识和记忆汉字的时间速度。比如：横：一。一般由“横”组成的字不少。如：一、二、

三、十等；“竖”组成的字也有不少，如：十、王、木、主等。“撇”组成的字也较多，如：八、人、等。

三. 汉字的笔顺问题。在学习汉语过程中正确掌握汉字并且按笔画顺序顺利地书写汉字对初学汉语者来说也是尤其重要的问题。学汉语不仅要学习汉语的语音、词汇、语法还要学习汉字的文字，尽量多掌握更多的汉字。对于在整个汉语写作过程中又整齐又快速地书写汉字从而快速表达自己的思想意识和感情情怀尤为重要。上述方法有助于提高我们学习汉语的效果。汉字的写法有其约定俗成的顺序和规律。这种规律是在漫长的历史发展过程中，由汉民族无数的文学家、思想家和语言学家通过无数次的考证而得出的有一定科学性的顺序规律。按汉字的笔顺来书写汉字有助于提高我们的书写速度并且我们所写的汉字变为整齐和优美。汉字的笔顺一般分为一下四类：

A. 从上到下。也就是说，汉字的笔画按顺序从上面的笔画开始写，然后写才能写下面的笔画。比如：“王”字，先写上面的两个“横”，然后写一个“竖”，最后写一个“横”。

B. 从左到右。也就是说，汉字的笔画按顺序从左边到右边写。先写左边的笔画，后写右边的笔画。比如：“汉”字。先写三点水，后写“又”字等。

C. 先坐车后走车。也就说，先写汉字整体的上面的部分，然后写下面的部分。因为有些汉字整体上有上下两个部分组成。比如：“这”字，按笔画顺序先写上面部分“文”字，然后写“走字底”。

D. 先进门后关门。也就说由内外两个部分组成的汉字按笔画顺序，先写完内部的全部笔画之后才能写外面的笔画便是关闭门。比如：“国”字，先写国字结构内部的“玉”字，最后写国字外部的竖横折横。

二. 汉语的四声问题（声调）。

声调，是指声音的高低升降的变化。在现代汉语语音学中，声调是指汉语音节中所固有的，可以区别意义的声音的高低和升降。音乐中的音阶也是由音高决定的，可以用音阶来模拟，学习声调也可以借助于自己的音乐感。但要注意声调的音高是相对的，不是绝对的；声调的升降变化是滑动的，不像从一个音阶到另一个音阶那样跳跃式地移动。声调的高低通常用五度标记法：立一竖标，中分5度，最低为1，最高为5。普通话有四个声调：阴平，阳平，上声，去声。汉语的音节都有固定的声调，也就是我们所说的四声，这在别的语言中是很少见的。外国人学汉语，声调几乎是他们共同的难点。声调也是汉语语音中最敏感的部分，许多外国人说话总是洋腔洋调，就是因为没有把握准四声的区别。有个很有名的笑话，说一个外国小伙子去饭馆买东西吃，他很认真地望着女服务员，并认真地问到：“小姐，睡觉多少钱一晚？”女服务员一听，骂了一声：“流氓！”外国小伙子被当成流氓了，其实他很冤枉，他想问的是：“小姐，水饺多少钱一碗？”。这个笑话因为外国学生没有准确掌握汉语词语声调而造成的。

语音是语言的物质外壳，是能表达一定的意义的声音。社会属性是语音的本质属性。语音的社会属性表现在多方面：

1. 语音传递意义的功能是社会所赋予的。语音是语言符号的形式，它本身没有意义，但有传递意义的功能。这种功能只有当语音与一定的意义结合成为语言里的语素、词语时才有可能体现出来。比如国际音标[p、u、i]这几个音，它们在汉语普通话里可以作各种不同的组合，负载不同的意义，构成不同的词语，[pu51—i55]（布衣）、[u214—pi214]（五笔）、[pi214—u214]（比武）等。

2. 一种民族语言或方言里用什么声音表达什么意义，是任意的，是由社会因素决定的。比如表示“数目五，四加一后所得”的意思，英语中用[faiv](five)，汉语普通话中用[u214](五)，哈语中用“6ec”，这完全是由不同民族、不同地区的操该种语言或方言的人们约定俗成的，是社会上自然形成的习惯，与语音的自然属性无关。当然用某个音表示某种意义，一经社会公认和普遍使用，音义的联系就固定下来了，不能再随意改变。汉语的初学者理应掌握语言的这种语音规律。

3. 不同民族的语言或方言都有各自不同的语音系统。不同的语音系统所包含的音素及其数目都是各不相同的。例如，普通话里有舌尖元音英语和俄语里就没有。英语、俄语里有与清音相对立浊辅音，英语和汉语广州话里有舌叶音这些音普通话里都没有。不同民族的人对同一个音的敏感程度和发音能力也有很大差异。人们对母语中没有的音就常常发不准或分不清，如俄语的舌尖颤音[r]，法语的小舌颤音[R]，中国人学起来就很困难。同样外国人学汉语语音也会遇到种种困难，其实人类发音器官的构造基本上是相同的，为什么不同的人对同一个音的敏感程度和发音能力会有差异呢？其原因只能归结为不同民族不同地域人们的语言习惯不同。所以，多听，多练是唯一的解决方法。

4. 有些音在几种语言里都有，但是它们在各自的语音系统里的作用和地位却不一样。在英、俄语中送气或不送气并不重要，而在普通话中却是非常重要的，它可以区别意义。如：（部）[pu51]和 [phu51]（铺）；[tu51]（肚）和 [thu51]（兔）；（故）[ku51]和（裤）[khu51]中的 [p、t、k]和[ph、th、kh]有送气和不送气的区别，是不能相混的，因为它们有区别词形和词义的作用。

这两组音英语、俄语里也有，然而送气与不送气的区别却并不重要，因为它们不起区别词形和词义的作用。例如英语“park”与“spark”、“top”与“stop”、“kill”与“skill”里的“p、t、k”读成送气音或不送气音都不会引起意义的变化，最多只是听起来不顺耳，发音不标准。可见，音素在不同语音系统里的不同地位和作用，也是由社会因素决定的，与语音的自然属性关系不大。

从比较语言学的角度来辨别汉语的词汇和语法特点有助于学生科学地掌握汉语语言结构特点。所以给学生必须讲解世界四大语法结构及其结构特点。北京语言大学的崔永华和杨寄洲教授认为：“将所学习的语法点与学生的母语中相应的语法结构或项目进行比较，达到理解的目的。比较的是相同、相似，相异之处。特别要指出不同之处”[3., 74页]。

人类语言可以从不同角度分类，形态学分类法根据语法结构特点把人类语言分为孤立语、屈折语、黏着语、复综语四类。

孤立语 (Isolated language)

孤立语又称分析语或词根语，特点在于其一般不是通过词形变化（即词的内部形态变化，又称作屈折变化）来表达语法的作用，而是通过独立的虚词和固定的词序来表达语法意义。

孤立语的主要特点：缺乏形式变化；词大多由词根语素构成；词序严格；词序和虚词作为重要语法手段；复合词多，派生词少。

1、词在句子中属于何种成分无形态标志，完全靠语序表示。例：我帮助他/他帮助我

2、句子中词和词的关系通常靠虚词表示。例：我和弟弟去了/我的弟弟去了。

他被人打了/他把人打了。

单字的词占用书面空间非常小，但如果要全记得并纯熟应用这些单字的词，难度会比学习多字的词高很多，而且汉字/词的数量也会无止境的增加下去，因此这种方法渐渐发展到了尽头（英语则不同，所以词汇量持续增加）。

如今，许多南方的方言中仍然保留着许多古代汉语遗留下来的单字的词。如“褛”（外套）；“衫”（衣裳）等。除了汉语外，彝语、壮语、苗语、越南语等，都是“孤立语”。

屈折语 (Inflection)

屈折语中的词语由音素组合，而且音素之间的分界不明显，音素组合成的概念会因位置和语法意义的改变而变化。例子：拉丁、希腊语和英、法、德、意、西和俄等语。

屈折语与黏着语：屈折语，是以词形变化作为表示语法关系的主要手段的语言；特点是有丰富的词形变化来表示词与词之间的关系；以俄语、英语为代表。这里的“屈折”是指词内部的语音形式的变化。

屈折语的主要特点：有比较丰富的词形变化，通过词形变化来表示词与词之前的关系；一种词性变化的语素可以表示几种不同的语法意义；词尾和词干或词根结合十分紧密，脱离开词尾，句子中词根不能独立存在。

很多时候，黏着语和屈折语之间的界限不明显。黏着语也是有词形变化的，但二者之间最大的区别在于屈折语的词根词缀相对更为固定（如复数的“-s”、过去式的“-ed”），黏着语（Adhesive）

黏着语里的词语可分出独立的音节而且音节之间界限清晰，语法概念主要由多于一个的音节组合而成，音节组合会因为所处的位置和语法意义的改变而变动。

而黏著语的词缀更复杂，独立性更强。如：Менің кітабым; менің досымның кітабы; менің досымның қарындасының кітабы; менің досымның үйіндегі қарындасының кітабы; менің досымның үйіндегі қарындасының көп ақшаға сатып алған кітабы等。根据词尾的不同，每个词的变形都会千差万别，较之英语的变形复杂得多，这也是哈萨克语初学者最头疼的瓶颈。

语言还会以其他方式影响我们在记忆中对信息的编码、储存和提取。在一项研究中，让会汉语和英语的留美中国大学生用英语和汉语来描述自己。当用英语进行自我描述时，他们简直是典型的加拿大人，其自我陈述带有非常积极的情绪。而用汉语进行描述时，他们完全是典型的中国人，言谈中有更多的中国人的价值观念，但积极情绪和消极情绪几乎各占一半。他们对语言的使用似乎塑造了其自我思维的方式。

Whorf 还认为，霍皮人语言的动词中没有过去式，因此霍皮人思考和追忆往事不是一件容易的事。

Edward Sapir 认为语言有助于思维，甚至会影响知觉和记忆。我们只有有限的方式来加工非语言心象，这种限制使人要用语言来加工心理表征。要让人回忆并画出无意义的图画是很困难的，但如果给这个图画加上语言标签就方便了。

思维能力的普遍性和思维方式的特殊性。思维能力是全人类共同的，语言是各民族不同的。不仅不同民族间在语言和思维方式上存在差异，不同汉语方言间在词汇系统上也有不少差异，反应出操不同方言的人在思维方式上的差异。人类的思维方式是相同的，但思维的表现形式语言则不相同。

因为人的身体器官是一样的。人类所生活的自然环境是一样的。人类有共同的地球。大致相同。如：水、食物：粮食、水果、温室。

研究俄汉成语文化对比的刘永红教授认为：“成语的发展变化和周围的世界环境密切相关。虽然每个民族的生存都有其独特的心里性格、风俗习惯和思维方式，但是人们在实践经验和思维方式方面又有很多相同的地方，同时一些决定和影响了人类社会的历史事件促成了语言间的互相影响和相互借用” [6, 103 页]。

不同民族的表达方式即语言不同。因为各民族的所生活的地理环境，社会生活、社生活方式、宗教信仰、生活习俗、历史发展进程各不相同。所以，形成了语言表达方式的不同。

语言研究家对此进行过研究并提出了自己的观点。语言研究者莫彭龄对俄汉成语文化的差异性进行研究后发现了差异性产生主要因素：“在汉语成语中，‘雨后春笋’是因为春天雨后，春笋长得又多又快，因此用来比喻事物的大量涌现和蓬勃发展。而俄语中，与此意义相同的成语使用 как грибы после дождя 即雨后蘑菇，足以见在俄罗斯人生活的自然环境中与森林、蘑菇的密切关系” [7, 60 页]。

地理环境：比如：胆小如鼠 қоян жүрек，过街老鼠 人人喊打 Сүтке тиген күшіктей，四面楚歌 Қайда барсаң қорқыттың көрі，泥菩萨过河，自身难保。泥菩萨过

河，自身难保是一个俗语。比喻连自己也保不住，怎么顾得上别人。菩萨像很多是泥胎做的，这样的菩萨像如果过河被水浸泡，就会崩解化掉的，因此说泥菩萨过河自身难保。与此相同的哈语中熟语 *Кәріжілік мал сақтағанды қойып өз басын сақтап алсын*。

典故：从前，一座庙里供奉着一个泥菩萨。这座庙年久失修，无人供奉香火。泥菩萨极其苦闷，每日无所事事。一天，他听到有人喊救命，急忙走下供台，向门外望去，原来有人掉进庙前的小河里了。泥菩萨以救人于危难为自己的职责，岂能坐视不管？他奋不顾身地跳进河里，可是还没等他游到落水人身边，泥菩萨已经化作一团泥，被河水冲走了。后人根据这个故事编了歇后语“泥菩萨过河——自身难保”，意思是说帮助别人要量力而为，如果自己都保护不了自己，还逞能帮助别人，最后没有好结果。

八仙过海，各显神通，八仙是中国民间传说中道家的八位仙人，历来说法不一。就是汉钟离、张果老、吕洞宾、铁拐李、韩湘子、曹国舅、蓝采和、何仙姑。神通：道教用词，指无所不能的本领，现指特别高明的本领。比喻做事各有各的一套办法。也比喻各自拿出本领互相竞赛。“八仙过海，各显神通”原指八位仙人法力无边，在过东海时铁拐李建议将各自法宝投于水面各自过海，结果八仙各自渡过了东海。现引申为做事各有各的办法，也有各自拿出自己的本领比赛的意思。“八仙过海”虽然用的是神话传说的手法，但与古代蓬莱寻仙活动一样，表达了人们探寻自然奥秘、追求美好生活的愿望。因此，没有古代海上寻仙发源地的影响，也不会产生八仙在蓬莱过海的历史传说。所以说，八仙的故事因蓬莱而产生，蓬莱也因八仙过海而扬名海内外。与此相同的哈语中熟语 *алуан алуан жүйрік бар, әліне қарай жүгірер*。

“泥鳅想翻船——不自量力”讥讽某人过高地估计自己的力量。“一条小泥鳅翻不起大浪”这句话比喻没本事的小人物，再折腾也成不了大事。泥鳅：身体呈圆柱形的鱼。出处：杨沫《东方欲晓》一卷四一：“夫人难道不知道，那个姓白的可是梅村小姐手下的红人。请夫人不必介意。中国有句俗话，一条小泥鳅翻不起大浪”。与此相同的哈语中熟语 *Тайынша меңкіп ыңыршақ шақпас*。

看人下菜碟：北方话。看人，根据不同的人；下菜，是把做好的菜端来放在桌子上；一般都是用此话的引申义，比喻不能一视同仁、待人因人而异，根据不同的人给予不同的待遇。因此：投机取巧对人不能一视同仁的做法叫“看人下菜碟”。一般也做“看人下菜碟儿”、“看人下菜”，或者“见人下菜碟儿”。

出自清·曹雪芹《红楼梦》第六十回：“我家里下三等奴才也比你高贵些的，你都会看人下菜碟儿。宝玉要给东西，你拦在头里，莫不是要了你的了？拿这个哄他，你只当他不认得呢！”*адамына қарай табақ тарту*
对牛弹琴 түйенің құлағына домбыра шерту

龙配龙，凤配凤 *тең теңімен тезек қабымен*。我国传统文化中，龙凤呈祥是祥瑞的化身，人们也多用龙凤比喻夫妻、恋人。拥有龙凤玉牌的新婚夫妇，在寓意着婚姻生活的幸福美满。在日常生活中，夫妻二人分别佩戴一个，男左女右，男子佩戴龙佩，女子佩戴凤佩，一龙一凤的双玉佩雕刻，也代表着夫妻情深，永远不分离。玉佩看起来温润，古朴典雅。

汉语和哈萨克语里能表达相似和相同意义的成语里所运用的名词有所不同，原因是汉哈各民族语言创造成语时所采用属于不同的地理环境中存在的各种事物和动物名称。如：*сүт, Қорқыт, кәріжілік, мал, жүйрік, тайынша, ыңыршақ, табақ тарту, түйе, домбыра, тезек, қап* 等。从而在汉哈两种语言中产生了意义相同或相近的，但语言表达形式不同的一些成语或谚语。

结语

总而言之，我们在汉语课堂教学当中不能把汉语教学法的研究理论知识作为指导，片面地强调实践训练，必然会降低学生的学习兴趣。没有以理论知识为指导的实践

教学不会取得预期的教学效果。甚至使学习者的学习行为最终会产生“只知其然，不知其所以然”的不良后果。

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EFL Teachers' Perceptions and Perspectives of using internet resources for the development of socio-cultural competence

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Abstract. This article explores how EFL teachers in Kazakhstan perceive and use internet resources for socio-cultural competence development. Drawing on theoretical frameworks like TPACK and SAMR, it examines factors influencing teachers' attitudes and practices. Challenges, including limited access and digital literacy issues, are discussed, along with concerns about online content quality and privacy. By addressing these issues, the article aims to inform EFL education and improve internet resource integration for socio-cultural competence in diverse settings.

Keywords: EFL education, Internet resources, Socio-cultural competence development, Teacher perceptions, Technology integration, Digital literacy, Pedagogical challenges.

Аңдатпа. Бұл мақала Қазақстандағы EFL мұғалімдерінің әлеуметтік-мәдени құзыреттілікті дамыту үшін интернет ресурстарын қалай қабылдайтынын және пайдаланатынын зерттейді. TPACK және SAMR сияқты теориялық тұжырымдамаларға сүйене отырып, ол мұғалімдердің көзқарастары мен тәжірибесіне әсер ететін факторларды зерттейді. Мақалада шектеулі қолжетімділік және цифрлық сауаттылық мәселелері, сондай-ақ желідегі мазмұн сапасы мен құпиялылыққа қатысты мәселелер талқыланады. Мақаланың мақсаты – ағылшын тілін шет тілінде білім беру саласы ретінде ақпараттандыру және әртүрлі орталарда әлеуметтік-мәдени құзыреттілікті дамыту үшін интернет-ресурстардың интеграциясын жақсарту.

Түйін сөздер: EFL білім беру, желілік ресурстар, әлеуметтік-мәдени құзыреттілікті дамыту, мұғалімдердің қабылдауы, технологияларды интеграциялау, цифрлық сауаттылық, педагогикалық қиындықтар.

Аннотация. Эта статья исследует, как преподаватели английского как иностранного языка в Казахстане воспринимают и используют интернет-ресурсы для развития социокультурной компетенции. Основываясь на теоретических концепциях, таких как TPACK и SAMR, она исследует факторы, влияющие на отношение и практику преподавателей. В статье обсуждаются проблемы, включая ограниченный доступ и проблемы цифровой грамотности, а также заботы о качестве онлайн-контента и приватности. Целью статьи является информирование в области образования по английскому как иностранному языку и улучшение интеграции интернет-ресурсов для развития социокультурной компетенции в различных средах.

Ключевые слова: Образование EFL, Интернет-ресурсы, Развитие социокультурной компетенции, Восприятия преподавателей, Интеграция технологий, Цифровая грамотность, Педагогические вызовы.

Introduction

Socio-cultural competence development in the context of English as a Foreign Language (EFL) education is a multifaceted process that encompasses learners' ability to navigate and communicate effectively in culturally diverse contexts. Research in this area underscores the

importance of integrating socio-cultural competence into language learning curricula to prepare learners for meaningful interactions in globalized societies. Scholars such as Byram (1997) and Fantini (2009) have emphasized various dimensions of socio-cultural competence, including intercultural communication skills, cultural awareness, empathy, adaptability, and critical cultural literacy. Their work highlights the significance of adopting pedagogical approaches that promote authentic cultural experiences and foster intercultural understanding in EFL classrooms.

Theoretical frameworks and definitions of socio-cultural competence in EFL education draw from interdisciplinary perspectives, including sociolinguistics, cultural psychology, and intercultural communication theory. Scholars such as Bennett (1993) and Hofstede (1980) have proposed conceptual models that emphasize the dynamic and context-dependent nature of socio-cultural competence, highlighting its cognitive, affective, and behavioral dimensions. Additionally, researchers such as Vygotsky (1978) have explored sociocultural theories of learning, which underscore the role of social interaction, cultural tools, and collaborative learning in socio-cultural competence development.

Previous research has documented the transformative impact of internet resources on language learning and intercultural communication in EFL contexts. Scholars such as Warschauer (1996) and Thorne (2003) have explored the potential of internet resources to enrich language learning experiences and promote intercultural understanding. Their work demonstrates that internet-based activities, such as online cultural simulations, virtual language exchanges, and social media interactions, can enhance learners' linguistic proficiency, cultural awareness, and intercultural communication skills. Additionally, researchers such as Kramsch (2009) have highlighted the role of internet resources in facilitating meaningful cross-cultural interactions and fostering empathy and tolerance towards cultural differences among EFL learners.

In general, the literature review highlights the importance of socio-cultural competence development in EFL education, explores theoretical frameworks and definitions of socio-cultural competence, and discusses previous research on the impact of internet resources on language learning and intercultural communication. By synthesizing existing literature and referencing key scholars in the field, this review provides a theoretical foundation for understanding the role of internet resources in fostering socio-cultural competence in EFL learning contexts.

Main part: Theoretical Framework for Understanding EFL Teachers' Perceptions and Perspectives

Understanding EFL (English as a Foreign Language) teachers' perceptions and perspectives regarding the integration of internet resources for the development of socio-cultural competence requires a comprehensive theoretical framework that encompasses multiple dimensions. This framework draws from relevant theoretical perspectives in education, language learning, and technology integration to provide a holistic understanding of the factors influencing teachers' attitudes, beliefs, and instructional practices.

1. Technology Integration Theory:

- Technological Pedagogical Content Knowledge (TPACK): TPACK framework emphasizes the dynamic interaction between technological knowledge, pedagogical knowledge, and content knowledge. EFL teachers' perceptions and perspectives are influenced by their ability to effectively integrate technology tools with pedagogical practices and language learning objectives.

- SAMR Model: The SAMR (Substitution, Augmentation, Modification, Redefinition) model provides a framework for understanding the levels of technology integration. EFL teachers' perceptions may vary based on whether they view internet resources as mere substitutes for traditional teaching methods or as transformative tools that redefine language learning experiences.

2. Socio-cultural Learning Theories:

- Socio-cultural Theory of Learning (Vygotsky): Vygotsky's socio-cultural theory emphasizes the role of social interaction, cultural context, and collaborative learning in cognitive development. EFL teachers' perceptions are influenced by their understanding of the socio-cultural context in which language learning occurs and their beliefs about the importance of socio-cultural competence development for language learners.

- Community of Inquiry (Garrison, Anderson, & Archer): The Community of Inquiry framework emphasizes the importance of cognitive presence, social presence, and teaching presence in online learning environments. EFL teachers' perceptions of internet resources may be shaped by their beliefs about the role of online communication tools in fostering socio-cultural interactions and collaborative learning experiences.

3. Teacher Beliefs and Attitudes:

- Theory of Planned Behavior (TPB): TPB posits that teachers' intentions to use technology are influenced by their attitudes towards technology, subjective norms, and perceived behavioral control. EFL teachers' perceptions of internet resources are influenced by their beliefs about the usefulness, ease of use, and social norms associated with technology integration in language teaching.

- Technology Acceptance Model (TAM): TAM suggests that teachers' attitudes towards technology adoption are determined by their perceived usefulness and ease of use of the technology. EFL teachers' perceptions of internet resources may be influenced by their attitudes towards innovation, their confidence in using technology tools, and their perceptions of the benefits of integrating technology into language teaching.

4. Critical Pedagogy and Intercultural Competence:

- Critical Pedagogy (Freire): Critical pedagogy emphasizes the importance of questioning dominant ideologies, fostering critical thinking skills, and promoting social justice in education. EFL teachers' perceptions may be influenced by their beliefs about the role of internet resources in challenging stereotypes, promoting global awareness, and fostering critical cultural literacy.

- Intercultural Competence Frameworks (Byram): Frameworks such as Byram's model of intercultural communicative competence emphasize the importance of developing learners' ability to communicate effectively across cultures. EFL teachers' perceptions of internet resources may be shaped by their beliefs about the role of online communication tools in promoting intercultural understanding, empathy, and respect for cultural diversity.

By synthesizing these theoretical perspectives, this framework provides a comprehensive understanding of EFL teachers' perceptions and perspectives regarding the integration of internet resources for socio-cultural competence development. It highlights the complex interplay between technology integration, socio-cultural learning theories, teacher beliefs and attitudes, and critical pedagogy in shaping teachers' instructional practices and decision-making processes in EFL education.

In our exploration of EFL teachers' perceptions and perspectives regarding the integration of internet resources for socio-cultural competence development, we draw upon several theoretical frameworks to provide a comprehensive understanding of the factors influencing teachers' attitudes, beliefs, and instructional practices.

We begin by examining the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes the seamless integration of technology tools with pedagogical practices and language learning objectives. By understanding how technology intersects with pedagogy and content knowledge, we gain insights into how EFL teachers navigate the complexities of incorporating internet resources into their instructional strategies.

Building upon TPACK, we delve into the Substitution, Augmentation, Modification, Redefinition (SAMR) model, which offers a lens through which to evaluate the transformative

potential of technology integration. By considering whether technology merely substitutes traditional teaching methods or redefines learning experiences, we uncover the nuanced ways in which internet resources are utilized in EFL classrooms to enhance socio-cultural competence development.

Our analysis also incorporates socio-cultural theories of learning, particularly Vygotsky's socio-cultural theory, which underscores the role of social interaction and cultural context in language learning. By exploring how EFL teachers create opportunities for authentic socio-cultural interactions and collaborative learning experiences, we uncover the ways in which internet resources contribute to the development of socio-cultural competence among language learners.

Additionally, we examine the Community of Inquiry framework, which highlights the importance of creating online communities where learners can engage in collaborative inquiry and knowledge construction. By investigating how EFL teachers foster socio-cultural interactions in virtual environments, we gain insights into the role of internet resources in promoting cross-cultural understanding and empathy among language learners.

In our analysis of teacher beliefs and attitudes towards technology integration, we draw upon the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM). Through TPB, we consider teachers' attitudes towards technology, subjective norms, and perceived behavioral control, uncovering the factors influencing their decisions to adopt and implement internet resources in EFL instruction. Similarly, TAM helps us understand teachers' perceptions of the benefits and usability of internet resources, informing their willingness to embrace technology-enhanced pedagogical practices in language education.

Through the synthesis of these theoretical perspectives, our article aims to provide a holistic understanding of EFL teachers' perceptions and perspectives regarding the integration of internet resources for socio-cultural competence development. By shedding light on the complex interplay between technology integration, socio-cultural learning theories, and teacher beliefs and attitudes, we hope to inform future research and practice in EFL education.

Challenges Faced by EFL Teachers in Integrating Internet Resources for Socio-cultural Competence Development in Kazakhstan

Integrating internet resources for socio-cultural competence development in EFL (English as a Foreign Language) education in Kazakhstan presents unique challenges for teachers:

1. Access and Infrastructure: Kazakhstan, like many other countries, grapples with disparities in access to reliable internet connectivity and technological infrastructure (Kazakhstan Ministry of Education and Science, 2020). EFL teachers across Kazakhstan may encounter difficulties in accessing online resources and implementing technology-enhanced activities due to limitations in internet access, outdated equipment, and insufficient technological support in some regions.

2. Digital Literacy and Technological Proficiency: While Kazakhstan is making strides in technological advancements, EFL teachers in the country may still face challenges related to digital literacy and technological proficiency (Kazakhstan National Innovation System, 2019). Many teachers may require additional training and support to effectively integrate internet resources into their teaching practices, navigate digital tools, and adapt online materials to foster socio-cultural competence among their students.

3. Time Constraints and Workload: Balancing the demands of curriculum requirements, teaching responsibilities, and professional development initiatives with the integration of internet resources can be particularly challenging for EFL teachers in Kazakhstan (Kazakhstan Association of Teachers, 2021). Limited time and resources may hinder teachers' ability to explore and implement innovative technology-enhanced pedagogical practices aimed at socio-cultural competence development.

4. Quality and Authenticity of Online Content: Ensuring the quality and cultural authenticity of online content poses a challenge for EFL teachers in Kazakhstan (Kazakhstan National Center for Curriculum and Methodology, 2018). With the vast array of online resources available, teachers may struggle to find high-quality materials that align with language learning objectives and promote socio-cultural understanding among students, especially given the diverse cultural landscape of Kazakhstan.

5. Digital Divide and Inequality: Socio-economic disparities and the digital divide present significant obstacles to equitable access to internet resources and technology tools in Kazakhstan (Kazakhstan Statistical Committee, 2020). EFL teachers may face challenges in ensuring all students have access to online learning opportunities, particularly those from rural or underprivileged areas who may lack access to internet-enabled devices or reliable internet connectivity.

6. Pedagogical Integration and Curriculum Alignment: Integrating internet resources for socio-cultural competence development requires careful alignment with Kazakhstan's curriculum goals and pedagogical approaches (Kazakhstan Ministry of Education and Science, 2019). EFL teachers must navigate the challenge of integrating technology tools in ways that complement existing curriculum standards, promote cultural awareness, and enhance language learning outcomes in Kazakhstan's educational context.

7. Privacy and Safety Concerns: EFL teachers in Kazakhstan must address privacy and safety concerns associated with online communication and internet use (Kazakhstan Ministry of Digital Development, Innovation, and Aerospace Industry, 2020). With the increasing reliance on online platforms and social media for educational purposes, teachers must navigate issues related to data privacy, cyberbullying, and online safety risks to ensure a safe and secure online learning environment for students.

8. Resistance to Change and Technological Innovation: Overcoming resistance to change and fostering a culture of technological innovation among teachers, students, parents, and educational stakeholders in Kazakhstan is essential for successful integration of internet resources (Kazakhstan Association of Educational Researchers, 2021). EFL teachers may encounter reluctance to embrace technology-enhanced pedagogical practices, necessitating comprehensive professional development initiatives and ongoing support to facilitate a shift in attitudes towards technology in EFL education in Kazakhstan.

Addressing these challenges requires collaborative efforts from educational policymakers, institutions, and stakeholders to invest in infrastructure, provide professional development opportunities, promote digital literacy skills, and foster a culture of innovation in EFL education in Kazakhstan. By addressing these challenges, EFL teachers can effectively harness the potential of internet resources to foster socio-cultural competence among students and prepare them for success in a globalized world."

Conclusion

In conclusion, the exploration of socio-cultural competence development in EFL education, coupled with an understanding of EFL teachers' perceptions and perspectives, sheds light on the complexities and challenges inherent in integrating internet resources for socio-cultural competence development, particularly in the context of Kazakhstan.

Through a theoretical framework encompassing technology integration, socio-cultural learning theories, and teacher beliefs and attitudes, we have gained valuable insights into the factors influencing EFL teachers' attitudes, motivations, and instructional practices. Despite the transformative potential of internet resources in fostering socio-cultural understanding and intercultural communication skills among language learners, EFL teachers in Kazakhstan encounter numerous challenges in their efforts to integrate these resources effectively.

From access and infrastructure limitations to digital literacy gaps and time constraints, EFL teachers face a multitude of obstacles in leveraging internet resources to enhance socio-cultural competence development in their classrooms. Moreover, ensuring the quality and cultural authenticity of online content, addressing privacy and safety concerns, and overcoming resistance to technological innovation further complicate the integration process.

However, amidst these challenges lie opportunities for growth and innovation. By investing in infrastructure, providing professional development opportunities, promoting digital literacy skills, and fostering a culture of innovation, Kazakhstan can empower EFL teachers to effectively harness the potential of internet resources to foster socio-cultural competence among students. Collaborative efforts from educational policymakers, institutions, and stakeholders are essential to addressing these challenges and advancing socio-cultural competence development in EFL education.

As we navigate the complexities of integrating internet resources for socio-cultural competence development in Kazakhstan, it is imperative to remain committed to creating inclusive, culturally responsive learning environments that empower students to thrive in an interconnected world. By embracing innovation, fostering collaboration, and prioritizing the development of socio-cultural competence, we can prepare EFL learners in Kazakhstan to become global citizens equipped with the skills and knowledge to navigate diverse cultural landscapes with confidence and empathy.

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PECULIARITIES OF TEACHING ENGLISH IN PRIMARY SCHOOLS

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Abstract

The aim of this scientific paper is to investigate the distinctive characteristics and challenges associated with teaching English in primary schools. It explores and highlights the particularities that shape the language learning experience for young learners. By examining various pedagogical approaches, curriculum considerations, and teacher-student dynamics, this research seeks to contribute valuable insights to the field of primary education and language teaching.

Keywords: *English language teaching, young learners, pedagogical approaches, curriculum, teacher-student interactions, language acquisition, communicative method, task-based learning, TPR (Total Physical Response), technology in language teaching.*

The early years of primary education are crucial in laying the foundations for a child's linguistic and intellectual development. In the globalised context where English serves as a lingua franca, the challenges and peculiarities associated with teaching this language in primary schools become particularly noteworthy. Children's formative years are a crucial period for language acquisition. Mastery of English is essential for effective communication and lays the groundwork for broader cognitive development. Therefore, it is essential for educators, curriculum developers, and policymakers to understand the nuances of teaching English in primary schools. Language instruction in primary schools goes beyond conventional teaching paradigms. Young learners bring a range of experiences, cognitive abilities, and cultural backgrounds to the classroom as they strive towards linguistic competence. Recognising and addressing these diversities is crucial for developing a pedagogical approach that resonates with the innate curiosity and receptivity of primary school students. So, choosing a pedagogical approach is of paramount importance in the field of education, particularly when it comes to teaching in primary schools. The effective instruction of English in primary schools necessitates a thoughtful examination and selection of pedagogical approaches tailored to the unique characteristics and needs of young learners.

- Within the expansive realm of language education, various methodologies have been explored to enhance the language learning experience for primary school students. One prominent approach is the communicative method, which places a strong emphasis on interaction as both the means and goal of learning (Celce-Murcia et al., 2014). By engaging students in authentic communicative activities, such as role-plays, discussions, and collaborative projects, this approach aims to develop not only linguistic competence but also practical language skills essential

for real-life communication. The communicative method is particularly well-suited for primary education, aligning with the natural curiosity and social development of young learners.

- Task-based learning represents another innovative pedagogical approach that has gained traction in the realm of primary language education (Willis & Willis, 2015). This approach integrates language learning with the completion of meaningful tasks, fostering a purposeful and goal-oriented language acquisition process. Tasks, designed to be age-appropriate and relevant, serve as a catalyst for language use, providing students with opportunities to apply language skills in practical contexts. Task-based learning not only enhances language proficiency but also promotes critical thinking, problem-solving, and collaborative skills among primary school students.

- Total Physical Response (TPR) stands out as one of the best approaches in teaching young learners due to its alignment with the cognitive, physical, and emotional characteristics of children. This methodology, developed by Dr. James Asher in the 1960s, capitalises on the natural ways in which children learn and has been widely praised for its effectiveness in fostering language proficiency among young learners. At the core of TPR is the recognition that young children are inherently active and learn best through movement and sensory experiences. TPR leverages this understanding by integrating physical actions, gestures, and whole-body responses into language instruction. TPR recognizes the importance of imitation and movement in the learning process. Young children have a natural inclination to imitate actions and movements, and TPR utilises this instinct by incorporating physical responses to verbal commands. For example, if the teacher says, "run," the students are expected to physically run. This direct link between language input and physical action enhances comprehension and reinforces vocabulary in a meaningful way. Whole-body learning is another crucial aspect of TPR. Instead of focusing solely on linguistic aspects, TPR involves the entire body in the learning experience. This holistic approach acknowledges that children are multisensory learners, and incorporating movement helps them connect language with real-world experiences. Through actions like clapping, stomping, or reaching, children not only internalise vocabulary but also associate words with specific physical sensations, making the learning process more memorable. Importantly, TPR creates a stress-free and enjoyable environment for language learning. By incorporating play and physical activities into lessons, TPR makes learning a fun and engaging experience. This positive atmosphere is essential for young learners, as it reduces anxiety and encourages active participation.

- Also, the integration of technology in language teaching has emerged as a dynamic tool in the primary education landscape (Hubbard, 2019). Interactive educational software, online resources, and digital platforms offer engaging avenues for language practice, catering to the technologically immersed generation of young learners. Incorporating multimedia elements not only captures students' attention but also provides a multisensory experience, reinforcing language concepts in a more interactive and memorable manner. The selection of an appropriate pedagogical approach for teaching English in primary schools requires a nuanced understanding of the cognitive and emotional development of young learners. As educators navigate the diverse landscape of primary education, the continuous exploration and integration of effective pedagogical methods contribute significantly to creating a vibrant and engaging language learning environment.

Furthermore, curriculum considerations are important beyond the classroom as they shape the educational experience and future prospects of primary school students. An effectively designed curriculum serves as a blueprint for the educational journey, providing a coherent and structured path for students as they progress through their language learning endeavours. One important aspect of the curriculum is its impact on long-term educational outcomes. A well-structured curriculum not only aids in language acquisition but also fosters the development of cognitive skills, critical thinking abilities, and a broader understanding of the world. The skills

acquired through a thoughtfully designed English language curriculum are transferable, empowering students to navigate diverse academic challenges in their educational journey. The design of an English language curriculum for primary schools requires careful consideration of age-appropriate content, language proficiency benchmarks, and developmental milestones.

In addition we wish to emphasise another critical aspect in the effective teaching of English in primary schools. The significance of the dynamics of teacher-student interactions extends beyond mere instructional methods; it encompasses the cultivation of a supportive and conducive learning environment where language acquisition becomes an engaging and enriching experience for young learners. One of the key elements in teacher-student interactions is the establishment of a positive rapport. Primary school students, in their formative years, greatly benefit from a nurturing relationship with their teachers (Pianta et al., 2016). Creating an atmosphere of trust and approachability encourages students to actively participate, ask questions, and express themselves in English. This positive rapport contributes not only to linguistic development but also to the overall socio-emotional growth of the students.

Moreover, effective teacher-student interactions involve adapting teaching strategies to meet the diverse needs of primary school learners (Gibbs & Huang, 2018). Recognizing the individual strengths, challenges, and learning styles of each student allows teachers to tailor their approaches accordingly. Differentiated instruction, incorporating various methodologies, ensures that all students, regardless of their linguistic background or abilities, have equal opportunities for language development. Communication forms the cornerstone of teacher-student interactions. Encouraging open and clear communication channels facilitates a mutual understanding of expectations, goals, and feedback (Krashen, 2016). In the context of learning English, teachers play a pivotal role in modelling correct language usage, pronunciation, and cultural nuances. Interactive and communicative activities create opportunities for students to practise and enhance their language skills within a supportive learning community. Furthermore, teacher-student interactions extend beyond the confines of the classroom, involving collaborative efforts with parents and caregivers (Desforges & Abouchaar, 2015). Keeping parents informed and engaged in their child's language learning journey fosters a holistic approach to education. Regular communication about students' progress, suggested home-based language activities, and strategies for language reinforcement at home contribute to a collaborative partnership between teachers and families.

In the realm of English language education, the teacher serves not only as an instructor but also as a language model and facilitator. Encouraging creativity, critical thinking, and curiosity through dynamic and interactive teaching methods fosters an environment where primary school students feel empowered to explore and express themselves in English (Ellis, 2018). This collaborative and communicative approach to teacher-student interactions ultimately shapes a positive attitude towards language learning and lays the groundwork for continued proficiency in English throughout the academic journey and beyond.

In conclusion, it is important to underline that the inquiry into the instruction of English in primary schools offers an exhaustive comprehension of the complexities entailed in nurturing language proficiency among primary school learners. Pedagogical methodologies, considerations pertaining to curriculum design, and interactions between teachers and students collectively play a key role in shaping a dynamic and effective environment for language acquisition. The persistent examination and assimilation of these methodologies assume paramount significance for educators and policymakers aspiring to augment language education in primary schools. So, as primary education continues to evolve, understanding and addressing the peculiarities of teaching English in this context becomes imperative for fostering language proficiency and academic success in young learners.

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Sociological Sciences

MÜASİR DÖVLƏT İDARƏETMƏSİNDƏ SOSIAL XİDMƏTLƏRİN GÖSTƏRİLMƏSİNDƏ KOMPLEKS YANAŞMALAR

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Xülasə. Bu məqalə Azərbaycanda sosial xidmətin göstərilməsinin mürəkkəb ölçülərini araşdırır, kompleks yanaşmanın vacibliyini vurğulayır. “Kompleks yanaşma” termini iqtisadi şərait, demoqrafik dinamika, mədəni nüanslar və texnoloji irəliləyişlər kimi müxtəlif amillərin mürəkkəb qarşılıqlı təsirini nəzərə alan hərtərəfli və integrasiya olunmuş strategiyayı ifadə edir. Azərbaycanda sosial xidmətlərin mövcud vəziyyətinin tənqidi təhlili vasitəsilə bu tədqiqat işi mürəkkəb və uyğunlaşa bilən inzibati çərçivə tələb edən çağırışları və imkanları aydınlaşdırmağa çalışır.

Bu fonda məqalədə kompleks yanaşmanın çoxşaxəli aspektləri araşdırmış, siyasət çərçivələri, texnoloji müdaxilələr, maraqlı tərəflərin cəlb edilməsi və beynəlxalq əməkdaşlığın rolu dəyərləndirilmişdir. Mövcud sosial xidmət modellərinin uğur və çatışmazlıqlarını tədqiq edərək, Azərbaycanın öz əhalisinin müxtəlif və dinamik ehtiyaclarına cavab verən möhkəm və çevik dövlət idarəçiliyini necə formalaşdırma biləcəyinə dair fikirlər təqdim etmək hədəflənir. Bununla da, məqalə Azərbaycanda dövlət idarəçiliyinin modernləşdirilməsi və sosial xidmətlərin göstərilməsinin optimallaşdırılması ilə bağlı davam edən mülahizələrə töhfə verir.

Açar sözlər: sosial xidmətlər, evdə (səyyar) sosial xidmət, inzibati çərçivə, iqtisadi şərait, siyasi dinamika, qanunlar və qaydalar, məlumata əsaslanan qərarların qəbulu

Sosial yönümlü dövlət olan ölkəmizin Konstitutsiyasında vətəndaşlarımıza layiqli həyat səviyyəsinin təmin edilməsi dövlətimizin ali məqsədlərindən və vəzifələrindən biri hesab edilmişdir. Buna görə də müstəqillik illərində ölkəmizin sosial siyasəti ardıcıl və yüksələn xətlə inkişaf edir. Azərbaycan Respublikası Prezidentinin 30 dekabr 2008-ci il tarixli sərəncamı ilə təsdiq edilmiş “2009-2015-ci illərdə Azərbaycan Respublikasında sığorta pensiya sisteminin inkişafında dair Dövlət proqramı” sosial qayğıya ehtiyacı olan şəxslər tərəfindən yüksək qiymətləndirilmişdir. Ən çox qayğıya və diqqətə möhtac olan əlil şəxslərin sosial müdafiəsinin hüquqi cəhətdən etibarlı müdafiəsini təmin etmək məqsədi ilə ölkəmizdə ardıcıl iş aparılır, qanunvericiliyin beynəlxalq standartlara uyğunlaşdırılması istiqamətində səmərəli tədbirlər həyata keçirilir.

Ümumilikdə, dövlət idarəçiliyinin müasir mənzərəsində sosial xidmətlərin göstərilməsi xalqın rifahının və tərəqqinin gücləndirilməsində mühüm dayaq kimi dayanır. Şərqi Avropa və Qərbi Asiyaın kəsişməsində yerləşən Azərbaycan sosial xidmət sistemlərində əhəmiyyətli dəyişikliklərə məruz qalıb. Müxtəlif sosial ehtiyacların, iqtisadi qeyri-bərabərliyin və inkişaf edən demoqrafik nümunələrin həllinin mürəkkəbliyi sosial xidmətlərə nüanslı və çoxşaxəli yanaşma tələb edir.

Azərbaycan Respublikasının qanunları müasir dövlət idarəetməsində sosial xidmətlərin göstərilməsinə kompleks yanaşmaları ifadə edərək bu sahədə yaranan münasibətləri tənzimləyir. Bildiyimiz kimi sosial xidmət çətin həyat şəraitində yaşayan şəxsin (ailənin) sosial problemlərinin

aradan qaldırılması və ictimai həyatda digər insanlarla bərabər iştirak imkanlarının yaradılması istiqamətində həyata keçirilən kompleks tədbirlərdir. Sosial xidmətin məqsədi vətəndaşların həyat səviyyəsini artırma, sosial-psixoloji vəziyyətini artırma, cəmiyyətdən təcrid olunmasına gətirib çıxaran halların qarşısını almaqdan, çətin həyat şəraitinin əmələ gəldiyi hallarda ehtiyacı olan şəxslərə sosial xidmətin göstərilməsini təmin etməkdən ibarətdir. Beləliklə, sosial xidmət sahəsində dövlət siyasətinin əsas prinsipləri aşağıdakılardan ibarətdir:

1. İnsan hüquq və azadlıqlarına riayət olunması;
2. Humanizm, könüllülük, məxfilik, tolerantlıq, ünvanlılıq, ədalətlik və əlçatanlıq;
3. Diskriminasiyaya və stigmatizasiyaya yol verilməməsi;
4. Çətin həyat şəraitində olan şəxslərin (ailələrin) sosial xidmətə götürülməsində bərabər imkanların təmin edilməsi;
5. Sosial inteqrasiya və əhəlinin yaşayış keyfiyyətinin yaxşılaşdırılması;
6. İctimai iştirakçılığın təmin olunması (1).

Azərbaycan müasir dövlət idarəçiliyinin mürəkkəb mənzərəsini gəzdirdiyi bir vaxtda sosial xidmətlərin göstərilməsi nüanslı və hərtərəfli strategiya tələb edən kritik bir sahə kimi meydana çıxır. "Kompleks yanaşma" termini millətin sosial-iqtisadi quruluşunu formalaşdıran müxtəlif amillərin sintezini tələb edən sadə həll yollarını aşan bir paradigmanı əhatə edir. Bu kontekstdə iqtisadi şəraitin, demoqrafik dinamikanın, mədəni nüansların və texnoloji irəliləyişlərin mürəkkəb qarşılıqlı təsiri inteqrasiya olunmuş və uyğunlaşa bilən inzibati çərçivəni tələb edir. Azərbaycanın sosial-iqtisadi mənzərəsi sürətli urbanizasiya, demoqrafik dəyişikliklər və iqtisadi diversifikasiya daxil olmaqla, amillərin dinamik qarşılıqlı təsiri ilə xarakterizə olunur. Bu amillər xidmətlərin əlçatanlığında qeyri-bərabərlik, sosial-iqtisadi bərabərsizlik və konkret demoqrafik qrupları həll etmək üçün məqsədyönlü müdaxilələrə ehtiyac kimi problemlərin həllinə kömək edir. Nəticə etibarilə, bu çağırışları idarə edə və onlara cavab verə bilən mürəkkəb inzibati çərçivə mütləqdir. Bundan əlavə, mədəni nüanslar sosial xidmətin effektivliyinin formalaşmasında mühüm rol oynayır. Tarixi irislərdən və müasir dinamikadan təsirlənən Azərbaycanın zəngin mədəni qobelenləri onun müxtəlif əhəlinin unikal ehtiyaclarına və həssaslıqlarına uyğunlaşdırılmış yanaşma tələb edir. Mədəni müxtəlifliyə hörmət edən və eyni zamanda ədalətli xidmət göstərilməsini təmin edən inzibati çərçivə cəmiyyətin birliyinə gücləndirmək üçün çox vacibdir.

Azərbaycanda sosial xidmətin təmin edilməsinə kompleks yanaşmanın vacibliyi millətin üzləşdiyi problemlərin mürəkkəb və bir-biri ilə əlaqəli xarakterindən irəli gəlir. Əhəlinin müxtəlif ehtiyaclarını səmərəli şəkildə həll etmək üçün müxtəlif amilləri nəzərə alan hərtərəfli strategiya vacibdir. Azərbaycan tarixi və coğrafi mövqeyi ilə formalaşan zəngin mədəni irsə malikdir. Mədəni amillər fərdlərin sosial xidmətləri necə qavramasına və onlarla məşğul olmasına təsir göstərir. Kompleks yanaşma müxtəlif mədəni norma və dəyərləri tanımaqla, mədəni cəhətdən həssas xidmət göstərilməsini nəzərdə tutur. Bu, sosial xidmətlərin xidmət etdikləri icmalar tərəfindən qəbul edilməsini və mənimsənilməsini təmin edir. Siyasi qərarlar, o cümlədən büdcə ayırmaları sosial xidmət proqramları üçün resursların mövcudluğuna təsir göstərir. İqtisadi inkişaf, milli təhlükəsizlik və ya infrastruktur layihələri kimi siyasi prioritetlər sosial xidmətlərə ayrılan büdcənin nisbətində təsir göstərə bilər. Sosial proqramlar üçün adekvat maliyyələşmənin təmin edilməsində və xidmətlərin göstərilməsinə təsir edə biləcək resurs məhdudiyyətlərinin həllində siyasi mühüm rol oynayacaq. Nəticə etibarilə, siyasi nüansların qarşılıqlı təsiri Azərbaycanda sosial xidmətin göstərilməsi mənzərəsinə əhəmiyyətli dərəcədə təsir göstərir. Siyasi qurumlar tərəfindən qəbul edilən qərarlar siyasətləri formalaşdırır, resursları bölüşdürür və tənzimləyici mühiti müəyyən edir, nəticədə əhəli üçün sosial xidmətlərin əlçatanlığına, keyfiyyətinə və inklüzivliyinə təsir göstərir. Siyasətçilər çox vaxt sosial xidmət anlayışından siyasi şüar kimi istifadə edirlər. İqtisadçılar isə sosial xidməti gəlirlərin yenidən bölüşdürülməsi kimi başa düşürlər (Nağıyev Ə.T., 2002: 214).

İqtisadi şərait fərdlərin və icmaların rifahının müəyyən edilməsində əsas rol oynayır. Sosial xidmətlərin göstərilməsində kompleks yanaşma əsas xidmətlərə çıxışa mane ola biləcək sosial-

iqtisadi bərabərsizlikləri qəbul edir və aradan qaldırır. Sosial xidmətlərin təkə mövcud deyil, həm də maliyyə vəziyyətindən asılı olmayaraq hamı üçün əlçatan olmasını təmin edərək, iqtisadi cəhətdən təcrid olunmuş əhalini yüksəltmək üçün xüsusi müdaxilələr tələb olunur. İqtisadi şərait tez-tez zəiflikləri gücləndirir, müəyyən qrupları daha yüksək sosial təcrid və ya xidmətlərə qeyri-adekvat çıxış riski altına qoyur. Kompleks yanaşma bu həssas qrupların müəyyən edilməsi və xüsusi müdaxilələrlə hədəflənməsini nəzərdə tutur. Məsələn, yoxsulluğun azaldılmasına yönəlmiş proqramlar, əlverişli mənzil təşəbbüsləri və ya məqsədyönlü səhiyyə müdaxilələri iqtisadi cəhətdən əlverişsiz əhalinin üzləşdiyi unikal problemləri birbaşa həll edə bilər. Sosial xidmətin göstərilməsi daha geniş iqtisadi inkişafı sıx bağlıdır. Kompleks yanaşma davamlı sosial xidmətlərin inklüziv iqtisadi artım mühitini tələb etdiyini qəbul edir. İqtisadi imkanları, iş yerlərinin yaradılmasını və gəlirlərin yaradılmasını stimullaşdıran siyasətlər təkə iqtisadi şəraitin yaxşılaşmasına deyil, həm də əhalinin ümumi rifahına töhfə verir. İqtisadi şərait sosial xidmət proqramları üçün mövcud olan maliyyə resurslarına birbaşa təsir göstərir. Kompleks yanaşma sosial xidmətlərin təsirini maksimum dərəcədə artırmaq üçün ehtiyatlı büdcə mülahizələrini və səmərəli resursların ayrılmasını nəzərdə tutur. Ən çox ehtiyac duyulan sahələrin prioritetləşdirilməsi və resurslardan istifadənin optimallaşdırılması sosial xidmət idarəçiliyinə iqtisadi cəhətdən əsaslandırılmış yanaşmanın əsas komponentləridir. İqtisadi şərait dalğalanmalara və gözlənilməz böhranlara məruz qalır. Kompleks yanaşma iqtisadi tənəzzül və ya fəvqəladə hallar zamanı sosial xidmət proqramlarının davamlı və çevik qalmasını təmin edərək, bu dəyişiklikləri qabaqlayır və onlara uyğunlaşır. Bu, fəvqəladə halların planlaşdırılmasını, çevik maliyyələşdirmə mexanizmlərini və yaranan ehtiyacları həll etmək üçün resursları sürətlə yenidən bölüşdürmə qabiliyyətini əhatə edə bilər. Bəzi sosial xidmətlər, xüsusən də səhiyyə, təhsil və yaşayış sahəsi əhəmiyyətli investisiyalar tələb edir. Kompleks yanaşma iqtisadi səmərəlilik və sosial təsir arasında tarazlığın yaradılmasını nəzərdə tutur. İqtisadiyyata hədsiz yüklənmədən sosial xidmət proqramlarının uzunömürlülüyünü və effektivliyini təmin etmək üçün davamlı maliyyələşdirmə modelləri, dövlət-özəl tərəfdaşlıq və innovativ maliyyələşdirmə mexanizmləri araşdırılır. Kompleks yanaşma sosial xidmət proqramlarının iqtisadi təsirinin qiymətləndirilməsini nəzərdə tutur. Sosial göstəricilərdən başqa, bu proqramların iqtisadi məhsuldarlığa, insan kapitalının inkişafına və yoxsulluğun azaldılmasına necə töhfə verdiyini başa düşmək vacibdir. Sosial xidmət müdaxilələrinin həm anı, həm də uzunmüddətli iqtisadi nəticələrini ölçmək üçün ciddi qiymətləndirmə çərçivələri həyata keçirilir. İqtisadi baxımdan sosial xidmət prosesində göstərilən xidmətlər ilk növbədə istehlak dəyərinin bir növü hesab edilməklə, insanların rifah halına təsir göstərə bilməsi əsas götürülür. Müasir iqtisad elminə görə, xidmət məqsədyönlü fəaliyyət kimi məhsuldar əmək nəticəsində yaranan faydalı təsirdir (Prof. T.S.Vəliyev, Ş.S.Qafarov, 2002: 365).

Azərbaycan Respublikasının qanunları sosial xidmətlərin göstərilməsinin hüquqi əsaslarını müəyyən edir. Qanunvericilik həm hökumətin, həm də vətəndaşların bu xidmətlərin əldə edilməsi və çatdırılmasında hüquq və vəzifələrini müəyyən edir. Müxtəlif sosial xidmət sektorlarını, o cümlədən səhiyyə, təhsil, rifah və mənzil təminatını tənzimləyən əhatə dairəsini, standartlarını və tənzimləyici tədbirlərini müəyyən etmək üçün hərtərəfli qanunvericilik bazası vacibdir. Qanunlar ədalətliyin təşviqində və sosial xidmətin göstərilməsində ayrı-seçkiliyin qarşısının alınmasında mühüm rol oynayır. Hüquqi çərçivələr xidmətlərin müxtəlif demoqrafik qruplar arasında ədalətli şəkildə bölüşdürülməsini təmin edən bərabər çıxış prinsiplərini açıq şəkildə əks etdirir. Ayrı-seçkiliyə qarşı qanunlar gender, etnik və ya sosial-iqtisadi status kimi amillərdən asılı olmayaraq sosial xidmətlərin hamı üçün əlçatan olduğu inklüziv mühitin yaradılmasına kömək edir. "Sosial xidmət haqqında" Azərbaycan Respublikası Qanununa əsasən ölkəmizdə yaşı 70-ə çatmış şəxslər ahi hesab olunurlar. Əmək və Əhalinin Sosial Müdafiəsi Nazirliyinin məlumatına görə, 2019-cu il yanvar ayının 1- nə olan rəsmi statistikaya əsasən, ölkəmizdə bu kateqoriyadan olan şəxslərin sayı 401 min nəfər (162,9 min kişilər, 238,1 min qadınlar)təşkil edir. Azərbaycan Respublikası Nazirlər

Kabinetinin 22 aprel 2014-cü il tarixli 108 sayılı Qərarı ilə təsdiq edilmiş “Evdə (səyyar) sosial xidmətin göstərilməsi Qaydası”na əsasən, hazırda Əmək və Əhalinin Sosial Müdafiəsi Nazirliyi tərəfindən 11 208 nəfər tənha ahıl və əlil şəxsə evlərində sosial-məişət xidmət göstərilir. Həmin insanların 8 857 nəfər ahıl şəxslərdir. Sosial işçilər onlara ev təsərrüfatında təmizlik işlərinin aparılması, yemək hazırlanması, zəruri ərzaq, sənaye və məişət mallarının, müvafiq hallarda tibbi və psixoloji yardımın, hüquqi məsləhətlərin alınması və s. işlərdə köməklik göstərirlər (“Ekspress” qəz., 2017, 3 oktyabr, № 176, s. 10).

Azərbaycan Respublikası Nazirlər Kabinetinin 2013-cü il 31 yanvar tarixli 17 nömrəli qərarı ilə təsdiq edilmiş “Evdə (səyyar) sosial xidmətin göstərilməsi” Qaydasının 3-cü bəndinə əsasən evdə (səyyar) sosial xidmət həmin xidmətin xarakterindən asılı olaraq, sosial işçi və sosial xidmətçi tərəfindən göstərilir.

Sosial işçi tərəfindən göstərilən xidmətlərə aşağıdakılar daxildir:

- sosial xidmətə ehtiyacı olan şəxsə tibbi və psixoloji yardım və hüquqi məsləhət almaqda köməklik göstərmək;
- qəyyumluq və himayəçilik sənədlərinin hazırlanmasına, tənha-ahıl vətəndaşların və əlillərin internat evinə, sağlamlıq imkanları məhdud uşaqlara müvafiq xüsusi təhsil müəssisələrinə göndərilməsi üçün lazımı sənədlərin toplanmasına köməklik göstərmək;
- əlillərə və sağlamlıq imkanları məhdud uşaqlara reabilitasiya xidməti göstərmək;
- sağlamlıq imkanları məhdud uşaqların gündəlik həyatda lazım olan vərdiş və bacarıqlarını, böyük və kiçik motorika, ünsiyyət və koqnitiv bacarıqlarını inkişaf etdirmək;
- sağlamlıq imkanları məhdud uşaqların sosial uyğunlaşmasına dəstək vermək;
- sağlamlıq imkanları məhdud uşaqların inkişafı üçün valideynlərə müvafiq məsləhətlər vermək, o cümlədən zəruri yardımçı cihaz və vasitələrdən istifadəni öyrətmək;
- ailənin sosial inkluziyasına köməklik göstərmək;
- sağlamlıq imkanları məhdud uşaqların ehtiyaclarının ödənilməsi və problemlərinin həlli məqsədi ilə müvəkkillik fəaliyyətini həyata keçirmək.

Sosial xidmətçi tərəfindən göstərilən xidmətlərə aşağıdakılar daxildir:

- yemək hazırlanmasına kömək etmək (o cümlədən diyetik yeməklər);
- özünə qulluq edə bilməyən xəstələri yedizdirmək və qabları yumaq;
- şəxsin çimildirilməsinə, saçlarının daranmasına yardım etmək;
- yataq dəstlərini dəyişdirmək, yataq və geyim əşyalarını yumaq və ütüləmək;
- yataq və geyim əşyalarını camaşırxanaya, kimyəvi təmizləmə məntəqəsinə (əgər camaşırxana və kimyəvi təmizləmə məntəqəsi varsa) aparıb-gətirmək;
- paltarların xırda təmirini etmək;
- mənzili yığışdırmaq və təmizləmək;
- zəruri ərzaq, sənaye və məişət mallarını almaq;
- mənzil pulunun və digər kommunal xərclərin ödənilməsini təşkil etmək;
- istiliyə, yanacağa, təmirə olan ehtiyacların ödənilməsi məqsədi ilə aidiyyəti təşkilatlarla əlaqə saxlamaq;
- həyətyanı sahəni nizama salmaq;
- evə həkim çağırmaq, həkimin təyinatı ilə aptekdən dərman almaq, həkim müayinəsinə aparıb-gətirmək;
- sosial xidmətə götürülmüş vətəndaş vəfat etdikdə, dəfni ilə bağlı məsələlərin həllinə köməklik göstərmək.

Bu Qayda “Sosial xidmət haqqında” Azərbaycan Respublikası Qanununun 19.1-ci maddəsinə əsasən hazırlanmışdır və əmək qabiliyyətli qohumları və ya qanuni nümayəndələri ilə eyni yaşayış məntəqəsində yaşamayan və sosial xidmətə ehtiyacı olan tənha ahıllara, ahıl ər-arvadlara, əlilliyi olan şəxslərə, xəstəliyin terminal (son) mərhələsində olan şəxslərə evdə (səyyar) sosial xidmətin göstərilməsi məsələlərini tənzimləyir (2).

Mürəkkəb inzibati çərçivə qərarların qəbul edilməsini məlumatlandırmaq üçün məlumat analitikasına əsaslanır. Demografik, iqtisadi və xidmətlərdən istifadə məlumatlarının müntəzəm toplanması və təhlili idarəçilərə tendensiyaları müəyyən etməyə, müdaxilələrin təsirini qiymətləndirməyə və sosial xidmət proqramlarında məlumatlı düzəlişlər etməyə imkan verir. Müxtəlif dövlət qurumları, qeyri-hökumət təşkilatları (QHT-lər) və beynəlxalq tərəfdaşlar arasında əməkdaşlıq hərtərəfli xidmətlərin göstərilməsi üçün vacibdir. Mürəkkəb inzibati çərçivə idarələrarası səmərəli koordinasiyanı təşviq edir, silosları parçalayır və sosial ehtiyacların həllinə vahid yanaşmanı təşviq edir. N.T.Nağıyev göstərir ki, bələdiyyələrə yerli sosial müdafiə və sosial inkişaf proqramlarının qəbul və icra edilməsi ilə bağlı səlahiyyətlər verilsə də, həmin səlahiyyətlər maliyyə çatışmazlığı səbəbindən həyata keçirilə bilmir. Bununla bağlı o, təklif edir ki, bələdiyyələrin sosial layihələrinin maliyyələşdirilməsi üçün dövlət büdcəsindən maddi yardımların ayrılması məqsədə müvafiq olardı (Nağıyev N.T., 2010: 180).

Nəticə olaraq, Azərbaycanda sosial xidmətlərin göstərilməsi iqtisadi, mədəni, siyasi və inzibati mülahizələrin müxtəlif elementlərini birləşdirən vahid və dinamik yanaşma tələb edir. Bu amillərin mürəkkəb qarşılıqlı təsiri ölkənin sosial-iqtisadi mənzərəsinə xas olan mürəkkəb çağırış və imkanları idarə edə bilən mürəkkəb və uyğunlaşa bilən inzibati çərçivəyə ehtiyac olduğunu vurğulayır. Zəngin mədəni irsi, inkişaf edən iqtisadi şəraiti və özünəməxsus siyasi dinamikası ilə Azərbaycan müxtəlif əhəlinin rifahı üçün sosial xidmətlərin optimallaşdırılmasının mühüm əhəmiyyət kəsb etdiyi bir nöqtədə dayanır. İqtisadi şərait mövcud resursları formalaşdırır, mədəni nüanslar isə sosial xidmətlərin qəbulu və effektivliyinə təsir göstərir. Siyasi mülahizələr, o cümlədən siyasət prioritetləri və beynəlxalq əməkdaşlıqlar sosial xidmətin göstərilməsinin ümumi mənzərəsinin formalaşmasında mühüm rol oynayır.

Sosial xidmətlərin göstərilməsinin mürəkkəbliklərini idarə edərkən Azərbaycanın güclü tərəflərinə əsaslanmaq, mövcud problemləri həll etmək və davamlı və inklüziv sistemi inkişaf etdirmək imkanı var. Siyasətlərin davamlı uyğunlaşdırılması, texnoloji yeniliklərin qəbul edilməsi və icmanın cəlb edilməsinə üstünlük verilməsi ölkənin mədəni müxtəlifliyi və sosial-iqtisadi istəkləri ilə uyğunlaşan sosial xidmət çərçivəsinə nail olmaqda əsas rol oynayacaqdır.

Inkişafda olan dövlət qurumları, vətəndaş cəmiyyəti, beynəlxalq tərəfdaşlar və yerli icmalar arasında birgə səy vacibdir. Sosial xidmətlərin optimallaşdırılması üzrə kollektiv öhdəliyi gücləndirməklə, Azərbaycan vətəndaşlarının rifahının prioritet olduğu, sosial xidmətlərin isə davamlı inkişaf və sosial tərəqqi üçün katalizatora çevrildiyi bir mühit yaratmağa can atır.

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MÜASİR DÖVRÜMÜZDƏ SOSIAL SAHƏDƏ “BİR” PƏNCƏRƏ KOSEPSİYASI

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GİRİŞ

Xülasə. Məqalədə Azərbaycanda vətəndaşlar və biznes üçün dövlət xidmətlərini mərkəzləşdirən transformativ inzibati platforma olan vahid pəncərə sisteminin tətbiqi araşdırılır. O, prosedurların sadələşdirilməsində, sənədləşmə işlərinin azaldılmasında və bürokratik proseslərdə şəffaflığın artırılmasında sistemin rolunu vurğulayır. Texnoloji integrasiyanı vurğulayaraq, sistem lisenziyalasdırma, vergi bəyannamələri və gömrük rəsmiləşdirilməsi kimi müxtəlif xidmətlərə çıxış üçün istifadəçi dostu interfeys təqdim edir və bununla da müxtəlif dövlət idarələri ilə qarşılıqlı əlaqələri sadələşdirir.

Məqalə sistemin Azərbaycanın rəqəmsallaşma gündəliyinə uyğunluğunu vurğulayır, səmərəliliyi və şəffaflığı təşviq edir, eyni zamanda kağız əsaslı əməliyyatların azaldılması yolu ilə ətraf mühitə təsirləri azaldır. Bununla belə, o, məlumatların təhlükəsizliyini və geniş şəkildə mənimsənilməsini təmin etmək üçün güclü kibertəhlükəsizlik tədbirlərinə və istifadəçi təliminə ehtiyac olduğunu etiraf edir. Nəticə etibarı ilə, vahid pəncərə sistemi Azərbaycanın inzibati landşaftında naviqasiyada təkmilləşdirilmiş rahatlıq və effektivlik vəd edən modernləşmə istiqamətində mühüm addımdır.

Azərbaycan “İpək Yolu”nun və Şimal-Cənub Nəqliyyat Dəhlizinin mühüm hissəsidir. Bu, Azərbaycanın beynəlxalq ticarətdə əhəmiyyətini artırır. Azərbaycan Rusiya, Qazaxıstan, Türkmənistan, İran, Türkiyə, Ermənistan və Gürcüstan kimi yeddi ölkə ilə həmsərhəddir. Azərbaycan Gömrük Xidməti infrastrukturuna 13 dəniz limanı, 5 beynəlxalq hava limanı, 4 beynəlxalq dəmir yolu məntəqəsi və 9 beynəlxalq əhəmiyyətli magistral yol daxildir.

Azərbaycan Respublikasının gömrük siyasəti respublikanın dövlətin iqtisadi siyasətindən irəli gələn gömrük nəzarəti və malların mübadiləsi alətlərindən maksimum səmərəli istifadəni təmin etməyə, daxili bazarın qorunmasına, milli iqtisadiyyatın inkişafına kömək etməyə, həyati vəzifələri həyata keçirməyə yönəlmişdir. .

Hal-hazırda beynəlxalq treyderlər müxtəlif orqanlarda çoxlu sayda müxtəlif sənədlərin təqdim edilməsi tələbləri ilə məşğul olmalıdırlar, bu agentliklərin hər birinin çox vaxt öz fərdi sistemləri və kağız sənədləri var. Azərbaycan bu məsələni ixrac-idxal prosedurlarından keçmək üçün ərizə tələblərinin sadələşdirilmiş mexanizminin - “bir pəncərə” mexanizminin tətbiqi yolu ilə həll etmək qərarına gəldi. Bu qabaqcıl yanaşma mühüm sosial xidmətlərə və imtiyazlara çıxışın sadələşdirilməsi üçün katalizator rolunu oynayır, vətəndaşların dövlət dəstəyi sistemləri ilə qarşılıqlı əlaqəsini möhkəmləndirir.

Vahid Pəncərə Sistemi paradiqma dəyişikliyi təcəssüm etdirir və fərdlərin bir sıra sosial xidmətlər və rifah proqramlarını rahat şəkildə idarə edə bilməsi üçün tək qapı təklif edir. Fərqli inzibati kanalları vahid interfeysdə birləşdirərək, bu yenilik səhiyyə, təhsil, mənzil və müxtəlif sosial imkanlar axtaran Azərbaycan vətəndaşları üçün rahatlığı, səmərəliliyi və əlçatanlığı yenidən müəyyənləşdirir.

Son illər Azərbaycanda “Vahid Pəncərə” sisteminin tətbiqi ilə sosial xidmətlərin müasirləşdirilməsi istiqamətində mühüm addımlar atılıb. Bu innovativ yanaşma vətəndaşların çoxsaylı imtiyazlara və dəstək proqramlarına səmərəli şəkildə çıxışı üçün mərkəzləşdirilmiş platforma təmin edərək, müxtəlif sosial xidmətlərə çıxışı asanlaşdırmaq və sadələşdirmək məqsədi

daşıyır. Vahid Pəncərə Sistemi ölkənin vətəndaş mərkəzli xidmətlərin təkmilləşdirilməsinə və sosial landşaftında daha çox əlçatanlığın təşviq edilməsinə sadıqlığının sübutudur. Yeni texnologiyaların tətbiqi və inkişafı çərçivəsində qəbul edilən çoxsaylı hüquqi-normativ aktlar məhz ölkənin elektron imkanlarından səmərəli şəkildə yararlanması məqsədini daşıyır. Hazırda dünyada "Elektron hökumət haqqında" qanunun qəbul edildiyi çox az ölkə (təqribən 7 ölkə) vardır ki, Azərbaycan bu siyahıda sadalanan ölkələrdən olan Avstriyanın təcrübəsinin yaxından öyrənilməsində maraqlıdır.

Azərbaycan MDB məkanında "elektron hökumət" layihəsi üzərində işlərin aparıldığı 4-cü ölkədir. "Azərbaycan Respublikasının inkişafı naminə informasiya-kommunikasiya texnologiyaları üzrə Milli Strategiyaya (2003-2012-ci illər)" əsasən işlənib hazırlanmış "E-hökumət" layihəsi "Elektron Azərbaycan" Dövlət Proqramı çərçivəsində həyata keçirilir. Layihə Azərbaycan cəmiyyəti üçün nisbətən yeni və fərqli formatlı olsa da cəmiyyətin qəbulu və uyğunlaşması baxımından arzuolunan nəticələri doğrultmaqdadır.

Azərbaycanda ilk dəfə olaraq "vahid pəncərə" və elektron xidmətə keçid Prezident İlham Əliyevin 25 oktyabr 2007-ci il tarixli "Sahibkarlıq fəaliyyəti subyektlərinin fəaliyyətinin "bir pəncərə" prinsipi üzrə təşkilinin təmin edilməsi tədbirləri haqqında sərəncamı"na əsasən 2009-cu il yanvarın 1-dən etibarən sahibkarlıq fəaliyyəti subyektlərinin "bir pəncərə" prinsipi üzrə qeydiyyatının aparılmasına başlanılmaqla start verilmişdir.(1) "Bir pəncərə" sistemi bütün məlumatların eyni mərkəzdə cəmləşdirilməsini, vergi qeydiyyatı da daxil olmaqla inzibati qeydiyyatların elektronlaşdırılmasını təmin etdi. Vahid Pəncərə Sistemi çoxsaylı sosial xidmətləri və proqramı vahid portalda birləşdirən hərtərəfli platformadır. O, vətəndaşlara müxtəlif imtiyazlardan, o cümlədən səhiyyə xidmətləri, sosial təminat proqramları, təhsil yardımı, mənzil təminatı və s. əldə etmək üçün mərkəzləşdirilmiş nöqtə təklif edir. Bu sistem vasitəsilə fərdlərin bir çox bürokratik əngəllərdən keçməsi və ya əsas xidmətlərdən yararlanmaq üçün müxtəlif ofislərə baş çəkməsi lazım deyil. Bu prinsip üzrə qeydiyyatın aparılması biznesin inkişafına xeyli təkan vermiş oldu.

Vətəndaşlar üçün üstünlüklər:

1)Sadələşdirilmiş Giriş

Vahid Pəncərə Sisteminin ən mühüm üstünlüklərindən biri onun müxtəlif sosial xidmətlərə sadələşdirilmiş çıxış imkanıdır. Artıq vətəndaşlar vahid onlayn portal və ya fiziki xidmət mərkəzi vasitəsilə ərizələr təqdim edə, məlumat əldə edə və sorğularının gedişatını izləyə bilirlər.

2)Səmərəlilik və vaxta qənaət

Sistem çoxsaylı müraciət və müxtəlif şöbələrə baş çəkmə ehtiyacını aradan qaldıraraq, vətəndaşların dəyərli vaxtına qənaət edir. Əvvəllər emal etmək üçün günlər və ya həftələr lazım olan işləri indi daha qısa müddət ərzində səmərəli şəkildə yerinə yetirmək olar.

3)Şəffaflıq və Hesabatlılıq

Sistem mövcud xidmətlər, uyğunluq meyarları və müraciətlərin statusu haqqında aydın məlumat verməklə şəffaflığı təşviq edir. Bu şəffaflıq sosial xidmətlər sektorunda hesabatlılığı artırır.

4)Azaldılmış qırmızı lent

Xidmətlərin vahid platformada birləşdirilməsi bürokratik xətalara minimuma endirir, prosedurları sadələşdirir və xidmətlərin çatdırılmasında səhv və ya gecikmə şanslarını azaldır.

"Vahid Pəncərə Sistemi"nin tətbiqi sosial xidmətlərə cavabdeh olan dövlət qurumlarına və idarələrinə də xeyli fayda verir:

1.Təkmilləşdirilmiş Səmərəlilik: Hökumət qurumları öz proseslərini sadələşdirə bilər ki, bu da səmərəliliyin və resursların bölüşdürülməsinin artmasına gətirib çıxarır.

2.Məlumatların Mərkəzləşdirilməsi: Sistem daha yaxşı təhlil və məlumatlı qərar qəbul etməyə imkan verən məlumatların mərkəzləşdirilməsinə imkan verir.

3.Xərclərə qənaət: Sənədləşməni azaltmaqla və əməliyyatları sadələşdirməklə, hökumət üçün potensial xərclərə qənaət var.

“Bir pəncərə” sistemi informasiya texnologiyaları, gömrük qeydiyyatı və avtomatlaşdırılmış gömrük idarəetmə sistemləri və risklərin idarə edilməsi sistemləri platforması üzərində qurulub. Bu sistemdən istifadə edən idxalçılar, ixracatçılar, ekspeditorlar, brokerlər, habelə digər dövlət orqanları “Bir pəncərə”də gömrük orqanlarına istinad edirlər. Azərbaycan Respublikasının Dövlət Gömrük Komitəsi “Azərbaycan Respublikasının dövlət sərhədindən buraxılış məntəqələrindən keçirilən malların və nəqliyyat vasitələrinin yoxlanılmasının “bir pəncərə” prinsipinin tətbiqi haqqında” fərmanı imzaladıqdan sonra layihənin icrasına başlayıb və aşağıdakı addımları atıb(2):

- Azərbaycan Respublikasının dövlət sərhədində gömrük-keçid məntəqələrindən keçirilən malların və nəqliyyat vasitələrinin yoxlanılması iş prosesini təhlil edib;
 - “bir pəncərə” prinsipinin həyata keçirilməsi üçün Gömrük Komitəsi nəzdində komissiya təşkil etmişdir;
 - Yerli adət-ənənələrdə insan resursları potensialının təkmilləşdirilməsi və qabaqcıl beynəlxalq təcrübələrin öyrənilməsi;
 - “Bir pəncərə” prinsipinin hərəkət sxemi yaradılmışdır;
 - Gömrük orqanları Azərbaycan Respublikasının dövlət sərhədinin buraxılış məntəqələrindən keçirilən malların və nəqliyyat vasitələrinin sənədlərinin, o cümlədən mallara dair baytarlıq, fitosanitar, sanitar və digər sertifikatların (şəhadətnamələrin) yoxlanılmasına və həmin mallara baytarlıq, fitosanitar, sanitar nəzarətinin həyata keçirilməsinə başlayıb;
 - Aparat və proqram təminatının qurulması;
 - Dövlət sərhədlərində “Bir pəncərə” pilot layihəsinin icrasının nəticələrinin monitorinqini aparıb.
 - infrastrukturun inkişafı çərçivəsində sərhəd gömrük-keçid məntəqələri tikilib və yenidən qurulub, vahid pəncərə sistemini dəstəkləyə bilər.
 - Sərhəddə gömrük orqanları baytarlıq, fitosanitar və sanitariya sertifikatlarına və digər icazələrə və icazə blanklarının verilməsinə nəzarət etməklə baytarlıq və fitosanitar nəzarətinə başlanılıb;
- Tək pəncərə prinsipi aşağıdakı xüsusiyyətləri təmin edir:
- Malların və nəqliyyat vasitələrinin giriş-çıxışı zamanı sərhəd keçidi haqqında məlumat;
 - Müvafiq nazirliklərin: fitosanitar, baytarlıq-sanitariya və karantin xidmətlərinin elektron arayışlarının mübadiləsi;
 - Bəyan edilmiş mallar haqqında məlumat vermək;
 - Sərhəddən keçən nəqliyyat vasitələri haqqında ilkin məlumatlar;
 - Gömrük hüquqpozmalarının qeydə alınmış faktları barədə məlumat;
 - Müxtəlif maliyyə hesabatlari;
 - Valyuta əmanətləri haqqında hesabat (5).

Məlumatların müxtəlifliyi səbəbindən davam edən əməliyyatların dəqiq sayını müəyyən etmək mümkün deyil, lakin hər gün təxminən 6000 əməliyyat, cəmi 60% təşkil edir. Hər gün və eyni zamanda 500-ə yaxın müştəri vahid pəncərə sistemindən istifadə edir.

Azərbaycanın sosial sferasında Vahid Pəncərə Sistemi çoxsaylı üstünlüklər gətirsə də, problemlər hələ də qalmaqdadır. Xüsusilə ucqar ərazilərdə universal çıxışın təmin edilməsi, texnoloji maneələrin aradan qaldırılması və məlumatların təhlükəsizliyinin təmin edilməsi davamlı diqqət tələb edən davamlı məsələlərdir.

Gələcəyə baxsaq, sistemin daha da təkmilləşdirilməsi üçün böyük potensial var. Süni intellekt və maşın öyrənməsi kimi inkişaf etməkdə olan texnologiyalarla inteqrasiya prosesləri optimallaşdırıla bilər, dövlət qurumları arasında əməkdaşlığın artırılması isə sosial xidmətlərin çatdırılmasına daha vahid yanaşmaya gətirib çıxara bilər.

Azərbaycanda vahid pəncərə sistemi inzibati proseslərin sadələşdirilməsi, səmərəliliyin artırılması və ölkənin bürokratik çərçivəsi daxilində şəffaflığın təşviqi edilməsində mühüm irəliləyişdir. Bu innovativ platforma müxtəlif dövlət xidmətlərini birləşdirən və vətəndaşlar, bizneslər və dövlət qurumları arasında maneəsiz qarşılıqlı əlaqəni asanlaşdıran mərkəzləşdirilmiş mərkəz rolunu oynayır.

Vahid pəncərə sisteminin tətbiqi həm də Azərbaycanın inzibati landşaftında rəqəmsallaşma və texnoloji integrasiyanın təşviqi üzrə daha geniş gündəliyinə uyğun gəlir. Texnologiyanın gücündən istifadə etməklə bu platforma təkcə rahatlığı gücləndirmir, həm də şəffaflığı və hesabatlılığı gücləndirir. Vətəndaşlar əvvəllər bürokratik proseslərdə görünməmiş şəffaflıq səviyyəsini təmin etməklə real vaxt rejimində müraciətlərinin gedişatını izləyə bilirlər.

Üstəlik, sistemin rəqəmsal təbiəti kağız əsaslı əməliyyatları minimuma endirməklə və ekoloji cəhətdən təmiz təcrübələri təşviq etməklə ətraf mühitin davamlılığına töhfə verir. Fiziki sənədlərin azaldılması nəinki prosesləri sadələşdirir, həm də daha davamlı gələcəyə yönəlik global səylərə uyğunlaşır.

Bununla belə, vahid pəncərə sisteminin uğurlu qəbulu və funksionallığı həssas məlumatların qorunması və sistemin bütövlüyünü təmin etmək üçün güclü kibertəhlükəsizlik tədbirlərini tələb edir. İstifadəçilər üçün adekvat təlim və dəstək də sistemin faydalarını artırmaq və geniş şəkildə mənimsənilməsini təmin etmək üçün çox vacibdir.

Yekun olaraq qeyd edək ki, vahid pəncərə sistemi Azərbaycanın idarəetmədə müasirləşməyə və səmərəliliyə sadiqliyinə sübutdur. Müxtəlif dövlət xidmətlərinə çıxış üçün vahid platforma təklif etməklə, o, inzibati proseslərdə rahatlıq, şəffaflıq və effektivliyin yeni dövrünü müjdələyir. Onun davamlı təkamülü və təkmilləşməsi bürokratik prosedurların sadələşdirildiyi, vətəndaşlara və bizneslərə inzibati mənzərəni asanlıqla idarə etmək üçün imkanlar verən gələcək vəd edir.

ƏDƏBİYYAT SİYAHISI

1. Azərbaycan Respublikası dövlət sərhədinin buraxılış məntəqələrindən keçirilən malların və nəqliyyat vasitələrinin yoxlanılmasında "bir pəncərə" prinsipinin tətbiqi haqqında Qanun

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2. "Bir Pəncərə" Prinsipi - <https://customs.gov.az/az/faydali/innovativ-layiheler/bir-pencere>

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Agricultural Sciences

DER EINFLUSS VON VORFRÜCHTEN UND AUSSAATTERMINEN AUF DIE BESONDERHEITEN VON WACHSTUM UND ENTWICKLUNG VON WINTERWEIZEN IN DER SÜDLICHEN STEPPE DER UKRAINE

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Der Aussaattermin spielt eine wichtige Rolle bei der Durchführung von Maßnahmen zur Erzielung hoher Erträge bei Feldfrüchten. Um hohe Erträge bei Winterweizen zu erzielen, sind die Aussaattermine ebenso wichtig wie Bodenbearbeitung und Düngung. Abhängig davon wachsen und entwickeln sich die Pflanzen unter verschiedenen Bedingungen unterschiedlich und reichern in den Bestockungsknoten in unterschiedlichem Maße Reservestoffe an. Sie werden unterschiedlich widerstandsfähig gegen niedrige und hohe Temperaturen, Krankheiten und Schädlinge und bringen unterschiedliche Erträge und Kornqualitäten hervor. Die prognostizierte "globale" Klimaerwärmung ist besonders wichtig für die Entwicklung wirksamer Maßnahmen zur Steigerung der Produktivität von Weizen [1, 2].

Der anhaltende Klimawandel lässt auf erhebliche Veränderungen in der Zukunft schließen. Die Lufttemperaturen in den Sommermonaten erreichen oft Rekordwerte, Dürreperioden nehmen zu, und die Niederschlagsmuster werden unregelmäßiger und heftiger während der warmen Jahreszeit [3]. In Anbetracht der Erwärmungstendenzen ist es notwendig, Änderungen der optimalen Bedingungen für die Aussaat von Winterweizen zu ermitteln, der eines der wichtigsten Instrumente der Agrartechnik und eine nachhaltige Methode zur Erzeugung von Nahrungsmittelgetreide ist [4].

Eine wichtige Voraussetzung für die Erzielung hoher Weizenerträge ist die Aussaat zum optimalen agronomischen Zeitpunkt, der von den Sorteneigenschaften, den Boden- und

Klimabedingungen und den Feuchtigkeitsreserven in der Aussaatschicht bestimmt wird [5]. Daher ist der Aussaatzeitpunkt das wirksamste Element dieser Technologie, die keine zusätzlichen Materialkosten erfordert, aber die Realisierung des Produktivitätspotenzials von Weizen erheblich beeinflusst [6, 7, 8].

In Versuchen hat sich gezeigt, dass die Leistung von Winterweizen am günstigsten mit optimalen Aussaatterminen kombiniert werden kann. Abweichungen von diesen Terminen in Richtung einer frühen oder späten Aussaat wirken sich negativ auf die Pflanzendichte, die produktive Buschigkeit und die Korngröße der Ähren aus. Jüngste Studien, die in den nördlichen und westlichen Steppenregionen der Ukraine durchgeführt wurden, zeigen, dass die Erwärmung des Klimas eine Verschiebung der Aussaattermine für Winterweizen um 15-20 Tage gegenüber den vor 30 Jahren festgelegten Terminen erfordert. Die Aussaat von Weichweizen am 5.-10. Oktober trägt zur Ertragsbildung um 1,0-1,5 t/ha mehr bei als die Aussaat am 15.-20. September [9].

Die Effektivität der Agrartechnik wird durch die Fähigkeit bestimmt, die Pflanzen mit Wasser und Nährstoffen zu versorgen, die notwendigen Strukturen der Biosynthese der Nutzpflanzen zu bilden und optimale Bedingungen für den entsprechenden morphologischen Aufbau zu schaffen [10].

Die Auswirkungen der Vorläufer hängen mit der Menge an verfügbarem Wasser und Nährstoffen zusammen, die nach der Ernte im Boden verbleiben, sowie mit der Veränderung der Bodeneigenschaften. Die Verfügbarkeit von Feuchtigkeit im Boden nach dem Vorläufer bestimmt die Feldkeimung und die frühe Pflanzenentwicklung [10, 11, 12, 13].

Moderne Hohertragssorten von Winterweizen sind durch erhöhte Anforderungen an Bodenfruchtbarkeit, Feuchtigkeit und Unkrautfreiheit gekennzeichnet [14-19]. In diesem Zusammenhang gewinnt die Rolle der Vorfrüchte beim Anbau solcher Sorten zunehmend an Bedeutung. Die Auswahl von Vorläufersorten für Weichwinterweizen richtet sich nach dem Anbaugebiet, der Struktur der Anbaufläche und der Reaktion der Sorte auf die Vorläufersorte. In den trockenen und halbtrockenen Regionen des Südens wird die Aussaat zuerst nach den Vorläufern mit der geringsten Austrocknung der Wurzelschicht des Bodens vorgenommen [10].

Die Zahl der Vorläufer, die hohe Winterweizenerträge liefern, variiert in der Ukraine von Region zu Region, aber alle sind zumindest in einer Hinsicht zuverlässig - der Anhäufung von ausreichender produktiver Feuchtigkeit zu Beginn der Aussaat. Die Anforderungen müssen erfüllt sein (mindestens 10 mm pro 10 cm dicker Bodenschicht). Es ist zu bedenken, dass intensive, leistungsstarke und ertragreiche Sorten anspruchsvoller sind als ihre Vorgänger. Daher sollten die besten Vorgängersorten (saubere und fleißige Paare, Leguminosen) für den Anbau ausgewählt werden.

Der Aussaattermin hängt in hohem Maße von der Vorfrucht und der Bodenfeuchte ab. Die Bodenfeuchte wird nicht nur von den Witterungsbedingungen während der Aussaat, sondern auch von den Vorfrüchten selbst beeinflusst.

Obwohl sich viele Wissenschaftler mit dem Einfluss der Vorfrucht auf die Bildung von Strukturelementen und die Kornqualität von Winterweizen befasst haben, ist die Verwendung von Winterraps, Erbsen und Sojabohnen als Vorfrucht für Winterweizen noch nicht ausreichend untersucht worden, und die Studie wurde unter den prognostizierten Bedingungen der globalen Erwärmung durchgeführt [19, 20].

Deshalb war das Ziel unserer Forschung die Untersuchung des Einflusses von Vorfrüchten und Aussaatterminen auf die Bildung von Elementen der Kornertragsstruktur einer intensiven einheimischen Winterweizensorte beim Anbau unter den Bedingungen der südlichen Steppenzonen der Ukraine [19, 20].

Die landwirtschaftliche Technologie des Pflanzenanbaus im Versuch war für die Anbauregion allgemein anerkannt, mit Ausnahme der untersuchten Faktoren. Nach der Ernte der Vorfrüchte wurde der Boden bis zu einer Tiefe von 12-14 cm mit einer Scheibenegge BDP-6.3 bearbeitet. Bei der Bodenbearbeitung vor der Aussaat, die im Herbst mit einem Grubber KPS-4 bis

zu einer Tiefe von 6-8 cm durchgeführt wurde, wurde Nitroammoniumphosphat (N16P16K16) ausgebracht. Vor der Aussaat wurde das Saatgut mit dem Kombinationspräparat Celeste Top 312.5 FS (1,5 l/t) mit dem Mikrodünger Quantum in einer Menge von 4 l pro 1 Tonne Saatgut behandelt. Im Frühjahr wurden auf gefrorenen Böden Stickstoffdünger in einer Menge von 45 Kilogramm Wirkstoff pro Hektar Aussaat ausgebracht.

Gesät wurden die Winterweichweizensorte Blagodarka odesa und als Vorfrüchte Winterraps, Erbsen und Sojabohnen. Die Aussaat erfolgte in drei Etappen: III. Septemberdekade (25. September), I. Oktoberdekade (5. Oktober), II. Oktoberdekade (15. Oktober). Für die Aussaat wurde nur hochwertiges Saatgut verwendet. Die Aussaat von Winterweichweizen erfolgte mit einer Sämaschine CH 16 mit einer Aussaatmenge von 5 Millionen Samen pro Hektar keimenden Saatguts. Nach der Aussaat wurde das Feld mit 3KKSh 6 Walzen gewalzt.

Während der Auflaufphase wurde eine Tankmischung aus dem Herbizid Granstar Pro (0,025 kg/ha) und dem Fungizid Tilt (0,5 kg/ha) auf die Kulturen ausgebracht.

Die Parzellen wurden in der Vollreife mit einem Samro 500 geerntet, anschließend wurden die Körner gereinigt und auf einen Feuchtigkeitsgehalt von 14 % gebracht, und der biologische Ertrag wurde mit der Testscheibenmethode berechnet.

Die Feldversuche wurden in den Jahren 2021-2023 auf den Versuchsfeldern des Lehr- und Forschungszentrums der Nationalen Agraruniversität Mykolaiv, Bezirk Mykolaiv, Region Mykolaiv, Ukraine, durchgeführt. In den Versuchen wurde der Einfluss von Aussaatterminen und Vorfrüchten auf die Produktivität der Winterweizensorte Blagodarka odesa untersucht.

Der Versuchsplan umfasste die folgenden Varianten:

Vorläufer Faktor A:

1. Winter raps;
2. Erbsen (Kontrolle);
3. Soja bohne.

Aussaattermin (Faktor B):

1. Termin (25. September - Kontrolle));
2. Termin (5. Oktober);
3. Termin (15. Oktober).

Die Versuche und Berechnungen wurden nach den allgemein anerkannten Methoden durchgeführt [21-25]. Der Versuch wurde viermal wiederholt, und die Anordnung der Varianten war systematisch. Die Fläche der Versuchsparzelle betrug 72 m², die Fläche der Buchungsparzelle 30 m².

Unsere Ergebnisse zeigen, dass die Dichte und Qualität der Setzlinge im Herbst zu einem erfolgreichen Wachstum beitragen, sich durch ein starkes Wurzelsystem und einen hohen Kornsertrag im Sommer unter verschiedenen Witterungsbedingungen auszeichnen. Herbstkulturen mit schlechter Entwicklung sind in der Regel ertragsschwach, obwohl es auch Ausnahmen gibt. Lufttemperatur, Bodenfeuchtigkeit und andere Faktoren können das Auflaufen und die Intensität der Keimung beeinflussen.

Im Laufe unserer Untersuchungen zeigte sich, dass die Keimung des Saatguts auf dem Feld je nach Witterungsbedingungen und Aussaatzeitpunkt während der Vegetationsperiode stark variierte.

Die Analyse unserer Daten zeigt, dass die höchsten Feldkeimraten für die Jahre 2021-2023 im Durchschnitt bei der Aussaat in der dritten Septemberdekade für Winterraps, Erbsen und Sojabohnen erzielt wurden (78,0 % - 81,1 %).

Wurden die Aussaattermine auf spätere Zeitpunkte verschoben, verringerte sich die Keimfähigkeit des Saatguts um durchschnittlich 1,2 %. Die Keimrate von Winterraps lag bei 77,0 %, von Erbsen und Sojabohnen bei 79,7 bzw. 78,1 %. Bei der Aussaat in der zweiten Oktoberdekade lag die durchschnittliche Feldkeimrate bei 79,5 % und damit höher als bei allen

anderen Aussaatterminen. Die Aussaat von Sojabohnen und Winterraps unterschied sich in Bezug auf diesen Indikator erheblich, so dass diese Kulturen eine geringere Keimfähigkeit aufwiesen (78,3 % und 76,1 %).

Die höchsten Feldkeimraten von Winterweizensaatgut der Sorte Blagodarka Odeska wurden bei Erbsen erzielt, die um 1,6 % höher sind als bei Sojabohnen und um 3,1 % höher als bei dem Vorgänger Winterraps. Der Rückgang der Feldkeimung von Winterweizensamen bei späten Aussaatterminen ist auf eine deutliche Abnahme des durchschnittlichen täglichen hydrothermischen Potenzials zurückzuführen.

Die Anhäufung von Kohlenhydraten in den Knoten des Strauches während des Anbaus von Winterweizen im Herbst ist für die Erhaltung der Pflanze von entscheidender Bedeutung, da sie wichtige Energiequellen darstellen, die Schäden durch niedrige Temperaturen und andere schädliche Faktoren verhindern können. Die Überwinterung des Winterweizens ist einer der Hauptfaktoren, die die Erträge in der Wachstumsperiode im Frühjahr und Sommer beeinflussen, da die Pflanzen nur während der Erneuerungsperiode im Herbst und Frühjahr überleben können.

Die Witterungsbedingungen in der Winterperiode 2021-2023 waren anders. Im Durchschnitt der untersuchten Jahre endete die Herbstsaison am 25. November und die Frühjahrssaison begann am 25. März. Das Wetter und die Bedingungen des Winters 2022-2023 waren günstig für die Überwinterung und zufriedenstellend für die Abhärtung der Winterweizenpflanzen der untersuchten Sorte.

Die höchste Überwinterungsrate wurde bei der Aussaat in der ersten Oktoberdekade erreicht, bei den Vorläuferpflanzen Erbsen und Sojabohnen 93,21% bzw. 92,82% und bei Winterraps 89,07%, was 0,78-1,82% mehr war als bei der Aussaat in der dritten Septemberdekade.

Hinsichtlich der Überlebensrate war jedoch im Durchschnitt der Jahre 2021-2023 die Aussaat in der dritten Septemberdekade der beste Aussaattermin für alle Vorläufer, mit Ausnahme der Variante mit dem Vorläufer Erbse, für die der beste Aussaattermin die Aussaat in der ersten Oktoberdekade war.

Die Aussaat in der dritten Dekade führte zu einem Rückgang der Überlebensrate der Pflanzen um 0,61-4,11 %. Der niedrigste Prozentsatz des Gesamtüberlebens wurde bei der Aussaat von Winterraps beobachtet und betrug 65,94 %.

Daraus lässt sich schließen, dass die Überlebensrate von Winterweizen in den Jahren 2021-2023 am höchsten ist, wenn er in der ersten Oktoberdekade nach dem Erbsenvorläufer gesät wird, und dass dieser Wert 3,84-5,61 % höher ist als der für Sojabohnen und Winterraps.

Wir stellten fest, dass die Weizenpflanzen im Herbst während des ersten und zweiten Aussaatdatums gut bestockt waren, und der Bestockungskoeffizient von weichem Winterweizen lag am Ende der Herbstwachstumsperiode in den Jahren 2021 und 2022 zwischen 1,5 und 2,1 Einheiten.

Die höchsten Bestockungsindizes wurden bei Pflanzen des ersten Saatedatums im September mit einer Spanne von 2,0 bis 2,1 Trieben erreicht, mit einer Differenz von 0,2 bis 0,6 Trieben im Vergleich zur Aussaat am 5. Oktober. Bei einer Aussaat in der ersten Oktoberdekade war im Vergleich zu einer frühen Aussaat eine Tendenz zur Erhöhung des Frühjahrsbestellungsindex festzustellen. Bei der Aussaat zum spätesten Termin wurde das Muster beibehalten und war mit 1,8-1,9 Trieben maximal.

Die höchsten Indikatoren für die Gesamtbestockung wurden bei Winterweizen beobachtet, der zum ersten und zweiten Aussaattermin nach Erbsen gesät wurde, und beliefen sich auf 3,6 Einheiten/Pflanze. Im Durchschnitt der Jahre 2021-2023 nahm der Bestockungskoeffizient der in der zweiten Oktoberdekade gesäten Winterweizenpflanzen nach dem Erbsenvorläufer ab, war jedoch nach den anderen Vorläufern am höchsten und erreichte den höchsten Wert für die Bildung produktiver Triebe durch Weizenpflanzen, wenn sie nach

Sojabohnen gesät wurden (2,2 Stück/Pflanze).

Aus den Daten über die Bestockung von Winterbrotweizen der Sorte Blagodarka Odesa lässt sich schließen, dass eine spätere Aussaat im Herbst zu einer Verringerung der Anzahl der Halme in der Kultur führt. Im Frühjahr wurde in Bezug auf den Bestockungskoeffizienten eine umgekehrte Beziehung festgestellt. Die Aussaat am 5. Oktober auf dem Vorläufer der Sojabohne führte zur Bildung der meisten produktiven Halme.

Phänologische Beobachtungen des Wachstums und der Entwicklung von Winterweichweizen zeigen, dass Aussaattermine und Vorfrüchte einen gewissen Einfluss auf die Dauer der Interphasen in der untersuchten Kultur haben. Der Durchgang der Entwicklungsstadien und der damit zusammenhängenden Stadien der Pflanzenorganogenese hängt unter bestimmten Bedingungen vom Zeitpunkt der Aussaat ab. Je später der Aussaatetermin, desto später die Keimung, was in diesem Fall auch in unseren Untersuchungen beobachtet wird.

Aus unseren Daten geht hervor, dass die Dauer der Periode "Aussaat - Keimung" bei der untersuchten Sorte im Durchschnitt zwischen 8 und 11 Tagen lag, je nach Aussaatzeitpunkt und Vorgängerpflanzen.

Nach 24-25 Tagen zeigten die Pflanzen der ersten Aussaatperiode das Erscheinen von Seitentrieben und Knotenwurzeln in einer Tiefe von 2 cm von der Bodenoberfläche sowie die Bildung von 4 Blättern, was zu einer neuen Phase - der Bestockung - führte. Die unterirdische Sprossbildung bei Weichweizen der zweiten Aussaatperiode begann 26 Tage nach dem Auflaufen, bei der dritten Aussaatperiode - 28 Tage später. Die Bestockungsphase begann im Herbst, wurde unterbrochen, als die durchschnittlichen Tagestemperaturen auf 3-5 °C sanken, und setzte sich bis ins Frühjahr fort.

Die Herbstvegetation des Winterweizens dauerte in der ersten Aussaatperiode durchschnittlich 52-53 Tage, in der zweiten Aussaatperiode - 41-42 Tage und in der dritten - 30-31 Tage. Im Frühjahr, wenn die durchschnittliche Tagestemperatur auf über 5 °C anstieg, setzte die Bestockung wieder ein, und die Pflanze wuchs weiter.

Unter den Bedingungen von 2021-2023 lag die Gesamtdauer der Vegetationsperiode bei der untersuchten Sorte von Winterweichweizen Blagodarka odesa zwischen 263 und 276 Tagen. Die kürzeste Vegetationsperiode wurde für alle untersuchten Vorgängersorten bei der Aussaat am 15. Oktober beobachtet, und im Vergleich zur Aussaat am 5. Oktober und 25. September betrug der Unterschied 5-6 bzw. 11 Tage. Der Unterschied wurde auch für die untersuchten Vorläufer beobachtet, war aber nicht so signifikant. Wenn also Weizen nach Winterraps gesät wurde, war die Dauer der Pflanzenvegetation im Durchschnitt 1 bis 2 Tage kürzer als bei der Aussaat von Sojabohnen. Ein ähnliches Merkmal zeigte sich auch bei Erbsen als Vorläufer.

Sowohl biotische als auch abiotische Faktoren beeinflussen die Bildung der photosynthetischen Oberfläche der Pflanzen. Zu den biotischen Faktoren gehören die biologischen Eigenschaften der Sorte, die Fütterungszone, der Zeitpunkt der Aussaat, die Dichte und Tiefe der Aussaat, der Boden, das Düngesystem und die Ausrichtung der Reihen. Sie erleichtern die Nutzung abiotischer Faktoren wie Sonnenlicht und Niederschlag und verringern die negativen Auswirkungen von extremer Luft- und Bodenfeuchtigkeit [10]. Wissenschaftler haben außerdem herausgefunden, dass für einen hohen Ertrag die Oberfläche der Blätter vier- bis fünfmal größer sein sollte als die Fläche des Bodens, auf dem die Pflanze angebaut wird.

Mit der Einführung neuer intensiver Sorten und verbesserter Anbaumethoden sind viele Wissenschaftler jedoch anderer Meinung, und heute liegt die optimale Blattfläche für Winterweizenpflanzen bei 50-60 Tausend m²/ha, so dass sie ihr produktives Potenzial besser ausschöpfen können.

Zu Beginn der Vegetationsperiode wächst die Blattfläche langsam und erreicht ihr Maximum während der "Ähren- bis Röhrenzeit", um dann allmählich abzunehmen. Die Erhaltung der optimalen Blattoberfläche in allen Phasen des Wachstums und der Entwicklung von

Winterweichweizen ist von großer Bedeutung für die Produktivitätsbildung, insbesondere für die Ertrags Elemente Wassergehalt der Ähre und Korngewicht pro Ähre.

Die erhaltenen Daten zeigen, dass die Pflanzen des ersten (25.09), zweiten (5.10) und dritten (15.10) Aussaatdatums vom Beginn der Frühjahrsvegetationserholung bis zur Phase des Röhrenaufgangs den Blattapparat intensiv vergrößerten.

Es wurde festgestellt, dass von der Ährenphase bis zur vollen Kornreife die untere Blattreihe des Winterbrotweizens aufgrund der natürlichen Alterung allmählich austrocknet, was zu einer raschen Abnahme des Chlorophyllgehalts führt, so dass die Hauptrolle bei der Versorgung der Ähre mit Assimilaten hauptsächlich vom oberen Fahnenblatt übernommen wird.

Auf der Grundlage der oben genannten Daten kann festgestellt werden, dass der höchste Indikator für die Blattfläche von Winterweizen in unseren Versuchen (45,9 Tausend m²/ha) bei der Aussaat am 5. Oktober unter dem Vorgänger der Sojabohne gebildet wurde. Ein etwas niedrigerer Wert wurde bei der Aussaat von Erbsen zum gleichen Zeitpunkt festgestellt, der Indikator betrug 44,7 Tausend m²/ha.

Die Aussaat im 2. Termin war für die Bildung der Assimilationsfläche der Kulturen am produktivsten und lieferte mit durchschnittlich 43,8 Tausend m²/ha die höchsten Ergebnisse im Versuch. Eine frühe Aussaat (25. September) und eine spätere Aussaat (15. Oktober) führten zu einem Rückgang dieser Indikatoren um 3,2 Tausend m²/ha bzw. 4,0 Tausend m²/ha Blattfläche.

Unter den Vorfrüchten des Winterweichweizens war der Vorfruchttyp Soja am besten, der im Versuch einen Durchschnittswert von 43,4 Tausend m²/ha Blattfläche aufwies, das sind 0,7 und 5,2 Tausend m²/ha mehr als bei Erbsen und Winterraps. Gleichzeitig sorgte der Vorgänger Erbsen für die Bildung von 42,7 Tausend m²/ha Blattpotenzial an der Pflanze, während Winterraps nur 38,2 Tausend m²/ha erreichte.

Der höchste Versorgungsgrad eines Stängels von Winterweichweizenpflanzen mit einer Blattfläche wurde im Versuch zur Variante mit Aussaat am 25. September unter dem Vorgänger Winterraps beobachtet und betrug 89,21 cm². Die Größe der Blattfläche der Weizenstängel stand in einem umgekehrten Verhältnis zum Aussaattermin und den Vorfrüchten. So führte eine spätere Aussaat zu einer Abnahme dieses Indikators. Bei der Aussaat am 25. September hatten die Pflanzen einen Durchschnittswert von 84,99 cm², bei der Aussaat am 5. Oktober - 84,56 cm² und bei der Aussaat am 15. Oktober - 83,60 cm²/Stängel.

Der Vorläufer des Winterrapses hatte mit 86,87 cm² die größte Blattfläche pro Stängel, der Vorläufer der Erbse mit 82,89 cm² und der Vorläufer der Sojabohne mit 83,39 cm².

Bei der Bildung des Weizenkorns spielt der gute Funktionszustand des oberen Fahnenblattes eine herausragende Rolle, denn es ermöglicht eine zusätzliche Ertragssteigerung von 20-25 %, da der Kornertrag weitgehend vom Gehalt an plastischen Substanzen während der Reifung abhängt [10].

So zeigten unsere Untersuchungen, dass die Bestände von Winterweichweizen der Sorte Blagodarka Odesa eine ungleiche Blattfläche aufwiesen, die weitgehend von den Vorfrüchten und dem Aussaattermin abhing. Eine optimale Belaubung der Bestände und intensivere Photosyntheseprozesse wurden bei Pflanzen mit später Aussaat (5. Oktober) beobachtet, was sich durch die hohe ökologische Plastizität der Sorte und die Schaffung einer optimalen Aussaatstruktur erklären lässt. Die Aussaat von Winterweichweizen am 25. September und 15. Oktober führte zu einem Rückgang der Blattfläche um durchschnittlich 15 bzw. 10 %. Die besten Vorfrüchte waren Erbsen und Sojabohnen.

Ausgehend von den Forschungsergebnissen war also die beste Option für die Bildung biometrischer Parameter von Winterweizenpflanzen der Sorte Blagodarka Odesa die Verwendung von Sojabohnen als Vorläufer und die Aussaat am 5. Oktober (im zweiten Termin). Diese Aussaatvariante bildete den Koeffizienten der produktiven Bestockung von 2,2 Stück/Pflanze und die maximale Blattfläche (45,9 Tausend m²/ha) bei einer Vegetationszeitdauer von 271 Tagen.

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Legal Sciences

Review of directives regulating the Safety conditions defined by the Association Agreement with the European Union in the field of road transport

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Keywords: Economy, Road transport, European Union, Association, Directive, Regulation, Management, Safety.

Abstract: The Association Agreement signed between Georgia and the European Union defines the main issues of cooperation between Georgia and the EU member states in the field of transport. Its purpose is to ensure the development of the national transport policy and relevant sectoral strategies in the country, promote the use of smart transport systems and modern technologies in the field of transport infrastructure policy development, and more.

The functioning of the country's economy is closely related to the development of road transport and roads, which constitute one of the crucial branches of its infrastructure. In a country of Georgia's size and complex natural relief, the priority of road transport in the structure of the transport system is indisputable, especially considering the high-tech transport service parameters.

Cargo transported by transport units other than road freight is ultimately conveyed by trucks to its destination, such as warehouses, rail terminals, airports, and ports.

The safe transportation of cargo is a crucial issue, particularly for dangerous cargo. Regulation of this matter and the relevant requirements are provided by the European Union Directive, which Georgia has committed to implementing within the framework of the Association Agreement.

According to the association agreement signed between the European Union and Georgia, Georgia must meet safety requirements and obligations in the field of road transport. In this direction, the agreement envisages two main directives:

- Directive 2006/126/EC of the European Parliament and of the Council of 20 December 2006 on driving licences;
- Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods.

Directive 2006/126/EC concerning driving licenses and conditions related to their issuance. A driver's license made according to the standards and requirements specified in the directive is equipped with a microchip to prevent the document from being easily forged. In addition to motor vehicle driving license categories, the directive describes information on motorcycles. The directive also defines testing requirements, rules of professional training of drivers, conditions of medical examination, and others.

In this article, was analyzed Directive 2008/68/EC, which deals with the transportation of dangerous goods in the field of road transport. The transportation of dangerous goods involves risks that can have a significant impact on the people involved in road transport, as well as on the infrastructure and the environment, which gives us an objective reason to take appropriate measures to ensure the minimization of risks in the transportation process.

In the research related to the implementation of the requirements of the directive, four main indicators were used, which allow us to determine the extent to which the requirements provided by the directive are reflected in the national legislation. Areas of dissemination of the requirements of the legislation have been identified, whether the requirements of the regulation apply to the cargo transportation and passenger transportation companies involved in international and domestic transportation of the country and the persons employed in these companies.

Enforcement of legislation and further monitoring of established rules improves the quality of compliance. Administrative assessment of performance - identification is made of the normative acts developed and approved by the relevant competent agency of the Government of Georgia, as well as the determination of the compliance of the main objectives of the requirements stipulated by the European Union directive or regulation provided for in the association agreement in the national legislation.

Assessment of the fulfillment of the obligation in international transportation - the status of the fulfillment of the directives stipulated by the association agreement for vehicles and personnel involved in international transportation is established.

Assessment of the fulfillment of obligations in domestic transportation - the status of the fulfillment of the directives provided for in the Association Agreement is determined for vehicles and personnel involved in domestic transportation.

Evaluation of the enforcement/monitoring of regulations - determines the enforcement of the directives or provisions of the regulations provided for in the association agreement in accordance with the national legislation for vehicles and personnel involved in domestic and international shipments, the extent to which the monitoring of the enforcement of relevant requirements is carried out on the road or in enterprises. The introduction of a new regulation or the provision of a public service is related to the relevant agency that performs this activity.

Implementation deadline of Directive: For all vehicles involved in international transport, the provisions of this Directive shall be implemented within three years of the entry into force of this Agreement. (until September 1, 2017) For all vehicles involved in domestic transport, the provisions of this Directive shall be implemented within five years of the entry into force of this Agreement. (until September 1, 2019)

The competent Authority For the implementation of the directive is the Land Transport Agency of the Ministry of Economy and Sustainable Development of Georgia.

2008/68/EC establishes minimum requirements applicable to the transport of dangerous goods by road, rail, and inland waterways within or between EU member states, including loading and unloading operations, transfers from one type of transport to another, and stops due to transport-related circumstances.

This Directive does not apply to the following shipments of dangerous goods:

- by vehicles, wagons, or vessels belonging to or under the responsibility of the armed forces;
- by seagoing vessels on maritime waterways forming part of inland waterways;
- by ferries only crossing an inland waterway or harbour; [1]

Annex I of Directive 2008/68/EC defines the rules for the road transport of dangerous goods.

The requirements of the directive are reflected in the technical regulations adopted by the government of Georgia.

- Resolution of the Government of Georgia, February 15, 2019, Technical Regulation №89 - On Approval of the "Rules for Transportation of Dangerous Goods by Vehicles" – ADR;
- Resolution of the Government of Georgia, February 7, 2018, Technical Regulation №72 - On Approval of the "Rules for Transportation of Nuclear and Radioactive Substances";
- Resolution of the Government of Georgia, March 29, 2016, Technical Regulation №145 – Regarding the approval of the technical regulation on the special requirements for the collection and processing of hazardous waste;
- Resolution of the Government of Georgia, April 18, 2016, Technical Regulation №189 - On the approval of the "Technical Regulation - Radioactive Waste Management Rules".

The regulation defines the conditions for the transportation of dangerous goods by means of vehicles, exceptional cases when the provisions of the European Agreement "On the International Carriage of Dangerous Goods by Road" (hereinafter - ADR) and the present regulation are not applied, the requirements related to the construction of vehicles carrying dangerous goods and their equipment, specified dangerous goods the requirements related to the admission of vehicles for transportation and the training of drivers of vehicles, the conditions for issuing a certificate of admission of vehicles for the transportation of specified dangerous goods, as well as the rights, obligations and responsibilities of participants in transportation by means of transport.[2]

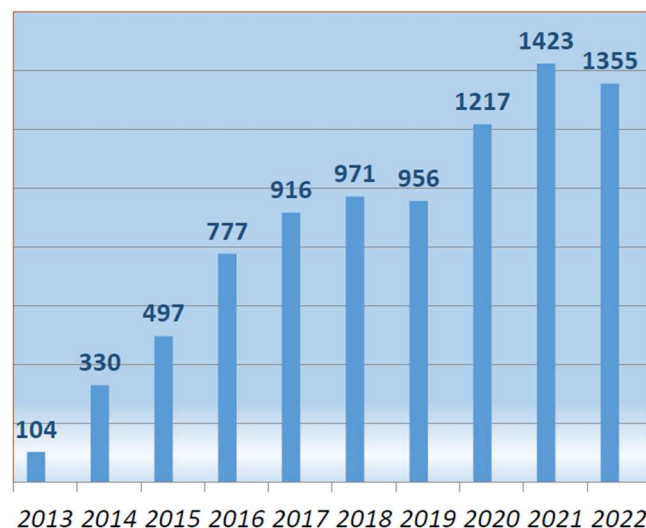
The purpose of the regulation is:

- Reflecting the requirements of the UN rules and ADR provisions related to the transportation of dangerous goods in the Georgian legislation in the field of road transport;
- Creating a legal basis for the implementation of ADR provisions in Georgian legislation;
- Ensuring the safety of drivers, passengers and pedestrians during the transportation of dangerous goods, as well as improving the safety of highways, road structures and cargo;
- Prevention of road accidents, emergency situations, damage to people and the environment during the transportation of dangerous goods. [2]

In addition to the requirements of the EU directive, since 2016 Georgia has become a signatory to the UNECE Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was done at Geneva on 30 September 1957 under the auspices of the United Nations Economic Commission for Europe, and it entered into force on 29 January 1968. ADR is an agreement between states and does not provide for any common regulatory body. In practice, the contracting parties inspect the highways, and the discovery of any non-compliance will lead to legal action by the national authorities against the violators in accordance with the laws of their country. The agreement itself does not provide for penal sanctions. The types and amount of the fine are determined in accordance with the internal legislation of the contracting party to the agreement. ADR applies to transport operations carried out in the territories of at least two of the above-mentioned contracting parties. [4]

The following documents are required for issuing a Certificate of Approval for Vehicles Carrying Certain Dangerous Goods:

- ADR certificate for drivers issued by the Georgian Technical University;
- ADR access certificate for international transport of dangerous goods;
- Roadworthiness testing document for the vehicle. [3]



Certificate of Approval for vehicles carrying certain dangerous goods[5]

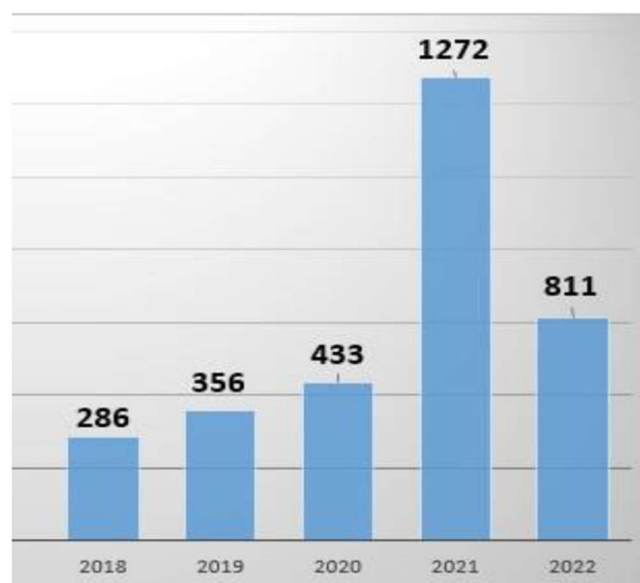
Training programs for drivers transporting dangerous goods in the following directions have been approved by the Land Transport Agency of Georgia:

- Basic training course
- Training course for carriage in tanks
- Training course for carriage of substances and articles of Class 1
- Training course for carriage of radioactive material of Class 7
- Training course for Safety Advisors

After completion of each course, the State Land Transport Agency conducts an exam, after successful completion of which drivers are issued an ADR driver's card, which is recognized in 54 member countries of the ADR agreement, including all EU countries. With this card, the driver can be employed in the member countries of the agreement. It should be noted that the sample of the card issued by the competent body has been uploaded on the website of the United Nations Economic Commission (website of the United Nations Economic Commission: <https://unece.org/adr-certificates>), which is used for the control of drivers involved in international transportation by the control agencies of different countries.



*Sample of ADR training certificate
(United Nations Economic Commission, 2024) [6]*



ADR driver cards issued by LTA [5]

conclusion

Based on the conducted research, we can conclude that Directive 2008/68/EC is reflected in the national legislation for both vehicles and drivers involved in international and domestic transportation. In this regard, the requirement outlined in the Association Agreement is fulfilled. However, several issues need to be resolved:

- Training safety managers employed in companies involved in the transportation of dangerous goods according to the obligations stipulated by the international agreement and the educational program;
- Monitoring vehicles carrying dangerous goods on the roads;
- ADR Tanks and Packages periodical inspection.

In relation to the control of the transportation of dangerous goods, it is recommended to introduce the Directive (EU) 2022/1999 of the European Parliament and of the Council of 19 October 2022 on uniform procedures for checks on the transport of dangerous goods by road.

Above mentioned Directive 2022/1999 (EU) provides an opportunity to effectively verify compliance with the safety standards stipulated by the 2008/68/ EC Directive, for which it is necessary to conduct appropriate inspections in enterprises as a preventive measure or in case of serious violations of the laws on the transportation of dangerous goods on the roads. Inspections should be carried out on a random basis and, as far as possible, should include vehicles carrying dangerous goods and persons involved in said transport. In accredited laboratories, it is also possible and recommended to test transported dangerous goods by the method of sending a sample. It is advisable to carry out checks in enterprises transporting dangerous goods. The mentioned action on the part of the relevant competent agency is of a supervisory and preventive nature to identify such violations that endanger the road transport of dangerous goods.

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