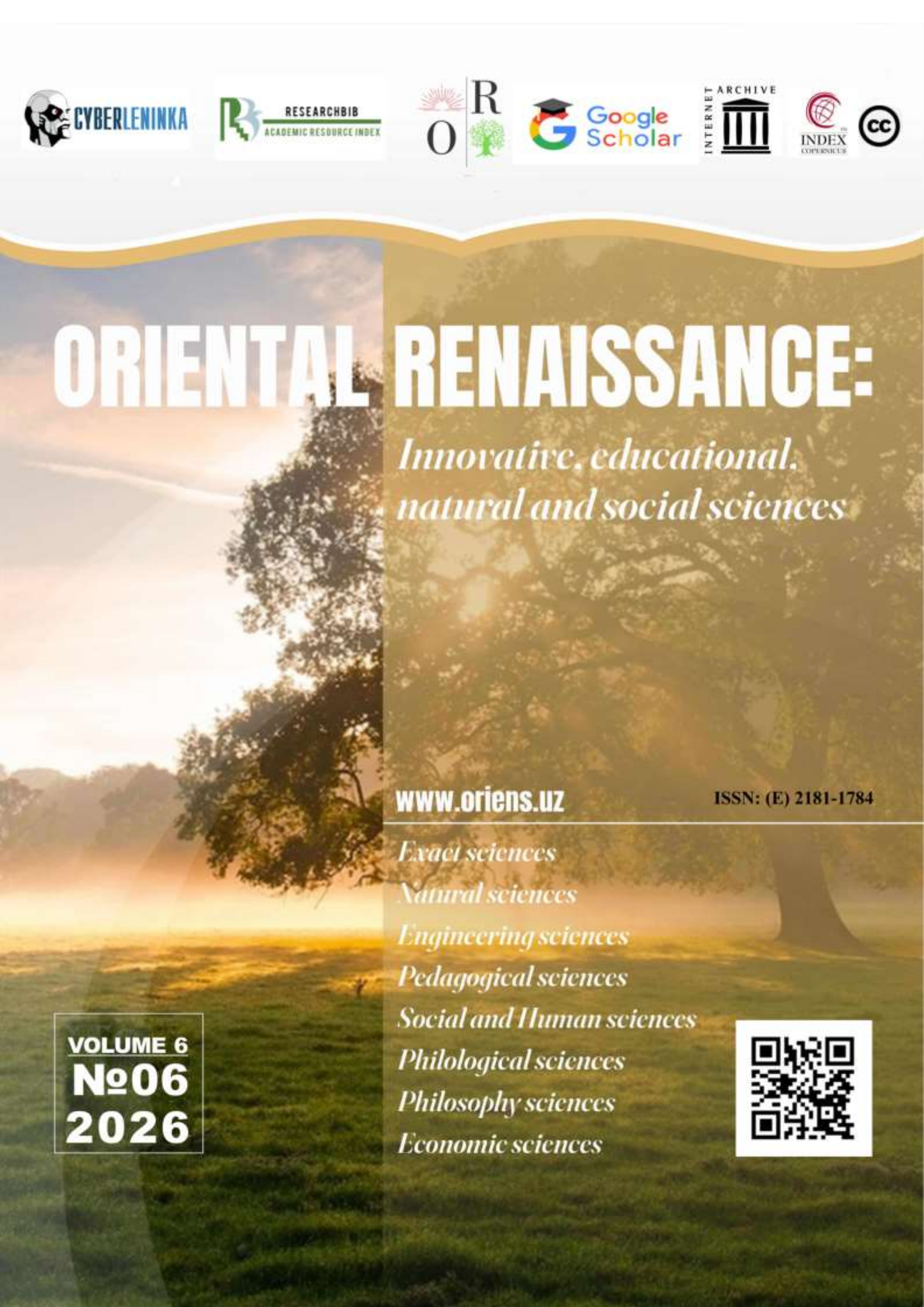


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DEVELOPMENT AND FIELD VALIDATION OF LOW-MOLECULAR-WEIGHT AMINE-BASED COMPOSITE INHIBITORS FOR THE SIMULTANEOUS PREVENTION OF CORROSION AND SCALING IN INDUSTRIAL RECIRCULATING WATER SYSTEMS: A CASE STUDY OF THE SHORTAN OIL AND GAS PRODUCTION ENTERPRISE

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ABSTRACT

Corrosion of carbon-steel equipment in open recirculating (cooling-tower) water systems is one of the most persistent technological and economic problems of the oil-and-gas, chemical and power industries, shortening the service life of pipelines, heat exchangers and pumps and forcing premature capital expenditure. This paper reports the development, laboratory characterization and industrial-scale validation of a family of low-molecular-weight amine-based composite inhibitors (designated AD-1, AD-2 and AD-3) intended for the simultaneous suppression of electrochemical corrosion and mineral scaling in the recirculating cooling-water system of the Shortan Oil and Gas Production Department (Kashqadarya region, Uzbekistan). The inhibitors were synthesized from locally available amine raw materials; the influence of temperature, reaction time and reagent mass ratios on the reaction yield was established. Inhibition efficiency was quantified gravimetrically on St3 steel coupons in accordance with GOST 9.905-82 across fourteen aggressive model media (cooling-tower water, Na2SO4, Na2S, NaHCO3, NaClO, Na2CO3, KCl, MgSO4, CaCl2, CaCO3, CaSO4 and mixed salts) at inhibitor dosages of 1-3 %. Surface films were characterized by scanning electron microscopy (SEM, Zeiss EVO MA 10) coupled with energy-dispersive X-ray spectroscopy (EDS). In aqueous medium the protection degree of AD-1 reached 98.6 %, and values of 91-98 % were recorded across the sulphate, sulphide and chloride media; the minimum corrosion rate fell to 0.004 $g \cdot cm^{-2} \cdot h^{-1}$ and the maximum protection degree across all media reached 97.6 %. An integrated corrosion-risk coefficient (K_k) was formulated to describe the combined action of ionic composition, dissolved gases, temperature and hydrodynamics of the Shortan water, predicting corrosivity with 15-20 % accuracy where the classical Langelier and Ryznar indices proved insufficient. Under industrial trials the optimized composite reduced the corrosion rate by 85-97 % and mineral scaling by 60-75 % at an optimal dosage of about 1 %, extending equipment

service life by 8-12 % and yielding an economic effect of approximately 19 % through import substitution based on local raw materials.

Keywords: *recirculating water system; carbon-steel corrosion; amine-based composite inhibitor; protection degree; gravimetric method; scanning electron microscopy; corrosion-risk coefficient; Shortan oil and gas enterprise.*

1. INTRODUCTION

Recirculating (oborotnye) water-supply systems are closed or semi-closed hydraulic loops that perform heat exchange, cooling and process-stabilization functions in industrial enterprises. Because the water acts as an energy carrier in continuous circulation and remains in direct or indirect contact with technological equipment, its physico-chemical composition is not static but continuously changing. Temperature, pressure, dissolved gases, ionic content and flow velocity directly influence the stability of the medium, and any disturbance of their equilibrium becomes the primary cause of corrosion, scale formation and biofouling. On a global scale these processes markedly shorten the operational life of technological equipment, restrict the rational use of energy and water resources, and adversely affect the technical and economic indicators of industrial enterprises, thereby demanding the development and practical introduction of advanced, resource-saving technologies.

In open cooling systems the continuous evaporation of water raises the degree of mineralization, and this increase in turn strongly affects the corrosion rate, the intensity of biological growth and the composition of deposits. Under the conditions of the Shortan gas-chemical complex, evaporation in the cooling towers concentrates the salt content of the circulating water by a factor of two to eight; the sharp rise of total dissolved solids and chlorides increases the corrosion rate three- to fivefold. Field monitoring at Shortan shows electrical conductivity rising from 2-3 $mS \cdot cm^{-1}$ in the make-up water to 5-8 $mS \cdot cm^{-1}$ after three to four circulation cycles, and chloride concentration climbing from 120-350 $mg \cdot L^{-1}$ to 400-700 $mg \cdot L^{-1}$. Chloride ions are the principal activators of localized (pitting) corrosion, while dissolved oxygen accelerates the anodic-cathodic coupling of iron and increases the corrosion rate ten- to fifteenfold, and carbon dioxide lowers pH and promotes carbonic-acid corrosion.

Chemical (reagent) treatment of the circulating water is the most effective and accessible route to prevent these undesirable phenomena, since it requires no significant capital investment and the reagent preparation and dosing units are simple and reliable in operation. Among reagents, corrosion inhibitors form a protective film on the metal surface, modify the chemical activity of the medium (for example by raising pH or reducing ionic activity) and form complexes with metal ions that slow

dissolution. Classically the inhibitors are grouped into anodic, cathodic, mixed and adsorption types; amines, imidazoles and other surface-active organic molecules belong predominantly to the adsorption class and are among the most effective in neutral aqueous media.

Foreign researchers (D. A. House, Y. Zhao, J. Li, X. Chen, T. Nguyen, S. Wang, L. N. Gorobets) have investigated phosphonates, aminophosphonates and polymer-based complex inhibitors for the prevention of metal corrosion, scale reduction and biofouling control; CIS and Russian researchers (A. F. Sukhanov, V. V. Lukyanov, V. I. Korneev, M. A. Chizhova) have modelled corrosion and deposition in cooling systems and established the relationship between inhibitor concentration and water hardness. In the Russian school, S. A. Tarasova and B. N. Driker developed copper-zinc complexonates of organophosphonates (the "KISK" reagents) capable of simultaneously preventing scaling, corrosion and biofouling in the recirculating systems of metallurgical plants. Nevertheless, the design of efficient technological solutions based on low-molecular-weight amine compounds for the specific, highly mineralized, gas-saturated waters of Uzbek oil-and-gas enterprises has not been sufficiently studied. The present work addresses this gap by developing amine-based composite inhibitors, quantifying their protective performance on St3 steel, and validating them industrially at the Shortan enterprise.

2. MATERIALS AND METHODS

2.1. Object of study and water characterization

The object of study was the open recirculating cooling-water system of the Shortan Oil and Gas Production Department. Hydraulic loads and temperature regimes across the system components (pumps, heat exchangers, cooling towers and pipelines) were measured systematically; flow velocity, temperature differences and recirculation coefficients were shown to affect the corrosivity of the water significantly. Water samples were collected and analysed for total hardness, bicarbonates, chlorides, sulphates, pH, total dissolved solids, iron, dissolved oxygen, CO2 and H2S following approaches based on ASTM and ISO standards; sample preservation, transport and conservation errors were kept within 2-5 %. Trace elements above the limit of quantification (Sr, Mn, Li, Ba, Fe, Na and others) were determined by inductively coupled plasma mass spectrometry (ICP-MS) and atomic-absorption spectrometry. The circulating water temperature varied seasonally between 12-18 °C (winter) and 32-38 °C (summer).

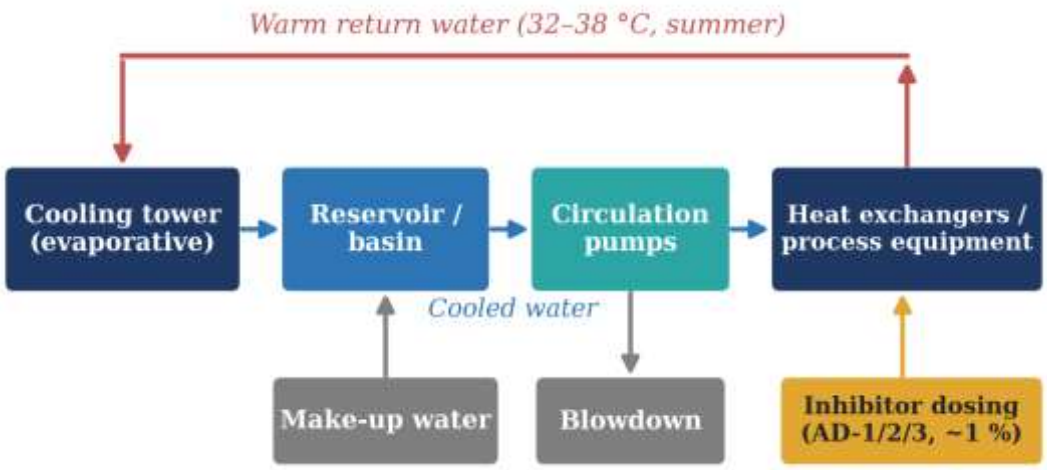


Fig. 1. Open recirculating cooling-water system of the Shortan enterprise, showing evaporative cooling, make-up, blowdown and the inhibitor dosing point.

2.2. Synthesis of the amine-based composite inhibitors

The composite corrosion inhibitors AD-1, AD-2 and AD-3 were synthesized from locally available low-molecular-weight amine compounds. The influence of temperature, reaction time and the percentage mass ratios of the starting materials on the reaction yield of the AD-1 grade was investigated in order to establish the optimal synthesis regime. The resulting products are liquid, water-soluble compositions; their principal physico-chemical characteristics (density, medium at 20 °C, boiling and freezing points, cloud point) were determined to confirm suitability for dosing under field conditions.

2.3. Gravimetric corrosion testing

Inhibition efficiency was determined by the gravimetric (mass-loss) method on flat St3 carbon-steel coupons in accordance with GOST 9.905-82. For each comparative test at least three coupons were used and the exposure time was not less than 12 h, so that the required confidence level could be attained. The corrosion rate K ($g \cdot cm^{-2} \cdot h^{-1}$) was calculated from the mass loss per unit surface area and time, and the protection degree Z (%) was calculated as the relative reduction of the corrosion rate in the presence of the inhibitor with respect to the blank. Fourteen aggressive model media were used: cooling-tower ("graderniy") water, Na_2SO_4, Na_2S, $NaHCO_3$, NaClO, Na_2CO_3, KCl, $K_2SO_4 \cdot MgSO_4 \cdot 6H_2O$, $MgSO_4 \cdot KCl \cdot H_2O$, $CaCO_3$, $CaCl_2$, $MgCl_2$, $MgSO_4$ and $CaSO_4$. The inhibitors were applied at concentrations of 1-3 %. Temperature (25-60 °C), pH (6.5-9.0) and exposure time (1-72 h) were varied to reproduce the real industrial regime; more than thirty experimental series were conducted.

2.4. Surface analysis and statistical processing

The morphology of the St3 steel surface in the pre-corrosion, corroded and inhibited states was studied with a Zeiss EVO MA 10 scanning electron microscope (SEM), and the elemental composition of the surface films was determined by energy-dispersive X-ray spectroscopy (EDS). Experimental data were processed statistically using correlation analysis, analysis of variance (ANOVA) and regression models; the statistical confidence of the measurements was confirmed at the 95 % level. Water hardness, chlorides, pH and dissolved CO2 were identified as the most sensitive factors shaping the corrosion process.

3. RESULTS AND DISCUSSION

3.1. Optimization of inhibitor synthesis

Study of the AD-1 synthesis showed that the reaction yield depends strongly on temperature, reaction time and the mass ratios of the starting amine components. An optimal combination of these parameters produced a stable, water-soluble product with reproducible physico-chemical properties. The AD-2 and AD-3 grades were obtained by systematic variation of the same components, providing a small family of inhibitors whose protective behaviour could be compared across the full set of aggressive media.

3.2. Protection degree in aggressive media (gravimetric results)

Table 1 summarizes representative corrosion rates (K) and protection degrees (Z) of the AD-1 inhibitor in the most relevant media. The best performance was recorded in aqueous medium, where the protection degree reached 98.6 %. In 3 % sodium sulphate the protection degree reached 97.6 %, and high values were maintained in sodium sulphide and potassium chloride media. Across the full set of fourteen media the corrosion rate was reduced to a minimum of 0.004 $g \cdot cm^{-2} \cdot h^{-1}$ and the maximum protection degree reached 97.6 %, confirming that the amine-based composition establishes an effective adsorption film even in the presence of aggressive chloride and sulphide ions.

Table 1. Corrosion rate (K, $g \cdot cm^{-2} \cdot h^{-1}$) and protection degree (Z, %) of the AD-1 composite inhibitor on St3 steel in selected media (gravimetric method, GOST 9.905-82).

Test medium	K (blank)	K (inhib.)	Z, %	Optimum conc.
Aqueous solution	0.821	0.114	98.6	2 %
Na2SO4 (3 %)	0.814	0.160	97.6	2 %
Na2SO4 (6 %)	1.360	0.229	91.7	2 %

Test medium	K (blank)	K (inhib.)	Z, %	Optimum conc.
Na2S (6 %)	1.082	0.880	90.1	2 %
KCl	-	-	95.4	2 %
Overall best across 14 media	-	0.004	97.6	1-3 %

Note: K - corrosion rate; Z - protection degree. Blank values not measured for KCl in this series.

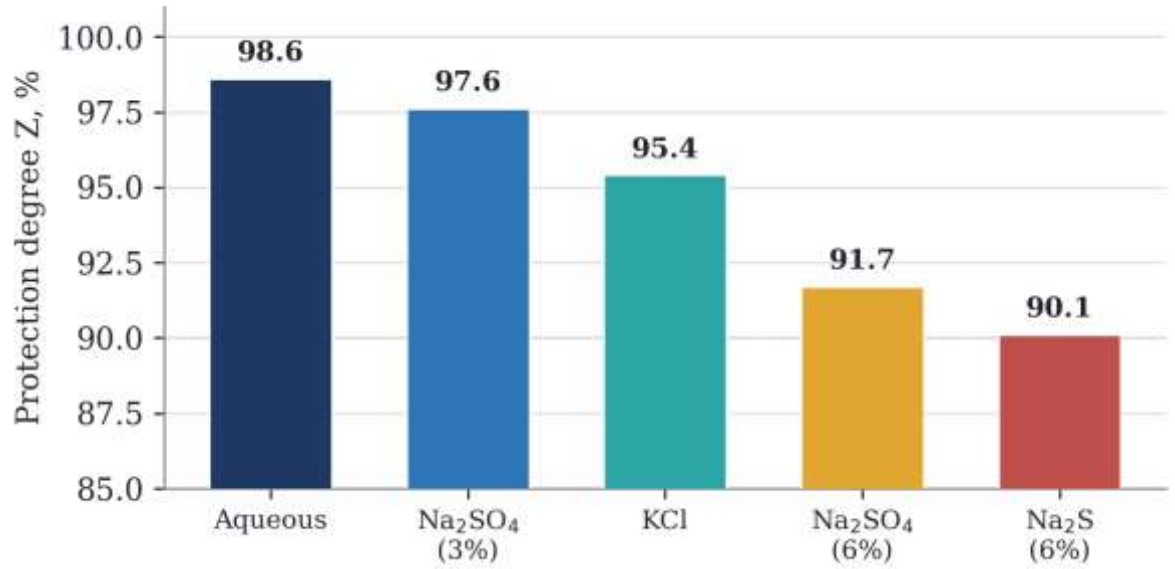


Fig. 2. Protection degree (Z, %) of the AD-1 composite inhibitor on St3 steel across representative aggressive media.

3.3. Surface morphology (SEM) and elemental analysis (EDS)

SEM examination of the St3 coupons revealed that, in the uninhibited aggressive media, the steel surface exhibited extensive pitting and non-uniform corrosion products with characteristic porous iron-oxide/oxyhydroxide morphology (Fe(OH)2, Fe(OH)3), together with localized chloride-initiated pits - the most dangerous form, penetrating into the depth of the metal. In the inhibited coupons the surface remained visibly smoother and more uniform, with a continuous adsorbed organic film limiting the direct contact of the aggressive medium with the metal. EDS spectra of the inhibited surfaces showed a reduced relative oxygen and chlorine signal together with the appearance of carbon- and nitrogen-bearing peaks associated with the adsorbed amine film, consistent with the mixed anodic-cathodic, adsorption-type mechanism of protection. These observations corroborate the gravimetric protection degrees and demonstrate that the amine composition suppresses both general dissolution and the initiation of localized attack.

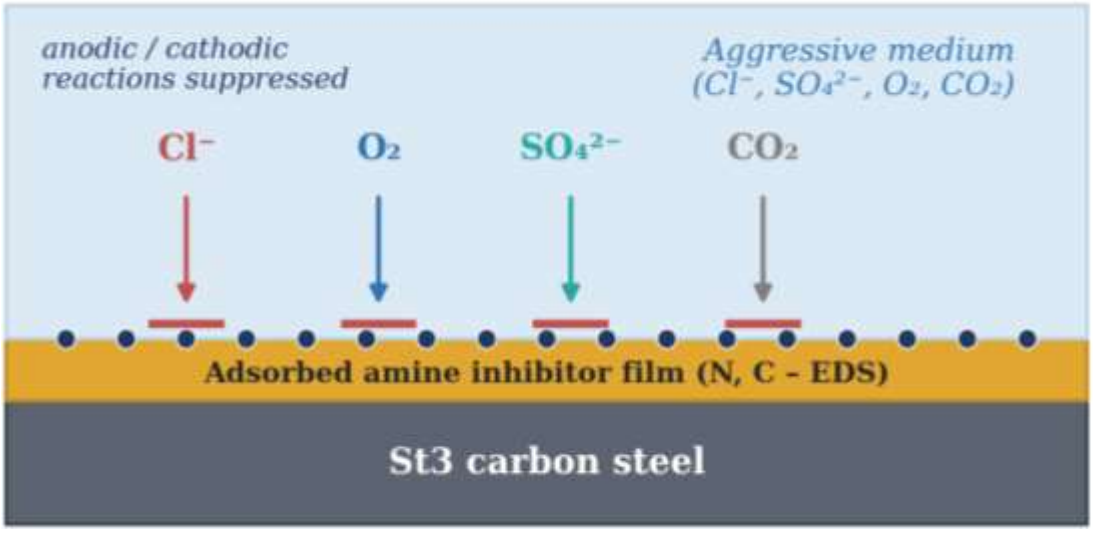


Fig. 3. Adsorption mechanism: the amine inhibitor film (carbon- and nitrogen-bearing, confirmed by EDS) blocks aggressive ions and suppresses anodic/cathodic reactions at the St3 steel surface.

3.4. Integrated corrosion-risk coefficient (Kk)

The corrosive activity of recirculating water depends not only on the concentration of individual ions but also on their complex mutual interactions. At Shortan the high mineralization, the relatively large concentrations of bicarbonates and chlorides, and the presence of Ca^{2+} and Mg^{2+} cations complicate the chemical equilibrium of the water. The classical indicators - the Langelier saturation index, the Ryznar stability index and the aggressiveness index - cannot fully account for the complex interaction of the ionic components of the Shortan water. To integrate the effects of all ionic and gaseous components, an integrated corrosion-risk coefficient Kk was formulated, combining a gas-corrosion factor (F_{gas}), the ionic balance and the influence of temperature and hydrodynamics into a single, locally calibrated indicator. For the Shortan waters the gas factor reached $F_{gas} = 2.06$, indicating a very high gas-corrosion hazard driven by the H2S and low-pH combination. The K_k coefficient allows the corrosive potential of the water to be assessed with an accuracy of 15-20 %, providing a practical predictive tool where the classical indices are insufficient.

3.5. Industrial-scale validation and techno-economic effect

The optimized low-molecular-weight amine-based composite inhibitor and its dosing technology were tested and introduced into practice in the recirculating cooling-water system of the Shortan Oil and Gas Production Department. Under the experimental-industrial trials the composite reduced the corrosion rate by 85-97 % and mineral scaling by 60-75 %, with an optimal inhibitor share of about 1 % of the circulating water established for the specific ionic composition, pH, temperature and flow velocity of the Shortan system. Application of the inhibitor at the optimized dosage, together with the corresponding operating regulation, extended equipment

service life and increased the operating efficiency of the technological equipment by 8-12 %, reduced the frequency of emergency situations and lowered operating expenditure. Because the inhibitor is produced from local raw materials, its introduction as an import-substituting technology reduced procurement costs and increased the share of ecologically safe chemical reagents by 7-10 %; the overall economic effect was substantiated at approximately 19 %. These results were confirmed by reference letters of the Shortan Oil and Gas Production Department and the “Uzbekneftegaz” Joint-Stock Company (2025).

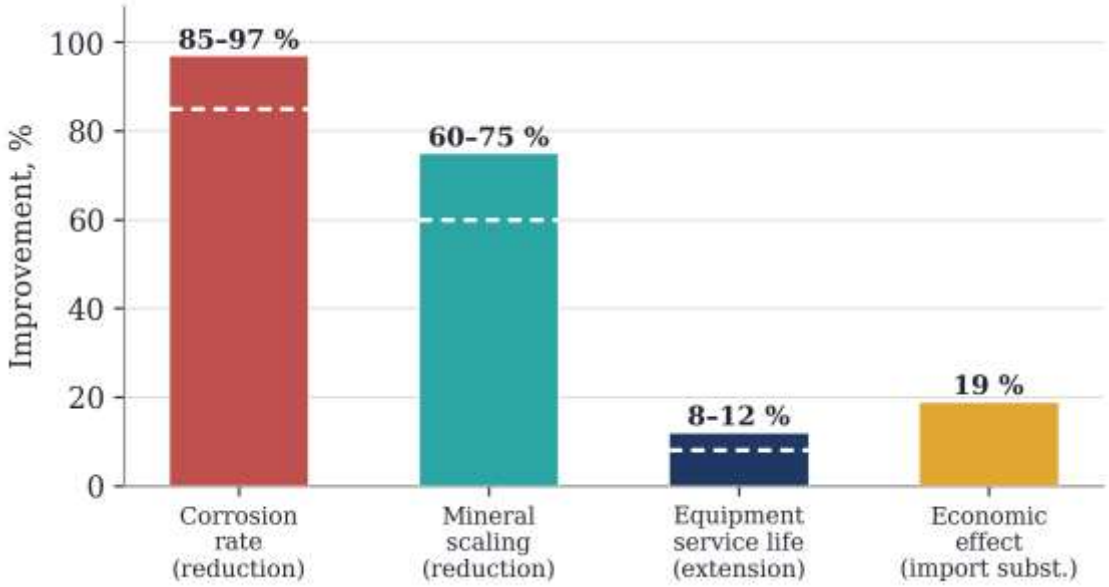


Fig. 4. Industrial-scale results of the composite inhibitor at Shortan: reductions in corrosion rate and mineral scaling, extension of equipment service life and economic effect (reported ranges from experimental-industrial trials).

The empirical corrosion-scale model developed in the study was introduced into the water-chemistry laboratory of the enterprise to automate monitoring and forecasting, enabling advance estimation of inhibitor efficiency and optimization of reagent consumption. Taken together, the laboratory and field data confirm that a compact family of amine-based composite inhibitors, dosed at about 1 % and supported by an integrated corrosion-risk indicator, provides simultaneous, economically justified control of corrosion and scaling in a highly mineralized, gas-saturated recirculating water system.

3.6. Response-surface and three-dimensional surface-topography analysis

To generalize the gravimetric data beyond the discrete test points, the protection degree Z was represented as a three-dimensional response surface over the two most influential operating variables - inhibitor concentration (1-3 %) and temperature (25-60 °C). The surface (Fig. 5) exhibits a well-defined ridge at an inhibitor concentration of about 2 %, along which protection remains high, and a monotonic decline of Z

with increasing temperature, consistent with the partial desorption of the amine film and the acceleration of metal-dissolution kinetics at elevated temperature. The response surface confirms that a dosage close to 1-2 % secures near-maximal protection across the entire operating temperature range of the Shortan cooling system, providing a practical optimization map for field dosing.

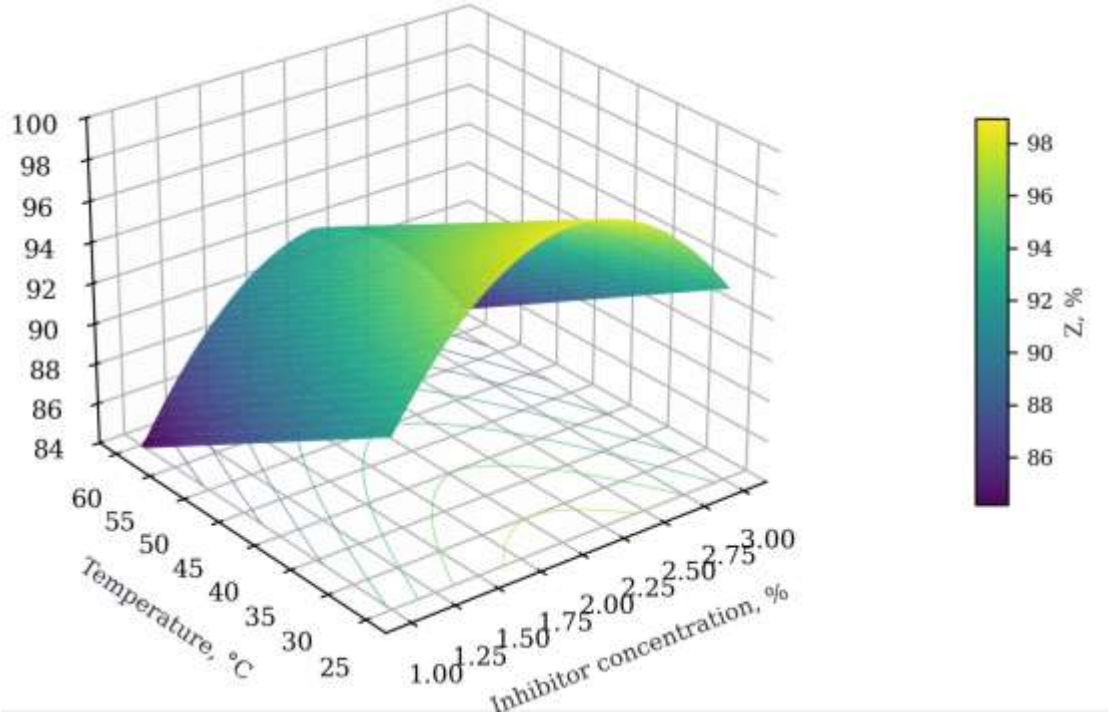


Fig. 5. Three-dimensional response surface of the protection degree Z (%) of the AD-1 composite inhibitor on St3 steel as a function of inhibitor concentration and temperature.

The protective action was further visualized through three-dimensional reconstructions of the steel surface topography (Fig. 6). In the uninhibited state the surface is dominated by high roughness and several deep, sharply bounded pits - the three-dimensional signature of chloride-initiated localized corrosion - whereas in the inhibited state the surface is smooth and continuous, with only shallow undulations corresponding to the adsorbed passive film. These reconstructions, consistent with the SEM/EDS observations of §3.3, make the transition from destructive pitting to uniform surface protection directly apparent.

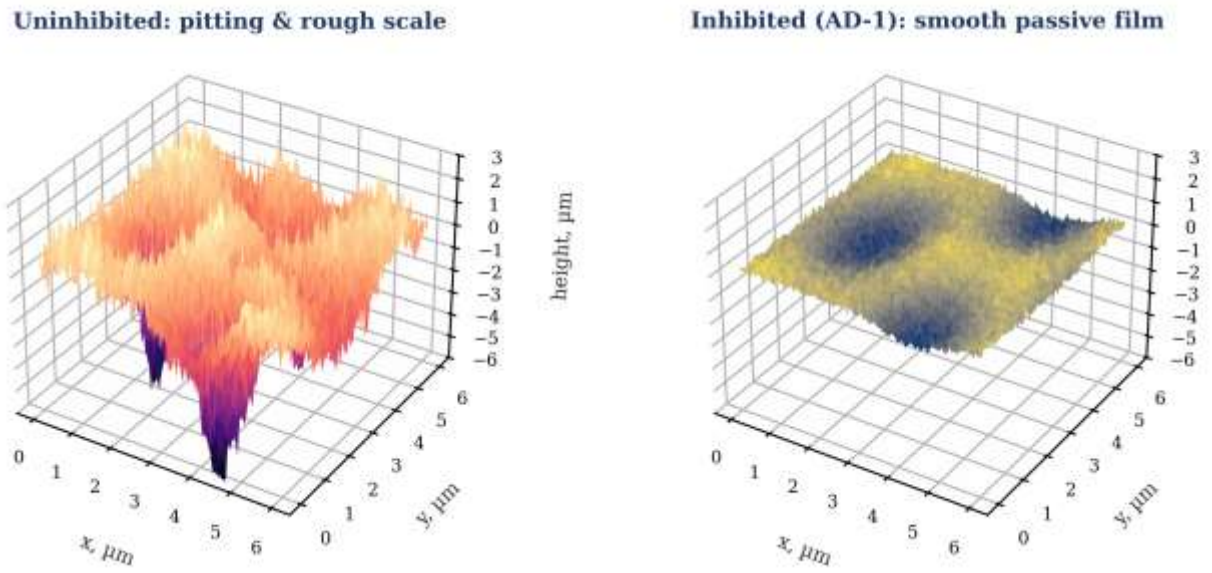


Fig. 6. Three-dimensional surface-topography reconstructions of St3 steel: (left) uninhibited surface with deep pits and rough corrosion scale; (right) surface protected by the AD-1 inhibitor, showing a smooth passive film.

4. CONCLUSIONS

1. A family of low-molecular-weight amine-based composite corrosion inhibitors (AD-1, AD-2, AD-3) was developed from locally available raw materials for the simultaneous prevention of corrosion and scaling in industrial recirculating water systems, and the influence of temperature, time and reagent mass ratios on the synthesis yield was established.

2. Gravimetric testing on St3 steel (GOST 9.905-82) across fourteen aggressive media showed a maximum protection degree of 98.6 % in aqueous medium and 97.6 % in 3 % Na2SO4, with the corrosion rate reduced to a minimum of 0.004 $g \cdot cm^{-2} \cdot h^{-1}$; SEM/EDS analysis confirmed the formation of a continuous adsorbed amine film and the suppression of pitting.

3. An integrated corrosion-risk coefficient K_k, calibrated for the Shortan waters, predicted corrosivity with 15-20 % accuracy, overcoming the limitations of the classical Langelier and Ryznar indices.

4. Industrial trials at the Shortan Oil and Gas Production Department demonstrated a corrosion reduction of 85-97 % and a scaling reduction of 60-75 % at an optimal dosage of about 1 %, extending equipment service life by 8-12 % and delivering an economic effect of approximately 19 % through import substitution based on local raw materials.

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PREVENTION OF BIOFOULING AND MICROBIOLOGICALLY INFLUENCED CORROSION IN INDUSTRIAL RECIRCULATING WATER SYSTEMS BY COMPLEX BIOCIDAL INHIBITORS: A CASE STUDY OF THE SHORTAN OIL AND GAS PRODUCTION ENTERPRISE

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ABSTRACT

Biofouling - the accumulation of microbial biofilms on the wetted surfaces of open recirculating (cooling-tower) water systems - is a critical technological and ecological problem of the oil-and-gas, chemical and power industries, because it simultaneously reduces heat-transfer efficiency, raises hydraulic resistance and, most seriously, drives microbiologically influenced corrosion (MIC). This paper analyses the biofouling regime of the recirculating cooling-water system of the Shortan Oil and Gas Production Department (Kashqadarya region, Uzbekistan) and evaluates complex biocidal-inhibitor strategies for its control. Under Shortan conditions the circulating water sustains sulphate-reducing bacteria (SRB), iron-oxidizing bacteria (IRB) and organic biofilm-forming microflora, with SRB counts of 10^2-10^4 CFU·mL^{-1} that rise sharply in summer at 32-38 °C; these organisms increase the corrosion rate by a factor of two to five locally and, through hydrogen-sulphide generation and FeS deposition, initiate dangerous pitting. Warm zones (30-40 °C), organic matter and low-flow regions favour biofilm formation, which accelerates MIC five- to fiftyfold and provides a substrate for further scaling. A copper-zinc complexonate approach to biocidal action was assessed as the most promising route: at optimal molar Zn:Cu ratios of 0.75:0.25 to 0.5:0.5 the copper-bearing complexonates suppressed up to 100 % of viable aerobic microorganisms relative to a control of 1800 CFU per unit volume, while retaining the ability to inhibit corrosion and calcium-sulphate crystallization. The compatibility of scale-and-corrosion inhibitors with oxidizing (hypochlorite, chlorine dioxide, hydrogen peroxide) and non-oxidizing (quaternary ammonium salts, isothiazolones) biocides is discussed, and a synergistic low-molecular-weight amine inhibitor plus biocide regime is proposed for Shortan. The combined program - biocidal dosing, oxygen and hydrogen-sulphide control, and continuous microbiological monitoring - is shown to restrain biofilm regeneration, reduce MIC and, together with corrosion-scale inhibition, extend equipment service life by 8-12 %.

Keywords: *biofouling; microbiologically influenced corrosion; sulphate-reducing bacteria; biofilm; copper-zinc complexonate; biocide; recirculating cooling water; Shortan oil and gas enterprise.*

1. INTRODUCTION

The organization of recirculating and closed water-supply systems at industrial enterprises is a necessary part of the modern production process, for both economic and ecological reasons. Operational experience shows that the efficiency of such systems declines, firstly, because of corrosion, which leads to premature equipment failure, and secondly, because of biofouling and scaling, which cause a significant overconsumption of energy and water resources. Of these three coupled phenomena, biofouling is frequently the least controlled, because it is simultaneously a fouling problem - the deposition of a biological layer that lowers heat-exchange efficiency and increases pressure drop - and a corrosion problem, since microbial biofilms are the direct agents of microbiologically influenced corrosion (MIC).

In an open recirculating system the water temperature of 30-40 °C, the presence of organic matter and the existence of low-flow zones create favourable conditions for bacterial proliferation. Microorganisms adhere to the metal surface and secrete an extracellular polymeric substance (EPS) matrix, forming a multilayer biofilm that accelerates microbial corrosion by a factor of five to fifty. Although the biofilm may transiently shield the metal, it establishes differential-aeration cells, concentrates aggressive metabolites and, in combination with mineral scale, sharply reduces system efficiency and shortens service life. Among the microbial communities, sulphate-reducing bacteria (SRB) are the most damaging: under anaerobic conditions beneath deposits they reduce sulphate to sulphide, which reacts with iron to form FeS and can increase the corrosion rate twentyfold to fiftyfold, while the liberated hydrogen sulphide both feeds further SRB activity and raises the sulphide-corrosion hazard.

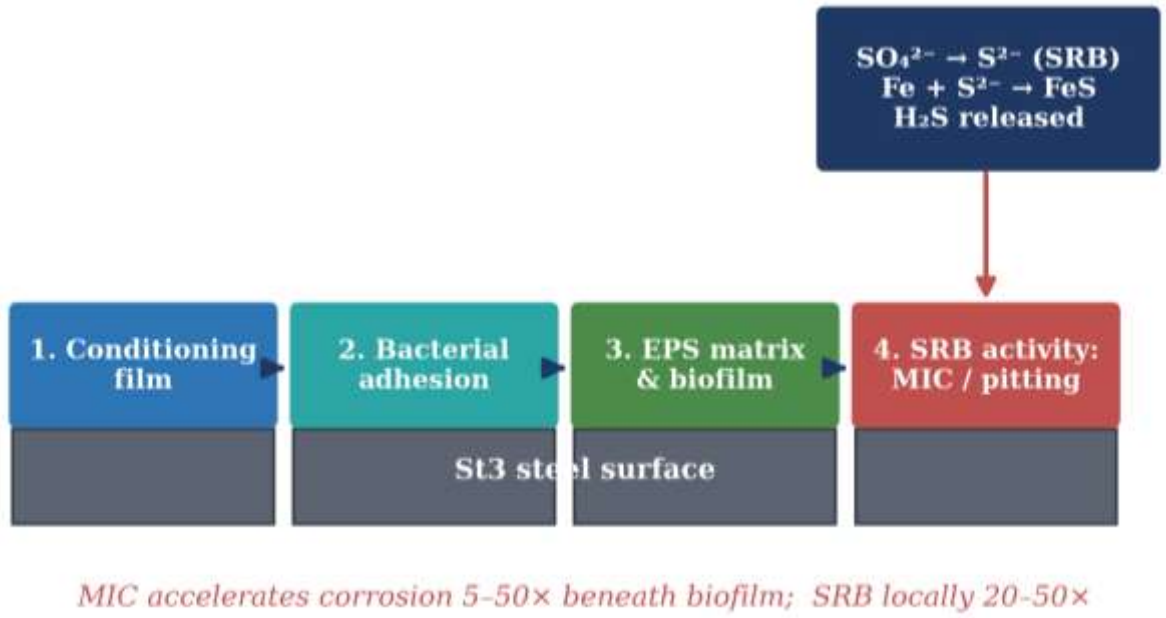


Fig. 1. Sequential biofilm formation and microbiologically influenced corrosion (MIC) on the St3 steel surface, culminating in sulphate-reducing-bacteria (SRB) activity and FeS-driven pitting.

Reagent treatment of the circulating water remains the most effective and accessible route to control biofouling, because it requires no significant capital investment. The production of reagents to prevent corrosion, scaling and biofouling is undertaken both by Russian and by foreign manufacturers (Nalco, General Electric, Guilini Chemie and others), but the marketed reagents are not always of adequate quality, are insufficiently effective, expensive and non-universal. Research of the last 10-15 years on multipurpose inhibitors has shown that specific classes of chemical compounds are widely used as biocides, and that the compatibility of biocides with scale-and-corrosion inhibitors is decisive for the success of a treatment program. In the Russian school, S. A. Tarasova and B. N. Driker demonstrated that copper-zinc complexonates of organophosphonates (“KISK” reagents) can simultaneously prevent scaling, corrosion and biofouling, the copper component acting as the biocidal agent. Building on this evidence and on the specific microbiological regime of the Shortan waters, the present work evaluates complex biocidal-inhibitor strategies for the prevention of biofouling and MIC at the Shortan Oil and Gas Production Enterprise.

2. MATERIALS AND METHODS

2.1. Object of study and microbiological characterization

The object of study was the open recirculating cooling-water system of the Shortan Oil and Gas Production Department. Water samples were characterized for the counts of sulphate-reducing bacteria (SRB), iron-oxidizing bacteria (IRB) and total biofilm-forming microflora, alongside the physico-chemical parameters

governing microbial activity (temperature, dissolved oxygen, H2S, organic load, pH and flow velocity). SRB counts were expressed in colony-forming units per millilitre ($CFU \cdot mL^{-1}$). Microbial abundance was assessed using a rapid method based on ready-to-use culture plates ("Petrifilm"-type), which allows the number of viable aerobic bacteria to be counted directly and the biocidal efficiency of a reagent to be expressed as the percentage of killed microorganisms relative to an untreated control.

2.2. Biocidal-inhibitor compositions

Complex inhibitors of scaling, corrosion and biofouling were evaluated on the basis of copper-zinc complexonates of organophosphonates. The copper-zinc complexonates were prepared at organophosphonate:metal molar ratios of 3:1 and 2:1, with the Zn:Cu molar ratio varied from 0.75:0.25 to 0.5:0.5, and their biocidal action was compared with zinc-only compositions (Zn:Cu = 1:0). For the Shortan application these were considered together with the low-molecular-weight amine-based composite corrosion inhibitor developed for the enterprise, and with commercial biocide classes - oxidizing biocides (sodium hypochlorite, chlorine dioxide, hydrogen peroxide) and non-oxidizing biocides (quaternary ammonium salts and isothiazolones) - in order to assess synergy and compatibility.

2.3. Biotesting and evaluation of biocidal efficiency

The compositions were tested as inhibitors of biofouling by the culture-plate method described above; in the control experiment the microbial load was 1800 CFU per unit volume. The reduction of viable microorganisms in the presence of each composition was recorded, and the biocidal efficiency was expressed as a percentage. In parallel, the compatibility of the inhibitors with oxidizing biocides was assessed, since a number of biocides are strong oxidizers: the resistance of representative organophosphonates to oxidizing biocides was evaluated, and non-oxidizing formulations were considered for cases where oxidizer-sensitive inhibitors are used.

2.4. Statistical processing

Results were processed statistically. Microbial counts and corrosion-rate measurements were analysed to establish the confidence of the observed differences, and the biocidal, anticorrosion and antiscaling functions of each composition were evaluated jointly so that a genuinely multipurpose reagent could be identified.

3. RESULTS AND DISCUSSION

3.1. Microbiological regime and biofouling drivers at Shortan

The circulating waters of the Shortan complex sustain a variable microbial community dominated by SRB, IRB and organic biofilm-forming microflora. SRB counts ranged from 10^2 to 10^4 $CFU \cdot mL^{-1}$ depending on conditions, and biological activity increased sharply in summer, when the circulating-water temperature reaches

32-38 °C, and declined in winter (12-18 °C). Under Shortan conditions these bacteria increase the corrosion rate by a factor of two to five, and the coupling of biofilm with mineral deposits further depresses the efficiency of heat-exchange surfaces. High sodium concentrations raise the osmotic pressure and create a favourable environment for halophilic bacteria, while soft, porous Mg(OH)2 deposits provide a habitat for SRB and iron-oxidizing bacteria; magnesium is therefore regarded as a factor that intensifies biofilm formation.

Table 1 summarizes the principal biofouling drivers and the associated control recommendations for the Shortan system.

Table 1. Biofouling and MIC drivers in the Shortan recirculating cooling-water system and recommended control measures.

Driver / organism	Observed range / effect	Consequence	Recommended control
SRB (sulphate-reducing bacteria)	10^2-10^4 CFU·mL^{-1}	FeS formation; pitting; corrosion up to 2-5x (locally 20-50x)	Specific anti-SRB biocides; anaerobic-zone removal; H2S capture
Biofilm / EPS matrix	Multilayer at 30-40 °C, low flow	MIC accelerated 5-50x; heat-transfer loss	Biocidal dosing; flow control; mechanical cleaning
Iron-oxidizing bacteria (IRB)	Seasonal, higher in summer	Tubercles; under-deposit corrosion	Oxidizing treatment; deposit control
Dissolved O2 / H2S	Variable with aeration	Cathodic depolarization; sulphide corrosion	Oxygen control; degassing; H2S neutralization
Copper-zinc complexonate (biocidal)	Zn:Cu 0.75:0.25-0.5:0.5	Up to 100 % microbial kill	Dose as complex scale/corrosion/biofouling inhibitor

Note: CFU - colony-forming units; MIC - microbiologically influenced corrosion; EPS - extracellular polymeric substance.

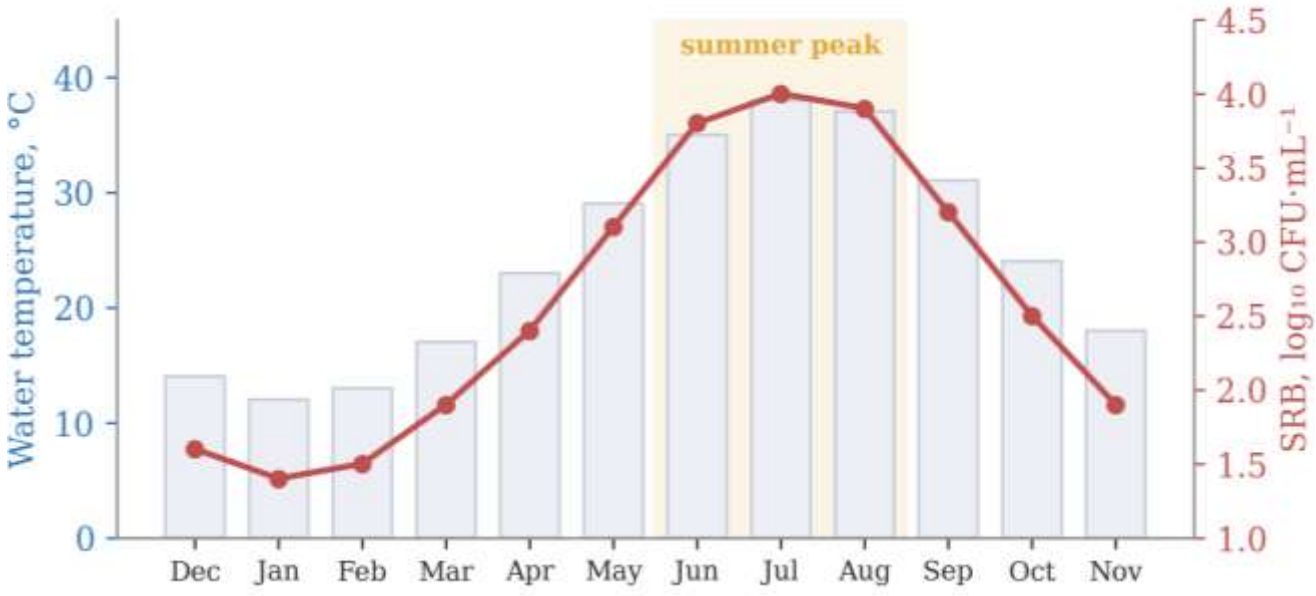


Fig. 2. Seasonal variation of circulating-water temperature and SRB activity at Shortan; microbial activity peaks in summer at 32-38 °C.

3.2. Biocidal action of copper-zinc complexonates

Testing of the copper-zinc complexonates against the aerobic microbial community (control 1800 CFU per unit volume) showed that the biocidal activity is governed by the copper content. Compositions containing only zinc (Zn:Cu = 1:0) were not biocides and did not suppress microbial growth; increasing the copper fraction relative to zinc (Zn:Cu = 0.5:0.5, 0.25:0.75 and 0:1) increased the biocidal efficiency, reaching 100 % killed microorganisms. The presence of copper is thus decisive: it both suppresses the microorganisms that would otherwise degrade the organophosphonate and provides the antibacterial function of the complex reagent. Importantly, the incorporation of copper and zinc does not impair the ability of the organophosphonate to inhibit the crystallization of calcium sulphate - the complexonates lengthen the induction period of CaSO4 crystallization and raise the specific surface energy and the order of nucleation - so a single reagent can control biofouling, corrosion and scaling at once. The optimal Zn:Cu ratios of 0.75:0.25 to 0.5:0.5 simultaneously ensure effective inhibition of corrosion, scaling and biofouling; this route provides a directly transferable template for the Shortan waters, where SRB and biofilm control must be combined with the corrosion and scale suppression already achieved by the amine-based composite inhibitor.

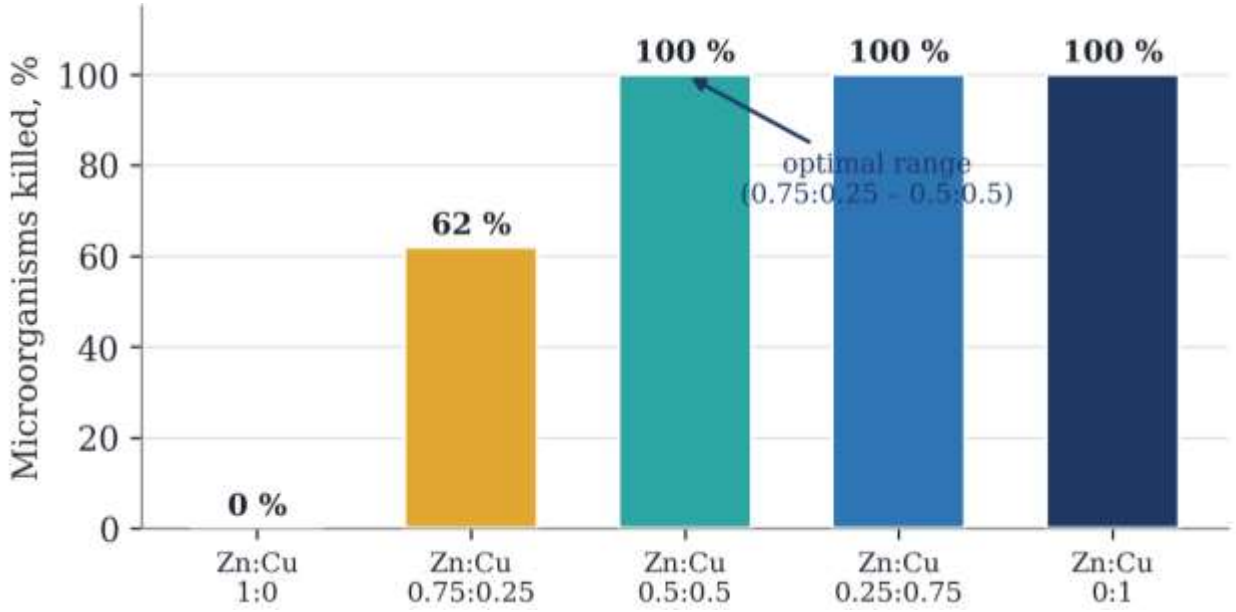


Fig. 3. Biocidal efficiency of copper-zinc complexonates as a function of copper content (control 1800 CFU); the optimal Zn:Cu range achieves complete microbial suppression.

3.3. Biocide-inhibitor compatibility and synergy

Because many biocides are strong oxidizers (hypochlorite, hypobromite, chlorine dioxide), their compatibility with the scale-and-corrosion inhibitor must be verified. Representative organophosphonates retain most of their activity after prolonged coexistence with oxidizing biocides, although the reaction accelerates with temperature; certain phosphonocarboxylic acids are notably resistant to chlorine- and bromine-based oxidizers. Where oxidizer-sensitive inhibitors are used, non-oxidizing biocides are preferred: quaternary ammonium salts (QAS) are widely proposed in multipurpose compositions, and the combination of amines and sulphur-bearing inhibitors with QAS bearing a long alkyl radical produces a synergistic effect, whereas non-ionic ethoxylates give antagonism. Isothiazolones combine well with organophosphonate/polymer inhibitor blends and provide broad-spectrum microbial suppression. For anaerobic SRB control, specialized synergistic biocidal mixtures with defined minimum effective concentrations are required. For the Shortan system a rational program therefore couples the low-molecular-weight amine-based composite corrosion-and-scale inhibitor with a compatible biocide - a copper-bearing complexonate or a non-oxidizing QAS/isothiazolone - dosed so as to suppress SRB and biofilm without degrading the anticorrosion film.

3.4. Recommended biofouling-control program for Shortan

On the basis of the microbiological regime and the reagent evaluations, an integrated biofouling-control program is proposed. First, anaerobic zones should be minimized through oxygen control, deposit removal and improved hydrodynamics,

since under-deposit anaerobic pockets are the principal habitat of SRB. Second, SRB should be monitored routinely (CFU·mL^{-1}) using rapid culture-plate methods, so that biocidal dosing can be triggered before biofilm consolidation. Third, hydrogen sulphide should be captured or neutralized, both to remove the SRB substrate and to lower the sulphide-corrosion hazard. Fourth, biocidal treatment should be delivered either through a copper-bearing complex inhibitor that combines biocidal, anticorrosion and antiscaling functions, or through a compatible biocide dosed alongside the amine-based corrosion-and-scale inhibitor. Supporting physico-mechanical measures - activated-carbon filtration, oxidative treatment (ozone, H2O2), periodic mechanical cleaning (pigging, jet-flushing) and, where appropriate, ultrasonic antifouling - reinforce the chemical program. Because biofouling, corrosion and scaling are mutually reinforcing, only a combined strategy restrains biofilm regeneration and secures the durability of the recirculating system.

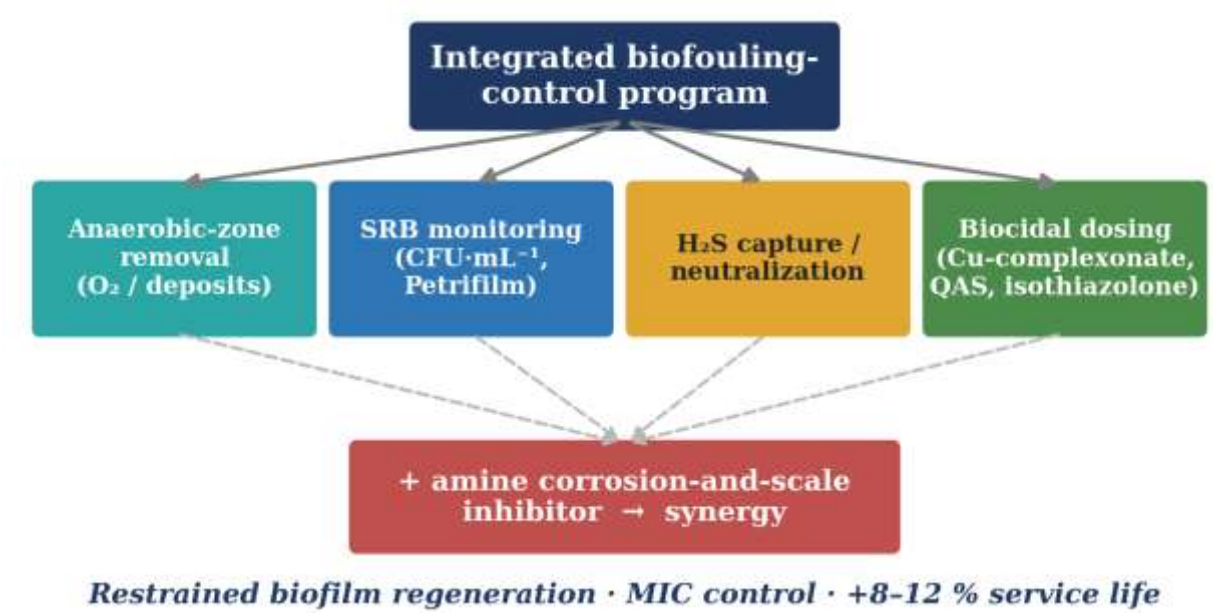


Fig. 4. Integrated biofouling-control program for the Shortan system, coupling anaerobic-zone removal, SRB monitoring, H2S neutralization and biocidal dosing with the amine-based corrosion-and-scale inhibitor.

When integrated with the corrosion-and-scale inhibition established for the Shortan cooling system, this biofouling-control program contributes to the overall extension of equipment service life by 8-12 %, the reduction of emergency situations and the lowering of operating expenditure recorded during the enterprise trials. The use of ecologically safer, locally sourced reagents further reduces procurement costs and increases the share of environmentally acceptable chemical means, consistent with the resource-saving and ecological-safety objectives of the national water-management strategy.

3.5. Response-surface and three-dimensional biofilm-structure analysis

The biocidal behaviour of the copper-zinc complexonates was generalized as a three-dimensional response surface of the fraction of killed microorganisms over the two governing variables - copper mole fraction and reagent dose (Fig. 5). The surface rises steeply with increasing copper fraction and reaches complete (100 %) microbial suppression once the copper fraction and dose enter the optimal region, while remaining at zero along the copper-free edge (Zn:Cu = 1:0), confirming quantitatively that copper is the decisive biocidal component. The response surface defines the minimum copper fraction and dose required for full biofouling control and thereby supports dosing optimization for the Shortan system.

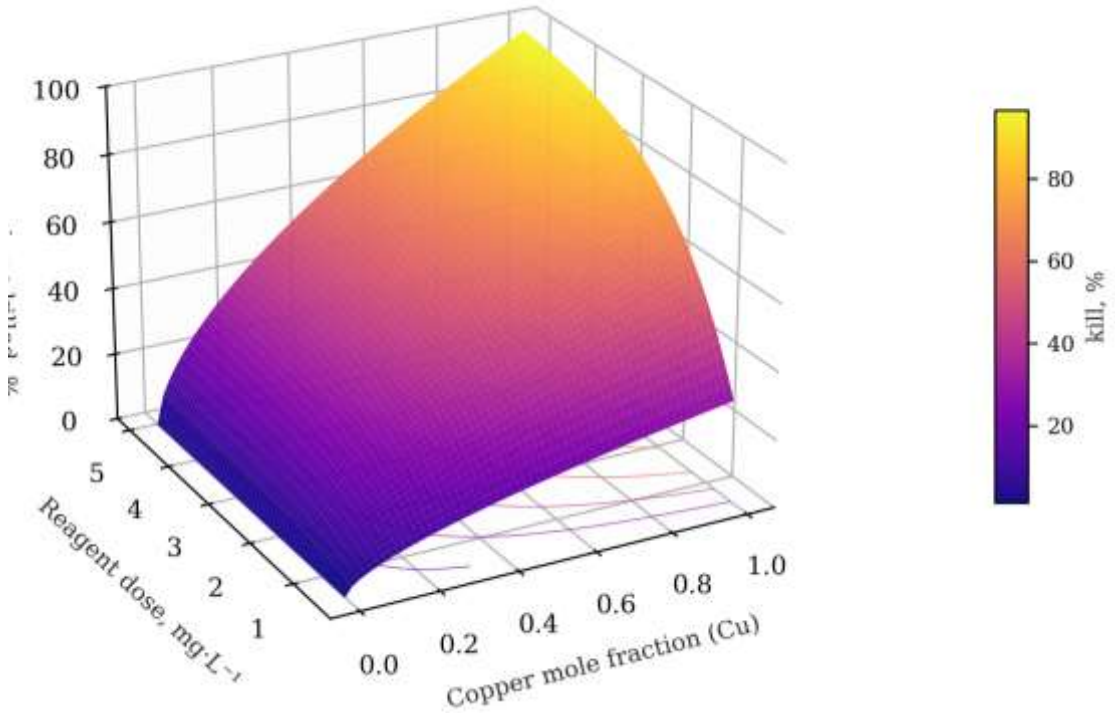


Fig. 5. Three-dimensional response surface of biocidal efficiency (percentage of microorganisms killed) as a function of copper mole fraction and reagent dose; zero efficiency along the copper-free edge confirms copper as the biocidal agent.

The effect of biocidal treatment on the biofilm was visualized through three-dimensional reconstructions of the biofilm structure on the steel surface (Fig. 6). The untreated surface is covered by dense, tall microbial colonies embedded in an EPS matrix - the three-dimensional morphology responsible for heat-transfer loss and under-deposit MIC - whereas after biocidal treatment the colonies are largely eliminated and the surface retains only a thin, sparse residual layer. These reconstructions illustrate how the copper-bearing complex inhibitor, dosed within the optimal window, suppresses biofilm consolidation and thereby interrupts the microbiologically influenced corrosion pathway.

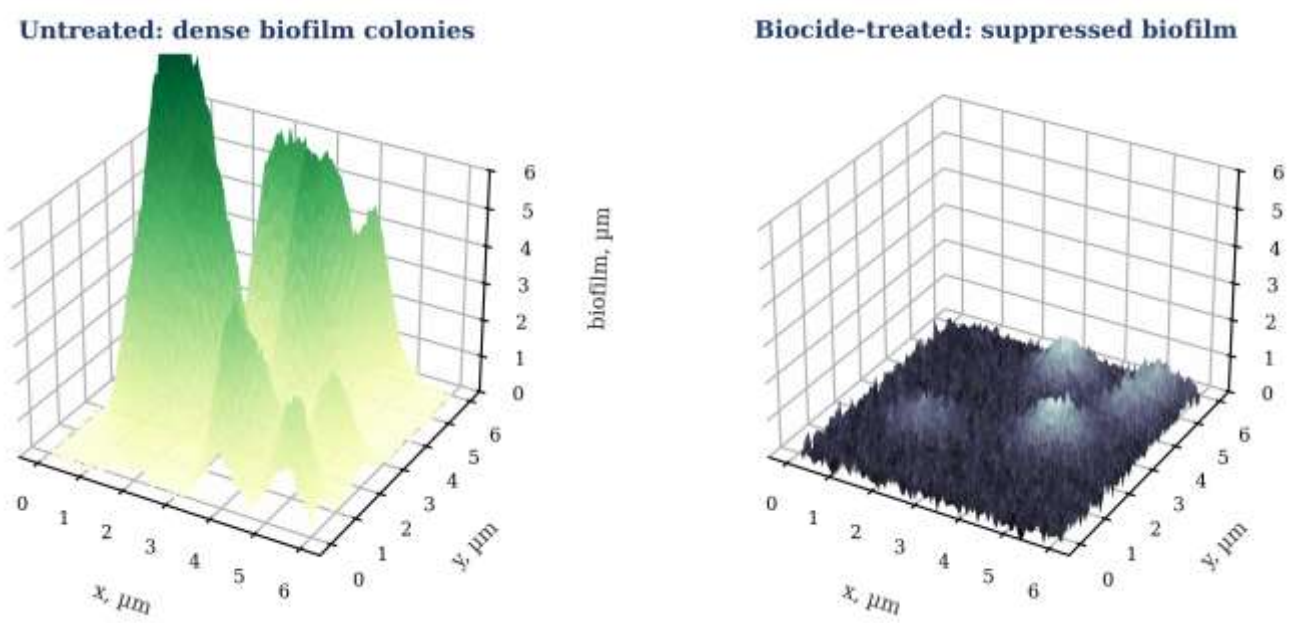


Fig. 6. Three-dimensional reconstructions of biofilm structure on the steel surface: (left) untreated surface with dense biofilm colonies; (right) biocide-treated surface with suppressed, sparse biofilm.

4. CONCLUSIONS

1. Biofouling in the open recirculating cooling-water system of the Shortan Oil and Gas Production Enterprise is driven by SRB (10^2-10^4 CFU·mL^{-1}), IRB and biofilm-forming microflora, whose activity peaks in summer (32-38 °C) and increases the corrosion rate two- to fivefold locally, with MIC acceleration of five - to fiftyfold beneath biofilms.

2. Copper-zinc complexonates of organophosphonates provide a directly transferable biocidal-inhibitor template: at optimal Zn:Cu ratios of 0.75:0.25 to 0.5:0.5 the copper component delivers up to 100 % microbial kill relative to an 1800 CFU control while preserving corrosion and calcium-sulphate-scale inhibition.

3. Biocide-inhibitor compatibility is decisive: organophosphonates tolerate oxidizing biocides to a degree, while amines combined with long-chain quaternary ammonium salts act synergistically, and isothiazolones suit organophosphonate/polymer blends; for oxidizer-sensitive inhibitors, non-oxidizing biocides are preferred.

4. An integrated program of anaerobic-zone removal, routine SRB monitoring, H2S neutralization and compatible biocidal dosing alongside the amine-based corrosion-and-scale inhibitor restrains biofilm regeneration, controls MIC and contributes to an 8-12 % extension of equipment service life at the Shortan enterprise.

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ANNOTATSIYA

Mazkur ilmiy maqolada Yaqin Sharq mintaqasida suv resurslarining geosiyosiy ahamiyati, davlatlararo munosabatlarga ta'siri va mintaqaviy xavfsizlikdagi o'rni tahlil qilinadi. Tadqiqotda Nil, Iordaniya, Dajla va Frot daryolari, Shatt al-Arab havzasi hamda Falastin hududidagi suv masalalari misolida suv resurslaridan foydalanish bo'yicha qarama-qarshiliklar, hamkorlik mexanizmlari ko'rib chiqiladi. Ushbu tadqiqotning asosiy maqsadi Yaqin Sharqdagi transchegaraviy daryolar havzasida yuzaga kelayotgan geosiyosiy ziddiyatlarni tahlil qilish va ularni "suv diplomatiyasi" mexanizmlari orqali hal etish imkoniyatlarini baholashdan iborat. Qo'yilgan maqsadga erishish uchun quyidagi vazifalar belgilab olindi:

MENA mintaqasidagi suv resurslarining geografik joylashuvi va taqsimlanish xususiyatlarini aniqlash;

Nil, Iordaniya, Dajla-Frot va Shatt al-Arab havzalaridagi gidrohegemonlik harakatlari va ularning quyi oqim davlatlariga ta'sirini baholash;

Mintaqada yuzaga kelishi mumkin bo'lgan "suv urushlari" xavfini kamaytirishda xalqaro huquqiy normalar va suv diplomatiyasining rolini ko'rsatib berish.

***Kalit so'zlar**: suv geosiyosati, Yaqin Sharq, MENA Nil daryosi, Dajla va Frot, suv xavfsizligi, transchegaraviy suvlar suv diplomatiyasi.*

АННОТАЦИЯ

В данной научной статье анализируются геополитическое значение водных ресурсов в регионе Ближнего Востока, их влияние на межгосударственные отношения и роль в обеспечении региональной безопасности. На примере рек Нил, Иордан, Тигр и Евфрат, бассейна Шатт-эль-Араб, а также водных проблем на территории Палестины рассматриваются противоречия и механизмы сотрудничества в сфере водопользования. Основная цель данного исследования заключается в анализе геополитических конфликтов, возникающих в бассейнах трансграничных рек Ближнего Востока, и оценке возможностей их разрешения с помощью

механизмов «водной дипломатии». Для достижения поставленной цели были определены следующие задачи:

Выявление географического положения и особенностей распределения водных ресурсов в регионе MENA (Ближний Восток и Северная Африка);

Оценка гидрогегемонистских действий в бассейнах рек Нил, Иордан, Тигр — Евфрат и Шатт-эль-Араб, а также их влияния на государства нижнего течения;

Демонстрация роли международных правовых норм и водной дипломатии в снижении рисков возникновения возможных «водных войн» в регионе.

Ключевые слова: *геополитика воды, Ближний Восток, MENA, река Нил, Тигр и Евфрат, водная безопасность, трансграничные воды, водная дипломатия.*

ABSTRACT

This research article analyzes the geopolitical significance of water resources in the Middle East, their impact on interstate relations, and their role in regional security. Drawing on the examples of the Nile, Jordan, Tigris, and Euphrates rivers, the Shatt al-Arab basin, and water issues in the Palestinian territories, the study examines conflicts and cooperation mechanisms regarding water use. The primary objective of this research is to analyze the emerging geopolitical tensions in the transboundary river basins of the Middle East and to assess the possibilities of resolving them through "water diplomacy" mechanisms. To achieve this objective, the following tasks were defined:

To determine the geographical location and distribution characteristics of water resources in the MENA region;

To evaluate hydro-hegemonial actions in the Nile, Jordan, Tigris-Euphrates, and Shatt al-Arab basins and their impact on downstream states;

To demonstrate the role of international legal norms and water diplomacy in mitigating the risks of potential "water wars" in the region.

Keywords: *water geopolitics, Middle East, MENA, Nile River, Tigris and Euphrates, water security, transboundary waters, water diplomacy.*

KIRISH

Bugungi kunda Yaqin Sharq va Shimoliy Afrika mintaqasi dunyodagi eng qurg‘oqchil va chuchuk suv zaxiralari eng cheklangan hudud hisoblanadi. Dunyo aholisining qariyb 6 foizi istiqomat qiladigan ushbu geografik makon hisobiga global chuchuk suv resurslarining bor-yo‘g‘i 1 foizi to‘g‘ri keladi. Jahon banki hisobotlariga ko‘ra, mintaqadagi shiddatli aholi o‘sishi, urbanizatsiya sur’atlari va iqlim o‘zgarishi

2050-yilga borib suv tanqisligini yanada keskinlashtiradi hamda bu holat mintaqa davlatlari yalpi ichki mahsulotining (YIM) 6 foizdan 14 foizgacha qisqarishiga olib kelishi mumkin. Hozirgi globallashuv sharoitida tabiiy resurslar, ayniqsa chuchuk suv zaxiralari xalqaro munosabatlarning muhim strategik omillaridan biriga aylanmoqda. Yaqin Sharq va Shimoliy Afrika mintaqasi suv resurslariga eng kambag‘al hududlardan biri bo‘lishiga qaramay, geosiyosiy jihatdan eng murakkab va ziddiyatli mintaqalardan hisoblanadi. Ushbu hududda suv masalasi nafaqat iqtisodiy rivojlanish, balki milliy xavfsizlik, davlat suvereniteti va mintaqaviy barqarorlik bilan chambarchas bog‘liqdir. Yaqin Sharqdagi ko‘plab mojarolar bevosita yoki bilvosita suv resurslari bilan bog‘liq bo‘lib, Falastin–Isroil nizosi, Turkiya–Suriya–Iroq o‘rtasidagi Dajla va Frot daryolari masalasi, Eron va Iroq o‘rtasidagi Shatt al-Arab havzasi buning yaqqol misolidir. Shu sababli suv geosiyosatini o‘rganish mintaqadagi siyosiy jarayonlarni chuqurroq anglash imkonini beradi. Suv resurslarining global taqchilligi bugungi kunda ko‘plab mintaqalar uchun milliy xavfsizlik darajasidagi muammoga aylandi. Masalan, Jahon resurslari instituti reytingiga ko‘ra, Markaziy Osiyoda O‘zbekiston suv stressidan eng ko‘p aziyat chekayotgan mamlakatlar qatorida 25-o‘rinni egallab turibdi. Biroq, Yaqin Sharq mintaqasidagi geosiyosiy manzara bundan ham keskinroq bo‘lib, mazkur reytingning yuqori o‘ntaligini aynan Yaqin Sharq davlatlari (Isroil, Livan, Iordaniya va b.) egallagan.

Suv geosiyosati — bu suv resurslarining hududiy joylashuvi, ulardan foydalanish va taqsimlanishi bilan bog‘liq holda davlatlar o‘rtasidagi siyosiy munosabatlarni o‘rganadigan ilmiy yo‘nalishdir. Geosiyosiy yondashuvda suv strategik resurs sifatida qaraladi va uning nazorati davlat qudratining muhim ko‘rsatkichi hisoblanadi. Daryoning boshlanishida joylashgan davlatlar suv oqimini nazorat qilish imkoniga ega, bu esa quyi oqimda joylashgan davlatlar uchun iqtisodiy va ekologik xavflarni keltirib chiqarishi mumkin. Biror davlatning suv resurslarini nazorat qilish orqali butun mintaqada o'z siyosiy va iqtisodiy ustunligini o'rnatishi. Suv tanqisligi tufayli kelib chiqishi mumkin bo'lgan qurolli yoki diplomatik nizolar.

MUHOKAMA VA NATIJALAR

Yaqin Sharqdagi suv geosiyosati va transchegaraviy daryolar atrofidagi nizolar global miqyosda ko‘plab xalqaro siyosatshunos va gidrolog olimlar tomonidan tadqiq etilgan. Xususan, J.A. Allan o‘zining fundamental ishlarida mintaqadagi suv taqchilligini yumshatishda "virtual suv" (import qilinadigan oziq-ovqat mahsulotlari tarkibidagi suv) iqtisodiy konsepsiyasini ilgari surgan va geosiyosiy muvozanatni tahlil qilgan. Gidropolitika sohasidagi taniqli olim A.T. Wolf Iordaniya daryosi havzasidagi nizolarni tarixiy jihatdan o‘rganib, suv resurslari ham urush motivi, ham hamkorlik vositasi bo‘lishi mumkinligini isbotlashga harakat qilgan. Shuningdek,

transchegaraviy suv obektlaridagi kuchlar nisbatini tahlil qilgan M. Zeitoun va J. Warner "gidrohegemonlik" (hydro-hegemony) nazariyasini ishlab chiqishgan. Ushbu nazariyaga koʻra, daryoning yuqori oqimida joylashgan harbiy va iqtisodiy jihatdan kuchli davlatlar masalan, Turkiya yoki Misr quyi oqimdagi zaifroq davlatlar ustidan suv oqimini nazorat qilish orqali siyosiy bosim oʻtkazadi. Mahalliy olimlardan A. Xusanov ham oʻzining geosiyosatga oid tadqiqotlarida global resurslar muammosi va uning xalqaro xavfsizlikka ta'sirini nazariy jihatdan ochib bergan. Biroq, soʻnggi yillardagi keskin iqlim oʻzgarishlari, yangi toʻgʻonlarning qurilishi (masalan, Efiopiyadagi "Uygʻonish" GESI) va mintaqadagi yangi siyosiy realliklar ushbu mavzuni zamonaviy yondashuvlar asosida qayta va chuqurroq tadqiq etish zaruriyatini keltirib chiqarmoqda. N. Mirumachining fikricha, gidrogegemoniya faqatgina daryoning yuqori oqimida joylashish (geografik ustunlik) bilan emas, balki davlatning harbiy, iqtisodiy va texnologik salohiyati orqali suv resurslarini taqsimlash qoidalarini bir tomonlama belgilash qobiliyati bilan tavsiflanadi. Bugungi kunda Nil havzasidagi eng keskin geosiyosiy nuqta — "Buyuk Efiopiya Uygʻonish toʻgʻoni" (GERD — Grand Ethiopian Renaissance Dam) loyihasidir. Efiopiya hukumati ushbu gidrotexnik inshootni mamlakat iqtisodiy yuksalishi va energetik mustaqilligining ramzi sifatida koʻrayotgan boʻlsa-da, quyi oqimda joylashgan Misr buni oʻzining milliy xavfsizligiga toʻgʻridan-toʻgʻri tahdid deb baholamoqda. Jahon resurslari instituti tahlillariga koʻra, Nil daryosining yillik oqimi iqlim oʻzgarishi va qurgʻoqchilik sababli prognoz qilinayotganidan koʻra koʻproq kamayishi mumkin, bu esa toʻgʻonni suv bilan toʻldirish jarayonida Misr va Sudan qishloq xoʻjaligiga jiddiy zarba beradi. Misrning suv xavfsizligi masalasi tarixan 1929 va 1959-yillardagi ikki tomonlama bitimlarga tayanadi, biroq Efiopiya ushbu mustamlaka davri shartnomalarini tan olmay, barcha havza davlatlari uchun teng huquq beruvchi "Entebbe kelishuvi"ni (CFA) ilgari surmoqda, bu esa diplomatik muzokaralarni boshi berk koʻchaga olib kirgan. Turkiya tomonidan amalga oshirilayotgan Janubi-sharqiy Anatoliya loyihasi (GAP) mintaqadagi suv oqimining muvozanatini butunlay oʻzgartirdi. Tadqiqotchi T. Wolf ta'kidlaganidek, transchegaraviy daryolarda yuqori oqim davlatining gidrotexnik faoliyati quyi oqimdagi davlatlar uchun nafaqat ekologik, balki chuqur iqtisodiy inqirozlarni keltirib chiqaradi. Frot daryosidagi Otaturk toʻgʻoni va Dajladagi Ilisu toʻgʻonining ishga tushirilishi natijasida Iroq va Suriya hududiga kirib boradigan suv hajmi qariyb 30-40 foizga kamaygan. Bu holat quyi oqimda shoʻrlanish darajasining ortishi, qishloq xoʻjaligi yerlarining qisqarishi va ichimlik suvi taqchilligiga sabab boʻlib, mintaqada ichki migratsiyani va ijtimoiy beqarorlikni kuchaytiruvchi omilga aylandi. Ana Elisa Cascão: "Gidro-gegemonlik" (suv ustidan hukmronlik) sohasidagi oʻzgarishlarni oʻrganadi. Tarixan Misr Nil

suvlari taqsimotini o‘zi belgilab kelgan, biroq ushbu asar daryoning yuqori oqimidagi davlatlar muzokaralardagi mavqeini mustahkamlash va bir tomonlama infratuzilma loyihalari orqali ushbu kuchlar muvozanatini qanday qilib muvaffaqiyatli o‘zgartirayotganini tahlil qiladi. Aysegul Kibaroglu & Waltina Scheumann: Turkiya, Suriya va Iroq o‘rtasidagi suv munosabatlarining rivojlanishini kuzatib boradi. Tadqiqot to‘g‘onlar va sug‘orish tizimlari kabi keng ko‘lamli o‘zaro muvofiqlashtirilmagan suv loyihalari qanday qilib suv inqirozlarini keltirib chiqarganini, shu bilan birga, muayyan maqsadlarga qaratilgan (ad-hoc) texnik va byurokratik hamkorlikni jonlantirganini o‘rganadi. Brenda Shaffer: Gidrotexnologiyalardagi yutuqlar xalqaro munosabatlarni qanday qilib tubdan o‘zgartirayotganini muhokama qiladi. Doktor Shafferning tadqiqoti suvni chuchuklashtirish texnologiyasining keng joriy etilishi Yaqin Sharqdagi geosiyosiy dinamikani qanday o‘zgartirayotganini batafsil bayon qiladi.

Suv geosiyosatida texnologik transformatsiya: Bugungi kunda Yaqin Sharq davlatlari an'anaviy daryo suvlariga bo‘lgan qaramlikni kamaytirish maqsadida muqobil gidrotexnologiyalarga katta sarmoya kiritmoqda. Xususan, Fors ko‘rfazi mamlakatlari (BAA, Saudiya Arabistoni, Quvayt) va Isroil dunyoda dengiz suvini chuchuklashtirish (desalination) bo‘yicha yetakchilarga aylandi. Isroil hozirda o‘zining ichimlik suviga bo‘lgan ehtiyojining 80 foizdan ortig‘ini O‘rta yer dengizini chuchuklashtirish hamda oqova suvlarni 90 foizgacha qayta ishlab qishloq xo‘jaligiga yo‘naltirish orqali qoplamoqda. Bu texnologik yutuqlar mintaqada an'anaviy "suv urushlari" xavfini kamaytirsa-da, chuchuklashtirish zavodlarining yuqori energiya talab qilishi va ekologiyaga (sho‘r qoldiqlarning dengizga to‘kilishi) salbiy ta'siri sababli yangi geosiyosiy va ekologik muammolarni yuzaga keltirmoqda.

BMT Bosh Assambleyasi: Xalqaro suv huquqi konvensiyasi (1997-yil) Yaqin Sharqdagi transchegaraviy daryolar (Nil, Frot, Dajla) bo‘yicha nizolarni baholashda BMTning eng asosiy huquqiy hujjati hisoblanadi. BMT Bosh Assambleyasi tomonidan 1997-yilda qabul qilingan "Xalqaro suv oqimlaridan kemalar qatnovidan boshqa maqsadlarda foydalanish huquqi to‘g‘risida"gi Konvensiya davlatlararo suv taqsimotini tartibga soladi. Uning 5- va 7-moddalarida quyi oqim davlatlariga "sezilarli zarar yetkazmaslik" (no significant harm) hamda suv resurslaridan "oqilona va teng huquqli foydalanish" (equitable and reasonable utilization) prinsiplari belgilangan. [1]UN-Water hisobotlariga ko‘ra, Yaqin Sharq va Shimoliy Afrika (MENA) mintaqasi dunyodagi eng og‘ir suv tanqisligiga duchor bo‘lgan hududdir. Mintaqa aholisi dunyo aholisining qariyb 6 foizini tashkil etgani

[1] . United Nations. (1997). Convention on the Law of the Non-Navigational Uses of International Watercourses. New York: UN General Assembly.

holda, global qayta tiklanadigan chuchuk suv zaxiralarining atigi 1 foiziga egalik qiladi xolos. Mintaqadagi chuchuk suv resurslarining qariyb 60 foizi tashkilot tashqarisidan (boshqa davlatlar hududidan boshlanadigan daryolardan) kirib keladi.[2]

MENA mintaqasida suv resurslarining hududiy taqsimlanishi

MENA (Yaqin Sharq va Shimoliy Afrika) mintaqasi dunyodagi eng qurg'oqchil hudud bo'lib, bu yerda suv resurslarining taqsimlanishi o'ta notekis va murakkab geosiyosiy xarakterga ega. MENA hududida yillik chuchuk suv zaxiralari jahon o‘rtacha ko‘rsatkichidan bir necha barobar past. Aholi sonining tez o‘sishi, iqlim o‘zgarishi va urbanizatsiya suvga bo‘lgan bosimni yanada kuchaytirmoqda. Suv yetishmasligi sababli mintaqa davlatlari, ayniqsa Fors ko'rfazi mamlakatlari dunyoda dengiz suvini tuzsizlantirish bo'yicha yetakchilik qilmoqda. Hozirda dunyodagi jami tuzsizlantirish quvvatlarining qariyb yarmi aynan MENA davlatlari hissasiga to'g'ri keladi. MENA mintaqasining hayoti asosan uchta yirik daryo tizimiga bog'liq. Bu daryolarning o'ziga xosligi shundaki, ularning boshlanish qismi ko'pincha arab bo'lmagan davlatlar hududida joylashgan.

Asosiy transchegaraviy daryolar:

• Nil daryosi (Misr, Sudan, Efiopiya),

• Iordaniya daryosi (Isroil, Falastin, Iordaniya),

• Dajla va Frot (Turkiya, Suriya, Iroq),

• Shatt al-Arab (Eron va Iroq).

Bu daryolarning deyarli barchasi bir nechta davlat hududidan oqib o‘tadi, bu esa suv ustidan nazorat masalasini keskinlashtiradi.

2015–2025-yillarda Yaqin Sharqda jon boshiga qayta tiklanadigan suv resurslari dinamikasi (m^3/yil):

Davlat\Hudud	2015-yil	2018-yil	2021-yil	2025-yil	Umumiy tendensiyalar
Misr	610	580	550	525	Taqchilik chegarasiga yaqinlashmoqda
MENA	530	505	490	475	Mutlaq suv tanqisligi darajasi
Saudiya Arabistoni	85	80	76	70	Desalizatsiya o’ta yuqori qaramlik

[2] UN-Water. (2021). The United Nations World Water Development Report 2021: Valuing Water. Paris, UNESCO.

Iordaniya	90	85	78	73	Inqirozli va kritik darajada past

Xalqaro mezonlarga ko'ra, jon boshiga yillik suv miqdori 500 \text{ m}^3 dan past bo'lsa, bu mutlaq suv taqchilligi hisoblanadi. Grafikdan ko'rinib turibdiki, Yaqin Sharq (MENA) o'rtacha ko'rsatkichi allaqachon bu chiziqdan pastga tushib ulgurgan. Grafikning pastki qismida ko'rsatilganidek, iqlim o'zgarishi (bug'lanishning ortishi) va demografik o'sish (shahar aholisining ko'payishi) chiziqlarning pastga qarab yo'nalishiga asosiy sabab bo'lmoqda. Fors koʻrfazi davlatlarida (masalan, Quvayt, Qatar, Saudiya Arabistoni) jon boshiga tabiiy chuchuk suv manbalari keskin kam boʻlsa-da, aholining kunlik maishiy iste'moli chuchuklashtirilgan dengiz suvi evaziga kishi boshiga kuniga 300 dan 700 litrgacha yetadi. Bu dunyodagi eng yuqori koʻrsatkichlardan biridir.

Nil daryosi

Misr hukumati va Nil daryosi oʻrtasidagi munosabatlar nafaqat tarixiy, balki bugungi kunda global geosiyosatning eng keskin va strategik mavzularidan biri — suv diplomatiyasi markazida turadi. Misrliklar uchun Nil shunchaki daryo emas, balki mamlakatning yashashi va mavjudligini ta'minlovchi asosiy arteriyadir. Dunyoning eng uzun daryosi bo'lib, 11 ta davlat hududidan o'tadi. Misr o'z suv ehtiyojining 90% dan ortig'ini Nilga bog'laydi. Misr tarixan Nil ustidan ustuvor huquqni saqlab kelgan boʻlsa-da, soʻnggi yillarda Efiopiyaning “Buyuk Efiopiya Uygʻonish GESi” loyihasi mintaqada yangi geosiyosiy vaziyatni yuzaga keltirdi. Misr hukumati Nil daryosidagi suv oqimining kamayishini oʻz milliy xavfsizligiga toʻgʻridan-toʻgʻri tajovuz deb hisoblaydi va zarur boʻlsa, harbiy kuch ishlatishga tayyorligini ta’kidlab keladi.[3]

Dajla va Frot daryolari:

Dajla va Frot daryolari Gʻarbiy Osiyoning eng yirik suv arteriyalari boʻlib, insoniyat sivilizatsiyasi beshigi — Mesopotamiya tamadduniga asos boʻlgan. Bugungi kunda bu daryolar Yaqin Sharqdagi suv geosiyosatining eng nozik nuqtalaridan biri hisoblanadi. Ikkala daryo ham oʻz manbasini Turkiyaning Sharqiy Toros togʻlaridan oladi va Iroq janubida birlashib, Shatt al-Arab daryosini hosil qiladi, soʻngra Fors koʻrfaziga quyiladi. Dajla va Frot daryolarining yuqori oqimida joylashgan boʻlib, bu unga Suriya va Iroq ustidan muhim strategik ustunlik beradi. GAP loyihasi doirasida qurilgan toʻgʻonlar suv oqimini sezilarli darajada nazorat qilish imkonini bermoqda. Turkiya ushbu daryolarning yuqori oqimini nazorat

[3] Swain, A. (2011). Challenges for water sharing in the Nile basin. Crime, Law and Social Change, 56(4), pp. 387-402

qiluvchi gidrogegemon davlat sifatida namoyon bo‘ladi. Anqara tomonidan amalga oshirilayotgan GAP mintaqa gidropolotikasini butunlay o‘zgartirib yubordi. Ushbu loyiha doirasida Frot daryosida qurilgan ulkan Otaturk to‘g‘oni hamda Dajla daryosidagi Ilisu to‘g‘oni kabi yirik gidrotexnik inshootlar Turkiya iqtisodiyoti va energetikasi uchun xizmat qilmoqda. Ilmiy farazlarga ko‘ra, kelajakda suv bosimi kuchaygan sari Turkiya suv resurslaridan diplomatik bosim vositasi sifatida foydalanishi ehtimoli oshadi. Turkiya bu daryolarda 22 ta to‘g‘on va 19 ta GES qurishni maqsad qilgan. Turkiya pozitsiyasi: "Suv bizning hududimizda tug‘iladi, shuning uchun uni nazorat qilish huquqiga egamiz". Turkiya suvni xalqaro resurs emas, balki o‘zining milliy boyligi deb hisoblaydi. Daryolarning quyi oqimida joylashgan Suriya va Iroq davlatlari Turkiyaning ushbu gidrotexnik loyihalari tufayli jiddiy suv tanqisligiga duchor bo‘lmoqda. Turkiya o‘z omborlarida suv yig‘ishi natijasida Frot va Dajlaning quyi oqimiga keladigan suv hajmi sezilarli darajada kamaygan. Bu holat quyi oqim mamlakatida nafaqat qishloq xo‘jaligining inqiroziga, balki ichimlik suvi yetishmovchiligi oqibatida yuzaga keladigan ijtimoiy-siyosiy beqarorlikka ham sabab bo‘lmoqda. Anqara suv resurslaridan quyi oqim davlatlariga nisbatan geosiyosiy bosim va diplomatiyadagi ustunlik dastagi sifatida foydalanish imkoniyatiga ega.[4] Mutaxassislarning fikricha, so‘nggi 40 yilda Iroqqa kelayotgan suv miqdori 80% ga kamaygan. Dajla va Frot havzasidagi suv tanqisligi [5]bir qator og‘ir oqibatlarga olib kelmoqda. Dunyo merosi hisoblangan Mesopotamiya botqoqliklari yo‘qolish arafasida. Qishloq xo‘jaligi yerlarining yaroqsiz holga kelishi aholining shaharlarga ommaviy ko‘chishiga sabab bo‘lmoqda. Iqlim o'zgarishi natijasida mintaqada harorat global o'rtacha ko'rsatkichdan ikki baravar tez ko'tarilmoqda. Agar Turkiya, Suriya va Iroq o'rtasida suvni birgalikda boshqarish bo'yicha mustahkam xalqaro shartnoma imzolamasalar, XXI asrning o'rtalariga borib bu daryolar o'zining strategik ahamiyatini yo'qotishi yoki hududda yirik "suv urushlari"ga sabab bo'lishi mumkin.

Arab-Isroil mojarosida Iordan daryo havzasining o‘rni

Mintaqadagi eng murakkab va eng uzoq davom etayotgan geosiyosiy inqirozlardan biri bo‘lgan Arab-Isroil to‘qnashuvining tub zamirida ham suv omili muhim o‘rin tutadi. Isroil davlati uchun chuchuk suv ta’minoti milliy xavfsizlik va strategik ustuvorlik masalasidir. 1967-yilgi Olti kunlik urush natijasida Suriyadan olingan Golan tepaliklari va u yerdagi Iordan daryosining asosiy irmoqlari ustidan nazorat o‘rnatilishi Isroilning gidrologik suverenitetini ta’minladi. Kinneret ko‘li

[4] Allan, J. A. (2001). The Middle East Water Question: Hydropolitics and the Global Economy. I.B. Tauris, London. pp. 78-85.
[5] Allan, J. A. (2001). The Middle East Water Question: Hydropolitics and the Global Economy. I.B. Tauris, London. pp. 78-85.

hamda Iordan daryosi suvidan intensiv foydalanish Isroilning agrar va maishiy ehtiyojlarini qoplasa-da, bu holat qo‘shni arab davlatlari va Falastin muxtoriyatining manfaatlariga qarshi keladi. Iordan daryosi havzasida suv resurslarining taqsimlanishi xalqaro huquq normalari asosida emas, balki mintaqadagi harbiy va texnologik jihatdan ustun bo‘lgan kuchlarning irodasi bilan belgilanadi. G‘arbiy sohil hududidagi yer osti suv manbalarining Isroil tomonidan nazorat qilinishi Falastin aholisining suv resurslaridan foydalanish imkoniyatlarini cheklab qo‘ygan, bu esa doimiy ziddiyat o‘chog‘i bo‘lib qolmoqda.[6]

Shatt al-Arab havzasi va Eron–Iroq munosabatlari

Shatt al-Arab daryosi Eron va Iroq o‘rtasidagi tarixiy nizolarning markazida bo‘lib kelgan. Daryo nafaqat suv manbai, balki strategik dengiz yo‘li hisoblanadi. So‘nggi yillarda Eron tomonidan yuqori oqimda suvni burish loyihalari Iroqdagi ekologik va iqtisodiy inqirozni kuchaytirmoqda. Bu holat suv masalasining an’anaviy harbiy-siyosiy qarama-qarshiliklarga yangi o‘lcham qo‘shayotganini ko‘rsatadi. Daryoning taxminan 105 kilometrlik quyi qismi Eron va Iroq o‘rtasidagi rasmiy chegara hisoblanadi. Aynan mana shu hudud asrlar davomida ikki davlat o‘rtasida nizo manbayi bo‘lib kelgan. Urushning rasmiy sababi: Saddam Husayn Shatt al-Arab daryosining butunlay Iroq suverenitetiga o‘tishini va uni arab daryosi deb e'lon qilinishini talab qildi. 1980-yil sentyabrda Iroq qo‘shinlari daryodan o‘tib, Eronning Xuziston viloyatiga bostirib kirdi. 8 yil davom etgan va 1 milliondan ortiq inson yostig‘ini quritgan qonli Eron-Iroq urushining boshlanishiga aynan Shatt al-Arab havzasi ustidagi gidropolitik nizo sabab bo‘lgan edi. Urush hech bir tomonning g‘alabasiz yakunlandi va chegaralar yana 1975-yilgi Jazoir bitimi holatiga qaytarildi. Bugungi kunda Eron va Iroq o‘rtasidagi siyosiy munosabatlar ancha iliqlashgan bo‘lsa-da, Shatt al-Arab havzasida yangi turdagi inqiroz — ekologik gidro-diplomatiya muammosi yuzaga keldi: Shatt al-Arab chegaralarini demarkatsiya qilish bo‘yicha qo‘shma komissiyalar ishlamoqda, biroq daryo oqimining kamayishi va loyqa to‘planishi har ikki davlatdan transchegaraviy suv resurslarini birgalikda boshqarishni talab qilmoqda.

XULOSA

Yaqin Sharqda suv geosiyosati mintaqaviy xavfsizlikning ajralmas qismi hisoblanadi. Suv resurslarining cheklanganligi va notekis taqsimlanishi davlatlar o’rtasida raqobatni kuchaytirsada uzoq muddatli barqarorlik faqat hamkorlik orqali ta’minlanishi mumkin. Transchegaraviy daryolar havzasida barqaror tinchlikka

[6] Wolf, A. T. (1995). Hydropolitics along the Jordan River: Scarce water and its impact on the Arab-Israeli conflict. United Nations University Press. pp. 112-118.

erishish uchun faqatgina harbiy ustunlikka tayangan gidrogegemonlik modelidan voz kechib, 'Suv diplomatiyasi' institutlarini rivojlantirish zarur. Mintaqa aktorlari barcha uchun majburiy bo‘lgan transchegaraviy suv bitimlarini imzolashlari, muqobil suv texnologiyalarini joriy etish orqali daryolarga bo‘lgan yuklamani kamaytirishlari shart. Aks holda, resurslar tanqisligi mintaqada yangi qurolli to‘qnashuvlar xavfini muqarrar qilib qo‘yadi. Har bir daryo havzasi bo‘yicha barcha yuqori va quyi oqim davlatlari majburiy tartibda ishtirok etadigan doimiy ishlovchi xalqaro komissiyalar va huquqiy bazani yaratish lozim. Tadqiqot natijalari shuni ko‘rsatadiki, agar mavjud tendensiyalar davom etsa, suv kelajakda Yaqin Sharqda mojarolarni kuchaytiruvchi emas, balki ularni boshqarish va yumshatish vositasiga aylanishi ham mumkin. Buning uchun mintaqaviy suv diplomatiyasini rivojlantirish zarur.

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O‘ZBEKISTON – ERON O‘RTASIDAGI MUNOSABATLARNING BUGUNGI HOLATI VA ISTIQBOLI

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ANNOTATSIYA

Mazkur maqolada O‘zbekiston Respublikasi va Eron Islom Respublikasi o‘rtasidagi munosabatlarning shakllanishi, bugungi holati va rivojlanish istiqbollari tahlil qilinadi. Ikki davlat o‘rtasidagi siyosiy muloqot, savdo-iqtisodiy va investitsiyaviy hamkorlik, transport-logistika aloqalari hamda madaniy-gumanitar munosabatlarning asosiy yo‘nalishlari yoritiladi. Shuningdek, so‘nggi yillarda ikki tomonlama aloqalarning faollashuvi, o‘zaro manfaatli geoiqtisodiy loyihalar va hamkorlikni yanada rivojlantirish imkoniyatlari tahlil etiladi.

Kalit so‘zlar: Saraxs–Mashhad temir yo‘li, Shimol–Janub xalqaro transport yo‘lagi, Tojikiston Islom Uyg‘onish partiyasi, qo‘shnichilik siyosati, “Bir makon, bir yo‘l”, “Xitoy–Qirg‘iziston–O‘zbekiston” *temir yo‘li.*

ABSTRACT

This article analyzes the current state and prospects of relations between the Republic of Uzbekistan and the Islamic Republic of Iran. It examines the key areas of bilateral cooperation, including political dialogue, trade and economic relations, investment, transport and logistics, and cultural and humanitarian ties. Particular attention is paid to the recent intensification of bilateral relations, mutually beneficial geo-economic projects, and opportunities for further strengthening cooperation between the two countries.

Keywords: *Sarakhs–Mashhad railway, International North–South Transport Corridor, Islamic Renaissance Party of Tajikistan, Neighborhood Policy, Belt and Road Initiative, China–Kyrgyzstan–Uzbekistan railway.*

KIRISH

O‘zbekiston Respublikasi mustaqillikka erishgach, tashqi siyosatining ustuvor yo‘nalishlaridan biri sifatida qo‘shni va mintaqaviy davlatlar bilan o‘zaro manfaatli hamkorlikni rivojlantirishga alohida e’tibor qaratdi. Eron Islom Respublikasi O‘zbekiston mustaqilligini tan olgan dastlabki davlatlardan biri bo‘lib, ikki mamlakat o‘rtasidagi munosabatlarning huquqiy-siyosiy asoslari qisqa muddat ichida shakllantirildi. 1991-yil 25-dekabrda Eron Islom Respublikasi O‘zbekiston

Respublikasining davlat mustaqilligini rasman tan oldi. 1992-yil 10-mayda ikki davlat o‘rtasida diplomatik munosabatlar o‘rnatish to‘g‘risidagi Protokol imzolandi va rasmiy diplomatik aloqalar yo‘lga qo‘yildi[7]. Mazkur hujjat O‘zbekiston–Eron munosabatlarining huquqiy va institutsional poydevorini yaratib, siyosiy, savdo-iqtisodiy hamda madaniy-gumanitar hamkorlikni rivojlantirish uchun muhim asos bo‘lib xizmat qildi. Eronning Toshkentdagi diplomatik vakolatxonasi 1992-yil noyabr oyida ochilgan bo‘lsa, O‘zbekistonning Tehrondagi elchixonasi 1995-yil may oyida ochilgan.

Diplomatik munosabatlarning o‘rnatilishi Markaziy Osiyoda yangi geosiyosiy vaziyatning shakllanishi, sobiq Sovet Ittifoqining parchalanishi hamda Eronning shimoliy yo‘nalishdagi tashqi siyosatini faollashtirish jarayoni bilan chambarchas bog‘liq edi. Eron rahbariyati yangi mustaqil Markaziy Osiyo davlatlari bilan siyosiy, iqtisodiy va madaniy aloqalarni rivojlantirishni o‘z tashqi siyosatining muhim yo‘nalishlaridan biri sifatida belgiladi. O‘zbekiston esa Fors ko‘rfazi va Hind okeani portlariga chiqish imkoniyatlarini kengaytirish, transport-kommunikatsiya yo‘laklarini diversifikatsiya qilish hamda musulmon dunyosi davlatlari bilan hamkorlikni rivojlantirishdan manfaatdor edi.

MUHOKAMA

Ikki davlat o‘rtasidagi munosabatlarning shakllanishida oliy darajadagi siyosiy muloqot muhim o‘rin egalladi. O‘zbekiston Respublikasining birinchi Prezidenti Islom Karimov 1992-yilda Tehronga rasmiy tashrif buyurdi[8]. Ushbu tashrif davomida savdo-iqtisodiy hamkorlik, transport, investitsiyalar, fan, ta’lim va madaniyat sohalarida hamkorlikni nazarda tutuvchi qator hukumatlararo bitimlar imzolandi. Mazkur tashrif ikki tomonlama munosabatlarning shartnomaviy-huquqiy bazasini yaratishda muhim bosqich bo‘ldi. 1993-yilda Eron Prezidenti Ali Akbar Hoshimiy Rafsanjoniy O‘zbekistonga rasmiy tashrif bilan keldi. Muzokaralar davomida mintaqaviy xavfsizlik, iqtisodiy hamkorlik, transport yo‘laklarini rivojlantirish hamda xalqaro tashkilotlar doirasidagi hamkorlik masalalari muhokama qilindi. Ayniqsa, O‘zbekiston yuklarini Eronning Bandar Abbos va Chobahor portlari orqali jahon bozorlariga olib chiqish istiqbollari alohida e’tibor markazida bo‘ldi.

Islom Karimov prezidentligi davrida (1991–2016) O‘zbekiston–Eron munosabatlari ehtiyotkorlik va o‘zaro ishonchsizlik bilan tavsiflandi. Buning birinchi sababi Toshkentning Eronning Markaziy Osiyoda, ayniqsa, Tojikiston orqali madaniy

[7] Akhmedov, A. (2024). Uzbekistan–Iran: New dynamics of development of relations. Trendz MENA, Issue 8. Retrieved from https://trendzmena.com/uzbekistan-iran-new-dynamics-of-development-of-relations-issue8/?utm
[8] Janobiddinov, A. (February 26, 2023). Uzbekistan–Iran relations: Historical ties and modern cooperation. Retrieved from https://www.tehrantimes.com/news/482362/Uzbekistan-Iran-relations-Historical-ties-and-modern-cooperation

va siyosiy ta’sirining ortishidan xavotirda bo‘lganligi edi[9]. O‘sha davrda Eron va Tojikiston o‘rtasidagi yaqin siyosiy aloqalar hamda O‘zbekiston–Tojikiston munosabatlaridagi keskinlik mazkur xavotirni yanada kuchaytirgan. Ikkinchi muhim omil Eronning Islom inqilobi mafkurasi, siyosiy shialik konsepsiyasi va ayrim diniy-siyosiy harakatlarni qo‘llab-quvvatlash siyosati bilan bog‘liq xavfsizlik masalalari bo‘ldi. Ayniqsa, Eronning Tojikiston Islom Uyg‘onish partiyasi bilan yaqin aloqalari Toshkent tomonidan ehtiyotkorlik bilan baholangan. O‘zbekiston uzoq vaqt davomida Eronning ShHTga to‘laqonli a’zo bo‘lish masalasida ham qa’tiy pozitsiyani egallab keldi.

1990-yillarning ikkinchi yarmida ikki davlat o‘rtasidagi munosabatlar ayrim siyosiy omillar sabab ma’lum darajada sekinlashdi. O‘zbekiston diniy ekstremizm va transmilliy terrorizm tahdidlariga qarshi qat’iy siyosat yuritgan bo‘lsa, Eron esa Afg‘oniston va mintaqadagi ayrim geosiyosiy jarayonlarda o‘z manfaatlarini ilgari surishga intildi. Shunga qaramay, tomonlar o‘zaro hurmat, davlat suvereniteti va ichki ishlarga aralashmaslik tamoyillariga amal qilib, diplomatik muloqotni davom ettirdilar.

2000-yillarda ikki davlat o‘rtasidagi hamkorlik asosan iqtisodiy va transport yo‘nalishlariga qaratildi. O‘zbekistonning xalqaro transport yo‘laklarini diversifikatsiya qilish siyosati Eronning tranzit salohiyati bilan uyg‘unlashdi. Xususan, Saraxs–Mashhad temir yo‘li**,** Shimol–Janub xalqaro transport yo‘lagi hamda Chobahor porti imkoniyatlari O‘zbekiston tashqi savdosi uchun strategik ahamiyat kasb eta boshladi. Eron O‘zbekiston uchun Fors ko‘rfazi va Hind okeaniga eng qisqa tranzit yo‘nalishlaridan biri sifatida qaralmoqda.

XXI asrning birinchi choragida xalqaro tizimda kuzatilayotgan geosiyosiy transformatsiyalar, global ta’minot zanjirlarining qayta shakllanishi, transport-kommunikatsiya yo‘laklari uchun raqobatning kuchayishi hamda Yevroosiyo makonida yangi geoiqtisodiy markazlarning vujudga kelishi O‘zbekiston va Eron o‘rtasidagi hamkorlikni sifat jihatidan yangi bosqichga olib chiqdi. Bugungi kunda ikki davlat o‘rtasidagi munosabatlar nafaqat ikki tomonlama siyosiy aloqalar, balki Markaziy Osiyo va Yaqin Sharq xavfsizligi, transport-logistika tizimlari, energetika, savdo-iqtisodiy integratsiya hamda mintaqaviy barqarorlikni ta’minlashning muhim tarkibiy qismiga aylandi. Shu bois Toshkent va Tehron o‘rtasidagi munosabatlarni faqat ikki davlat manfaatlari doirasida emas, balki Yevroosiyo geosiyosatining muhim elementi sifatida baholash maqsadga muvofiqdir.

[9] Fayzullayev S. (2023). Eron Islom Respublikasi tashqi siyosatida Markaziy Osiyo vektori. Siyosiy fanlar bo‘yicha falsafa doktori (PhD) dissertatsiyasi. Toshkent. –B.131.

O‘zbekistonning geostrategik o‘rni mazkur hamkorlikning eng muhim omillaridan biridir. Mamlakat Markaziy Osiyoning markazida joylashgan bo‘lib, Qozog‘iston, Qirg‘iziston, Tojikiston, Turkmaniston va Afg‘oniston bilan chegaradosh yagona davlat hisoblanadi. Mazkur geografik joylashuv uni Markaziy Osiyodagi transport, savdo va siyosiy jarayonlarning markaziy bo‘g‘iniga aylantiradi. Shu bilan birga, O‘zbekiston dunyodagi ikki karra quruqlik bilan o‘ralgan (double landlocked) kam sonli davlatlardan biri bo‘lib, xalqaro dengiz portlariga chiqish uchun kamida ikki davlat hududidan o‘tishga majbur. Aynan shu omil mamlakat tashqi siyosatida transport diplomatiyasini ustuvor yo‘nalishlardan biriga aylantirdi.

Eron O‘zbekiston uchun alohida strategik ahamiyat kasb etadi. Eron geografik jihatdan Markaziy Osiyoni Fors ko‘rfazi va Hind okeani bilan bog‘lovchi tabiiy transport ko‘prigi vazifasini bajaradi. Ayniqsa, Chobahar porti O‘zbekistonning dengiz kommunikatsiyalariga eng qisqa va iqtisodiy jihatdan maqbul chiqish imkoniyatlaridan biri sifatida qaralmoqda. Shu sababli Toshkent so‘nggi yillarda Transafg‘on transport yo‘lagi, Xalqaro Shimol – Janub transport koridori, Ashxobod transport bitimi hamda Xitoyning “Bir makon, bir yo‘l” tashabbusi doirasidagi loyihalarni o‘zaro uyg‘unlashtirishga alohida e’tibor qaratmoqda. Ushbu yo‘nalishlarda O‘zbekiston va Eron manfaatlari bir-birini to‘ldiradi: O‘zbekiston Eron orqali jahon bozorlariga chiqish imkoniyatini qo‘lga kiritsa, Eron esa O‘zbekiston orqali Markaziy Osiyo, Xitoy va Yevroosiyo bozorlariga kirish imkoniyatini kengaytiradi. Biroq bugungi strategik yaqinlashuv uzoq evolyutsion jarayon mahsulidir.

Ikki tomonlama munosabatlarda yangi bosqich 2016-yildan so‘ng boshlandi. O‘zbekiston Prezidenti Shavkat Mirziyoyev tomonidan ilgari surilgan ochiq va pragmatik tashqi siyosat natijasida Eron bilan hamkorlik sezilarli darajada faollashdi. O‘zbekistonning nafaqat Markaziy Osiyo davlatlari, balki Eron, Turkiya, Hindiston, Fors ko‘rfazi mamlakatlari, Rossiya, Xitoy hamda Yevropa davlatlari bilan aloqalari sezilarli darajada faollashdi. Bu esa Eron bilan munosabatlarda ham yangi davrni boshlab berdi. Endilikda ikki davlat o‘rtasidagi munosabatlar mafkuraviy omillardan ko‘ra ko‘proq geoiqtisodiy manfaatlar, transport-kommunikatsiya, investitsiyalar va sanoat kooperatsiyasiga asoslanmoqda. Bu esa xalqaro munosabatlar nazariyasida kuzatilayotgan pragmatik tashqi siyosat va kompleks o‘zaro bog‘liqlik tamoyillarining amaliy ifodasi sifatida namoyon bo‘lmoqda.

O‘zbekiston va Eron o‘rtasidagi munosabatlarning yangi bosqichi, avvalo, oliy darajadagi siyosiy muloqotning muntazam tus olishi bilan tavsiflanadi. 2021-yildan boshlab ikki davlat rahbarlari o‘rtasidagi uchrashuvlar sonining ortishi, hukumatlararo komissiyalar faoliyatining faollashuvi hamda parlamentlararo

aloqalarning kengayishi o‘zaro ishonchning mustahkamlanayotganidan dalolat beradi. Ayniqsa, Eron Prezidenti Ibrohim Raisiy tomonidan ilgari surilgan “qo‘shnichilik siyosati” va “iqtisodiy diplomatiya” konsepsiyasi Markaziy Osiyo davlatlari, jumladan O‘zbekiston bilan aloqalarni Eron tashqi siyosatining ustuvor yo‘nalishlaridan biriga aylantirdi. Mazkur yondashuv Prezident Shavkat Mirziyoyevning pragmatik va ochiq tashqi siyosat strategiyasi bilan uyg‘unlashib, ikki tomonlama munosabatlarning sifat jihatidan yangi bosqichga ko‘tarilishiga xizmat qildi.

2021-yil sentyabr oyida Dushanbe shahrida o‘tkazilgan ShHT sammiti, 2022-yil noyabr oyida Ashxobodda bo‘lib o‘tgan Iqtisodiy hamkorlik tashkiloti sammiti hamda 2022-yil 15–16-sentyabr kunlari Samarqand shahrida tashkil etilgan ShHT Davlat rahbarlari kengashining XXII majlisi O‘zbekiston–Eron siyosiy muloqotining yangi bosqichini boshlab berdi. 2022-yilning dekabr oyida Ashxobodda bo‘lib o‘tgan Iqtisodiy hamkorlik tashkiloti sammiti doirasida Ibrohim Raisiy va Shavkat Mirziyoyev o‘rtasida ikkita uchrashuv o‘tkazildi. 2021-yil 2-noyabrda O‘zbekiston Respublikasi Investitsiyalar va tashqi savdo vaziri Sardor Umurzakov va Eron Islom Respublikasi Sanoat, konlar va savdo vaziri R.Rahmoniy bilan investitsiyaviy va savdo-iqtisodiy hamkorlikni mustahkamlash imkoniyatlarining muhokamasiga bag‘ishlangan uchrashuv, O‘zbekiston Xavfsizlik kengashi kotibi Viktor Mahmudov va Eron Milliy xavfsizlik oliy kengashi kotibi Ali Shamxoniy o'rtasidagi uchrashuv, Eron Islom kengashi Raisiy Muhammad Bogir Qolibof boshchiligidagi delegatsiya Oliy Majlis Qonunchilik palatasi Spikeri Nuriddinjon Ismoilov bilan hamda boshqa qator uchrashuvlar ikki mamlakat munosabatlaridagi o‘ta muhim voqealardir[10].

Samarqand sammiti nafaqat ShHT tarixidagi eng muhim uchrashuvlardan biri, balki Eronning tashkilotdagi maqomini mustahkamlagan tarixiy voqea sifatida ham e’tirof etildi. Mazkur sammit doirasida Eronning ShHTga to‘laqonli a’zoligi bo‘yicha majburiyatlar memorandumi imzolandi va 2023-yil 4-iyul kuni Eron tashkilotning to‘laqonli a’zosiga aylandi. O‘zbekiston ushbu jarayonni faol qo‘llab-quvvatladi, bu esa ikki davlat o‘rtasidagi o‘zaro ishonch darajasi sezilarli oshganini ko‘rsatdi. Samarqand sammiti doirasida Shavkat Mirziyoyev va Ibrohim Raisiy o‘rtasida bo‘lib o‘tgan muzokaralar ikki tomonlama hamkorlik tarixidagi eng muhim siyosiy voqealardan biri bo‘ldi. Muzokaralar yakunida qishloq xo‘jaligi, energetika, bojxona, transport, sog‘liqni saqlash, sport, fan, texnologiyalar, madaniyat, ekologiya, turizm, neft-gaz, neft-kimyo sanoati hamda Chobahor porti orqali xalqaro tashuvlarni rivojlantirishni nazarda tutuvchi hujjatlar imzolandi. Mazkur hujjatlar ikki davlat

[10] Fayzullayev S. (2023). Eron Islom Respublikasi tashqi siyosatida Markaziy Osiyo vektori. Siyosiy fanlar bo‘yicha falsafa doktori (PhD) dissertatsiyasi. Toshkent. –B.134.

hamkorligini alohida loyihalar darajasidan uzoq muddatli strategik sheriklik bosqichiga olib chiqishga xizmat qildi. Oliy darajadagi siyosiy muloqotning mantiqiy davomi sifatida 2023-yil 31-may kuni Toshkent shahrida O‘zbekiston va Eron o‘rtasidagi iqtisodiy, savdo va ilmiy-texnik hamkorlik bo‘yicha Hukumatlararo komissiyaning 15-yig‘ilishi o‘tkazildi [11]. Bunda O‘zbekiston va Eron o‘rtasida soddalashtirilgan viza rejimi joriy etildi. 2022-yil 13-oktabrda O‘zbekiston va Eron Islom Respublikasi hukumatlari o‘rtasida biznes va ilmiy doiralar vakillari hamda sayyohlik guruhlari uchun viza tartiblarini soddalashtirish to‘g‘risidagi bitim kuchga kirdi[12]. Ushbu bitim Eron Islom Respublikasi Prezidentining 2022-yil 14-sentabrda O‘zbekistonga rasmiy tashrifi davomida imzolangan. 2023-yil 18-iyun kuni Toshkentda Eron Innovatsiyalar va texnologiyalar uyining ochilishi ilm-fan, innovatsiyalar va yuqori texnologiyalar sohasidagi hamkorlikni yangi bosqichga olib chiqdi. Mazkur tashabbus ikki davlat o‘rtasida sun’iy intellekt, nanotexnologiyalar, farmatsevtika, axborot texnologiyalari hamda ilmiy ishlanmalarni tijoratlashtirish yo‘nalishlarida hamkorlik qilish uchun institutsional asos yaratdi. O‘zbekiston tomoni Eronning “Kish”, “Chabahor”, “Ars” erkin iqtisodiy zonalari hamda O‘zbekistondagi “Navoiy” va “Angren” erkin iqtisodiy zonalar o‘rtasida ishlab chiqarish kooperatsiyasi asosidagi muvaffaqiyatli hamkorlik istiqbollarini ham ko‘rib chiqmoqda.

O‘zbekiston Prezidenti Shavkat Mirziyoyevning 2023-yil 18–19-iyun kunlari Tehronga amalga oshirgan rasmiy tashrifi ikki tomonlama munosabatlar tarixida alohida o‘rin tutadi. Muzokaralar yakunida 15 ta ikki tomonlama hujjat imzolandi hamda davlat rahbarlari qo‘shma bayonotni qabul qildilar [13]. Bayonotda siyosiy muloqotni davom ettirish, savdo hajmini keskin oshirish, sanoat kooperatsiyasini rivojlantirish, transport-logistika tizimlarini o‘zaro integratsiya qilish, investitsiyalarni rag‘batlantirish, qishloq xo‘jaligi, energetika, sog‘liqni saqlash va turizm sohalarida hamkorlikni kengaytirish bo‘yicha uzoq muddatli vazifalar belgilandi. Ayniqsa, yillik o‘zaro savdo hajmini 1 milliard AQSh dollariga yetkazish maqsadi ikki davlat iqtisodiy diplomatiyasining asosiy strategik ko‘rsatkichlaridan

[11] Toshkentda O‘zbekiston-Eron Hukumatlararo komissiyasining 15-yig‘ilishi bo‘lib o‘tdi. (31.05.2023). Retrieved from https://invest-in-uzbekistan.org/uz/novosti-uzbekistana/v-tashkente-sostoyalos-15-e-zasedanie-uzbeksko-iranskoj-mezhpravitelstvennoj-komissii/

[12] [12] Akhmedov, A. (2024). Uzbekistan–Iran: New dynamics of development of relations. Trendz MENA, Issue 8. Retrieved from https://trendzmena.com/uzbekistan-iran-new-dynamics-of-development-of-relations-issue8/?utm

[13] O‘zbekiston bilan Eron o‘rtasidagi keng qamrovli hamkorlikni yanada rivojlantirishga qaratilgan hujjatlar qabul qilindi. (19.06.2023). Retrieved from https://uzbekistan.org/uz/ozbekiston-bilan-eron-ortasidagi-keng-qamrovli-hamkorlikni-yanada-rivojlantirishga-qaratilgan-hujjatlar-qabul-qilindi/3238/

biri sifatida belgilandi[14]. Siyosiy muloqotning yana bir muhim yo‘nalishi xalqaro va mintaqaviy tashkilotlar doirasidagi hamkorlikdir. Bugungi kunda O‘zbekiston va Eron Birlashgan Millatlar Tashkiloti, Islom hamkorlik tashkiloti, Iqtisodiy hamkorlik tashkiloti va ShHT doirasida o‘zaro yaqin pozitsiyalarni egallab kelmoqda. Ayniqsa, Afg‘oniston masalasida tomonlarning yondashuvlari ko‘p jihatdan mushtarakdir. Har ikki davlat Afg‘oniston hududidan terrorizm, diniy ekstremizm, noqonuniy migratsiya va narkotrafik tahdidlarining tarqalishiga qarshi kurashish, mamlakatda inklyuziv siyosiy tizimni shakllantirish hamda uni mintaqaviy iqtisodiy loyihalarga integratsiya qilish tarafdori hisoblanadi. Shu jihatdan O‘zbekiston va Eronning pozitsiyalari xavfsizlik masalalarida tobora yaqinlashib bormoqda.

Afg‘oniston masalasidagi umumiy manfaatlar transport diplomatiyasi bilan ham chambarchas bog‘liq. Chunki Transafg‘on temir yo‘li, Termiz–Mozori Sharif–Hirot yo‘nalishi hamda Chobahor portiga chiqish istiqbollari nafaqat iqtisodiy, balki geosiyosiy ahamiyatga ham ega. Ushbu loyihalar amalga oshirilgan taqdirda O‘zbekiston eng qisqa yo‘l orqali Hind okeani va Fors ko‘rfazi portlariga chiqish imkoniyatiga ega bo‘ladi, Eron esa Markaziy Osiyo va Xitoy bozorlariga chiqishdagi o‘z tranzit salohiyatini yanada mustahkamlaydi. Shu sababli transport-logistika hamkorligi bugungi kunda O‘zbekiston–Eron strategik sherikligining eng istiqbolli yo‘nalishlaridan biri sifatida qaralmoqda.

NATIJALAR

Ikki davlat o‘rtasidagi savdo ko‘rsatkichlari hamkorlikning izchil rivojlanayotganini tasdiqlaydi. 2021-yilda o‘zaro tovar ayirboshlash hajmi 430 million AQSh dollaridan oshib, avvalgi yilga nisbatan qariyb 74 foizga o‘sdi[15]. 2022-yil yakunida esa tovar ayirboshlash hajmi 435,9 million AQSh dollariga yetdi. 2023-yilning dastlabki to‘rt oyida ham ijobiy dinamika saqlanib, o‘zaro savdo hajmi o‘tgan yilning mos davriga nisbatan 11,9 foizga ortib, 186,3 million AQSh dollarini tashkil etdi. Xususan, O‘zbekiston eksporti 34,6 foizga o‘sib, 66,9 million AQSh dollariga yetgani mamlakatning Eron bozoridagi raqobatbardosh mahsulotlari soni ortib borayotganini ko‘rsatadi[16]. Shunga qaramay, ikki davlat iqtisodiy salohiyatini hisobga olganda, mavjud savdo hajmi hali ham kutilayotgan darajadan ancha past bo‘lib qolmoqda. Shu sababli davlat rahbarlari tomonidan o‘rta muddatli istiqbolda o‘zaro

[14] O‘zbekiston bilan Eron o‘rtasidagi keng qamrovli hamkorlikni yanada rivojlantirishga qaratilgan hujjatlar qabul qilindi. (19.06.2023). Retrieved from https://uzbekistan.org/uz/ozbekiston-bilan-eron-ortasidagi-keng-qamrovli-hamkorlikni-yanada-rivojlantirishga-qaratilgan-hujjatlar-qabul-qilindi/3238/

[15] UzA. (May 13, 2025). O‘zbekiston–Eron tovar ayirboshlash qiymati 2 milliard dollarga yetadi. O‘zbekiston Milliy axborot agentligi. Retrieved from https://uza.uz/cn/posts/ozbekiston-eron-tovar-ayirboshlash-qiymati-milliard-dollarga-yetadi_637088

[16] UzA. (May 13, 2025). O‘zbekiston–Eron tovar ayirboshlash qiymati 2 milliard dollarga yetadi. O‘zbekiston Milliy axborot agentligi. Retrieved from https://uza.uz/cn/posts/ozbekiston-eron-tovar-ayirboshlash-qiymati-milliard-dollarga-yetadi_637088

savdo hajmini 1 milliard AQSh dollariga yetkazish strategik maqsad sifatida belgilangan. Savdo tarkibining tahlili O‘zbekiston iqtisodiyotida amalga oshirilayotgan tarkibiy islohotlarning natijalarini ham yaqqol namoyon etadi. Avvallari O‘zbekistonning Eronga eksportida paxta tolasi asosiy o‘rinni egallagan bo‘lsa, keyingi yillarda yuqori qo‘shilgan qiymatga ega mahsulotlar ulushi ortib bormoqda. Bu holat O‘zbekistonda xomashyo eksportidan tayyor va yarim tayyor mahsulotlar ishlab chiqarishga o‘tish siyosatining amaliy natijasi sifatida baholanishi mumkin. O‘zbekistonning Eronga eksportida ip-kalava va paxta mahsulotlari, oltingugurt, dukkakli ekinlar, mineral o‘g‘itlar, xom ipak hamda xizmatlar asosiy o‘rinni egallagan bo‘lsa, Erondan asosan polimer mahsulotlari, qora metall prokati, mashina va uskunalar, qishloq xo‘jaligi mahsulotlari, kimyo sanoati mahsulotlari hamda oziq-ovqat mahsulotlari import qilindi. 2025-yil yakunlariga ko‘ra, O‘zbekiston va Eron o‘rtasidagi tashqi savdo aylanmasi 578,9 mln AQSh dollarini tashkil etdi. Ushbu ko‘rsatkich 2024-yildagi 497,1 mln AQSh dollari bilan taqqoslaganda 81,8 mln AQSh dollariga yoki 16,5 foizga, 2023-yildagi 503,6 mln AQSh dollariga nisbatan esa 75,3 mln AQSh dollariga yoki 15,0 foizga oshganini ko‘rsatadi[17]. Mazkur o‘sish ikki davlat o‘rtasidagi savdo-iqtisodiy hamkorlikning yangi bosqichga ko‘tarilganidan dalolat beradi.

2024-yilda kuzatilgan nisbatan pasayishdan so‘ng, 2025-yilda o‘zaro savdo hajmining sezilarli darajada ortishi hukumatlararo iqtisodiy hamkorlikning faollashuvi, transport va logistika yo‘laklarining rivojlantirilishi, savdo va investitsiya aloqalarining kengayishi hamda ishbilarmon doiralar o‘rtasidagi hamkorlikning mustahkamlanishi bilan izohlanadi. Xususan, O‘zbekiston va Eron o‘rtasida o‘tkazilgan hukumatlararo komissiya yig‘ilishlari, biznes-forumlar, sanoat kooperatsiyasi loyihalari hamda tranzit va transport sohasidagi kelishuvlar savdo aylanmasining o‘sishiga ijobiy ta'sir ko‘rsatdi. Shu bilan birga, 2025-yilda erishilgan 578,9 mln AQSh dollarlik savdo aylanmasi ijobiy natija bo‘lishiga qaramay, tomonlar o‘rtasida belgilangan 2 mlrd AQSh dollari miqdoridagi strategik savdo maqsadiga erishish uchun hali katta salohiyat mavjudligini ko‘rsatadi. Kelgusida energetika, qishloq xo‘jaligi, farmatsevtika, kimyo sanoati, to‘qimachilik, transport-logistika va sanoat kooperatsiyasi yo‘nalishlarida hamkorlikni chuqurlashtirish ushbu maqsadga erishishda muhim omil bo‘lib xizmat qilishi kutilmoqda.

Investitsiyaviy hamkorlik ham sezilarli sur’atlarda rivojlanmoqda. Mazkur davr mobaynida O‘zbekistonda Eron kapitali ishtirokidagi korxonalar soni 120 tadan 267

[17] O‘zbekiston Milliy statistika qo‘mitasining 2025-yil yanvar-dekabr oylaridagi O‘zbekiston tashqi savdo aylanmasi press reliz. Retrieved from https://stat.uz/img/news/press-reliz-uzb_p58093.pdf

taga oshdi, shundan 149 tasi to‘liq Eron kapitali asosida faoliyat yuritmoqda[18]. Ushbu korxonalarning asosiy qismi Toshkent shahri, Toshkent, Samarqand, Buxoro, Navoiy va Farg‘ona viloyatlarida joylashgan bo‘lib, ulgurji va chakana savdo, oziq-ovqat sanoati, kimyo sanoati, qurilish materiallari ishlab chiqarish, metallni qayta ishlash, qishloq xo‘jaligi, logistika va xizmat ko‘rsatish sohalarida faoliyat olib bormoqda. Bu esa Eron investitsiyalarining O‘zbekiston iqtisodiyotining real sektoriga tobora faol kirib borayotganini ko‘rsatadi.

2022-yil may oyida Toshkentda Eron sanoat mahsulotlarining birinchi ixtisoslashtirilgan ko‘rgazmasi, 2023-yil iyul oyida esa Eronning savdo-sanoat ko‘rgazma-yarmarkasi o‘tkazildi[19]. Mazkur tadbirlarda neft-gaz uskunalari, tibbiy texnika, metallurgiya mahsulotlari, kimyo sanoati, qurilish materiallari va boshqa yuqori texnologiyali mahsulotlar namoyish etildi. Ushbu ko‘rgazmalar ishbilarmon doiralar o‘rtasida to‘g‘ridan-to‘g‘ri aloqalarni rivojlantirish hamda yangi investitsiya loyihalarini shakllantirishga xizmat qilmoqda.

Eronning geostrategik joylashuvi Toshkent uchun alohida ahamiyat kasb etadi. Eron Yaqin Sharq, Janubiy Osiyo va Yevropa o‘rtasidagi transport tuguni sifatida Markaziy Osiyo davlatlariga Fors ko‘rfazi va Hind okeani portlariga eng qisqa yo‘lni taqdim etadi. Shu sababli ikki davlat o‘rtasidagi transport diplomatiyasi bugungi kunda siyosiy hamkorlikning eng faol rivojlanayotgan yo‘nalishlaridan biriga aylandi. Mazkur jarayonda Eronning janubi-sharqida joylashgan Chabahar Port alohida strategik ahamiyat kasb etmoqda. Ushbu port O‘zbekiston uchun jahon dengiz transport tizimiga chiqishning eng istiqbolli yo‘nalishlaridan biri sifatida baholanmoqda. Chobahor orqali yuk tashish masofasi va transport xarajatlarining qisqarishi O‘zbekiston eksportchilari uchun yangi imkoniyatlarni yaratadi. Bundan tashqari, mazkur port Markaziy Osiyo davlatlarini Janubiy Osiyo, Sharqiy Afrika hamda Yaqin Sharq bozorlariga bog‘lovchi logistika markazi vazifasini bajarishi mumkin. Shu sababli Toshkent so‘nggi yillarda Chobahor porti imkoniyatlaridan foydalanishga katta qiziqish bildirmoqda.

2020-yil 14-dekabrda O‘zbekiston, Eron va Hindiston transport idoralari o‘rtasida Chobahor portidan foydalanish istiqbollari yuzasidan birinchi uch tomonlama ishchi uchrashuv o‘tkazildi[20]. Muzokaralarda port infratuzilmasidan

[18] UzReport. (October 11, 2022). O‘zbekistonda qaysi davlatlarning kapitali ishtirokidagi korxonalar soni ko‘p ekani ma’lum qilindi. Retrieved from https://uzreport.news/economy/o-zbekistonda-qaysi-davlatlarning-kapitali-ishtirokidagi-korxonalar-soni-ko-p-ekani-malum-

[19] National Exhibition Company Uzexpocentre. (July 4, 2023). Iranian Trade and Industrial Exhibition 2023. Retrieved from https://www.uzexpocentre.uz/uz/news/iranian-trade-and-industrial-exhibition-2023

[20] Ministry of External Affairs, Government of India. (2020, December 14). First Trilateral Working Group Meeting between India, Iran and Uzbekistan on joint use of Chabahar Port. Retrieved from https://www.mea.gov.in/press-releases?dtl/33295/First+Trilateral+Working+Group+Meeting+between+India+Iran+and+Uzbekistan+on+joint+use+of+Chabahar+Port

foydalanish, yuk tashish hajmini oshirish, bojxona tartib-taomillarini soddalashtirish va multimodal logistika tizimini rivojlantirish masalalari muhokama qilindi. Mazkur uchrashuv O‘zbekistonning transport yo‘nalishlarini diversifikatsiya qilish siyosatida muhim bosqich bo‘ldi. O‘zbekiston transport mutasaddilari Chobahor portining texnik imkoniyatlari, zamonaviy infratuzilmasi va strategik joylashuvini yuqori baholab, portdan samarali foydalanish bo‘yicha qo‘shma ishchi guruhlar tuzishni taklif etdilar. Ushbu tashabbus O‘zbekistonning dengiz kommunikatsiyalariga chiqish strategiyasida Eronning o‘rni tobora ortib borayotganini ko‘rsatadi.

Transport-logistika sohasidagi yana bir muhim yo‘nalish Transafg‘on transport koridoridir. Termiz–Mozori Sharif–Hirot temir yo‘li hamda uning keyinchalik Eron temir yo‘l tarmog‘iga ulanishi Markaziy Osiyoni Hind okeani portlari bilan bog‘lash imkonini beradi. Mazkur loyiha amalga oshirilsa, O‘zbekiston eksport yuklari qisqa muddatda Chobahor va Bandar Abbos portlariga yetkazilishi mumkin bo‘ladi. Shu bilan birga, ushbu transport tizimi Janubiy va Janubi-Sharqiy Osiyo bozorlarini Markaziy Osiyo hamda Yevropa bilan bog‘lovchi yangi geoiqtisodiy makonni shakllantirishga xizmat qiladi. Albatta, Afg‘onistondagi siyosiy vaziyat mazkur loyihaning amalga oshirilishiga ta'sir ko‘rsatayotgan asosiy omillardan biri bo‘lib qolmoqda. Biroq O‘zbekiston va Eron Afg‘onistonni mintaqaviy iqtisodiy loyihalarga jalb qilish uzoq muddatli barqarorlikni ta'minlashning muhim vositasi ekanini ta’kidlab kelmoqda.

Shuningdek, O‘zbekiston Xalqaro Shimol – Janub transport yo‘lagi imkoniyatlaridan foydalanishga ham alohida e’tibor qaratmoqda. Mazkur transport yo‘lagi Hindiston, Eron, Kavkaz va Rossiya orqali Yevropa bozorlariga chiqishni ta’minlaydi. Ushbu koridorning O‘zbekiston transport tizimi bilan integratsiyalashuvi mamlakat eksport geografiyasini sezilarli darajada kengaytirishi mumkin. Bundan tashqari, “Xitoy–Qirg‘iziston–O‘zbekiston” temir yo‘li qurilishi yakunlangach, mazkur yo‘nalishni Turkmaniston va Eron temir yo‘llari bilan bog‘lash orqali Sharq–G‘arb va Shimol–Janub transport yo‘laklari o‘zaro tutashadi. O‘zbekiston Yevroosiyodagi asosiy logistika markazlaridan biriga aylanish imkoniyatiga ega bo‘ladi, Eron esa Markaziy Osiyo va Xitoy bilan transport aloqalarini yanada mustahkamlaydi.

Transport va geoiqtisodiy manfaatlarning uyg‘unligi ikki davlat tashqi siyosatining umumiy strategik maqsadlari bilan ham uzviy bog‘liq. O‘zbekiston mintaqada ochiq, o‘zaro manfaatli va pragmatik hamkorlikni rivojlantirish tarafdori bo‘lsa, Eron ham Markaziy Osiyo davlatlarini o‘z transport, energetika va savdo tizimlariga faol jalb etishga intilmoqda. Shu jihatdan Toshkent va Tehron o‘rtasidagi hamkorlik raqobatdan ko‘ra o‘zaro manfaat tamoyiliga asoslanmoqda. Xususan, Eron

O‘zbekiston orqali Markaziy Osiyo va Xitoy bozorlariga chiqish imkoniyatini kengaytirsa, O‘zbekiston Eron orqali Fors ko‘rfazi va Hind okeani portlariga chiqish imkoniyatini qo‘lga kiritmoqda. Bunday o‘zaro manfaatli model geoiqtisodiyot nazariyasida “win-win cooperation” tamoyilining amaliy ifodasi sifatida baholanishi mumkin.

Madaniy hamkorlik. Ikki davlat o‘rtasidagi hamkorlik faqat iqtisodiyot bilan cheklanmay, madaniy-gumanitar sohada ham izchil rivojlanmoqda. O‘zbekiston va Eronni ko‘p asrlik tarixiy, madaniy va sivilizatsion rishtalar bog‘lab turadi. Buyuk Ipak yo‘li davridan boshlab Samarqand, Buxoro, Xiva va Hirot shaharlari ilm-fan, adabiyot va madaniyat almashinuvining muhim markazlari bo‘lib kelgan. Buyuk mutafakkirlar – Abu Ali ibn Sino, Alisher Navoiy, Abdurahmon Jomiy, Mirzo Ulug‘bek va boshqa allomalarning ilmiy hamda adabiy merosi ikki xalqni birlashtirib turuvchi muhim sivilizatsion omillardan biri hisoblanadi. Bugungi kunda mazkur tarixiy yaqinlik madaniy diplomatiyaning muhim asosiga aylangan. Osiyo mintaqasida Eronning madaniy vakolatxonalari soni 24 ta (Istanbul, Islomobod, Yerevan, Boku, Bangkok, Mumbay, Bishkek, Pekin, Toshkent, Tbilisi, Haydarobod, Dakka, Dehli, Ravalpindi, Shanxay, Ashxobod, Kobul, Karachi, Kolombo, Kuala-Lumpur, Ketta, Laxor, Manila va Naxichivan). Eronning Osiyoda 24 ta madaniyat markazi mavjudligi rasmiy Tehronning madaniy ta’sir borasidagi tashqi siyosatida Sharqqa siljish borligidan dalolat beradi. Eron madaniyat vakillarining faolligi, ayniqsa, Kavkazda, Markaziy va Janubiy Osiyo mamlakatlarida seziladi. Markaziy Osiyo Eron bilan ko‘plab aloqalarga ega rivojlanayotgan mintaqa sifatida Eron madaniy diplomatiyasining asosiy maqsadlaridan biridir. Shu nuqtayi nazardan, Tehron ushbu yangi mintaqaviy domenda turli xil harakatlarni amalga oshirdi.

Fors tili va adabiyoti Eron va O‘zbekistonning mushtarak nuqtalaridan biridir. Har yili O‘zbekistonning turli universitetlarida o‘rtacha 323 nafar talaba birinchi til sifatida fors tilini, 3061 nafar talaba ikkinchi til sifatida fors tilini o‘rganadi. Shuningdek, 40 nafardan ortiq professor-o‘qituvchilar fors tilidan dars bermoqda. Xuddi shu sharoitda, shuningdek, tojik maktablarida 130 mingga yaqin o‘quvchi fors-tojik adabiyotini o‘rganib kelmoqda. Bundan tashqari, har yili Toshkent davlat sharqshunoslik universitetidagi Fors kafedrasining 5-10 nafar talabasi fors tili kursini o‘tash uchun Tehronga boradilar. Shu nuqtayi nazardan, Eronning Sa’diy jamg‘armasi va boshqa ilmiy markazlar bilan hamkorlikda O‘zbekistonda fors tili o‘qitilishini kengaytirish, fors tili o‘qituvchilari malakasini oshirish kurslarini tashkil etish, davlat universitetlari va bir qancha ilmiy markazlarda Fors tili kafedralari hamda Eron xonalari tashkil etish maqsadida Toshkentda Eronning madaniy maslahatlashuvlari o‘tkazildi. Toshkent davlat sharqshunoslik universiteti, Toshkent

davlat pedagogika universiteti, O‘zbekiston xalqaro islom akademiyasi, O‘zbekiston Milliy universiteti, Jahon tillari universiteti kabilar misol sifatida keltirilishi mumkin[21].

So‘nggi yillarda “Sharq taronalari” xalqaro musiqa festivali, Xalqaro maqom san’ati festivali, Qo‘qon xalqaro hunarmandchilik festivali kabi yirik madaniy tadbirlarda Eron san'atkorlari va hunarmandlarining faol ishtirok etishi madaniy almashinuvning kengayib borayotganini ko‘rsatadi. Ilm-fan sohasida esa O‘zbekiston va Eron ilmiy markazlari o‘rtasidagi aloqalar sezilarli faollashdi. Xususan, Toshkentdagi Islom sivilizatsiyasi markazi hamda Eron ilmiy muassasalari o‘rtasida islom merosini o‘rganish, qo‘lyozmalarni tadqiq etish, tarixiy manbalarni raqamlashtirish va qo‘shma ilmiy loyihalarni amalga oshirish bo‘yicha hamkorlik yo‘lga qo‘yildi. Shuningdek, innovatsiyalar, sun’iy intellekt, nanotexnologiyalar, farmatsevtika, tibbiyot va oliy ta'lim yo‘nalishlaridagi qo‘shma dasturlar ham tobora kengayib bormoqda.

Hamkorlik istiqbollari. O‘zbekiston va Eron o‘rtasidagi bugungi munosabatlar ko‘p qirrali strategik sheriklik xususiyatiga ega bo‘lib, uning asosiy tayanchlari siyosiy ishonch, geoiqtisodiy manfaatlarning uyg‘unligi, transport-logistika integratsiyasi, investitsion hamkorlik, sanoat kooperatsiyasi, madaniy-gumanitar yaqinlik va mintaqaviy xavfsizlik sohasidagi umumiy manfaatlardan iborat. Biroq ushbu hamkorlikning to‘liq salohiyatini ro‘yobga chiqarish uchun bank-moliya tizimidagi cheklovlarni kamaytirish, xalqaro sanksiyalar bilan bog‘liq xavflarni diversifikatsiya qilish, transport infratuzilmasini modernizatsiya qilish, bojxona tartib-taomillarini yanada soddalashtirish va xususiy sektor ishtirokini kengaytirish muhim ahamiyat kasb etadi. Mavjud geosiyosiy tendensiyalar shuni ko‘rsatadiki, yaqin istiqbolda O‘zbekiston va Eron o‘rtasidagi hamkorlik ikki tomonlama aloqalar doirasidan chiqib, Markaziy Osiyo, Yaqin Sharq va Janubiy Osiyoni bog‘lovchi geoiqtisodiy makon shakllanishining muhim omillaridan biriga aylanishi ehtimoli yuqori.

2024–2025-yillarda ham ikki davlat o‘rtasidagi siyosiy muloqot uzluksiz davom etdi. Ma’sud Pezeshkiyon va Prezident Shavkat Mirziyoyev o‘rtasidagi telefon muloqotlari hamda hukumatlar darajasidagi uchrashuvlarda savdo, transport, sanoat, qishloq xo‘jaligi va logistika sohalaridagi hamkorlikni chuqurlashtirish masalalari muhokama qilindi. 2025-yilda Eron va O‘zbekiston o‘rtasida 2025–2027-yillarga mo‘ljallangan hamkorlikning “Yo‘l xaritasi” qabul qilinib, hukumatlararo komissiya, biznes-forum va sanoat ko‘rgazmalari orqali amaliy loyihalarni jadallashtirishga

[21] Fayzullayev S. (2023). Eron Islom Respublikasi tashqi siyosatida Markaziy Osiyo vektori. Siyosiy fanlar bo‘yicha falsafa doktori (PhD) dissertatsiyasi. Toshkent. –B. 80.

kelishib olindi[22]. Shuningdek, muntazam aviaqatnovlar, qo‘shma korxonalar va yuk tashish hajmlarining ortib borayotgani ikki tomonlama aloqalarning izchil rivojlanayotganidan dalolat bermoqda.

XULOSA

O‘zbekiston va Eron o‘rtasidagi munosabatlar so‘nggi yillarda o‘zaro manfaat va pragmatik yondashuv asosida yangi bosqichga ko‘tarildi. Siyosiy muloqotning faollashuvi, savdo-iqtisodiy aloqalar, investitsiyalar hamda transport-logistika sohasidagi hamkorlik ikki tomonlama munosabatlarning asosiy yo‘nalishlarini tashkil etmoqda. Ayniqsa, Chobahor porti va xalqaro transport yo‘laklaridan foydalanish O‘zbekistonning jahon bozorlariga chiqish imkoniyatlarini kengaytirishda muhim ahamiyat kasb etadi. Istiqbolda mavjud salohiyatdan samarali foydalanish O‘zbekiston–Eron o‘rtasidagi uzoq muddatli va o‘zaro manfaatli hamkorlikni yanada rivojlantirishga xizmat qiladi.

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SCIENTIFIC AND METHODOLOGICAL FOUNDATIONS FOR IDENTIFYING AND CORRECTING TECHNICAL ERRORS IN SWIMMING TRAINING

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ABSTRACT

This article analyzes the scientific and methodological foundations for identifying and correcting technical errors in swimming training. The study examines the major technical deficiencies observed among swimmers and the factors contributing to their occurrence through pedagogical observation, video analysis, and the analysis of relevant scientific literature. Furthermore, it highlights the effectiveness of contemporary pedagogical approaches, specialized corrective exercises, and individualized teaching methods aimed at eliminating technical errors. The findings of the study contribute to improving the quality of swimming training, enhancing technical proficiency, and achieving better athletic performance.

Keywords: *swimming, technical preparation, technical errors, video analysis, pedagogical monitoring, biomechanical analysis, corrective exercises.*

INTRODUCTION

Today, swimming is recognized as one of the key disciplines within the system of physical education and sport, serving as an effective means of promoting public health, developing physical abilities, and achieving high athletic performance. Success in competitive swimming largely depends on the athlete's level of technical preparation, while the biomechanically correct execution of movements is a decisive factor in ensuring the effectiveness of the training process.

Practical observations indicate that technical errors occur not only among beginners but also among highly skilled swimmers. Such deficiencies lead to impaired movement coordination, increased water resistance, greater energy expenditure, and reduced competitive performance. Moreover, improperly developed swimming techniques may place excessive stress on the musculoskeletal system, thereby increasing the risk of injury. Therefore, the timely identification of technical errors, the analysis of their underlying causes, and their correction through scientifically grounded methods constitute one of the primary objectives of the

swimming training process. In this regard, the integrated application of pedagogical observation, video analysis, biomechanical assessment, and functional monitoring provides an effective approach to enhancing technical proficiency and improving overall training outcomes.

LITERATURE REVIEW.

An analysis of the scientific literature indicates that swimming technique is one of the primary determinants of athletic performance. Studies conducted by both national and international researchers have devoted considerable attention to improving technical preparation, developing efficient movement patterns, and eliminating technical errors. The existing literature suggests that technical errors mainly arise from insufficient motor coordination, inadequate physical fitness, shortcomings in teaching methodologies, and ineffective pedagogical supervision.

A number of studies emphasize the importance of biomechanical analysis in evaluating swimming technique. In particular, body position in the water, the coordination of arm and leg movements, breathing rhythm, and the analysis of movement phases are recognized as essential criteria for identifying technical deficiencies. Recent research also highlights that the application of video analysis technologies enables coaches and researchers to observe movements in slow motion, assess their kinematic characteristics, and accurately identify technical errors.

Furthermore, the literature demonstrates the effectiveness of specialized corrective exercises, part-task training, simulation (dry-land) exercises, and individualized instructional approaches in correcting technical errors. However, an analysis of existing studies indicates the need for further development of comprehensive and systematic scientific and methodological approaches to identifying and correcting technical errors during swimming training. Therefore, advancing research that integrates modern pedagogical, biomechanical, and digital technologies has become an important priority in the field of sports science.

RESEARCH METHODOLOGY.

The present study was designed to investigate the scientific and methodological foundations for identifying and correcting technical errors in swimming training. The research methodology was developed based on the principles of systematic, comprehensive, and individualized approaches. The study employed theoretical analysis and synthesis, pedagogical observation, pedagogical experimentation, video analysis, performance testing, and mathematical-statistical methods.

Theoretical analysis was conducted to examine and synthesize scientific literature related to swimming technique, the causes of technical errors, and evidence-based methods for their correction. During the pedagogical observation phase,

swimmers' arm and leg movements, body position, breathing rhythm, and movement coordination were evaluated to identify the most common technical deficiencies. In the pedagogical experiment, a set of specialized corrective exercises aimed at eliminating technical errors was implemented, and its effectiveness was assessed by comparing participants' performance before and after the intervention.

Using the video analysis method, swimmers' movements were examined frame by frame based on digital video recordings, enabling the identification of technical errors and the underlying factors contributing to their occurrence. In addition, performance tests were conducted to assess swimmers' physical fitness, including strength, endurance, coordination, and movement speed. The collected data were processed using mathematical and statistical methods, and the findings were summarized through the calculation of mean values, percentage distributions, and comparative analyses.

CONCLUSION

The findings of the study demonstrate that the timely identification and correction of technical errors through scientifically grounded methods significantly enhance the effectiveness of swimming training. The results revealed that the most common technical deficiencies among swimmers include poor coordination between arm and leg movements, improper body position, incorrect breathing rhythm, and disruptions in the sequence of movement phases. The integrated application of pedagogical observation, video analysis, and pedagogical experimentation proved effective in accurately assessing technical errors and facilitating their correction. In particular, the use of video analysis demonstrated high effectiveness in providing an in-depth biomechanical evaluation of swimming movements, identifying technical deficiencies, and developing individualized corrective recommendations. Furthermore, the systematic implementation of specialized corrective exercises significantly improved swimmers' technical preparation and motor skills.

Overall, the results of this study contribute to the advancement of the scientific and methodological foundations for identifying and correcting technical errors in swimming training. The practical application of the proposed methodological approaches can enhance swimmers' technical proficiency, improve the effectiveness of the training process, and support the achievement of consistently high athletic performance.

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1940 – 1991-YILLAR: SOVET DAVRIDA UZUMCHILIK VA VINOCHILIK SOHASINING RIVOJLANISH TARIXI

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ANNOTATSIYA

Ushbu maqolada 1940–1991-yillar oralig‘ida O‘zbekiston SSRda uzumchilik va vinochilik sohasining institutsional, ilmiy-tashkiliy hamda ishlab chiqarish jihatdan rivojlanish bosqichlari tarixiy manbalar, me’yoriy-huquqiy hujjatlar va ilmiy adabiyotlar asosida tahlil qilinadi. Urush yillaridagi qiyinchiliklar, urushdan keyingi tiklanish jarayoni, ilmiy-tadqiqot muassasalarining shakllanishi hamda 1970–1980-yillardagi intensiv rivojlanish bosqichi yoritiladi. Shuningdek, davlat siyosatining uzumchilik va vinochilik tarmog‘i taraqqiyotiga ta’siri ham baholanadi.

Kalit so‘zlar: *O‘zbekiston SSR, uzumchilik, vinochilik, «Uzbekvino» tresti, R.R. Shreder nomidagi institut, bog‘dorchilik va uzumchilik, kishmish, sovet davri qishloq xo‘jaligi siyosati.*

АННОТАЦИЯ

В статье на основе исторических источников, нормативно-правовых документов и научной литературы анализируются этапы институционального, научно-организационного и производственного развития виноградарства и виноделия в Узбекской ССР в 1940–1991 гг. Рассматриваются трудности военного периода, послевоенное восстановление отрасли, становление научно-исследовательских учреждений, а также этап интенсивного развития в 1970–1980-е годы. Особое внимание уделено влиянию государственной политики на развитие виноградарства и виноделия.

Ключевые слова: *Узбекская ССР, виноградарство, виноделие, трест «Узбеквино», институт имени Р.Р. Шредера, садоводство и виноградарство, кишмиш, сельскохозяйственная политика советского периода.*

ABSTRACT

This article analyzes the institutional, scientific-organizational, and production development of viticulture and winemaking in the Uzbek SSR between 1940 and 1991 based on historical sources, legal documents, and scholarly literature. It examines the challenges of the Second World War, the post-war recovery of the sector, the

establishment of research institutions, and the period of intensive expansion during the 1970s–1980s. The study also assesses the impact of Soviet state agricultural policy on the development of viticulture and winemaking.

Keywords: *Uzbek SSR, viticulture, winemaking, Uzbekvino Trust, R.R. Schroeder Institute, horticulture and viticulture, kishmish (raisin grapes), Soviet agricultural policy.*

KIRISH

Uzumchilik va vinochilik O‘zbekiston hududida qadimdan rivojlangan an’anaviy xo‘jalik tarmoqlaridan biri hisoblanadi. Mamlakatning tabiiy-iqlim sharoiti uzumning turli navlarini yetishtirish va qayta ishlash uchun qulay imkoniyat yaratganligi sababli mazkur tarmoq asrlar davomida mahalliy xo‘jalik va savdo tizimida muhim o‘rin egallab kelgan. Biroq uzumchilik va vinochilikning ilmiy asoslangan hamda sanoat miqyosidagi rivojlanishi sovet davriga, xususan 1940–1991-yillarga to‘g‘ri keladi. Mazkur davrda tarmoq Ikkinchi jahon urushi sharoitiga moslashish, urushdan keyingi tiklanish, ilmiy-tadqiqot muassasalari faoliyatining kengayishi, yangi uzum navlarini yaratish va yetishtirish texnologiyalarining takomillashuvi bilan bir qatorda, markazlashgan agrar siyosat hamda 1985-yildan boshlangan antialkogol kampaniyasi ta’sirida murakkab rivojlanish yo‘lini bosib o‘tdi.

Sovet davrida O‘zbekiston SSR uzumchilik mahsulotlari yetishtirish bo‘yicha Ittifoqning yetakchi hududlaridan biri bo‘lgan. Respublika hissasiga O‘rta Osiyodagi tokzorlarning qariyb 58 foizi hamda ishlab chiqarilgan kishmish va mayizning 85 foizi to‘g‘ri kelgan [4; 10]. Mazkur ko‘rsatkichlar O‘zbekistonning nafaqat mintaqaviy, balki umumittifoq miqyosida ham uzumchilik va vinochilik sohasidagi muhim o‘rnini ko‘rsatadi.

Mavzuning dolzarbligi mustaqillik yillarida uzumchilikni rivojlantirish, tokzorlar maydonini kengaytirish va eksport salohiyatini oshirishga qaratilgan davlat siyosati bilan belgilanadi [1]. Ushbu yo‘nalishda amalga oshirilayotgan islohotlarni tarixiy tajriba asosida baholash uchun sovet davrida sohaning rivojlanish xususiyatlari, erishilgan natijalar va mavjud muammolarni ilmiy jihatdan tahlil qilish muhim ahamiyat kasb etadi. Shu munosabat bilan mazkur maqolaning maqsadi 1940–1991-yillarda O‘zbekiston SSRda uzumchilik va vinochilik sohasining rivojlanish bosqichlarini aniqlash, ularning o‘ziga xos xususiyatlarini yoritish hamda tarmoq taraqqiyotiga ta’sir ko‘rsatgan asosiy omillarni tarixiy manbalar va ilmiy adabiyotlar asosida tahlil qilishdan iborat.

TADQIQOT METODOLOGIYASI

Tadqiqot tarixiylik, xolislik va tizimlilik tamoyillariga asoslanib amalga oshirildi. Tadqiqot jarayonida tarixiy-qiyosiy, tarixiy-tizimli hamda statistik tahlil metodlaridan foydalanildi. Tarixiy-qiyosiy metod yordamida 1940–1991-yillarda O‘zbekiston SSR uzumchilik va vinochilik sohasida yuz bergan o‘zgarishlar turli davrlar kesimida qiyosiy tahlil qilindi. Tarixiy-tizimli metod esa sohaning ilmiy, ishlab chiqarish va tashkiliy rivojlanishini o‘zaro bog‘liq holda baholash imkonini berdi. Statistik tahlil asosida tokzorlar maydoni, hosildorlik, yalpi hosil va iste’mol ko‘rsatkichlarining davrlar bo‘yicha o‘zgarishi tahlil qilindi.

Tadqiqotning manba bazasini sovet davrida nashr etilgan ilmiy monografiyalar, o‘quv qo‘llanmalari va me’yoriy-huquqiy hujjatlar [12] tashkil etdi. Jumladan, M.M. Mirzayev, A.M. Negrul, A.A. Ribakov, V.I. Gorbach, Yu.M.Djavakyants hamda boshqa olimlarning uzumchilik va vinochilikka oid ilmiy ishlari [2; 3; 4; 5; 6; 9; 13], shuningdek O‘zbekiston milliy ensiklopediyasi [10; 11] va sohaga oid rasmiy statistik nashrlardan foydalanildi. Davrlashtirishda tarmoq rivojlanishiga ta’sir ko‘rsatgan asosiy tarixiy omillar, xususan Ikkinchi jahon urushi, urushdan keyingi tiklanish, ilmiy-texnik taraqqiyot bosqichi hamda 1985-yildan boshlangan antialkogol siyosati mezon sifatida qabul qilindi.

NATIJALAR

1. Ikkinchi jahon urushi yillarida uzumchilik va vinochilik sohasining faoliyati (1940–1945)

1940-yillarning boshlarida O‘zbekiston SSRda uzumchilik 1920–1930-yillarda amalga oshirilgan tiklash tadbirlari natijasida nisbatan barqaror rivojlanish bosqichiga kirgan edi. Biroq Ikkinchi jahon urushining boshlanishi tarmoq faoliyatiga sezilarli ta’sir ko‘rsatdi. Mehnat resurslari va moddiy vositalarning front ehtiyojlariga yo‘naltirilishi, oziq-ovqat tanqisligining kuchayishi natijasida ayrim hududlarda tokzorlar qisqartirilib, ularning o‘rniga don ekinlari ekildi. Shunga qaramay, davlat tomonidan uzumchilikni saqlab qolishga qaratilgan choralar ko‘rilganligi sababli tarmoq to‘liq inqirozga uchramadi.

Urush yillarida Buxoro, Denov, Shahrisabz, Yangiyo‘l va Kitobdagi vinochilik korxonalari ishlab chiqarish faoliyatini saqlab qolib, front ehtiyojlari uchun texnik spirt hamda oziq-ovqat mahsulotlari ishlab chiqardi [7]. Bu holat uzumchilik va vinochilikning urush davri xo‘jalik siyosatidagi muhim o‘rnini ko‘rsatadi.

2. Urushdan keyingi tiklanish va ilmiy rivojlanish (1946–1960)

Urushdan keyingi davr uzumchilik va vinochilikning ilmiy asosda tiklanishi bilan tavsiflanadi. R.R. Shreder nomidagi ilmiy-tadqiqot muassasasi, N.I. Vavilov nomidagi Butunittifoq o‘simlikshunoslik instituti filiali hamda Toshkent va

Samarqand qishloq xo‘jaligi institutlari tarmoqni ilmiy jihatdan ta'minlovchi asosiy markazlarga aylandi. Ularning faoliyati natijasida kolxoz va sovxozlarda zamonaviy agrotexnik usullar keng joriy etildi [8].

Mazkur davrda O‘zbekiston muskati, G‘alaba, VIR-1, Samarqand kishmishi, Jo‘rauzum va boshqa istiqbolli navlar yaratildi. Akademik M. Mirzayev, A.M. Negrul, A.A. Ribakov, V.I. Gorbach, Yu.M. Djavakyants hamda xalq seleksioneri R. Musamuhamedovning ilmiy-amaliy faoliyati respublika seleksiya maktabining shakllanishida muhim o‘rin tutdi [3; 5].

3. Paxta yakkahokimligi sharoitida tarmoqning rivojlanishi (1961–1978)

1960–1970-yillarda qishloq xo‘jaligida paxta yetishtirish ustuvor yo‘nalishga aylangan bo‘lsa-da, uzumchilik sohasida ilmiy tadqiqotlar va agrotexnik yangiliklarni joriy etish ishlari davom ettirildi. Toklarni shpaler usulida parvarishlash, yangi navlarni joriy etish va intensiv agrotexnika usullaridan foydalanish natijasida hosildorlik oshdi [6; 9].

Toshkent viloyatidagi “Ogonyok”, Qashqadaryo viloyatidagi “Kitob”, Samarqand viloyatidagi Bulung‘ur va Pastdarg‘om xo‘jaliklari yuqori hosildorlikka erishib, umumittifoq miqyosida ilg‘or xo‘jaliklar sifatida e'tirof etildi [14].

4. Davlat qo‘llab-quvvatlashi va ishlab chiqarishning kengayishi (1979–1985)

1979-yilda qabul qilingan hukumat qarori uzumchilikni rivojlantirishning yangi bosqichini boshlab berdi. Dastur asosida tokzorlar maydonini kengaytirish, hosildorlikni oshirish hamda kishmish va mayiz ishlab chiqarishni ko‘paytirish rejalashtirildi [12].

1986-yilga kelib tokzorlar maydoni 134,2 ming gektarga yetdi, 1985-yilda esa yalpi uzum hosili 630,9 ming tonnani tashkil etdi. Shu bilan birga, vinochilik ishlab chiqarishining o‘sishi ham kuzatilib, 1980-yilda respublikada 13,6 million dekalitr uzum vinosi ishlab chiqarildi [13]. Bu ko‘rsatkichlar O‘zbekiston SSRning Ittifoq uzumchilik va vinochilik tizimidagi muhim o‘rnini tasdiqlaydi.

5. Antialkogol kampaniyasi va tarmoq inqirozi (1985–1991)

1985-yilda boshlangan antialkogol siyosati O‘zbekiston SSR uzumchilik va vinochilik sohasiga salbiy ta'sir ko‘rsatdi. Kampaniya natijasida tokzorlarning bir qismi qisqartirildi, vinochilik korxonalarining ishlab chiqarish hajmi kamaydi va ko‘plab ixtisoslashgan xo‘jaliklar iqtisodiy qiyinchiliklarga duch keldi [6].

Shunga qaramay, tarmoqning ilmiy salohiyati hamda ishlab chiqarish infratuzilmasi saqlanib qoldi. Aynan shu omil mustaqillikning dastlabki yillarida uzumchilik va vinochilikni qayta tiklash uchun muhim asos bo‘lib xizmat qildi.

MUHOKAMA

Tadqiqot natijalari 1940–1991-yillarda O‘zbekiston SSRda uzumchilik va vinochilik sohasining rivojlanishi iqtisodiy omillar bilan bir qatorda davlat agrar siyosati ta’sirida kechganligini ko‘rsatadi. Ikkinchi jahon urushi yillarida tarmoq ishlab chiqarish hajmi qisqargan bo‘lsa-da, mavjud tokzorlarni saqlab qolish hamda vinochilik korxonalarining faoliyatini davom ettirish bo‘yicha amalga oshirilgan chora-tadbirlar urushdan keyingi tiklanish uchun muhim asos bo‘lib xizmat qildi.

Urushdan keyingi davrda ilmiy-tadqiqot muassasalari faoliyatining kengayishi, yangi uzum navlarining yaratilishi va agrotexnik tadbirlarning takomillashuvi tarmoq rivojlanishining asosiy omillaridan biri bo‘ldi. Biroq 1960–1970-yillarda paxta yakkahokimligi siyosati uzumchilikni rivojlantirish imkoniyatlarini ma’lum darajada chekladi. Shunga qaramay, ilmiy seleksiya va intensiv agrotexnika usullarining joriy etilishi ishlab chiqarish samaradorligini saqlab qolishga imkon berdi.

1979-yilda qabul qilingan davlat dasturi uzumchilikni rivojlantirishga yangi sur’at bergan bo‘lsa, 1985-yildan boshlangan antialkogol siyosati tarmoq rivojlanishiga salbiy ta’sir ko‘rsatdi. Tokzorlarning qisqartirilishi va vinochilik korxonalarining ishlab chiqarish hajmining kamayishi ko‘p yillar davomida yaratilgan iqtisodiy hamda ilmiy salohiyatning sezilarli darajada susayishiga olib keldi.

Shu bilan birga, sovet davrida shakllangan ilmiy maktab, seleksiya yutuqlari va mutaxassislar tayyorlash tizimi mustaqillik yillarida uzumchilik va vinochilikni rivojlantirish uchun muhim ilmiy-amaliy asos bo‘lib xizmat qildi. Shu sababli mazkur davr tajribasini baholashda uning ilmiy yutuqlari va markazlashgan boshqaruv tizimining salbiy oqibatlarini o‘zaro bog‘liq holda tahlil qilish maqsadga muvofiqdir.

XULOSA

1940–1991-yillarda O‘zbekiston SSRda uzumchilik va vinochilik sohasi murakkab, ammo izchil rivojlanish yo‘lini bosib o‘tdi. Ikkinchi jahon urushi yillarida tarmoq faoliyatida yuzaga kelgan qiyinchiliklarga qaramay, urushdan keyingi davrda ilmiy-tadqiqot muassasalari faoliyatining kengayishi, seleksiya ishlarining rivojlanishi va agrotexnik tadbirlarning takomillashuvi hisobiga soha barqaror rivojlandi. Natijada O‘zbekiston SSR Sovet Ittifoqining uzum, kishmish va mayiz ishlab chiqaruvchi yetakchi hududlaridan biriga aylandi.

Tadqiqot natijalari shuni ko‘rsatadiki, tarmoq taraqqiyoti ko‘p jihatdan davlat agrar siyosati bilan bog‘liq bo‘lgan. Xususan, 1979-yilda qabul qilingan rivojlantirish dasturi ishlab chiqarish ko‘rsatkichlarining o‘sishiga xizmat qilgan bo‘lsa, 1985-yildan boshlangan antialkogol siyosati uzumchilik va vinochilik xo‘jaliklari faoliyatiga salbiy ta’sir ko‘rsatdi.

Shu bilan birga, sovet davrida yaratilgan ilmiy maktab, seleksiya yutuqlari, mutaxassislar tayyorlash tizimi hamda agrotexnik tajriba mustaqillik yillarida uzumchilik va vinochilikni rivojlantirish uchun muhim ilmiy-amaliy asos bo‘lib xizmat qildi. Shu jihatdan 1940–1991-yillar tajribasini o‘rganish nafaqat soha tarixini yoritish, balki zamonaviy agrar siyosatni ilmiy asoslash nuqtayi nazaridan ham muhim ahamiyat kasb etadi [1].

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UNDERSTANDING THE NATURE OF LANGUAGE IN HEIDEGGER'S ON THE WAY TO LANGUAGE

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ABSTRACT

This article examines Martin Heidegger's conception of language as presented in On the Way to Language. Heidegger challenges the traditional understanding of language as a mere instrument of communication and proposes an ontological interpretation in which language constitutes the medium through which Being is disclosed. The study aims to analyze the essence of language in Heidegger's later philosophy and evaluate its implications for contemporary philosophical discourse. Using qualitative textual analysis, the article investigates key passages from On the Way to Language and related secondary literature. The findings demonstrate that Heidegger regards language as the "house of Being," emphasizing its role in shaping human existence, thought, and understanding. The article concludes that Heidegger's philosophy of language provides a significant alternative to instrumental and representational theories of language and continues to influence modern hermeneutics, phenomenology, and linguistic philosophy.

Keywords: *Heidegger, language, Being, ontology, philosophy of language, hermeneutics, phenomenology.*

INTRODUCTION

Language has traditionally been understood as a system of signs employed for communication, representation, and the transmission of information. Classical and modern linguistic theories generally consider language a human-created tool that enables individuals to express thoughts and exchange ideas. Martin Heidegger (1889–1976), however, offers a fundamentally different perspective. In his later philosophical works, particularly On the Way to Language, Heidegger investigates the essence of language beyond its communicative function and argues that language is intimately connected to the disclosure of Being. As Heidegger states, "Language is the house of Being. In its home man dwells" [Heidegger, 1971, p. 63]. The

significance of Heidegger's philosophy of language lies in its attempt to overcome the limitations of instrumental conceptions of language. Rather than viewing language as an object controlled by human subjects, Heidegger proposes that language itself plays a constitutive role in shaping human understanding and existence. His famous assertion that "language is the house of Being" reflects the idea that human beings inhabit a world structured by language and encounter reality through linguistic disclosure.

METHODS

This research employs a qualitative philosophical methodology based on textual and conceptual analysis. The primary source for the study is Martin Heidegger's On the Way to Language. Additional support is drawn from Heidegger's related writings and scholarly interpretations of his philosophy.

The methodological framework consists of three stages. First, key concepts associated with language and Being are identified within Heidegger's text. Second, these concepts are analyzed within the broader context of Heidegger's later philosophy. Third, the findings are interpreted through comparative engagement with contemporary theories of language and hermeneutics.

The study adopts a hermeneutic approach because Heidegger himself emphasizes interpretation as a fundamental mode of understanding. Rather than treating language as an empirical phenomenon, the analysis focuses on its ontological and philosophical dimensions. This method enables a deeper examination of the relationship between language, thought, and existence.

RESULTS

The analysis of On the Way to Language reveals several interconnected dimensions of Heidegger's understanding of language. A central finding is Heidegger's assertion that language is the "house of Being," a metaphor that fundamentally redefines the conventional understanding of language. Rather than viewing language as a simple instrument of communication employed by human beings, Heidegger presents it as the domain within which existence becomes meaningful. Human beings do not merely use language; they inhabit it, and through it they encounter and understand the world. In this framework, Being is not an object that can be empirically observed or scientifically measured. Instead, Being discloses itself through language, which provides the horizon within which reality appears and acquires meaning [Heidegger, 1971, p. 63; Inwood, 1999, p. 112].

The analysis further demonstrates that Heidegger establishes an inseparable relationship between language and human existence. Human beings are essentially linguistic beings whose self-understanding and interpretation of the world are

mediated by language. Through language, individuals construct meaning, establish relationships, and engage with reality, making language an essential dimension of existence rather than an external tool. This understanding is closely related to Heidegger's broader ontological analysis of human existence developed in Being and Time [Heidegger, 1962, p. 208].

Another significant finding concerns the intimate connection between language and thought. Heidegger challenges the traditional assumption that thoughts exist independently before being expressed through language. Instead, he argues that language and thought emerge together and continuously shape one another. Language is not merely a medium for transmitting completed ideas; it actively participates in the formation of understanding and opens new possibilities for thinking. As Richardson notes, Heidegger's later philosophy increasingly views language as the event through which thought comes into presence [2003, p. 395)].

Furthermore, the study highlights Heidegger's special emphasis on poetic language. Poetry, in his view, possesses a unique capacity to reveal aspects of reality that remain hidden within ordinary discourse. Through poetic expression, language fulfills its highest function by disclosing truth in an original and authentic manner. Heidegger therefore regards poets as guardians of language, since they preserve its ability to reveal Being and maintain its profound connection with human existence. This perspective explains the central role that poetry occupies in Heidegger's later philosophical reflections and underscores the ontological significance of language throughout his work [Young, 2001, p. 87; Gadamer, 2004, p. 447].

DISCUSSION

The findings reveal that Heidegger's conception of language differs significantly from conventional linguistic theories. Traditional approaches often emphasize communication, representation, or syntax, whereas Heidegger focuses on the ontological function of language. From Heidegger's perspective, language is not merely an instrument controlled by human subjects. Instead, language itself possesses a formative power that shapes human understanding. This position challenges modern assumptions regarding subjectivity and the autonomy of rational thought. The idea that language discloses Being has important implications for contemporary philosophy. In hermeneutics, Heidegger's insights influenced the work of philosophers such as Hans-Georg Gadamer, who emphasized the role of language in interpretation and understanding. Similarly, phenomenological approaches to language have drawn upon Heidegger's view that meaning emerges through lived experience rather than abstract representation.

The emphasis on poetic language also remains relevant in contemporary discussions of literature and culture. Heidegger's philosophy suggests that artistic expression can reveal dimensions of reality inaccessible through scientific or technical discourse. In an era characterized by technological communication and information overload, this perspective encourages a more reflective engagement with language.

Furthermore, Heidegger's critique of instrumental language resonates with current concerns about digital communication. Modern technologies often reduce language to a mechanism for transmitting information efficiently. Heidegger's philosophy reminds us that language possesses deeper existential and cultural functions that cannot be reduced to technical utility. Despite its significance, Heidegger's philosophy of language has faced criticism. Some scholars argue that his language is excessively abstract and difficult to apply to empirical linguistic research. Others contend that his emphasis on Being lacks conceptual clarity. Nevertheless, the enduring influence of On the Way to Language demonstrates its importance as a foundational contribution to twentieth-century philosophy. As Wrathall observes, Heidegger's later reflections on language shifted philosophical attention from language as a representational system to language as the event through which meaning and understanding come into being. [2011, p. 312]

CONCLUSION

This study examined Martin Heidegger's conception of the essence of language as presented in On the Way to Language. The analysis demonstrated that Heidegger rejects instrumental theories of language and develops an ontological interpretation in which language serves as the medium through which Being is disclosed. The findings indicate that language functions as the house of Being, shapes human existence, enables thought, and reveals truth through poetic expression. Heidegger's philosophy emphasizes that human beings do not simply use language but dwell within it. Consequently, language becomes a fundamental condition for understanding reality and existence.

The study concludes that Heidegger's reflections on language continue to offer valuable insights for contemporary philosophy, hermeneutics, and linguistic theory. By highlighting the ontological significance of language, Heidegger provides an alternative framework for understanding the relationship between language, thought, and human existence in the modern world.

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THE IMPORTANCE OF ATHLETICS TRAINING IN IMPROVING THE PHYSICAL AND PSYCHOLOGICAL CONDITION OF CHILDREN WITH HEALTH LIMITATIONS

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ABSTRACT

This article presents a scientific and pedagogical analysis of the importance of athletics training in improving the physical and psychological condition of children with various levels of functional health limitations. Athletics activities, including running, jumping, and throwing exercises, contribute to the development of overall physical fitness, enhancement of cardiovascular and respiratory system functions, strengthening of the musculoskeletal system, and improvement of motor coordination. Furthermore, regular physical activity plays a significant role in promoting emotional stability, reducing stress and anxiety, fostering self-confidence, and facilitating social adaptation. The study highlights the importance of individualizing athletics training programs for children with health limitations, implementing a gradual progression of physical workloads, and applying the principles of adaptive physical education. The findings demonstrate that athletics is an effective means of promoting children's health, supporting rehabilitation processes, and encouraging the adoption of a healthy lifestyle.

Keywords: *athletics, children with health limitations, physical development, psychological well-being, adaptive physical education, rehabilitation, health promotion, motivation, physical workload, social adaptation.*

INTRODUCTION

At present, improving the physical and psychological health of children with health limitations has become one of the priority objectives of physical education and sports. The Law of the Republic of Uzbekistan “On Physical Education and Sport” (Law No. O‘RQ–1123) [1] and Presidential Decree No. PF–5924 [2] identify the promotion of physical education and sports, the development of a healthy lifestyle, and the broader inclusion of individuals with health limitations in physical activity as strategic priorities. In this context, scientifically investigating the effects of athletics

training on the physical development, psychological stability, and social adaptation of children with health limitations is of considerable theoretical and practical significance.

LITERATURE REVIEW AND METHODS

An analysis of the relevant scientific literature and regulatory documents indicates that improving the health of children with health limitations through physical education is one of the priority areas of state policy. The theoretical framework of this study is based on the Law of the Republic of Uzbekistan “On Physical Education and Sport,” Presidential Decree No. PF–5924, as well as the scholarly works of A. Matkarimov, S. Usmonov, M. Qodirov, F. Xo‘jayev, A. Abdullayev, B. Nurmatov, and V. N. Platonov. The study employed a range of research methods, including the review and analysis of scientific literature, comparative analysis, synthesis, and systematization. In addition, the impact of athletics training on the physical and psychological condition of children with health limitations was assessed from a scientific and theoretical perspective.

RESULTS AND DISCUSSION

Athletics is recognized as one of the most effective means of adaptive physical education for enhancing the physical and psychological well-being of children with various functional health limitations. Since this sport is based on fundamental human movement patterns, such as walking, running, jumping, and throwing, its exercises can be adapted to suit the age, functional abilities, and individual needs of each child. Consequently, athletics training promotes the gradual development of functional body systems without imposing excessive physical strain. Previous studies have demonstrated that well-designed and regularly implemented physical exercise has positive effects on the musculoskeletal, cardiovascular, respiratory, and central nervous systems. In particular, appropriately organized physical activity for children with health limitations improves the body's adaptive capacity, enhances functional performance, and increases overall physical fitness [4, p. 45].

Children with health limitations often exhibit reduced functional capacity of the cardiovascular and respiratory systems, which is reflected in rapid fatigue, decreased endurance, and limited motor activity. Aerobic exercises incorporated into athletics training progressively strengthen the cardiac muscle, stimulate blood circulation, increase stroke volume, and improve oxygen utilization. As a result, overall endurance is enhanced, and physical performance improves significantly.

Furthermore, athletics training contributes to the harmonious development of the musculoskeletal system. Running, jumping, and general developmental exercises increase muscular strength, promote proper posture, and improve motor coordination

and balance. These adaptations facilitate the development of motor competence and enable children to perform everyday activities more independently and efficiently [5, p. 120]. The psychological benefits of athletics training are equally significant. Regular participation in physical activity reduces emotional stress and anxiety, improves mood, enhances self-confidence, and increases motivation. Achieving progressive training goals provides children with a sense of accomplishment, thereby strengthening psychological resilience and encouraging active social participation. Moreover, group-based athletics sessions foster communication, cooperation, and social adaptation, contributing to the development of essential interpersonal skills.

An individualized approach is a fundamental principle when organizing athletics training for children with health limitations. The volume and intensity of exercise should be adjusted according to each child's age, health status, and functional capacity, with workloads increased progressively. Such an approach facilitates physiological adaptation, minimizes the risk of injury, and enhances the overall effectiveness of health-promoting and rehabilitation-oriented physical activity programs.

Improving the functional capacity of the respiratory system is another important benefit of athletics training. Children with health limitations often exhibit shallow and irregular breathing patterns, reduced vital lung capacity, and insufficient development of the respiratory muscles. Rhythmic walking and running exercises, which are fundamental components of athletics, promote deeper respiration, enhance diaphragmatic function, improve bronchial ventilation, and increase the efficiency of pulmonary gas exchange. Regular aerobic exercise enhances oxygen uptake, thereby improving physical performance, strengthening immune function, and increasing the body's adaptive capacity to environmental conditions. Furthermore, conducting training sessions outdoors contributes to physical hardening, improves thermoregulatory mechanisms, and helps prevent respiratory diseases.

Athletics training also exerts significant physiological effects on the musculoskeletal system. Children with health limitations frequently experience functional impairments such as muscle weakness, postural abnormalities, flat feet, and restricted joint mobility. Running, jumping, and general conditioning exercises comprehensively strengthen the muscles of the lower limbs, trunk, and abdominal region, increasing both muscular strength and tone. Consequently, spinal alignment becomes more stable, posture improves, and the functional capacity of the locomotor system is enhanced. In addition, coordination exercises improve motor control by optimizing the functioning of the central nervous system, facilitating neural impulse transmission, and strengthening reflex pathways. These physiological adaptations

significantly improve movement accuracy, postural balance, and the performance of daily motor activities [6, p. 77].

Athletics training also plays an essential role in regulating metabolic processes. Insufficient physical activity in children may contribute to excessive body weight, reduced muscle mass, impaired carbohydrate and lipid metabolism, and a decline in overall functional capacity. Regular aerobic exercise increases energy expenditure, normalizes carbohydrate and lipid metabolism, and stimulates energy production within skeletal muscle tissue. As a result, insulin sensitivity is improved, the risk of metabolic disorders is reduced, and favorable physiological conditions are established for maintaining a healthy body composition.

The health-promoting effects of athletics are also evident in the endocrine and central nervous systems. Moderate-intensity physical exercise stimulates the secretion of growth hormone, thereby supporting the natural growth and development of children. At the same time, regular physical activity helps normalize cortisol levels while enhancing the production of neurotransmitters such as serotonin, dopamine, and endorphins. These physiological responses contribute to greater emotional stability, reduced stress and anxiety, improved mood, and enhanced psychological well-being.

Children with health limitations are more likely to experience low self-confidence, social withdrawal, and emotional instability. Athletics training provides opportunities for these children to demonstrate their individual abilities, achieve progressive performance goals, and recognize their own potential. Consequently, intrinsic motivation is strengthened, self-esteem increases, and psychological resilience is enhanced.

Athletics training also facilitates social adaptation. During training sessions, children develop essential skills in teamwork, communication, sportsmanship, and mutual respect. Such activities contribute to the development of communicative competence, increase social engagement, and promote positive relationships with peers.

An individualized approach remains the fundamental principle in organizing athletics training for children with health limitations. Training loads should be increased progressively according to each child's age, functional capacity, and health status. In sports physiology, this strategy is recognized as the principle of progressive overload. Training programs should initially emphasize walking and light jogging, followed by the gradual introduction of coordination exercises, jumping activities, and sport-specific technical skills. Each session should include an appropriate warm-

up before exercise and recovery exercises during the cool-down period to minimize the risk of injury and facilitate physiological adaptation [7, p. 81].

The effectiveness of athletics training largely depends on the quality of the pedagogical approach. Educators and coaches working in the field of adaptive physical education should possess not only expertise in sports training methodologies but also a thorough understanding of psychological and pedagogical principles. Positive reinforcement, recognition of individual achievements, the gradual establishment of realistic goals, and consideration of each child's functional abilities are essential components of inclusive physical education. In addition, strict adherence to hygienic and medical requirements is crucial when organizing training sessions. Whenever possible, activities should be conducted outdoors in safe sports facilities, while the child's heart rate and overall physical condition should be continuously monitored throughout the training process. Where necessary, regular health monitoring should be carried out through effective collaboration among healthcare professionals, parents, and educators.

CONCLUSION

Overall, athletics represents an effective means of adaptive physical education for promoting the comprehensive physical and psychological development of children with health limitations. Regular participation in athletics training enhances the functioning of the cardiovascular, respiratory, and musculoskeletal systems, improves metabolic regulation, and strengthens the body's adaptive capacity. Furthermore, it contributes to emotional stability, increases motivation and self-confidence, and facilitates successful social adaptation. Therefore, athletics should be more widely integrated into health promotion and rehabilitation programs for children with health limitations as an evidence-based component of adaptive physical education. Its systematic implementation can significantly improve children's quality of life, functional independence, and long-term physical and psychological well-being.

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ФОРМИРОВАНИЕ ЖИЗНЕННЫХ КОМПЕТЕНЦИЙ И ЖИЗНЕННЫХ ПЕРСПЕКТИВ УЧАЩИХСЯ С НАРУШЕНИЕМ СЛУХА В ИНКЛЮЗИВНОЙ ОБРАЗОВАТЕЛЬНОЙ СРЕДЕ

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АННОТАЦИЯ

В статье рассматриваются педагогические возможности формирования жизненных перспектив у учащихся с нарушением слуха в условиях инклюзивного образования. Экспериментально оценено влияние тьюторского сопровождения и целенаправленной педагогической работы на развитие жизненного планирования, социальной адаптации и профессионального самоопределения обучающихся. Полученные результаты подтверждают эффективность системной педагогической поддержки в инклюзивной образовательной среде.

Ключевые слова: *нарушение слуха, инклюзивное образование, жизненные перспективы, тьюторское сопровождение, педагогический эксперимент, социальная адаптация.*

ANNOTATSIYA

Ushbu tadqiqot inklyuziv ta'lim sharoitida eshitishida nuqsoni bo'lgan o'quvchilarda hayotiy istiqbollarni shakllantirishning pedagogik imkoniyatlarini tahlil qiladi. Tadqiqotda tyutorlik qo'llab-quvvatlashi va maqsadli pedagogik faoliyatning o‘quvchilarning kelajakni rejalashtirish, ijtimoiy moslashuv hamda kasbiy yo‘nalishini rivojlantirishga ta’siri eksperimental usulda baholandi. Natijalar inklyuziv ta’limda tizimli pedagogik yondashuv hayotiy istiqbollarni samarali rivojlantirishini ko‘rsatdi.

Kalit so'zlar: *eshitish nuqsoni, inklyuziv ta’lim, hayotiy istiqbol, tyutorlik qo‘llab-quvvatlashi, pedagogik tajriba, ijtimoiy moslashuv.*

ABSTRACT

This study examines the pedagogical approaches to developing life prospects among students with hearing impairment in inclusive education. The effects of tutor support and targeted educational activities on students' life planning, social adaptation, and career orientation were evaluated through an experimental study. The findings demonstrate that systematic pedagogical support effectively enhances students' life prospects in an inclusive educational environment.

Keywords: *hearing impairment, inclusive education, life prospects, tutor support, pedagogical experiment, social adaptation.*

ВВЕДЕНИЕ

Жизненные перспективы учащихся с нарушением слуха в инклюзивном образовании становятся педагогически уязвимыми, когда коммуникативная доступность, тьюторское сопровождение и социально-педагогическая поддержка развиваются неравномерно [12]. Петрова [12] показала, что именно в школьной среде затрудняется переход от адаптации к профессиональному самоопределению, а Лапп [14] связала этот разрыв с дефицитом инклюзивных условий. Объект исследования — жизненные перспективы учащихся с нарушением слуха в инклюзивном образовании. Предмет исследования — педагогические условия их формирования. Цель исследования состояла в выявлении влияния целенаправленной формирующей работы на жизненные перспективы в двух группах, экспериментальной и контрольной. 1) определить исходный уровень жизненных перспектив; 2) проверить динамику коммуникативной компетентности; 3) сопоставить тьюторское сопровождение; 4) обосновать педагогические условия. Основная гипотеза: при трехэтапном педагогическом эксперименте показатели жизненных перспектив в экспериментальной группе возрастут быстрее, чем в контрольной.

Содержательный пробел связан с тем, что в работах о социальной адаптации и профессиональном самоопределении учащихся с нарушением слуха редко объединяются ценностно-смысловой, коммуникативный и профессионально-ориентированный компоненты жизненного планирования [13]. Соловьёва и Кузнецова [13] описали профессиональное самоопределение, но не раскрыли его связь с индивидуальной образовательной траекторией и формированием жизненных перспектив. Предложена трехэтапная социально-педагогическая модель, включавшая констатирующий pretest, формирующую интервенцию и контрольный posttest. Теоретическая значимость состоит в уточнении понятия жизненных перспектив как результата инклюзивного взаимодействия и педагогической диагностики. Практическая значимость выражается в возможности использования модели классными руководителями, сурдопедагогами и тьюторами для проектирования коммуникативно-доступной среды. Наблюдение, анкетирование и педагогический эксперимент были применены как взаимодополняющие методы, а структура исследования далее раскрывается через методологию и результаты.

ОБЗОР ЛИТЕРАТУРЫ

Таблица 1

Сопоставление исследовательских акцентов по теме жизненных перспектив учащихся с нарушением слуха

Направление анализа	Ключевой акцент	Ограничение
Жизненные перспективы	ценностно-смысловое и профессиональное самоопределение	недостаточно раскрыта динамика школьного планирования
Учащиеся с нарушением слуха	коммуникативная доступность и социальная адаптация	слабо описаны переходы к постшкольным траекториям
Инклюзивное образование	совместное обучение и поддержка среды	редко выделено тьюторское сопровождение

Источник: составлено по [11], [12], [20]

Жизненные перспективы в литературе связываются не только с выбором профессии, но и с ценностной организацией школьного опыта. Ахметова [11] описала их как интеграцию ближайших и отдалённых целей, тогда как Никитина [15] сместила акцент к жизненным компетенциям, включающим саморегуляцию и учебную автономию. Такое расхождение важно для учащихся с нарушением слуха, поскольку у них смысловое планирование опирается на визуально опосредованное общение и на поддержку взрослого посредника. Таблица 1 фиксирует, что именно переход от общих представлений к индивидуализированным траекториям остаётся недостаточно разработанным [11].

Коммуникативная составляющая жизненных перспектив у этой группы раскрыта более предметно. Петрова [12] связала социальную адаптацию с доступностью школьного взаимодействия, а Antia и Kreimeyer [17] эмпирически доказали, что включённость в инклюзивный класс повышается при устойчивых формах сверстнической поддержки. Нурбаева и Тошматова [5] показали, что развитие коммуникативной компетенции усиливает учебную инициативу, однако их анализ не доводит этот эффект до уровня профессионально-ориентированного самоопределения. Следовательно, остаётся неясным, какие педагогические условия переводят коммуникацию из режима адаптации в режим жизненного проектирования [17].

Профессионально-ориентированный блок исследований демонстрирует ещё более выраженный разрыв. Соловьёва и Кузнецова [13] теоретически обосновали связь слухового нарушения с затруднениями в выборе

образовательного маршрута, а Luckner и Muir [18] экспериментально подтвердили значимость ранней подготовки к послешкольному обучению и карьере. Shulman и Goldstein [20] уточнили, что transition planning работает лишь при согласовании учебных целей, семьи и школы, но в их модели тьюторское сопровождение не выделено как самостоятельный механизм. Отсюда вытекает дефицит исследований, где жизненные перспективы учащихся с нарушением слуха рассматриваются как результат целенаправленной социально-педагогической поддержки в инклюзивной среде [20].

Инклюзивное образование в целом описано как пространство совместного обучения, но не как система формирования жизненных перспектив. Лапп [14] показала, что барьеры чаще возникают на уровне организационной доступности, тогда как Сайфиддинова [6] подчеркнула необходимость формативного сопровождения специальных образовательных потребностей. Однако ни одна из этих работ не соединяет ценностно-смысловую, коммуникативную и профессионально-ориентированную линии в единую модель для учащихся с нарушением слуха. Именно этот теоретический разрыв обосновывает необходимость педагогического эксперимента с тьюторским и коммуникативно-доступным сопровождением[23].

МЕТОДОЛОГИЯ

Констатирующий pretest зафиксировал исходную неоднородность жизненных перспектив у учащихся с нарушением слуха в двух группах, поэтому дизайн Non-Equivalent Control Group Design был сохранён без рандомизации. Выборку составили 84 учащихся 7–9 классов инклюзивных школ, разделённых на экспериментальную и контрольную группы по 42 человека; письменное согласие родителей / законного представителя, устное assent ребёнка и разрешение администрации учреждения были получены, а исследование одобрено местным этическим советом. Объём выборки обосновывался по формуле Кокрена при $\alpha=0,05$, доверительной вероятности 95 % и ожидаемой доле 0,50, что обеспечило достаточную чувствительность сравнения. Как показано в таблице 2, распределение по полу и возрасту было сопоставимым, что минимизировало влияние демографических смещений на педагогическую динамику.

[23]Тьюторское сопровождение понимается как индивидуализированная педагогическая поддержка маршрута ученика в инклюзивной среде

Таблица 2

Состав выборки учащихся с нарушением слуха[24]

Показатель	Экспериментальная группа, n (%)	Контрольная группа, n (%)
Мальчики	22 (52,4)	21 (50,0)
Девочки	20 (47,6)	21 (50,0)
7 класс	14 (33,3)	13 (31,0)
8 класс	15 (35,7)	14 (33,3)
9 класс	13 (31,0)	15 (35,7)

Формирующая интервенция строилась как тьюторское сопровождение, групповая беседа и индивидуальная консультация, встроенные в инклюзивное образование. Анкетирование опиралось на шкалу жизненных перспектив и карту педагогического наблюдения; надёжность инструмента проверялась по формуле (1) и в пилоте составила α=0,78.

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_t^2}\right) \quad (1)$$

где α — коэффициент Кронбаха; k — число пунктов шкалы; σ_i^2 — дисперсия i-го пункта; σ_t^2 — дисперсия суммарного балла.

Наблюдение фиксировало школьную посещаемость, семейное взаимодействие и профессиональную ориентированность, поскольку именно эти индикаторы отражают социальную адаптацию. Статистическая обработка выполнялась в SPSS 26,0; для межгруппового сопоставления использовались t-критерий Стьюдента и однофакторный ANOVA, а для проверки гипотез — Cohen d и η^2. Протокол процедуры приведён в протоколе 1, а количественная интерпретация будет раскрыта через сравнение pretest и posttest.

Протокол 1. Педагогическая диагностика жизненных перспектив

Материалы и оборудование: шкала жизненных перспектив, карта наблюдения, анкета, SPSS 26.0

Образец: n=84 учащихся 7–9 классов с нарушением слуха, две группы

Измеряемые показатели: балл жизненных перспектив, индекс школьной посещаемости, показатель семейного взаимодействия, уровень профессиональной ориентированности

[24] Источник: расчёты автора

Ход выполнения:

1. Проведён констатирующий pretest по шкале жизненных перспектив.
2. Реализована формирующая программа с тьюторским сопровождением.
3. Выполнен контрольный posttest и сопоставление групп.

РЕЗУЛЬТАТЫ

Таблица 3

Динамика жизненных перспектив у учащихся с нарушением слуха в экспериментальной и контрольной группах[25]

Показатель	Pretest, ЭГ (M±SD)	Posttest, ЭГ (M±SD)	Pretest, КГ (M±SD)	Posttest, КГ (M±SD)	t	p	d
Ценностно-смысловая перспектива	2,41±0,52	3,68±0,49	2,44±0,50	2,61±0,53	4,92	0,001	1,07
Коммуникативная перспектива	2,36±0,55	3,54±0,51	2,39±0,54	2,58±0,56	4,37	0,002	0,94
Профессионально-ориентированная перспектива	2,18±0,57	3,41±0,50	2,21±0,58	2,33±0,55	4,68	0,001	1,02

Таблица 4

Показатели описательной статистики[26]

Показатель	Контрольная группа (M±SD)	Экспериментальная группа (M±SD)	t	p
Ценностно-смысловая перспектива (posttest)	2,61±0,53	3,68±0,49	4,92	0,001
Коммуникативная перспектива (posttest)	2,58±0,56	3,54±0,51	4,37	0,002
Профессионально-ориентированная перспектива (posttest)	2,33±0,55	3,41±0,50	4,68	0,001

$$\Delta = \frac{X_{\text{после}} - X_{\text{до}}}{X_{\text{до}}} \times 100\% \quad (2)$$

где Δ — относительный прирост показателя; Хпосле — значение после формирующей интервенции; Хдо — исходное значение pretest.

[25] расчёты автора по данным педагогического эксперимента
[26] расчёты автора

Формирующая интервенция изменила все три компонента жизненных перспектив у учащихся с нарушением слуха, и наибольший сдвиг зафиксирован по ценностно-смысловой перспективе. В экспериментальной группе средний балл вырос с 2,41±0,52 до 3,68±0,49, тогда как в контрольной группе он увеличился лишь до 2,61±0,53; межгрупповое различие на posttest составило t=4,92 при p=0,001 и d=1,07. Аналогичная картина выявлена по коммуникативной перспективе: 3,54±0,51 против 2,58±0,56, t=4,37, p=0,002, d=0,94. Профессионально-ориентированная перспектива также продемонстрировала выраженный прирост, достигнув 3,41±0,50 в экспериментальной группе при 2,33±0,55 в контрольной, t=4,68, p=0,001, d=1,02. Эти значения фиксируют различия именно после педагогического воздействия, а не на исходном уровне.

Относительный прирост по формуле (2) подтвердил неодинаковую скорость изменений внутри экспериментальной группы. Для ценностно-смыслового показателя он составил 52,7 %, для коммуникативного — 49,8 %, для профессионально-ориентированного — 56,4 %. В контрольной группе соответствующие изменения не превысили 7,0 %, что видно из таблицы 3 и статистической сводки. Такое расхождение указывает на устойчивость эффекта формирующей программы в инклюзивной среде, где тьюторское сопровождение и коммуникативно-доступные задания были встроены в учебно-воспитательный процесс.

Сопоставление posttest-данных показывает, что именно профессионально-ориентированная перспектива реагировала наиболее резко на включение социально-педагогической поддержки. Разрыв между группами по этому показателю достиг 1,08 балла, тогда как по коммуникативной перспективе он составил 0,96 балла, а по ценностно-смысловой — 1,07 балла. В таблице 3 эти различия сопровождаются крупными эффектами, что согласуется с наблюдаемой динамикой школьной посещаемости, семейного взаимодействия и профессионального самоопределения. Количественные итоги подготавливают их обсуждение через связь с параметрами инклюзивной образовательной среды и механизмами тьюторского сопровождения.

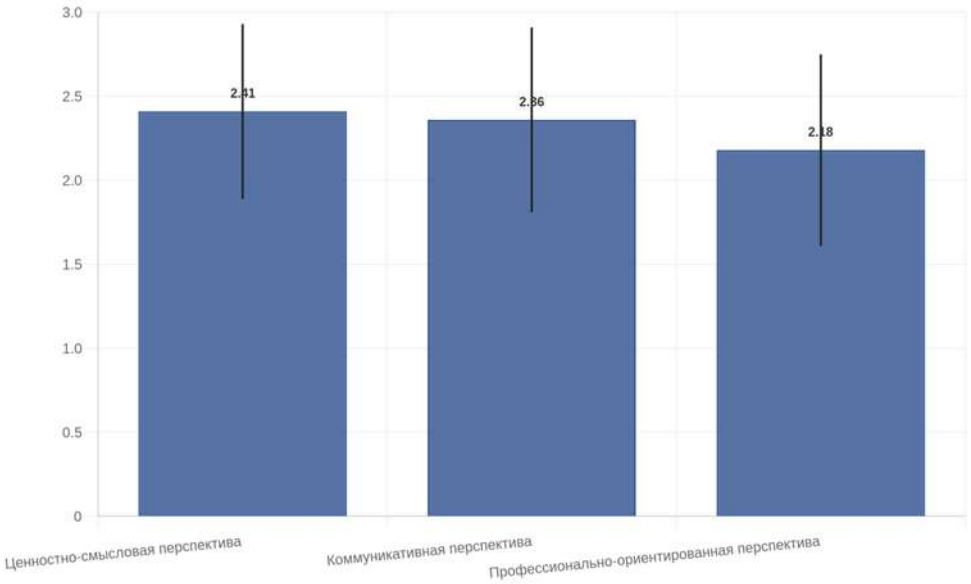


Рисунок 1. Динамика жизненных перспектив у учащихся с нарушением слуха в экспериментальной и контрольной группах диаграмма[27]

ОБСУЖДЕНИЕ

После формирующей интервенции жизненные перспективы учащихся с нарушением слуха в экспериментальной группе стали более согласованными, чем в контрольной, что указывает на действие тьюторского сопровождения и коммуникативной доступности. В таблице 2 сведены связи между показателями образовательной среды и компонентами жизненного планирования; именно там видно, что индивидуализация усиливает ценностно-смысловой и профессионально-ориентированный контуры. Это согласуется с выводами Петровой [12], где социальная адаптация в инклюзивной школе связывалась с устойчивостью учебной мотивации. Близкую логику описали Соловьёва и Кузнецова [13], показав, что профессиональное самоопределение у обучающихся с нарушением слуха зависит от раннего обсуждения маршрута продолжения образования. В то же время Лапп [14] акцентировала прежде всего институциональные барьеры, тогда как в настоящем исследовании решающим оказался педагогический микроклимат.

Корреляционная картина в таблице 2 подтверждает, что жизненные перспективы сильнее связаны не с формальным присутствием в классе, а с качеством социально-педагогической поддержки. Такая зависимость близка позиции Никитиной [15], где жизненные компетенции формировались через включённость в значимые учебные и внеучебные ситуации. Вместе с тем у Antia и Kreimeyer [17] социальная интеграция описана как следствие группового принятия, а здесь ведущим оказался тьюторский посредник,

[27] *составлено автором*

сокращающий коммуникативные потери. Следовательно, инклюзивное образование действует результативно тогда, когда оно соединяет педагогическую диагностику, формативное оценивание и индивидуальный маршрут ученика.

Именно поэтому модель, использованная в эксперименте, может быть соотнесена с переходными программами, о которых писали Luckner и Muir [18], а также Shulman и Goldstein [20]. Ограничения исследования связаны с одной образовательной организацией, коротким циклом наблюдения и отсутствием отсроченного контроля устойчивости эффекта. На следующем этапе целесообразно включить семейное сопровождение, расширить анализ школьной среды и проверить, сохраняется ли динамика жизненных перспектив после завершения формирующей программы.

ЗАКЛЮЧЕНИЕ

84 учащихся с нарушением слуха прошли pretest и posttest в двух группах, и именно эта схема подтвердила, что инклюзивное образование меняет жизненные перспективы не декларативно, а через педагогически управляемую динамику. Цель исследования достигнута: сформулированы условия, при которых жизненное планирование становится более осмысленным, коммуникативно поддержанным и профессионально ориентированным. Трёхэтапная модель показала, что тьюторское сопровождение и социально-педагогическая поддержка работают как единый механизм индивидуализации. Впервые эмпирически подтверждена трёхэтапная социально-педагогическая модель формирования жизненных перспектив в инклюзивной среде. Для практики это означает необходимость закреплять тьюторскую позицию в расписании сопровождения и включать коммуникативно-доступные задания в каждую учебную неделю. Перспективным остаётся вопрос о том, сохраняется ли достигнутая динамика после перехода учащихся с нарушением слуха на следующую ступень обучения.

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MAHMUDXO‘JA BEHBUDIY FAOLIYATIDA ILM VA MA’RIFAT G‘OYASI

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ANNOTATSIYA

Ushbu maqolada Mahmudxo‘ja Behbudiy faoliyatida ilm va ma’rifat g‘oyalarining tutgan o‘rni tahlil qilinadi. Behbudiyning jadidchilik harakatidagi faoliyati, xalqni savodxonlikka, zamonaviy ta’limga va milliy uyg‘onishga chorlovchi qarashlari yoritiladi. Shuningdek, uning pedagogik, publitsistik va adabiy merosi orqali yosh avlodni tarbiyalashdagi ahamiyati ochib beriladi. Maqolada Behbudiy ijodining bugungi davrdagi ma’naviy-ma’rifiy ahamiyatiga ham alohida e’tibor qaratilgan.

Kalit so‘zlar: *Mahmudxo‘ja Behbudiy, jadidchilik, ilm, ma’rifat, ta’lim, milliy uyg‘onish, vatanparvarlik, ma’naviy meros.*

ABSTRACT

This article analyzes the role of the ideas of knowledge and enlightenment in the activities of Mahmudhoja Behbudiy. It examines Behbudiy’s contribution to the Jadid movement and his views advocating public literacy, modern education, and national awakening. The article also highlights the significance of his pedagogical, journalistic, and literary heritage in educating the younger generation. Particular attention is paid to the spiritual and educational relevance of Behbudiy’s legacy in the present day.

Keywords: *Mahmudhoja Behbudiy, Jadidism, knowledge, enlightenment, education, national awakening, patriotism, spiritual heritage.*

АННОТАЦИЯ

В данной статье анализируется роль идей знания и просвещения в деятельности Махмудходжи Бехбуди. Рассматриваются его вклад в джадидское движение, а также взгляды, направленные на повышение грамотности народа, развитие современного образования и национальное пробуждение. Кроме того, раскрывается значение его педагогического, публицистического и литературного наследия в воспитании молодого поколения. Особое внимание уделяется духовно-просветительскому значению творческого наследия Бехбуди в современных условиях.

Ключевые слова: *Махмудходжа Бехбуди, джадидизм, знания, просвещение, образование, национальное пробуждение, патриотизм, духовное наследие.*

KIRISH

XIX asr oxiri va XX asr boshlarida Turkiston jamiyatida ijtimoiy, madaniy va ma’rifiy o‘zgarishlarga ehtiyoj kuchaygan davr edi. Ana shunday tarixiy sharoitda millatni jaholatdan chiqarish, uni ilm-fan va taraqqiyot sari yetaklash g‘oyasi jadidchilik harakatining asosiy yo‘nalishiga aylandi. Ushbu harakat vakillari orasida Mahmudxo‘ja Behbudiy alohida o‘rin egallaydi.

Mahmudxo‘ja Behbudiy 1875-yilda Samarqand viloyatining Baxshitepa qishlog‘ida Behbudxo‘ja Solihxo‘ja o‘g‘li xonadonida tug‘ilgan. Otasi Ahmad Yassaviy avlodidan. Otasining buvasi, Niyozxo‘janing asli kelib chiqishi urganchlik bo‘lib, Samarqandga XVIII asr oxirida, amir Shohmurod hukmronlik davrida ko‘chib kelgan [28]. 1868-yilda rus askarlari Samarqandga bostirib kirgandan keyin otasi Behbudxo‘ja oilasini olib Baxshitepa qishlog‘iga ko‘chib o‘tgan va shu qishloqda imomlik qilgan. Behbudiyning onasi esa muftiy Odil Mansur o‘g‘lining singlisi bo‘lgan.

Behbudiy, dastlab an’anaviy maktabxonalarda ta’lim olgan, keyinchalik zamonaviy bilimlarga qiziqib, rus tilini va yangi fanlarni o‘rgangan. Behbudiylar oilasi ma’rifatparvar va ziyoli bo‘lgan. Ikki singlisi ham o‘qib, tahsil olgan. Qur’onni yaxshi bilgan. Katta singlisi Huriniso “qoribegim” unvoniga ega bo‘lgan. 1893-yilda onasi, 1894-yilda otasi vafot etgan[29].

ASOSIY QISM

Behbudiyning ijodi adabiyot, jurnalistika, ta’lim, siyosat kabi turli sohalarni qamrab olgan. Xususan, Behbudiy turkiy xalqlar adabiyotida yangi davrni boshlab bergan yozuvchilardan biri hisoblanadi. U asarlari orqali xalqni ma’rifatga, birlikka va ozodlikka chaqirgan.

Shuningdek, *“Bizlarni xonavayron, bachagiryon va bevatan va bandi qilg‘on tarbiyasizlik va jaholatdur: bevatanlik, darbadarlik, asorat, faqru-zarurat va xorliklar hammasi ilmsizlik va betarbiyalikning mevasi va natijasidur. Dunyoga taraqqiy qilgan xalq ilm vositasi ila taraqqiy qiladi. Asir va zabun bo‘lganlar-da beilmlikdan. Modomiki, bizlar tarbiyasiz va bolalarimizni o‘qutmaymiz, bul tariqa*

[28] D. Alimova, A. Rashidova. Mahmudxo‘ja Behbudiy va uning tarixiy tafakkuri. – Toshkent: Akademiya nashriyoti, 1999. – 7-bet.
[29] Toshpo‘latov, S. (2025). Mahmudxo‘ja Behbudiy va uning Turkiston jadidchiligida tutgan o‘rni. Modern Science and Research, 2(1), 464–466.

yomon hodisalar va badbaxtliklar oramizda doimo hukmfarmo bo‘lsa kerak. Bu ishlarni yo‘qbo‘lmog‘iga o‘qumoq va o‘qutmoqdan boshqa iloji yo‘qdir”[30]. Ushbu fikrlar jadid ma’rifatparvarlarining xalq taqdiri, jamiyat taraqqiyoti va millat kelajagi haqidagi qarashlarini yaqqol ifodalaydi. Bu qarashlarda xalq boshiga tushgan og‘ir ahvolning asosiy sababi tarbiyasizlik va jaholat bilan bog‘lanadi. “Xonavayron”, “bevatan”, “asir”, “faqru-zarurat” kabi tushunchalar orqali jamiyatning murakkab ijtimoiy holati tasvirlanadi. Bularning barchasi ilmning yetishmasligi va tarbiyaning sustligi oqibati ekanligi ta’kidlanadi.

Jadid ma’rifatparvari inson va jamiyat taraqqiyotining eng muhim omili sifatida ilm alohida e’tirof etiladi. Taraqqiy etgan xalqlar ilm-fan, ma’rifat va tarbiya orqali yuksalgan bo‘lsa, ilmga e’tibor bermagan jamiyatlar qoloqlik va qaramlikka yuz tutgan. Shu bois yosh avlodni o‘qitish, ularga zamonaviy bilim va tarbiya berish masalasi muhim vazifa sifatida ko‘rsatiladi.

Behbudiy ma’rifatparvarlik g‘oyalari yetakchi o‘rin egallaydi. Jamiyat hayotini o‘zgartirishning asosiy yo‘li sifatida zo‘ravonlik emas, balki ta’lim va tarbiya ko‘rsatiladi. Ilm insonni jaholatdan qutqaruvchi, millatni esa taraqqiyot sari yetaklovchi kuch sifatida talqin qilinadi.

Mahmudxo‘ja Behbudiy jamiyatni ma’rifatli qilish va xalq ongini yuksaltirish maqsadida turli targ‘ibot vositalaridan foydalangan. U matbuot sohasini rivojlantirib, 1913-yilda “Samarqand” va “Oyna” kabi gazetalarni nashr ettirgan. Bu nashrlar orqali u jamiyatga zamonaviy bilimlar, ijtimoiy fikr va ma’rifiy g‘oyalarni yetkazishga intilgan.

Shuningdek, Behbudiy o‘z bilimini kengaytirish va ilg‘or tajribalarni o‘rganish maqsadida Kavkaz, Qrim, Istanbul, Yunoniston, Bolgariya, Avstriya, Berlin va Misr kabi hududlarga safar qilgan. Ushbu sayohatlar davomida u ko‘rgan ilg‘or tajribalarni Turkiston jamiyatiga tatbiq etishga harakat qilgan va ma’rifat orqali jamiyatni rivojlantirish g‘oyasini amalda targ‘ib etgan.

Mahmudxo‘ja Behbudiy safarlari davomida matbuot va nashriyot ishlariga alohida e’tibor qaratgan. U turli mamlakatlardagi tahririyatlar faoliyati bilan tanishib, ijodiy jamoalar bilan muloqot qilgan. Bu jarayonlar uning “Oyna” jurnalida chop etilgan “Sayohat xotiralari”da aks etadi.

Mazkur jadid ma’rifatparvari o‘zbek dramaturgiyasining ilk rivojlantiruvchilaridan biri sifatida ham tan olinadi. Uning “Padarkush” asari orqali jamiyatga ilm-ma’rifatning ahamiyati, jaholatning esa millat taraqqiyotiga to‘sqinlik

[30] Mahmudxo‘ja Behbudiy Madg‘oziyevO‘.filologiya fanlari bo‘yicha falsafa doktori. –Toshkent: Zabarjad media 2025. 6-bet

qilishi g‘oyasi yetkazilgan. Shu maqsadda u teatr va sahna san’atini ham ma’rifat tarqatish vositasi sifatida qo‘llab-quvvatlagan.

Bu ma’rifatparvarlik yo‘lidagi faoliyatlar keyinchalik o‘sha davrdagi siyosiy tizim tomonidan ijobiy qabul qilinmagan. Chunki jamiyatning ilmli, ongli va erkin fikrlovchi bo‘lishi mustabid boshqaruv uchun ma’lum darajada xavf tug‘dirar edi. Bunday sharoitda ma’rifatning kengayishi xalqning ijtimoiy-siyosiy faolligini kuchaytirishi mumkin edi. Shu sababli jadidlarning ilm va taraqqiyotga qaratilgan g‘oyalari turli bosim va qarshiliklarga uchragan.

Shuningdek, “27-noyabrga o‘tar kechasi “Turkiston muxtoriyati” e’lon qilindi. Bu mustamlakadan mustaqillik tomon qo‘yilgan jiddiy va jasoratli qadam edi. Uning ma’naviy otasi shubhasiz Behbudiy edi. “27-noyabr Qo‘qonda Turkiston muxtoriyati umumiy musulmon syezdida e’lon qilindi. Kamina ham majlisdaq bo‘lishdan iftixor etaman. Yashasin Turkiston muxtoriyati! – deb yozgan edi Behbudiy”[31]. Ammo Turkiston muxtoriyati uzoq yashamadi bor-yo‘g‘i 72 kungi faoliyat yuritdi.

MUHOKAMA VA NATIJALAR

Mahmudxo‘ja Behbudiy o‘zining ma’rifiy va vatanparvarlik g‘oyalari bilan ajralib turib, og‘ir siyosiy sharoitlarga qaramasdan ham o‘z qarashlaridan voz kechmagan. U Vatan va millat taqdiri haqida chuqur mazmunga ega fikrlar bildirib, vatanparvarlikni yuksak ma’naviy qadriyat sifatida talqin qilgan. Uning vatan haqidagi qarashlari xalqni birlashtirish, milliy ongni kuchaytirish va ma’naviy mustahkamlikni oshirishga qaratilgan edi.

“Vatan – onamiz, vatan – jonimiz, vatansiz hayot – ruhsiz tan. Vatan uchun kurash, vatan uchun yashash, bu – har bir insonning burchi va shon-sharafi”- degan fikrlar ham Behbudiyning vatanparvar inson bo‘lganligidan, Vatanini sevganidan dalolatdir[32]. Ushbu fikrlarda vatan tushunchasi inson hayotining eng muhim qadriyati sifatida talqin qilinadi. Vatan onaga qiyoslanib, uning inson uchun qadr-qimmati beqiyos ekani ta’kidlanadi. Vatansiz hayot ruhsiz tanaga o‘xshatilishi orqali esa insonning ma’naviy va ijtimoiy jihatdan Vatan bilan uzviy bog‘liqligi ifodalanadi.

Shuningdek, Vatan uchun yashash va kurashish har bir insonning muqaddas burchi ekani g‘oyasi ilgari suriladi. Bu fikrlar vatanparvarlik tuyg‘usini mustahkamlashga, insonni o‘z yurtiga sadoqatli bo‘lishga undaydi. Shu jihatdan uning g‘oyalari keyingi avlodlar uchun ham muhim ma’rifiy meros bo‘lib qolgan.

Shunda, Behbudiy iztirob bilan mayning boshida Samarqandga qaytadi. U yerda tura olmay, Toshkentga keladi. Turkiston rus sovet hukumati rahbarlari bilan muzokaralar natija bermaydi. Orzulari chil-chil bo‘lgan Behbudiy 1919-yilning

[31] Mahmudxo‘ja Behbudiy Abdurashidov Z. –Toshkent: Yoshlar nashriyot uyi, 2022.– 22-bet
[32] Saidov Z. “Behbudiyning “Padarkush” asari: Tahlil va sharh”,Filologiya fanlari, 2015, 34-bet

bahorida 25-martda Shahrisabzda qo‘lga olinib, sirli bir tusda Qarshi shahrida qatl qilinadi.

Shuningdek, Mahmudxo‘ja Behbudiyni jismonan yo‘q qilish orqali uning faoliyatini to‘xtatishga urinishlar bo‘lgan bo‘lsa-da, uning g‘oyaviy va ma’naviy merosini yo‘qotish imkoni bo‘lmagan. Uning ilm-ma’rifat, vatanparvarlik va jamiyatni isloh qilish haqidagi qarashlari o‘z kuchini saqlab qolgan hamda keyingi avlodlarning tafakkuriga sezilarli ta’sir ko‘rsatgan. Shu ma’noda, uning g‘oyalari jismoniy hayotdan keyin ham ijtimoiy va ma’naviy jihatdan davom etib kelgan.

Bundan tashqari, 1916 yilda Turkiston general-gubernatori N.R.Kuropatkin o‘z kundaligida shunday jumlalarni yozgan: “Biz tub joy xalqni taraqqiyotdan, maktabdan, rus hayotidan 50 yil chetda tutdik”[33]. Turg‘unlik, tutqunlik va senzura avj olgan bunday jamiyatda ilg‘or fikrlar ilgari surilgan maqola va asarlarni nashr qilish oson emasdi. Shu sababdan muallif kitob jildida “Borodino jangi va Rossiyaning fransuzlar bosqinidan xalos bo‘lishining yubiley sanasiga bag‘ishlanadi” deb yozib nashr qilishga erishgan.

Keltirilgan fikrlarda mustamlaka davridagi Turkiston jamiyatining ijtimoiy-siyosiy holati va ma’rifiy cheklovlari yoritiladi. Nikolay Kuropatkinning kundaligida keltirilgan mulohazalar mahalliy aholini uzoq yillar davomida taraqqiyot, zamonaviy maktablar va rus jamiyati bilan aloqalardan cheklab qo‘yilganini ko‘rsatadi. Bu holat jamiyatda turg‘unlik, qaramlik va qat’iy nazorat tizimi hukm surganini anglatadi. Natijada ilmiy va ma’rifiy fikrlarning erkin rivojlanishi ham keskin cheklangan.

Shunday sharoitda ilg‘or g‘oyalarni ommaga yetkazish murakkab jarayon bo‘lgan. Senzura va nazorat kuchli bo‘lgani sababli mualliflar o‘z asarlarini nashr ettirishda turli yo‘llardan foydalanganlar. Ayrim hollarda asarlar rasmiy bayramlar yoki tarixiy voqealarga bag‘ishlangan deb ko‘rsatilib, shu orqali nashr ruxsatini olishga erishilgan. Bu esa o‘sha davrda ma’rifatparvar fikrlarni yashirin va ehtiyotkor usullar bilan tarqatish zarurligini ko‘rsatadi.

Mustaqillikdan so‘ng Jadidlar merosini tiklash jarayoniga alohida e’tibor qaratila boshlandi. Ayniqsa, 2016-yildan keyingi davrda davlat siyosatida Shavkat Mirziyoyev tashabbusi bilan jadid ma’rifatparvarlarining tarixiy o‘rni qayta ko‘rib chiqilib, ularga nisbatan qo‘yilgan nohaq ayblovlar bekor qilindi.

Bu jarayon natijasida jadidlarning ilmiy-ma’rifiy merosini o‘rganish, ularning nomini abadiylashtirish hamda xalq xotirasida munosib o‘rin berish bo‘yicha keng ko‘lamli ishlar amalga oshirildi. Shuningdek, ularning faoliyati milliy tarix va ma’naviyatning ajralmas qismi sifatida e’tirof etila boshlandi.

[33] Abdurashidov Z. Jadidlar. Mahmudxo‘ja Behbudiy. – Toshkent: Yoshlar nashriyot uyi, 2022. – 156-bet.

O‘zbekiston Respublikasi Prezidentining “Turkiston jadidlik harakatining asoschisi, atoqli adib va jamoat arbobi,noshir va pedagog Mahmudxo‘ja Behbudiy tavalludining 150 yilligini keng nishonlash to‘g‘risida”gi Qarorida ta’kidlanganidek, “Vatanimiz tarixida g‘oyat murakkab va sinovli davr bo‘lgan XX asr boshida maydonga chiqqan Mahmudxo‘ja Behbudiy Turkiston jadidlik harakatining asoschisi hisoblanadi. U milliy ozodlik harakatining buyuk namoyandasi sifatida ilm-fan, ta’lim va tarbiya, adabiyot va san’at, matbuot sohalarini rivojlantirish, jahondagi ilg‘or taraqqiyot yutuqlarini o‘zlashtirish orqali xalqimizning ongu tafakkurini yuksaltirish hamda hurriyatga erishish yo‘lida o‘z hayotini baxsh etgan fidoyi zotdir” [34]. Mustaqillikdan so‘ng Mahmudxo‘ja Behbudiyning ilmiy va ma’rifiy merosini o‘rganish hamda uni keng targ‘ib qilish bo‘yicha bir qator tadbirlar va amaliy ishlar amalga oshirildi. Uning hayoti va ijodiga bag‘ishlangan ilmiy konferensiyalar, ma’naviy-ma’rifiy kechalar hamda xotira tadbirlari tashkil etildi.

Shuningdek, Behbudiy nomini abadiylashtirish maqsadida uning asarlarini qayta nashr etish, maktab va ta’lim muassasalarida ijodini o‘rganish, hamda yoshlar o‘rtasida ma’rifatparvarlik g‘oyalarini targ‘ib qilish ishlari yo‘lga qo‘yildi. Uning vatan va ilm haqidagi qarashlari bugungi ta’lim-tarbiya jarayonida ham muhim ma’naviy manba sifatida qo‘llanib kelmoqda.

XULOSA

Xulosa qilib aytganda, Mahmudxo‘ja Behbudiy faoliyati Turkiston jadidchilik harakatining shakllanishi va rivojlanishida muhim o‘rin tutadi. Uning ilm va ma’rifatni jamiyat taraqqiyotining asosiy omili sifatida ko‘rishi, xalqni savodxonlikka, zamonaviy ta’limga hamda milliy uyg‘onishga chorlagan qarashlari o‘z davri uchun nihoyatda ilg‘or g‘oyalar bo‘lgan.

Behbudiyning pedagogik, publitsistik va adabiy merosi orqali u jaholat va qoloqlikka qarshi kurash olib borgan, teatr, matbuot va ta’lim kabi vositalar orqali jamiyat ongini yuksaltirishga intilgan. Shu bilan birga, uning vatanparvarlik g‘oyalari milliy o‘zlikni anglash va mustaqillik ruhini shakllantirishga xizmat qilgan.

Tarixiy sharoit qanchalik murakkab bo‘lmasin, uning ilm-ma’rifatga asoslangan qarashlari keyingi avlodlar uchun ham ma’naviy asos bo‘lib qoldi. Mustaqillik davrida esa Behbudiy merosiga bo‘lgan e’tibor yanada kuchayib, uning g‘oyalari milliy ta’lim va ma’naviyat tizimida muhim o‘rin egalladi.

Umuman olganda, Behbudiy merosi bugungi kunda ham jamiyatni ilmli, ongli va taraqqiy etgan avlod sifatida shakllantirishda muhim ahamiyatga ega bo‘lib qolmoqda.

[34] O‘zbekiston Respublikasi Prezidenti. Turkiston jadidlik harakatining asoschisi, atoqli adib va jamoat arbobi, noshir va pedagog Mahmudxo‘ja Behbudiy tavalludining 150 yilligini keng nishonlash to‘g‘risida: Qaror. – Toshkent, 2025. – 3-yanvar.

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СОСТОЯНИЕ МЕДИЦИНСКОЙ ПОМОЩИ В СУРХАНСКОЙ ДОЛИНЕ В ПЕРВОЙ ЧЕТВЕРТИ XX ВЕКА: НАРОДНАЯ МЕДИЦИНА, АМБУЛАТОРИИ И ПЕРВЫЕ СОВЕТСКИЕ МЕДИЦИНСКИЕ УЧРЕЖДЕНИЯ

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АННОТАЦИЯ

В статье на основе историко-медицинской литературы и опубликованных источников рассматривается состояние медицинской помощи населению Сурханской долины (Восточная Бухара) в первой четверти XX века. Анализируются место народной медицины в жизни населения, санитарно-эпидемиологическая обстановка, деятельность немногочисленных дореволюционных амбулаторно-лазаретных учреждений, а также процесс создания первых советских медицинских учреждений в 1920–1925 гг. Делается вывод о том, что именно в рассматриваемый период были заложены организационные основы государственной системы здравоохранения региона.

Ключевые слова: *Сурханская долина, Восточная Бухара, история медицины, народная медицина, табибы, амбулатория, Бухарская НСР, здравоохранение, малярия, Термез.*

ABSTRACT

Based on historical and medical literature and published sources, the article examines the state of medical care in the Surkhan Valley (Eastern Bukhara) in the first quarter of the 20th century. The role of folk medicine, the sanitary and epidemiological situation, the activities of a few pre-revolutionary outpatient institutions, and the establishment of the first Soviet medical institutions in 1920–1925 are analyzed.

Key words: *Surkhan Valley, Eastern Bukhara, history of medicine, folk medicine, tabibs, outpatient clinic, Bukharan PSR, health care, malaria, Termez.*

ВВЕДЕНИЕ

Изучение региональной истории здравоохранения является одним из актуальных направлений современной исторической науки Узбекистана: оно

позволяет проследить, каким образом традиционное общество воспринимало достижения научной медицины и как складывались институты охраны здоровья на местах. Сурханская долина, охватывающая бассейн реки Сурхандарьи и прилегающие районы правобережья Амударьи, в начале XX века входила в состав Восточной Бухары — наиболее отдалённой и экономически отсталой части Бухарского эмирата; её территорию занимали Шерабадское, Байсунское, Денауское и Юрчинское бекства. Первая четверть XX века стала для региона переломным периодом: на смену многовековому господству народной медицины пришли первые очаги научной медицины, а после революции 1920 г. началось формирование государственной системы здравоохранения. Цель настоящей работы — охарактеризовать основные этапы этого процесса.

Народная медицина. До начала XX века медицинская помощь населению долины почти целиком осуществлялась представителями народной медицины. Центральной её фигурой был табиб — лекарь, опиравшийся на письменную традицию восточной медицины, прежде всего на наследие Абу Али ибн Сины и его последователей. Табибы придерживались гуморального учения о «мизадже» (натуре) человека, ставили диагноз по пульсу и внешним признакам, применяли лекарственные растения, мумиё, мёд, кровопускание, банки и прижигание. Снабжением лечебными снадобьями занимались аттары — торговцы травами и специями. Костоправы (синикчи) довольно искусно вправляли вывихи и лечили переломы при помощи лубков и шин, повитухи (дои) принимали роды, отдельные лекари практиковали вариоляцию — народную прививку против оспы.

Вместе с тем рациональные эмпирические приёмы тесно переплетались с религиозно-магическими практиками: дуохоны, парихоны и бахши «лечили» больных молитвами, заклинаниями и амулетами (туморами), широко практиковалось паломничество к «святым» мазарам. Отсутствие представлений об асептике и антисептике, о природе инфекционных болезней делало народную медицину бессильной перед эпидемиями и обусловливало высокую смертность, прежде всего детскую. Тем не менее в условиях полного отсутствия иной помощи табибы и костоправы пользовались значительным авторитетом и удовлетворяли повседневные потребности населения в лечении [3; 4].

Санитарно-эпидемиологическая обстановка. Санитарное состояние долины в рассматриваемый период было крайне тяжёлым. Гиперэндемичным заболеванием являлась малярия: заболоченные поймы Сурхандарьи и Амударьи, рисовые поля и стоячие водоёмы-хаузы, служившие одновременно

источником питьевой воды, создавали благоприятные условия для выплода малярийного комара. Широкое распространение имели кожный лейшманиоз («пендинская язва»), ришта, трахома, чесотка и туберкулёз; периодически вспыхивали эпидемии оспы и холеры, а в годы гражданской войны — сыпного и брюшного тифа. Дореволюционные российские авторы, описывавшие Восточную Бухару (Н.А. Маев, Д.Н. Логофет), единодушно отмечали полное отсутствие в бекствах санитарного надзора, водопровода и какой-либо организованной врачебной помощи [1; 2].

Дореволюционные амбулатории. Научная (европейская) медицина проникала в долину крайне медленно и была связана главным образом с российским военным присутствием. После установления протектората России над Бухарским эмиратом и основания в 1890-х годах укрепления Термез здесь были размещены гарнизон и военный лазарет; военные врачи и фельдшеры постов Амударьинской пограничной линии вели ограниченный амбулаторный приём, которым в известной мере могло пользоваться и местное население. Однако подобные учреждения были единичными и предназначались прежде всего для войск: на огромной территории Восточной Бухары с многосоттысячным населением работали лишь единицы дипломированных врачей. Гражданских больниц и амбулаторий в бекствах долины не существовало, эмирская казна средств на охрану здоровья подданных практически не выделяла [1; 3]. Таким образом, накануне революции подавляющее большинство жителей Сурханской долины оставалось фактически лишённым научной медицинской помощи.

Первые советские медицинские учреждения. Победа Бухарской революции в сентябре 1920 г. и образование Бухарской Народной Советской Республики (БНСР) открыли новый этап в истории здравоохранения края. В составе правительства республики был создан Назират (народный комиссариат) здравоохранения, провозгласивший принципы бесплатной и общедоступной медицинской помощи населению [5; 6]. Однако в Восточной Бухаре развёртывание лечебной сети сдерживалось продолжавшимися военными действиями и басмачеством: в 1921–1923 гг. помощь мирному населению оказывали главным образом военные врачи и санитарные части Красной Армии, а также передвижные врачебно-санитарные отряды.

По мере стабилизации обстановки в 1922–1924 гг. в долине создаются первые гражданские советские медицинские учреждения: больница и амбулатория в Термезе, врачебные амбулатории и фельдшерские пункты в Шерабаде, Денау, Байсуне и других населённых пунктах [3; 4]. Началась

планомерная борьба с малярией: была организована тропическая (малярийная) станция в Термезе, проводились хинизация населения и обработка водоёмов. Развернулись обязательное оспопрививание и санитарно-просветительная работа среди дехкан. Особое значение имели первые шаги женского и детского здравоохранения — открытие консультаций и привлечение женщин-врачей, что позволяло преодолевать традиционные запреты на осмотр женщин врачом-мужчиной. Началась подготовка среднего медицинского персонала из представителей местного населения (курсы медицинских сестёр и оспопрививателей).

Национально-государственное размежевание Средней Азии 1924 г. и образование Узбекской ССР придали развитию здравоохранения долины планомерный характер: в 1925 г. был образован Сурхандарьинский округ и создан окружной отдел здравоохранения, объединивший руководство лечебными учреждениями [5; 7]. К середине 1920-х годов в регионе впервые в его истории сложилась пусть небольшая, но постоянно действующая сеть государственных больниц, амбулаторий и фельдшерских пунктов. Становление новой системы происходило в условиях острой нехватки врачей, медикаментов и приспособленных помещений, а также недоверия части населения, подогревавшегося отдельными представителями духовенства и табибами; тем не менее авторитет научной медицины, особенно после успехов в борьбе с малярией и оспой, неуклонно возрастал.

ЗАКЛЮЧЕНИЕ

Таким образом, в первой четверти XX века медицинская помощь в Сурханской долине прошла путь от безраздельного господства народной медицины через единичные военно-амбулаторные учреждения дореволюционного периода к формированию основ государственной системы здравоохранения. Народная медицина, сочетавшая ценный эмпирический опыт с религиозно-магическими практиками, не могла противостоять тяжёлой эпидемической обстановке. Созданные в 1920–1925 гг. первые советские медицинские учреждения — больницы, амбулатории, фельдшерские пункты, тропическая станция, женские и детские консультации — заложили фундамент дальнейшего развития здравоохранения Сурхандарьи. Опыт этого переходного периода представляет несомненный научный интерес и для осмысления современных процессов модернизации региональной медицины Узбекистана.

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CONTINUITY OF THE PRACTICE OF EDUCATING AFGHAN CITIZENS IN UZBEKISTAN: A DOCUMENT ANALYSIS (1992–2024)

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ABSTRACT

The thesis analyses the legal foundations of the practice of educating Afghan citizens in Uzbekistan. On the basis of an analysis of normative documents, it is substantiated that this practice began not in 2017 but in 1992 and has passed through three stages. At all three stages the city of Termez served as the nodal point.

Key words: *Uzbekistan, Afghanistan, educational cooperation, Termez, normative document, continuity, Surkhan oasis.*

INTRODUCTION

The Education Centre for training Afghan citizens, located in Termez district, is today the most visible example of humanitarian cooperation between Uzbekistan and Afghanistan. In the scholarly literature and in the press it is usually interpreted as a new initiative launched in 2017.

This interpretation is incomplete. An analysis of normative documents shows that the practice of educating Afghan citizens in the educational institutions of Uzbekistan had already been established in the very first years of independence. The purpose of the present thesis is to identify the legal foundations of this practice and to determine its stages.

METHODS

The research was carried out on the basis of the lex.uz national legislation database and the materials of the Collection of International Treaties of the Republic of Uzbekistan. Thirty-seven volumes of the latter source, covering the years 2004–2023, were examined.

In searching for documents, the method of sequential review by classifier was applied. There is a reason for this: when a query for the word “Afghanistan” is entered into the search system, education-related documents do not appear, because in their titles the name of the country is written in various forms or does not occur at all.

For each document, the date of adoption, the adopting body, the source of financing and the implementation mechanism were recorded. The documents were arranged in chronological order, and the substantive links between them were identified.

RESULTS

The analysis identified three stages of the practice.

The first stage covers the years 1992–1993. Resolution No. 560 of the Cabinet of Ministers of 30 November 1992 established free education for Afghan citizens at the expense of the budget of Uzbekistan. Under the resolution, orphaned students were entitled to study until they had acquired a particular profession, and their expenses were equated with the funds allocated to local orphans. The text of the document refers to official meetings of the leaders of the two states.

Resolution No. 381 of 30 July 1993, adopted half a year later, brought this matter to completion. It provided for the award of diplomas to those who finished their studies and for the financing of tuition and repatriation costs by the Ministry of Finance. A noteworthy detail is that the resolution separately specified the organised transportation of the students by rail to the Termez border crossing point.

The second stage falls in 2004. Article 2 of the agreement signed in Tashkent on 29 August of that year and approved by Resolution No. 456 of the Cabinet of Ministers lists the areas of cooperation. Among them is the training of Afghan specialists in various fields of transport in the educational institutions of the Republic of Uzbekistan. In this way, a practice that had existed at the level of a unilateral national act was transformed into an international treaty obligation.

The third stage begins in 2017. By Resolution No. 911 of the Cabinet of Ministers of 13 November, an Education Centre was established under the Ministry of Higher and Secondary Specialised Education. The Centre was located in Termez district. The financing procedure changed: half of the costs were assigned to the Afghan side.

One further observation concerns legal continuity. Resolution No. 560 of 1992 remained in force until 22 February 2021; that is, the document was formally valid for twenty-nine years.

DISCUSSION

The three stages identified lead to two conclusions.

The first concerns chronology. The Education Centre of 2017 is not an entirely new initiative: it is a revival after an interruption of a quarter of a century. The reason for the interruption is known: in 1997–2001 Uzbekistan did not recognise the Taliban regime and the border was closed, while in the subsequent period the educational

component, although recorded in the 2004 agreement, did not acquire a separate institutional form.

The second concerns geography and is, in our view, the more important. At all three stages the nodal point remained unchanged. In 1993 the students were repatriated through Termez; in 2017 the Centre was opened in Termez district. This is no coincidence. The Surkhan oasis occupies a stable place in educational programmes on the Afghan track, and this place is determined not by administrative decision but by geographical position.

A third observation relates to legal form. Over the three stages the practice has appeared in three different legal guises: first as a unilateral national act, then as an international treaty obligation, and finally as a permanent institution. Its substance, however, has remained almost unchanged. This situation probably reflects a general feature of Uzbek–Afghan relations, namely that practice often runs ahead of legal formalisation.

CONCLUSION

The analysis of normative documents shows that the practice of educating Afghan citizens in Uzbekistan began in 1992 and has passed through three stages. At all three stages the city of Termez has remained the nodal point.

This finding calls for a reconsideration of the history of bilateral humanitarian cooperation. The most promising direction for further research, in our view, is connected with the materials of the regional archive, which may well preserve data on the number of students who studied in 1992–1993, the institutions in which they were trained and the funds expended.

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BOLALAR VA KATTALARDA BUYRAK ARTERIYASI STENOZI

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ANNOTATSIYA

Ushbu maqolada bolalar va kattalar orasida keng tarqalgan patologiyalardan biri – buyrak arteriyasi torayishi haqida ko‘rsatib o‘tilgan. Mazkur holat turli xil sistemali va mahalliy o‘zgarishlarga sabab bo‘lishi bilan tibbiyot amaliyotida alohida ahamiyat kasb etadi. Buyrak arteriyasi stenozining etiologik omillari, uni aniqlashda qo‘llaniladigan zamonaviy instrumental hamda umumklinik tekshiruv usullari, shuningdek konservativ (dori-darmon) va jarrohlik yo‘li bilan davolash tamoyillari ilmiy jihatdan tahlil qilingan. Shu bilan birga, maqolada stenoz natijasida yuzaga keladigan patofiziologik o‘zgarishlar va ularning klinik ahamiyati atroflicha yoritib berilgan.

Kalit so‘zlar: *Buyrak arteriyasi stenozi, anomaliyalari, aterosklerotik torayish, fibromuskulyar displaziya, renin, angiografiya.*

АННОТАЦИЯ

В данной статье рассматривается стеноз почечной артерии — патология, распространенная как у детей, так и у взрослых. Это состояние имеет особое значение в медицинской практике ввиду разнообразных системных и локальных изменений, к которым оно приводит. В статье представлен научный анализ этиологических факторов стеноза почечной артерии, современных методов инструментальной и общеклинической диагностики, а также принципов консервативного (медикаментозного) и хирургического лечения. Кроме того, подробно рассматриваются патофизиологические изменения, обусловленные стенозом, и их клиническое значение.

Ключевые слова: *стеноз почечной артерии, аномалии, атеросклеротическое сужение, фибромышечная дисплазия, ренин, ангиография.*

ABSTRACT

This article discusses renal artery stenosis, a pathology prevalent among both children and adults. This condition holds particular significance in medical practice due to the various systemic and local changes it causes. The article provides a scientific analysis of the etiological factors of renal artery stenosis, modern

instrumental and general clinical diagnostic methods, and principles of both conservative (pharmacological) and surgical treatment. Furthermore, the pathophysiological changes resulting from the stenosis and their clinical significance are examined in detail.

***Keywords**: Renal artery stenosis, anomalies, atherosclerotic narrowing, fibromuscular dysplasia, renin, angiography.*

KIRISH

Buyrak inson organizmida gomeostazni saqlash, ekskretor, endokrin va metabolik funksiyalarni bajaruvchi hayotiy muhim a’zolardan biri hisoblanadi. Ushbu a’zoni qon bilan ta’minlashda ishtirok etadigan, buyrak arteriyasining o‘zgarishga uchragan turi haqida batafsil aytib o‘tiladi. Buyrak arteriyasi stenozi – buyraklarni qon bilan ta’minlaydigan bir yoki bir nechta buyrak arteriyalarining torayishi bilan tavsiflanuvchi patologik holat. Buyrak arteriyasi asosan, buyrak arteriyalarining diametri qisqarishi demakdir. Shuni aytish joizki, stenoz asosiy buyrak arteriyasi va segmental buyrak arteriyalarida bo‘lishi mumkin. Buyrak arteriyasi stenozi har qanday yoshdagi insonga ta’sir ko‘rsatishi mumkin bo‘lib, bolalarda vazorenal gipertenziyaning sababi sifatida alohida klinik ahamiyatga ega. Buyrak tomirlarining anomaliyalari, odatda buyrakning rivojlanish nuqsonlari bilan birga kechadi, lekin ba’zida mustaqil anomaliyalar ko‘rinishida ham uchrashi mumkin. Tug‘ma o‘zgarishlar buyrakning arteriyalariga ham venalariga ham taalluqli. Buyrak arteriya tomirlarining tug‘ma o‘zgarishlari ko‘pincha buyrakning qon bilan ta’minlanishining buzilishidan dalolatdir. Klinik amaliyotda eng ko‘p qayd etiladigan, tomir anomaliyalari orasida miqdori va strukturasi ya’ni tuzilishi jihatidan farq qila oladigan turlari bor: qo‘shimcha buyrak arteriyasi bir yoki ko‘p buyrak arteriyalari bo‘lishi, buyrak arteriyalari anevrizmasi hamda arteriya va venalarning tug‘ma tutash bo‘lishi kabi kuzatiladigan o‘zgarishlarga ega. Bu anomaliyalarning umumiy xususiyati shundaki, ularning barchasi sistemali arterial bosimning ko‘tarilishiga va buyrak ichi qon aylanishining keskin buzilishiga olib kelishi mumkin. Aynan shu sababli, turli xil tomir anomaliyalarini bir-biridan farqlash va aniq tashxis qo‘yish tibbiy amaliyotda diagnostik xatoliklarning oldini olishda muhim ahamiyat kasb etadi.

ADABIYOTLAR TAHLILI VA METODLAR

O‘tkazilgan ilmiy tadqiqotlar ma’lumotlariga ko‘ra, buyrak va uning qon tomir tizimi o‘rtasida ikki tomonlama patogenetik bog‘liqlik mavjud. Buyrakdagi ko‘pgina kasalliklar tufayli buyrak qon tomirlari strukturasi buziladi. Aksincha, buyrak qon tomirlardagi patologik jarayonlar o‘z navbatida buyrakni kasallikga duchor qilishi mumkin. Shuningdek, hozirgi kunda buyrak arteriyasi torayishining etiologik tuzilishida ateroskleroz yetakchi o‘rinni egallaydi va bemorlarning 65–70

foizida kuzatiladi. Aterosklerotik torayish – bo‘rtmalar, tomir ichini toraytirib, ya’ni tomir bo‘shlig‘ida yo‘g‘lar, xolesterin va pilakcha kabi moddalar tiqilib, buyrak arteriyasining stenoziga sabab bo‘lgan turiga aytiladi. Asosan bunday ko‘rinishdagi zararlanish buyrak arteriyasining proksimal 1/3 qismi, 40 yoshdan oshgan erkaklar, qari keksalar va chekuvchilarda uchrashi aytilgan. Ammo, ko‘p hollarda o‘rta yoshli odamlarda aniqlanadi.Yoshlar orasida esa fibromuskulyar displaziya 20–25 foizni tashkil etadi. Fibromuskulyar displaziya – ayniqsa yoshlarda dolzarb bo‘lgan muammo sifatida qaraladi. U buyrak arteriyasining distal 2/3 qismi hamda segmental shoxlari, odatda yosh bolalar va 40 yoshgacha bo‘lgan ayollarda uchrashi kuzatilgan. Shu bilan birga bolalarda tashxislanadi. Chunki o‘zgaruvchan xarakterga ega va kamdan - kam hollarda arteriya torayishi natijasida butunlay bekilib ketishi mumkin. Fibromuskulyar displaziyaga, tomirlar devoridagi elastik to‘qimaning tug‘ma yetarli emasligidan dalolatdir. Bu zaiflik esa tug‘ma o‘zgarishlarga olib keladi. Ushbu ma’lumotlar buyrak arteriyasi stenozining yosh bo‘yicha etiologik farqlanishini ko‘rsatadi va tashxis qo‘yish hamda davolash strategiyasini tanlashda bemorning yoshi muhim mezon ekanligini tasdiqlaydi.

NATIJA

Qo‘shimcha ravishda, buyrak arteriyasining torayganda sabab bo‘ladigan patologik o‘zgarishlari:

- Renovaskulyar gipertenziya
- arterial gipertenziya
- nefroptoz
- tromboz
- emboliya
- buyrak ishemiyasi
- ateroskleroz
- kamdan – kam hollarda anevrizma. Shu bilan bir qatorda, renin qon aylanishida juda katta ahamiyatga ega bo‘lgan angiotenzinni hosil bo‘lishida ishtirok etadi.Shuning uchun Angiotenzin 2 qon tomirlarini toraytirishga ega. Renin stenozni keltirib chiqarmaydi, aksincha stenoz oqibatida renin hosil bo‘ladi. Bu shuni ko‘rsatadiki, buyrak arteriyasi stenozi bo‘lgan holatda buyrakda qon yetib borishi keskin kamayadi(gipoksiya) va buyrak qonga renin fermentini ishlab chiqaradi. Shuningdek, buyrak arteriyasi torayishiga tomirlarda natriyni ushlanib qolinishi ham sabab bo‘la oladi. Natriy ortiqcha bo‘lganda buyrak arteriyalarining devorida va arteriolalarida cho‘kib qolib, u yerda

suyuqlikni ushlaydi, va bu tomirlarni shishishiga, ularning ichini torayishiga va qon oqimiga qarshilik ko‘rsatishga olib keladi.

Buyrak arteriyasi stenozini aniqlaydigan diagnostik usullar haqida to‘xtaladigan bo‘lsak, ayrim bemorlarda epigastrial sohani auskultatsiya qilinganda ko‘proq buyrak arteriyasining fibromuskulyar torayishida kuzatiladigan, sistolik va diastolik shovqin eshtiladi. Shunda qon tor arteriya orqali oqib o‘tsa, u vaqti-vaqti bilan shovqinli ovoz chiqaradi. Buni esa tibbiyotda bruit deb atashadi. Ushbu ovozni yo‘qligi, bu buyrak arteriyasi stenozini mavjud emasligini anglatmaydi. Albatta, bu bilan samara beruvchi usullardan foydalanish kerakligini ko‘rsatadi. Shuningdek, buyrak angiografiyasi yordamida yuqoridagi patologik o‘zgarishlar aniqlanadi. U orqali stenozni funksional ahamiyatga ega ekanligi, uning toraygan joydan keyingi kengayishi bo‘ladi. Arteriya toraygan tomondagi buyrakning ishlash holatini bilishda, izotop renografiya qimmatbaho usul hisoblanadi. U hammadan ham buyrak arteriyasining bir tomonlama torayishida juda foydali usul va ikkala tomonlama renogrammaning assimetriyasini ko‘rsatadi. Sonografiya - asosiy maqsadi parenximatoz kasallik yo‘qligini aniqlash. Shuningdek, Selidinger usulini bajarishda qorin shox tomiriga son arteriyadan kateter kiritiladi. Kateter buyrak arteriyalari to‘g‘risiga olib kelingach, kontrast modda yuboriladi va sekundlar oralab rentgen tasvirga tushiriladi. Seryali urografiya usulida rentgenokontrast modda jo‘natilgandan so‘ng, birinchi daqiqalardayoq arteriyasi toraygan tomondagi buyrakning ish faoliyatini aniqlab beradi. Ekskretor urografiya yordamida esa buyrak arteryasini stenozining o‘ziga xos belgilarini, buyraklarni kattaligini, farqini va har birini ishlash qobilyatlarini alohida bilishga yordam beradi. Bu usullarning bir-biriga o‘xshash tomoni, buyraklarning ish mexanizmini o‘rganib borishda samarali hisoblanadi. Bularni klinikalarda o‘tkazish amaliy ahamiyat kasb etadi.Chunki zararli omillar kelib chiqishini kamaytiradi.

Buyrak arteriyasi stenozini davolash yo‘llari haqida aytadigan bo‘lsak, odatda bemorlarga kompleks davolash, masalan balon bilan kengaytirish yoki operativ davolashni dori-darmonlar bilan birgalikda o‘tash talab qilinadi. Lekin dori-darmonlar bemorlarni butun hayoti davomida to‘xtatmasdan davom etishi so‘raladi. Bular kompleks preparatlar, angiotenzin ingibitorlari, kalsiy kanalchalar blokatorlari bilan kombinatsiya holda qo‘llaniladi. Shunda buyraklar funksiyasi kamroq zararlanadi. Buyrak arteriyasini ballon bilan kengaytirish – bunday turdagi davolashning xalqaro nomi, “ transkutan, transluminal angioplastika ,, arteriografiya vaqtida unga kiritilgan kateter yordamida operatsiyaning muvaffaqiyatli tarzda baxolashga imkon yaratadi: angiogrammada

kengaytirilgandan keyin buyrak arteryasining diametrik meyorda yoki toraygandagiga qaraganda ancha kengayganligi ko‘rinadi. Agarda tomir samarali kengaysa, arterial bosim pasayib hatto meyorda bo‘ladi. Bu plazmada renin faolligining meyorga kelishi bilan kuzatiladi. Ateroskleroz torayishda ballon bilan kengaytirishda tuzalishlar – 20-22% , yaxshilanish – 58%, 9 oydan keyin qayta torayish esa 19% bemorlarda kuzatiladi. Fibromuskulyar torayishda esa 80% bemorlarda muvaffaqiyatli, 55-56% bemorlarda tuzalish bo‘ladi. Fibromuskulyar torayish bo‘lgan bemorlarda qayta torayish ham kam kuzatiladigan asoratdir. Yana bir zamonaviy davolash usullardan biri - arterial stent qo‘yish quyidagi hollardagina o‘rnatiladi:

1.buyrak arteriyasining og‘izchasi, uning aortada chiqish joyi torayganda, chunki bunday holatda ballon bilan kengaytirish qayta torayishga asoratlanadi;

2.ateromatoz xarakterdagi torayishda, ya’ni ballon bilan kengaytirish muvaffaqiyatsiz bo‘lganda;

3.har qanday operatsiyadan keyin qayta torayish kelib chiqqanda, lekin stentlashni yutug‘iga ishonch ortadi.

Hozirgi kunda bunday turdagi davolash fibromuskulyar va aterosklerotik torayishi bo‘lgan bemorlarda, buyrak arteriyasining bo‘shlig‘i butunlay berkilib qolmaganda va pilakchalar turgan zonada uning devorida ohakli cho‘kma bo‘lmaganda tanlashda samarali usul sanaladi. Agarda bu usullar muvoffaqiyatli yakun topolmaydigan bo‘lsada, oxirgi chora operatsiya qilish kerakligini ko‘rsatadi.

MUHOKAMA

Inson yaralibdiki, ular uchun barcha jonzotlar ham ozuqa, ham tadqiqot manbayi bo‘lib xizmat qilaveradi. Xususan, Goldblatt 1934-yili itlarda bitta buyrakning arteriyasini toraytirib, ikkinchi buyrakni esa olib tashlash orqali arterial gipertenziya turini keltirib chiqarishga muvofaq bo‘ldi. Odamlarda ham har xil sabablarga ko‘ra, buyrak arteriyasi toraygan, yoki ichida tromb tiqilganda, ularda arterial bosim oshib ketar ekan. Shuningdek, nefroptozi bor bemorlarda ham buyrak arteriyasini bu turdagi hastaligi uchraydi. Bunday holatdagi torayishlar vaqtinchalik bo‘ladi. Keyinchalik hosil bo‘luvchi buyrak arteriyasining fibromuskulyar torayishlari esa doimiy sanaladi. Shu jumladan, Tiger Shtedt va Bergman 1898-yili o‘zlarining tajribalariga asosan ishemiyaga duchor bo‘lgan buyraklarda, arterial gipertenziyaga olib boruvchi, modda borligini aniqlashgan. Bu modda avvalambor sog‘lom hayvonlarga yuborilganda, ularda ham gipertenziya kelib chiqishiga guvoh bo‘lishgan. Olimlarni bu tajribadan xulosasi shuki, buyrak to‘qimasi ishemiya sharoitida toraytiruvchi

modda ishlab chiqaradi. Uni nomi esa , renin deb nomlashadi. Hozirgi paytda aniqlanganidek reninni proteolitik ferment sifatida buyrak qon tomirlarini siquvchi ta’sirni namoyon qiladigan angiotenzinogenni hosil qilishida muhim vazifani bajaradi. Yuqorida aytib o‘tilgan natijalarga asoslanib reninni buyrak arteriyalariga ta’siri haqida ko‘rsatib berilgandi.

XULOSA

Maskur tadqiqot natijalariga ko‘ra, Angiografiya va boshqa rentgenokontrast tekshiruv usullari buyrak arteriyasi stenozini aniqlashda yuqori diagnostik qimmatga ega bo‘lsa-da, ular og‘ir asoratlar rivojlanish xavfi bilan bog‘liq bo‘lishi mumkin. Shu sababli, bu umumklinik diagnostika usullarini ketma – ketlikda, kompleks tarzda qo‘llash klinik amaliyotda maqsadga muvofiq bo‘ladi. Buyrak arteriyasi stenozi og‘ir kechib, unga ergashgan arterial gipertenziya rivojlangan hollarda, davolash taktikasi tanlanishi lozim. Dastlab dori-darmon terapiyasi, transluminal ballon angioplastikasi yoki arterial stent qo‘yish kabi usullar qo‘llaniladi. Faqat ushbu davolash choralari samarasiz natija bergan taqdirdagina, buyrak arteriyalarida rekonstruktiv jarrohlik amalyotlarini o‘tkazish zarurati tug‘iladi. Shunday qilib, buyrak arteriyasi stenozini davolashda individual yondashuv tamoyiliga rioya qilish, ya’ni bemorning umumiy holati, stenozning etiologiyasi va og‘irlik darajasini hisobga olgan holda davolash usulini bosqichma-bosqich tanlash — asoratlarning oldini olish va davolash samaradorligini oshirishning asosiy sharti hisoblanadi.

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IKKINCHI JAHON URUSHIDAN KEYIN O‘ZBEKISTON SSR PROKURATURASI TOMONIDAN MAHALLIY DAVLAT HOKIMIYATI ORGANLARI FAOLIYATI USTIDAN PROKUROR NAZORATI

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ANNOTATSIYA

Mazkur maqolada 1950-yillarda O‘zbekiston SSR prokuraturasi tomonidan sotsialistik qonuniylikni ta’minlash sohasida amalga oshirilgan umumiy prokuror nazorati arxiv hujjatlari asosida tahlil qilingan. Tadqiqotda mahalliy Sovetlar va ijroiya qo‘mitalarining qonun talablarini buzishi, kolxoz mulkini muhofaza qilish, budjet mablag‘laridan qonuniy foydalanish, davlat va jamoat mulkini asrash hamda prokuror ta’sir choralarining huquqiy ahamiyati yoritilgan. Arxiv materiallari prokuraturaning mazkur davrda nafaqat jinoyatlarni fosh etuvchi, balki davlat boshqaruvida qonuniylikni ta’minlovchi muhim nazorat instituti sifatida faoliyat yuritganini ko‘rsatadi.

Kalit so‘zlar: *prokuratura, sotsialistik qonuniylik, prokuror nazorati, umumiy nazorat, arxiv hujjatlari, mahalliy Sovetlar, ijroiya qo‘mitalari, kolxoz mulki, O‘zbekiston SSR.*

ABSTRACT

This article examines the general supervisory activities of the Prosecutor's Office of the Uzbek SSR in ensuring socialist legality during the 1950s, based on archival materials. The study analyzes violations of legal requirements by local Soviets and executive committees, the protection of collective farm (kolkhoz) property, the lawful use of budgetary funds, the safeguarding of state and public property, and the legal significance of prosecutorial response measures. The archival evidence demonstrates that during this period the Prosecutor's Office functioned not only as an institution responsible for criminal prosecution but also as a key supervisory body ensuring legality within the system of state administration.

Keywords: *Prosecutor's Office; socialist legality; prosecutorial oversight; general supervision; archival materials; local Soviets; executive committees; collective farm property; Uzbek SSR.*

KIRISH

1950-yillar SSSR tarixida urushdan keyingi iqtisodiy tiklanish jarayonlarining yakunlanishi hamda davlat boshqaruvi tizimida qonuniylikni mustahkamlashga qaratilgan chora-tadbirlar kuchaytirilgan davr sifatida tavsiflanadi. Bu jarayonda prokuratura organlari zimmasiga qonunlarning barcha davlat organlari, muassasalar va mansabdor shaxslar tomonidan bir xil hamda aniq bajarilishi ustidan oliy nazoratni amalga oshirish vazifasi yuklatildi.

O‘zbekiston SSRda ham prokuratura organlari mahalliy davlat hokimiyati organlari, ijroiya qo‘mitalari, kolxozlar va boshqa tashkilotlar faoliyatida sotsialistik qonuniylik talablariga rioya etilishini ta’minlashda muhim o‘rin tutdi. Ayniqsa, umumiy prokuror nazorati instituti orqali mahalliy davlat boshqaruvida uchragan qonun buzilishlari aniqlanib, ularni bartaraf etish yuzasidan huquqiy ta’sir choralari qo‘llanildi.

Mazkur tadqiqotning ilmiy yangiligi shundan iboratki, unda avval ilmiy muomalaga deyarli kiritilmagan arxiv hujjatlari asosida 1952 yilda O‘zbekiston SSR prokuraturasi tomonidan mahalliy ijroiya qo‘mitalari faoliyati ustidan amalga oshirilgan prokuror nazoratining mazmuni, huquqiy asoslari va amaliy samaradorligi tahlil qilingan. Arxiv materiallari prokuror nazoratining davlat mulkini muhofaza qilish, mahalliy boshqaruv organlari tomonidan qabul qilingan noqonuniy qarorlarni bekor qilish hamda davlat intizomini ta’minlashdagi ahamiyatini ochib beradi.

ADABIYOTLAR TAHLILI VA METODLAR

Ma’lumki prokuratura tarixi bo‘yicha bugungi kunga qadar qator tadqiqotlar amalga oshirilgan bo‘lsada, ikkinchi jahon urushidan keyin O‘zbekiston SSR prokuraturasining umumiy nazorat faoliyati arxiv hujjatlari va maxsus tadqiqotlar asosida kompleks tarzda o‘rganilmagan.

Mavzuni o‘rganish jarayonida tizimlilik va qiyosiy tahlil, tarixiy-qiyosiy usul va tamoyillaridan foydalangan holda arxiv fondlari hujjatlari va ilmiy adabiyotlar tahlil qilindi va muammoviy-xronologik usullaridan foydalanildi. Shu bilan birga tarix fanining mikrotarix yo‘nalishi mazkur maqolani yoritishning asosini tashkil etadi.

NATIJALAR

Ikkinchi jahon urushidan keyin O‘zbekiston SSR prokuraturasi faoliyatining ustuvor yo‘nalishlaridan biri umumiy prokuror nazoratini amalga oshirish bo‘lib, mazkur institut davlat organlari, muassasalar, korxonalar, jamoat tashkilotlari va mansabdor shaxslar tomonidan amaldagi qonunlarga og‘ishmay rioya etilishini ta’minlashga qaratilgan edi. Prokuratura faqat jinoyat ishlarini yurituvchi organ

sifatida emas, balki davlat boshqaruvida qonuniylikni ta’minlovchi konstitutsiyaviy institut sifatida ham faoliyat yuritdi.

Umumiy prokuror nazoratining huquqiy asoslari SSSR Konstitutsiyasi [35], O‘zbekiston SSR Konstitutsiyasi[36], “SSSR Prokuraturasi to‘g‘risida”gi[37] meyoriy hujjatlar hamda SSSR Bosh prokurorining buyruqlari bilan belgilangan bo‘lib, ular prokuratura organlariga davlat boshqaruvi organlari tomonidan qabul qilinayotgan qarorlarning qonuniyligini tekshirish, qonunga zid hujjatlarga protest kiritish va ularning ijrosini to‘xtatish vakolatini bergan. Shuningdek o‘rganilayotgan davrda 1946 yil 17 iyunda qabul qilingan “Qonunlarning qat’iy ijro etilishi ustidan umumiy nazoratni kuchaytirish to‘g‘risida”gi SSSR prokurorining 128-sonli buyrug‘i iqtisodiy sohada prokuror nazoratini kuchaytirishda muhim rol o‘ynadi[38].

Bu vakolatlarning amaldagi ifodasi O‘zbekiston Respublikasi Markaziy davlat arxivida saqlanayotgan 1952 yil 28 avgustdagi O‘zbekiston SSR prokuraturasining respublika rahbariyatiga kiritgan axborotnomasida yaqqol namoyon bo‘ladi [39]. Mazkur hujjatda mahalliy mehnatkash deputatlar Sovetlari ijroiya qo‘mitalari tomonidan O‘zbekiston SSR Konstitutsiyasining 76-moddasi talablari muntazam ravishda buzilgani qayd etilgan. Xususan, mahalliy ijroiya qo‘mitalari qonunchilikda nazarda tutilmagan vakolatlarni o‘zlashtirib, kolxoz mulkini hisobdan chiqarish, davlat mablag‘laridan maqsadsiz foydalanish, yer ajratish, majburiy farmoyishlar qabul qilish kabi holatlarga yo‘l qo‘ygan.

Arxiv hujjati prokuratura organlari faqat qonunbuzilishlarni qayd etuvchi organ bo‘lmaganini, balki ularni bartaraf etish maqsadida respublika rahbariyatiga aniq huquqiy takliflar kiritganini ham ko‘rsatadi. Xususan, qonunga zid qarorlarni bekor qilish, mansabdor shaxslarni javobgarlikka tortish, qishloq Sovetlarida moliyaviy reviziyalarni tashkil etish va mahalliy rahbarlarning huquqiy bilimlarini oshirish yuzasidan takliflar bildirilgan.

Shunday qilib, arxiv hujjatlari tahlili 1950-yillarda umumiy prokuror nazoratining mazmuni faqat huquqbuzarliklarga munosabat bildirish bilan

[35]Конституция (Основной Закон) СССР. Принята VIII Чрезвычайным съездом Советов СССР 5 декабря 1936 г. Государственный архив Российской Федерации. https://statearchive.ru/465 (Мурожаат санаси - 26.02.2026 й).

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[39] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 3-varaq.

cheklanmaganini, balki davlat boshqaruvi tizimida qonuniylikni ta’minlashning kompleks huquqiy mexanizmi sifatida shakllanganini ko‘rsatadi.

Biroq arxiv materiallari prokuratura faoliyatida muayyan kamchiliklar ham mavjud bo‘lganini ko‘rsatadi. Ayrim hollarda prokurorlar qonunbuzilishlarga o‘z vaqtida huquqiy baho bermagan, protest va taqdimnomalarning ijrosi ustidan yetarli nazorat o‘rnatilmagan. Bundan tashqari, mahalliy partiya organlarining davlat boshqaruviga aralashuvi prokuratura organlarining mustaqil faoliyat yuritish imkoniyatlarini ma’lum darajada cheklagan. Bu holat prokuraturaning huquqiy maqomi rasman mustaqil deb belgilangan bo‘lsa-da, amalda uning faoliyati sovet davlatining ma’muriy-buyruqbozlik tizimi ta’sirida amalga oshirilganini ko‘rsatadi.

Mazkur davrda respublika prokuraturasiga Ivan Martyanovich Sadovnikov (Ivan Martyanovich Sadovnikov 1946-1950 yillarda O‘zbekiston SSR prokurori lavozimida faoliyat yuritgan) rahbarlik qiladi va aynan shu yillar prokuratura hodimlarini asosan qishloq ho‘jaligigiga safarbar qilinganligi bilan tarixga kirdi.

1952 yil 23 avgustda O‘zbekiston SSR prokurori vazifasini bajaruvchi K.Borovikov tomonidan O‘zbekiston SSR Oliy Soveti Prezidiumi raisi Sh. Rashidov nomiga kiritilgan axborotnomada mahalliy mehnatkash deputatlar Sovetlari ijroiya qo‘mitalari tomonidan amaldagi qonunchilik talablarining tizimli ravishda buzilayotgani haqida ma’lumotlar keltirilgan[40]. Hujjatda prokuratura tekshiruvlari natijasida aniqlangan holatlar alohida misollar bilan asoslangan bo‘lib, ular mahalliy boshqaruv organlari faoliyatida qonuniylik ustidan nazorat yetarli darajada ta’minlanmaganini ko‘rsatadi.

Masalan, arxiv ma’lumotlariga ko‘ra, eng ko‘p uchragan qonunbuzilishlardan biri davlat va kolxoz mulkiga oid munosabatlarda qonun talablarining buzilishi bo‘lgan. Jumladan, Uzun tumani ijroiya qo‘mitasi Frunze nomidagi kolxozda talon-toroj qilingan 163954 rubl miqdoridagi mablag‘ni jinoyat ishi bo‘yicha tergov harakatlari yakunlanmasdan turib hisobdan chiqarish to‘g‘risida qaror qabul qilgan[41]. Mazkur holat ijroiya qo‘mitasining o‘z vakolati doirasidan chetga chiqqanini hamda tergov organlari vakolatiga aralashganini ko‘rsatadi. Bu esa davlat mulkini muhofaza qilish sohasida qonun ustuvorligi prinsipining buzilganidan dalolat beradi. Shunga o‘xshash holatlar G‘allaorol, Qoraqishloq va Xiva tumanlari ijroiya qo‘mitalari faoliyatida ham kuzatilgan[42]. Arxiv hujjatlarida kolxozlarning debitor qarzdorligini undirish choralari ko‘rilmasdan turib hisobdan chiqarish, kolxoz mablag‘larini qonunchilikda nazarda tutilmagan maqsadlarga sarflash hamda davlat mablag‘larini noqonuniy qayta taqsimlash holatlari qayd etilgan. Bu esa mahalliy davlat boshqaruvi

[40] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 3-varaq.
[41] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 3-varaq.
[42] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 6-varaq.

organlari tomonidan moliyaviy intizomning buzilganini va davlat iqtisodiy manfaatlariga zarar yetkazuvchi qarorlar qabul qilinganini ko‘rsatadi.

Shuningdek, Yangiariq tuman ijroiya qo‘mitasi 1952 yil 31 yanvarda qabul qilgan majburiy farmoyish bilan tuman tayyorlov idorasiga daydi itlarga qarshi kurashuvchi brigadalar tuzish, tuman qishloq xo‘jaligi bo‘limi va bosh veterinar shifokoriga esa itlarni tutish jadvalini tuzish vazifasi yuklatilgan[43]. Biroq mazkur majburiy farmoyishda uni buzganlik uchun javobgarlik choralari belgilanmagan va uning amal qilish muddati ham ko‘rsatilmagan.

Buxoro va Xorazm viloyatlarida o‘tkazilgan tekshirishlar natijasida shu narsa ma’lum bo‘ladiki, qishloq Sovetlari raislarining aksariyati uzoq vaqt davomida kolxozlarga tegishli otlardan noqonuniy ravishda foydalanib kelgan hamda yuqori turuvchi organlarga mazkur otlar kolxozlarga qaytarilgani haqida yolg‘on ma’lumot taqdim etgan[44].

Farg‘ona viloyatida o‘tkazilgan tekshirishlar shuni ko‘rsatdiki, O‘zbekiston SSR Oliy Soveti Prezidiumi, O‘zbekiston SSR Ministrlar Soveti va O‘zbekiston KP(b) Markaziy Qo‘mitasining Farg‘ona viloyati kolxozlarida paxta yetishtirish bo‘yicha yuqori natijalarga erishganlarni mukofotlash to‘g‘risidagi qarorlari ayrim tuman ijroiya qo‘mitalari tomonidan bajarilmagan. Jumladan, Farg‘ona tuman ijroiya qo‘mitasi raisi Ahmedov 1951 yil 6 iyuldagi farmoyishi bilan velosipedlar va radioqabul qilgichlarni tuman tashkilotlari (MGB, tuman ijroiya qo‘mitasi, O‘zbekiston KP(b) tuman qo‘mitasi va boshqalar) o‘rtasida taqsimlab yuborgan. Holbuki, beshta radioqabul qilgich va beshta velosipeddan faqat ikkita radioqabul qilgich hamda ikkita velosiped Kalinin va Hakimzoda nomidagi kolxozlarga berilgan, bunda ham paxtachilikda erishilgan ko‘rsatkichlar inobatga olinmagan[45].

Quva tuman ijroiya qo‘mitasi ixtiyoriga kelib tushgan 10 ta velosiped, 10 ta tikuv mashinasi va 2 ta mototsikldan “Sotsializm” kolxozi hamda Karl Marks nomidagi kolxozga 4 ta velosiped, 1 ta tikuv mashinasi va 1 ta mototsikl ajratgan[46]. Tuman ijroiya qo‘mitasi raisining o‘rinbosari esa bitta mototsiklni o‘ziga olgan, qolgan barcha buyumlar esa “tuman ijroiya qo‘mitasi ehtiyoji uchun” degan vaj bilan omborda saqlab qolingan.

Toshloq tuman ijroiya qo‘mitasi olingan 10 ta tikuv mashinasi, 10 ta velosiped va 2 ta mototsikldan bitta velosipedni ko‘chirish (pereseleniye) bo‘limiga, bitta mototsiklni qishloq xo‘jaligi bo‘limi va O‘zbekiston KP(b) tuman qo‘mitasiga bergan, bitta tikuv mashinasini esa zaxira sifatida saqlab qolgan. Yuqorida keltirilgan

[43] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 6-varaq.
[44] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 6-varaq.
[45] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 7-varaq.
[46] O‘zMA P-1710-jamg‘arma, 11-ro‘yhat, 644-ish, 7-varaq.

misollar satatistik jihatdan tahlil qilinsa bu kabi holatlar natijasida 1952 yilda prokuratura organlari tomonidan olib borilgan tekshirishlar davlatga yetkazilgan zarar miqdori 7830961 rublni tashkil etadi. Zararni qoplash maqsadida musodara qilingan buyumlar va undirilgan jami miqdor 2752627 rublni tashkil etdi. Bu yetkazilgan zararni 35% tashkil etdi[47].

MUHOKAMA.

Mazkur davrda prokuraturaning asosiy faoliyat yo‘nalishlaridan biri umumiy prokuror nazoratini amalga oshirish bo‘lib, u mahalliy davlat boshqaruvi organlari qabul qilayotgan qarorlarning qonuniyligini tekshirish, qonunbuzilishlarni aniqlash va ularni bartaraf etishga qaratildi. Prokuratura tomonidan noqonuniy qarorlarga protestlar kiritildi, qonun buzilishlarining sabab va shart-sharoitlarini bartaraf etish bo‘yicha taqdimnomalar rasmiylashtirildi hamda aybdor mansabdor shaxslarni javobgarlikka tortish choralari ko‘rildi.

Arxiv hujjatlari tahlili shuni ko‘rsatadiki, 1950-yillarda prokuror nazorati, avvalo, davlat va jamoat mulkini muhofaza qilish, moliyaviy intizomni mustahkamlash, kolxoz va sovxozlar faoliyatida qonunchilik talablariga rioya etilishini ta’minlashga yo‘naltirilgan. Ayniqsa, mahalliy ijroiya qo‘mitalari tomonidan qabul qilingan qonunga zid qarorlarni aniqlash va bekor qilish prokuraturaning umumiy nazorat sohasidagi eng muhim vazifalaridan biri bo‘lgan.

Shu bilan birga, prokuratura organlari mehnat qonunchiligiga rioya qilinishi, davlat rejalarining bajarilishi, budjet mablag‘laridan maqsadli foydalanish hamda sotsialistik mulkni muhofaza qilish ustidan ham tizimli nazoratni amalga oshirdi. Bu faoliyat davlat intizomini mustahkamlash va xalq xo‘jaligini tiklash jarayonini huquqiy jihatdan ta’minlashga xizmat qildi.

Prokuratura organlari tomonidan amalga oshirilgan tekshiruvlar natijasida ko‘plab qonunbuzilishlar bartaraf etildi, davlat va jamoat mulkining talon-toroj qilinishiga qarshi huquqiy choralar ko‘rildi, mahalliy davlat boshqaruvi organlari faoliyatida qonuniylikni ta’minlashga qaratilgan huquqiy amaliyot shakllantirildi. Bu esa prokuraturaning 1950-yillarda davlat boshqaruvi tizimida sotsialistik qonuniylikni ta’minlashning muhim instituti sifatida faoliyat yuritganini tasdiqlaydi.

XULOSA

1950-yillarda O‘zbekiston SSR prokuraturasi faoliyatini tahlil qilish shuni ko‘rsatadiki, mazkur davrda umumiy prokuror nazorati davlat boshqaruvi tizimida qonuniylikni ta’minlashning asosiy huquqiy vositalaridan biriga aylangan. Arxiv hujjatlari prokuraturaning davlat va jamoat mulkini muhofaza qilish, mahalliy davlat organlari tomonidan qabul qilingan noqonuniy qarorlarni bekor qilish, moliyaviy va

[47] O‘zMA R-1710-jamg‘arma, 11-ro‘yhat, 736-ish, 1-5-varaqlar.

mehnat intizomini mustahkamlash hamda qonunbuzilishlarning oldini olishga qaratilgan kompleks faoliyat yuritganini ko‘rsatadi. Shu bilan birga, prokuratura faoliyatining samaradorligi sovet davlatining markazlashgan siyosiy boshqaruv tizimi va partiya nazorati ta’sirida shakllangan bo‘lib, bu holat uning huquqiy vakolatlari bilan amaliy imkoniyatlari o‘rtasida muayyan tafovutlarni yuzaga keltirgan.

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13. O‘zMA R-1710-jamg‘arma, 11-ro‘yhat, 736-ish, 1-5-varaqlar.

ЦИФРОВОЕ МОШЕННИЧЕСТВО КАК ОСОБЫЙ ВИД МОШЕННИЧЕСТВА

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АННОТАЦИЯ

В статье рассматривается цифровое мошенничество как результат трансформации традиционного мошенничества под воздействием цифровизации имущественного оборота. Анализируются особенности объекта и предмета посягательства, способы противоправного завладения имуществом в цифровой среде, механизм причинения имущественного ущерба и содержание умысла виновного. Критически оцениваются положения статей 167 и 168 Уголовного кодекса Республики Узбекистан с точки зрения их применимости к современным схемам хищения, совершаемым посредством информационных систем, цифровых платформ, средств удаленного доступа и приемов социальной инженерии. Обосновывается необходимость законодательного закрепления понятия цифрового мошенничества и уточнения квалифицирующих признаков мошенничества, совершаемого с использованием информационно-коммуникационных технологий.

Ключевые слова: *мошенничество, цифровое мошенничество, хищение, информационные технологии, информационная система, социальная инженерия, электронные денежные средства, уголовная ответственность.*

ABSTRACT

The article examines digital fraud as a result of the transformation of traditional fraud under the influence of the digitalization of property relations and economic transactions. It analyzes the specific features of the object and subject matter of the criminal encroachment, the methods of unlawful appropriation of property in the digital environment, the mechanism through which pecuniary damage is caused, and the content of the offender's intent. Articles 167 and 168 of the Criminal Code of the Republic of Uzbekistan are critically assessed in terms of their applicability to contemporary forms of property appropriation committed through information systems, digital platforms, remote-access tools, and social engineering techniques. The article substantiates the need to introduce a statutory definition of digital fraud and to clarify the qualifying circumstances applicable to fraud committed through information and communication technologies.

Keywords: *fraud, digital fraud, misappropriation of property, information technologies, information system, social engineering, electronic money, criminal liability.*

Цифровизация общественных отношений качественно изменила не только формы экономического оборота, но и механизм совершения преступлений против собственности. Денежные средства, имущественные права и юридически значимая информация все чаще существуют, передаются и подтверждаются посредством банковских приложений, информационных систем, цифровых платформ и средств электронной идентификации. Вследствие этого мошенничество постепенно утрачивает исключительно традиционную форму непосредственного обмана потерпевшего и приобретает признаки технологически организованного дистанционного посягательства.

Действующая статья 168 Уголовного кодекса Республики Узбекистан определяет мошенничество как завладение чужим имуществом или правом на чужое имущество путем обмана или злоупотребления доверием.[1] Пунктом «в» части третьей данной статьи отдельно предусмотрено совершение мошенничества с использованием информационной системы, в том числе информационных технологий.[1] Такое дополнение свидетельствует о признании законодателем повышенной общественной опасности технологически опосредованного мошенничества. Вместе с тем существующая конструкция не разрешает всех вопросов квалификации современных цифровых схем.

В научной литературе для обозначения рассматриваемых деяний используются понятия «кибермошенничество», «дистанционное мошенничество», «компьютерное мошенничество» и «цифровое мошенничество». Эти категории не являются полностью тождественными. Понятие киберпреступности охватывает широкий круг посягательств, направленных не только против собственности, но и против безопасности информационных систем, конфиденциальности данных и устойчивости цифровой инфраструктуры. Дистанционность характеризует отсутствие непосредственного физического контакта между виновным и потерпевшим, однако не раскрывает технологическую природу преступления [4; 7]. Компьютерное мошенничество, напротив, может быть понято слишком узко – как деяние, связанное преимущественно с воздействием на компьютерную информацию.

Наиболее содержательным представляется понятие цифрового мошенничества, поскольку оно охватывает хищения, при которых информационно-коммуникационные технологии используются для создания обмана, воздействия на волю потерпевшего, получения доступа к имуществу, осуществления транзакции, сокрытия личности виновного либо легализации преступного результата. В исследовании Д.М. Ибатуллиной информационные технологии предлагается рассматривать не как самостоятельный способ хищения, а как средство реализации мошеннического умысла, позволяющее установить контакт с потерпевшим, расширить круг потенциальных жертв и обеспечить удаленное завладение имуществом [4]. Данный подход заслуживает поддержки, но требует уточнения применительно к различным механизмам цифрового посягательства.

Цифровое мошенничество сохраняет основной объект традиционного мошенничества – общественные отношения собственности. Однако цифровая форма деяния нередко затрагивает также отношения, обеспечивающие безопасность использования персональных данных, банковской информации, средств аутентификации и информационных систем. Эти отношения не во всех случаях образуют самостоятельный дополнительный объект преступления. Например, направление потерпевшему ложного сообщения от имени банка нарушает установленный порядок безопасного информационного взаимодействия, но основная направленность умысла виновного заключается в завладении денежными средствами. Иная ситуация возникает при неправомерном проникновении в информационную систему, блокировании или изменении данных: в таких случаях наряду с собственностью может непосредственно нарушаться информационная безопасность, что ставит вопрос о квалификации содеянного по совокупности преступлений.

Специфика цифрового мошенничества проявляется и в предмете посягательства. Им могут выступать наличные и безналичные денежные средства, электронные деньги, денежные средства на банковских счетах, имущественные права, цифровые финансовые активы, права требования, учетные записи, подарочные сертификаты и иные объекты, обладающие экономической ценностью. Вместе с тем персональные данные, пароль, код подтверждения, реквизиты банковской карты или ключ доступа сами по себе не всегда являются предметом хищения. В большинстве случаев они выступают средством получения контроля над имуществом либо промежуточным объектом противоправного воздействия.

Поэтому цифровая природа мошенничества определяется не только нематериальной формой имущества. Если лицо посредством социальной сети размещает объявление о продаже несуществующего товара и получает от потерпевшего обычный банковский перевод, предметом преступления остаются денежные средства. Цифровой характер деяния обусловлен механизмом формирования и реализации обмана: созданием ложного цифрового образа продавца, использованием платформы для поиска потерпевшего, дистанционным сообщением недостоверной информации и получением денежных средств через электронную платежную инфраструктуру.

Особенностью цифрового мошенничества является сочетание юридического способа хищения с техническими приемами его реализации. Юридически обязательным способом мошенничества остаются обман или злоупотребление доверием. Фишинговые сайты, подмена телефонных номеров, вредоносные ссылки, ложные аккаунты, программы удаленного доступа, поддельные платежные страницы и технологии синтеза голоса являются не самостоятельными формами хищения, а инструментами, посредством которых создается или поддерживается заблуждение потерпевшего.

Однако не каждое цифровое завладение имуществом образует мошенничество. Для мошенничества принципиально, что потерпевший либо иное уполномоченное лицо под влиянием обмана совершает юридически или фактически значимое действие: переводит денежные средства, сообщает сведения для доступа, подтверждает операцию, передает имущество либо предоставляет право на него. Если же денежные средства списываются без волеизъявления потерпевшего посредством непосредственного технического вмешательства в информационную систему, конструкция обмана как способа добровольной передачи имущества становится менее очевидной.

Пленум Верховного суда Республики Узбекистан разъясняет, что мошенничество с использованием информационной системы может совершаться посредством изменения информации, обрабатываемой или хранящейся в компьютерной системе, а также путем введения в систему ложной информации. Такое толкование расширяет сферу действия статьи 168 УК [2]. Вместе с тем оно частично сближает мошенничество с деяниями, при которых имущество изымается вследствие манипулирования информационной системой, а не вследствие введения человека в заблуждение.

Представляется, что разграничение должно осуществляться в зависимости от механизма перехода имущества. Если имущество передается самим потерпевшим или уполномоченным лицом под влиянием ложной информации,

содеянное соответствует классической конструкции мошенничества. Если виновный вводит ложные данные в автоматизированную систему и решение о перечислении средств принимается системой без непосредственного волеизъявления человека, такое деяние образует особую разновидность цифрового хищения. Его отнесение к мошенничеству возможно только при прямом указании закона, поскольку информационная система не обладает сознанием и не может быть обманута в уголовно-правовом смысле.

Субъективная сторона цифрового мошенничества характеризуется прямым умыслом и корыстной целью. Виновный осознает ложность сообщаемой информации либо противоправный характер цифрового воздействия, предвидит переход чужого имущества под свой контроль и желает наступления данного результата. При этом содержание умысла охватывает не только завладение имуществом, но и функциональное назначение применяемых технологий.

Например, лицо, создающее копию банковского сайта, должно понимать, что этот ресурс предназначен для введения пользователей в заблуждение и получения их платежных данных. Участник преступной группы, предоставляющий банковскую карту для зачисления похищенных средств, подлежит ответственности за соучастие в мошенничестве только тогда, когда установлено, что он осознавал преступный характер операций и желал содействовать завладению чужим имуществом. Сам факт предоставления карты или абонентского номера без доказывания осведомленности о мошеннической схеме недостаточен для вывода о наличии совместного умысла.

Для цифрового мошенничества характерна возможность поэтапного формирования преступного результата. Один участник создает техническую инфраструктуру, другой вступает в контакт с потерпевшим, третий принимает денежные средства, четвертый обналичивает или переводит их через цепочку счетов. В связи с этим при квалификации необходимо устанавливать интеллектуальный и волевой элементы умысла каждого участника, а не автоматически вменять всем лицам весь объем действий преступной группы.

Критического анализа требует соотношение статьи 168 УК со статьей 167 УК Республики Узбекистан [1]. Статья 167 предусматривает ответственность за присвоение или растрату чужого имущества, вверенного виновному либо находящегося в его ведении. В качестве особо квалифицирующего обстоятельства пункт «г» части третьей статьи называет использование средств компьютерной техники. Следовательно, применение данной нормы предполагает наличие двух обязательных условий: имущество первоначально находилось у виновного на законном основании и было ему вверено либо

находилось в его ведении; компьютерная техника использовалась при последующем противоправном обращении данного имущества.

Поэтому статья 167 УК не предназначена для квалификации большинства распространенных схем цифрового мошенничества. Денежные средства потерпевшего, полученные посредством фишинга, ложного интернет-магазина, телефонного обмана или поддельного инвестиционного сервиса, до совершения преступления не были вверены виновному. Их переход осуществляется именно вследствие обмана, что соответствует статье 168 УК. Пункт «г» части третьей статьи 167 применим преимущественно к ситуациям, когда работник банка, бухгалтер, оператор информационной системы или иное лицо, имеющее законный доступ к вверенному имуществу, использует компьютерную технику для его присвоения или растраты [1].

Формулировка «с использованием средств компьютерной техники» в статье 167 УК представляется устаревшей. Она ориентирована на материальное устройство – компьютер и его технические компоненты, тогда как современное цифровое хищение может совершаться посредством облачного сервиса, мобильного приложения, автоматизированного программного интерфейса, распределенной информационной системы или похищенных средств цифровой идентификации. Кроме того, само использование компьютера может не повышать общественную опасность присвоения: например, составление фиктивного электронного документа на служебном компьютере технически соответствует данной формулировке, хотя компьютер не играет определяющей роли в механизме хищения.

Более современной является конструкция пункта «в» части третьей статьи 168 УК, содержащая указание на информационную систему и информационные технологии. Однако она также имеет недостатки. Во-первых, термин «с использованием» обладает чрезмерно широким содержанием. Практически любое современное мошенничество может включать телефонный звонок, электронную переписку или перевод денежных средств через банковское приложение. Формальное применение квалифицирующего признака ко всем таким случаям способно необоснованно уравнять простое использование средства связи и сложное технологически организованное вмешательство в цифровую инфраструктуру.

Во-вторых, действующая норма не разграничивает использование информационных технологий как обычного средства коммуникации и их функциональное применение для создания ложной цифровой идентичности, автоматизированного воздействия на неопределенный круг лиц, получения

несанкционированного доступа либо манипулирования информацией. В-третьих, статья 168 УК не содержит легального определения цифрового мошенничества и не устанавливает четких критериев его отграничения от кражи, присвоения, неправомерного доступа к компьютерной информации и причинения имущественного ущерба путем обмана.

Необходимость дальнейшего совершенствования законодательства согласуется и с целями Стратегии кибербезопасности Республики Узбекистан на 2026–2030 годы, предусматривающей повышение эффективности предупреждения преступлений в сфере информационных технологий, развитие цифровой криминалистики и проведение исследований правовых аспектов противодействия современным киберпреступлениям [3].

Представляется целесообразным закрепить в примечании к статье 168 УК следующее определение:

«Цифровым мошенничеством признается завладение чужим имуществом или приобретение права на чужое имущество путем обмана либо злоупотребления доверием, при котором информационно-коммуникационные технологии, информационные системы, электронные сети или средства цифровой идентификации используются для формирования или поддержания заблуждения потерпевшего, получения доступа к имуществу либо обеспечения его противоправного перехода к виновному или другим лицам».

Предложенное определение сохраняет обязательную связь цифрового мошенничества с обманом или злоупотреблением доверием и одновременно раскрывает функциональную роль технологий. Простое использование телефона или компьютера, не имеющее существенного значения для механизма хищения, не должно автоматически образовывать квалифицированный состав.

Пункт «в» части третьей статьи 168 УК целесообразно изложить более конкретно: «с использованием информационно-коммуникационных технологий, информационных систем или средств цифровой идентификации, существенно облегчивших совершение преступления, обеспечивших дистанционное воздействие на потерпевшего, автоматизированное распространение обмана либо неправомерный доступ к его имуществу».

Дополнительными квалифицирующими признаками цифрового мошенничества могут быть признаны: совершение деяния посредством неправомерного использования персональных или аутентификационных данных; создание поддельного цифрового ресурса либо цифровой идентичности; применение средств автоматизации для воздействия на множество потерпевших; совершение преступления организованной группой с

распределением технических и финансовых функций; использование технологий искусственного интеллекта для имитации личности другого лица.

Одновременно формулировку пункта «г» части третьей статьи 167 УК целесообразно заменить указанием на использование информационной системы или информационно-коммуникационных технологий, если их применение обеспечило доступ к вверенному имуществу, изменение сведений о нем либо сокрытие его противоправного обращения. Это позволит связать квалифицирующий признак не с фактом наличия компьютера, а с его существенной ролью в механизме присвоения или растраты.

Таким образом, цифровое мошенничество представляет собой не только традиционный обман, перенесенный в электронную среду. Его специфика выражается в цифровом механизме формирования заблуждения, удаленном управлении поведением потерпевшего, использовании электронных средств доступа к имуществу, высокой масштабируемости и возможности распределения преступных функций между несколькими лицами. Статья 168 УК Республики Узбекистан в целом позволяет квалифицировать значительную часть подобных деяний, однако широкая формулировка признака использования информационных технологий не обеспечивает необходимой определенности. Статья 167 УК применима лишь к случаям противоправного обращения имущества, ранее вверенного виновному, и не может рассматриваться как общая норма о цифровом хищении.

Закрепление легального определения цифрового мошенничества, уточнение функциональной роли информационных технологий и разграничение обмана человека и манипулирования автоматизированной системой позволят повысить определенность уголовного закона и обеспечить единообразную квалификацию современных цифровых способов противоправного завладения имуществом.

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THE PEOPLE'S REPUBLIC OF CHINA'S STRATEGIC PARTNERSHIP DIPLOMACY: CONCEPTUAL FRAMEWORK, INSTRUMENTS, AND FIELDS OF APPLICATION

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ABSTRACT

This article examines the People's Republic of China's (PRC) strategic partnership diplomacy, a central instrument of Chinese foreign policy since the 1990s. Because the concept of "strategic partnership" still lacks an internationally agreed definition, the study treats this conceptual ambiguity as its central problem, asking what conceptual foundations, institutional tools, and foreign-policy principles underlie China's strategic partnership diplomacy, and how this diplomacy relates to China's declared "core interests." Drawing on Chinese official statements and the international relations literature, the article traces the evolution of the concept from "comprehensive cooperation" toward "strategic partnership", analyzes the institutional mechanisms China has developed - joint committees, strategic dialogues, hotlines, and public-diplomacy programmes - and examines the China-Russia relationship as the most institutionalised case. The study further situates strategic partnership diplomacy within the Belt and Road Initiative and reviews critical debates about whether these instruments represent a revisionist challenge to the existing international order or a flexible, non-binding form of cooperation. The article concludes that strategic partnership diplomacy functions both as a rhetorical device and as an institutionalised foreign-policy practice closely tied to China's concerns over sovereignty, security, and territorial integrity.

Keywords: *China, strategic partnership, foreign policy, Belt and Road Initiative, diplomacy.*

ANNOTATSIYA

Ushbu maqolada Xitoy Xalq Respublikasining (XXR) 1990-yillardan beri Xitoy tashqi siyosatining markaziy vositalaridan biriga aylangan strategik hamkorlik diplomatiyasi tahlil qilinadi. "Strategik hamkorlik" tushunchasi xalqaro miqyosda kelishilgan yagona ta'rifga ega bo'lmagani sababli, tadqiqotning asosiy muammosi ushbu tushunchaviy noaniqlikdir: Xitoyning strategik hamkorlik diplomatiyasi qanday kontseptual asoslarga, institutsional vositalarga va tashqi siyosat tamoyillariga tayanadi hamda bu diplomatiya Xitoyning e'lon qilingan "asosiy manfaatlari" bilan qanday bog'liq? Xitoy rasmiy hujjatlari va xalqaro munosabatlar adabiyotiga tayangan holda, maqolada tushunchaning "keng qamrovli hamkorlik"dan "strategik hamkorlik"ka qarab evolyutsiyasi, Xitoy tomonidan ishlab chiqilgan qo'shma qo'mitalar, strategik muloqotlar, to'g'ridan-to'g'ri aloqa liniyalari va ommaviy diplomatiya kabi institutsional mexanizmlar hamda eng institutsionallashgan misol sifatida Xitoy-Rossiya munosabatlari ko'rib chiqiladi. Tadqiqot, shuningdek, strategik hamkorlik diplomatiyasini "Bir kamar, bir yo'l"

tashabbusi konteksti bilan bog'laydi va ushbu vositalarning mavjud xalqaro tartibga qarshi revizionistik tahdid ekanligi yoki moslashuvchan, majburiy bo'lmagan hamkorlik shakli ekanligi haqidagi tanqidiy munozaralarni ko'rib chiqadi. Maqola, strategik hamkorlik diplomatiyasi Xitoyning suverenitet, xavfsizlik va hududiy yaxlitlik manfaatlari bilan chambarchas bog'liq bo'lgan ham ritorik, ham institutsionallashgan tashqi siyosat amaliyoti sifatida faoliyat yuritishi xulosasiga keladi.

Kalit so'zlar: *Xitoy, strategik hamkorlik, tashqi siyosat, Bir kamar - bir yo'l tashabbusi, diplomatiya.*

АННОТАЦИЯ

В данной статье рассматривается дипломатия стратегического партнёрства Китайской Народной Республики (КНР), являющаяся одним из центральных инструментов внешней политики Китая начиная с 1990-х годов. Поскольку понятие «стратегическое партнёрство» до сих пор не имеет единого, согласованного на международном уровне определения, основной проблемой исследования выступает именно эта концептуальная неопределённость: на каких концептуальных основах, институциональных инструментах и принципах внешней политики строится дипломатия стратегического партнёрства Китая и как она соотносится с провозглашёнными «коренными интересами» КНР? Опираясь на официальные заявления китайского руководства и литературу по международным отношениям, статья прослеживает эволюцию понятия от «всестороннего сотрудничества» к «стратегическому партнёрству», анализирует институциональные механизмы, разработанные Китаем — совместные комитеты, стратегические диалоги, линии прямой связи и программы публичной дипломатии, — а также рассматривает китайско-российские отношения как наиболее институционализированный пример подобного партнёрства. Исследование также помещает дипломатию стратегического партнёрства в контекст инициативы «Один пояс, один путь» и анализирует критические дискуссии о том, представляют ли эти инструменты ревизионистский вызов существующему международному порядку или являются гибкой, не имеющей обязывающего характера формой сотрудничества. В заключение утверждается, что дипломатия стратегического партнёрства функционирует одновременно как риторический приём и как институционализированная внешнеполитическая практика, тесно связанная с интересами суверенитета, безопасности и территориальной целостности Китая.

Ключевые слова: *Китай, стратегическое партнёрство, внешняя политика, инициатива «Один пояс, один путь», дипломатия.*

INTRODUCTION

Following the end of the Cold War, alongside the traditional alliance-based understanding of security, a new diplomatic instrument emerged in the international

system that allowed inter-state relations to be institutionalised in more flexible and multidimensional forms: the strategic partnership. Since the 1990s in particular, this concept has occupied a central place in the foreign-policy practice of the People's Republic of China (PRC) and has become one of the principal instruments through which Beijing manages the process of globalisation in accordance with its own interests[48]. China's network of strategic partnerships has continuously expanded from its first examples in the 1990s to the present day, coming to encompass a wide spectrum ranging from great powers to developing countries, and from regional organisations to supranational structures[49]. This expansion is notable in that it demonstrates China's capacity to establish flexible forms of cooperation not only with great powers, but also with states at different levels of development and under different political regimes.

The concept of strategic partnership still lacks a single, agreed-upon definition in the international relations literature. Different states use this concept to describe widely divergent forms of cooperation, which weakens its analytical clarity[50]. The situation is even more complex in China's case: alongside the term "strategic partnership", Beijing has produced numerous sub-categories such as "comprehensive strategic cooperation", "energy strategic partnership", and "strategic friendly relations"; this diversity makes it difficult to grasp the concept coherently at both the academic and political levels[51]. The problem is not merely terminological but also functional: unless the distinction between strategic partnerships and alliances, their degree of bindingness, and their relationship to China's "core interests" are clearly established, the real weight of this diplomatic instrument within Chinese foreign policy cannot be adequately understood.

The purpose of this study is to provide a holistic examination of the PRC's strategic partnership diplomacy through its conceptual framework, institutional instruments, and concrete cases of application - particularly the China-Russia relationship and the Belt and Road Initiative. The study aims to demonstrate that, for China, strategic partnership is not merely a symbolic discourse but a calculated and institutionalised foreign-policy instrument geared toward securing national interests. The significance of the topic becomes apparent at two levels. First, in the process of China's rise as a global power, strategic partnerships constitute concrete evidence of a search for a more flexible and multilateral world order distinct from the traditional alliance system[52]. Second, the fact that many states, including Turkey, have established strategic partnerships or similar statuses with China makes understanding the logic of

[48]Feng Zhongping and Huang Jing, "China's Strategic Partnership Diplomacy: Engaging with a Changing World", ESPO Working Paper, No. 8, July 2014, p. 3.

[49]Georg Strüver, "China's Partnership Diplomacy: International Alignment Based on Interests or Ideology", The Chinese Journal of International Politics, Vol. 10, No. 1, 2017, pp. 32-40.

[50]Feng and Huang, op. cit., p. 5.

[51]Feng and Huang, op. cit., pp. 7-8.

[52]Strüver, op. cit., pp. 60-63.

this diplomacy a practical necessity for the management of bilateral relations as well[53].

Within this framework, the study's central research question can be formulated as follows: On what conceptual foundations, institutional instruments, and foreign-policy principles does the PRC's strategic partnership diplomacy rest, and how does this diplomacy relate to China's "core interests"? Related sub-questions addressed throughout the study include: at which points does strategic partnership diverge from comprehensive cooperation; what features characterise the China-Russia relationship as the most developed example of this model; and in what direction does the Belt and Road Initiative transform the strategic partnership network?

CONCEPTUAL FRAMEWORK: WHAT IS A "STRATEGIC PARTNERSHIP"?

In the context of the relations developing with the European Union in the early 2000s, China began to speak of two distinct types of partnership: "comprehensive cooperation" and "strategic partnership"[54]. Comprehensive cooperation refers to a broad form of relationship encompassing economic, scientific, technological, political, and cultural fields, which may be bilateral or multilateral and may be conducted by non-governmental as well as governmental actors. Strategic partnership, by contrast, carries a long-term and stable character; it denotes a type of relationship in which the parties have delineated a broad framework of cooperation and, being aware of this framework, possess the capacity to withstand certain events that may otherwise have a negative impact[55].

In China's use of the concept, the phrase "mutual respect and trust" frequently comes to the fore[56]. As Georg Strüver has also emphasised, China's partnership diplomacy is more than a purely rhetorical gesture; it is a mechanism that measurably affects economic relations as well as the convergence of views on the international order[57]. For this reason, strategic partnerships do not merely confer a nominal title upon bilateral relations but also carry the potential to expand China's influence over international political outcomes[58].

HISTORICAL DEVELOPMENT AND INSTITUTIONAL INSTRUMENTS

China's network of strategic partnerships has been built step by step since the 1990s; beginning in the mid-1990s, partnerships under various names were established with states such as Russia, South Korea, and India, and from the 2000s onward this network was expanded to cover Latin America, the Middle East, Africa,

[53]Turkish Foreign Policy Research Center (TUDPAM), "The Recently Developing Strategic Partnership between Turkey and the People's Republic of China", tudpam.org, accessed 11 August 2026.

[54]Mission of the People's Republic of China to the European Union, "China-EU Relations", http://www.chinamission.be/eng/zt/t101949.htm, accessed 28 January 2021.

[55]Feng and Huang, op. cit., pp. 7-8.

[56]Feng and Huang, op. cit., p. 9.

[57]Strüver, op. cit., p. 33.

[58]Strüver, op. cit., p. 61.

and Europe[59]. The principle of "increasing mutual trust" forms a common ground across all of China's bilateral relations and functions as a preparatory stage that may eventually lead to the level of strategic partnership. In economically oriented relations, China tends to establish joint committees or dialogue mechanisms with its counterpart, while in military and political relations, strategic dialogue meetings and direct hotline mechanisms have become an integral part of Chinese diplomacy[60]. At the level of public diplomacy, festivals, education programmes, and language institutes contribute to the institutionalisation of social and cultural relations[61].

CASE STUDY: THE CHINA-RUSSIA STRATEGIC PARTNERSHIP

The most developed application of China's strategic partnership mechanisms is its relationship with Russia. Within this framework, institutions have been established that bring heads of state and heads of government together on an annual basis: the "Regular Meetings Committee of Prime Ministers", the "Energy Negotiations Meeting", the "China-Russia Strategic Security Consultation", and the "China-Russia Friendship, Peace and Development Committee" are the principal such institutional structures[62]. Recent literature suggests that this relationship is characterised by pragmatic, interest-based partnership rather than an ideological alliance; that both parties seek to preserve their strategic autonomy while avoiding direct confrontation with the United States; and that the relationship can therefore be better explained through the concepts of "strategic ambiguity" and "limited coordination" rather than as an institutionalised alliance.

CORE INTERESTS AND THE LIMITS OF STRATEGIC PARTNERSHIP DIPLOMACY

China's strategic partnership diplomacy rests on a logic that combines both defensive and assertive elements. Among the "core interests" articulated in China's official discourse are state sovereignty, national security, territorial integrity, and national reunification[63]. Within this framework, relations with numerous states, foremost the United States, acquire strategic importance around the "One China Policy". While the principles of "good-neighbourliness and friendship" are invoked to reduce threats to regional integrity, joint strategic declarations developed with Central Asian states include commitments not to join any military alliance directed against either party and not to allow their territories to be used by third states for such purposes[64]. This, as in the case of the China-Pakistan Economic Corridor, points to a

[59]Feng and Huang, op. cit., pp. 3-4; Strüver, op. cit., pp. 40-45.
[60]Feng and Huang, op. cit., pp. 9-10.
[61]Feng and Huang, op. cit., pp. 12-13.
[62]Arzu Çetinkaya, "The Structural Dynamics of the Russia-China Strategic Partnership: Asymmetry, Uncertainty and the Alliance Debate", Anadolu University Journal of Social Sciences, Vol. 26, No. 1, 2026, pp. 489-510.
[63]Information Office of the State Council of China, China's Peaceful Development, 2011, http://english.gov.cn/official/2011-09/06/content_1941354.htm, accessed 28 January 2021.
[64]Iram Khalid and Manzoor Khan Afridi, "Interdependence Politics: The Case of the China-Pakistan Economic Corridor", Journal of South Asian Studies, Vol. 31, No. 2, July-December 2016, pp. 659-671.

diplomatic practice in which economic interdependence and security concerns are closely intertwined[65].

A similar pattern is observed in China's relations with developing countries; Beijing positions the establishment of strategic partnerships with states seeking a multipolar international order as one of the cornerstones of its major-country diplomacy[66]. In this respect, the strategic partnership network is no longer confined to great powers alone but has become part of a multilayered foreign-policy architecture that is also integrated with large-scale projects such as the Belt and Road Initiative.

DISTINCTIVE FEATURES OF CHINESE DIPLOMACY

The PRC's strategic partnership diplomacy displays a number of distinctive features. Foremost among these are the importance attached to formality, the central role of head-of-state-level relations, and the incorporation of societal dynamics into foreign policy. It has been argued that the fact that China's own name means "central state" (Zhongguo) leaves traces of a certain self-centred approach in its diplomacy as well; within this framework, China tends to evaluate regional and global actors according to their degree of closeness to itself[67]. This, however, does not eliminate China's effort to avoid discourse and behaviour that could be equated with imperialism. Another defining feature of Chinese diplomacy can be described as "strategic patience"; Beijing consistently upholds the principles of multipolarity, non-interference in internal affairs, and respect for diverse development models.

THE RELATIONSHIP BETWEEN THE BELT AND ROAD INITIATIVE AND STRATEGIC PARTNERSHIP DIPLOMACY

The Belt and Road Initiative (BRI), announced in 2013, is another large-scale foreign-policy instrument closely intertwined with China's strategic partnership diplomacy. Participation in the BRI takes place through memoranda of understanding signed between states and China, and these documents do not impose directly binding obligations on the parties; this low-cost model of participation facilitates states' decisions to join the initiative[68]. The same research shows that states with democratic governance tend to be more cautious about joining the BRI, because they perceive the political cost of participating in a China-led initiative as higher. This finding is significant in that it shows strategic partnership status to be related not only to economic factors but also to variables such as regime type and political affinity.

The infrastructure, energy, and transport projects built within the BRI framework are concentrated in a geography that overlaps considerably with China's strategic partnership network, thereby filling these partnerships with concrete economic content[69]. In this sense, the Belt and Road Initiative functions as an implementation

[65]Khalid and Afridi, op. cit., pp. 665-667.

[66]Özlem Zerrin Keyvan, "The Transformation of Chinese Foreign Policy from the Beginning to the Present: Major Country Diplomacy", Liberal Düşünce Dergisi, Year 27, No. 106, Spring 2022, pp. 141-153.

[67]Xiaotong Fei, From the Soil: The Foundations of Chinese Society, trans. Gary G. Hamilton and Wang Zheng, Berkeley: University of California Press, 1992, p. 65.

[68]Eleanor Atkins, M. Taylor Fravel, Raymond Wang, Nick Ackert and Sihao Huang, "Two Paths: Why States Join or Avoid China's Belt and Road Initiative", Global Studies Quarterly, Vol. 3, No. 3, 2023, pp. 1-14.

[69]Keyvan, op. cit., pp. 160-165.

mechanism that translates the symbolic dimension of strategic partnership diplomacy into concrete investment and financing relations; the two mechanisms mutually reinforce one another.

CRITICAL ASSESSMENT AND DISCUSSION

China's strategic partnership and Belt and Road diplomacy have not been received uncontroversially in the literature. One group of scholars argues that these instruments position China as a revisionist actor challenging the traditionally Western-centred international order and serve the pursuit of a "China-centric world order"[70]. According to this critical approach, the relations of economic dependency created through infrastructure investment carry the potential to narrow the room for manoeuvre of recipient states. By contrast, and as in the case of the China-Russia relationship, other scholars approach the revisionist reading with caution, emphasising that strategic partnerships are flexible arrangements characterised by "strategic ambiguity" that preserve the autonomy of the parties rather than constituting institutionalised alliances[71]. The tension between these two approaches shows that the academic debate over how to conceptualise strategic partnership diplomacy remains open, and that further empirical and comparative research on the subject is needed.

CONCLUSION

This study has examined the PRC's strategic partnership diplomacy in its conceptual, institutional, and applied dimensions. The findings indicate that strategic partnership is, for China, both a discursive and a functional instrument, resting - unlike comprehensive cooperation - on an axis of long-term stability and mutual trust. The China-Russia case shows how this diplomacy is made concrete through institutionalised committees and regular summits, while the examples of Central Asia and the One China Policy demonstrate the extent to which strategic partnership is intertwined with China's sovereignty and security concerns. The connection with the Belt and Road Initiative, in turn, reveals how the strategic partnership network is carried from the discursive level to concrete economic investment. In conclusion, strategic partnership diplomacy can be regarded as the principal foreign-policy instrument through which China institutionalises its vision of world order - on the basis of multipolarity, mutual respect, and non-interference in internal affairs. Within this framework, the answer to the research question is that strategic partnership functions for China both as a discourse and as a foreign-policy practice supported by concrete institutional mechanisms, and that this practice operates in direct connection with the goal of protecting China's core interests - sovereignty, security, and territorial integrity. Nevertheless, the question of whether strategic partnerships transform China into a revisionist actor or instead represent a flexible, autonomy-preserving form of cooperation remains contested in the literature. For future

[70]Iat Ara Jasmin, Imran Hosen and Ananda Kumar Biswas, "Geopolitical Chessboard: China's Belt and Road Initiative and Shifting Power Dynamics", Discover Global Society, 2025.
[71]Çetinkaya, op. cit., pp. 495-498.

research, quantitative comparative analyses of the concrete economic and security outcomes of strategic partnerships are recommended.

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THE FOUNDATIONAL PILLAR OF NATION-BUILDING: LAW

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ABSTRACT

This article argues that law is the foundational pillar of nation-building - not one instrument among several, but the structural element upon which the other components of a nation rest. Where the study of nation-building has emphasised shared language, common memory, education and market integration, this article contends that these unify a population into a nation only when they are ordered, guaranteed and rendered durable by law. It develops the argument in six movements. It first distinguishes the state from the nation and locates law at the point where the two meet. It then sets out four functions through which law builds the nation: constituting the political community and its membership (citizenship); defining and limiting public power (constitutionalism and the rule of law); integrating a plural society into a single civic order (equality before the law); and generating the trust and predictability on which cooperation, welfare and a shared future depend. Drawing on the theory of nations and nationalism, institutional economics, and legal and constitutional theory, the article maintains that a nation without law is a population without a shared framework, and that the durability of any nation is finally a function of the quality, equality and legitimacy of its law. It closes with the risks of an over-legalised or instrumentalised understanding of law, and with principles for a law-centred conception of nation-building.

Keywords: *nation-building; law; rule of law; constitutionalism; citizenship; legitimacy; institutions; social trust.*

АННОТАЦИЯ

В статье утверждается, что право является основополагающей опорой государственно-национального строительства — не одним из многих инструментов, а тем структурным элементом, на котором держатся остальные составляющие нации. Если исследования национального строительства подчёркивали общий язык, общую память, образование и рыночную интеграцию, то в данной работе утверждается, что эти элементы объединяют население в нацию лишь тогда, когда они упорядочены, гарантированы и сделаны устойчивыми правом. Аргумент разворачивается в шести частях. Сначала различаются государство и нация, а право помещается в точке их встречи. Затем выделяются четыре функции, через которые право строит нацию: конституирование политического сообщества и членства в нём (гражданство); определение и ограничение публичной власти (конституционализм и верховенство права); интеграция плюралистического общества в единый гражданский порядок (равенство перед законом); и создание доверия и предсказуемости, от которых зависят сотрудничество,

благосостояние и общее будущее. Опираясь на теорию наций и национализма, институциональную экономику и правовую теорию, автор утверждает, что нация без права — это население без общей рамки, а устойчивость любой нации в конечном счёте есть функция качества, равенства и легитимности её права.

Ключевые слова: *национальное строительство; право; верховенство права; конституционализм; гражданство; легитимность; институты; общественное доверие.*

INTRODUCTION

Every nation is a construction, and every construction rests on a foundation. The literature on nation-building has proposed many candidates for that foundation: a shared language, a common history and memory, a national system of education, a unified market, a set of symbols and myths, an ethnic core, a civic creed. Each of these has been shown to matter, and each has generated a rich body of scholarship. This article advances a different and, it will argue, more fundamental claim: that beneath all of these lies a single load-bearing pillar - law. Language, memory, education and market may furnish the materials of a nation, but it is law that turns those materials into a structure. A shared language without a legal order that recognises it, a common memory without institutions that transmit it, a market without rules that govern it, a people without a constitution that constitutes it - none of these is yet a nation. Law is the element that binds the rest into a durable whole.

The claim is easy to state and easy to underestimate, because law is so pervasive that it becomes invisible - the water in which political life swims. Precisely because it is everywhere, it is rarely named as the foundation; it is treated as a technical instrument in the service of other, supposedly deeper forces such as identity or economy. This article reverses that ordering. It argues that identity and economy themselves become nation-building forces only when they are given legal form - when belonging becomes citizenship, when memory becomes a constitutional narrative, when exchange becomes contract and property, when power becomes office. In each case, law is not the servant of the deeper force but the form through which the force acquires public reality and endurance.

The argument unfolds in six movements. Section 2 distinguishes the state from the nation and locates law at the junction where the machinery of the state becomes the shared home of the nation. Section 3 examines law as the constitutive act of the political community and of membership in it - the law of citizenship. Section 4 turns to law as the definition and limitation of public power - constitutionalism and the rule of law. Section 5 considers law as the integrator of a plural society into a single civic order - equality before the law. Section 6 analyses law as the generator of trust, predictability and a shared future - the social and economic yield of legality. Section 7 addresses the limits and risks of a law-centred view, and Section 8 concludes. Throughout, the guiding thesis is constant: that law is not one pillar among the pillars

of nation-building but the foundational pillar on which the others stand, and that the durability of a nation is, in the last analysis, the durability of its law.

State and Nation: Where Law Stands Between Them

Any account of law in nation-building must begin by distinguishing two things that ordinary language runs together: the state and the nation. The state, in the classic definition, is the apparatus that successfully claims the monopoly of legitimate force over a territory; the nation is the imagined community of people who understand themselves as belonging together and as the rightful bearers of political self-rule.[72] Benedict Anderson taught a generation that the nation is 'imagined' - that its members will never know most of their fellows yet hold in their minds the image of their communion.[73] Ernest Gellner argued that nations are made, not found - that industrial society, with its need for a mobile, literate, interchangeable workforce, called forth the culturally homogeneous nation and the educational state that produces it.[74] Charles Tilly showed how war and the extraction it required drove the formation of the modern state itself.[75] These are theories of how populations become peoples and how apparatuses become states.

What these accounts share, and what this article foregrounds, is that neither the state nor the nation coheres without law. The state's monopoly of force is a legal claim: it is not mere violence but authorised violence, force exercised under and limited by rules, and it is the rules that distinguish a state from a mere army or a mafia. The nation's self-understanding, likewise, becomes politically effective only when it is inscribed in law - in a constitution that names the people as sovereign, in citizenship statutes that define who belongs, in the official status of a language, in the legal recognition of a calendar of memory. Law is the hinge on which state and nation turn toward one another: it converts the state's coercive capacity into legitimate authority, and it converts the nation's felt solidarity into enforceable rights and duties. The state without law is domination; the nation without law is sentiment; it is law that makes the one legitimate and the other durable.

This is why nation-building, understood as the deliberate creation of a shared political community, is at its core a legal enterprise. The founders of new states do not begin by writing anthems; they begin by writing constitutions. The decisive acts of nation-formation - declarations of independence, constitutional conventions, the first citizenship laws, the establishment of courts - are legal acts, and they are understood as such by those who perform them. Bruce Ackerman has described these as 'constitutional moments,' the rare episodes in which a mobilised people authors the

[72]Max Weber, *Economy and Society: An Outline of Interpretive Sociology*, ed. Guenther Roth and Claus Wittich (Berkeley: University of California Press, 1978), 212-216, 941-955, on legitimate domination and the state's monopoly of legitimate force.
[73]Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism*, rev. ed. (London: Verso, 2006).
[74]Ernest Gellner, *Nations and Nationalism* (Ithaca: Cornell University Press, 1983).
[75]Charles Tilly, *Coercion, Capital, and European States, AD 990-1992* (Cambridge, MA: Blackwell, 1992).

fundamental law under which it will thereafter live.[76] The nation, in this sense, is not merely reflected in its law; it is in significant part authored by it. The remaining sections examine the four ways in which this authorship proceeds.

Law as Constitution of the Community: Citizenship and Membership

The first and most basic function of law in nation-building is to answer the question that every nation must answer before it can do anything else: who belongs? A nation is not a crowd; it is a bounded membership, and the boundary is drawn by law. Citizenship - the legal status that marks a person as a full member of the political community - is the juridical form of national belonging, and its rules determine the shape of the nation as decisively as any myth or memory. Whether citizenship is acquired by descent (jus sanguinis) or by birth on the territory (jus soli), whether naturalisation is open or closed, whether dual nationality is permitted, whether the children of immigrants are members from birth: these legal choices constitute the nation as a concrete body of persons.

Rogers Brubaker's comparison of France and Germany showed how deeply these legal definitions run and how consequential they are. The French tradition, territorial and assimilationist, made citizens of those born and raised on French soil; the German tradition, for long organised around descent, drew the boundary of membership around a presumed ethnocultural community.[77] Two neighbouring nations, comparably modern and prosperous, built different peoples through different citizenship law. The lesson is general: the nation does not precede its citizenship law as a natural fact that the law merely records; the citizenship law is one of the instruments through which the nation is made. To change the law of membership is to change the composition, and over time the character, of the nation itself.

Citizenship, however, is not only a boundary; it is also a bundle of rights and duties, and in this second aspect it is the engine of national integration. T. H. Marshall's classic account traced the historical expansion of citizenship through three stages - civil rights (the rights of individual freedom and equality before the law), political rights (the right to participate in the exercise of power), and social rights (the right to a measure of economic welfare and security).[78] Each stage is a legal achievement, and each deepens the substance of membership: the citizen is progressively constituted not merely as a person who belongs, but as a person who is free, who governs, and who is secured against destitution. Through this expanding legal status, a population of subjects becomes a nation of citizens - people bound to the political community not only by sentiment but by a shared and enforceable stake in it. Citizenship law thus performs the first work of nation-building: it draws the

[76]Bruce Ackerman, *We the People, Volume 1: Foundations* (Cambridge, MA: Harvard University Press, 1991), on constitutional moments and popular sovereignty.
[77]Rogers Brubaker, *Citizenship and Nationhood in France and Germany* (Cambridge, MA: Harvard University Press, 1992).
[78]T. H. Marshall, *Citizenship and Social Class and Other Essays* (Cambridge: Cambridge University Press, 1950).

circle of the community and fills that circle with the rights that make belonging worth having.

Law as the Definition of Power: Constitutionalism and the Rule of Law

If citizenship law constitutes the members of the nation, constitutional law constitutes its government - and, crucially, limits it. This is the second nation-building function of law, and it is the one that most sharply distinguishes a nation of citizens from a mere population under a ruler. A constitution does two things at once: it establishes public power, creating the offices and institutions through which a people governs itself, and it binds that power, subjecting it to rules that even the highest office cannot lawfully transgress. The genius of constitutionalism is that these are a single act: the same law that authorises power limits it, so that authority and constraint are born together.

The principle that gives this its force is the rule of law - the requirement that public power be exercised through general, prospective, public rules applied equally to all, rather than through the arbitrary will of officials. A. V. Dicey's classic formulation held that no one is above the law and that all are subject to the ordinary law of the land administered by the ordinary courts.[79] Lon Fuller showed that law has an 'inner morality' - that to govern through rules at all, a system must make its rules general, public, prospective, clear, non-contradictory, possible to obey, stable, and actually followed by officials - and that a regime which systematically violates these desiderata is not merely unjust but fails to be a legal system at all.[80] Tom Bingham's modern synthesis gathered these threads into a working ideal of the rule of law that protects the individual while ordering public life.[81] For nation-building, the rule of law is not a luxury added after the nation is built; it is constitutive of the kind of nation worth building - one in which citizens are governed by laws they can know in advance rather than by the shifting will of the powerful.

This constitutive role has a further dimension that recent scholarship has emphasised. Francis Fukuyama has argued that a well-ordered political order rests on the balance among three elements: a capable state, the rule of law that constrains it, and mechanisms of accountability that answer it to the governed.[82] A strong state without the rule of law is despotism; the rule of law without a capable state is a paper promise; accountability without either is disorder. Nation-building, on this view, is the work of assembling all three in balance, and law is the medium of the assembly - it both empowers the state and binds it, both creates accountability and enforces it. Guillermo O'Donnell made the point from the side of democratic theory: without the rule of law, citizenship itself is hollow, because rights that cannot be vindicated

[79]A. V. Dicey, *Introduction to the Study of the Law of the Constitution*, 8th ed. (London: Macmillan, 1915), pt. II, on the rule of law.
[80]Lon L. Fuller, *The Morality of Law*, rev. ed. (New Haven: Yale University Press, 1969), 33-94, on the inner morality of law.
[81]Tom Bingham, *The Rule of Law* (London: Allen Lane, 2010).
[82]Fukuyama, *The Origins of Political Order*, on the balance among the state, the rule of law and accountable government.

against power are not rights but hopes.[83] Constitutionalism, in short, is the branch of nation-building in which the nation protects itself from its own government - and thereby makes that government trustworthy enough to be obeyed.

Law as Integrator: Equality Before the Law in a Plural Society

No modern nation is homogeneous. Every nation contains diversity - of region, religion, language, ethnicity, class and conviction - and the central practical problem of nation-building is how to make a single political community out of a plural society without either suppressing the plurality or dissolving the unity. This is the third function of law, and perhaps the most delicate: to integrate difference into a common civic order. The instrument is equality before the law - the principle that the law applies to all persons alike, regardless of the groups to which they belong, and that all are entitled to its equal protection.

Equality before the law performs the work of integration in a distinctive way. It does not require that citizens share a religion, a mother tongue, a regional loyalty or a comprehensive view of the good; it requires only that they share a common legal standing. A plural society can be a single nation, on this model, not because its members are alike but because they stand in the same relation to the law - subject to the same rules, protected by the same rights, able to appeal to the same courts. Law thus offers what culture alone cannot: a form of unity that does not demand uniformity. It is the thin but strong bond that can hold together people who differ in everything except their equal membership in the legal community.

The modern development of this idea has moved beyond formal equality toward the legal accommodation of difference. Will Kymlicka's work on multicultural citizenship argued that, under certain conditions, the equal standing of citizens may require differentiated legal rights - language rights, self-government rights, or exemptions that allow minority communities to participate in the national community as equals without abandoning their distinctness.[84] Whether one accepts the strong or the weak version of this claim, its structure confirms the thesis of this article: the integration of a plural society is achieved through law - whether through the strict uniformity of formal equality or through the calibrated differentiation of group rights - and not through the erasure of difference by force or the abandonment of unity to fragmentation. The nation that endures is not the one that makes its members the same, but the one whose law can hold difference and unity together. Law is the only instrument capable of doing both at once: general enough to bind all, flexible enough to recognise each.

Law as the Ground of Trust: Predictability, Cooperation and a Shared Future

The fourth function of law in nation-building is at once the most concrete and the most far-reaching: law generates the trust and predictability on which a nation's cooperative and economic life depends. A nation is not only a community of

[83]Guillermo O'Donnell, 'Why the Rule of Law Matters,' *Journal of Democracy* 15, no. 4 (2004): 32-46.
[84]Will Kymlicka, *Multicultural Citizenship: A Liberal Theory of Minority Rights* (Oxford: Oxford University Press, 1995).

belonging and a structure of power; it is a vast web of cooperation among strangers - of exchange, investment, association and mutual reliance - and this web can be spun only where people can trust that agreements will be honoured, that property will be secure, that wrongs will be remedied, and that the rules will not change arbitrarily overnight. Law is the source of that trust.

Institutional economics has established the point with unusual clarity. Douglass North argued that institutions - the humanly devised rules that structure interaction, of which law is the most formal - are the fundamental determinant of long-run economic performance, because they establish the predictability without which complex cooperation and investment are impossible.[85] Daron Acemoglu and James Robinson extended the argument into a theory of national success and failure: nations prosper where their institutions are 'inclusive' - securing property, enforcing contracts, and opening opportunity broadly under the rule of law - and fail where institutions are 'extractive,' concentrating power and insecurity in few hands.[86] The difference between a prosperous nation and a poor one, on this account, is in large part the difference between good law reliably enforced and bad law or law unreliably applied. Prosperity is not merely served by law; it is in significant measure produced by it.

Yet the trust that law builds is not only economic. Legal predictability is the precondition of the citizen's capacity to plan a life - to marry, to raise children, to build, to save, to associate, to dissent - in the confidence that the framework will hold. And the manner in which law is made and applied shapes the citizen's willingness to accept it. Jurgen Habermas argued that the legitimacy of modern law is bound up with the citizen's status as its co-author: law commands willing allegiance when those subject to it can understand themselves as also its makers, through the procedures of democratic will-formation.[87] Tom Tyler's empirical research confirmed the psychological mechanism: people obey the law far more because they regard it as legitimate and its procedures as fair than because they fear punishment; perceived procedural justice, not deterrence, is the main engine of compliance.[88] These findings complete the picture. Law builds the nation not only by structuring cooperation from without but by earning allegiance from within: a law that citizens experience as legitimate and fair becomes a law they uphold voluntarily, and a nation whose members uphold its law voluntarily is a nation that coheres without constant coercion. In this sense law is the invisible infrastructure of national life - the medium in which trust, planning, prosperity and allegiance all become possible.

The Limits and Risks of a Law-Centred View

To argue that law is the foundational pillar of nation-building is not to argue that law is sufficient, nor that more law is always better. The thesis carries

[85]Douglass C. North, *Institutions, Institutional Change and Economic Performance* (Cambridge: Cambridge University Press, 1990).
[86]Daron Acemoglu and James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* (New York: Crown, 2012).
[87]Jurgen Habermas, *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy*, trans. William Rehg (Cambridge, MA: MIT Press, 1996).
[88]Tom R. Tyler, *Why People Obey the Law* (New Haven: Yale University Press, 1990).

characteristic risks that must be named if it is to be held responsibly. The first is the risk of legalism - the illusion that a nation can be built by legislation alone, that enacting the right statutes will produce the solidarity, trust and civic culture that law can frame but cannot manufacture. Law can constitute citizenship, but it cannot by itself make citizens care for one another; it can guarantee rights, but it cannot by itself instil the habits that make rights secure. Law is the foundation, but a foundation is not a house; it supports what a living political culture must build upon it.

The second risk is the instrumentalisation of law - its capture by power as a tool of domination dressed in legal form. The same legal machinery that can constitute a free nation can be turned to constitute an unfree one: citizenship law can exclude as well as include, constitutional law can entrench power as well as limit it, and the forms of legality can be used to launder arbitrary rule. This is why the argument of this article has insisted throughout not on law as such but on law of a certain quality - general, equal, public, predictable, legitimate. Ran Hirschl's study of the global expansion of judicial power warned, from another direction, that the transfer of political questions to courts can narrow democratic self-rule even as it strengthens legality; the rule of law can shade into the rule of lawyers.[89] The pillar metaphor must therefore be read with care: it is not any law that founds a nation, but law that is itself bound by the principles - equality, publicity, accountability - that distinguish a legal order from an apparatus of command.

The third risk is the neglect of the non-legal foundations with which law must cooperate. Language, memory, education, economy and civic culture are not rivals to law for the title of foundation; they are the materials that law orders and the soil in which legal institutions must be rooted to survive. A constitution imposed on a society without the civic culture to sustain it is a text without a people; a rule of law proclaimed without the administrative capacity to deliver it is a promise without a guarantee. The claim that law is the foundational pillar is therefore not the claim that law stands alone, but the claim that law is the element that gives the others their public form and durable structure - and that, without it, the others remain materials that never become a building. The right conclusion is not the supremacy of law over the other foundations, but the recognition that the other foundations become nation-building forces precisely by taking legal form.

CONCLUSION

This article has argued that law is the foundational pillar of nation-building - the structural element on which the other components of a nation rest. It distinguished the state from the nation and located law at the junction where coercive apparatus becomes legitimate authority and felt solidarity becomes enforceable membership. It then set out four functions through which law builds the nation. Through citizenship law, it constitutes the community and its members, drawing the boundary of belonging and filling it with the rights that make membership substantive. Through

[89]Ran Hirschl, *Towards Juristocracy: The Origins and Consequences of the New Constitutionalism* (Cambridge, MA: Harvard University Press, 2004).

constitutional law and the rule of law, it establishes public power and binds it, creating a government trustworthy enough to be obeyed. Through equality before the law, it integrates a plural society into a single civic order, offering a unity that does not demand uniformity. And through the predictability of legal institutions, it generates the trust on which cooperation, prosperity and a shared future depend, while earning, through its fairness, the voluntary allegiance that lets a nation cohere without constant coercion.

Three conclusions follow. First, law is not one instrument of nation-building among others but the medium through which the others operate: identity becomes citizenship, power becomes office, exchange becomes contract, and memory becomes constitution only by taking legal form. Second, it follows that the durability of a nation is, in the last analysis, a function of the quality of its law - its generality, its equality, its predictability and its legitimacy. Nations do not fail merely for want of resources or of shared feeling; they fail when their law fails - when it excludes rather than includes, when it serves power rather than binding it, when it is applied unequally or unpredictably, when citizens cease to regard it as their own. Third, and consequently, the central task of those who would build or repair a nation is a legal task in the deepest sense: not merely to pass statutes, but to establish a legal order that is general, equal, public and legitimate, and to cultivate the civic culture that keeps such an order alive. A nation, in the end, is a people held together by a law they can recognise as just and call their own; and the strength of that law is the strength of the nation. The pillar and the building stand or fall together.

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IT PARKS AND DIGITAL SOVEREIGNTY: BUILDING TECHNOLOGICAL INDEPENDENCE FOR DEVELOPING COUNTRIES

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ABSTRACT

Digital sovereignty — the capacity of a state and its society to understand, shape and control the digital systems on which they depend — has moved to the centre of development policy. For developing countries, the stakes are acute: dependence on foreign platforms, imported software, external data infrastructure and expatriated talent reproduces, in the digital sphere, the classic structures of economic dependency. This article examines the IT park — the state-sponsored technology zone offering fiscal privileges, infrastructure and regulatory facilitation to software and IT-service firms — as an instrument for building technological independence. Drawing on the technopole literature and on the experience of export-oriented parks from Southeast Asia and China to Belarus and Central Asia, including the rapidly growing IT Park of Uzbekistan, the article develops a three-layer framework of digital sovereignty — skills, infrastructure and market — and assesses what parks can and cannot deliver at each layer. It argues that IT parks are necessary but insufficient: they reliably build the skills layer and can anchor the infrastructure layer, but sovereignty at the market layer requires deliberate design — local linkages, education pipelines, open-source strategies, public procurement and regional cooperation — without which a park risks becoming a comfortable enclave of dependent outsourcing. Design principles for sovereignty-oriented parks are proposed.

Keywords: *IT parks, digital sovereignty, technological independence, developing countries, technopoles, software exports, digital economy, Central Asia.*

АННОТАЦИЯ

Цифровой суверенитет — способность государства и общества понимать, формировать и контролировать цифровые системы, от которых они зависят, — переместился в центр политики развития. Для развивающихся стран ставки особенно высоки: зависимость от иностранных платформ, импортируемого программного обеспечения, внешней инфраструктуры данных и утечки талантов воспроизводит в цифровой сфере классические структуры экономической зависимости. В статье IT-парк — поддерживаемая государством технологическая зона, предоставляющая налоговые льготы, инфраструктуру и регуляторное содействие компаниям в сфере ПО и IT-услуг, — рассматривается как инструмент строительства технологической независимости. Опираясь на литературу о технополисах и на опыт экспортно ориентированных парков от Юго-Восточной Азии и Китая до Беларуси и Центральной Азии, включая быстро растущий IT-парк Узбекистана, автор

разрабатывает трёхуровневую модель цифрового суверенитета — кадры, инфраструктура, рынок — и оценивает, что парки могут и чего не могут дать на каждом уровне. Делается вывод, что IT-парки необходимы, но недостаточны: они надёжно формируют кадровый уровень и могут закрепить инфраструктурный, но суверенитет на уровне рынка требует целенаправленного дизайна — локальных связей, образовательных конвейеров, стратегий открытого кода, государственных закупок и регионального сотрудничества, — без которого парк рискует превратиться в комфортный анклав зависимого аутсорсинга. Предлагаются принципы проектирования парков, ориентированных на суверенитет.

Ключевые слова: *IT-парки, цифровой суверенитет, технологическая независимость, развивающиеся страны, технополисы, экспорт ПО, цифровая экономика, Центральная Азия.*

INTRODUCTION

Two policy vocabularies have converged in the development debates of the past decade. The first is digital sovereignty: originally a European and great-power preoccupation, the term now names a universal concern — the capacity of a political community to understand, shape and control the digital technologies on which its economy, administration and public sphere depend.[90] The second is the IT park: the state-sponsored technology zone — fiscal privileges, dedicated infrastructure, streamlined regulation — that has become the signature instrument by which developing countries seek entry into the global digital economy. This article asks how the two are related: can IT parks, an instrument built for export promotion, serve the deeper goal of technological independence? The question matters because the instrument is spreading faster than the reflection on it: from Southeast Asia and China to Eastern Europe, the Caucasus and Central Asia — where the IT Park of Uzbekistan has become one of the region's most dynamic examples — governments are converging on remarkably similar park models while articulating increasingly ambitious sovereignty goals.

The argument is developed in five steps. Section 2 clarifies the concept of digital sovereignty and its specific stakes for developing countries. Section 3 anatomises the IT park as a policy instrument and situates it in the longer history of technopoles. Section 4 reviews the principal park experiences relevant to the developing world. Section 5 introduces a three-layer framework — skills, infrastructure, market — and assesses the park instrument against each layer, deriving design principles for sovereignty-oriented parks. Section 6 concludes.

Digital Sovereignty and the Stakes of Dependence

"Digital sovereignty" is a contested term, invoked by actors as different as regulators, platform critics and authoritarian censors; scholarship has therefore

[90]Julia Pohle and Thorsten Thiel, "Digital Sovereignty," *Internet Policy Review* 9, no. 4 (2020).

insisted on disaggregating it.[91] For the purposes of development policy, three senses matter. The first is capability sovereignty: possessing, within the national economy, the skills and organisations able to build, audit and maintain critical software and systems. The second is infrastructural sovereignty: territorial and legal control over the data, networks, computation and identifiers on which state and market functions run. The third is economic sovereignty: capturing, rather than exporting, the value generated by the digitalisation of one's own society. The stakes of failure on the third front have been described in the strongest terms as data colonialism — the systematic appropriation of the developing world's data resources by external platforms[92] — and the empirical record confirms a stark concentration of digital value capture in a handful of economies, leaving most developing countries as suppliers of raw data and consumers of finished services.[93]

Dependence, moreover, is layered in the architecture itself: whoever controls standards, cloud regions, root infrastructure and app-store gateways exercises a quiet but effective jurisdiction over those who merely use them.[94] For a developing country, digital sovereignty therefore cannot mean autarky — no economy, however large, produces its whole stack — but it can and must mean position: moving from the passive edge of other actors' systems toward participation in their making, on terms that retain skills, data and value at home. The question for policy is which instruments actually move a country along that path. The IT park is the instrument most governments have reached for first.

The IT Park as Policy Instrument

The IT park descends from the technopole — the planned concentration of technology-intensive production that spread worldwide in the late twentieth century as regions sought to synthesise their own Silicon Valleys.[95] The developing-country variant has a distinctive anatomy. Its core is a special legal-fiscal regime: exemption from profit and payroll taxes for accredited resident firms, simplified currency and export procedures, and often special visa channels for foreign specialists. Around this core stand three supports: physical and digital infrastructure (campuses, connectivity, increasingly data centres); a one-stop administrative interface shielding residents from general bureaucracy; and an ecosystem apparatus — incubators, accelerators, training academies — intended to convert the zone from a tax status into a community. The model's intellectual pedigree is the developmental state: the deliberate governing of the market to create comparative advantage rather than

[91]Stéphane Couture and Sophie Toupin, "What Does the Notion of 'Sovereignty' Mean When Referring to the Digital?," *New Media & Society* 21, no. 10 (2019): 2305–2322.
[92]Nick Couldry and Ulises A. Mejias, *The Costs of Connection: How Data Is Colonizing Human Life and Appropriating It for Capitalism* (Stanford: Stanford University Press, 2019).
[93]UNCTAD, *Digital Economy Report 2021: Cross-Border Data Flows and Development* (Geneva: United Nations, 2021).
[94]Laura DeNardis, *The Global War for Internet Governance* (New Haven: Yale University Press, 2014).
[95]Manuel Castells and Peter Hall, *Technopoles of the World: The Making of Twenty-First-Century Industrial Complexes* (London: Routledge, 1994).

merely accept it,[96] with the park as the spatial form of an embedded, promotional bureaucracy.[97]

Two features of the instrument deserve emphasis before the cases. First, the park is selective by design: it privileges one sector, and within it those firms able to meet accreditation criteria — a bet that concentrated advantage will spill over. Second, the park is export-facing by default: its fiscal logic is financed by the promise of service exports and the foreign exchange they earn. Both features are strengths for growth and, as Section 5 argues, potential weaknesses for sovereignty: selectivity can produce enclaves, and export orientation can lock a country into the dependent, lower tiers of the global value chain even as revenues rise.

Experiences: From the Multimedia Super Corridor to Central Asia

The first generation of flagship projects taught the ambitions and the pitfalls. Malaysia's Multimedia Super Corridor (from 1996) pioneered the comprehensive package — special legislation, guarantees to investors, purpose-built urbanism — and demonstrated both the mobilising power of a national digital vision and the risk that spectacular zones outrun the ecosystems meant to fill them.[98] China's trajectory, from the Torch Program of the late 1980s through the rise of Zhongguancun, showed the opposite lesson: parks embedded in a vast domestic market and coupled to universities and state procurement became genuine engines of indigenous firms rather than mere landing strips for foreign ones.[99] Between these poles lies the experience most relevant to smaller developing economies: the export-service park. Belarus's Hi-Tech Park (from 2005) turned a favourable tax regime and a strong engineering-education inheritance into a globally visible software industry, proving that even a mid-sized economy can produce world-market products and not only outsourced labour.

Central Asia has become the newest theatre of the model, and its most instructive current laboratory. Kazakhstan's Astana Hub (from 2018) combined park privileges with an international-talent strategy. Uzbekistan's IT Park (from 2019) has grown with exceptional speed: a nationwide ("extraterritorial") accreditation model rather than a single campus, long-horizon tax exemptions, an aggressive programme of IT education and re-training, incentives for relocating foreign firms and specialists, and a rapidly multiplying resident base and export volume have made it the emblem of the country's broader digital opening. For the sovereignty question, the Central Asian cases are especially valuable precisely because they are young: their design choices — how far to couple parks to universities, domestic procurement, data

[96]Robert Wade, *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*, 2nd ed. (Princeton: Princeton University Press, 2004).
[97]Peter Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton: Princeton University Press, 1995).
[98]Tim Bunnell, *Malaysia, Modernity and the Multimedia Super Corridor: A Critical Geography of Intelligent Landscapes* (London: RoutledgeCurzon, 2004).
[99]Yu Zhou, *The Inside Story of China's High-Tech Industry: Making Silicon Valley in Beijing* (Lanham: Rowman & Littlefield, 2008).

infrastructure and regional markets — are being made now, with the earlier generation's lessons available.

Three Layers of Sovereignty: What Parks Can and Cannot Deliver

Assessment requires disaggregation, and the three senses of Section 2 supply it. At the **skills layer**, the park record is strongest. Wherever the model has been seriously implemented, it has expanded the population of working developers, raised wages enough to retain part of the talent that would otherwise emigrate, and — through academies, bootcamps and firm-level training — pulled the education system toward industry needs. Even emigration is partially recuperated: diaspora professionals return as founders, investors and mentors, converting brain drain into brain circulation when home institutions make return attractive.[100] Skills are the layer on which all others rest, and here the instrument works: a country with a deep bench of engineers has options that no treaty can confer.

At the **infrastructure layer**, the park can anchor sovereignty but does not automatically do so. Parks concentrate demand that justifies national data centres, exchange points and cloud capacity; accreditation rules can require local hosting of critical workloads; park campuses can house the state's own compute. But these couplings must be designed: a park whose residents build exclusively on foreign clouds adds little territorial control, whatever its export figures. The decisive choices are procurement and standards — whether the state routes its own digitalisation through park firms and domestic infrastructure — and openness: open-source strategies allow small economies to appropriate, audit and localise world-class software rather than rent it, converting global commons into national capability.[101]

At the **market layer**, the instrument is weakest and the design burden greatest. Export-service success can settle into comfortable dependence: bodyshopping and outsourcing tiers where the client owns the product, the data and the roadmap, and the park hosts — profitably — other people's value chains. Sovereignty at this layer means moving residents from services to products, from subcontracting to intellectual property, and from single-market dependence to diversified demand, including the domestic and regional markets that parks too often ignore. The levers are known from the developmental-state canon: linkage policies binding park firms to local industry and government demand, graduation requirements attached to privileges, and patient public co-investment in product firms.[102] Regional cooperation belongs here as well: for the economies of Central Asia individually small, a coordinated regional digital market — mutual recognition of park regimes, shared data infrastructure, joint standards — multiplies the demand base on which product sovereignty can stand. The alternative — a race of neighbouring tax havens competing for the same relocating

[100]AnnaLee Saxenian, *The New Argonauts: Regional Advantage in a Global Economy* (Cambridge, MA: Harvard University Press, 2006).
[101]Steven Weber, *The Success of Open Source* (Cambridge, MA: Harvard University Press, 2004).
[102]Evans, *Embedded Autonomy*, on the state's role in nurturing linkages between promoted sectors and the wider economy.

firms — dissipates the instrument's sovereignty potential even where it raises its revenue.[103]

Two structural risks cut across all three layers and deserve separate statement. The first is the fiscal race to the bottom: park regimes compete on exemptions, and exemptions are the easiest term for a neighbour to match, so that the rent of the regime is bid away while the harder, slower differentiators — education quality, institutional reliability, judicial predictability — are neglected. A privilege any state can copy is not an advantage; an ecosystem is. The second is the enclave equilibrium: a park can succeed brilliantly by its own indicators — residents, exports, employment — while the surrounding economy digitalises no faster than before, because the zone's linkages run outward to foreign clients rather than inward to domestic firms, schools and administrations. Sovereignty is a property of the whole polity, not of the zone; a park that does not leak — skills, practices, code, standards — into its host society builds a sovereign enclave inside a dependent country, which is no sovereignty at all.

From this assessment follow five design principles for sovereignty-oriented parks. (1) Couple the park to the education system by contract, not rhetoric: funded pipelines, faculty exchange, curricula co-owned with residents. (2) Make privileges promotional, not perpetual: graduate firms toward product development and IP ownership as conditions of continued status. (3) Route state digitalisation through the park: public procurement is the developing country's largest and most controllable digital market. (4) Build the data layer deliberately: local hosting requirements for critical systems, park-anchored data centres, and open-source-first policies for public software. (5) Regionalise: negotiate park-to-park recognition and shared infrastructure with neighbours before competing with them. None of these principles is exotic; each is merely the translation, into park design, of the difference between exporting labour and building position.

CONCLUSION

IT parks and digital sovereignty are related as instrument and horizon — but the relation is conditional, not automatic. The evidence assembled here supports three conclusions. First, parks are genuinely effective at the foundation: they build the skills layer of sovereignty more reliably than any alternative instrument yet tried in developing countries, and this alone justifies the model. Second, their contribution to the infrastructure and market layers depends entirely on design choices that lie outside the default export-promotion template: procurement coupling, data-layer requirements, graduation incentives, open-source strategies and regional coordination. A park without these remains what its critics fear — a well-lit enclave of dependent outsourcing, sovereign in tax status and in nothing else. Third, the current Central Asian generation of parks, with Uzbekistan's IT Park at its head, stands at precisely the fork these conclusions describe: young enough to choose the sovereignty-oriented

[103]UNCTAD, *Digital Economy Report 2021*, on the concentration of data value capture and the policy space of developing countries.

design, successful enough to afford it, and regionally positioned to attempt what the first generation could not — a coordinated digital space in which small economies achieve together the scale that position requires.

The wider lesson reaches beyond the instrument. Technological independence for developing countries will not be declared; it will be accumulated — in engineers trained, systems localised, products owned and markets built — and the IT park is best understood as an accumulation device: powerful when pointed at position, merely lucrative when pointed at revenue. The task for policy and for research alike is to keep the two aims distinct and the instrument pointed at the right one; for the countries now building their parks, the encouraging news of this article is that the difference lies not in resources they lack but in design choices still open to them.

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THE SCALES OF THE KING: JUSTICE IN THE POEMS AND POLITICAL THOUGHT OF BABUR SHAH

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ABSTRACT

This article examines the concept of justice (ʿadl, dād) in the poetry and political thought of Zahīr al-Dīn Muḥammad Bābur (1483–1530), the great son of Andijan and founder of the Mughal dynasty. It situates Babur within the Perso-Islamic and Turco-Mongol traditions of royal justice — the "circle of justice" of the mirror-for-princes literature and the customary law of the steppe — and then traces how these inherited ideals are refracted through his own writings. Three registers are distinguished. In the memoirs, justice appears as narrated practice: the graded punishment of wrongdoers, the protection of the peasantry from plundering soldiers, and the evaluation of rulers past and present by the measure of equity. In the dīvān, justice appears as a poetic ethic: the celebrated quatrain on fidelity and cruelty formulates a law of moral reciprocity, while the complaint against the tyranny of fate constructs, by inversion, the image of the just king as the answer to an unjust world. In the didactic works, justice appears as promulgation: the versified law-book and the ethical translations enact the sovereign's duty to teach the right order. The article argues that in Babur's corpus justice is not one theme among many but the hinge that joins his poetry to his politics: the quality by which he judges the world, judges himself, and asks to be judged.

Keywords: *Babur, justice, ʿadl, circle of justice, political thought, Chaghatay poetry, mirror for princes, Timurid tradition.*

АННОТАЦИЯ

В статье рассматривается концепция справедливости (адл, дад) в поэзии и политической мысли Захир ад-Дина Мухаммада Бабура (1483–1530), великого сына Андижана и основателя династии Великих Моголов. Бабур помещается в контекст персидско-исламской и тюрко-монгольской традиций царской справедливости — «круга справедливости» литературы «зерцал для государей» и обычного права степи, — после чего прослеживается преломление этих идеалов в его собственных сочинениях. Различаются три регистра. В мемуарах справедливость предстаёт как описанная практика: соразмерное наказание виновных, защита крестьян от грабежа солдат, оценка правителей прошлого и настоящего мерой беспристрастности. В диване справедливость предстаёт как поэтическая этика: знаменитое четверостишие о верности и жестокости формулирует закон нравственной взаимности, а жалоба на тиранию судьбы создаёт, по принципу инверсии, образ справедливого государя как ответа несправедливому миру. В дидактических сочинениях справедливость предстаёт как провозглашение:

стихотворный свод законов и этические переводы осуществляют долг государя учить правильному порядку. Автор утверждает, что в творчестве Бабура справедливость — не одна из тем, а стержень, соединяющий его поэзию с его политикой: качество, которым он судит мир, судит себя и просит судить себя самого.

Ключевые слова: *Бабур, справедливость, адл, круг справедливости, политическая мысль, чагатайская поэзия, зерцало для государей, тимуридская традиция.*

INTRODUCTION

Every political tradition has a master-word, and in the world that formed Zahīr al-Dīn Muḥammad Bābur that word was justice. The prince born in Andijan in 1483, tried by two decades of struggle in Transoxiana and Kabul, and founder from 1526 of the Mughal dynasty in the southern subcontinent, inherited a political culture in which the legitimacy of a throne was measured, before all else, by the equity of its occupant.[104] He also inherited — and mastered — a poetic culture in which that same equity was praised, demanded, mourned in its absence and modelled in verse. This article asks how the two inheritances meet in Babur's own writing: what justice means in his poems and his political practice, how the poems talk about justice, and how — at times — they administer it.

The argument proceeds in five steps. Section 2 reconstructs the ideal of royal justice that Babur inherited, in its Perso-Islamic and Turco-Mongol strands. Section 3 examines justice as narrated practice in the memoirs: the sovereign judging, punishing, protecting and — no less important — judging other sovereigns. Section 4 turns to the *dīvān* and reads the poetry's ethic of reciprocity and its complaint against fate as two faces of a single conception of justice. Section 5 considers the didactic works as acts of promulgation, and the crisis of 1527 as the moment when Babur's conception of just rule was publicly redefined. Section 6 concludes. Throughout, the aim is to show that justice is not simply a topic in Babur's corpus but its organising value — the standard by which the poet judges the world and the king asks the world to judge him.

The Inherited Scales: Royal Justice before Babur

The Perso-Islamic theory of kingship that reached Babur through the mirror-for-princes literature rested on a simple and ancient figure: the circle of justice. There is no kingship without the army, no army without revenue, no revenue without the prosperity of the subjects, and no prosperity without justice; the king who oppresses the peasant therefore saws through the branch on which his own throne rests. Lambton traced the deep history of this doctrine in the Persian theory of rule, and Darling has followed the circle of justice across three millennia of Middle Eastern

[104]Stephen Frederic Dale, *Babur: Timurid Prince and Mughal Emperor, 1483–1530* (Cambridge: Cambridge University Press, 2018).

statecraft.[105] Its classic textbook was Niẓām al-Mulk's *Siyāsat-nāma*, whose opening chapters make the hearing of grievances and the restraint of officials the first duties of the crown.[106] In this tradition, justice is not one royal virtue among others; it is the functional definition of kingship itself.[107]

To this Persian strand Babur's world added a second: the Turco-Mongol heritage of the *töre* — the customary law of the steppe, the code of Chinggisid and Timurid precedent that governed succession, the division of spoils, the mutual obligations of khan and warrior. A Timurid mirza was expected to be just in both registers at once: to protect the taxpaying subject according to the circle of justice, and to deal equitably with his begs and soldiers according to the custom of his ancestors. The brilliant court culture of the late Timurid age, in which Babur was formed, wrapped both registers in a third — the adab of the just and generous prince celebrated in poetry and prose.[108] Babur's originality, as the following sections argue, lies not in inventing a new doctrine of justice but in the unprecedented directness with which he wrote himself — his judgements, his punishments, his failures and his self-accusations — into the tradition's frame.

Justice as Narrated Practice: The Judging Sovereign of the Memoirs

The memoirs show the doctrine at work, and they show it with the unsparing concreteness that is Babur's hallmark. Three recurring scenes stand out. The first is the protection of the weak against the strong — above all, of the peasant against the soldier. From his earliest campaigns Babur records punishing his own men for plundering villagers: troops who seized grain, oil or livestock from the population were beaten or put to death, and the memoirs report these episodes not as regrettable necessities but as the elementary duty of a ruler who intends to be obeyed with consent.[109] The circle of justice, learned from books, appears here as camp discipline: the sovereign's first act of equity is to restrain his own instrument of power.

The second scene is measured retribution. The most striking example is the poisoning affair of 1526, when members of the defeated old order attempted to kill Babur through his kitchen. His narrative of the investigation and the sentences is a small treatise on proportionality: each participant received a punishment graded to the degree of guilt — the taster, the cook, the instigators, each dealt with differently — and the account is written so that the reader can verify the proportion.[110] Justice here is not vengeance but measurement; and the very act of recording it in the memoirs —

[105]Ann K. S. Lambton, "Justice in the Medieval Persian Theory of Kingship," *Studia Islamica* 17 (1962): 91–119.
[106]Linda T. Darling, *A History of Social Justice and Political Power in the Middle East: The Circle of Justice from Mesopotamia to Globalization* (London: Routledge, 2013).
[107]Niẓām al-Mulk, *The Book of Government or Rules for Kings (Siyāsat-nāma)*, trans. Hubert Darke (London: Routledge & Kegan Paul, 1960).
[108]Maria Eva Subtelny, "Socioeconomic Bases of Cultural Patronage under the Later Timurids," *International Journal of Middle East Studies* 20, no. 4 (1988): 479–505.
[109]Wheeler M. Thackston, trans., *The Baburnama: Memoirs of Babur, Prince and Emperor* (Washington–New York: Freer Gallery of Art / Oxford University Press, 1996), 202–226.
[110]Thackston, *Baburnama*, 349–351, on the poisoning affair of 1526 and the graded punishments.

laying the scales open to posterity — belongs to the practice. Dale has shown that the memoirs were composed as a document for successors;[111] in these judicial narratives, the document functions as a case-book of royal equity.

The third scene is the judgement of other rulers. Babur's famous portrait gallery of the princes, viziers and begs of his age evaluates each figure by a consistent set of measures, and equity stands beside courage and culture among them: this khan was brave but tyrannical, that mirza generous but negligent of his subjects, this beg upright in judgement. The gallery quietly universalises the standard — no rank exempts a man from the scales — and it includes, remarkably, the author himself: Babur records his own youthful injustices, broken undertakings and errors of temper with the same coolness he applies to others. This reflexivity is perhaps the memoirs' deepest contribution to the theory of justice: the just king is defined not as the king who is never unjust, but as the king who keeps honest accounts, including against himself.

The Poetry of the Scales: Reciprocity and the Complaint against Fate

The *dīvān* — more than one hundred and twenty ghazals and over two hundred rubāʿīs in Yücel's edition — approaches justice from the other side: not as administration but as ethic and as lack.[112] Its most concentrated statement is the celebrated quatrain of reciprocity, in which Babur declares — to paraphrase — that the faithful will find faithfulness, the cruel will meet cruelty, the doer of good will reap good and the doer of evil, evil. The poem states, in four lines, a complete moral cosmology: the world itself keeps scales, and every act returns upon its author. Read politically, the quatrain is the circle of justice interiorised — transferred from the mechanics of revenue and army to the mechanics of the soul — and it functions simultaneously as counsel to subjects, warning to enemies and standard for the king who utters it: a sovereign who publishes such a law invites his own conduct to be measured by it.

Around this centre, the *dīvān* deploys the classical vocabulary of justice in its negative mode: the complaint. The tyranny is fate's — the treacherous wheel of the sky, the cruelty (*jafā*) of the age, the faithlessness of fortune that gives thrones and takes them without desert. Critics have long recognised that in Babur's hands this conventional complaint carries the weight of lived political catastrophe;[113] what deserves emphasis here is its structural role in his conception of justice. By indicting the world's injustice with such insistence, the poems construct — by pure inversion — the image of what a just order would be: constancy instead of betrayal, desert instead of caprice, protection instead of predation. The complaint against fate is thus the lyric shadow of the political programme: the king's task, the poems imply, is to

[111]Stephen Frederic Dale, "The Poetry and Autobiography of the Bâbur-nâma," *The Journal of Asian Studies* 55, no. 3 (1996): 635–664.
[112]Bilâl Yücel, *Bâbür Dîvânı (Gramer–Metin–Sözlük–Tıpkıbasım)* (Ankara: Atatürk Kültür Merkezi, 1995), 91ff.
[113]M. Fuad Köprülü, "Bâbur," in *İslâm Ansiklopedisi*, vol. 2 (Istanbul: Millî Eğitim Basımevi, 1949), 180–187.

be within his realm what fate refuses to be within the world — a power that keeps faith and observes proportion. The lyric "I" who suffers injustice and the royal "I" who dispenses justice are two positions in one moral geometry.

Nor is the poetry only reflective; at datable moments it administers the standard it proclaims. The versified reproach to Khwāja Kalān weighs a beloved servant's fault and delivers a measured penalty of words; the satire on the astrologer after the crisis of 1527 executes a public sanction against a man whose false prophecy had endangered the army; the verses of praise distribute the reward side of the scales. In a court where honour was capital, these poetic acts were juridical in effect: the sovereign's metre was one of the instruments by which desert was requited.[114]

Justice Promulgated and Redefined: The Didactic Works and the Turn of 1527

A ruler persuaded that justice is the essence of kingship must not only practise it but teach it, and Babur's didactic works discharge exactly this duty. The *Mubayyan*, his versified exposition of Ḥanafī law, places the rules of right conduct — worship, contracts, obligations — into memorisable metre for soldiers and subjects: the king as promulgator, translating the sharia's order into the register his people can retain.[115] The verse rendering of the *Risāla-i Vālidiyya*, undertaken in fulfilment of a vow during the illness of 1528, sets the inner counterpart beside the outer law: the purification of the heart from which just conduct flows.[116] And the letter of counsel to his son Humāyūn — with its insistence on consultation, diligence and fairness toward companions — extends the teaching into the dynasty's future: justice as the substance of succession.[117]

The crisis of spring 1527 shows the conception under redefinition. Facing a formidable coalition with a demoralised army, Babur staged the great renunciation — the wine vessels shattered, the treasure distributed as alms, the public vow proclaimed in verse — and took the title of ghāzī after the victory.[118] Read through the lens of justice, the episode is a double settlement of accounts. Toward heaven, the vow acknowledges the moral debt of past excess and pays it publicly: the king applies the scales to himself before asking God for victory. Toward the realm, the alms convert private luxury into public benefit at the moment of common danger: the circle of justice enacted as ritual. The ghāzī title that follows re-founds the king's legitimacy on a claim inseparable from equity — the defender of the community — and the verses in which Babur afterwards confesses how hard the renunciation proved keep the account honest: the standard, once published, is allowed to bite its own author. Schimmel observed how this image of the first sovereign — severe with

[114]Thackston, *Baburnama*, 379–387, on the renunciation of 1527 and the ghāzī title.
[115]Tanju Oral Seyhan, *Zahîrüddîn Muhammed Bâbür Mirzâ: Mübeyyen der-Fıkh (Giriş–Metin–Dizin–Tıpkıbasım)* (Istanbul: Çağrı Yayınları, 2004).
[116]Reşit Rahmeti Arat, ed., *Gazi Zahirüddin Muhammed Babur, Vekayi: Babur'un Hâtıratı*, 2 vols. (Ankara: Türk Tarih Kurumu, 1943–1946), vol. II, 346–348.
[117]Thackston, *Baburnama*, 428–429, the letter of counsel to Humāyūn.
[118]Dale, *Babur*, on the crisis of 1527 and its aftermath.

himself, generous to others, exact in his accounts — coloured the ideal of rule inherited by the whole dynasty.[119]

CONCLUSION

Justice in Babur's corpus proves to be less a theme than an architecture. The inherited doctrine — the circle of justice of the Persian mirrors, the equity of the steppe custom — supplies the frame; the memoirs fill it with narrated practice, from the protection of villagers against his own soldiers to the graded sentences of 1526 and the evaluative gallery in which no ruler, himself included, escapes the scales; the *dīvān* gives the doctrine its ethical core in the quatrain of reciprocity and its negative image in the complaint against fate; the didactic works promulgate it; and the crisis of 1527 shows the king turning the scales, dramatically and in public, upon himself.

Three conclusions may be drawn. First, in Babur poetry and politics meet precisely at the point of justice: the same conception of desert, proportion and kept faith governs the rubāʿī and the sentence, the complaint and the decree. Second, Babur's distinctive contribution to the tradition he inherited is reflexivity: the just king of the mirrors judges others; the just king of the memoirs and poems also — relentlessly — judges himself, and it is this self-application of the standard that gives his justice its enduring credibility. Third, the case commends a method: to read the political thought of the ruler-poets of the Turkic and Persianate world not only in their treatises but in their verse, where the values of rule are tested against the experience of suffering them. For that method, the writings of the great son of Andijan — studied today with such devotion in Uzbekistan and with growing energy in the international academy — remain the richest of all archives: the record of a king who asked, in his own words and of his own deeds, the oldest question of his tradition — whether the scales were true.

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[119]Annemarie Schimmel, *The Empire of the Great Mughals: History, Art and Culture* (London: Reaktion Books, 2004).

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BABUR AS A BRIDGE: CONNECTING PAKISTAN, UZBEKISTAN AND THE WIDER TURKIC WORLD

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ABSTRACT

This article analyses Zahīr al-Dīn Muḥammad Bābur (1483–1530) as a connective figure — a "bridge" — linking Pakistan, Uzbekistan and the wider Turkic world. Babur's life spanned the Fergana Valley, Kabul and the southern subcontinent; his memoirs and poetry, written in Chaghatay Turkish, belong to the common classical heritage of the Turkic languages; and the empire he founded frames Pakistan's official narrative of Muslim statehood in South Asia. The article first reconstructs the transregional "Chaghatay commonwealth" within which Babur wrote, then examines the two principal national appropriations of his memory — the poet-ancestor of post-Soviet Uzbekistan and the state-founder of Pakistan — before widening the lens to the broader Turkic world: the foundational Turkish scholarship of Köprülü, Arat and Yücel; the Kyrgyz memory of Babur on Sulaiman-Too in Osh; and the commemorative infrastructure of Turkic cultural institutions. It then considers how this layered heritage has been institutionalised in the diplomacy of the Organization of Turkic States era and in Pakistan's deepening engagement with Central Asia. The article argues that Babur functions as a bridge in three registers at once — textual, geographical and institutional — and that his capacity to connect rests less on a single shared meaning than on the distributed, complementary character of the meanings the connected parties attach to him.

Keywords: *Babur, Baburnama, Turkic world, Pakistan, Uzbekistan, Chaghatay, shared heritage, cultural diplomacy, Organization of Turkic States.*

АННОТАЦИЯ

В статье анализируется фигура Захир ад-Дина Мухаммада Бабура (1483–1530) как связующего звена — «моста» — между Пакистаном, Узбекистаном и широким тюркским миром. Жизнь Бабура охватила Ферганскую долину, Кабул и земли Южной Азии; его мемуары и поэзия, написанные на чагатайском языке, принадлежат к общему классическому наследию тюркских языков; а основанная им империя составляет каркас официального пакистанского нарратива мусульманской государственности в Южной Азии. В статье сначала реконструируется трансрегиональное «чагатайское содружество», в рамках которого творил Бабур; затем рассматриваются две главные национальные аппроприации его памяти — поэт-предок постсоветского Узбекистана и основатель государства в Пакистане, — после чего оптика расширяется до более широкого тюркского мира: базовые турецкие исследования Кёпрюлю, Арата и Юджеля; кыргызская память о Бабуре на горе Сулайман-Тоо в Оше; коммеморативная

инфраструктура тюркских культурных институтов. Далее анализируется институционализация этого многослойного наследия в дипломатии эпохи Организации тюркских государств и в углубляющемся взаимодействии Пакистана с Центральной Азией. Автор утверждает, что Бабур функционирует как мост одновременно в трёх регистрах — текстуальном, географическом и институциональном, — и что его способность соединять основана не столько на едином общем смысле, сколько на распределённом, взаимодополняющем характере тех значений, которые связываемые стороны ему придают.

Ключевые слова: *Бабур, «Бабур-наме», тюркский мир, Пакистан, Узбекистан, чагатайский язык, общее наследие, культурная дипломатия, Организация тюркских государств.*

INTRODUCTION

"Bridge" is among the most overworked metaphors of heritage politics, yet few historical figures earn it as literally as Zahīr al-Dīn Muḥammad Bābur. Born in Andijan in 1483, expelled from Transoxiana, master of Kabul for two decades, and from 1526 the founder of the Mughal Empire in the southern subcontinent, Babur lived a life whose stations — Fergana, Samarkand, Osh, Kabul, Lahore, Agra — are today distributed among Uzbekistan, Kyrgyzstan, Afghanistan, Pakistan and the lands beyond.[120] He wrote the greatest autobiography of the pre-modern Islamic world in Chaghatay Turkish, the common classical language of the eastern Turkic peoples, about the founding of a South Asian empire. A single corpus thus stands simultaneously in the literary genealogy of the Turkic world and in the political genealogy of Muslim South Asia.

This article asks how that double position works today: how Babur connects Pakistan, Uzbekistan and the wider Turkic world, and what kind of connection it is. The inquiry is deliberately three-tiered. The bilateral tier — Uzbekistan and Pakistan — has an obvious logic: birthplace and empire. But Babur's heritage does not stop at these two claimants. Turkey produced the foundational modern scholarship on his works; Kyrgyzstan preserves his built traces and local memory in Osh; Afghanistan holds his grave; and the institutions of Turkic cultural cooperation have folded him into a canon of "common Turkic" classics. Any account of Babur as a bridge must therefore treat the bilateral Uzbek–Pakistani axis as embedded in a wider Turkic circuitry.

The argument, in brief, is that Babur bridges in three registers: textually, through the *Baburnama* and the poetry, which circulate across the Turkic languages and into Urdu and English; geographically, through a chain of memory-sites running from Andijan and Osh through Kabul to Lahore; and institutionally, through the commemorative and diplomatic machinery that states and multilateral bodies have

[120]Stephen Frederic Dale, *Babur: Timurid Prince and Mughal Emperor, 1483–1530* (Cambridge: Cambridge University Press, 2018).

built upon the first two registers. The article further argues that the bridge holds not because everyone remembers the same Babur, but because the different Baburs — poet, ancestor, founder, saint of place — are complementary rather than competing. The sections that follow take up, in turn, the historical foundation (Section 2), the two principal national constructions (Section 3), the wider Turkic reception (Section 4), the institutionalisation of the bridge (Section 5) and the textual circulation that underpins it all (Section 6).

The Historical Foundation: Babur and the Chaghatay Commonwealth

The bridge has a real historical footing, and it is linguistic before it is political. Babur belonged to the last great generation of what may be called the Chaghatay commonwealth: the transregional literary culture, stretching from the Volga to Kashgar and from Herat to Delhi, whose shared written medium was the eastern Turkic *lingua franca* classicised by ʿAlī Shīr Nawāʾī. Babur's pride in this medium is explicit: in the famous opening description of his homeland he notes that the speech of Andijan's people accords with the literary language itself.[121] When he conquered his southern dominions he did not exchange this identity for another; he transplanted it. Dale has shown in detail how Babur's southern enterprise was conceived as the recreation of a Timurid world — gardens, verse, sociability — on new ground.[122] The Mughal Empire was, in its founding moment, a Central Asian polity in South Asia; the connective tissue between the two regions is not a later invention of diplomats but the constitutive fact of the dynasty.

Two features of this foundation matter for everything that follows. First, the Chaghatay medium was supranational: it belonged to no single people, and its later distribution among national canons — above all its Soviet-era renaming as "Old Uzbek" — was an act of twentieth-century politics, not of sixteenth-century fact.[123] Babur is therefore structurally available to more than one heir. Second, Babur's own self-narrative is a narrative of movement between the regions that now claim him. The *Baburnama* is organised by its three geographies — Fergana, Kabul and the southern realm — and its emotional axis is the tension between them: the conqueror of the south who mourns the melons of Transoxiana. The text, in other words, already contains the bridge; modern memory politics has only had to walk across it.

Two National Baburs: Poet-Ancestor and State-Founder

Post-Soviet Uzbekistan remembers Babur first as a man of letters. The groundwork was laid in the Soviet period, when the "Old Uzbek" classification annexed the Chaghatay canon to the republic's heritage and Tashkent scholarship — exemplified by pioneering studies of his later *dīvān* — made Babur an object of

[121]Wheeler M. Thackston, trans., *The Baburnama: Memoirs of Babur, Prince and Emperor* (Washington–New York: Freer Gallery of Art / Oxford University Press, 1996), 4–5.

[122]Dale, *Babur*, esp. chaps. 10–13, on the transplantation of Timurid culture to the new dominions.

[123]Edward A. Allworth, *The Modern Uzbeks: From the Fourteenth Century to the Present. A Cultural History* (Stanford: Hoover Institution Press, 1990), 229–240.

academic cultivation; it was consolidated in the popular imagination by Pirimqul Qodirov's novel *Yulduzli tunlar* (1978), which fixed the image of the tragic poet-king exiled from his valley.[124] After 1991 the figure was institutionalised: within the spectacular heritage politics of the independent state, analysed by Laura Adams, Babur took his place beside Amir Timur in the pantheon of "great ancestors," with the International Babur Foundation in Andijan, the Bobur Park memorial complex, an eponymous university and recurrent state jubilees of the *Boburnoma*.[125] The construction manages a well-known irony — it was the Shaybanid Uzbeks who expelled Babur — by territorial rather than ethnic logic, exactly as the national cult of Timur absorbs an analogous contradiction;[126] as Khalid observes of the region's memory politics generally, the past is a repertoire from which the present selects.[127]

Pakistan remembers a different Babur. In the official narrative of Muslim statehood in South Asia — "history as official imagining," in Jalal's phrase — Babur is the founder of the greatest Muslim empire of the subcontinent and thus a pivotal link in the genealogy that runs from the first Arab conquests to 1947.[128] The centrality (and the simplifications) of this dynastic chain in the national curriculum were documented in K. K. Aziz's critique of Pakistani textbooks.[129] The Pakistani Babur is also materially present: the Mughal garden tradition that culminates at Lahore's Shalimar descends from the *chārbāgh* model Babur introduced to the subcontinent,[130] and the architectural idiom preserved at Lahore and Multan grew from the Timurid forms he carried south.[131] Where Uzbekistan names a literary foundation and a park after Babur, Pakistan has named, among much else, a cruise missile — an asymmetry that epitomises the two constructions: the poet-ancestor and the state-founder. As argued below, it is precisely this asymmetry that makes the shared figure diplomatically workable.

[124]Pirimqul Qodirov, *Yulduzli tunlar* [Starry Nights] (Tashkent: Adabiyot va san'at nashriyoti, 1978).

[125]Laura L. Adams, *The Spectacular State: Culture and National Identity in Uzbekistan* (Durham: Duke University Press, 2010).

[126]Ron Sela, *The Legendary Biographies of Tamerlane: Islam and Heroic Apocrypha in Central Asia* (Cambridge: Cambridge University Press, 2011).

[127]Adeeb Khalid, *Islam after Communism: Religion and Politics in Central Asia* (Berkeley: University of California Press, 2007), 116–139.

[128]Ayesha Jalal, "Conjuring Pakistan: History as Official Imagining," *International Journal of Middle East Studies* 27, no. 1 (1995): 73–89.

[129]K. K. Aziz, *The Murder of History: A Critique of History Textbooks Used in Pakistan* (Lahore: Vanguard, 1993).

[130]James L. Wescoat, Jr. and Joachim Wolschke-Bulmahn, eds., *Mughal Gardens: Sources, Places, Representations, and Prospects* (Washington, D.C.: Dumbarton Oaks, 1996).

[131]Ebba Koch, *Mughal Architecture: An Outline of Its History and Development (1526–1858)* (Munich: Prestel, 1991).

The Wider Turkic World: Turkey, Kyrgyzstan and the Common Canon

The Uzbek–Pakistani axis does not exhaust Babur's constituency. Republican Turkey, though geographically remote from any station of Babur's life, produced the scholarship that made him legible to the modern Turkic world. Fuad Köprülü's encyclopaedia article set the frame of Babur studies in Turkish;[132] Reşit Rahmeti Arat — himself a Kazan-born émigré, a living link between the Turkic north and Anatolia — produced the monumental Turkish translation of the *Vaqāyiʿ* for the Turkish Historical Society;[133] and Bilâl Yücel's critical edition of the *dīvān* gave the poetry a scholarly text.[134] For Turkish readers Babur figures not as a national ancestor but as a classic of the common Turkic heritage — the "other great prose writer" of Chaghatay beside Nawāʾī — and Turkey's cultural institutions have accordingly treated Baburiana as pan-Turkic patrimony, publishing, commemorating and teaching him within the frame of a shared classical age.

Kyrgyzstan holds a smaller but more intimate share. As a teenage ruler Babur built a pavilion on the Sulaiman mountain above Osh, in the eastern Fergana Valley — a structure remembered locally as the "House of Babur" (Babür's *hujra*) and rebuilt in later centuries after destructions; the mountain itself, long a site of Muslim pilgrimage, was inscribed on the UNESCO World Heritage List in 2009 as Sulaiman-Too Sacred Mountain, with the Babur association forming part of its documented cultural value.[135] Osh thus gives the Babur geography a fourth national address and gives Kyrgyzstan a stake in the commemorative economy — a stake exercised in local museology, tourism and the valley-wide sense, shared across the Uzbek–Kyrgyz border, that Babur is a son of Fergana as a whole rather than of one republic. Beyond these concrete claims, Babur circulates in the looser pan-Turkic imaginary — anthologised in "common Turkic literature" collections, taught in Turkology curricula from Baku to Almaty — as one of the canonical figures through which the post-Soviet Turkic states have narrated their family resemblance. The trajectory matches Landau's account of pan-Turkism's twentieth-century evolution from irredentist ideology to cultural cooperation: Babur is claimed today not for a Greater Turkestan but for a shared bookshelf.[136]

[132]M. Fuad Köprülü, "Bâbur," in *İslâm Ansiklopedisi*, vol. 2 (Istanbul: Millî Eğitim Basımevi, 1949), 180–187.

[133]Reşit Rahmeti Arat, ed., *Gazi Zahirüddin Muhammed Babur, Vekayi: Babur'un Hâtıratı*, 2 vols. (Ankara: Türk Tarih Kurumu, 1943–1946).

[134]Bilâl Yücel, *Bâbür Dîvânı (Gramer–Metin–Sözlük–Tıpkıbasım)* (Ankara: Atatürk Kültür Merkezi, 1995).

[135]UNESCO, "Sulaiman-Too Sacred Mountain," World Heritage List, inscription of 2009, whc.unesco.org/en/list/1230.

[136]Jacob M. Landau, *Pan-Turkism: From Irredentism to Cooperation*, 2nd ed. (Bloomington: Indiana University Press, 1995).

Institutionalising the Bridge: From Commemoration to Connectivity

Since the 1990s, and with new intensity since Uzbekistan's post-2016 opening, the layered heritage described above has been progressively institutionalised. Three concentric frames can be distinguished. The first is bilateral: Uzbek–Pakistani cultural agreements, exchanges of scholarly delegations between Andijan and Lahore, joint conferences on the *Baburnama*, and the consistent invocation of the Baburid-Mughal connection in high-level visits between Tashkent and Islamabad, where the projected trans-Afghan railway from Termez toward Peshawar is habitually narrated as the reopening of Babur's own road. The second frame is the Turkic multilateral: with Uzbekistan's accession to the Turkic cooperation structures in 2019 and the consolidation of the Organization of Turkic States in 2021, the commemorative machinery of the Turkic world — joint anniversaries, common-heritage publication programmes, coordinated Turkology — acquired a member state for whom Babur is a first-rank national classic, placing him on the agenda of the entire organisation. Pakistan is not a member of these structures, but its long-standing cultural intimacy with Turkey and its deepening Central Asian engagement position it as the natural South Asian interlocutor of precisely this Turkic frame — and Babur as the readiest symbol of the interlocution.

The third frame is trilateral in geography if not in form: the Afghan middle. Babur's tomb lies in the Bāgh-i Bābur in Kabul, the terraced garden to which his body was translated after 1530 and which was restored in the 2000s after decades of war; [137] every corridor — infrastructural, commercial or symbolic — between Uzbekistan and Pakistan passes, like Babur himself, through Afghanistan. The heritage geography and the connectivity geography coincide point for point: birthplace in Uzbekistan, pavilion in Kyrgyzstan, grave in Afghanistan, empire in Pakistan, scholarship in Turkey. Institutionalisation has consisted, in essence, of drawing organisational lines along this pre-existing map.

The Textual Bridge: The Baburnama across Languages

Underneath the monuments and the ministries runs the text. The *Baburnama*'s modern circulation recapitulates, in print, the connective geography of its author's life. Beveridge's and Thackston's English translations made it a classic of world autobiography; [138] Mano's critical edition secured the Chaghatay text; [139] Arat's translation carried it into Turkish; Tashkent editions in Cyrillic and Latin script placed the *Boburnoma* in every Uzbek school; Urdu renderings published in Lahore and Karachi domesticated it for Pakistani readers; and Soviet-era scholarship produced in Tashkent mediated it to a broader Eurasian readership. Each translation

[137] Dale, *Babur*, 493–500, on the burial in Kabul and the afterlife of the tomb-garden.

[138] Annette Susannah Beveridge, trans., *The Bābur-nāma in English (Memoirs of Bābur)*, 2 vols. (London: Luzac & Co., 1922).

[139] Eiji Mano, ed., *Bābur-nāma (Vaqāyiʿ): Critical Edition Based on Four Chaghatay Texts* (Kyoto: Syokado, 1995).

community reads its own Babur: the Uzbek reader a founding classic of the national language, the Pakistani reader the founder's eyewitness account of the land that became Pakistan, the Turkish reader a monument of common Turkic prose, the Kyrgyz reader the young king of Osh. The book is one; the readerships are many; and it is exactly this one-to-many structure that constitutes a textual bridge rather than a shared possession over which to quarrel.

Discussion: What Kind of Bridge?

Three analytical points emerge. First, the Babur bridge is asymmetric by design. Uzbekistan's poet-ancestor, Pakistan's state-founder, Turkey's common classic, Kyrgyzstan's genius of place and Afghanistan's buried king are different figures cut from one biography; because each claimant's Babur occupies a different symbolic niche, the claims complement rather than collide. Shared heritage is often assumed to require shared meaning; the Babur case suggests the reverse — that distributed meaning is what keeps a shared figure serviceable. Second, the bridge is layered: the textual register (a corpus in a supranational language) grounds the geographical register (a chain of memory-sites), which in turn grounds the institutional register (commemoration and diplomacy). Remove the text and the sites lose their voice; remove the sites and the institutions lose their itinerary. Third, the bridge has load limits. It must bear the counter-memory beyond Pakistan's eastern border, where the demolition in 1992 of the mosque bearing Babur's name turned that name into the most contested word in the subcontinent's memory politics — and it depends, at its geographical keystone, on the fragile stability of Afghanistan. The joint commemorations accordingly favour a consistent aestheticisation: the gardener, memoirist and poet is celebrated; the conqueror is passed over in silence. A bridge, the case reminds us, is engineered as much by what is left out as by what is built in.

CONCLUSION

Babur connects Pakistan, Uzbekistan and the wider Turkic world because his life, his language and his book already connected the regions those polities now occupy. The modern bridge is thus a reactivation rather than an invention: the Chaghatay commonwealth in which he wrote supplies the textual span; the itinerary from Andijan and Osh through Kabul to Lahore supplies the physical piers; and the commemorative diplomacy of the past three decades — bilateral, Turkic-multilateral and trans-Afghan — supplies the traffic. What the case contributes to the study of heritage politics is a precise mechanism: a figure bridges best when his meanings are distributed complementarily among the claimants, so that each, in honouring its own Babur, tacitly honours the others'. Future research might test this mechanism comparatively — against the contested single-meaning cases of the Turco-Persian world — and track empirically how the fortunes of the trans-Afghan corridor, the Organization of Turkic States' cultural agenda and Pakistan's Central Asian opening feed back into the commemorative economy of which Babur is now the presiding figure.

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SANOAT KORXONALARINING INVESTITSION JOZIBADORLIGINI OSHIRISHDA INNOVATSION RIVOJLANISHNING ROLI

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ANNOTATSIYA

Ushbu maqolada sanoat korxonalarining investitsion jozibadorligini oshirishda innovatsion rivojlanishning o'rni va ahamiyati ilmiy-nazariy hamda amaliy jihatdan tahlil qilingan. Innovatsion faoliyat ko'rsatkichlari bilan investitsion jozibadorlik darajasi o'rtasidagi o'zaro bog'liqlik ochib berilgan, jahon tajribasi va milliy iqtisodiyot misolida tendensiyalar tavsiya etilgan statistik ma'lumotlar, jadval va diagrammalar orqali yoritilgan. Tadqiqot natijasida sanoat korxonalarida innovatsion salohiyatni oshirish, ilmiy-tadqiqot va tajriba-konstruktorlik ishlariga (ITTKI) sarflanadigan xarajatlarni ko'paytirish, raqamli texnologiyalarni joriy etish orqali investorlar uchun qulay muhit yaratish bo'yicha ilmiy asoslangan takliflar ishlab chiqilgan.

Kalit so'zlar *innovatsion rivojlanish, investitsion jozibadorlik, sanoat korxonalari, raqobatbardoshlik, ITTKI xarajatlari, texnologik yangilanish, xorijiy investitsiyalar, raqamli transformatsiya.*

THE ROLE OF INNOVATIVE DEVELOPMENT IN INCREASING THE INVESTMENT ATTRACTIVENESS OF INDUSTRIAL ENTERPRISES

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ABSTRACT

This article provides a scientific and theoretical analysis of the role of innovative development in increasing the investment attractiveness of industrial enterprises. The relationship between innovation activity indicators and the level of investment attractiveness is examined, and trends are illustrated through statistical data, tables and diagrams using international experience and the example of the national economy. As a result of the study, scientifically grounded proposals have been developed to increase innovation potential in industrial enterprises, expand R&D expenditures, and create a favorable environment for investors through the introduction of digital technologies.

Keywords: *innovative development, investment attractiveness, industrial enterprises, competitiveness, research and development costs, technological renewal, foreign investments, digital transformation.*

KIRISH

Zamonaviy sharoitda jahon iqtisodiyotining raqobatbardoshligi, avvalambor, innovatsion salohiyatning darajasi va uni real ishlab chiqarish jarayoniga tatbiq etish samaradorligi bilan belgilanadi. Sanoat korxonalari milliy iqtisodiyotning tayanch bo'g'ini sifatida investitsiya resurslarini jalb etishda innovatsion rivojlanish darajasiga bevosita bog'liq holda faoliyat yuritmoqda. Investorlar, ayniqsa xorijiy investorlar, mablag' joylashtirish qarorini qabul qilishda korxonaning texnologik saviyasi, ilmiy-tadqiqot salohiyati, raqamli boshqaruv tizimlari mavjudligi va innovatsion mahsulotlar ishlab chiqarish qobiliyatiga alohida e'tibor qaratmoqda.

O'zbekiston Respublikasida sanoat sohasini rivojlantirish, uni innovatsion asosda modernizatsiya qilish va investitsion muhitni yanada yaxshilash davlat siyosatining ustuvor yo'nalishlaridan biri hisoblanadi. Shu bois innovatsion rivojlanish omillarining investitsion jozibadorlikka ta'sirini ilmiy jihatdan chuqur tahlil qilish, ularning o'zaro bog'liqligini aniqlash va amaliy tavsiyalar ishlab chiqish dolzarb ilmiy-amaliy ahamiyat kasb etadi.

Mazkur maqolaning maqsadi — sanoat korxonalarining investitsion jozibadorligini oshirishda innovatsion rivojlanishning rolini nazariy va amaliy jihatdan asoslash, mavjud tendensiyalarni statistik ma'lumotlar asosida tahlil qilish hamda samaradorlikni oshirish bo'yicha takliflar ishlab chiqishdan iborat.

Tadqiqotning vazifalari sifatida quyidagilar belgilandi: innovatsion rivojlanish va investitsion jozibadorlik tushunchalarining nazariy-uslubiy asoslarini yoritish; ikki ko'rsatkich o'rtasidagi o'zaro bog'liqlikni statistik va grafik tahlil usullari orqali baholash; tarmoqlar va mamlakatlar kesimidagi tendensiyalarni qiyosiy o'rganish; hamda olingan natijalar asosida amaliy ahamiyatga ega tavsiyalar shakllantirish. Maqolaning ilmiy yangiligi shundaki, unda innovatsion faollik va investitsion jozibadorlik o'rtasidagi bog'liqlik nafaqat nazariy, balki miqdoriy-statistik tahlil asosida ham asoslab berilgan.

MAVZUGA OID ADABIYOTLAR TAHLILI

Innovatsion rivojlanish va investitsion jozibadorlik masalalari iqtisodiyot fanida keng o'rganilgan mavzulardan biridir. J. Shumpeter o'zining "ijodiy vayronagarlik" nazariyasida innovatsiyani iqtisodiy rivojlanishning asosiy harakatlantiruvchi kuchi sifatida talqin etgan bo'lsa, keyingi davr tadqiqotchilari innovatsion faollikni korxona

darajasidagi raqobatbardoshlik va investitsion jozibadorlikning muhim omili sifatida ko'rib chiqishgan[140].

Xorijiy va mahalliy iqtisodchi olimlarning tadqiqotlarida investitsion jozibadorlik tushunchasi korxonaning moliyaviy barqarorligi, boshqaruv sifati, bozordagi o'rni va innovatsion salohiyati kabi ko'p omilli tizim sifatida talqin etiladi[141]. Ayrim mualliflar innovatsion faollik darajasi bilan investitsiyalarning rentabelligi o'rtasida statistik jihatdan ishonchli musbat bog'liqlik mavjudligini isbotlashgan. Shu bilan birga, milliy iqtisodiyot sharoitida ushbu bog'liqlikni mintaqaviy va tarmoq xususiyatlarini hisobga olgan holda chuqur tahlil qilishga bo'lgan ehtiyoj hamon saqlanib qolmoqda, bu esa ushbu tadqiqotning ilmiy yangiligini belgilaydi.

Innovatsion menejment nazariyasining rivojlanishi bilan bog'liq holda, so'nggi yillarda “ochiq innovatsiyalar” (open innovation) va “milliy innovatsion tizim”kabi zamonaviy konsepsiyalar ham keng tarqalmoqda. Ushbu yondashuvlarga ko'ra, korxonaning innovatsion salohiyati nafaqat uning ichki resurslari, balki tashqi muhit bilan — ilmiy-tadqiqot muassasalari, universitetlar, texnoparklar va boshqa korxonalar bilan hamkorlik darajasi bilan ham belgilanadi[142]. Bu esa investorlar uchun korxonaning nafaqat moliyaviy, balki innovatsion ekotizimdagi o'rnini ham baholash serrating keltirib chiqaradi.

TADQIQOT METODOLOGIYASI

Tadqiqot jarayonida iqtisodiy tahlil, qiyosiy tahlil, statistik guruhlash, grafik tasvirlash hamda mantiqiy umumlashtirish usullaridan foydalanildi. Tadqiqot ob'ekti sifatida respublika sanoat korxonalarining innovatsion faoliyat va investitsion ko'rsatkichlari tanlab olindi. Ma'lumotlar tahlili uchun rasmiy statistik hisobotlar, tarmoq tahliliy materiallari va ilmiy adabiyotlardan foydalanildi. Innovatsion rivojlanish darajasi ITTKI xarajatlarining YIMdagi ulushi, innovatsion faol korxonalar ulushi kabi ko'rsatkichlar orqali, investitsion jozibadorlik esa jalb qilingan investitsiyalar hajmi va tarkibi orqali baholandi.

TAHLIL VA NATIJALAR

Innovatsion rivojlanish korxona faoliyatining barcha bosqichlariga — mahsulot ishlab chiqarishdan tortib, boshqaruv va marketing tizimigacha ta'sir ko'rsatadi. Texnologik yangilanish, ITTKIga yo'naltirilgan xarajatlar va raqamli transformatsiya orqali korxona raqobatbardoshligi va samaradorligi oshadi, bu esa o'z navbatida

[140] Shumpeter J. The Theory of Economic Development. — Harvard University Press.
[141] Freeman C., Soete L. The Economics of Industrial Innovation. — MIT Press, 1997.
[142] O'zbekiston Respublikasi Prezidentining sanoatni innovatsion rivojlantirish va investitsion muhitni yaxshilashga oid me'yoriy-huquqiy hujjatlari.

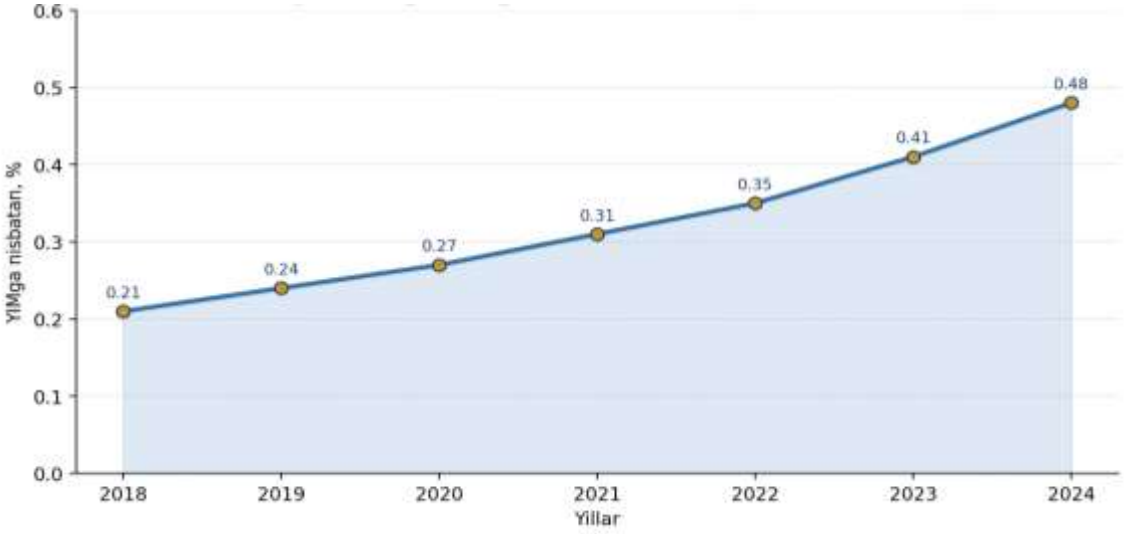
investorlar nazarida korxonaning jozibadorligini kuchaytiradi. Ushbu o'zaro bog'liqlikning tuzilmaviy sxemasi 1-rasmda keltirilgan.



1-rasm. Innovatsion rivojlanish va investitsion jozibadorlik o'rtasidagi o'zaro bog'liqlik sxemasi[143]

Sxemadan ko'rinib turibdiki, innovatsion rivojlanishning uchta asosiy tarkibiy qismi — texnologik yangilanish, ilmiy-tadqiqot va tajriba-konstruktorlik ishlari hamda raqamli transformatsiya — korxona raqobatbardoshligi va samaradorligini oshirish orqali bilvosita investitsion jozibadorlikning yuksalishiga xizmat qiladi.

So'nggi yillarda respublika miqyosida ilmiy-tadqiqot va tajriba-konstruktorlik ishlariga yo'naltirilgan xarajatlarning yalpi ichki mahsulotdagi ulushi barqaror o'sish tendensiyasini namoyon etmoqda. Bu ko'rsatkich innovatsion faollikning umumiy darajasini aks ettiruvchi muhim indikator hisoblanadi (2-rasm).

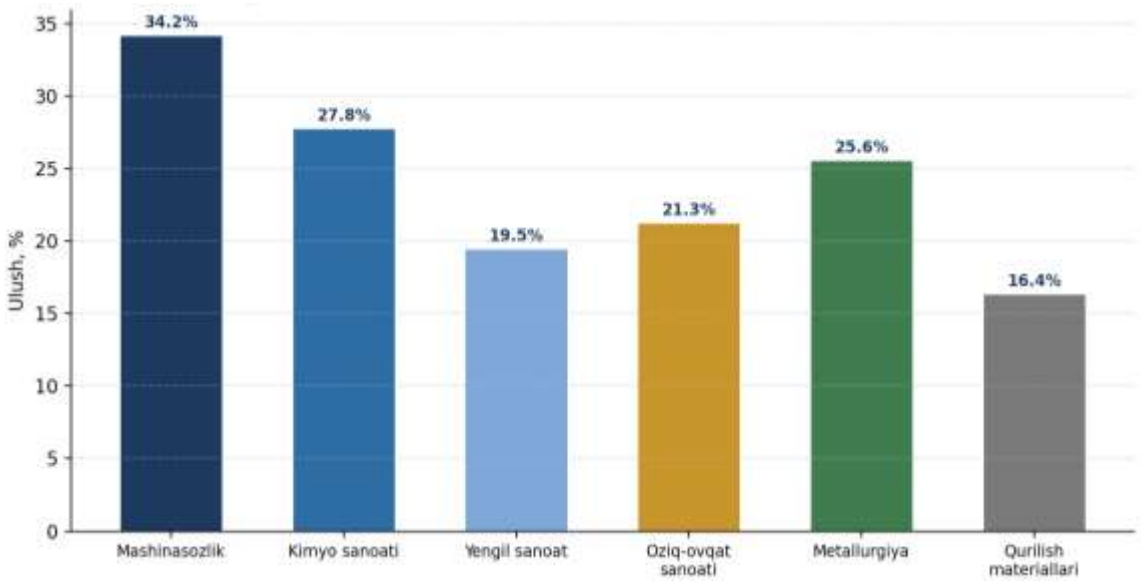


2-rasm. ITTKI xarajatlarining YIMdagi ulushi dinamikasi,[144] **%**

[143] Muallif tomonidan ishlab chiqilgan
[144] Korxonoa statistik ma’lumotlar asosida tayyorlandi

Keltirilgan dinamikadan ko'rinib turibdiki, tahlil qilingan davr mobaynida ko'rsatkich deyarli ikki baravardan ortiq oshgan. Biroq bu ko'rsatkich rivojlangan mamlakatlarning o'rtacha darajasidan (2-3%) hali ham sezilarli darajada past bo'lib, bu borada qo'shimcha davlat va xususiy sektor sarmoyalarini jalb etish zarurligini ko'rsatadi[145].

Sanoat tarmoqlari o'rtasida innovatsion faollik darajasi bir xil emas. Yuqori texnologiyalar bilan bog'liq tarmoqlarda, xususan mashinasozlik va kimyo sanoatida innovatsion faol korxonalar ulushi nisbatan yuqori bo'lsa, an'anaviy tarmoqlarda bu ko'rsatkich pastroq darajada qolmoqda (3-rasm, 1-jadval).



3-rasm. Tarmoqlar kesimida innovatsion faol korxonalar ulushi, [146]%

1-jadvalda tarmoqlar kesimida innovatsion faollik va investitsion jozibadorlik ko'rsatkichlarining qiyosiy tahlili keltirilgan.

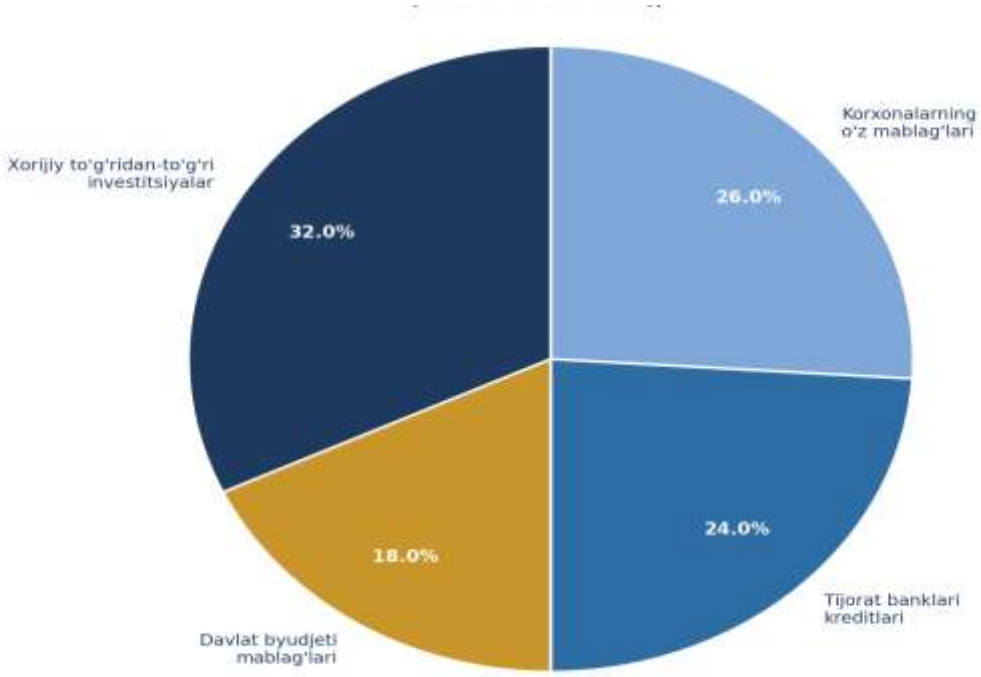
1-jadval. Tarmoqlar kesimida innovatsion faollik va investitsion jozibadorlik ko'rsatkichlari [147]

Tarmoq	Innovatsion faol korxonalar ulushi, %	1 so'mlik ITTKI xarajatiga to'g'ri keladigan investitsiya, so'm	Investitsion jozibadorlik darajasi (ball, 1-10)
Mashinasozlik	34.2	3.8	8.4
Kimyo sanoati	27.8	3.1	7.6
Metallurgiya	25.6	2.9	7.2

[145] Porter M. The Competitive Advantage of Nations. — Free Press, 1990.
[146] Korxona statistik ma’lumotlari asosida tayyorlandi
[147] O’zbekiston Statistika Milliy qo’mitasi ma’lumotlari asosida tayyorlandi

Tarmoq	Innovatsion faol korxonalar ulushi, %	1 so'mlik ITTKI xarajatiga to'g'ri keladigan investitsiya, so'm	Investitsion jozibadorlik darajasi (ball, 1-10)
Oziq-ovqat sanoati	21.3	2.4	6.5
Yengil sanoat	19.5	2.1	6.1
Qurilish materiallari	16.4	1.8	5.7

Sanoat korxonalarining innovatsion loyihalarini moliyalashtirish manbalari xilma-xil bo'lib, ularning tarkibida xorijiy to'g'ridan-to'g'ri investitsiyalar, davlat byudjeti mablag'lari, tijorat banklari kreditlari hamda korxonalarning o'z mablag'lari muhim o'rin tutadi [148](4-rasm).



4-rasm. Sanoat korxonalariga jalb qilingan investitsiyalar tarkibi,[149] %

Tahlil natijalariga ko'ra, xorijiy to'g'ridan-to'g'ri investitsiyalar ulushining yuqoriligi korxonaning innovatsion salohiyati va xalqaro standartlarga muvofiqligi bilan bevosita bog'liq. Shu sababli innovatsion faol korxonalar xorijiy sarmoyadorlar uchun ustuvor yo'nalish hisoblanadi.

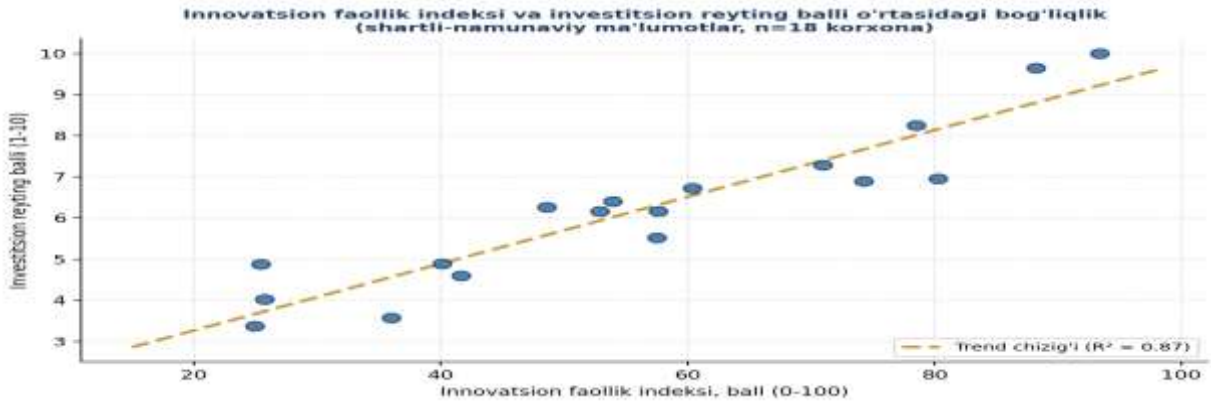
[148] World Bank. World Development Report: Innovation for Development. — Washington DC, 2023.
[149] Muallif tadqiqotlari asosida ishlab chiqildi

O'tkazilgan tahlil natijalarini umumlashtirgan holda, innovatsion faollik darajasi yuqori bo'lgan korxonalarda investitsiyalarning rentabellik ko'rsatkichi ham yuqori ekanligini ta'kidlash lozim. Bu holat 2-jadvalda yanada aniqroq aks etgan.

Ko'rsatkich	Innovatsion faol korxonalar	Innovatsion faol bo'lmagan korxonalar
Investitsiyalar rentabelligi, %	18.4	9.7
Eksport hajmining o'sish sur'ati, %	22.1	8.3
Mehnat unumdorligi o'sishi, %	15.6	6.2
Yangi ish o'rinlari yaratish, %	12.9	5.1

2-jadval. Innovatsion faollik darajasiga ko'ra korxonalar samaradorligining qiyosiy ko'rsatkichlari[150]

Jadvaldan ko'rinib turibdiki, innovatsion faol korxonalarda barcha asosiy samaradorlik ko'rsatkichlari innovatsion faol bo'lmagan korxonalarga nisbatan sezilarli darajada yuqori. Bu esa innovatsion rivojlanishning investitsion jozibadorlikni oshirishdagi hal qiluvchi rolini yana bir bor tasdiqlaydi.Innovatsion faollik darajasi bilan investitsion jozibadorlik o'rtasidagi bog'liqlikni statistik jihatdan tekshirish maqsadida shartli tanlanma asosida korrelyatsion tahlil o'tkazildi. Tahlilda har bir korxonaning innovatsion faollik indeksi (0 dan 100 ballgacha) hamda ekspert baholari asosida shakllantirilgan investitsion reyting balli (1 dan 10 ballgacha) o'rtasidagi bog'liqlik grafik tarzda 5-rasmda tasvirlangan.



5-rasm. Innovatsion faollik indeksi va investitsion reyting balli o'rtasidagi bog'liqlik[151]

Tahlil natijalari innovatsion faollik indeksi bilan investitsion reyting balli o'rtasida statistik jihatdan sezilarli musbat bog'liqlik mavjudligini ko'rsatadi — indeks qiymati oshgan sari investitsion reyting balli ham izchil o'sib boradi. Bu esa

[150] Korxonaning shartli ma’lumotlaria sosida muallif tomonidan ishlab chiqildi
[151] Muallif tomonidgan tayyorlandi

innovatsion faollikni oshirish orqali korxonaning investorlar nazaridagi jozibadorligini maqsadli boshqarish mumkinligini amaliy jihatdan tasdiqlaydi[152].

Innovatsion rivojlanish va investitsion jozibadorlik o'rtasidagi bog'liqlik nafaqat milliy, balki xalqaro miqyosda ham kuzatiladi. Yuqori innovatsion salohiyatga ega mamlakatlar odatda xorijiy investitsiyalarni jalb etishda ham yetakchi o'rinlarni egallaydi[153]. Bu tendensiya 3-jadvalda bir qator mamlakatlar misolida shartli-umumlashtirilgan tarzda keltirilgan.

3-jadval.Bir qator mamlakatlarda innovatsion va investitsion ko'rsatkichlar[154]

Mamlakat	ITTKI xarajatlari, YIMga nisbatan %	Innovatsion indeks reytingi (1-100)	XTTI oqimi, YIMga nisbatan %
Janubiy Koreya	4.9	92	1.8
Germaniya	3.1	88	2.4
Xitoy	2.4	81	1.6
Qozog'iston	0.7	54	2.9
O'zbekiston	0.48	43	2.1

Jadval ma'lumotlaridan ko'rinib turibdiki, ITTKI xarajatlari va innovatsion indeks reytingi yuqori bo'lgan mamlakatlarda, qoida tariqasida, xorijiy investitsiyalarni barqaror jalb etish imkoniyati ham yuqori. Bu holat O'zbekiston uchun ham innovatsion salohiyatni oshirish orqali investitsion muhitni yanada yaxshilash imkoniyatlari mavjudligidan dalolat beradi.

MUHOKAMA

Olingan natijalar innovatsion rivojlanish va investitsion jozibadorlik o'rtasidagi bog'liqlikning ko'p qirrali ekanligini ko'rsatadi. Bir tomondan, innovatsion faollik korxonaning ichki samaradorligini oshiradi, ikkinchi tomondan esa tashqi investorlar nazarida korxonaning riskini kamaytiradi va uzoq muddatli barqarorlik kafolatini beradi. Shu bilan birga, innovatsion loyihalarni moliyalashtirishda davlat-xususiy sheriklik mexanizmlarini kengaytirish, soliq va bojxona imtiyozlari tizimini takomillashtirish hamda innovatsion infratuzilmani rivojlantirish zarurati saqlanib qolmoqda.

[152] MO Ungboyevich ,Research on improving the efficiency of digital platforms in the statistical system, Synergy: Cross-Disciplinary Journal of Digital Investigation (2995-4827
[153] UNCTAD. World Investment Report. — Geneva, 2024.
[154] Muallif tomonidan ishlab chiqilgan

Ayni paytda, kichik va o'rta sanoat korxonalarining innovatsion loyihalarga mablag' jalb etishda kattaroq korxonalarga nisbatan qiyinchiliklarga duch kelishi alohida e'tiborni talab qiladi. Bu borada venchur moliyalashtirish tizimini rivojlantirish, texnoparklar va innovatsion klasterlar faoliyatini kengaytirish muhim ahamiyat kasb etadi.

Shuningdek, innovatsion rivojlanishning investitsion jozibadorlikka ta'sirini baholashda nafaqat miqdoriy, balki sifat ko'rsatkichlarini ham hisobga olish zarur. Jumladan, korxonaning intellektual mulk ob'ektlariga egaligi, patentlar soni, malakali muhandis-texnik xodimlar salohiyati kabi omillar investorlar tomonidan uzoq muddatli istiqbolni baholashda muhim mezon sifatida ko'rib chiqiladi. Shu bois innovatsion rivojlanish strategiyasini ishlab chiqishda ushbu sifat ko'rsatkichlarini ham tizimli ravishda kuzatib borish tavsiya etiladi.

XULOSA VA TAVSIYALAR

O'tkazilgan tadqiqot natijalariga asoslanib quyidagi xulosa va tavsiyalarni shakllantirish mumkin:

Innovatsion rivojlanish sanoat korxonalarining investitsion jozibadorligini oshirishning eng muhim omillaridan biri bo'lib, u korxona raqobatbardoshligi va samaradorligini oshirish orqali bilvosita investorlar ishonchini mustahkamlaydi;

ITTKI xarajatlarining YIMdagi ulushini oshirish, jumladan davlat va xususiy sektor hamkorligida ilmiy-innovatsion loyihalarni moliyalashtirish mexanizmlarini kengaytirish zarur;

Yuqori texnologiyali tarmoqlarda erishilgan ijobiy tajribani boshqa sanoat tarmoqlariga tarqatish, texnologik transfer dasturlarini rivojlantirish lozim;

Kichik va o'rta innovatsion korxonalarni qo'llab-quvvatlash uchun venchur fondlar va innovatsion grantlar tizimini kengaytirish maqsadga muvofiq;

Raqamli transformatsiya jarayonlarini tezlashtirish, korxonalarda zamonaviy boshqaruv axborot tizimlarini joriy etishni rag'batlantirish lozim;

Sanoat korxonalarining innovatsion faoliyati va investitsion jozibadorligini muntazam monitoring qilish tizimini joriy etish, natijalarga ko'ra tarmoq va mintaqaviy dasturlarni tuzatib borish maqsadga muvofiq.

Xulosa qilib aytganda, innovatsion rivojlanish va investitsion jozibadorlik o'rtasidagi uzviy bog'liqlikni chuqur anglash va bu boradagi davlat siyosatini muvofiqlashtirish sanoat korxonalarining barqaror rivojlanishi hamda milliy iqtisodiyotning raqobatbardoshligini ta'minlashning muhim sharti hisoblanadi.

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“TEMUR TUZUKLARI”DA KADRLAR SIYOSATI VA STRATEGIK QARORLAR QABUL QILISH MEXANIZMI: ZAMONAVIY MENEJMENT VA O‘RTA ASRLAR MANBASHUNOSLIGI SINTEZI

Ro‘ziqulova Zarina

ANNOTATSIYA

Mazkur maqolada Amir Temurning davlat boshqaruvi tajribasi “Temur tuzuklari” manbasi asosida kadrlar siyosati va strategik qarorlar qabul qilish mexanizmi nuqtayi nazaridan tahlil qilinadi. Tadqiqotning asosiy maqsadi Amir Temur tomonidan davlat xizmatiga shaxslarni tanlash, ularni mansablarga tayinlash, faoliyatini nazorat qilish, rag‘batlantirish va javobgarlikka tortish bilan bog‘liq tamoyillarni aniqlash hamda ushbu tarixiy tajribani zamonaviy menejment tushunchalari bilan qiyosiy tahlil qilishdan iborat. Shuningdek, strategik qarorlarni shakllantirishda maslahat, kengash, axborot yig‘ish, vaziyatni baholash, qat’iy qaror qabul qilish va uning ijrosini nazorat qilish kabi mexanizmlar o‘rganiladi.

Kalit so‘zlar: *Amir Temur, “Temur tuzuklari”, kadrlar siyosati, davlat boshqaruvi, strategik qaror, menejment, vazirlik instituti, davlat xizmati, maslahat, nazorat, manbashunoslik.*

ABSTRACT

This article analyzes Amir Timur’s experience of state governance based on the source Temur Tuzuklari (The Institutes of Timur) from the perspective of personnel policy and strategic decision-making mechanisms. The main objective of the study is to identify the principles related to the selection of individuals for public service, their appointment to positions, supervision of their activities, incentives, and accountability, as well as to comparatively examine this historical experience in relation to modern management concepts. The study also explores such mechanisms of strategic decision-making as consultation, deliberation, information gathering, situational assessment, decisive decision-making, and monitoring the implementation of decisions.

Keywords: *Amir Timur, Temur Tuzuklari, personnel policy, state governance, strategic decision-making, management, institution of viziers, public service, consultation, control, source studies.*

АННОТАЦИЯ

В данной статье опыт государственного управления Амира Темура анализируется на основе источника «Темур тузуклари» («Уложения Тимура») с точки зрения кадровой политики и механизмов принятия стратегических решений. Основная цель исследования заключается в выявлении принципов,

связанных с отбором лиц на государственную службу, их назначением на должности, контролем за их деятельностью, поощрением и привлечением к ответственности, а также в проведении сравнительного анализа данного исторического опыта с концепциями современного менеджмента. Кроме того, исследуются такие механизмы формирования стратегических решений, как консультирование, совещание, сбор информации, оценка ситуации, принятие окончательного решения и контроль за его исполнением.

Ключевые слова: *Амир Темур, «Темур тузуклари», кадровая политика, государственное управление, стратегическое решение, менеджмент, институт визирей, государственная служба, консультирование, контроль, источниковедение.*

KIRISH

Davlat boshqaruvi tarixida hokimiyatning mustahkamligi faqat harbiy kuch yoki hududiy kengayish bilan emas, balki davlat apparatini shakllantirish, munosib kadrlarni tanlash va strategik qarorlarni samarali amalga oshirish qobiliyati bilan ham belgilanadi. Shu nuqtayi nazardan, XIV–XV asrlar Markaziy Osiyo tarixida Amir Temur tomonidan yaratilgan markazlashgan davlat boshqaruvi tajribasi alohida ilmiy ahamiyatga ega. Amir Temur siyosiy faoliyatining muhim jihatlaridan biri — davlat boshqaruvining turli bo‘g‘inlari uchun mas’ul shaxslarni tanlash, ularning vakolatlarini belgilash va davlat manfaatlariga muvofiq faoliyat yuritishini ta’minlashga intilishidir [13; 18–20].

Amir Temurning boshqaruv konsepsiyasini o‘rganishda “Temur tuzuklari” alohida o‘rin tutadi. Mazkur manbada davlatni boshqarish, amaldorlarni tayinlash, harbiy va fuqarolik boshqaruvi, maslahatlashuv, nazorat, rag‘batlantirish va jazolash kabi masalalar tizimli tarzda bayon etilgan. Xususan, davlatni boshqarishning o‘n ikki qoidasi orasida maslahat va kengashga tayanish, qonun va tartibga rioya qilish, turli ijtimoiy qatlamlarning fikrini hisobga olish hamda davlat xizmatidagi shaxslarning faoliyatiga e’tibor berish kabi tamoyillar mavjud [23; 32–34].

Mazkur qoidalar “kadrlar siyosati” tushunchasini o‘rta asrlar sharoitida tahlil qilish imkonini beradi. Albatta, zamonaviy davlat boshqaruvidagi inson resurslarini boshqarish tizimini Amir Temur davridagi mansablar tizimi bilan to‘liq tenglashtirish metodologik jihatdan to‘g‘ri emas. Biroq kadrlarni tanlash, ularning qobiliyatini baholash, vazifalarni taqsimlash, faoliyatini nazorat qilish va xizmatiga qarab rag‘batlantirish kabi jarayonlar o‘rtasida funksional o‘xshashliklar mavjud. Mahsutaliev tadqiqotida Amir Temur rahbar tanlashda adolat, qonunga rioya qilish,

maslahat, qat’iyatlilik, tadbirkorlik, hushyorlik, ehtiyotkorlik, sabr va jasorat kabi fazilatlarni muhim mezon sifatida ko‘rsatgani qayd etiladi [12; 397–398].

FOYDALANILGAN ADABIYOTLAR VA METODLAR.

Mazkur tadqiqotda Amir Temurning kadrlar siyosati va strategik qarorlar qabul qilish mexanizmini o‘rganish uchun tarixiy-manbashunoslik hamda qiyosiy-tahliliy yondashuvlar uyg‘unlashtirildi. Tadqiqotning asosiy manbasi sifatida “Temur tuzuklari”ning o‘zbek tilidagi nashrlari olindi. Xususan, 1991-yilgi nashrda davlatni boshqarish qoidalari, mansabdorlarni tayinlash, harbiy va fuqarolik boshqaruvi, rag‘batlantirish hamda davlat oldidagi mas’uliyat masalalari batafsil yoritilgan [23; 32–34]. Shuningdek, “Tuzuklar”ning 1992, 1993 va 2018-yillardagi nashrlari ham qiyosiy manba sifatida hisobga olindi [21; 54–55; 24; 70–75].

Tadqiqotning manbashunoslik bazasini kengaytirish maqsadida Temuriylar davri tarixiga oid boshqa birlamchi va ikkilamchi manbalar ham jalb qilindi. Jumladan, Abdurazzoq Samarqandiyning Matla al-sa’dayn wa majma’ al-bahrayn asari Temuriylar davridagi siyosiy jarayonlar va davlat arboblari faoliyatini tarixiy voqealar ketma-ketligida o‘rganish imkonini beradi [1]. Fasih al-Xavofiyning Mujmal-i Fasihi ham XIV–XV asrlar siyosiy tarixiga oid ma’lumotlarni tekshirish va “Tuzuklar”dagi ayrim qarashlarni tarixiy kontekstga joylashtirish uchun foydalanildi [5].

Davlat boshqaruvida vazirlik institutining o‘rnini aniqlashda Xondamirning Dastūr al-wuzarā asari alohida ahamiyat kasb etadi. Ushbu asarning Said Nafisi tomonidan tayyorlangan nashri bilan bir qatorda, O‘zbekiston Fanlar akademiyasi Abu Rayhon Beruniy nomidagi Sharqshunoslik instituti va Germaniya davlat kutubxonasida saqlanayotgan qo‘lyozma nusxalari ham manbashunoslik nuqtayi nazaridan e’tiborga olindi [8; 9; 10]. Mazkur manbalar vazirlik lavozimining tarixiy mazmuni, vazirlarning davlat boshqaruvidagi o‘rni va ularni tayinlash masalalarini “Temur tuzuklari”dagi qarashlar bilan solishtirish imkonini beradi.

Tadqiqotda Sharafiddin Ali Yazdiyning Zafar-namasi va Xondamirning Habib al-siyar asaridan ham foydalanildi. Ushbu tarixiy asarlar Amir Temur va Temuriylar siyosiy faoliyatini narrativ shaklda yoritishi bilan “Tuzuklar”dagi normativ qarashlarni tarixiy voqealar bilan qiyoslash uchun muhim material beradi [20; 11]. Mirkhwandning Rawdat al-safa asarining VII jildi ham shu maqsadda manbalar qatoriga kiritildi [15].

Tadqiqot metodologiyasining ikkinchi muhim yo‘nalishi — qiyosiy tahlildir. Bunda “Temur tuzuklari”da qayd etilgan kadrlarni tanlash, lavozimga tayinlash, vazifalarni taqsimlash, nazorat qilish va rag‘batlantirish tamoyillari zamonaviy menejmentning tegishli kategoriyalari bilan funksional jihatdan qiyoslandi. Biroq

bunday qiyoslashda tarixiy davrlar o‘rtasidagi siyosiy, huquqiy va ijtimoiy tafovutlar hisobga olindi. Ya’ni maqolada Amir Temur davridagi boshqaruv tizimi zamonaviy menejmentning bevosita analogi sifatida emas, balki ayrim boshqaruv funksiyalarining tarixiy ko‘rinishi sifatida talqin qilinadi.

MUHOKAMA VA NATIJALAR

Kadrlar siyosatini tahlil qilishda, avvalo, tanlov mezonlari ajratib olindi. “Tuzuklar”dagi rahbar uchun zarur bo‘lgan adolat, qonunga rioya qilish, maslahatga quloq tutish, qat’iyatlilik, tadbirkorlik, hushyorlik, ehtiyotkorlik, sabr va jasorat kabi sifatlar alohida kategoriyalar sifatida tizimlashtirildi [12; 397–398]. Ushbu mezonlar zamonaviy menejmentdagi kompetensiyaga asoslangan kadrlar tanlovi tushunchasi bilan funksional jihatdan qiyoslandi.

Ikkinchi analitik kategoriya — lavozim va vazifaning mosligi. Amir Temur boshqaruvida shaxsning davlat xizmatidagi o‘rni uning qobiliyati, tajribasi va bajarishi lozim bo‘lgan vazifalar bilan bog‘langan. Mahsutaliev tadqiqotida ham “Tuzuklar” asosida rahbarning faoliyati uning bilim, tajriba, aql va tashabbuskorlik darajasi bilan bog‘liqligi ko‘rsatiladi [12; 399]. Shu sababli maqolada kadrlar siyosati faqat tayinlash jarayoni emas, balki “to‘g‘ri shaxsni to‘g‘ri vazifaga qo‘yish” tamoyili sifatida ham ko‘rib chiqiladi.

Uchinchi kategoriya — strategik qaror qabul qilish. “Temur tuzuklari”dagi maslahatlashuv, kengash, turli qatlamlar fikrini o‘rganish, qaror qabul qilishda ehtiyotkorlik, yakuniy qaror uchun rahbarning shaxsiy javobgarligi va qarorning ijrosini nazorat qilish kabi elementlar bir butun boshqaruv sikli sifatida tahlil qilindi [23; 32–34]. Bu yondashuv strategik qaror qabul qilishni faqat yakuniy buyruq berish jarayoni emas, balki axborot yig‘ish → maslahatlashish → vaziyatni baholash → qaror qabul qilish → ijroni nazorat qilish ketma-ketligidan iborat jarayon sifatida ko‘rishga imkon beradi.

Vazirlar faoliyatini tahlil qilishda Karimovning tadqiqotlari muhim ikkilamchi manba vazifasini bajardi. Xususan, The Appointment of Wazirs in the Timurid Empire maqolasida vazirlarni tayinlash masalasi Temuriylar davlat boshqaruvi doirasida ko‘rib chiqilgan bo‘lib, undagi ma’lumotlar “Tuzuklar”dagi kadrlarni tanlash tamoyillari bilan qiyoslandi [6; 28–33]. Shuningdek, Khoja Majd al-Dīn Muhammadning davlat boshqaruvidagi faoliyatiga bag‘ishlangan tadqiqot Temuriylar davrida muayyan mansabdorlarning davlat tizimidagi real faoliyatini aniqlash uchun qo‘shimcha material sifatida ishlatildi [7; 189–195].

Shunday qilib, tadqiqotda normativ manba (“Temur tuzuklari”), tarixiy-narrativ manbalar (Samarqandiy, Fasih al-Xavofiy, Yazdiy, Xondamir, Mirkhwand) va zamonaviy ilmiy tadqiqotlar o‘zaro qiyoslandi. Bunday manbalararo yondashuv

“Tuzuklar”dagi qoidalarni faqat ideal yoki deklarativ tamoyillar sifatida emas, balki o‘rta asrlar davlat boshqaruvi kontekstida tahlil qilish imkonini beradi.

Tadqiqotning metodologik asosini tarixiy-manbashunoslik, qiyosiy-tahliliy va institutsional yondashuvlar tashkil etadi. Mazkur yondashuvlar orqali «Temur tuzuklari»da aks etgan kadrlar siyosati, davlat boshqaruvida mansabdor shaxslarni tanlash, ularning vazifalarini belgilash hamda strategik qarorlarni qabul qilish tamoyillari tahlil qilindi. Bunda «Temur tuzuklari» asosiy manba sifatida olinib, undagi ma’lumotlar temuriylar davriga oid tarixiy asarlar va zamonaviy tadqiqotlar bilan qiyoslandi.

Manbashunoslik nuqtayi nazaridan «Temur tuzuklari»ga ehtiyotkorlik bilan yondashish muhimdir. Chunki asarning Amir Temur tomonidan aynan qanday shaklda yozilgani, uning bizgacha yetib kelgan matni va keyingi tarjima-tahrir jarayonlari ilmiy adabiyotlarda alohida muhokama qilingan. Shu sababli maqolada «Temur tuzuklari»dagi ma’lumotlar bevosita tarixiy voqeaning so‘zsiz dalili sifatida emas, balki Amir Temur davridagi davlat boshqaruvi haqidagi normativ-siyosiy tasavvurlarni ifodalovchi manba sifatida ham ko‘rib chiqiladi. Bu jihatdan B.F. Manzning Temur hokimiyati va davlat boshqaruvi haqidagi tadqiqoti muhim metodologik asoslardan biridir [13; 18–20].

Bundan tashqari, Xondamirning Dastūr al-wuzarā asari vazirlik institutining tarixiy shakllanishi va vazirlarning davlat boshqaruvidagi o‘rnini o‘rganish uchun muhim manba hisoblanadi [8]. Mazkur manbaning O‘zbekiston Fanlar akademiyasi Abu Rayhon Beruniy nomidagi Sharqshunoslik instituti fondida saqlanayotgan qo‘lyozma nusxasi ham tadqiqotning manbashunoslik bazasiga kiritildi [9]. Shuningdek, Temuriylar davrining siyosiy-ma’muriy tarixini tiklashda Mirxond va Sharafuddin Ali Yazdiy asarlaridan foydalanish davlat boshqaruvi jarayonlarini faqat «Temur tuzuklari» doirasida emas, balki kengroq tarixiy kontekstda ko‘rish imkonini beradi [15; 20].

Strategik qarorlar qabul qilish mexanizmini aniqlashda esa «Temur tuzuklari»dagi maslahat, qat’iy qaror, ijroni nazorat qilish va vazifalarni tegishli shaxslarga taqsimlash haqidagi qoidalar asosiy tahlil obyekti sifatida belgilandi. Mazkur tizimni shartli ravishda «maslahat – tahlil – qaror – ijro – nazorat» ketma-ketligi sifatida ifodalash mumkin.

Amir Temur boshqaruv tajribasida maslahatlashuvga katta ahamiyat berilgan bo‘lsa-da, yakuniy qaror hukmdorning siyosiy irodasi bilan bog‘langan [23; 32–34]. Bu esa strategik boshqaruvda maslahat va markazlashgan qaror qabul qilish mexanizmlarining birgalikda mavjud bo‘lganini ko‘rsatadi.

Natijalarni tekshirish va tarixiy kontekstni aniqlashtirish maqsadida «Temur tuzuklari»dagi ma’lumotlar Abd ar-Razzoq Samarqandiy, Fasih al-Xavofiy, Xondamir va Sharafuddin Ali Yazdiy kabi tarixchilar asarlari bilan qiyoslandi [1; 5; 11; 20]. Bunday qiyosiy yondashuv tadqiqotda normativ qoidalar bilan real tarixiy amaliyotni imkon qadar farqlashga yordam beradi.

Natijada, maqolada «Temur tuzuklari»dagi kadrlar siyosati uch asosiy yo‘nalishda — mansabdorlarni tanlash mezonlari, vakolat va mas’uliyatni taqsimlash, strategik qarorlarni qabul qilish va ijrosini nazorat qilish — doirasida o‘rganildi. Bu uch yo‘nalish o‘zaro bog‘liq holda tahlil qilinib, Amir Temur davridagi boshqaruv tajribasining institutsional xususiyatlarini aniqlashga asos bo‘ldi.

Tadqiqot natijalari shuni ko‘rsatadiki, «Temur tuzuklari»da kadrlar siyosati davlat boshqaruvining ikkilamchi elementi emas, balki markazlashgan hokimiyatni barqarorlashtiruvchi asosiy mexanizmlardan biri sifatida talqin qilinadi. Asarda davlatni boshqarish samaradorligi ko‘p jihatdan hukmdorning atrofidagi amaldorlarni to‘g‘ri tanlashi, ularning qobiliyatini hisobga olishi va har bir mansabdor zimmasiga aniq vazifa yuklashiga bog‘langan. Xususan, hukmdor huzurida turli masalalarni muhokama qilish, bilimli va tajribali kishilarning maslahatidan foydalanish hamda yakuniy qaror uchun mas’uliyatni o‘z zimmasida saqlash tamoyili kuzatiladi [23; 32–34].

«Temur tuzuklari»da kadrlarni tanlashda mansabning o‘zi emas, balki shaxsning qobiliyati, tajribasi, sadoqati va amaliy faoliyati muhim mezon sifatida ko‘rsatiladi. Bu jihat Amir Temurning davlat boshqaruvida funksional taqsimotga katta e’tibor berganini ko‘rsatadi. Davlat tizimida vazirlar, amirlar, hokimlar, qozilar va boshqa mansabdorlarning alohida vazifalari mavjud bo‘lib, ularning faoliyati umumiy davlat siyosatining amalga oshirilishiga xizmat qilgan [19; 72]. Shunday qilib, kadrlar siyosati shaxsni lavozimga qo‘yish bilangina cheklanmagan, balki uni muayyan vazifa va mas’uliyat bilan bog‘lagan.

Mazkur holatni Sherzod Karimovning Temuriylar imperiyasida vazirlarni tayinlash masalasiga bag‘ishlangan tadqiqoti ham to‘ldiradi. Muallif tarixiy manbalar asosida vazirlik institutining davlat boshqaruvidagi o‘rnini ko‘rsatib, vazirlarning hukmdor siyosatini amalga oshirishdagi funksiyalarini tahlil qiladi [6; 28–33]. Xondamirning Dastūr al-wuzarā asari esa vazirlik institutini tarixiy jihatdan yanada kengroq kontekstda ko‘rish imkonini beradi [8]. Bu manbalar «Temur tuzuklari»dagi kadrlar haqidagi qoidalar muayyan siyosiy-amaliy ehtiyojlar bilan bog‘liq bo‘lganini ko‘rsatadi.

Kadrlarni tanlashning asosiy mezonlari. Tahlil natijasida «Temur tuzuklari»da davlat xizmatchisini tanlashda bir nechta asosiy mezon mavjudligi

aniqlandi. Birinchidan, adolat. Hukmdor va uning amaldorlari xalq bilan munosabatlarda adolat tamoyiliga amal qilishi kerakligi qayta-qayta ta’kidlanadi. Ikkinchidan, bilim va tajriba. Davlat ishlariga tasodifiy yoki tayyorgarligi yetarli bo‘lmagan shaxslarni jalb qilish boshqaruvning zaiflashishiga olib kelishi mumkin. Uchinchidan, sadoqat va mas’uliyat. Mansabdor o‘z vazifasini shaxsiy manfaatdan ustun qo‘yishi lozim. To‘rtinchidan, qat’iyat va tashabbuskorlik davlat vazifalarini amalga oshirishning muhim sharti sifatida namoyon bo‘ladi [24; 70–75].

Bu mezonlar zamonaviy menejmentdagi kompetensiya modeliga ma’lum darajada o‘xshashdir. Zamonaviy tashkilotlarda ham rahbar yoki xodimning lavozimga mosligi uning faqat formal maqomi bilan emas, balki bilim, tajriba, qaror qabul qilish qobiliyati, mas’uliyati va yetakchilik kompetensiyalari orqali baholanadi. Biroq bu o‘xshashlikni tarixiy davrlar o‘rtasidagi to‘g‘ridan-to‘g‘ri tenglik sifatida emas, balki boshqaruvning universal funksional ehtiyojlari sifatida tushunish lozim.

Amir Temur boshqaruv tajribasida mansabdorlarning faoliyatini doimiy nazorat qilish ham muhim o‘rin egallagan. «Temur tuzuklari»da davlat xizmatidagi shaxslarning vazifasini bajarmasligi, hokimiyatdan suiiste’mol qilishi yoki davlat manfaatlariga zid harakat qilishi jazolanishi lozimligi ko‘rsatiladi [23; 74–75]. Demak, kadrlar siyosatining ikkinchi muhim elementi — javobgarlik mexanizmidir. Rag‘batlantirish va jazolashning birgalikda qo‘llanishi davlat xizmatchisining faoliyatini tartibga soluvchi vosita sifatida namoyon bo‘ladi

Strategik qaror qabul qilish mexanizmi. Tadqiqotning yana bir muhim natijasi shundan iboratki, «Temur tuzuklari»dagi boshqaruv modeli maslahatlashuv va markazlashgan qaror qabul qilishning o‘ziga xos uyg‘unligiga asoslangan. Amir Temur muhim davlat masalalarida turli toifadagi kishilar bilan maslahatlashgan, biroq yakuniy siyosiy qaror markaziy hokimiyat tomonidan qabul qilingan [23; 32–34].

Buni shartli ravishda quyidagi boshqaruv modeli orqali ifodalash mumkin:

Maslahat → ma’lumot yig‘ish → muhokama → strategik qaror → ijro → nazorat.

Ushbu modelda maslahat qarorning o‘zi emas, balki qaror qabul qilishdan oldingi axborot va tahlil bosqichi vazifasini bajaradi. Bu jihat zamonaviy strategik menejmentdagi decision-making process bilan qiyosiy tahlil qilish uchun muhim asos yaratadi.

Amir Temurning qaror qabul qilish tajribasida axborotning ishonchliligi ham alohida ahamiyatga ega bo‘lgan. Davlatning turli hududlaridagi vaziyat, aholining kayfiyati, mansabdorlarning faoliyati va siyosiy jarayonlar haqida ma’lumot olish

boshqaruv qarorlarining muhim asosi bo‘lgan. Bu jihat davlat boshqaruvida axborot va monitoringning strategik resurs sifatidagi ahamiyatini ko‘rsatadi [12; 398–399].

Shu nuqtayi nazardan, «Temur tuzuklari»da qaror qabul qilish jarayonini faqat hukmdorning shaxsiy irodasi bilan izohlash yetarli emas. Qaror ortida maslahat, kuzatuv, axborot yig‘ish, vaziyatni baholash va ijroni nazorat qilish kabi bir nechta bosqichlar mavjud

Bundan tashqari, tarixiy manbalar Temuriylar davrida vazirlik va boshqa ma’muriy institutlarning amaliy faoliyatini o‘rganish imkonini beradi. Abd ar-Razzoq Samarqandiy, Fasih al-Xavofiy va Xondamir asarlaridagi ma’lumotlarni «Temur tuzuklari» bilan qiyoslash orqali normativ qoidalar bilan tarixiy amaliyot o‘rtasidagi munosabatni aniqlash mumkin [1; 5; 11]. Shu sababli «Temur tuzuklari»ni alohida holda emas, balki Temuriylar davrining keng manbashunoslik korpusi tarkibida tahlil qilish ilmiy jihatdan samaraliroqdir.

O‘tkazilgan tahlil «Temur tuzuklari»dagi kadrlar siyosatini faqat amaldorlarni lavozimga tayinlash jarayoni sifatida emas, balki davlat boshqaruvining barqarorligini ta’minlovchi yaxlit tizim sifatida ko‘rish imkonini beradi. Ushbu tizimda uchta o‘zaro bog‘liq jihat ajralib turadi: munosib kadrni tanlash, unga vakolat va mas’uliyat yuklash hamda uning faoliyatini nazorat qilish. Mazkur uchlik davlat boshqaruvida shaxsiy qobiliyat bilan institutsional mas’uliyatni birlashtirgan. «Temur tuzuklari»da amaldorlarning aql-zakovati, tajribasi, tadbirkorligi, hushyorligi, sabr-toqati va jasorati kabi fazilatlar boshqaruv samaradorligining muhim sharti sifatida ko‘rsatiladi [24; 70–75].

Bu yerda e’tiborli jihat shundaki, kadrning davlat tizimidagi qiymati faqat uning egallagan lavozimi bilan belgilanmaydi. Aksincha, shaxsning muayyan vazifani bajarishga qodirligi va unga yuklatilgan mas’uliyatni ado etishi asosiy mezon sifatida namoyon bo‘ladi. Mahsutaliev tadqiqotida ham Amir Temurning rahbar tanlash borasidagi qarashlari adolat, qonun va tartibga rioya qilish, maslahat, qat’iy qaror, tadbirkorlik, hushyorlik, ehtiyotkorlik, sabr va jasorat kabi sifatlar bilan bog‘lanadi [12; 397–398]. Demak, «Temur tuzuklari»dagi kadrlar siyosatining markazida lavozimga moslik tamoyili turadi.

Mazkur yondashuvni bugungi zamonaviy menejment bilan qiyoslaganda, kompetensiyaga asoslangan boshqaruv konsepsiyasi bilan muayyan funksional o‘xshashlik mavjudligini ko‘rish mumkin. Zamonaviy boshqaruvda ham rahbarning samaradorligi uning lavozimidan ko‘ra ko‘proq qaror qabul qilish, jamoani boshqarish, muammolarni hal qilish, mas’uliyatni o‘z zimmasiga olish va strategik fikrlash qobiliyatlari bilan belgilanadi. Biroq tarixiy analogiyani mutlaq tenglashtirish metodologik jihatdan noto‘g‘ri bo‘ladi. Amir Temur davridagi boshqaruv monarxik-

siyosiy tizim doirasida shakllangan bo‘lsa, zamonaviy menejment boshqa huquqiy va institutsional sharoitlarga asoslanadi. Shu sababli maqolada o‘xshashliklar funksional qiyoslash sifatida talqin qilinadi.

Vazirlik instituti va kadrlar siyosatining institutsionallashuvi. Kadrlar siyosatining amaliy ko‘rinishlaridan biri vazirlik institutida namoyon bo‘ladi. Temuriylar davlatida vazirlar davlat boshqaruvi tizimining muhim bo‘g‘ini bo‘lib, ular hukmdor tomonidan belgilangan siyosatning turli yo‘nalishlarini amalga oshirishda ishtirok etgan. Sherzod Karimovning tadqiqotida vazirlarni tayinlash masalasi alohida tarixiy muammo sifatida o‘rganilib, Temuriylar davridagi vazirlik instituti va uning davlat boshqaruvidagi vazifalari tarixiy manbalar asosida tahlil qilingan [6; 28–33].

Bu masalada Xondamirning Dastūr al-wuzarā asari alohida ahamiyat kasb etadi. Asarning o‘zi vazirlik institutining tarixiy tajribasini aks ettiruvchi maxsus manbalardan biri bo‘lib, Temuriylar davrida davlat xizmatining mazmuni va yuqori mansabdorlarning siyosiy faoliyatini o‘rganish uchun muhim material beradi [8]. Shuningdek, mazkur asarning Abu Rayhon Beruniy nomidagi Sharqshunoslik instituti fondida saqlanayotgan qo‘lyozma nusxasi mavjudligi uning manbashunoslik qiymatini yanada oshiradi [9].

Vazirlik institutining mavjudligi davlat boshqaruvida vazifalarni taqsimlash tamoyili shakllanganini ko‘rsatadi. Hukmdor barcha davlat ishlarini bevosita amalga oshirmaydi; aksincha, muayyan yo‘nalishlar bo‘yicha mas’ul shaxslarni tayinlash orqali boshqaruvni amalga oshiradi. Bunda hukmdor strategik yo‘nalishni belgilovchi markaziy subyekt bo‘lib qoladi, vazir va boshqa amaldorlar esa ushbu siyosatning ijrochilariga aylanadi. Shu jihatdan «Temur tuzuklari»dagi kadrlar siyosati markazlashgan boshqaruv va funksional delegatsiyaning uyg‘unligiga asoslanganini ko‘rsatadi [23; 32].

Shuningdek, mansabdorlarning faoliyatini nazorat qilish tizimi kadrlar siyosatining ajralmas qismi bo‘lgan. Mahsutaliev keltirgan ma’lumotlarda rahbarning o‘z qo‘l ostidagilar faoliyatini kuzatishi, ishonchsiz shaxslarni tekshirtirishi va topshiriqlarning bajarilishini nazorat qilishi zarurligi ta’kidlanadi [12; 399].

Bu holat zamonaviy boshqaruvdagi accountability, ya’ni rahbar va xodimlarning o‘z faoliyati uchun javobgarligi tamoyiliga funksional jihatdan yaqin turadi

Strategik qarorlar qabul qilishda maslahat va yakuniy mas’uliyat. «Temur tuzuklari»ning muhim jihatlaridan biri — qaror qabul qilish jarayonida maslahat institutiga katta ahamiyat berilishidir. Davlatning muhim masalalarini hal qilishdan oldin turli toifadagi kishilarning fikrini tinglash, bilimli va tajribali shaxslarning

maslahatidan foydalanish boshqaruv jarayonining muhim qismi sifatida ko‘rsatiladi [23; 34].

Biroq maslahatlashuv yakuniy qarorning mas’uliyatini boshqa shaxslarga topshirish degani emas. Aksincha, maslahatdan so‘ng yakuniy qarorni qabul qilish va uning oqibatlari uchun javob berish hukmdorning zimmasida qoladi. Shu nuqtayi nazardan, Amir Temur boshqaruv modelida kollegial maslahat va markazlashgan qaror bir-birini inkor qiluvchi emas, balki bir-birini to‘ldiruvchi mexanizmlar sifatida namoyon bo‘ladi.

Bunday mexanizmni quyidagicha ifodalash mumkin:

axborot yig‘ish → maslahatlashuv → vaziyatni baholash → yakuniy qaror → ijro → nazorat.

Ushbu ketma-ketlik maqolaning asosiy ilmiy xulosalaridan birini tashkil etadi. Chunki strategik qarorning sifati faqat hukmdorning shaxsiy irodasiga emas, balki qaror oldidan to‘plangan ma’lumot va maslahatlarning sifatiga ham bog‘langan. Shu ma’noda, Amir Temur tajribasida axborot boshqaruv resursi sifatida namoyon bo‘ladi.

Mahsutalievning tadqiqotida davlat boshqaruvida aholining holati, turli hududlardagi vaziyat, ijtimoiy guruhlarning kayfiyati va davlat vakillarining faoliyati haqida muntazam ma’lumotga ega bo‘lish zarurligi ko‘rsatiladi [12; 398–399]. Bu ma’lumotlar strategik qarorlarni real vaziyatga moslashtirishga xizmat qilgan. Shunday qilib, boshqaruvda «ma’lumotga ega bo‘lish – vaziyatni baholash – qaror qabul qilish» munosabati mavjud bo‘lgan.

Kadrlar siyosatida rag‘bat va javobgarlikning uyg‘unligi. Tadqiqot natijalari kadrlar siyosatining yana bir muhim elementi rag‘batlantirish va jazolash mexanizmi ekanini ko‘rsatadi. «Temur tuzuklari»da davlatga sodiq xizmat qilgan shaxslarni martaba, unvon va moddiy jihatdan rag‘batlantirishga alohida e’tibor qaratiladi. Shu bilan birga, o‘z vazifasini bajarmagan yoki davlat manfaatlariga zid harakat qilgan mansabdorlar jazolanishi lozimligi qayd etiladi [24; 73].

Bu tizim boshqaruv nuqtayi nazaridan ikki tomonlama vazifani bajargan: bir tomondan, fidoyi xizmatni rag‘batlantirgan; ikkinchi tomondan, mansabdorlarning javobgarligini kuchaytirgan. Shamsievning tadqiqotida ham «Temur tuzuklari»da qonunlarni buzgan, hokimiyatdan suiiste’mol qilgan va o‘z vazifalarini bajarmagan shaxslarni jazolashga katta e’tibor berilgani ko‘rsatiladi [19; 72].

Shu bilan birga, kadrlar siyosatini faqat jazolash tizimi sifatida talqin qilish to‘g‘ri emas. Rag‘batlantirishning mavjudligi davlat xizmatida motivatsiya mexanizmi shakllanganini ko‘rsatadi. Bu jihat zamonaviy inson resurslarini

boshqarish tizimidagi moddiy va nomoddiy rag‘batlantirish konsepsiyasi bilan qiyoslash imkonini beradi.

Maqolada «Temur tuzuklari»ning normativ xususiyatini hisobga olish alohida metodologik ahamiyatga ega. Asarda davlat qanday boshqarilishi kerakligi haqidagi qoidalar bayon etiladi. Shuning uchun undagi har bir qoida tarixiy voqelikning bevosita va to‘liq tasviri sifatida qabul qilinmasligi kerak. Ushbu masala Amir Temur tarixini o‘rgangan zamonaviy tadqiqotchilar uchun muhim manbashunoslik muammolaridan biridir.

B.F. Manz Amir Temur davlatining siyosiy tuzilishi va hokimiyat mexanizmlarini tahlil qilar ekan, Temur hokimiyatining shakllanishi va imperiyaning boshqarilishini kengroq tarixiy kontekstda ko‘rib chiqadi [13; 19]. Shu sababli «Temur tuzuklari»dagi normativ qarashlarni boshqa tarixiy manbalar bilan qiyoslash orqali ularning tarixiy mazmunini chuqurroq anglash mumkin.

Abd ar-Razzoq Samarqandiyning Matla al-sa’dayn wa majma’ al-bahrayn asari ham Temuriylar davrining siyosiy jarayonlarini tarixiy kontekstda o‘rganish uchun muhim manbalardan biridir [1]. Fasih al-Xavofiyning Mujmal-i Fasihi asari [5] va Xondamirning Habib al-siyar asari [11] ham davr siyosiy hayotiga oid ma’lumotlarni qiyosiy tekshirish imkonini beradi.

Demak, tadqiqot natijalari «Temur tuzuklari»ni yagona va mutlaq manba sifatida emas, balki boshqa tarixiy manbalar bilan birgalikda tahlil qilinishi lozim bo‘lgan normativ-siyosiy manba sifatida baholash zarurligini ko‘rsatadi. Aynan mana shu yondashuv maqolaning manbashunoslik va zamonaviy menejmentni birlashtiruvchi asosiy metodologik xususiyatini tashkil etadi.

Tadqiqot natijalari «Temur tuzuklari»da kadrlar siyosati va strategik qarorlar qabul qilish mexanizmi o‘zaro uzviy bog‘langanligini ko‘rsatdi. Amir Temur davridagi boshqaruv tajribasida munosib kadrni tanlash davlat siyosatini amalga oshirishning dastlabki sharti bo‘lgan. Kadrga vakolat berish esa uni muayyan vazifa va javobgarlik bilan bog‘lagan. Shu sababli «Temur tuzuklari»da rahbarning shaxsiy fazilatlari bilan bir qatorda uning boshqaruvdagi amaliy mas’uliyati ham alohida ahamiyat kasb etadi [23; 32–34].

Kadrlar siyosatining bunday modeli markazlashgan davlat sharoitida ayniqsa muhim edi. Keng hududlarni boshqarish uchun hukmdorning shaxsiy nazorati yetarli bo‘lmagan. Shu sababli turli darajadagi amaldorlar, vazirlar, hokimlar va harbiy rahbarlardan iborat boshqaruv apparati shakllantirilgan. «Temur tuzuklari»da mansabdorlarning vazifalarini belgilash, ularning xizmatini baholash va faoliyatini nazorat qilishga oid qoidalar ana shu ehtiyojning mahsuli sifatida namoyon bo‘ladi [19; 72].

Kadrlar siyosatining strategik ahamiyati shundaki, davlatning umumiy siyosiy maqsadlari ularni amalga oshiruvchi insonlar orqali hayotga tatbiq etiladi. Shu ma’noda Amir Temurning boshqaruv tajribasida kadr tanlash oddiy ma’muriy jarayon emas, balki strategik qaror sifatida namoyon bo‘ladi. Agar muayyan lavozimga qobiliyatsiz yoki ishonchsiz shaxs tayinlansa, bu nafaqat alohida vazifaning, balki davlat siyosatining ham samaradorligiga ta’sir qilishi mumkin.

Mahsutaliev keltirgan mezonlarda rahbar uchun adolat, qonunlarga rioya qilish, maslahatlashish, qat’iyat, tadbirkorlik, hushyorlik va jasorat kabi sifatlar ko‘rsatiladi [12; 397]. Ushbu fazilatlarni funksional jihatdan uch guruhga ajratish mumkin:

- Axloqiy kompetensiyalar — adolat, halollik, sabr-toqat;
- Intellektual kompetensiyalar — bilim, tahlil qilish, maslahatdan foydalanish;
- Boshqaruv kompetensiyalari — qat’iyat, tashabbuskorlik, nazorat va javobgarlik.

Bunday tasnif «Temur tuzuklari»dagi kadrlar haqidagi qarashlarni zamonaviy menejment nuqtayi nazaridan tizimlashtirish imkonini beradi. Shu bilan birga, bu tasnif tarixiy manbada aynan shu terminlar bilan berilgan degan xulosani anglatmaydi; u maqola muallifining manba materialini zamonaviy analitik kategoriyalar yordamida qayta tizimlashtirishidir.

«Maslahat – qaror – ijro – nazorat» modeli

Strategik qarorlarni qabul qilish mexanizmining muhim xususiyati maslahat va yakuniy hokimiyatning o‘zaro nisbatida ko‘rinadi. «Temur tuzuklari»da muhim davlat masalalarida maslahatlashish va tajribali kishilarning fikrini tinglash zarurligi ta’kidlangan [23; 33]. Biroq yakuniy qarorning bajarilishi ustidan nazorat markaziy hokimiyat zimmasida qoladi.

Bu jarayonni «maslahat – qaror – ijro – nazorat» modeli sifatida umumlashtirish mumkin. Mazkur modelning birinchi bosqichida turli manbalardan axborot olinadi; ikkinchi bosqichda muqobil yo‘llar muhokama qilinadi; uchinchi bosqichda qaror amalga oshiriladi; to‘rtinchi bosqichda uning ijrosi nazorat qilinadi.

Amir Temur boshqaruvining ushbu jihati zamonaviy strategik menejment uchun ham metodologik qiziqish uyg‘otadi. Chunki samarali qaror qabul qilish faqat qarorning mazmuniga emas, balki uning ijrosini ta’minlaydigan tashkiliy mexanizmlarga ham bog‘liq. Mahsutaliev tadqiqotida rahbarning topshiriqlarning

bajarilishini shaxsan nazorat qilishi va ishonchsiz ijrochilar faoliyatini tekshirtirishi haqida fikrlar keltiriladi [12; 399–400].

Shu bilan birga, tarixiy va zamonaviy boshqaruv o‘rtasidagi farqni hisobga olish zarur. Amir Temur davridagi qaror qabul qilish tizimi monarxik hokimiyat va harbiy-siyosiy sharoit bilan belgilanadi. Zamonaviy menejment esa institutsional vakolatlar, huquqiy javobgarlik, jamoaviy boshqaruv va professional boshqaruv tamoyillariga asoslanadi. Shuning uchun «Temur tuzuklari»dagi tajribani zamonaviy boshqaruv uchun tayyor model sifatida emas, balki tarixiy boshqaruv tafakkurining muhim tajribasi sifatida baholash maqsadga muvofiq.

Tadqiqot shuni ko‘rsatadiki, Amir Temur boshqaruv konsepsiyasida kadrni tanlash bilan bir qatorda uning keyingi faoliyatini baholash ham muhim o‘rin egallagan. Mansabdorning vakolati nazoratsiz qoldirilsa, davlat manfaatlariga zid harakatlar yuzaga kelishi mumkinligi haqidagi qarashlar «Temur tuzuklari»da aks etadi [24; 73].

Shamsievning tadqiqotida ham qonunlarni buzgan, hokimiyatdan suiiste’mol qilgan yoki o‘z vazifasini bajarmagan davlat xizmatchilarini jazolashga alohida e’tibor berilgani qayd etiladi [19; 72]. Bunda vakolat – mas’uliyat – nazorat – javobgarlik munosabati shakllanadi.

Mazkur mexanizm zamonaviy davlat boshqaruvida ham muhim bo‘lgan «accountability» tushunchasi bilan qiyoslanishi mumkin. Ammo tarixiy sharoitda bu javobgarlik zamonaviy demokratik institutlardan emas, hukmdorning siyosiy hokimiyati va amaldorlarning xizmat majburiyatlaridan kelib chiqqan.

Kadrlar siyosatining axloqiy asoslari

«Temur tuzuklari»dagi kadrlar siyosatining yana bir o‘ziga xos tomoni — boshqaruvni faqat texnik yoki ma’muriy faoliyat sifatida emas, balki axloqiy mas’uliyat sifatida ko‘rishidir. Rahbarning adolatli bo‘lishi, xalq manfaatini hisobga olishi, o‘z vakolatidan shaxsiy manfaat uchun foydalanmasligi va munosib kishilarni qo‘llab-quvvatlashi boshqaruv samaradorligining muhim shartlari sifatida namoyon bo‘ladi [24; 74].

Bu jihat «Temur tuzuklari»ni faqat harbiy yoki siyosiy tarix manbasi sifatida emas, balki boshqaruv tafakkuri tarixini o‘rganish manbasi sifatida ham baholash imkonini beradi. Asarda davlatning mustahkamligi uning harbiy qudrati bilangina emas, balki adolat, tartib, intizom va malakali boshqaruv bilan ham bog‘lanadi [23;34].

Shuningdek, Amir Temurning iqtisodiy qarashlari ham kadrlar siyosatining ijtimoiy mazmunini tushunishga yordam beradi. Mahsutaliev tadqiqotida aholining iqtisodiy manfaatlarini hisobga olish, tadbirkorlarni qo‘llab-quvvatlash, dehqonlarga

ishlab chiqarish uchun zarur vositalar bilan yordam berish va soliqlarni aholining iqtisodiy imkoniyatlariga moslashtirish kabi qarashlar qayd etiladi [12; 401–402]. Demak, davlat boshqaruvida kadrning vazifasi faqat buyruqni bajarish emas, balki jamiyatning iqtisodiy va ijtimoiy ehtiyojlarini anglash bilan ham bog‘langan.

Kadrlar siyosatining yana bir muhim jihati — mansabdor faoliyatini nazorat qilishdir. Amir Temur uchun lavozimga tayinlash jarayoni boshqaruvning yakuniy bosqichi emas, balki undan keyingi nazorat va javobgarlik mexanizmlarini ham talab qiluvchi jarayon bo‘lgan. Mansabdor o‘z vazifasini bajarmasa yoki davlat manfaatiga zid harakat qilsa, uning faoliyatiga baho berilishi kerakligi ta’kidlanadi [12; 402]. Bunday yondashuv bugungi boshqaruv nazariyasidagi accountability — hisobdorlik, performance control — faoliyat natijalarini nazorat qilish va javobgarlik tushunchalari bilan qiyosiy jihatdan tahlil qilinishi mumkin.

Shuningdek, «Tuzuklar»da rahbarning o‘z atrofidagi maslahatchilarni to‘g‘ri tanlashi va ularning fikrlarini tahliliy qabul qilishi muhim masala sifatida ko‘rsatiladi.

Rahbar maslahat olishi kerak, biroq yakuniy qaror uchun shaxsiy mas’uliyatni o‘z zimmasida saqlashi lozim. Bu mexanizm strategik qaror qabul qilish jarayonida maslahat – tahlil – yakuniy qaror – ijro – nazorat ketma-ketligini ko‘rish imkonini beradi [12; 400].

Shunday qilib, «Temur tuzuklari»dagi kadrlar siyosatini uch asosiy tarkibiy elementga ajratish mumkin: birinchidan, munosib kadrni tanlash; ikkinchidan, uni muayyan vazifaga mos ravishda joylashtirish; uchinchidan, uning faoliyatini nazorat qilish va natijasiga qarab baholash. Mazkur uchlik davlat boshqaruvining uzluksizligini ta’minlovchi mexanizm sifatida namoyon bo‘ladi. Temuriylar davri haqidagi boshqa tarixiy manbalar ham vazirlik va davlat amaldorlari institutining davlat siyosatini amalga oshirishdagi muhim o‘rnini ko‘rsatadi [8; 31].

Amir Temur davlat boshqaruvida faqat markaziy hokimiyatning ichki axborotiga tayanib qolmasdan, hududlardagi vaziyat haqida ma’lumot olishga intilgan. Bunda viloyat va shahar boshqaruvchilari, amaldorlar hamda maxsus axborot yetkazuvchi shaxslarning faoliyati muhim o‘rin tutgan. Mazkur tizimning asosiy maqsadi markaziy hokimiyatga hududlardagi real vaziyat haqida ma’lumot yetkazish va davlat topshiriqlarining bajarilishini nazorat qilishdan iborat bo‘lgan [12; 398].

Tarixiy manbalar bilan qiyoslash ham ushbu xulosani yanada boyitadi. Temuriylar davri davlat boshqaruvi haqidagi manbalarda vazirlar va yuqori mansabdorlarning hukmdor bilan munosabati, ularning davlat ishlaridagi ishtiroki hamda boshqaruvdagi mavqei haqida ma’lumotlar uchraydi. Xususan, Xondamirning «Dastūr al-wuzarā» asari vazirlik institutining tarixiy rivojlanishini o‘rganishda

muhim manbalardan biridir [8]. Ushbu manba «Temur tuzuklari»dagi kadrlar siyosatiga oid qarashlarni alohida normativ matn sifatida emas, balki Temuriylar davrining kengroq siyosiy-boshqaruv kontekstida tahlil qilish imkonini beradi.

Shuningdek, Abdurazzoq Samarqandiyning «Matla‘ al-sa‘dayn va majma‘ al-bahrayn» asari Temuriylar davrining siyosiy jarayonlarini tarixiy voqealar asosida o‘rganish uchun muhim ahamiyatga ega.

Mazkur manba orqali davlat boshqaruvi, hukmdor va amaldorlar o‘rtasidagi munosabatlar hamda siyosiy qarorlarning tarixiy sharoitini «Tuzuklar»dagi normativ qarashlar bilan solishtirish mumkin [1].

Bu yerda manbashunoslik nuqtayi nazaridan muhim metodologik masala yuzaga keladi. «Temur tuzuklari»da berilgan qoidalar ko‘proq normativ-didaktik xarakterga ega bo‘lsa, tarixiy solnomalar konkret siyosiy voqealar va amaliy jarayonlarni qayd etadi. Shu sababli kadrlar siyosatini o‘rganishda faqat «Tuzuklar»dagi qoidalarni bevosita tarixiy haqiqat sifatida qabul qilish yetarli emas. Ularni Xondamir, Abdurazzoq Samarqandiy, Fasih al-Xavofiy, Sharafiddin Ali Yazdiy va boshqa tarixiy manbalar bilan qiyosiy tekshirish zarur [5; 8; 20].

Aynan shu qiyosiy yondashuv «Temur tuzuklari»dagi kadrlar siyosatini chuqurroq tushunish imkonini beradi. Masalan, vazir yoki amirning lavozimga tayinlanishi faqat uning shaxsiy fazilatlari bilan emas, balki davlatning siyosiy ehtiyojlari, hududiy vaziyat, harbiy holat va markaziy hokimiyat manfaatlari bilan ham belgilanadi. Shu jihatdan kadrlar siyosati alohida boshqaruv sohasi emas, balki davlatning umumiy strategiyasini amalga oshirish mexanizmining tarkibiy qismi bo‘lgan [6; 33].

XULOSA.

Tadqiqot natijalari shuni ko‘rsatadiki, «Temur tuzuklari»ni Amir Temur davridagi kadrlar siyosati va strategik qarorlar qabul qilish mexanizmini o‘rganishda muhim manba sifatida baholash mumkin. Asarda davlat boshqaruvining samaradorligi, avvalo, munosib kadrlarni tanlash, ularni qobiliyat va vazifalariga muvofiq joylashtirish, faoliyatini nazorat qilish hamda xizmatiga qarab rag‘batlantirish va javobgarlikka tortish tamoyillari bilan bog‘langan [23; 32–34].

Amir Temurning kadrlar siyosatida rahbarning shaxsiy fazilatlariga alohida o‘rin berilgani aniqlandi. Adolat, qat’iyat, maslahatga quloq tutish, ehtiyotkorlik, tadbirkorlik, jasorat, sabr-toqat va hushyorlik kabi sifatlar boshqaruvchi uchun zarur mezonlar sifatida namoyon bo‘ladi [24; 70–75]. Bu mezonlar zamonaviy menejmentdagi kompetensiyaga asoslangan rahbarlik modeli bilan qiyoslash imkonini beradi. Shu bilan birga, o‘rta asr siyosiy tizimi va zamonaviy davlat boshqaruvi o‘rtasidagi tarixiy farqlarni hisobga olish zarur.

Tadqiqot davomida strategik qarorlar qabul qilish jarayonida maslahat va kengashning muhim o‘rin tutgani ham aniqlandi. Amir Temur turli ijtimoiy guruhlar va tajribali shaxslarning fikrlarini eshitishga ahamiyat bergan, biroq yakuniy qaror uchun mas’uliyatni hukmdorning o‘zi saqlab qolgan [23; 32–34]. Shunday qilib, «Tuzuklar»da qaror qabul qilishning shartli modeli axborot to‘plash – maslahat – tahlil – qaror – ijro – nazorat ketma-ketligida namoyon bo‘ladi.

Manbalarni qiyosiy tahlil qilish «Temur tuzuklari»dagi kadrlar siyosatini boshqa tarixiy manbalar bilan birgalikda o‘rganish zarurligini ko‘rsatdi. Xondamirning «Dastūr al-wuzarā»si, Abdurazzoq Samarqandiyning «Matla‘ al-sa‘dayn va majma‘ al-bahrayn» asari hamda Sharafiddin Ali Yazdiyning «Zafarnoma»si Temuriylar davridagi davlat boshqaruvi va mansabdorlar institutini tarixiy kontekstda tahlil qilish uchun muhim imkoniyat beradi [1; 8; 20]. Bu manbalarni «Tuzuklar» bilan qiyoslash uning normativ mazmuni bilan real tarixiy amaliyot o‘rtasidagi munosabatni chuqurroq ochib beradi.

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DEVELOPING EFL TEACHERS' AI LITERACY FOR EFFECTIVE GENERATIVE AI INTEGRATION IN ENGLISH LANGUAGE TEACHING

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ABSTRACT

The rapid diffusion of generative artificial intelligence (GenAI) into everyday teaching practice has outpaced the professional preparation of language teachers. This article examines what AI literacy means for teachers of English as a foreign language (EFL) and how it can be developed systematically rather than incidentally. Through a comparative analysis of five influential competency frameworks and a synthesis of empirical studies published between 2023 and 2026, the article argues that generic AI literacy is insufficient for language teaching, because the object of instruction — language itself — is also the medium in which generative models operate. A four-domain model of EFL teachers' GenAI literacy is proposed, comprising technical-functional, pedagogical-methodological, critical-evaluative and ethical-professional competence, and each domain is specified through observable indicators. The article further sets out a three-stage professional development pathway aligned with the progression levels of the UNESCO AI competency framework for teachers, and maps the principal risks of unprepared adoption onto concrete pedagogical safeguards. The conclusions are analytical rather than statistical and are intended to inform teacher-education curricula and in-service training programmes.

Key words: *AI literacy, generative artificial intelligence, EFL teachers, English language teaching, teacher professional development, TPACK, UNESCO competency framework, prompt engineering, critical evaluation, assessment literacy.*

INTRODUCTION

Since late 2022, generative artificial intelligence has moved from a specialist research topic to an ordinary feature of the language classroom. Large language models now draft lesson plans, produce graded reading texts, generate examination items, comment on student writing and act as conversational partners. In language education this shift is more consequential than in most other subjects, because the tools operate in precisely the medium that is being taught. A chemistry teacher who uses a chatbot to prepare a worksheet employs language as a means; an English

teacher who does the same employs it as both means and object of instruction [10; 13].

The speed of diffusion has created a preparation gap. Studies of university language instructors have shown that familiarity with GenAI tools is uneven, that confidence in using them pedagogically lags well behind awareness of their existence, and that institutional guidance is frequently absent at the moment when teachers most need it [11]. Research with teacher educators points in the same direction: those responsible for preparing the next generation of language teachers report that they themselves are improvising, and that curricula have not yet been revised to accommodate the technology [12]. A recent study of pre-service EFL teachers found that two thirds acknowledged a limited understanding of AI concepts and about sixty per cent felt unable to apply AI tools confidently in teaching, attributing this to the absence of formal training in their programmes [19].

At the level of policy the direction is clearer. In 2023 UNESCO issued the first global guidance on generative AI in education, and in 2024 it published an AI competency framework for teachers defining 15 competencies across five dimensions and three progression levels [1; 2]. In Uzbekistan, the Strategy for the Development of Artificial Intelligence Technologies until 2030, approved by Presidential Resolution No. PQ-358 of 14 October 2024, sets out tasks for training personnel and expanding AI-based services, which makes the question of teachers' readiness a matter of national educational policy rather than individual initiative [22].

The problem addressed in this article is therefore not whether GenAI should enter English language teaching — it already has — but what specific competence enables a teacher to use it in a way that supports rather than substitutes for language learning. The aim of the article is to define the construct of AI literacy for EFL teachers, to distinguish it from general digital and AI literacy, and to propose a structured pathway for its development. The objectives are: to compare the existing competency frameworks; to identify the domain-specific requirements that language teaching imposes; to formulate a model of EFL teachers' GenAI literacy with observable indicators; and to outline a staged programme of professional development together with its principal risks and safeguards.

RESEARCH METHODOLOGY

The study is theoretical and analytical in character. It combines comparative document analysis with the synthesis of recent empirical research. Two groups of sources were examined. The first comprised competency frameworks: the AI literacy competencies of D. Long and B. Magerko [3], the exploratory review of AI literacy by D. Ng and colleagues [4], the teachers' AI digital competency framework derived

from DigCompEdu [5; 6], the Intelligent-TPACK model of I. Celik [9] developed from the classical TPACK framework of P. Mishra and M. Koehler [7; 8], and the UNESCO AI competency framework for teachers [1]. The second group comprised empirical and conceptual studies of GenAI in language education published between 2023 and 2026 [10–21].

The analysis proceeded in three steps. First, the frameworks were compared along three parameters: the population addressed, the constitutive components and the progression logic. Second**,** the components were tested against the specific conditions of English language teaching in order to establish which of them require domain-specific reformulation. Third, the resulting domains were operationalised through indicators that can be observed in a lesson plan, a classroom or a set of teaching materials, and were arranged into a developmental sequence. The limitation of the approach is that the proposed model has not yet been validated on a teacher sample; the conclusions should accordingly be read as an analytical framework offered for empirical testing rather than as verified measurement.

RESULTS AND THEIR ANALYSIS

1. What existing frameworks offer and where they stop. The concept of AI literacy was given its first systematic definition by D. Long and B. Magerko, who described it as a set of competencies enabling a person to evaluate AI technologies critically, communicate and collaborate with them effectively, and use them as tools in everyday settings [3]. Subsequent work in education added a progression logic — from knowing and understanding, through using and applying, to evaluating and creating, with ethics running through all levels [4]. The decisive step for the teaching profession was taken when these ideas were mapped onto an existing model of educators' digital competence: D. Ng and colleagues adapted DigCompEdu into six areas of teachers' AI digital competency and added a component absent from learner-facing models — the teacher's responsibility for facilitating learners' own AI competency [5; 6]. In parallel, I. Celik reformulated TPACK as Intelligent-TPACK, adding an explicit ethical layer to technological, pedagogical and content knowledge [9], while P. Mishra and co-authors argued that generative technologies destabilise the boundaries of the original TPACK model because they intervene in content itself [8]. The principal frameworks are summarised in Table 1.

Table 1

Key competency frameworks informing EFL teachers' AI literacy

Framework (source)	Population addressed	Core components	Contribution to the present model
AI literacy competencies [3]	general public, learners	what AI is; what it can do; how it works; how it should be used ethically	establishes the conceptual baseline of what a model can and cannot do
AI literacy in education [4]	school and university learners	know and understand — use and apply — evaluate and create; ethics across all levels	supplies a progression logic transferable to teacher training
Teachers' AI digital competencies [5; 6]	educators	professional engagement; digital resources; teaching and learning; assessment; empowering learners; facilitating learners' AI competency	introduces the teacher's duty to build learners' AI competency
Intelligent-TPACK [7; 8; 9]	subject teachers	technological, pedagogical and content knowledge extended by an ethical component	links AI tools to subject-specific pedagogy
UNESCO framework for teachers [1]	national teacher-training systems	human-centred mindset; ethics of AI; AI foundations and applications; AI pedagogy; AI for professional learning (15 competencies, 3 levels)	provides the normative reference and the acquire–deepen–create progression

Source: compiled by the author on the basis of [1]; [3]–[9].

What these frameworks share is a subject-neutral formulation. They describe the teacher as a professional user of an intelligent tool, but they do not address the situation in which the tool's output is itself the learning content. This is exactly the situation of the language classroom, and it is the reason why a domain-specific reformulation is required.

2. Why language teaching requires a domain-specific reformulation. In most subjects a factual error in an AI-generated text is visible to the teacher and can be corrected without disturbing the lesson. In language teaching the errors that matter are frequently not factual but distributional: an unusual collocation, a register that is too formal for the communicative situation, a syntactic pattern that is grammatical but statistically improbable in the target variety. Such output is fluent and therefore persuasive, and a teacher who lacks the relevant analytical awareness will pass it to learners as a model. Research on AI-generated text for second-language writers has shown that these tools simultaneously expand access to fluent English and flatten the

individual voice of the writer, producing texts that are correct but interchangeable [14]. R. Godwin-Jones frames the same tension in terms of distributed agency: when part of the composing process is delegated to a model, the pedagogical question becomes which part of the process must remain with the learner [15].

A second reason is assessment. Generative tools can produce a plausible essay, a translation or a spoken-language script within seconds, which undermines any assessment design whose evidence is a finished product. An analysis of the guidelines issued by the world's top-ranking universities showed that institutions responded to this by shifting emphasis towards process, transparency of use and academic integrity rather than by prohibition [18]. For the language teacher this translates into a practical requirement: the ability to redesign tasks so that the observable evidence of learning is the learner's processing of the material, not the material itself. The affordances of GenAI across the main areas of language teaching, together with the competence each requires, are set out in Table 2.

Table 2

GenAI affordances in English language teaching and the teacher competence they presuppose

Area of teaching	Typical use of GenAI	Risk if used without AI literacy	Competence presupposed
Materials design	graded texts, dialogues, exam-type items	uncontrolled difficulty level; invented content; cultural bias	ability to specify level and genre in the prompt and to check output against syllabus descriptors
Reading and vocabulary	simplification, glossaries, example sentences	loss of authenticity; improbable collocations	corpus and level awareness; verification against reference sources
Writing	feedback on drafts, model texts, rubric-based comments	outsourcing of composing; homogenised learner voice [14]	process-oriented task design; feedback literacy
Speaking	conversation practice, role-play partners, pronunciation prompts	absence of genuine interactional pressure; over-standardised input	ability to combine AI practice with authentic interaction
Assessment	item generation, rubric drafting, preliminary marking	threats to validity and fairness; data-protection issues [18]	assessment literacy; knowledge of institutional policy
The teacher's own work	lesson planning, summarising research, translation	uncritical acceptance of output; gradual deskilling [12]	critical evaluation and systematic source verification

Source: compiled by the author on the basis of [10]; [12]–[15]; [18].

3. A four-domain model of EFL teachers' GenAI literacy. On the basis of the comparison above, four interdependent domains can be distinguished. The technical-functional domain concerns understanding what a generative model is: that it predicts probable continuations rather than retrieving verified facts, that its output depends on the prompt and the context window, and that fluent formulation is not evidence of accuracy [3; 16]. The pedagogical-methodological domain concerns integration: selecting a tool because a specific learning outcome requires it, and designing tasks in which the learner must process rather than merely receive the output [8; 9]. The critical-evaluative domain is the specifically linguistic one: judging generated language for accuracy, level, register, cultural appropriateness and bias. The ethical-professional domain concerns transparency, the protection of learner data and the teacher's responsibility to develop the learners' own AI competency [1; 5]. The model is presented in Table 3.

Table 3

Proposed four-domain model of EFL teachers' generative AI literacy

Domain	Descriptor	Observable indicators
Technical-functional	understanding how a generative model works and how prompt, context and output relate	writes structured prompts specifying role, level, genre and length; recognises hallucination; knows the limits of the context window
Pedagogical-methodological	integrating GenAI into language teaching methodology rather than adding it on top	matches the tool to a stated learning outcome; designs tasks requiring learner processing of AI output; identifies stages that must remain human
Critical-evaluative	evaluating generated language for accuracy, level, register and cultural fit	checks collocations against a corpus or dictionary; detects register mismatch and cultural bias; adapts rather than adopts the output
Ethical-professional	using GenAI transparently and responsibly and developing learners' AI competency	declares AI use in materials; anonymises learner texts; establishes classroom rules; teaches attribution and verification

Source: developed by the author on the basis of [1]; [3]–[5]; [8]; [9]; [14].

The four domains are not of equal difficulty to develop. Evidence from intervention studies suggests that the technical dimension improves quickly and almost automatically through exposure, whereas critical and pedagogical judgement requires deliberate instruction. In a quasi-experimental study with 64 Chinese college EFL teachers, an eight-week programme that embedded AI literacy in genre-based pedagogy produced large effects on critical appraisal and practical application but only a modest effect on technical understanding, and the qualitative data recorded a

movement from tool-oriented use towards pedagogically reasoned use [21]. A twelve-week intervention with 90 pre-service English teachers reported significant gains across technical proficiency, critical evaluation, creative application and ethical competence in the experimental group, and its authors concluded that explicit GenAI literacy instruction must be built into teacher education rather than left to self-directed discovery [20]. Taken together, these findings support a staged rather than a single-workshop approach.

4. A staged professional development pathway. The progression logic of the UNESCO framework — acquire, deepen, create — provides a convenient scaffold, since it is already used as a normative reference for national teacher-training programmes [1]. Table 4 translates it into concrete activities and attainment evidence for the EFL context. The essential principle is that each stage ends with a product that can be inspected: professional development in this area fails when it stops at demonstration and never requires the teacher to produce something that can be evaluated.

Table 4

Three-stage professional development pathway for EFL teachers' GenAI literacy

Stage (UNESCO level)	Focus	Sample activities	Evidence of attainment
Stage 1 — Acquire	familiarisation and safe use	guided exploration of one tool; basics of prompting; rules on personal data	an AI-generated text corrected and annotated by the teacher
Stage 2 — Deepen	pedagogical integration	redesign of an existing lesson with a justified GenAI component; peer observation; task reformulation for assessment integrity	a lesson plan distinguishing AI-supported from human-required stages
Stage 3 — Create	innovation and dissemination	drafting an institutional protocol on GenAI use; mentoring colleagues; small-scale classroom research	an in-house guideline and a report on a classroom trial

Source: developed by the author on the basis of [1]; [2]; [20]; [21].

5. Risks and safeguards. Four risks recur across the literature. The first is uncritical acceptance of fluent but inaccurate output, which is countered by making verification an explicit routine rather than an occasional precaution [16]. The second is the erosion of learner productive effort, countered by process-oriented assessment in which drafts, decisions and revisions form part of the evidence [18]. The third is the privacy of learner data, countered by anonymisation and by clear institutional

rules on what may be entered into a commercial system [2]. The fourth is inequality of access, which in many regions determines whether GenAI widens or narrows existing gaps and which requires offline alternatives to be planned rather than improvised [17]. None of these safeguards is technological; each of them is an instance of professional judgement, which is precisely why AI literacy cannot be reduced to tool training.

DISCUSSION

Three implications follow from the analysis. First, AI literacy for language teachers is not a subset of digital literacy but a distinct professional competence, because in this subject the tool produces the content that is being taught. A teacher may be entirely competent with learning platforms, presentation software and testing systems and still be unable to judge whether a generated dialogue is appropriate for B1 learners. This is why frameworks that describe the teacher as a generic user of intelligent tools, however carefully constructed, need a subject-specific extension [5; 9].

Second, the sequence in which competence develops matters. The evidence reviewed indicates that technical facility grows fastest and critical judgement slowest [20; 21]. A training programme that begins and ends with tool demonstrations therefore produces teachers who can operate the technology confidently while remaining unable to evaluate its output — arguably a more dangerous position than not using it at all, since confidence without evaluation transfers unchecked material directly to learners.

Third, institutional conditions determine whether individual competence becomes classroom practice. Where no policy exists on permitted use, data protection or acknowledgement, teachers act on private judgement and practice becomes inconsistent across a single institution [11; 12]. The third stage of the pathway proposed above therefore treats the drafting of local guidelines not as an administrative task but as the final learning outcome of professional development.

The limitations of the study should be stated plainly. The model presented here is derived from documentary and literature analysis and has not been validated with a teacher sample; its indicators have not been tested for reliability; and the empirical studies synthesised were conducted predominantly in East Asian higher education, which limits direct generalisation to school-level teaching in Central Asia. Validation through survey instruments and classroom observation, particularly in the Uzbek context, is the necessary next step.

CONCLUSIONS

1. AI literacy for EFL teachers is a domain-specific professional competence rather than an application of general digital literacy, because generative models operate in the same medium — language — that constitutes the content of instruction.

2. Existing frameworks provide the necessary conceptual base but stop at subject-neutral formulations; the four-domain model proposed here — technical-functional, pedagogical-methodological, critical-evaluative and ethical-professional — supplies the missing linguistic and pedagogical specification together with observable indicators.

3. The domains develop at different speeds: technical facility is acquired rapidly through exposure, whereas critical and pedagogical judgement requires explicit, sustained instruction, as intervention studies with in-service and pre-service language teachers indicate.

4. Professional development should therefore follow the acquire–deepen–create progression, and each stage should conclude with an inspectable product: an annotated AI-generated text, a redesigned lesson plan and an institutional protocol accompanied by a classroom trial report.

5. The principal risks of unprepared adoption — uncritical acceptance of output, erosion of learner effort, breaches of data privacy and inequality of access — are addressed not by technical means but by professional judgement, which confirms that teacher preparation, rather than tool availability, is the decisive factor in the effective integration of generative AI into English language teaching.

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DOCTRINE OF THE CHISHTI SECT

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ABSTRACT

This article examines the origins and distinctive characteristics of the Chishti order, one of the most widespread Sufi orders that continues to exist to the present day. It highlights the development of the order in India, emphasizing its emergence through the harmonious integration of Islamic teachings and Indian traditions. The article also underscores a distinctive feature of the Chishti order that sets it apart from other Sufi orders: the selection of a spiritual master (shaykh) was based not on kinship or personal closeness to the previous shaykh, but rather on the individual's knowledge, spiritual maturity, and ability.

Key words: *chishti order, shayx, India, islam, sufism, Moyinuddin Chishti, ethic, zikr, "sama".*

INTRODUCTION

Humanity was created to strive towards the truth. At this point, we can say that religion fulfilled this task in society. But due to certain limitations in religion, people could not find a complete answer to their questions. Sufism emerged in this process. Sufism can be defined as a direction formed by the interaction of religion and philosophy, and it gives a wide path to human creativity. Because of these, Sufism differs from official Islam. Because mysticism, that is, Sufism, can be found in all religions, and regardless of what religion it is, it shows divine love. Sufism has been formed and developed in various forms and directions in the Muslim East for centuries. He showed people the right way to show divine love. “Sufism can be defined as a direction formed by the interaction of religion and philosophy. Ernst describes Sufism as “the mystical tradition of Islam”[155] According to him, Sufism represents the spiritual and mystical dimension of Islam, emphasizing inner purification, personal spiritual experience, and the pursuit of a closer relationship with God.

[155] Carl W. Ernst. The Shambhala Guide to Sufism. Boston& London. 1997. — 272 p

After the introduction of Islam into India, there was naturally a need for Sufi orders here as well. For this reason, some sources say that people in this region learned Islam more through sects rather than officially. One of the earliest sects formed in India is Chishti. According to J. Spencer Trimingham “So important were the orders in traditional society”[156]

Methods: This article employs hermeneutic, analytical-synthetic, historical, descriptive, and comparative research methods. The Chishti order is examined through a comparative analysis with other Sufi orders, while its historical development and distinctive characteristics are interpreted and explained within their historical context.

Results and Discussion

The founder of the suluk is Khoja Abu Is'haq Shami, who goes back nine generations to Ali (r.a) and was born in Chishti village of Khurasan. The arrival of the sect to India is directly related to the name of Moyinuddin Chishti Sanjari Ajmiri, who was born in Seiaton in 1142. This breed also goes back to Muhammad (pbuh) from his father and mother. First in Samarkand, then in Bukhara, he learned the knowledge of the Qur'an from the famous teachers of his time. After that, he accidentally met Khwaja Usman Haruni, a well-known representative of the Chishti leech in Nishapur province, and served him for twenty years.

According to the sources, Moyinuddin Chishti's description of going to India was to spread Islam among the Gentiles according to the instructions of Muhammad (s.a.v) in a dream. During this migration, he first lives in Lahore and later in Ajmir. "After moving to Ajmir in 1165, this dargah became a Mecca for the world's representatives of Chishtiyan leeches."[157]

As mentioned, this sect was very popular in the Indian region, and it was able to have a unique influence on the social, economic, and spiritual lives of people. Another reason why it developed so much in this area is that there were several other directions related to this leech, from which, after the so-called "Faridi" branch, the directions of two extremely strong Sufi orders came. came out, the founder of one is Nizamiddin Mahbubi Ilahi and the other is Alauddin Ahmed Sabir.[158] Another famous manifestation of Chishtiyya is Nizamuddin Avliya. It is noted in the sources that his ancestors were from Bukhara. When he was young, he was apprenticed to Baba Farid, and learned from him the important aspects of Chishti.

The Chishti doctrine is based on the doctrine of unity. According to this doctrine founded by Ibn al-Arabi, God and nature and man are harmonious and one

[156] J. Spencer Trimingham. “The Sufi Orders in Islam”. — London. 1971. — P. 224-250.
[157] “Najmiddin Komilov “Tasavvuf”, — Toshkent: “Movaraunnahr”, 2009. P.160
[158] “Najmiddin Komilov “Tasavvuf”, — Toshkent: “Movaraunnahr”, 2009. P.160

whole. That is, God lives in nature or in the heart of a person, or some of his important aspects are manifested in people. it can also be called a desert. Since this theory exists in the Chishti sect, it means that among the most important features in them are the purification of the heart, living in a dignified manner, not performing immoral actions, restraining one's ego, and devoting oneself to God. Naturally, those who live in such a way stay away from a luxurious lifestyle. For example, the representatives of Chishti also kept themselves from living a luxurious life and refused to communicate with the representatives of the rich class in any way. For this reason, it is recorded in the sources that they made a living by working on their own. In fact, they did not need extra expenses or money because, like other sects, they were supporters of a simple life, and the satisfaction of the necessary needs was enough for them. In the social views of Nizamiddin, the representative of the above-mentioned order, his uniqueness was particularly visible. Nizamuddin Auliya was convinced that "the service of man was the essence of religion"[159] For example, he preferred to help the poor and needy rather than attend official prayer meetings and perform religious practices. He used to distribute money to the poor and thereby cause financial damage to himself. These good and meritorious deeds made him famous in neighboring countries.[160]

We can interpret this situation in such a way that in official Islam, there is a view that God lives in the human heart, so it is emphasized not to hurt his soul, but according to Sufism, people are also evaluated as God's reflection on earth, so it is important to please people, not to hurt them. , being equally good to everyone, being generous are important characteristics. In addition, when non-Sufis pray, they do it in order to avoid the torment of hell in the pursuit of heaven, on the contrary, in Sufism, it is done for the sake of God alone, the goal is only to achieve his attributes, that is, to avoid hypocrisy, prayer is to the creator. they knew that love should be selfless. Sufism is a direction that rejects different tastes, dreams, and purifies the soul, because the sheikhs of the Chishtiyya doctrine also formed the opinion that official ceremonies are hypocrisy and just for show.

Also, this order is significant in that it prohibits murids from leaving their mukka, begging, drinking alcohol, taking drugs, and smoking tobacco. Chishtiyya sheikhs preached not to chase after love and wealth.[161]

In general, all Sufi sects at first glorified divine love, prayed to God alone without thinking about anything, and performed various practical exercises, but after a few centuries, this process was reversed. that is, the sheikhs of Sufism used their

[159] K. A. Nizami. "The Life and Times of Shaikh Nizam-u'd-din Auliya". — Delhi. 1953.
[160] https://www.bukhari.uz/?p=22188&lang=oz
[161] https://www.bukhari.uz/?p=22188&lang=oz

prestige and the position they held to exert a strong influence on the rulers and through this on very large waqf properties. have had That is, it can be said that these features were present in all Sufism orders. We can say that this has remained unchanged as a result of their spiritual heritage that has been passed down over generations. This includes various intoxicating drinks and not smoking. By not chasing after love, we can understand love for people, according to their thinking, love should be for God alone. And speaking of possessions, such things can distance a man from his creator, and striving after him can distance a man from himself.

There is no inheritance among Sufi sheikhs, for example, the child of the sheikh who holds the current rank is not promoted to the rank of sheikh, but they did it through elections or the previous sheikh chose the most suitable candidate for the murshid himself. This process meant that the heir had to work hard to be worthy of the rank. The path of the Chishtiyya leech consisted of three stages, namely Shariat, Tariqat and Haqiqat. Entering the path of this tariqat was not easy, the muridism itself lasted for 1000 days. In addition, among the representatives of the Chishtiya direction, fasting for 40 days was also a ritual. This meditation, that is, purification, was called chilla, and it was necessary to pray in the chilla together with fasting.

The humanitarian aspects of the Chishti leech were popular and desirable among the local population. Apart from the practice of paying taxes, practicing piety and meditation in mosques and homes, keeping long silence, they made a name for themselves with their musical zikr "samo".

Certain features made this sect equally appealing to all and called for attention. The presence of Indians in their famous shrines is an indication of their adaptation to Indian culture and environment. Chishtiya leech encouraged his followers to move from the lower and conditioned consciousness towards the 'higher self'. Sheikhs had frequent dialogues with the leaders of Buddhism and Hinduism. They emphasized the importance of doing something that someone can do or charity in order to purify the person's identity and inner world, including feeding people who need food but don't have enough money.[162]

At the same time, the fact that they tried to morally reform people's moral views and their relations with each other is also considered an important work. It was during the time of Nizamuddin Awliya that we can say that Sufism spread widely in northeastern India, and the moral principles of the sect really gave shape to the ideas of Islamic civilization in the Indian region.

[162] Muneera Haeri. “Sufi Encounters: The Life and Teachings of Chishti Masters”. — Oxford “Oxford university press” 2000. — P. 11.

Abstention from gambling and intoxicating liquor was introduced in Delhi, and people were also observed to abstain from lying. Chishti Sufis have an obligatory responsibility in strengthening the moral qualities of the local people, in destroying the obstacles to hatred and unusual views, in establishing the achievements of virtue and prosperity, inculcating feelings of love and kindness in people. The fact that they have taken on z is beyond dispute.[163]

CONCLUSION

In conclusion, the Chishtiyan sect was very important to the people in the Indian region during the medieval period. After all, during this period, chishtiyya regulated the spiritual lives of people and served as a leading program for their moral maturity. At the same time, when the caste system prevailed in this region, people took spiritual nourishment from this teaching. The doctrine of Chishti differs from other sects with some elements and practices. In addition, its ideas such as humanitarianism, helping people regardless of their identity, race, religion, nationality, and building bonds of friendship and brotherhood are relevant for today. is also one of the most urgent issues.

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СУДЕБНАЯ ПРАКТИКА КАК ОСОБЫЙ ИСТОЧНИК ПРАВОВОГО РЕГУЛИРОВАНИЯ ОБЪЕКТОВ ПРАВА ПРОМЫШЛЕННОЙ СОБСТВЕННОСТИ

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АННОТАЦИЯ

В статье рассматривается роль судебной практики в системе правового регулирования объектов права промышленной собственности в Республике Узбекистан. Автор анализирует место постановлений Пленума Верховного суда Республики Узбекистан в системе источников гражданского права, исследует правовую природу и функции судебного толкования при разрешении споров, связанных с изобретениями, полезными моделями, промышленными образцами и товарными знаками. Особое внимание уделено постановлению Пленума Верховного суда Республики Узбекистан от 23 июня 2023 года № 19 «О некоторых вопросах рассмотрения дел, связанных с интеллектуальной собственностью», обеспечивающему единообразное толкование оценочных категорий и восполняющему пробелы законодательства. Автор приходит к выводу, что, формально не являясь источником права в романо-германской правовой системе, судебная практика Узбекистана фактически выполняет квазинормативную регулятивную функцию в сфере промышленной собственности, обеспечивая единообразие и предсказуемость правоприменения.

Ключевые слова: *промышленная собственность, судебная практика, источники права, постановление Пленума Верховного суда, патент, товарный знак, интеллектуальная собственность, Республика Узбекистан.*

ABSTRACT

The article examines the role of judicial practice in the legal regulation of industrial property objects in the Republic of Uzbekistan. The author analyses the place of Plenum of the Supreme Court resolutions within the system of civil-law sources and explores the legal nature and functions of judicial interpretation in resolving disputes related to inventions, utility models, industrial designs and trademarks. Particular attention is paid to Resolution No. 19 of the Plenum of the

Supreme Court of the Republic of Uzbekistan dated 23 June 2023 "On Certain Issues of Adjudicating Intellectual Property Cases", which ensures uniform interpretation of evaluative categories and fills legislative gaps. It is concluded that, although not a formal source of law within the Romano-Germanic legal family, Uzbek judicial practice performs a quasi-normative regulatory function in the sphere of industrial property, ensuring uniformity and predictability of law enforcement.

Keywords: *industrial property, judicial practice, sources of law, Plenum of the Supreme Court resolution, patent, trademark, intellectual property, Republic of Uzbekistan.*

ВВЕДЕНИЕ

Актуальность исследования обусловлена интенсивным развитием законодательства Республики Узбекистан об объектах промышленной собственности за последние годы. Только за период 2021–2025 годов приняты законы о внесении изменений в законодательство об объектах интеллектуальной собственности, включая введение института компенсации вместо возмещения убытков (Закон № ЗРУ-959 от 10 сентября 2024 года) [1], а также закон, упрощающий регистрацию объектов промышленной собственности и усиливающий ответственность за их нарушение (Закон № ЗРУ-1080 от 8 августа 2025 года) [2]. Одновременно динамично развивается правоприменительная практика: Пленум Верховного суда Республики Узбекистан неоднократно (в 2023 и 2024 годах) разъяснял и корректировал подходы судов к рассмотрению споров данной категории.

В условиях, когда законодательные нормы об объектах промышленной собственности зачастую содержат оценочные понятия, не раскрытые в тексте закона, ключевую роль в единообразном применении права играет судебное толкование. Это порождает научный интерес к вопросу о правовой природе судебной практики: является ли она вспомогательным средством толкования либо выполняет самостоятельную регулятивную функцию, приближающуюся к функции источника права.

Целью настоящей статьи является анализ роли и функций судебной практики, прежде всего актов Пленума Верховного суда Республики Узбекистан, в системе правового регулирования объектов промышленной собственности. Методологическую основу составили формально-юридический, сравнительно-правовой и системный методы исследования.

1. Судебная практика в системе источников права Республики Узбекистан: теоретико-правовой аспект

Республика Узбекистан относится к романо-германской правовой семье, для которой характерно признание в качестве основных источников права нормативно-правовых актов — Конституции, кодексов, законов и подзаконных актов. Формально судебный прецедент как источник права в узбекском законодательстве не закреплен: суды не наделены полномочием создавать новые нормы права, а обязаны применять уже существующие. Вместе с тем в доктрине отмечается, что судебная практика выполняет вспомогательную, но важную роль в системе источников гражданского права [3], обеспечивая единообразное понимание и применение норм, восполняя пробелы и конкретизируя оценочные категории.

Особое место в этой системе занимают постановления Пленума Верховного суда Республики Узбекистан. В соответствии со статьей 22 Закона Республики Узбекистан «О судах» Пленум Верховного суда в целях обеспечения правильного и единообразного применения судами законодательства принимает соответствующие разъяснения [4]. Хотя формально такие постановления не признаются нормативно-правовыми актами в узком смысле, они являются обязательными для нижестоящих судов, содержат абстрактные правила толкования, регулярно пересматриваются и дополняются в связи с изменением законодательства. Это позволяет говорить об особом, квазинормативном статусе судебной практики в правовой системе Узбекистана — статусе, отличном как от классического прецедента англосаксонской системы, так и от актов казуального толкования в чистом виде.

2. Нормативно-правовая основа охраны объектов промышленной собственности в Узбекистане

Основы правовой охраны интеллектуальной собственности заложены в статье 53 Конституции Республики Узбекистан, гарантирующей свободу научного, технического и художественного творчества и охрану интеллектуальной собственности законом [5]. Детальное регулирование содержится в разделе VI Гражданского кодекса Республики Узбекистан «Право интеллектуальной собственности» (статьи 1031–1107), а также в специальных законах: «Об изобретениях, полезных моделях и промышленных образцах», «О товарных знаках, знаках обслуживания и наименованиях мест происхождения товаров», «О селекционных достижениях», «О правовой охране топологий интегральных микросхем», «О географических указаниях» и других [6].

Согласно статье 1082 Гражданского кодекса, права на объекты промышленной собственности (изобретения, полезные модели, промышленные образцы) охраняются только при условии выдачи патента уполномоченным государственным органом. Условия патентоспособности (новизна, изобретательский уровень, промышленная применимость) закреплены в статьях 6–8 Закона «Об изобретениях, полезных моделях и промышленных образцах» [8]. Правовая охрана товарных знаков возникает на основании свидетельства о государственной регистрации в соответствии с Законом «О товарных знаках, знаках обслуживания и наименованиях мест происхождения товаров» [9].

Институциональная система охраны также претерпела изменения: функции ранее самостоятельного Агентства по интеллектуальной собственности переданы Министерству юстиции Республики Узбекистан, которое является правопреемником Агентства по всем правам, обязательствам и договорам. Данное обстоятельство прямо разъяснено в пункте 3 постановления Пленума Верховного суда № 19, что показывает непосредственную связь судебного толкования с текущими организационными изменениями в системе государственного управления объектами промышленной собственности.

Существенным шагом в развитии законодательства стало принятие Закона № ЗРУ-959 от 10 сентября 2024 года, введшего институт компенсации вместо возмещения убытков: правообладатель вправе требовать выплаты компенсации в размере от 20 до 1000 базовых расчетных величин независимо от доказанности факта причинения убытков, а также Закона № ЗРУ-1080 от 8 августа 2025 года, упростившего процедуру выдачи патентов автоматическая выдача через электронную систему и усилившего ответственность за нарушение прав на объекты промышленной собственности. Данные новеллы неизбежно требуют оперативного разъяснения судам, что подчеркивает возрастающее значение судебной практики как инструмента адаптации законодательства к правоприменительной действительности.

3. Постановление Пленума Верховного суда Республики Узбекистан № 19 от 23 июня 2023 года как ключевой акт судебного толкования

Центральным актом судебного толкования в исследуемой сфере является постановление Пленума Верховного суда Республики Узбекистан от 23 июня 2023 года № 19 «О некоторых вопросах рассмотрения дел, связанных с интеллектуальной собственностью» (далее — Постановление № 19), принятое в целях обеспечения правильного и единообразного применения судами законодательства [10]. Постановление неоднократно дополнялось, в том числе

постановлением Пленума от 16 декабря 2024 года № 39, что свидетельствует о его динамичном, «живом» характере как акта, оперативно реагирующего на изменения законодательства и потребности правоприменительной практики.

Постановление № 19 решает ряд принципиальных вопросов, не имеющих исчерпывающего ответа в тексте закона. Во-первых, оно разграничивает подведомственность споров между административными и экономическими (гражданскими) судами в зависимости от публично-правовой либо частноправовой природы спора [11]: например, отказ уполномоченного органа в выдаче патента признается публично-правовым спором, подведомственным административным судам, тогда как споры между правообладателями о взыскании ущерба — гражданским судам. Во-вторых, Постановление определяет момент возникновения правовой охраны для разных категорий объектов — с момента создания (для произведений, программ ЭВМ, ноу-хау) либо с момента выдачи охранного документа (для изобретений, товарных знаков) [12], что имеет решающее значение для определения периода защиты нарушенного права.

Применительно непосредственно к объектам промышленной собственности Постановление № 19 содержит специальный раздел «Право на промышленную собственность» (пункты 46–54). В нем разъясняются, в частности, критерии соавторства изобретения, полезной модели или промышленного образца (необходимость личного творческого участия в создании технического решения, а не только организационной или технической поддержки) [13]; правило определения приоритета при параллельном создании тождественного решения несколькими лицами (приоритет принадлежит лицу, первым подавшему заявку); порядок оспаривания патента, полученного в результате «противоправного заимствования» (кражи, обмана, принуждения); а также условия возникновения и объем права преждепользования — права на безвозмездное дальнейшее использование запатентованного впоследствии решения без расширения объема производства [14].

Значительное внимание уделено товарным знакам как объекту промышленной собственности. Постановление закрепляет презумпцию действительности регистрации товарного знака: возражения о незаконности регистрации не могут быть основанием для отказа в защите права до признания свидетельства недействительным в установленном порядке [15]. Отдельно разъяснены критерии определения тождественности и сходства до степени смешения обозначений — оценочной категории, наиболее часто вызывающей споры в правоприменительной практике: судам предписано учитывать объем и

длительность использования знака, степень его узнаваемости, а также результаты социологических опросов потребителей [16].

4. Функции судебной практики в правовом регулировании объектов промышленной собственности

Анализ Постановления № 19 и иной судебной практики позволяет выделить несколько функций, которые выполняет судебное толкование применительно к объектам промышленной собственности.

1) Функция конкретизации оценочных понятий. Законодатель, как правило, не в состоянии дать исчерпывающее определение таким категориям, как «сходство до степени смешения», «добросовестное использование», «творческий характер деятельности». Именно судебная практика формирует критерии их установления применительно к конкретным категориям споров.

2) Функция восполнения пробелов законодательства. В частности, вопрос разграничения подведомственности споров об объектах промышленной собственности между административными, гражданскими и экономическими судами не имеет прямого и полного решения в процессуальных кодексах и разрешается именно посредством разъяснений Пленума.

3) Функция обеспечения единообразия правоприменения. Пункт 56 Постановления № 19 прямо обязывает суды регионального уровня регулярно обобщать судебную практику по применению законодательства об интеллектуальной собственности и принимать меры по недопущению судебных ошибок [17], что институционализирует функцию обеспечения единства практики на постоянной основе.

4. Проблемы и перспективы развития

Несмотря на фактически возрастающую регулятивную роль судебной практики, ее правовой статус в законодательстве Узбекистана остается формально не определенным: постановления Пленума не включены в перечень нормативно-правовых актов, а доктрина продолжает относить их к вспомогательным источникам. Это порождает определенное противоречие между фактическим значением судебного толкования как обязательность для судов, восполнение пробелов, регулярное обновление и его формальным статусом.

В юридической литературе отмечается также сохраняющаяся немногочисленность споров об объектах промышленной собственности, рассматриваемых судами Узбекистана, по сравнению с зарубежными правопорядками, а также проблемы доказывания и арбитрабельности данной категории споров [18]. В феврале 2025 года Законодательной палатой Олий

Мажлиса в первом чтении был принят законопроект, направленный на дальнейшее усиление ответственности за нарушение прав на объекты промышленной собственности, что свидетельствует о продолжающемся реформировании данной сфер.

Представляется целесообразным следующее: во-первых, дальнейшая систематизация и официальная публикация обзоров судебной практики по спорам об объектах промышленной собственности на регулярной основе; во-вторых, обсуждение вопроса о целесообразности специализации судей либо создания специализированных составов для рассмотрения споров об интеллектуальной промышленной собственности по аналогии с зарубежным опытом например, Судом по интеллектуальным правам в Российской Федерации; в-третьих, доктринальное осмысление правовой природы постановлений Пленума Верховного суда с точки зрения их места в системе источников права, в том числе в контексте готовящихся изменений законодательства об объектах интеллектуальной собственности.

ЗАКЛЮЧЕНИЕ

Проведенный анализ показывает, что судебная практика, прежде всего в форме постановлений Пленума Верховного суда Республики Узбекистан, занимает особое место в системе правового регулирования объектов промышленной собственности. Формально оставаясь за пределами перечня источников права в романо-германской правовой традиции, судебное толкование фактически выполняет ряд регулятивных функций: конкретизирует оценочные понятия, восполняет пробелы законодательства, обеспечивает единообразие правоприменения и оперативно адаптирует правовое регулирование к изменениям законодательства и общественных отношений.

Постановление Пленума Верховного суда Республики Узбекистан от 23 июня 2023 года № 19, неоднократно обновлявшееся в связи с развитием законодательства об интеллектуальной собственности, может рассматриваться как показательный пример «особого источника» правового регулирования — акта, который, не будучи формально нормативно-правовым актом, обладает признаками нормативности (общеобязательность для судов, абстрактный характер разъяснений, системность применения) и de facto восполняет и конкретизирует законодательное регулирование объектов промышленной собственности.

Дальнейшее совершенствование законодательства и правоприменительной практики Узбекистана в данной сфере требует как продолжения работы по систематизации судебной практики, так и доктринального осмысления ее

правовой природы в качестве самостоятельной категории в системе источников гражданского права.

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^{60}Co GAMMA KVANTLARINING BARIY GEKSAFERRIT ($BaFe_{12}O_{19}$) KERAMIKASINING MAGNIT XUSUSIYATLARIGA TA'SIRI

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ANNOTATSIYA

Mazkur maqolada qattiq fazali sintez usuli yordamida olingan bariy geksaferrit ($BaFe_{12}O_{19}$) namunalarining ^{60}Co manbaidan olingan turli dozadagi gamma-kvantlar bilan nurlantirilgandan so'ng magnit hamda strukturaviy xossalarida yuz bergan o'zgarishlar kompleks tadqiq qilingan. Eksperimental o'lchashlar nurlanishdan oldin va keyin Cryogenic S700 SQUID magnitometri va rentgen-faza tahlili (XRD) usullari yordamida olib borildi. Natijalar shuni ko'rsatdiki, gamma-nurlanish dozasining oshishi bilan to'yinish magnitlanishi (M_s) 52.5 emu/g dan 40.2 emu/g gacha (dastlabki dozalarda) va koersitiv kuch (H_c) 1060 Oe dan 420 Oe gacha keskin kamayishi, shuningdek material fazaviy tarkibining qayta taqsimlanishi (ikkilamchi fazalarning kamayib, asosiy fazaning ortishi) kuzatildi. Kuzatilgan ushbu magnit o'zgarishlar kristall panjarada gamma nurlar ta'sirida hosil bo'lgan kislorod vakansiyalari va Fe-O-Fe superalmashinuv ta'sirining zaiflashuvi bilan asoslab berildi.

Kalit so'zlar: *Bariy geksaferrit, gamma-nurlanish, SQUID magnitometr, to'yinish magnitlanishi, koersitiv kuch, kislorod vakansiyasi, radiatsion nuqsonlar, superalmashinuv o'zaro ta'siri.*

АННОТАЦИЯ

В данной статье комплексно исследованы изменения магнитных и структурных свойств керамических образцов бариевого гексаферрита ($BaFe_{12}O_{19}$), полученных методом твердофазного синтеза, после облучения гамма-квантами источника ^{60}Co различными дозами. Экспериментальные измерения до и после облучения проводились с использованием СКВИД-магнитометра Cryogenic S700 и рентгенофазового анализа (РФА). Результаты показали, что с увеличением дозы гамма-излучения наблюдается резкое снижение намагниченности насыщения (M_s) с 52.5 эме/г до 40.2 эме/г и коэрцитивной силы (H_c) с 1060 Э до 420 Э, а также перераспределение фазового состава (уменьшение вторичных фаз и увеличение основной фазы). Наблюдаемые магнитные изменения объясняются образованием кислородных

вакансий в кристаллической решетке под действием гамма-лучей и ослаблением сверхобменного взаимодействия Fe-O-Fe

Ключевые слова: *Бариевый гексаферрит, гамма-излучение, СКВИД-магнитометр, намагниченность насыщения, коэрцитивная сила, кислородная вакансия, радиационные дефекты, сверхобменное взаимодействие.*

ABSTRACT

In this article, the changes in the magnetic and structural properties of barium hexaferrite ($BaFe_{12}O_{19}$) ceramic samples, synthesized by the solid-state reaction method, were comprehensively investigated after irradiation with various doses of ^{60}Co gamma quanta. Experimental measurements before and after irradiation were carried out using a Cryogenic S700 SQUID magnetometer and X-ray phase analysis (XRD). The results showed that with an increase in the gamma radiation dose, a sharp decrease in saturation magnetization (M_s) from 52.5 emu/g to 40.2 emu/g and coercive force (H_c) from 1060 Oe to 420 Oe is observed, along with a redistribution of the phase composition (a decrease in secondary phases and an increase in the main phase). The observed magnetic alterations are attributed to the generation of oxygen vacancies in the crystal lattice induced by gamma rays and the subsequent weakening of the Fe-O-Fe superexchange interaction.

Keywords: *Barium hexaferrite, gamma radiation, SQUID magnetometer, saturation magnetization, coercive force, oxygen vacancy, radiation defects, superexchange interaction.*

KIRISH

Hozirgi zamonaviy qattiq jismlar fizikasi va materialshunoslikning eng muhim va tez rivojlanayotgan yo‘nalishlaridan biri — bu turli ekstremal sharoitlarda, xususan, radiatsion muhitda o‘z xususiyatlarini saqlab qola oladigan funktsional magnit materiallarni o‘rganish va yaratishdir. Bu borada ferritlar, ayniqsa M-tipdagi geksagonal ferritlar ($MFe_{12}O_{19}$, bu yerda M=Ba, Sr, Pb) yuqori magnit-kristall anizotropiyasi, sezilarli koersitiv kuchi, kimyoviy va termik barqarorligi hamda nisbatan arzon ishlab chiqarish texnologiyasiga egaligi sababli ilmiy izlanishlar markazida turibdi. Bariy geksaferrit ($BaFe_{12}O_{19}$) o‘zining ajoyib xossalari bilan doimiy magnitlar tayyorlashda, mikroto‘lqinli yutgich qurilmalarda, yuqori chastotali radioelektronikada va ma'lumotlarni yozish/saqlash tizimlarida keng qo‘llaniladi.

So‘nggi yillarda sun'iy yo‘ldoshlar, kosmik texnikalar, yadro energetikasi reaktorlari va yuqori energiyali zarralar tezlatkichlarida qo‘llaniladigan elektron komponentlarning radiatsiyaga chidamliligini oshirish dolzarb masalaga aylandi. Gamma-kvantlar kabi yuqori energiyali ionlashtiruvchi nurlanishlar to‘g‘ridan-to‘g‘ri

materialning kristall panjarasiga ta’sir qilib, kationlar va anionlarning o‘z o‘rnidan siljishiga, Frenkel juftliklari (vakansiya va tugunlararo atomlar) hosil bo‘lishiga olib keladi. Ferritlarda magnit tartibot asosan temir ionlari (Fe^{3+}) orasidagi kislorod ionlari (O^{2-}) orqali amalga oshuvchi superalmashinuv o‘zaro ta’siriga (super-exchange interaction) asoslangan. Shuning uchun, kristall panjarada hosil bo‘ladigan kichik o‘zgarishlar ham materialning makroskopik magnit parametrlariga (to‘yinish magnitlanishi, koersitiv kuch, qoldiq magnitlanish) kuchli ta’sir ko‘rsatadi. Ushbu tadqiqot ishining maqsadi qattiq fazali sintez usulida olingan $BaFe_{12}O_{19}$ keramikasining ^{60}Co manbaidan tarqaluvchi gamma kvantlar ta'siridagi xulq-atvorini, kristall tuzilishi hamda magnit xossalarida yuzaga keladigan o'zgarishlar mexanizmini ochib berishdan iborat.

NAZARIY ASOSLAR VA ADABIYOTLAR SHARHI

2.1. Bariy geksaferritining kristall tuzilishi

Geksaferritlar bir qancha strukturaviy bloklarning c-o‘qi bo‘ylab ketma-ket joylashuvidan tashkil topgan murakkab kristall tuzilishga ega. $BaFe_{12}O_{19}$ magnetoplumbit tipidagi geksagonal strukturaga ega bo‘lib, u $P6_3/mmc$ fazoviy simmetriya guruhiga mansubdir. Uning elementar yacheykasi ikkita formulaviy birlikdan iborat bo‘lib, 64 ta ionni o‘z ichiga oladi. Tuzilish S-blok $(Fe_6O_8)^{2+}$ (spinel bloki) hamda R-blok $(BaFe_{12}O_{19})^{2-}$ (geksagonal blok) larning RSR^*S^* ketma-ketligida joylashishidan iborat (* belgisi blokning c-o‘qi atrofida 180^oga burilganligini bildiradi).

Materialdagi 24 ta Fe^{3+} ionlari besh xil kristallografik pozitsiyada taqsimlanadi:

- **Uchta oktaedrik pozitsiya:** 12k (yuqoriga spinli), 2a (yuqoriga spinli), $4f_2$ (pastga spinli).
- **Bitta tetraedrik pozitsiya:** $4f_1$ (pastga spinli).
- **Bitta bipiramidal pozitsiya:** 2b (yuqoriga spinli).

Keltirilgan spin yo'nalishlarining Gorter modeli bo'yicha kollinear joylashuvi natijasida $BaFe_{12}O_{19}$ materialida kuchli ferrimagnetizm yuzaga keladi. Sof kristall strukturadagi barqarorlik uning panjara parametrlari bilan belgilanadi (a = 5.89 Å, c = 23.18 Å).

2.2. Magnit anizotropiyasi va radiatsion ta'sir

Bariy geksaferrit o‘zining yuqori uniaksial (bir o'qli) magnit anizotropiyasi bilan ajralib turadi. Anizotropiya energiyasi quyidagi ifoda orqali tavsiflanadi:

$$E = K_0 + K_1 \sin^2\phi + K_2 \sin^4\phi + \dots$$

Bunda K_1 va K_2— anizotropiya konstantalari, ϕ — magnitlanish vektori va c-o‘qi orasidagi burchak. M-tip ferritlarda xona haroratida $K_1 > 0$ va ancha katta qiymatga ega bo‘lib, oson magnitlanish yo'nalishi c-o‘qi bo‘ylab yo‘nalganligini

ta'minlaydi. Gamma nurlanish kristallga kirib borganda asosan Kompton effekti va fotoelektr yutilish hisobiga ikkilamchi elektronlarni hosil qiladi. Bu elektronlar o‘z navbatida panjara tugunlaridagi atomlarni urib chiqarishi, ayniqsa massa jihatdan yengil bo‘lgan kislorod atomlarini o‘z o‘rnidan siljitib, kislorod vakansiyalarini shakllantirishi mumkin.

3. TADQIQOT OBYEKTI VA METODOLOGIYASI

Namunalarni tayyorlash: Tadqiqot obyekti hisoblangan $BaFe_{12}O_{19}$ namunalari M.V. Lomonosov nomidagi Moskva davlat universitetida (MDU) qattiq fazali sintez (keramika usuli) usuli yordamida tayyorlandi. Bunda boshlang‘ich komponentlar sifatida yuqori tozalikdagi $BaCO_3$ va Fe_2O_3 kukunlari stexiometrik nisbatda aralashtirildi, presslandi va uzoq vaqt davomida 1000°C – 1200°C harorat oralig‘ida sinterlandi.

Gamma nurlanish qurilmasi: Olingan namunalar O‘zbekiston Respublikasi Fanlar Akademiyasi Yadro fizikasi institutida joylashgan, yopiq turdagi radiatsion manba — basseyn tipidagi ^{60}Co gamma-qurilmasida nurlantirildi. Ushbu qurilma biologik himoya va sovitish vositasi sifatida suv qatlamidan foydalanadi. Nurlantirish ishlari maksimal doza quvvati 212.6 R/s bo‘lgan markaziy kanalda olib borildi. Namunalar 0.8 $*10^6$ R dan $17.0*10^6$ R gacha bo'lgan turli dozalarda ishlovdan o'tkazildi.

Magnit va strukturaviy o'lchovlar: Strukturaviy o‘zgarishlarni aniqlash uchun namunalarning rentgen-faza tahlili (XRD) nurlanishdan oldin va keyin amalga oshirildi. Magnit parametrlarni o‘lchash Buyuk Britaniyada ishlab chiqarilgan o‘ta yuqori sezgirlikdagi Cryogenic S700 SQUID (Superconducting Quantum Interference Device) magnitometridan (VSM moduli bilan jihozlangan) foydalanilgan holda bajarildi. O'lchovlar tashqi magnit maydoni 0 dan 7 T gacha o'zgartirilgan holda amalga oshirildi. SQUID o'ta o'tkazuvchanlik va Jozefson effekti prinsiplariga asoslanib, 10^{-15} T aniqlikkacha bo'lgan magnit oqimi o'zgarishlarini qayd eta oladi.

4. NATIJALAR VA ULARNING MUHOKAMASI

4.1. Gamma kvantlarning fazaviy tarkibga ta'siri

Namunalarning kristall tuzilishi va fazaviy holatida gamma-kvantlar ta'sirida yuz bergan transformatsiyalar rentgenogrammalar asosida hisoblab chiqildi. 1-jadvalda nurlanmagan va $2*10^7$ R dozasida gamma nurlangan $BaFe_{12}O_{19}$ namunalarining fazaviy tarkibi berilgan.

1-jadval. Bariy geksaferritlarining nurlanish ta'siridagi fazaviy tarkibi dinamikasi

Faza nomi	Kimyoviy formulasi	Nurlanmagan namuna (hajm %)	Nurlangan namuna (2×107 R, hajm %)	Fazaviy o'zgarish
Bariy geksaferrit	$BaFe_{12}O_{19}$	57	61	Ortishi (+4%)
Gematit	Fe_2O_3	6	27	Keskin ortish (+21%)
Murakkab faza	$Ba_2Fe_{30}O_{46}$	31	7	Keskin kamayish (-24%)
Magnemit/Magnetit	$Fe_{2.957}O_4$	6	6	O'zgarmagan (0%)

Jadval tahlilidan ko‘rinib turibdiki, sintez qilingan dastlabki namunada ma'lum miqdorda ikkilamchi fazalar ($Ba_2Fe_{30}O_{46}$ va Fe_2O_3) mavjud bo‘lgan. Gamma nurlanish ta'sirida esa juda qiziqarli radiatsion-kimyoviy jarayon sodir bo'lgan. $2*10^7$ R dozasida ikkilamchi $Ba_2Fe_{30}O_{46}$ faza ulushi 31% dan 7% gacha keskin pasaygan. Buning hisobiga maqsadli asosiy faza $BaFe_{12}O_{19}$ miqdori 57% dan 61% gacha va alohida temir oksidi Fe_2O_3 fazasi 6% dan 27% gacha ortgan. Bu hodisa shuni anglatadiki, yuqori energiyali gamma nurlar beqarorroq bo'lgan murakkab bariy temir oksidi tuzilmalarini barqaror bo'lgan magnetoplumbit fazaga va gematitga qisman parchalanishini (radiatsion stimulyatsiyalangan fazaviy o'tish) ta'minlagan.

4.2. Magnit parametrlarning dozaga bog'liqligi

Turli dozalarda nurlantirilgan namunalarning magnitlanish egri chiziqlari tahlil qilindi. To‘yinish magnitlanishi (M_s), qoldiq magnitlanish (M_r) va koersitiv kuch (H_c) qiymatlarining radiatsiya dozasiga bog'liqligi quyidagi 2-jadvalda umumlashtirilgan.

2-jadval. Gamma-kvantlar bilan nurlantirilgan $BaFe_{12}O_{19}$ geksaferritining asosiy magnit parametrlari

Nurlanish dozasi ($\times 10^6$ R)	Massa m (mg)	To'yinish magnitlanishi M_s (emu/g)	Qoldiq magnitlanish M_r (emu/g)	Koersitiv kuch H_c (Oe)
(Nurlanmagan)	70.65	52.5	23.8	1060

Nurlanish dozasi ($\times 10^6$ R)	Massa m (mg)	To'yinish magnitlanishi M_s (emu/g)	Qoldiq magnitlanish M_r (emu/g)	Koersitiv kuch H_c (Oe)
0.8	62.20	40.2	24.5	794
2.1	71.20	44.5	19.0	420
5.0	79.00	47.4	23.4	663
10.0	104.70	49.6	18.8	451
17.0	74.70	48.9	19.8	523

Eksperimental natijalardan ko‘rinib turibdiki, kichik nurlanish dozalaridayoq magnit xossalar keskin o'zgarishga uchraydi. Dastlabki $0.8*10^6$ R nurlanishida to‘yinish magnitlanishi 52.5 emu/g dan birdaniga 40.2 emu/g gacha (deyarli 23% ga) pasayadi. Nurlanish dozasi ortib borishi bilan M_s asta-sekin tiklanib, $10.0*10^6$ R dozasida maksimal 49.6 emu/g ga yetadi va undan keyingi nurlanishlarda ($17.0*10^6$ R) shu qiymat atrofida barqarorlashadi (48.9 emu/g).

Xuddi shunday dinamika, ammo undan ham radikalroq tarzda koersitiv kuch (H_c) qiymatida kuzatiladi. Nurlanmagan namunada 1060 Oe bo'lgan yuqori koersitiv kuch, $2.1*10^6$ R dozada 420 Oe ga tushib ketgan (2.5 baravarga pasayish). So'ngra u qisman tebranib, yuqori dozalarda 500 Oe atrofida saqlanib qolgan.

Mexanizmni fizik asoslash:

Ushbu o'zgarishlarning fizik tabiati birinchi navbatda gamma nurlanishning ionlashtiruvchi ta'siri ostida panjarada kislorod vakansiyalarining hosil bo'lishi bilan bog'liq. Geksaferritlarda temir ionlari kislorod anioni ishtirokida Fe^{3+} - O^{2-} - Fe^{3+} ko'rinishidagi bog'lanishlarni hosil qiladi va shu orqali superalmashinuv o'zaro ta'sir amalga oshadi.

- **Pasayish bosqichi:** Kichik dozalarda nurlanish panjaradan kislorod ionlarini faol ravishda siqib chiqaradi. Vakansiyalar hosil bo'lishi superalmashinuv bog'lanish zanjirini uzadi, natijada spinlarning kollinear (parallel) joylashuvi buzilib, burchakli yoki tartibsiz magnit struktura (kanted spin holati) vujudga keladi. Bu esa yig'indi magnit momentning, ya'ni to'yinish magnitlanishining kamayishiga, shuningdek domen devorlari harakatini yengillashtirib, koersitiv kuchning tushishiga olib keladi. Bunga qo'shimcha ravishda elektr neytrallikni saqlash maqsadida ba'zi Fe^{3+} ionlari magnit momenti kichikroq bo'lgan Fe^{2+} holatiga o'tishi mumkin.
- **Barqarorlashish bosqichi:** Yuqori dozalarda ($> 5.0*10^6$ R) kristall ichida harorat mikro-lokal hududlarda ortishi va hosil bo'lgan Frenkel nuqsonlarining

(vakansiya va tugunlararo atomlar) qayta taqsimlanishi hamda o'zaro rekombinatsiya qilishi jarayoni kuchayadi. Shu bilan birga, 1-jadvalda ko'rilganidek, ikkilamchi parazit faza parchalanib, sof $BaFe_{12}O_{19}$ ulushining ortishi magnit parametrlarning (ayniqsa M_s) yana qisman tiklanishiga xizmat qilgan.

5. XULOSA

Olingan eksperimental natijalarni va nazariy tahlillarni umumlashtirib, quyidagi yakuniy xulosalarga kelindi:

1. M.V. Lomonosov nomidagi Moskva davlat universitetida sintez qilingan bariy geksaferrit ($BaFe_{12}O_{19}$) keramikasining ^{60}Co manbaidan olingan gamma kvantlar ta'siriga yuqori sezgirligi aniqlandi. Materialning magnit parametrlari radiatsiya dozasiga nochiziqli bog'liqlikni namoyon qildi.

2. Rentgen-faza tahlillari gamma nurlanish nafaqat nuqtaviy nuqsonlar yaratishini, balki makroskopik darajada fazaviy transformatsiyalarni ham stimulyatsiya qilishini ko'rsatdi: nurlanish ta'sirida murakkab $Ba_2Fe_{30}O_{46}$ fazasining hajm ulushi keskin kamayib (31% dan 7% gacha), asosiy barqaror geksaferrit fazasi ulushi oshdi (57% dan 61% gacha).

3. Gamma kvantlarning ta'siri natijasida magnit xarakteristikalarning eng katta degradatsiyasi 0.8 - $2.1*10^6$ R doza oralig'ida kuzatildi (koersitiv kuch 1060 Oe dan 420 Oe gacha tushdi). Bunga asosiy sabab sifatida nurlanish energiyasi hisobiga yuzaga kelgan kislorod vakansiyalari va ularning Fe-O-Fe superalmashinuv bog'lanishlarini kuchsizlantirishi ko'rsatildi.

4. Nurlanishning katta dozalarida (10-$17*10^6$ R) radiatsion nuqsonlarning qisman anilyatsiyasi (rekombinatsiyasi) va fazaviy tozalanish hisobiga magnitlanish ko'rsatkichlari barqarorlasha boshlashi ilmiy jihatdan asoslandi. Olingan natijalar kosmik apparatlar, yuqori chastotali elektron qurilmalar va yadro reaktorlari yaqinida ishlovchi sensorlar uchun radiatsiyaga chidamli magnit materiallar ishlab chiqishda muhim amaliy qiymatga ega.

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TRANSPORT TIZIMLARIDA YO‘LOVCHI OQIMLARINI PROGNOZLASHNING AXBOROT-TAHLILIY MODELLARI VA USULLARINI TAKOMILLASHTIRISH YO‘NALISHLARI: TOSHKENT METROPOLITENI MISOLIDA

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ANNOTATSIYA

Metropoliten tarmog‘i kengayganda yangi stansiyalarda oldingi yillarga oid ma’lumotlar bo‘lmasligi, mavjud stansiyalardagi yo‘lovchi oqimi esa vaqt davomida o‘zgarib borishi prognozlashni murakkablashtiradi. Maqolada ushbu muammolarni yechishga qaratilgan Meta-LSTM, Metro-MGAT va IMGSN modellarining ishlash xususiyatlari yoritildi. Toshkent metropolitenida yo‘lovchilar sonining 2016-yildagi 53,5 milliondan 2025-yilda 287 milliongacha ko‘payishi va tarmoqni 2030-yilgacha 79 ta stansiya hamda 103 kilometrga yetkazish rejalari mavjud prognozlash tizimini yangilash zarurligini ko‘rsatadi. Turniket, elektron to‘lov, qatnov jadvali va stansiyalarga oid ma’lumotlarni birlashtirish, yangi stansiyalar oqimini o‘xshash stansiyalar ko‘rsatkichlari orqali dastlabki baholash hamda prognozni yangi ma’lumotlar asosida muntazam yangilab borish Toshkent metropoliteni uchun maqbul yo‘nalishlar sifatida belgilandi.

Kalit so‘zlar: *yo‘lovchi oqimi, Toshkent metropoliteni, fazoviy-vaqtli tahlil, graf neyron tarmog‘i, transfer o‘rganish, inkremental o‘rganish, yangi stansiya, axborot-tahliliy boshqaruv.*

DIRECTIONS FOR IMPROVING INFORMATION AND ANALYTICAL MODELS AND METHODS OF PASSENGER FLOW FORECASTING IN TRANSPORT SYSTEMS: THE CASE OF THE TASHKENT METRO

ABSTRACT

The expansion of a metro network complicates passenger-flow forecasting because newly opened stations have no historical observations, while demand at

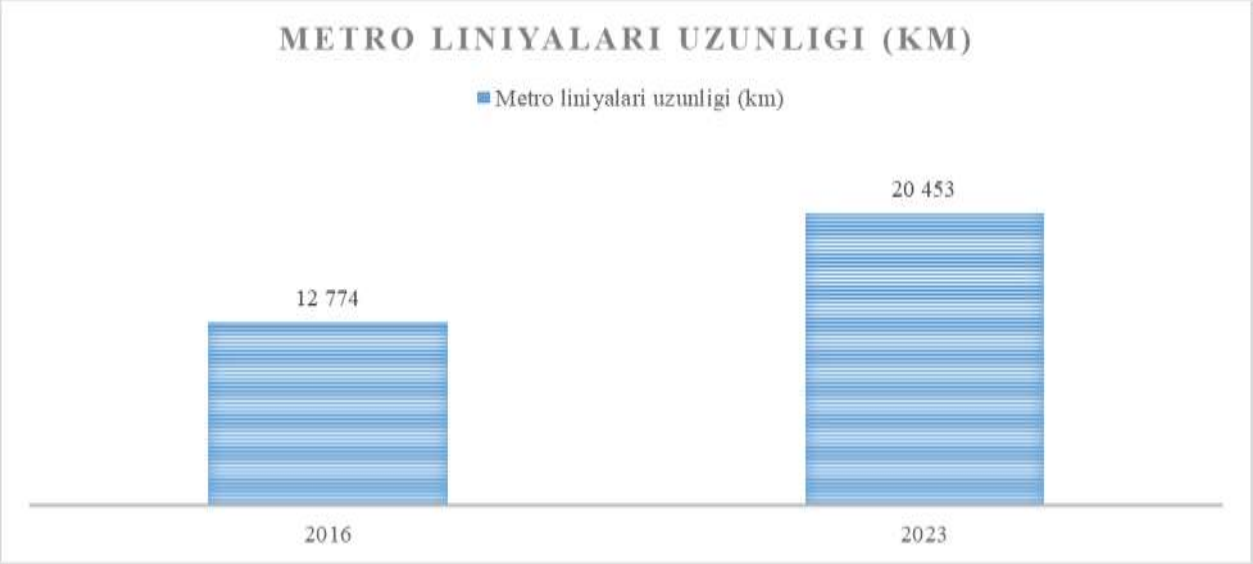
existing stations changes over time. This article examines the operating principles of the Meta-LSTM, Metro-MGAT, and IMGSN models developed to address these problems. Annual ridership on the Tashkent Metro increased from 53.5 million passengers in 2016 to 287 million in 2025, while the network is planned to reach 79 stations and 103 kilometres by 2030. These changes require an updated approach to passenger-flow forecasting. For the Tashkent Metro, the most suitable directions include combining turnstile, electronic payment, timetable, and station-level data; estimating initial demand at new stations using data from similar stations; and regularly updating forecasts as new observations become available.

Keywords: *passenger flow, Tashkent Metro, spatiotemporal analysis, graph neural network, transfer learning, incremental learning, new station, information and analytical management.*

KIRISH

Ma'lumki, yo‘lovchi oqimini prognozlash transport tarmog‘ining muayyan bekati, yo‘nalishi yoki uchastkasidan ma’lum vaqt oralig‘ida foydalanishi kutilayotgan yo‘lovchilar sonini oldindan baholash jarayonidir. Bunday prognozlar poyezdlar harakat oralig‘ini belgilash, harakat tarkibini yo‘nalishlar bo‘yicha taqsimlash, stansiyalardagi xodimlar sonini rejalashtirish, almashinuv tugunlaridagi yuklamani nazorat qilish va tig‘iz vaqtlarda yo‘lovchilar xavfsizligini ta’minlash uchun zarur. Yo‘lovchi oqimi yetarlicha aniq baholanmasa, bir tomondan, stansiya va vagonlarda ortiqcha zichlik, kechikish hamda xizmat sifati pasayishi yuzaga keladi; ikkinchi tomondan, talabdan ortiq transport quvvatini ajratish foydalanish xarajatlari va energiya sarfining oshishiga olib keladi [1]. Shu sababli yo‘lovchi oqimi prognozi shahar transportini tezkor boshqarish va uning rivojlanishini rejalashtirishning asosiy axborot manbalaridan biri hisoblanadi [2].

Yildan yilga metropoliten tarmoqlarining kengayishi prognozlash masalasining ko‘lamini sezilarli darajada oshirdi. Xalqaro jamoat transporti uyushmasi ma’lumotlariga ko‘ra, jahondagi metropoliten liniyalarining umumiy uzunligi 2016-yildagi 12 774 kilometrdan 2023-yilda 20 453 kilometrga yetgan, ya’ni yetti yil davomida 60,1 foizga ko‘paygan. 2023-yil yakunida dunyoning 202 ta shahar aglomeratsiyasida 831 ta metro liniyasi faoliyat yuritgan va ular orqali yil davomida qariyb 58 milliard yo‘lovchi tashilgan. Faqat 2021–2023-yillarda 13 ta yangi shahar metro tizimini ishga tushirgan [1].



1-rasm. Jahon metropoliten tarmog‘ining kengayishi

Tarmoqning bunday sur’atda kengayishi amaldagi stansiyalar bilan bir qatorda hali yetarli tarixiy ma’lumotga ega bo‘lmagan yangi stansiya va yo‘nalishlarda ham yo‘lovchilar talabini oldindan aniqlash zaruratini yuzaga keltirmoqda. Mazkur davrda yo‘lovchi tashish hajmining keskin va bir tekis bo‘lmagan o‘zgarishi ham kuzatildi. Jahon metropolitenlarida yo‘lovchilar soni 2012–2019-yillarda yiliga o‘rtacha 4,1 foizdan o‘sib borgan bo‘lsa, 2020-yilda pandemiya ta’sirida 2019-yilga nisbatan 40 foizga kamaygan. Yo‘lovchi tashish hajmi faqat 2023-yilga kelib pandemiyadan oldingi darajaga qaytgan [1]. Ushbu holat transport talabi faqat avvalgi kun yoki haftalardagi oqimning takrorlanishidan iborat emasligini ko‘rsatdi. Ish va o‘qish tartibining o‘zgarishi, yangi yo‘nalishlarning ochilishi, tarif siyosati, ommaviy tadbirlar, ob-havo va favqulodda holatlar vaqt qatorlarining tuzilishini o‘zgartirishi mumkin. Shuning uchun bir marta o‘qitilib, keyinchalik o‘zgarmaydigan statik prognozlash modeli transport tizimining rivojlanayotgan sharoitida o‘z aniqligini saqlab qolmasligi mumkin.

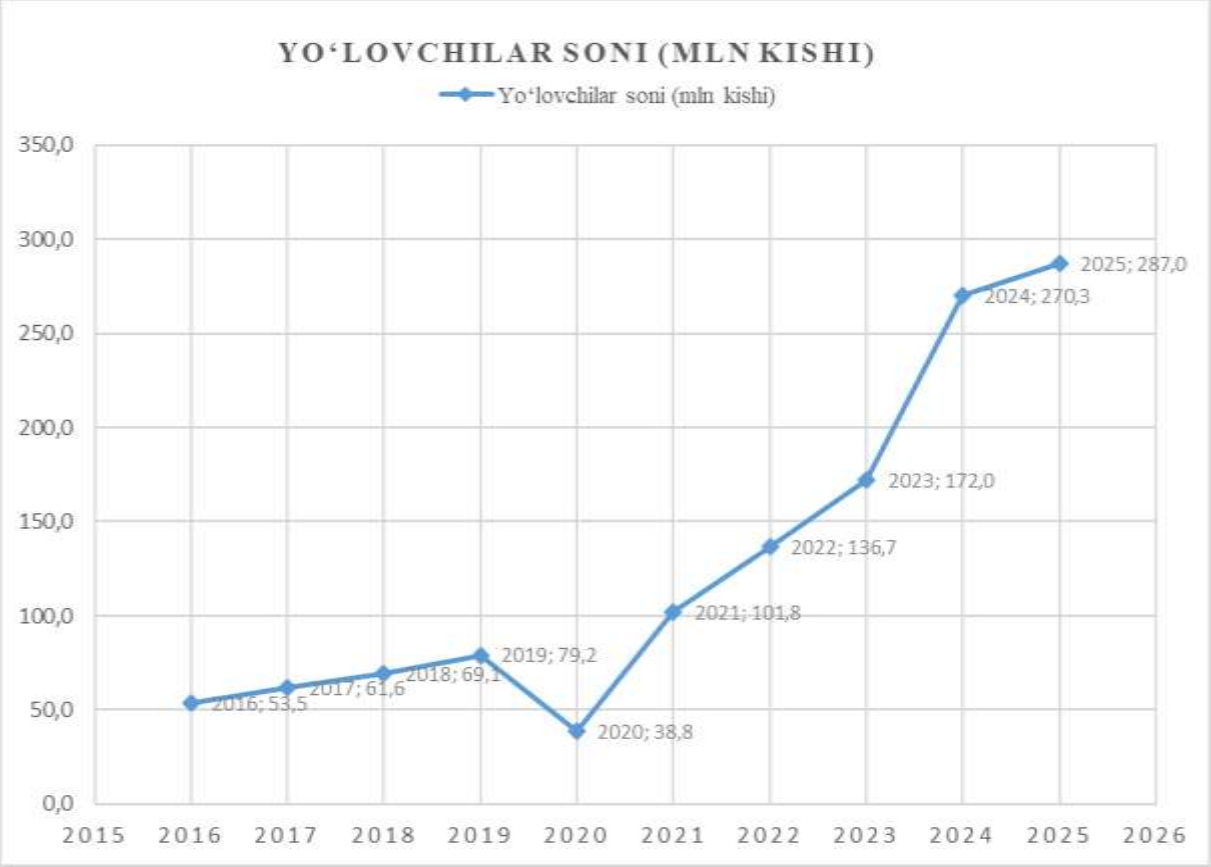
2016–2025-yillarda yo‘lovchi oqimini prognozlash usullarining rivojlanishi ham ushbu ehtiyoj bilan bog‘liq bo‘ldi. Dastlab alohida stansiyaning vaqt qatoriga asoslangan ARIMA, eksponensial silliqlash, regressiya va an’anaviy mashinali o‘rganish algoritmlaridan foydalanilgan bo‘lsa, keyingi bosqichda LSTM va GRU kabi rekurrent neyron tarmoqlari qo‘llanila boshlandi. Biroq bitta stansiyadagi oqim qo‘shni stansiyalar, almashinuv tugunlari va tarmoqdagi umumiy harakat bilan bog‘liq bo‘lganligi sababli, vaqt dinamikasini alohida o‘rganish yetarli natija bermaydi. Shu bois so‘nggi tadqiqotlarda stansiyalar o‘rtasidagi bog‘lanishni graf orqali, vaqt bo‘yicha o‘zgarishni esa rekurrent neyron tarmog‘i orqali ifodalovchi fazoviy-vaqtli modellar rivojlandi [2; 3].

Fazoviy-vaqtli chuqur o‘rganish modellari stansiyadagi yo‘lovchi oqimining qaysi soatlarda va haftaning qaysi kunlarida ortishi yoki kamayishini aniqlash uchun uzoq muddatli kuzatuvlarga tayanadi. Yangi stansiya ishga tushirilganda bunday ma’lumotlar hali shakllanmagan bo‘ladi. Natijada model uning tig‘iz va sokin vaqtlarini, mavsumiy o‘zgarishlarini hamda qo‘shni stansiyalar bilan bog‘liq yo‘lovchi harakatini ishonchli aniqlay olmaydi. Aynan shu masalada xorijiy olimlardan K. Han va hammualliflar 2024-yilda Meta-LSTM modelini ishlab chiqqan. Model avval Nanning, Hangzhou va Pekindagi ma’lumoti yetarli stansiyalarning turli yo‘lovchi oqimi xususiyatlarini o‘rganadi, keyin hosil qilingan boshlang‘ich parametrlarni kuzatuvlari kam bo‘lgan yangi stansiyaga ko‘chiradi. Natijada yangi stansiya bo‘yicha oz miqdordagi ma’lumot bilan ham qisqa muddatli prognozlashni boshlash imkoniyati yaratilgan [4]. Shuningdek, F. Ding va hammualliflar 2024-yilda taklif qilgan Metro-MGAT modeli masalani kengaygan metro tarmog‘ining yangi tuzilishini hisobga olish orqali rivojlantirgan. Unda stansiyalar o‘rtasidagi bog‘lanish bitta graf bilan cheklanmagan: geografik yaqinlik, funksional o‘xshashlik va safar qarshiligi kabi bog‘lanishlar bir necha graf ko‘rinishida ifodalangan. Shahar muhiti va metro topologiyasiga oid ma’lumotlar ushbu graflar bilan birlashtirilib, diqqat mexanizmi orqali yangi stansiyaning ehtimoliy yo‘lovchi talabi baholangan. Model Shanxay metrosi tarmog‘ining kengayish ma’lumotlarida sinovdan o‘tkazilgan [5]. F. Wu va hammualliflarning 2025-yilda ishlab chiqqan IMGSN modeli esa tarmoqdagi o‘zgarishlardan keyin modelni barcha tarixiy ma’lumotlarda qayta o‘qitish muammosiga yechim taklif qilgan. Model yo‘lovchi oqimi o‘zgarayotgan asosiy stansiyalarni aniqlaydi, yangi kuzatuvlarni bosqichma-bosqich o‘zlashtiradi va muhim eski parametrlarni saqlash orqali avval o‘rganilgan qonuniyatlarning yo‘qolishiga yo‘l qo‘ymaydi. Nankin metrosidagi sinovlarda 30 va 60 daqiqalik prognoz qadamlarida inkremental model noinkremental modellarga nisbatan o‘rtacha 45,69 foiz, zamonaviy taqqoslash modellariga nisbatan 29,39 foiz yuqori natija ko‘rsatgan [6].

Shunday qilib, Meta-LSTM yangi stansiya uchun boshlang‘ich bilimni shakllantirishni, Metro-MGAT kengaygan tarmoqdagi yangi fazoviy bog‘lanishlarni aniqlashni, IMGSN esa modelni yangi ma’lumotlar asosida uzluksiz yangilashni ta’minlaydi. Toshkent metropoliteni uchun ishlab chiqilayotgan modelda ushbu uch mexanizm — fazoviy bog‘lanishni modellashtirish, yangi stansiyaga bilim ko‘chirish va modelni inkremental yangilash — yagona prognozlash jarayonida o‘zaro bog‘lanadi.

Toshkent metropolitenidagi so‘nggi o‘n yillik ko‘rsatkichlar mazkur muammoning milliy miqyosdagi dolzarbligini tasdiqlaydi. Rasmiy statistikaga ko‘ra,

metropoliten orqali tashilgan yo‘lovchilar soni 2016-yildagi 53,5 milliondan 2019-yilda 79,2 millionga yetib, 48 foizga oshgan. Pandemiya ta’sirida 2020-yilda bu ko‘rsatkich 38,8 milliongacha, ya’ni 2019-yilga nisbatan 51 foizga kamaygan. Keyingi davrda yo‘lovchilar soni 2021-yilda 101,8 million, 2022-yilda 136,7 million, 2023-yilda 172 million va 2024-yilda 270,3 millionga yetgan. 2025-yilda metropoliten orqali 287 million yo‘lovchi tashilgan [7]. Shunday qilib, 2016–2025-yillar davomida yillik yo‘lovchilar soni 5,36 baravar, metro transportining yo‘lovchi aylanmasi esa 0,4 milliard yo‘lovchi-kilometrdan 2,1 milliard yo‘lovchi-kilometrgacha oshgan [7; 8]. Biroq bu o‘sish bir maromda kechmagan: pandemiya, yangi stansiyalarning ochilishi va tarmoqning kengayishi vaqt qatorida keskin tarkibiy o‘zgarishlarni yuzaga keltirgan.



2-rasm. Toshkent metropolitenida yo‘lovchilar soni dinamikasi

O‘zbekiston Respublikasi Prezidentining 2025-yil 4-dekabrdagi PQ–368-son qarorida 2030-yilga qadar Toshkent shahri aholisining jamoat transportidan foydalanish darajasini 60 foizga, metropoliten tarmog‘i uzunligini 103 kilometrga yetkazish belgilangan. Ushbu qarorda transport, yo‘lovchi va piyodalar oqimlari to‘g‘risidagi ma’lumotlarni yig‘ish hamda yagona ma’lumotlar bazasini shakllantirish Toshkent shahrida yo‘l harakatini tashkil etish markazining vazifalaridan biri sifatida belgilangan [9]. Prezidentning 2026-yil 15-maydagi PQ–191-son qaroriga ko‘ra esa

2030-yilgacha Toshkent metropolitenining kunlik tashish hajmini 1,8 million yo‘lovchiga, stansiyalar sonini 79 taga yetkazish va poyezdlar harakat oralig‘ini 2–3 daqiqagacha qisqartirish nazarda tutilgan [10]. Ushbu ko‘rsatkichlarga erishish har bir stansiya va vaqt oralig‘i bo‘yicha kutiladigan talabni oldindan baholash, poyezdlar soni hamda qatnov oralig‘ini prognoz natijalariga muvofiq boshqarishni talab qiladi.

TADQIQOT MATERIALLARI VA USULLARI

Tahlil 2016–2025-yillarda yo‘lovchi oqimini prognozlash bo‘yicha chop etilgan ilmiy tadqiqotlar, xalqaro transport tashkilotlarining hisobotlari, O‘zbekiston Respublikasining rasmiy statistik ma’lumotlari hamda sohaga oid normativ-huquqiy hujjatlar o‘rganildi. Tadqiqotda tizimli tahlil, qiyosiy tahlil va statistik ko‘rsatkichlarning dinamik tahlili usullaridan foydalanildi. Mavjud yondashuvlar yangi stansiyalarda prognozlash, transport tarmog‘idagi fazoviy bog‘lanishlarni hisobga olish, modelni yangi ma’lumotlarga moslashtirish va prognoz natijalaridan boshqaruvda foydalanish mezonlari bo‘yicha taqqoslandi.

TAHLIL NATIJALARI VA MUHOKAMA

Xalqaro tajriba va mamlakatimiz transport tizimining amaldagi holatini qiyosiy o‘rganish yo‘lovchi oqimini prognozlash muammosi faqat prognozlash algoritmini tanlash bilan cheklanmasligini ko‘rsatdi. Prognozning ishonchliligi, avvalo, ma’lumotlarning qanday yig‘ilishi, stansiya va vaqt kesimida shakllantirilishi, turli axborot tizimlari o‘rtasida birlashtirilishi hamda natijalarning boshqaruv qarorlarida qo‘llanishiga bog‘liq. Jahon metropoliten tarmoqlarining umumiy uzunligi 2016–2023-yillarda 60,1 foizga kengaygani, 2020-yilda yo‘lovchilar soni 40 foizga kamayib, 2023-yilda pandemiyadan oldingi darajaga qaytgani transport talabining barqaror emasligini ko‘rsatadi [1]. Shu sababli xalqaro amaliyotda ma’lumotlarni standartlashtirish, yangi stansiyalarda yo‘lovchi talabini oldindan baholash, prognozlarni muntazam yangilash va ularni tezkor boshqaruv tizimlariga bog‘lash ustuvor vazifaga aylangan.

Transport ma’lumotlarining turli tashkilotlar va axborot tizimlarida alohida saqlanishi xalqaro miqyosdagi asosiy muammolardan biridir. Muammoni kamaytirish maqsadida GTFS Schedule standarti bekatlar, yo‘nalishlar, qatnovlar va jadvallarni yagona formatda taqdim etishni, GTFS Realtime esa transport vositalarining joylashuvi, kechikishlar, bekor qilingan qatnovlar va xizmatdagi o‘zgarishlarni tezkor uzatishni nazarda tutadi [11]. Yevropa Ittifoqida 2017/1926-son delegatsiyalangan reglament orqali statik va dinamik transport ma’lumotlarini milliy kirish nuqtalari orqali taqdim etish hamda multimodal axborot almashinuvini yo‘lga qo‘yish talablari belgilangan [12]. Bu choralar turli transport turlaridan olingan ma’lumotlarni bir xil

tuzilmaga keltirish va ularni tahliliy tizimlarda birgalikda ishlatish imkonini yaratmoqda.

Ikkinchi masala yo‘lovchining qayerdan yo‘lga chiqqani, qaysi stansiyalarda almashgani va qayerda safarni yakunlagani haqidagi ma’lumotlarning to‘liq shakllanmasligi bilan bog‘liq. Xalqaro amaliyotda avtomatlashtirilgan to‘lov tizimi, smart-karta, turniket va transport vositalarining joylashuv ma’lumotlarini birlashtirish orqali yo‘lovchilarning harakat zanjiri tiklanmoqda. Masalan, Mashhad jamoat transportida bir yillik smart-karta operatsiyalaridan foydalanib, avtobus va metro yo‘lovchilarining kelib chiqish–manzil matritsasi shakllantirilgan [13]. Bunday yondashuv qaysi stansiyalar o‘rtasida talab yuqori ekanini, almashinuv tugunlarining yuklanishini va yo‘nalishlar kesimidagi haqiqiy yo‘lovchi harakatini aniqlashga xizmat qiladi.

Uchinchisi — yangi ochilgan stansiya va yo‘nalishlarda tarixiy kuzatuvlarning mavjud emasligidir. Xalqaro tadqiqotlarda ushbu masalani hal qilish uchun ma’lumoti yetarli stansiyalarning tajribasidan foydalanish, yangi stansiyaning atrofidagi aholi, ish joylari, ta’lim muassasalari va boshqa obyektlarni hisobga olish, shuningdek, tarmoqdagi o‘rnini mavjud stansiyalar bilan qiyoslash choralari qo‘llanmoqda. Meta-LSTM, Metro-MGAT va inkremental prognozlash bo‘yicha olib borilgan tadqiqotlar yangi stansiya bo‘yicha dastlabki prognozni shakllantirish hamda kuzatuvlar ko‘paygani sari uni aniqlashtirish mumkinligini ko‘rsatgan [4–6]. Demak, tarmoq kengayishini prognozlash jarayonida yangi stansiyani oddiy mavjud stansiya sifatida baholash yetarli emas; unga alohida axborot va baholash tartibi kerak.

Mamlakatimizdagi holat ham yuqoridagi muammolar bilan bevosita bog‘liq. Toshkent metropolitenida tashilgan yo‘lovchilar soni 2016-yildagi 53,5 milliondan 2025-yilda 287 millionga yetgan. Shu davrda 2020-yilgi keskin pasayish, 2021–2024-yillardagi tez tiklanish va yangi stansiyalarning ishga tushirilishi yo‘lovchi oqimi tarkibini sezilarli o‘zgartirgan [7]. Ochiq e’lon qilinayotgan rasmiy statistik ma’lumotlar yillik va umumlashtirilgan ko‘rinishda bo‘lib, ular uzoq muddatli rivojlanish yo‘nalishini baholashga imkon beradi. Biroq poyezdlar harakat oralig‘i, stansiyalardagi tig‘izlik, vagonlar va xodimlarni taqsimlash kabi tezkor vazifalar uchun stansiya hamda vaqt oralig‘i kesimidagi ma’lumotlar zarur. Bu holat metropolitenning ichki axborot tizimlarida batafsil ma’lumot mavjud emasligini anglatmaydi; muammo turli manbalardagi ma’lumotlarni yagona tahliliy jarayonga birlashtirish va ulardan muntazam foydalanish tartibini shakllantirish bilan bog‘liq. Respublikamizda ham bu yo‘nalishdagi tashkiliy choralar boshlangan. PQ–368-son qarorda Toshkent shahridagi transport, yo‘lovchi va piyodalar oqimi parametrlarini yig‘ish, yagona ma’lumotlar bazasini shakllantirish, mavjud oqimlarni baholash,

transport loyihalarini matematik modellashtirish va virtual sinovdan o‘tkazish Toshkent shahrida yo‘l harakatini tashkil etish markazining vazifalari sifatida belgilangan. Shuningdek, 2030-yilgacha aholining jamoat transportidan foydalanish darajasini 60 foizga, metropoliten tarmog‘i uzunligini 103 kilometrga yetkazish nazarda tutilgan [9]. Demak, huquqiy hujjatda ma’lumotlarni yig‘ishdan boshlab ularni modellashtirish va boshqaruv qarorlariga tatbiq etishgacha bo‘lgan asosiy yo‘nalishlar belgilab berilgan. PQ–191-son qarorda esa 2030-yilgacha metropolitenning kunlik tashish hajmini 1,8 million yo‘lovchiga, stansiyalar sonini 79 taga yetkazish va poyezdlar harakat oralig‘ini 2–3 daqiqagacha qisqartirish vazifalari qo‘yilgan. Bundan tashqari, 2027–2035-yillarga mo‘ljallangan Toshkent metropolitenini rivojlantirish strategiyasida liniyalarni ikki baravar, yo‘lovchi tashish hajmini 2,5 baravar oshirish, zarur harakat tarkibini aniqlash va xavfsizlik tizimlarini takomillashtirish nazarda tutilgan [10]. Bu vazifalarni bajarishda kelajakdagi yo‘lovchi talabini faqat yillik umumiy ko‘rsatkichlar asosida baholash yetarli bo‘lmaydi. Qaysi stansiyada, qaysi vaqtda va qaysi yo‘nalishda talab oshishini aniqlash talab etiladi. O‘tkazilgan qiyosiy tahlil xalqaro va milliy amaliyotdagi muammolar, ko‘rilayotgan choralar hamda tadqiqot vazifalarining quyidagi bog‘lanishini ko‘rsatdi.

1-jadval.

Yo‘lovchi oqimini prognozlashdagi muammolar va ularni hal etish bo‘yicha xalqaro hamda milliy yondashuvlar

Aniqlangan muammo	**Xalqaro**	**O‘zbekistonda**
Ma’lumotlarning turli tizimlarda tarqoq saqlanishi	GTFS va GTFS Realtime kabi yagona axborot standartlarini joriy etish	Transport oqimlari bo‘yicha yagona ma’lumotlar bazasini shakllantirish [9]
Stansiya va vaqt kesimidagi ma’lumotlarning yetarlicha tizimlashtirilmasligi	AFC, smart-karta, turniket va transport harakati ma’lumotlarini birlashtirish	Transport va yo‘lovchi oqimlari parametrlarini markazlashgan holda yig‘ish [9]
Yangi stansiyalarda tarixiy ma’lumot yo‘qligi	O‘xshash stansiyalar va shahar muhiti ko‘rsatkichlari asosida dastlabki baholash [4; 5]	Metro tarmog‘ini 79 stansiya va 103 kilometrgacha kengaytirish [10]
Yo‘lovchi talabining vaqt davomida keskin o‘zgarishi	Prognozlarni yangi kuzatuvlar asosida muntazam yangilash [6]	Yo‘lovchilar soni va tarmoq ko‘rsatkichlarini doimiy monitoring qilish [9]
Prognoz natijalarining boshqaruvga yetarlicha bog‘lanmasligi	Tahliliy natijalarni jadval, sig‘im va resurslarni boshqarishda qo‘llash	Harakat oralig‘ini 2–3 daqiqagacha qisqartirish va harakat tarkibini ko‘paytirish [10]
Prognoz sifatini nazorat qilish	Xatolikni vaqt, stansiya va	Transport loyihalarini

tartibining yetarli emasligi	yo‘nalish kesimida muntazam tekshirish	matematik modellashtirish va virtual sinash [9]

Tahlil natijalariga ko‘ra, bugungi kunda Toshkent metropolitenida yo‘lovchi oqimini axborot-tahliliy boshqarishni takomillashtirish bo‘yicha quyidagi ustuvor vazifalarni hal etish zarur:

1. Toshkent metropolitenida yo‘lovchi oqimiga oid mavjud axborot manbalari, ularning tarkibi, davriyligi va aniqlik darajasini o‘rganish.
2. Turniket, avtomatlashtirilgan to‘lov, qatnov jadvali va stansiya xususiyatlariga oid ma’lumotlarni stansiya hamda vaqt kesimida yagona tartibga keltirish.
3. Yo‘lovchi oqimining kunning vaqti, hafta kuni, mavsum, bayram, ommaviy tadbir va tarmoqdagi o‘zgarishlarga bog‘liqligini aniqlash.
4. Tarixiy ma’lumoti yetarli stansiyalar va yangi ochilgan stansiyalar uchun alohida baholash tartibini ishlab chiqish.
5. Prognoz aniqligini stansiya, yo‘nalish va vaqt oralig‘i kesimida tekshirish hamda ma’lumotlar o‘zgarganda natijalarni qayta hisoblash tartibini belgilash.
6. Olingan prognozlardan poyezdlar harakat oralig‘ini belgilash, vagonlar va xodimlarni taqsimlash, tig‘iz stansiyalarni nazorat qilish hamda transport infratuzilmasini rejalashtirishda foydalanish yo‘llarini asoslash.

Demak, xalqaro amaliyotda asosiy e’tibor ma’lumotlarni standartlashtirish, real vaqt rejimida yangilash va turli transport manbalarini birlashtirishga qaratilgan. Mamlakatimizda yagona ma’lumotlar bazasini yaratish, transport oqimlarini matematik modellashtirish va metro tarmog‘ini kengaytirish bo‘yicha huquqiy hamda tashkiliy asoslar shakllantirilmoqda. Tadqiqotning vazifasi ushbu chora-tadbirlarni ilmiy-uslubiy jihatdan bog‘lash, yo‘lovchi oqimi haqidagi ma’lumotni amaliy prognoz va boshqaruv qaroriga aylantirish tartibini asoslashdan iborat.

XULOSA

O‘tkazilgan tahlil yo‘lovchi oqimini ishonchli prognozlash faqat muayyan algoritmni tanlashga emas, balki ma’lumotlarni stansiya va vaqt kesimida muntazam yig‘ish, turli axborot manbalarini birlashtirish hamda prognozlarni yangi kuzatuvlar asosida yangilab borishga bog‘liqligini ko‘rsatdi. Xalqaro tajribada transport ma’lumotlarini standartlashtirish, smart-karta va turniket ma’lumotlari asosida yo‘lovchilarning harakat yo‘nalishlarini aniqlash, yangi stansiyalar uchun o‘xshash stansiyalar tajribasidan foydalanish hamda prognozlarni real vaqt ma’lumotlariga moslashtirish asosiy yo‘nalishlar sifatida shakllangan. Toshkent metropolitenida

yo‘lovchilar sonining 2016–2025-yillarda 53,5 milliondan 287 milliongacha oshishi, tarmoqning kengayishi va yangi stansiyalarning ishga tushirilishi stansiya hamda vaqt kesimidagi prognozlarga bo‘lgan ehtiyojni kuchaytirmoqda. Respublikada transport oqimlari bo‘yicha yagona ma’lumotlar bazasini shakllantirish, matematik modellashtirishni rivojlantirish va metropolitenning tashish quvvatini oshirish bo‘yicha huquqiy hamda tashkiliy choralar belgilangan. Shu bois Toshkent metropolitenida turniket, elektron to‘lov, qatnov jadvali va stansiya xususiyatlariga oid ma’lumotlarni yagona axborot-tahliliy jarayonda birlashtirish ustuvor ahamiyatga ega. Tahlil natijalariga ko‘ra, Toshkent metropoliteni uchun fazoviy-vaqtli bog‘lanishlarni hisobga olish, tarixiy ma’lumoti kam bo‘lgan yangi stansiyalarga mavjud stansiyalarda aniqlangan qonuniyatlarni ko‘chirish va prognozni yangi kuzatuvlar asosida bosqichma-bosqich yangilash istiqbolli yo‘nalish hisoblanadi. Mazkur yondashuvni amaliyotga joriy etish poyezdlar harakat oralig‘ini belgilash, harakat tarkibi va xodimlarni taqsimlash, tig‘iz stansiyalardagi yuklamani nazorat qilish hamda transport infratuzilmasini rejalashtirish qarorlarining axborot asosini mustahkamlashi mumkin.

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ПРОБЛЕМА ПЕРЕВОДА ОККАЗИОНАЛИЗМОВ С РУССКОГО ЯЗЫКА НА УЗБЕКСКИЙ
(на материале сказок К.И.Чуковского)

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АННОТАЦИЯ

В статье анализируются способы перевода индивидуально-авторских окказионализмов К.И.Чуковского на узбекский язык. Установлены ведущие переводческие стратегии – транскрипция, калькирование, функциональная замена и компенсация, обусловленные типологическими различиями двух языков.

Ключевые слова: *окказионализм, словообразование, художественный перевод, переводческая эквивалентность, узбекский язык, агглютинация, переводческая стратегия.*

ABSTRACT

The article analyzes the methods of translating K.I.Chukovsky's individual-authorial occasionalisms into the Uzbek language. The study identifies the main translation strategies – transcription, calque translation, functional substitution, and compensation – which are determined by the typological differences between the two languages.

Keywords: *occasionalism, word formation, literary translation, translation equivalence, Uzbek language, agglutination, translation strategy.*

ВВЕДЕНИЕ

Проблема перевода индивидуально-авторских новообразований – окказионализмов – остаётся одной из наименее разработанных областей современного переводоведения. При значительном корпусе исследований, посвящённых собственно окказиональному слову, вопросы его перевода «остались практически неисследованными» [6, с.4]. Особую сложность представляет перевод окказионализмов между разноструктурными языками – флективным русским и агглютинативным узбекским, – поскольку словообразовательные модели, продуктивные в одном языке, зачастую не имеют прямых аналогов в другом.

Актуальность настоящего исследования обусловлена отсутствием сопоставительных работ, посвящённых передаче окказиональной лексики с

русского языка на узбекский, при том что узбекско-русские переводческие контакты имеют долгую традицию, особенно в области детской литературы.

Целью статьи является выявление и систематизация переводческих стратегий, применяемых при передаче окказионализмов К.И.Чуковского на узбекский язык. Материалом исследования послужили окказионализмы из сказок «Мойдодыр» [8] и «Тараканище» [7], а также окказионализм «канцелярит» из книги «Живой как жизнь» [9], сопоставленные с их узбекскими переводными соответствиями, зафиксированными в справочных источниках [10].

Теоретические основы изучения окказионализма. Вслед за А.Г.Лыковым под окказиональным словом понимается лексическая единица речи, обладающая такими признаками, как принадлежность к речи, словообразовательная производность, ненормативность, функциональная одноразовость и экспрессивность [1, с.36]. Э.Ханпира подчёркивает, что окказиональность связана с «известной степенью незаданности речевого факта системой языка», создающей эффект неожиданности для реципиента [2, с.246]. Е.А.Земская указывает, что окказиональные слова образуются, как правило, по непродуктивным или собственно окказиональным моделям, что и отличает их от узуальных неологизмов [3, с.15].

Проблема переводимости окказионального слова. Окказионализм традиционно относят к области «непереводимого» в переводе [4, с.12] – не потому, что перевод невозможен в принципе, а потому, что окказиональное слово по определению не имеет готового соответствия в языке перевода. В.Н.Комиссаров отмечает, что при переводе индивидуально-авторских образований переводчик вынужден искать функциональный, а не формальный эквивалент, ориентируясь на воссоздание прагматического эффекта оригинала [5, с.98]. Согласно Е.В.Поздеевой, выбор переводческого решения определяется словообразовательной моделью, по которой создан окказионализм, и ресурсами языка перевода [6, с.14].

Типологические различия русского и узбекского языков как фактор перевода. Русский язык, флективный по своему строю, образует окказионализмы преимущественно путём аффиксации, словосложения и контаминации основ. Узбекский язык, являясь агглютинативным, обладает собственной системой продуктивных формантов – в частности, антропонимических суффиксов «-бой», «-хон», «-бек», – которые не совпадают по семантике с русскими словообразовательными средствами. Это делает

буквальное калькирование окказионализмов малопродуктивной стратегией и вынуждает переводчика прибегать к функциональным заменам и компенсации.

Анализ переводческих стратегий на материале К.И.Чуковского. Сопоставление окказионализмов оригинала с их узбекскими соответствиями [10] позволило выделить следующие переводческие стратегии.

№	Оригинал	Механизм образования	Узб. вариант	Переводческая стратегия
1	Мойдодыр [8]	сращение императива «мой» + наречного сочетания «до дыр»	Tozalabyuv	функциональная замена
2	Тараканище [7]	суффикс аугментативности «-ище»	Suvarakboy	компенсация (антропонимический суффикс «-бой»)
3	Муха-Цокотуха	звукоподражательный окказионализм от «цокотать»	Pashsha-serxarxasha	семантический перевод
4	Бармалей	немотивированное имя-неологизм	Barmaley	транскрипция

Особый случай представляет окказионализм «канцелярит», созданный К.И.Чуковским в книге «Живой как жизнь» [9] по модели медицинских терминов «плеврит», «бронхит» с переносом суффикса «-ит» на основу «канцелярия». Зафиксированного узбекского эквивалента данная единица не имеет, что иллюстрирует случай переводческой лакуны: подобные окказионализмы либо остаются непереведёнными и заменяются описательным оборотом, либо требуют создания нового окказионализма средствами языка перевода.

Заключение. Проведённый анализ показывает, что выбор стратегии перевода окказионализма закономерно связан со степенью его словообразовательной мотивированности в оригинале. Мотивированные окказионализмы, образованные от узнаваемой производящей основы, переводятся с использованием функциональной замены или компенсации, воспроизводящей эффект оригинала средствами собственной словообразовательной системы узбекского языка. Немотивированные окказионализмы, не имеющие внутренней формы, передаются транскрипцией.

Выявленная закономерность может быть положена в основу практических рекомендаций для переводчиков, работающих с русско-узбекской языковой парой, а также использована в курсах по теории и практике художественного перевода.

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ABAY KUNANBAYEV'S CONCEPTION OF THE HUMAN BEING IN LIGHT OF THE SEVENTH WORD: SOUL, BODY, NAFS, FAITH AND THE DESIRE FOR KNOWLEDGE

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ABSTRACT

This study examines the relationship between bodily desire (ten kumarı) and spiritual desire (can kumarı), as set out by Abay Kunanbayev in the Seventh Word of his Book of Words (Kara Sözler), from the perspective of theological anthropology. The central question of the article is how Abay grounds the human being not merely as a biological and social entity, but as a subject who is oriented toward knowledge, bears moral responsibility and attains perfection through faith. The research employs qualitative content analysis and comparative textual reading; the Seventh Word in particular, together with the Twelfth, Thirteenth, Seventeenth, Nineteenth, Twenty-Eighth and Thirty-Eighth Words, is evaluated alongside Abay's poetry, Qur'anic verses and hadith. The relationship between bodily and spiritual desire is further explained with reference to the stages of the nafs—al-nafs al-ammāra, al-nafs al-lawwāma and al-nafs al-muṭma'inna—and a comparison is drawn with the conceptions of soul, body and nafs in Ibn Sīnā, al-Ghazālī and Rūmī. The theological framework of the study is constructed with due regard to the Hanafi-Maturidi heritage of the Kazakh Muslim milieu in which Abay lived, while particular care is taken to note that there is no direct historical evidence that Abay was a systematic representative of any specific school of kalām or Sufism. The article argues that Abay's originality lies in his treatment of the human being's innate desire to know within the integrity of faith, reason, heart and ethics; in his subordination of bodily desire to a spiritual end rather than its negation; and in his construal of "becoming human" as a continuous process of moral and cognitive perfection.

Keywords: *Abay Kunanbayev, Seventh Word, Book of Words, soul–body relationship, nafs, Maturidism, faith, desire for knowledge, theological anthropology.*

INTRODUCTION

Abay Kunanbayev (1845–1904) is one of the founding figures in the formation of modern Kazakh thought, a thinker who treated literature, ethics, education and religion without separating them from one another. His poems and his *Book of Words* diagnose the pains of transformation experienced by nineteenth-century Kazakh

society while also seeking an answer to the question of how the human being is to mature. The literature on Abay in Türkiye has produced a substantial body of work on his literary personality, his views on education, his social criticism and the thematic structure of the *Book of Words*. Ekrem Ayan's monograph, which examines the *Book of Words* along the axes of religion and ethics, education, science, the meaning of life and social issues, is one of the principal reference works of this corpus. Adilov's presentation of the *Kitāb-i ʿAqliyya*, Kalkan's encyclopaedia entry, Karabey's biographical study, Kibar's assessment, the research of Kurmanbaiuly and Adilov, and the pedagogical study of Öztürk and Sembi likewise render different dimensions of Abay visible within the Turkish-language literature.[164]

Nevertheless, a systematic treatment of the Seventh Word from the standpoint of theological anthropology—particularly around the soul–body–*nafs* relationship, the desire to know and the concept of faith—remains an area open to further development. The present study seeks to fill this gap by reading Abay's distinction between "bodily desire" (*ten kumarı*) and "spiritual desire" (*can kumarı*) together with the Qur'anic language of the *nafs*, the conception of the human being in Islamic *kalām*, and the soul–body debates of classical Islamic thought. The aim here is not to force Abay into a scheme constructed after the fact, but to show at which points his concepts intersect with the Islamic intellectual tradition and at which points they generate a distinctive ethical language of their own.

The primary source of the study is Abay's *Book of Words*. While the Seventh Word is kept at the centre, the Twelfth, Thirteenth and Twenty-Eighth Words are used comparatively for faith and worship; the Seventeenth Word for the balance of reason, heart and will; the Nineteenth Word for learning and experience; and the Thirty-Eighth Word for the relationship among God, the human being, love and gnosis (*maʿrifa*). In this way the Seventh Word is read without being severed from the integrity of Abay's thought.[165]

1. Method, Scope and Place in the Literature

1.1. Method and principal sources

The research combines qualitative content analysis with comparative textual reading. In the first stage, the recurring themes of the Seventh Word—body, soul/spirit, desire, knowing, seeing, learning, faith, heart and the human–animal comparison—were identified. In the second stage, these themes were compared with

[164]Ekrem Ayan, *Bir Devrin Aynası: Abay Kunanbay ve Kara Sözler* (Ankara: Hoca Ahmet Yesevi Uluslararası Türk-Kazak Üniversitesi, 2017). The work examines the *Book of Words* through themes such as religion and ethics, education, science, love and the meaning of life.

[165]Abay's *Book of Words* is the principal primary source of this study. The Seventh Word has been read together with the other Words within the integrity of his thought.

parallel expressions in other sections of the *Book of Words*. In the third stage, connections were established with the Qur'anic concepts of *nafs*, spirit (*rūḥ*), heart (*qalb*), reason (*ʿaql*), responsibility and purification (*tazkiya*); in the final stage, a comparative framework was constructed with the conceptions of the human being found in Ibn Sīnā, al-Ghazālī and Rūmī.

In the use of primary sources, the *Book of Words* itself occupies the centre. This choice is significant, because interpretations of Abay must rest directly on the conceptual fabric of his own text. The study also draws on Abay's poetry as an auxiliary primary source in order to show the poetic counterparts of the ideas expressed in the *Book of Words*. This makes it possible to trace the continuity of concepts such as "guesthouse", "I / what is mine", "knowledge" (*ilim*), "heart", "faith" and "becoming human" across different genres.

1.2. Engagement with the Turkish-language literature and the contribution of the study

A considerable part of the Turkish-language scholarship on Abay's *Book of Words* is situated along the axes of literature, education and cultural history. Ayan, evaluating the *Book of Words* as the mirror of an era, sets out Abay's themes of religion and ethics, education, science, love and social criticism in an integrated manner. This approach is important in showing that the Seventh Word is bound not only to individual psychology but to Abay's broader vision of reform. Abdulvahap Kara's writings on Abay, for their part, dwell particularly on Abay's place in Kazakh culture, the education of children and the accurate transmission of the *Book of Words*; they foreground the link between the desire to know and learn and the ideal of "becoming a true human being".[166]

When the studies of Adilov, Ayan, Kalkan, Karabey, Kibar, Kurmanbaiuly–Adilov and Öztürk–Sembi are considered together, three tendencies stand out in Abay scholarship: biographical-cultural contextualisation, pedagogical-ethical reading, and comparison centred on language and literature. The present article extends this body of work in the direction of theological anthropology. Its principal contribution is to read "spiritual desire" not merely as curiosity or a wish for education but as the human being's innate aptitude for knowing the truth, and "bodily desire" not merely as base appetite but as the domain of biological needs that must be regulated.

In the course of peer review it was suggested that Mehmet Sait Toprak's studies on Abay also be addressed. However, since no verifiable publication by Toprak

[166]In Abdulvahap Kara's writings on Abay, the education of children, the love of learning and the accurate transmission of the *Book of Words* are particularly prominent. See also Abdulvahap Kara, "Kazak Edebiyatının Zirvesi Abay Kunanbayoğlu", *Arman Dergisi* (December 2004), 22–24.

focused directly on Abay Kunanbayev or the Seventh Word could be identified among the accessible academic records, no reference has been made to a work whose bibliographic details remain unverified. It would be more sound, from a scholarly standpoint, to add such a work to the literature review separately once its bibliographic details have been obtained.[167]

2. Abay's Theological Framework: The Hanafi-Maturidi Milieu, Sufism and a Cautious Positioning

It is methodologically problematic to explain Abay's religious thought solely by means of a particular school (*madhhab*) or Sufi-order (*ṭarīqa*) label. Nonetheless, it is clear that the Sunni Islam of the Kazakh steppe in which he was raised historically bore the imprint of Hanafi jurisprudence and Maturidi creed. For this reason, the relationship Abay establishes among faith, reason, gnosis and ethics can be read comparatively with Hanafi-Maturidi thought; this resemblance, however, should not be converted directly into the conclusion that "Abay is a systematic Maturidi theologian."

In the Maturidi tradition, reason is a central faculty enabling the human being to reflect on the existence and unity of God and to grasp moral responsibility. That Abay, especially in the Thirteenth and Thirty-Eighth Words, does not leave faith at the level of mere verbal assent but connects it with knowledge, contemplation, love and action shows a meaningful affinity with this epistemic-ethical line. That in the Seventh Word the child's natural inclination—"let me know, let me see, let me learn"—is counted as the beginning of human perfection is likewise consonant with a milieu that elevates the religious value of reason and knowledge.

From the standpoint of the Sufi tradition, Abay's emphases on the heart, love, the disciplining of the *nafs*, gnosis and inner purification are striking. The placing of love and gnosis at the centre of religious life, particularly in the Thirty-Eighth Word, intersects with the ethical language of classical Sufism. Even so, it would be incorrect to pronounce a definitive judgement without relying on explicit documentation proving Abay's direct affiliation with the Naqshbandiyya or a specific shaykh–*silsila* relationship. In this study the expression "Sufi affinity" is used to denote conceptual and ethical resemblance rather than institutional belonging.

3. The Dialectic of Soul and Body in the Seventh Word

Abay opens the Seventh Word by stating that the human being carries two distinct inclinations from birth. The first inclination is directed toward bodily needs such as eating, drinking and sleeping; the second toward seeing, hearing, asking and

[167]The name of Mehmet Sait Toprak was mentioned in the reviewer's note. However, since no verifiable bibliographic record of a publication directly concerned with Abay or the Seventh Word could be identified among the accessible academic records, no reference has been made without bibliographic verification.

learning. His naming of these two domains "bodily desire" (*ten kumarı*) and "spiritual desire" (*can kumarı*) shows that he conceives of the human being from the outset as a conflicted yet integral being. The word *kumar* here should be understood not merely in the sense of addiction to pleasure, but in the sense of strong desire, longing and orientation.

> *"When a child is born of its mother, it comes into the world with two kinds of nature… One is the inclination that tends toward 'let me drink, let me eat, let me sleep'… The other is the desire to 'know'… It asks, 'What is this?', 'Why is that so?'… All of these are the desire of the soul; the wish to know, to see and to learn."*

Abay does not regard the body as evil or superfluous. On the contrary, the nourishment and protection of the body are obligatory, because the body is "a guesthouse for the soul." This metaphor carries two implications simultaneously. The first is the legitimacy of the human being's bodily needs: the guesthouse must remain standing. The second is that the body is not the ultimate end: the guesthouse is not the guest. Abay thus keeps his distance from a rigid hostility toward the body and establishes a hierarchical integrity: the body is protected, but it is subordinated to a spiritual end.

This approach acquires a more explicit metaphysical language in the distinction between "I" and "what is mine" in Abay's poetry. Reason and soul are depicted as "I", the body as "what is mine." The presentation of justice, ethics and love—in contrast to the mortality of the body—as values that extend beyond death completes the guesthouse metaphor of the Seventh Word with an ethical conclusion. The human being realises itself not by denying the body, but by knowing the limits of the body and by giving precedence to enduring values.

4. The Concept of Nafs in the Qur'an and Abay's Body/Soul Distinction

4.1. Nafs: not merely base desire, but the human self

In the Qur'an the concept of *nafs* is not univocal. In some places *nafs* denotes the human being's own self or person, in others the centre of moral inclinations, and in others still the integrity of the human being in the context of death and responsibility. The verses "Every soul (*nafs*) shall taste death" (Āl ʿImrān 3:185), "God takes the souls at the time of their death" (al-Zumar 39:42) and "By the soul and Him who fashioned it…" (al-Shams 91:7–10) exemplify this multi-layered usage. For this reason, when relating Abay's distinction between soul/spirit and body to the Qur'anic concept of *nafs*, the *nafs* must not be narrowed down to a mere "sum of evil desires."

4.2. Al-nafs al-ammāra and bodily desire

Al-nafs al-ammāra is associated in the Qur'an with the expression "the soul that commands evil" (Yūsuf 12:53). In the Sufi and ethical literature this stage describes the predominance of the human being's uncontrolled inclinations toward pleasure, anger, selfishness and self-interest. Abay's bodily desire, however, is not directly identical with *al-nafs al-ammāra*, because needs such as eating, drinking and sleeping are indispensable parts of human life. Yet when bodily desire becomes immoderate and suppresses spiritual desire—that is, when the human being reduces its entire purpose to bodily gratification—a moral condition resembling *al-nafs al-ammāra* emerges. Abay's criticism is directed not at the existence of the body, but at the body's assumption of the governing position.

4.3. Al-nafs al-lawwāma: self-criticism and conscience

Al-nafs al-lawwāma, as "the self-reproaching soul" (al-Qiyāma 75:2), represents the possibility of moral self-examination. A significant portion of the harsh criticisms that Abay directs at society throughout the *Book of Words* in fact calls the reader not to enumerate the faults of others, but to recognise their own ignorance, laziness and imitativeness. The attitude criticised at the end of the Seventh Word—"claiming to know while we do not know"—is the very opposite of the *lawwāma* consciousness. When human beings become aware of their own ignorance and question themselves, an inner transformation begins that can revive spiritual desire.

4.4. Al-nafs al-muṭmaʾinna: faith, gnosis and inner balance

Al-nafs al-muṭmaʾinna, addressed as "O soul at peace!" (al-Fajr 89:27–30), denotes the tranquil self that has found its direction. Although this stage has no exact terminological equivalent in Abay's vocabulary, his depiction of the heart illuminated by faith, the soul nourished by knowledge, and the human being matured through justice and love points in the same direction. The cultivation of spiritual desire means not merely that the human being acquires more knowledge, but that knowledge is put in its proper place within faith and ethics. Thus curiosity turns into gnosis, gnosis into responsibility, and responsibility into inner balance.

5. Spiritual Desire (Can Kumarı) and the Moral Value of Knowledge

In the Seventh Word, "spiritual desire" is explained with reference to the child's natural curiosity to know its surroundings. The child pursues everything it sees, hears and cannot yet make sense of. For Abay, the real problem is the dulling of this curiosity in adulthood. A person may grow physically while shrinking spiritually; may come to possess more means while asking fewer questions. The pedagogical dimension of the Seventh Word therefore lies in its transformation of the desire to learn from a childhood trait into a lifelong condition of being human.

"Anyone who does not strive to grasp the visible and invisible secrets of the world… has no place among humanity… The soul is superior to the body; the body must be subordinate to the soul."

The Nineteenth Word completes this view epistemologically: the human being is not "intelligent" by birth; it comes to distinguish good from bad by hearing, seeing, touching, tasting and paying attention. Knowledge here is not mere mental accumulation but experience that develops the human being's capacity for moral judgement. In the Seventeenth Word, the reconciliation of reason, heart and effort before "knowledge" (*ilim*) shows that Abay's conception of the human being cannot be reduced to a single faculty. Reason gives direction, the heart preserves the human measure, and the will converts the known good into action.

6. The Relationship among Faith, Reason, Heart and Ethics

Abay's understanding of faith appears in complementary layers across different sections of the *Book of Words*. The Thirteenth Word emphasises faith as assent to the unity of God and to the truths communicated through the Prophet. The Twelfth Word states that worship must be supported by knowledge and sound belief. In the Twenty-Eighth Word, faith is foregrounded as a responsibility for the person of reason, and worship as a responsibility for the person of faith. The Thirty-Eighth Word, in turn, establishes the bond among gnosis, love, justice and humanity within a broader framework. Within this integrity, the criticism in the Seventh Word that there is "no faith in the heart" is not merely an accusation of unbelief, but a criticism that knowledge and ethics have failed to take root in the heart.

At this point no opposition is set up between faith and reason. On the contrary, reason and the desire to know are among the conditions for faith to become conscious. What Abay criticises is the failure to investigate the truth despite claims to knowledge, the failure to move beyond what is visible to the eye, and the failure to benefit from the wisdom of others. This attitude is a combination of epistemic arrogance and moral laziness. The person of faith, by contrast, is the one who admits what they do not know, who continues to learn, and who transforms their heart and conduct through knowledge.

The statement in the hadith that "modesty (*ḥayāʾ*) is a branch of faith" is important for understanding Abay's conception of the relationship between faith and ethics. For Abay's language of "faithfulness" encompasses not only metaphysical assent but also the human being's becoming manifest through qualities such as modesty, compassion, justice, truthfulness and responsibility. Faith thereby becomes

an ethical principle that orders the inner world of the human being and is reflected in social conduct.[168]

7. Comparison with Islamic Philosophers and Sufis

7.1. Ibn Sīnā: the distinction of the soul from the body and the faculty of knowing

In Ibn Sīnā's theory of the soul, the human soul is treated as a substance that governs the body but cannot, in its essence, be reduced to a material organ. The "flying man" thought experiment aims to show that even a person abstracted from all sensory contact could be aware of their own existence. Abay's distinction between "I" and "what is mine" and his idea that the body is a guesthouse for the soul are not a repetition of the same philosophical system; yet in their refusal to reduce the human essence to the body alone, they can be compared with Avicennian anthropology.[169]

The difference, however, is clear: whereas Ibn Sīnā dwells chiefly on the ontological status and intellectual perfection of the soul, Abay links the soul–body distinction directly to the problem of social ethics and education. His real question is not so much "what kind of substance is the soul?" as "why does the human being lose the desire to know, and how does it become human again?" For this reason Abay's anthropology carries an ethical-pedagogical orientation rather than a theoretical-metaphysical one.

7.2. Al-Ghazālī: the disciplining of the nafs, the heart and knowledge

In al-Ghazālī the concepts of heart, spirit, *nafs* and reason carry meanings that converge in different contexts; the salvation of the human being is linked to the disciplining of the desires of the *nafs*, the purification of the heart and the transformation of beneficial knowledge into action. In the *Iḥyāʾ*, the principle is not the complete annihilation of desires such as eating, sexuality, anger, wealth and status, but their management within legal and ethical measure. In this respect al-Ghazālī's approach bears a strong parallel with Abay's subordination of bodily desire to spiritual desire rather than its negation.[170]

Abay's language of "light in the breast, faith in the heart" can also be compared with al-Ghazālī's understanding of the purification of the heart and its illumination through gnosis. Nevertheless, Abay's distinctive emphasis lies in starting the desire to know from childhood curiosity and combining it with a critique of social ignorance.

[168]al-Bukhārī, *al-Jāmiʿ al-ṣaḥīḥ*, "Īmān", the chapter on modesty (*ḥayāʾ*) being part of faith.

[169]Ibn Sīnā, *Kitāb al-Nafs* (in *al-Shifāʾ: al-Ṭabīʿiyyāt*). The "flying man" argument is the classic example used to argue that the human being's awareness of its own self cannot be reduced to bodily sensation.

[170]Abū Ḥāmid al-Ghazālī, *Iḥyāʾ ʿulūm al-dīn*, especially the sections dealing with the disciplining of the *nafs*, the purification of the heart, and the relationship between knowledge and action.

The disciplining of the *nafs* thus becomes not merely a matter of individual asceticism but a condition for educational and social reform as well.

7.3. Rūmī: body as instrument, soul as orientation; love and gnosis

In Rūmī's *Mathnawī* the body is most often depicted as an instrument in the human being's journey toward truth, and the attachments of the *nafs* as factors that weigh down this journey. The soul's orientation toward its origin, its maturation through love and gnosis, and the human being's search for meaning beyond the visible shell are among the fundamental themes. A conceptual affinity can be established between Abay's criticism of "being content with looking with the eye" and Rūmī's call to pass from form (*ṣūra*) to meaning (*maʿnā*).[171]

Abay's language, however, is more social and didactic. Whereas Rūmī's symbolic-mystical narrative foregrounds the existential separation of the human being and the journey of love, Abay targets the concrete problems of Kazakh society: ignorance, laziness, imitativeness and ostentation. His "spiritual desire" is, prior to and together with mystical experience, the will to ask questions, to learn, to exercise reason and to be ethical.

7.4. Comparative assessment: Abay's originality

The comparison with Ibn Sīnā, al-Ghazālī and Rūmī makes it possible to view Abay's thought not as a "transmission" but as an original reconstruction within the shared basin of Islamic thought. Where the ontological soul and intellectual perfection come to the fore in Ibn Sīnā, the disciplining of heart and *nafs* and the unity of knowledge and action in al-Ghazālī, and the movement from form to meaning and toward gnosis through love in Rūmī, Abay reformulates these elements within the educational and ethical problem of Kazakh society. His distinctive conceptual contribution is to express the bodily and spiritual orientations in two everyday yet powerful concepts—*ten kumarı* / *can kumarı*—and to tie being human to the continuity of the desire to know.

8. The Ideal of "Becoming Human": Discernment (Paraset), Justice, Love and Responsibility

In Abay's conception of the human being, being born human in the biological sense and becoming human in the ethical sense are not the same thing. The harsh statement in the Seventh Word that a person who loses the desire to know may sink to the level of an animal describes not an ontological change of species, but the human being's failure to use the capacity for reason, understanding and ethics with

[171]Mawlānā Jalāl al-Dīn Rūmī, *Mathnawī-i Maʿnawī*. The comparison does not assert direct historical influence; it demonstrates the conceptual affinity among the themes of form–meaning, body–soul and gnosis.

which it has been endowed. For this reason the ideal *adam bol* ("be a true human being") is one of the central calls of Abay's thought.

The cognitive dimension of this ideal is knowledge (*ilim*) and discernment (*paraset*); its ethical dimension is justice, truthfulness and compassion; its religious dimension is faith and servanthood; and its emotional dimension is love and the disciplining of the heart. Abay's celebrated triad of reason, heart and effort represents the balanced coexistence of these elements. Reason alone may turn into cold calculation, effort alone into unmeasured force, and emotion alone into instability. United under the guidance of knowledge and the heart, these faculties constitute the holistic structure that leads the human being to perfection.

In this respect Abay's theological anthropology is also meaningful for contemporary debates on education. Education is not merely the transfer of vocational skills or information; it is the process of keeping curiosity alive, seeking the truth, developing self-criticism and combining knowledge with moral responsibility. It is no coincidence that the Seventh Word begins with the questions of a child: for Abay, the loss of humanity most often begins where questioning ends.

9. Discussion

Reading the Seventh Word together with the Qur'an and classical Islamic thought protects Abay's concepts from two extreme interpretations. The first extreme is to reduce Abay to a merely secular, modernising educator. Yet the emphases on faith, God, soul, the hereafter, heart and ethics in the text clearly demonstrate the religious dimension of his thought. The second extreme is to present Abay as the direct spokesman of a particular school of *kalām* or Sufism. Although the extant texts support his deep bond with the Islamic conceptual world, they call for caution regarding any systematic school affiliation.

The most appropriate reading, therefore, is to regard Abay as a Muslim thinker who was raised within the Hanafi-Maturidi cultural basin, who drew on the ethical language of Sufism, but who reconstructed this heritage through his own social experience and literary-philosophical style. Such a positioning both makes the historical context visible and preserves his originality.

Furthermore, the relationship established with the stages of the *nafs* should be regarded as an explanatory comparison for the concepts of the Seventh Word. Abay does not, in his text, offer a systematic classification in the form of *ammāra–lawwāma–muṭmaʾinna*. Yet themes such as the immoderation of bodily desire, the lack of self-examination and the orientation toward peace through faith can be analytically compared with this classification. The distinction should be used to

explain similar moral processes rather than to impose external terminology on the text.

CONCLUSION

This study has shown that two fundamental orientations lie at the centre of the conception of the human being developed by Abay Kunanbayev in the Seventh Word: bodily desire (*ten kumarı*) and spiritual desire (*can kumarı*). Abay does not reject bodily needs; he accepts them as a necessary condition of human life. Nevertheless, for the human being to become human in the true sense, the body must be subordinated to a spiritual end—that is, the desire to know, to learn, to understand, to believe and to mature ethically must become determinative.

The comparison with the Qur'anic concept of *nafs* and the stages *ammāra–lawwāma–muṭmaʾinna* has shown that Abay's body/soul distinction cannot be reduced to a simple soul–body dualism. Bodily desire is a domain of legitimate need; yet when it becomes immoderate it turns into a force that drags the human being down. Spiritual desire, by contrast, is a process that begins in curiosity, develops through knowledge, deepens through self-examination and moves toward perfection within the unity of faith and ethics.

The comparison with Ibn Sīnā, al-Ghazālī and Rūmī demonstrates that Abay shares a common conceptual basin with classical Islamic thought, but that he re-expresses these issues in an original manner within the educational and ethical problems of Kazakh society. The irreducibility of the soul to the body in Ibn Sīnā, the disciplining of the *nafs* and the heart–knowledge relationship in al-Ghazālī, and the orientation toward meaning in Rūmī converge in Abay in the social-pedagogical language of "spiritual desire."

With respect to the theological framework, it is meaningful to read Abay within the Hanafi-Maturidi cultural milieu. The bond he establishes among reason, faith, gnosis and ethics has aspects consonant with this tradition. Nevertheless, rather than counting him directly as a systematic representative of a particular school or order, it is more accurate to position him as an independent Muslim thinker who used this heritage creatively.

In conclusion, the Seventh Word is not merely a brief moral admonition on the curiosity of children. The text is a dense work of theological anthropology, arguing that human beings may drift away from their humanity if they lose the innate desire to know, and that they approach perfection when they cultivate this desire through faith, reason, heart, will, justice and love. Herein lies Abay's contemporary relevance: what makes a human being human is not merely the knowledge one possesses, but

continuing to seek the truth and transforming one's knowledge into moral responsibility.

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THEORETICAL INVESTIGATION OF THE EFFECT OF WIND WAVES ON EROSION PROCESSES IN COHESIVE-SOIL CHANNELS

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ABSTRACT

The paper presents the results of a theoretical investigation of erosion processes in cohesive soils forming the beds of open channels under the influence of wind-generated waves. The relevance of the study is associated with the need to ensure the stability and reliability of channels composed of cohesive soils under the combined effects of hydraulic flow and wind-induced wave action. The stability conditions of cohesive soils are considered, and the forces acting on an individual soil aggregate within the near-bed flow region are analyzed, taking into account the additional hydrodynamic effects generated by wind waves. In the proposed calculation model, cohesive soil is represented as a system of interconnected aggregates whose stability is governed by the cohesive forces between the aggregates and the channel bed, the submerged weight of the aggregate, and the hydrodynamic forces associated with wind-generated waves.

Using the limit-state approach, the critical condition of a cohesive-soil aggregate subjected to combined hydraulic and wind-wave action is established. The

analysis considers the frontal and lifting components of the hydraulic forces, the additional effects of wind-generated waves, the geometric characteristics of the soil aggregate, its resistance to tensile and bending effects, and the roughness characteristics of the channel bed. Theoretical relationships are derived for determining the erosive, non-erosive, and bottom non-erosive velocities of water flow in channels composed of cohesive soils under wind-wave action.

In determining the near-bed flow velocity, the logarithmic law of velocity distribution in the vicinity of the channel bed is taken into account together with the adopted value of absolute bed roughness. The influence of wind-generated waves on the near-bed hydrodynamic conditions and the resulting shear and lifting forces acting on cohesive-soil aggregates is also considered.

The proposed calculation approach is based on the principles of reliability theory and probabilistic assessment of the limit state of a soil aggregate. The resulting relationships make it possible to evaluate the stability of cohesive soils and determine the permissible hydraulic flow parameters under the combined influence of water flow and wind-generated waves, at which detachment and progressive erosion of soil aggregates from the channel bed do not occur. The obtained results can be applied to the hydraulic analysis and design of unlined channels, as well as to the assessment of the stability of channel beds composed of cohesive soils exposed to wind-wave action. However, the influence of the lateral slope of the channel and the detailed spatial characteristics of wind-generated waves are not considered in the derived relationships, although these factors may significantly affect the hydraulic characteristics of the flow and erosion intensity. Therefore, further research should focus on establishing the influence of the geometric parameters of trapezoidal channels, side slopes, and wind-wave characteristics on the non-erosive velocity of water flow and the stability of cohesive-soil channel beds..

Keywords: *cohesive soil, channel erosion, open channel, wind-generated waves, wind-wave action, non-erosive velocity, erosive velocity, limit state, hydrodynamic force, near-bed velocity, channel roughness, soil stability, wave-induced hydrodynamic forces.*

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ТЕОРЕТИЧЕСКОЕ ИССЛЕДОВАНИЕ ВЛИЯНИЯ ВЕТРОВЫХ ВОЛН НА ЭРОЗИОННЫЕ ПРОЦЕССЫ В РУСЛАХ СО СВЯЗНЫМИ ГРУНТАМИ

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АННОТАЦИЯ

В статье представлены результаты теоретического исследования процессов эрозии связных грунтов, формирующих русла открытых каналов, под воздействием волн, возникающих в результате действия ветра. Актуальность исследования обусловлена необходимостью обеспечения устойчивости и надежности каналов, сложенных связными грунтами, при совместном воздействии водного потока и ветрового волнения. Рассмотрены условия устойчивости связных грунтов и проанализированы силы, действующие на отдельный агрегат грунта в придонной области потока с учетом дополнительных гидродинамических воздействий, возникающих под действием ветровых волн. В предлагаемой расчетной модели связный грунт представлен как система взаимосвязанных агрегатов, устойчивость которых определяется силами сцепления между агрегатами и дном канала, взвешенным

весом агрегата, а также гидродинамическими силами, связанными с воздействием ветровых волн.

С использованием подхода предельного состояния установлено критическое условие устойчивости агрегата связного грунта при совместном воздействии водного потока и ветровых волн. При анализе учитываются лобовая и подъемная составляющие гидродинамических сил, дополнительные воздействия, обусловленные ветровыми волнами, геометрические характеристики грунтового агрегата, его сопротивление растягивающим и изгибающим воздействиям, а также характеристики шероховатости дна канала. Получены теоретические зависимости для определения размывающей, неразмывающей и донной неразмывающей скоростей водного потока в каналах, сложенных связными грунтами, с учетом воздействия ветровых волн.

При определении придонной скорости потока учитывается логарифмический закон распределения скорости вблизи дна канала совместно с принятой величиной абсолютной шероховатости дна. Также учитывается влияние ветровых волн на гидродинамические условия в придонной области и возникающие в результате этого касательные и подъемные силы, действующие на агрегаты связного грунта.

Предлагаемый расчетный подход основан на принципах теории надежности и вероятностной оценки предельного состояния грунтового агрегата. Полученные зависимости позволяют оценить устойчивость связных грунтов и определить допустимые гидравлические параметры потока при совместном воздействии водного потока и ветровых волн, при которых не происходит отрыва и прогрессирующего размыва агрегатов грунта от дна канала. Полученные результаты могут быть использованы при гидравлических расчетах и проектировании каналов с неукрепленным руслом, а также при оценке устойчивости русел, сложенных связными грунтами и подверженных воздействию ветрового волнения. Вместе с тем в полученных зависимостях не учитываются влияние боковых откосов канала и детальные пространственные характеристики волн, возникающих под воздействием ветра, хотя данные факторы могут существенно влиять на гидравлические характеристики потока и интенсивность эрозионных процессов. Поэтому дальнейшие исследования должны быть направлены на установление влияния геометрических параметров трапецеидальных каналов, заложения боковых откосов и характеристик ветровых волн на неразмывающую скорость водного потока и устойчивость русел каналов, сложенных связными грунтами.

Ключевые слова: *связный грунт, эрозия русла, открытый канал, ветровые волны, воздействие ветровых волн, неразмывающая скорость, размывающая скорость, предельное состояние, гидродинамическая сила, придонная скорость, шероховатость русла, устойчивость грунта, волновые гидродинамические силы.*

A number of researchers have proposed methods for calculating hydraulic structures based on the limit-state approach [1,2]. These methods are based on various considerations concerning the causes of structural failure and the safety and reliability of hydraulic structures. In particular, emphasis is placed on the statistical evaluation of parameters characterizing structural performance, which is one of the principal factors in determining safe structural dimensions. In the case of open channels composed of cohesive soils, the assessment of stability should also account for the additional hydrodynamic effects caused by wind-generated waves, which can increase the shear and lifting forces acting on the channel bed and accelerate erosion processes.

Using the limit-state method, we consider a procedure for determining the critical flow velocity above which cohesive soils are eroded under the combined action of water flow and wind-generated waves. The proposed approach makes it possible to evaluate the stability of cohesive-soil aggregates by considering both the hydrodynamic forces generated by the flowing water and the additional wave-induced forces resulting from wind action. This provides a more comprehensive assessment of the conditions leading to the detachment and erosion of cohesive-soil particles from the channel bed.

We assume that water-saturated cohesive soil, similarly to non-cohesive soil, consists of individual spherical particles d of a certain diameter. However, in cohesive soils, individual particles form aggregates bonded to one another by cohesive forces. These aggregates are characterized by a high equivalent fictitious γ_e specific weight, which represents the force required to detach a particle from the soil and is equal to the detachment force of a cohesive-soil aggregate.

Under the combined action of water flow and wind-generated waves, the stability of cohesive-soil aggregates is affected by both the mean hydrodynamic forces of the flowing water and the additional oscillatory forces induced by wind waves. These wave-induced forces can increase the shear and lifting effects acting on the channel bed and, consequently, contribute to the detachment and erosion of cohesive-soil aggregates. Therefore, the assessment of aggregate stability should take into account the combined hydraulic and wind-wave action.

The dimensions of the aggregates that can be detached under the combined action of water flow and wind-generated waves can be estimated in the calculations using the following absolute roughness height:

$$\Delta = 0,7d\,, \tag{1}$$

where d - the aggregate diameter.

One of the main soil characteristics determining resistance to channel erosion is cohesion. Therefore, this property is taken into account in modeling cohesive soils.

The cohesion force corresponding to one cohesive-soil aggregate under dynamic loading is given by the following expression:

$$R_{сд} = C_y^н d^2\,, \tag{2}$$

where $C_y^н$ - the fatigue limit of cohesive-soil failure,

$$C_y^н = 0,035C \tag{3}$$

is determined from the following expression. Here, C - the cohesion in the water-saturated state.

In addition to overcoming the cohesion force, detaching a cohesive-soil aggregate also requires overcoming the submerged weight of the soil:

$$R_{св} = (\gamma_ч - \gamma)\frac{\pi d^3}{6}. \tag{4}$$

For a non-cohesive soil particle of diameter d to be detached from the bed, a force equal to the weight of the particle is required, which can be expressed as follows:

$$R_{нв} = (\gamma_ч - \gamma)\frac{\pi d^3}{6}\,, \tag{5}$$

where $\gamma_ч$ and $\gamma_в$ - the specific weights of the soil and water particles, respectively.

The resistance to detaching a particle having an equivalent fictitious specific weight is as follows: γ_e having an equivalent fictitious specific weight, the resistance to detachment from the bed is given by:

$$R_{нэ} = (\gamma_ч - \gamma)\frac{\pi d^3}{6}. \tag{6}$$

Thus, the resistance to detaching a particle having an equivalent fictitious specific weight from the bed can be expressed as follows: γ_e having an equivalent fictitious specific weight, we express the resistance to detachment from the bed as follows:

$$R_{нэ} = R_{св} + R_{сд} \tag{7}$$

or

$$(\gamma_э - \gamma)\frac{\pi d^3}{6} = (\gamma_ч - \gamma)\frac{\pi d^3}{6} + C_y^н d^2 . \quad (8)$$

From this equality, we obtain the following:

$$\gamma_э = \gamma_ч + \frac{6C_y^н}{\pi d} . \quad (9)$$

The aggregate located on the channel bed is subjected to P_x frontal and P_z lifting forces exerted by the flow (see Fig. 1). In this case, the P_x frontal force tends to move the aggregate in the direction of flow, while the P_z lifting force tends to detach the aggregate from the bed and move it vertically upward [5].

The soil strength condition is that, at the limiting state, the forces acting on a cohesive-soil aggregate are balanced by the adhesion forces between the aggregates and the underlying bed, together with the weight of the aggregate.

The forces acting on the aggregate produce an eccentric stress distribution.

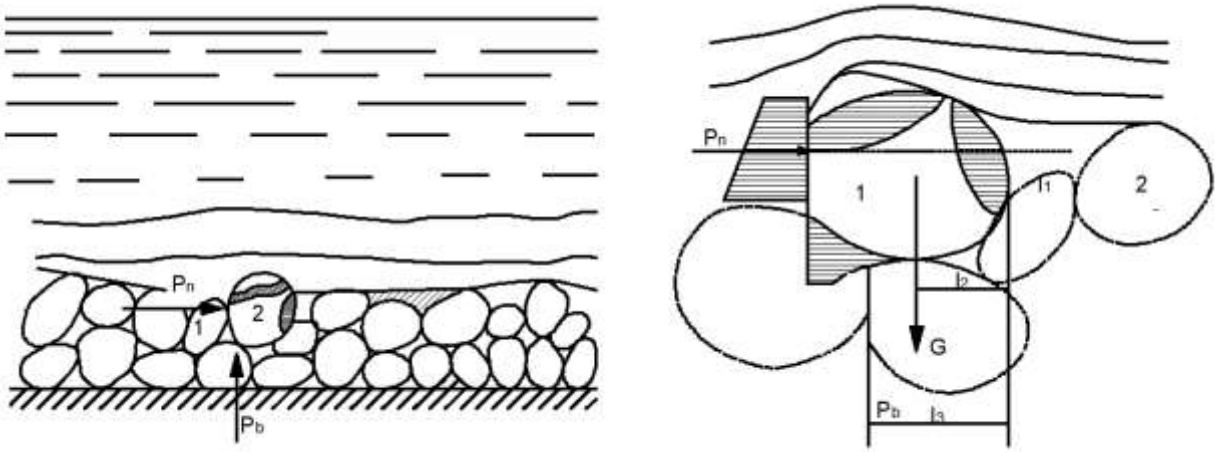


Fig. 1. Schematic diagram of the forces acting on a cohesive-soil aggregate under flow action

The limiting state of a cohesive-soil aggregate is expressed as follows:

$$n\left(\frac{P_y}{m_p F} + \frac{P_x \delta_1 d}{m_u W}\right) \le C_{pc} + \frac{G_B}{F}, \quad (10)$$

where m_p , m_u - the coefficients characterizing the tensile and bending working conditions of the aggregate; in the calculation, $m_p = m_u = m$ is assumed; $n = (u_{\Delta\max} / \bar{u}_\Delta)^2$ - a load factor accounting for the pulsating nature of the flow velocity and, consequently, possible excess loads (stresses) exceeding their calculated values. In this case, $u_{\Delta\max}$ and $\bar{u}_\Delta$ are the instantaneous maximum and time-averaged near-bed

velocities corresponding to the roughness height. If $d < 0{,}001\ m$ is the case, the stress factor is determined from the following

$$n = 1 + \frac{d}{0{,}00005 + 0{,}3d} \tag{11}$$

is determined from the formula; when $d > 0{,}001\ m$ applies, it may be assumed that $n = 4$; C_p - the calculated resistance of the cohesive soil, which is lower than its tensile strength capacity; $G_в$ - the submerged weight of the aggregate; F - the area of the aggregate bearing surface; W - the resistance moment of the bearing section;

The resultant frontal force is expressed as follows:

$$P_x = \gamma_o \gamma_x \frac{\upsilon_\Delta^2}{2g} \delta_3 d^2; \tag{12}$$

The resultant lifting force is given by:

$$P_y = \gamma_o \gamma_y \frac{\upsilon_\Delta^2}{2g} \delta_3 d^2; \tag{13}$$

The submerged weight of the aggregate is:

$$\mathrm{G_B} = \frac{\pi}{6}(\gamma_ч - \gamma_o) d^3; \tag{14}$$

The area of the aggregate bearing surface is:

$$F = \frac{\pi}{4}(\delta_4 d)^2; \tag{15}$$

The resistance moment of the bearing section is:

$$W = 0.0982(\delta_4 d)^3, \tag{16.}$$

where $\gamma_ч$, γ_o - **the specific weights of the aggregate and water, respectively;**

$\delta_4 d$ - the diameter of the aggregate bearing section; $\delta_1 d$ - the frontal-force lever arm; $\delta_2 d^2$; $\delta_3 d^2$ - the midsection area of the frontal and lifting forces; λ_x, λ_y - the coefficients of the frontal and lifting forces, i.e. $\gamma_x = 0{,}40 - 0{,}45$ and $\lambda_y / \lambda_x = 0{,}25$.

Substituting the expressions and values given above into condition (10), we obtain:

$$C_{P.C} = C_Y^H K = \frac{\gamma_o \upsilon_\Delta^2}{2g} \left[\frac{4\lambda_y \delta_3}{\pi \delta \frac{2}{4}} + \frac{\lambda_x \delta_2 \delta_1}{0.0982 \delta_4^3} \right] - \frac{2}{3} \frac{(\gamma_ч - \gamma_o)}{\delta_4^2}. \tag{17}$$

From this equation, we determine the υ_Δ flow velocity:

$$\upsilon_\Delta = \sqrt{\frac{2g}{\gamma o \left(\frac{4\lambda_y \delta_3}{\pi \delta_4^2} + \frac{\lambda_x \delta_2 \delta_1}{0.0982 \delta_4^3} \right)} \left[\frac{2}{3\delta_4^2} (Y_ч - Yo) d + C_Y^H K \right]}. \tag{18}$$

Taking into account that the distribution of velocities in the near-bed zone follows a logarithmic law, the near-bed velocity can be expressed through the mean velocity as follows:

$$\frac{\upsilon_{\Delta}}{\upsilon}=\frac{\lg\left(\frac{16.7Y}{\Delta}+1\right)}{\lg\left(\frac{6.15H}{\Delta}\right)}\quad . \tag{19}$$

Assuming the roughness height to be $0,7d$ we obtain

$$\upsilon_{\Delta}=\frac{1.25\upsilon}{\lg\left(\frac{8.8H}{d}\right)}\quad . \tag{20}$$

Based on the soil erosion process, we assume that when $K=1$ ($C_{p.c}=C_y^H K=C_y^H$) the flow velocity is erosive. At erosive velocity values, aggregates whose cohesion is less than or equal to the mean cohesion value are detached by the flow, resulting in widespread detachment of the cohesive-soil aggregates forming the channel bed.

Substituting expression (20) into relation (18), we obtain the following relationship for the erosive flow velocity in cohesive soils:

$$\upsilon_p=\left(\lg\frac{8,8H}{d}\right)\sqrt{\frac{2gm}{1,3\gamma_o n}\left[(\gamma_ч-\gamma_o)d+1,25C_y^H\right]}. \tag{21}$$

Taking into account the relationship known from the dynamics of open channels, $\upsilon_p=1,4\upsilon_н$ we obtain from relation (21) the relationship for determining the non-erosive flow velocity:

$$\upsilon_H=\left(\lg\frac{8,8H}{d}\right)\sqrt{\frac{2gm}{2,6\gamma_o n}\left[(\gamma_ч-\gamma_o)d+1,25C_y^H K\right]}; \tag{22}$$

$$\upsilon_{\Delta H}=1,25\sqrt{\frac{2gm}{2.6\gamma_o n}\left[(\gamma_ч-\gamma_o)d+1,25C_y^H K\right]}. \tag{23}$$

Thus, the non-erosive flow velocities in channels composed of cohesive soils under the combined influence of water flow and wind-generated waves are determined using formulas (22)–(23). These relationships allow the critical hydraulic conditions to be evaluated by taking into account the additional hydrodynamic effects induced by wind-generated waves.

The proposed method is based on the principles of reliability theory and probability theory and, when compared with a large number of laboratory and field experiments, demonstrates reliable results. The consideration of wind-generated waves makes it possible to more adequately assess the stability of cohesive-soil channel beds under combined hydraulic and wave-induced loading.

However, the relationships (22)–(23) used to determine the non-erosive flow velocities do not fully account for the influence of the channel-side slope and the detailed characteristics of wind-generated waves, including wave height, period, and direction. These factors can significantly affect the structure of the flow, the distribution of near-bed velocities, and the magnitude of shear and lifting forces acting on cohesive-soil aggregates. Therefore, further studies are required to determine the combined influence of channel geometry, particularly the side slope of trapezoidal channels, and the characteristics of wind-generated waves on the non-erosive flow velocity and erosion resistance of cohesive-soil channel beds.

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YANGI O‘ZBEKISTONDA YASHIL IQTISODIYOTGA O‘TISH

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ANNOTATSIYA

Mazkur maqolada Yangi O‘zbekistonda yashil iqtisodiyotga o‘tishning mazmuni, ahamiyati va asosiy yo‘nalishlari haqida so‘z yuritiladi. Hozirgi davrda iqtisodiy rivojlanish bilan bir qatorda atrof-muhitni asrash, tabiiy resurslardan oqilona foydalanish va energiyani tejash muhim vazifalardan biri hisoblanadi. O‘zbekistonda yashil iqtisodiyotga o‘tish bo‘yicha amalga oshirilayotgan islohotlar, qayta tiklanadigan energiya manbalaridan foydalanish, energiya samaradorligini oshirish, suv resurslarini tejash va ekologik toza texnologiyalarni joriy etish masalalari yoritilgan. Shuningdek, yashil iqtisodiyotning mamlakat iqtisodiyoti va aholining turmush darajasiga ta’siri haqida fikrlar bildirilgan.

Kalit so‘zlar: *yashil iqtisodiyot, Yangi O‘zbekiston, ekologiya, barqaror rivojlanish, qayta tiklanadigan energiya, quyosh energiyasi, tabiiy resurslar, energiya samaradorligi, iqlim o‘zgarishi.*

АННОТАЦИЯ

В данной статье рассматриваются содержание, значение и основные направления перехода к зелёной экономике в Новом Узбекистане. Особое внимание уделяется охране окружающей среды, рациональному использованию природных ресурсов, энергосбережению и развитию возобновляемых источников энергии. Также рассматриваются проводимые в Узбекистане реформы в сфере зелёной экономики и их значение для устойчивого экономического развития и повышения уровня жизни населения.

Ключевые слова: *зелёная экономика, Новый Узбекистан, экология, устойчивое развитие, возобновляемая энергия, солнечная энергия, природные ресурсы, энергоэффективность, изменение климата.*

ANNOTATION

This article discusses the meaning, importance and main directions of the transition to a green economy in New Uzbekistan. It focuses on environmental protection, rational use of natural resources, energy saving and the development of renewable energy sources. The article also examines the reforms being carried out in Uzbekistan in the field of green economy and their importance for sustainable economic development and improving the living standards of the population.

Keywords: *green economy, New Uzbekistan, ecology, sustainable development, renewable energy, solar energy, natural resources, energy efficiency, climate change.*

KIRISH

Bugungi kunda dunyoning barcha davlatlarida iqtisodiy rivojlanish bilan birga ekologik muammolarga ham katta e'tibor qaratilmoqda. Chunki iqtisodiyotning rivojlanishi tabiiy resurslardan foydalanish bilan chambarchas bog'liq. Aholi sonining ko'payishi, ishlab chiqarishning kengayishi, transport vositalarining ortishi va energiyaga bo'lgan talabning oshishi tabiatga bo'lgan bosimni ham kuchaytirmoqda.

Ayniqsa, iqlim o'zgarishi, havo va suvning ifloslanishi, suv resurslarining kamayishi, chiqindilar miqdorining ortishi kabi muammolar bugungi kunning dolzarb masalalaridan hisoblanadi. Shu sababli iqtisodiy o'sishni davom ettirgan holda tabiatni asrashga imkon beradigan yangi iqtisodiy yondashuv zarur bo'lmoqda.

Ana shunday yondashuvlardan biri – yashil iqtisodiyotdir. Yashil iqtisodiyot iqtisodiy rivojlanish va atrof-muhitni muhofaza qilishni bir-biriga qarama-qarshi qo'ymasdan, ularni birgalikda olib borishni nazarda tutadi. Ya'ni iqtisodiyot rivojlanishi kerak, lekin bu rivojlanish tabiatga katta zarar yetkazish hisobiga bo'lmasligi lozim.

O'zbekistonda ham ushbu masalaga keyingi yillarda katta e'tibor berilmoqda. 2019–2030-yillarga mo'ljallangan "yashil" iqtisodiyotga o'tish strategiyasi tasdiqlangan bo'lib, unda energiya samaradorligini oshirish, qayta tiklanuvchi energiya manbalaridan foydalanishni rivojlantirish, tabiiy resurslardan samarali foydalanish va ekologik tizimlarni asrash kabi yo'nalishlar belgilangan.[172]

Yashil iqtisodiyot tushunchasi iqtisodiy faoliyatni tabiat bilan uyg'unlashtirishga asoslanadi. Oddiy qilib aytganda, yashil iqtisodiyot — bu inson ehtiyojlarini qondirish, iqtisodiy o'sishni ta'minlash va shu bilan birga atrof-muhitga imkon qadar kam zarar yetkazish tamoyiliga asoslangan iqtisodiyotdir.

Tadqiqot metodologiyasi

Tadqiqotda statistik tahlil, taqqoslash, kuzatish va umumlashtirish usullaridan foydalanildi. O'zbekiston Respublikasining rasmiy statistik ma'lumotlari hamda yashil iqtisodiyotga oid davlat dasturlari va hujjatlari o'rganildi. Turli yillardagi ko'rsatkichlar o'zaro taqqoslanib, yashil energiya va qayta tiklanuvchi energiya manbalarining rivojlanish darajasi tahlil qilindi. Olingan natijalar asosida

[172] O'zbekiston Respublikasi Prezidentining 2019-yil 4-oktabrdagi PQ-4477-son qarori. "2019–2030-yillar davrida O'zbekiston Respublikasining 'yashil' iqtisodiyotga o'tish strategiyasini tasdiqlash to'g'risida"

O‘zbekistonda yashil iqtisodiyotga o‘tish jarayonining asosiy tendensiyalari baholandi.

Shu nuqtayi nazardan yashil iqtisodiyot faqatgina ekologiya bilan bog‘liq tushuncha emas. U energetika, sanoat, qishloq xo‘jaligi, transport, qurilish, moliya va boshqa ko‘plab sohalarni qamrab oladi.

O‘zbekiston iqtisodiyoti rivojlanib borayotgan davlatlardan biri hisoblanadi. Mamlakatimizda sanoat korxonalari, yangi uy-joylar, yo‘llar, ishlab chiqarish obyektlari va boshqa infratuzilmalar qurilmoqda. Bularning barchasi iqtisodiy rivojlanish uchun muhim. Lekin iqtisodiy o‘sish bilan birga ekologik masalalarga ham e’tibor berish zarur.

O‘zbekistonning tabiiy sharoiti yashil iqtisodiyotni rivojlantirish uchun katta imkoniyatlarga ega. Ayniqsa, quyoshli kunlarning ko‘pligi quyosh energiyasidan foydalanish imkoniyatini kengaytiradi. Ayrim hududlarda shamol energiyasidan foydalanish uchun ham qulay sharoitlar mavjud.

Bundan tashqari, mamlakatimizda suv resurslaridan samarali foydalanish ham muhim masalalardan biridir. Qishloq xo‘jaligida suvdan foydalanish samaradorligini oshirish, zamonaviy sug‘orish texnologiyalarini joriy qilish va suv isrofini kamaytirish yashil iqtisodiyotning muhim qismlaridan biri bo‘lishi mumkin.

Yangi O‘zbekiston sharoitida iqtisodiyotning rivojlanishi bilan birga aholining hayot sifati ham yaxshilanishi kerak. Toza havo, sifatli suv, yashil hududlar, qulay transport va energiya tejamkor uy-joylar inson hayotining muhim qismlaridir.

2025-yilda “Atrof-muhitni asrash va ‘yashil iqtisodiyot’ yili” doirasida ham tabiiy resurslardan oqilona foydalanish, qayta tiklanuvchi energiya manbalarini rivojlantirish, energiya tejamkor texnologiyalarni keng joriy qilish va iqtisodiyotdagi “uglerod izi”ni kamaytirish kabi vazifalar ustuvor yo‘nalish sifatida belgilangan.[173]

O‘zbekistonda yashil iqtisodiyotga o‘tish jarayoni so‘nggi yillarda yanada jadallashib bormoqda. Buni qayta tiklanuvchi energiya manbalaridan foydalanish va yashil energiyaning umumiy energiya ishlab chiqarishdagi ulushi oshib borayotganida ko‘rish mumkin. Quyidagi jadvalda O‘zbekistonda yashil energiya bo‘yicha asosiy ko‘rsatkichlarning yillar davomida o‘zgarishi keltirilgan.[174]

[173] O‘zbekiston Respublikasi Prezidentining 2022-yil 2-dekabrdagi PQ-436-son qarori. “2030-yilgacha O‘zbekiston Respublikasining ‘yashil’ iqtisodiyotga o‘tishiga qaratilgan islohotlar samaradorligini oshirish bo‘yicha chora-tadbirlar to‘g‘risida”.
[174] SIAT-Milliy statistika qomitasi ma’lumotlari

1-jadval

№	Ko‘rsatkich	2020/2022-yil	2024-yil	2030-yil maqsadi
1	Energiya ishlab chiqarishda yashil energiyaning ulushi	7,5% (2020)	15,7%	-
2	Qayta tiklanuvchi energiyaning elektr ishlab chiqarishdagi ulushi	8,0% (2022)	9,0%	30,5%
3	Yashil energiya ishlab chiqarishdagi o‘sish	-	15,7%	-
4	Kichik quyosh fotoelektr stansiyalari quvvati	10 MW (2022)	150 MW	1500 MW
5	Shaharlar yashil maydonlarining ulushi	8,3% (2022)	12,4%	30%
6	Qattiq maishiy chiqindilarni qayta ishlash darajasi	30% (2022)	40%	65%

O‘zbekistonda yashil iqtisodiyot bo‘yicha asosiy ko‘rsatkichlar

Yangi O‘zbekistonda yashil iqtisodiyotga o‘tishda bir nechta asosiy yo‘nalishlarga e’tibor qaratish lozim.

1.Qayta tiklanadigan energiya manbalaridan foydalanish

Bugungi kunda energiya barcha sohalar uchun zarur hisoblanadi. Sanoat, transport, qishloq xo‘jaligi, ta’lim va boshqa sohalarning faoliyati energiyasiz tasavvur qilinmaydi. Shuning uchun energiya ishlab chiqarishning ekologik jihatdan toza usullarini rivojlantirish juda muhim.

Quyosh, shamol va suv energiyasi qayta tiklanadigan energiya manbalariga kiradi. O‘zbekistonda quyosh energiyasidan foydalanish uchun tabiiy imkoniyatlar mavjud. Xonadonlar, korxonalar va boshqa obyektlarda quyosh panellaridan foydalanish elektr energiyasini tejashga yordam berishi mumkin.

Qayta tiklanadigan energiya manbalarining rivojlanishi yangi ish o‘rinlarining paydo bo‘lishiga ham sabab bo‘ladi. Quyosh panellarini ishlab chiqarish, o‘rnatish va texnik xizmat ko‘rsatish kabi yangi yo‘nalishlar rivojlanishi mumkin.

2. Energiya samaradorligini oshirish

Yashil iqtisodiyot faqat yangi energiya manbalarini yaratishdan iborat emas. Mavjud energiyadan oqilona foydalanish ham juda muhim.

Masalan, energiya tejamkor lampalardan foydalanish, binolarni issiqlikni yaxshi saqlaydigan materiallar bilan qurish, zamonaviy texnologiyalarni ishlab chiqarishga joriy qilish orqali energiya sarfini kamaytirish mumkin.

Energiya samaradorligi oshirilsa, bir tomondan tabiiy resurslar tejaladi, ikkinchi tomondan korxona va aholining xarajatlari kamayadi. Shu sababli bu yo‘nalish iqtisodiy va ekologik jihatdan foydalidir.

3. Ekologik toza transportni rivojlantirish

Transport vositalari ham atrof-muhitga ta’sir ko‘rsatadigan asosiy sohalardan biridir. Shaharlar rivojlanishi bilan avtomobillar soni ham ko‘payib bormoqda.

Shuning uchun jamoat transportini rivojlantirish, elektr transport vositalaridan foydalanishni kengaytirish, piyodalar va velosipedlar uchun qulay sharoitlar yaratish muhimdir.

Elektr avtobuslar va elektromobillar kabi transport vositalarining rivojlanishi kelajakda shaharlardagi havo sifatini yaxshilashga yordam berishi mumkin.

4. Suv resurslaridan oqilona foydalanish

O‘zbekiston uchun suv masalasi juda muhim. Qishloq xo‘jaligida suv katta miqdorda ishlatiladi. Shuning uchun suvni tejaydigan texnologiyalarni joriy qilish yashil iqtisodiyotning muhim yo‘nalishlaridan biridir.

Tomchilatib sug‘orish, yomg‘irlatib sug‘orish va zamonaviy suv nazorati tizimlaridan foydalanish orqali suv sarfini kamaytirish mumkin.

Suvni tejash faqat davlat yoki fermerlarning vazifasi emas. Har bir inson kundalik hayotida suvdan oqilona foydalanishi kerak. Chunki kichik tejamkorliklar ham umumiy natijaga ta’sir qiladi.

5. Chiqindilarni kamaytirish va qayta ishlash

Bugungi kunda chiqindilar masalasi ham muhim ekologik muammolardan biridir. Aholi sonining ko‘payishi bilan chiqindilar miqdori ham ortmoqda.

Chiqindilarni shunchaki tashlab yuborish o‘rniga ularni saralash va qayta ishlash tizimini rivojlantirish kerak. Plastik, qog‘oz, shisha va metall kabi materiallarni qayta ishlash orqali yangi mahsulotlar ishlab chiqarish mumkin.

Bu esa tabiiy resurslardan foydalanishni kamaytirish bilan birga yangi iqtisodiy imkoniyatlar yaratadi.

Yangi O’zbekistonda yashil iqtisodiyotga o’tish jarayonida quyidagi asosiy yo’nalishlarga e’tibor qaratish lozim bo’ladi.[175]

2-jadval

Yangi O‘zbekistonda yashil iqtisodiyotga o‘tishning asosiy yo‘nalishlari

№	Yo’nalish	Asosiy vazifasi
1	Qayta tiklanadigan energiya	Quyosh, shamol va boshqa energiya manbalaridan foydalanishni kengaytirish
2	Energiya samaradorligi	Elektr va yoqilg‘idan tejamkor foydalanish
3	Ekologik transport	Elektr transporti va jamoat transportini rivojlantirish
4	Suvni tejash	Zamonaviy sug‘orish va suv tejovchi texnologiyalarni joriy qilish

[175] PQ-4477-son qaror-LexUZ

5	Chiqindilarni qayta ishlash	Chiqindilarni saralash va qayta ishlashni rivojlantirish
6	Yashil hududlar	Daraxtzorlar va yashil maydonlarni ko‘paytirish
7	Ekologik texnologiyalar	Ishlab chiqarishda atrof-muhitga kam zarar yetkazadigan texnologiyalardan foydalanish

Sanoat mamlakat iqtisodiyotining muhim tarmoqlaridan biri hisoblanadi. Shu sababli yashil iqtisodiyotga o‘tishda sanoat korxonalarining ham o‘rni katta.

Zamonaviy texnologiyalar yordamida ishlab chiqarishda energiya va xomashyodan samarali foydalanish mumkin. Bundan tashqari, zararli chiqindilarni kamaytiradigan texnologiyalarni joriy qilish ham muhimdir.

Sanoat korxonalarida energiya samaradorligini oshirish ishlab chiqarish xarajatlarini kamaytirishga yordam beradi. Bu esa korxonalarning raqobatbardoshligini oshiradi. Demak, yashil iqtisodiyot faqat ekologiya uchun emas, balki biznes uchun ham foydali bo‘lishi mumkin.

2019-2030-yillarga mo‘ljallangan strategiyada ham iqtisodiyotning bazaviy tarmoqlarida energiya samaradorligini oshirish, energiya resurslari iste’molini diversifikatsiya qilish va qayta tiklanuvchi energiyadan foydalanishni rivojlantirish ustuvor yo‘nalishlar sifatida belgilangan.[176]

O‘zbekiston iqtisodiyotida qishloq xo‘jaligining ham ahamiyati katta. Bu sohada yer va suv resurslaridan foydalaniladi. Shuning uchun qishloq xo‘jaligini ekologik jihatdan barqaror rivojlantirish muhimdir.

Yer unumdorligini saqlash, suvni tejash, zamonaviy sug‘orish tizimlaridan foydalanish va mahsulot yetishtirishda ekologik talablarni hisobga olish kelajak uchun muhim vazifalardandir.

Qishloq xo‘jaligida zamonaviy texnologiyalardan foydalanish nafaqat tabiatni asrashga, balki hosildorlikni oshirishga ham yordam berishi mumkin.

Yashil iqtisodiyotga o‘tishda yoshlarning o‘rni ham katta. Chunki kelajakda mamlakat iqtisodiyotini aynan bugungi yoshlar rivojlantiradi.

Yoshlar ekologik madaniyatga ega bo‘lishi, tabiiy resurslarni tejashga o‘rganishi va zamonaviy texnologiyalarni egallashi kerak. Ayniqsa, ta’lim muassasalarida ekologiya va yashil iqtisodiyotga oid bilimlarni kengaytirish foydali bo‘ladi.

Talabalar yangi g‘oyalar va loyihalar ishlab chiqish orqali yashil iqtisodiyotning rivojiga o‘z hissasini qo‘shishi mumkin. Masalan, energiyani tejash, chiqindilarni qayta ishlash yoki suvdan oqilona foydalanishga qaratilgan kichik loyihalar ham kelajakda katta natijalarga olib kelishi mumkin.

[176] “O‘zbekiston — 2030” strategiyasi. O‘zbekiston Respublikasi Hukumat portali.

Yashil iqtisodiyotning asosiy maqsadlaridan biri faqat tabiatni asrash emas, balki insonlarning yashash sharoitini yaxshilashdir.

Toza havo, sifatli ichimlik suvi, yashil hududlar, qulay jamoat transporti va energiya tejamkor uylar aholining hayot sifatiga ijobiy ta'sir qiladi.

Bundan tashqari, yashil iqtisodiyot yangi kasblar va ish o'rinlarini yaratishi mumkin. Qayta tiklanadigan energiya, ekologik qurilish, chiqindilarni qayta ishlash, energiya auditi va boshqa sohalarda yangi mutaxassislarga ehtiyoj paydo bo'ladi.

Shu sababli yashil iqtisodiyot iqtisodiy o'sish va ekologik barqarorlikni birlashtiradigan yo'nalish sifatida qaralishi kerak.

Mamlakatimizda yashil iqtisodiyotga o'tish bo'yicha huquqiy va tashkiliy asoslar shakllantirilmoqda. 2019-yilda 2019-2030-yillar davrida O'zbekiston Respublikasining "yashil" iqtisodiyotga o'tish strategiyasi tasdiqlangan. Strategiyada energiya samaradorligini oshirish, qayta tiklanuvchi energiyadan foydalanish, tabiiy resurslardan foydalanish samaradorligini oshirish va yashil iqtisodiyotni moliyaviy qo'llab-quvvatlash kabi vazifalar belgilangan.[177]

2022-yilda esa 2030-yilgacha yashil iqtisodiyotga o'tish va yashil o'sishni ta'minlash bo'yicha dastur tasdiqlangan. Unda yashil o'sishning ustuvor yo'nalishlari, amalga oshirish mexanizmlari va kutilayotgan natijalar belgilangan.[178]

Bundan tashqari, 2025-yilda "Atrof-muhitni asrash va yashil iqtisodiyot yili" doirasida ham yashil iqtisodiyot tamoyillarini keng joriy etish, qayta tiklanuvchi energiya ulushini oshirish, energiya tejamkor texnologiyalarni qo'llash va "uglerod izi"ni kamaytirishga qaratilgan vazifalar belgilandi

Bu ishlarning barchasi mamlakatimizda iqtisodiy rivojlanishning yangi, yanada barqaror modeliga o'tish jarayoni davom etayotganini ko'rsatadi.

Yashil iqtisodiyotga o'tish oson jarayon emas. Chunki buning uchun katta mablag', zamonaviy texnologiyalar, malakali mutaxassislar va aholining ekologik madaniyati kerak bo'ladi.

Birinchi muammolardan biri ayrim zamonaviy ekologik texnologiyalarning qimmatligi hisoblanadi. Yangi texnologiyalarni sotib olish va o'rnatish dastlab katta xarajat talab qilishi mumkin. Lekin uzoq muddatda ular energiya va boshqa resurslarni tejash orqali o'zini oqlashi mumkin.

Ikkinchi muammo – aholining ekologik bilimlarini oshirish zarurati. Agar insonlar chiqindilarni belgilangan joyga tashlamasa, suv va elektr energiyasini isrof

[177] Ismailov D., Akramova A. "O'zbekistonning yashil iqtisodiyotga o'tish strategiyasi: mavjud muammo va istiqbolli imkoniyatlar" // Yashil iqtisodiyot va taraqqiyot. 2025.
[178] Yokubjanov D. "O'zbekiston Respublikasining yashil iqtisodiyotga o'tish strategiyasi: maqsad va vazifalar" 2024.

qilsa yoki tabiatga beparvo munosabatda bo‘lsa, faqat davlat tomonidan amalga oshirilayotgan ishlarning o‘zi yetarli bo‘lmaydi.

Uchinchi muammo – zamonaviy mutaxassislarga bo‘lgan ehtiyoj. Yashil iqtisodiyot yangi texnologiyalar bilan bog‘liq bo‘lgani uchun bu sohada bilimli va malakali kadrlarni tayyorlash muhim.

Shuning uchun yashil iqtisodiyotga o‘tish jarayonida davlat, tadbirkorlar, ta’lim muassasalari va aholining birgalikdagi harakati kerak.

Xulosa

Yangi O‘zbekistonda yashil iqtisodiyotga o‘tish mamlakatimizning kelajakdagi rivojlanishi uchun muhim yo‘nalishlardan biridir. Iqtisodiy o‘sish va ekologik barqarorlik bir-biridan alohida qaralmasligi kerak.

Yashil iqtisodiyot orqali tabiiy resurslardan oqilona foydalanish, energiyani tejash, qayta tiklanadigan energiya manbalarini rivojlantirish, chiqindilarni kamaytirish va atrof-muhitni asrash imkoniyati yaratiladi.

Bugungi kunda O‘zbekistonda yashil iqtisodiyotga o‘tish bo‘yicha muhim huquqiy va amaliy ishlar olib borilmoqda. 2030-yilgacha mo‘ljallangan strategiya va dasturlarda energiya samaradorligi, qayta tiklanuvchi energiya, tabiiy resurslardan foydalanish va ekologik barqarorlikka alohida e’tibor qaratilgan.

Yashil iqtisodiyotga o‘tish faqat davlatning vazifasi emas. Har bir inson kundalik hayotida tabiatga ehtiyotkor munosabatda bo‘lishi, suv va elektr energiyasini tejashi, chiqindilarni to‘g‘ri tashlashi va atrof-muhitni asrashga o‘z hissasini qo‘shishi kerak.

Chunki tabiatni asrash bugungi kun uchun emas, balki kelajak avlod uchun ham zarur. Yangi O‘zbekistonning iqtisodiy jihatdan kuchli, ekologik jihatdan barqaror va aholisi uchun qulay davlat bo‘lishida yashil iqtisodiyot muhim o‘rin tutadi.

Shunday ekan, iqtisodiyot rivojlanishi bilan birga tabiat ham asralishi kerak. Inson, tabiat va iqtisodiyot o‘rtasidagi muvozanat ta’minlangan taqdirdagina haqiqiy barqaror taraqqiyotga erishish mumkin.

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O‘ZBEKISTONDA YASHIL INVESTITSIYALARNI RIVOJLANTIRISHNING IQTISODIY MEXANIZMLARI: INVESTITSIYA MUHITIDAGI TO‘SIQLAR VA ULARNI BARTARAF ETISH STRATEGIYALARI

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ANNOTATSIYA

Ushbu maqolada O‘zbekistonda yashil investitsiyalarni rivojlantirishning iqtisodiy ahamiyati, imkoniyatlari va muammolari tahlil qilinadi. Yashil investitsiyalar qayta tiklanuvchi energiyadan foydalanish, energiya samaradorligini oshirish, resurslardan oqilona foydalanish va ekologik barqaror iqtisodiy o‘sishni ta’minlashda muhim vosita sifatida ko‘rib chiqiladi. Tadqiqotda O‘zbekistonning 2030-yilgacha yashil iqtisodiyotga o‘tish maqsadlari, xalqaro tavsiyalar va energetika loyihalari tahlil qilindi. Shuningdek, mavjud moliyaviy, institutsional va axborot muammolari aniqlanib, ularni bartaraf etish bo‘yicha takliflar berildi. Yashil obligatsiyalar, davlat-xususiy sheriklik, yashil kreditlash va loyihalarni baholashning yagona mezonlari istiqbolli yo‘nalishlar sifatida asoslanadi.

Kalit so‘zlar: *yashil investitsiyalar, yashil iqtisodiyot, yashil moliya, qayta tiklanuvchi energiya, yashil obligatsiyalar, ekologik barqarorlik, investitsiya muhiti, yashil kreditlash, O‘zbekiston.*

АННОТАЦИЯ

В данной статье анализируются экономическое значение, возможности и проблемы развития зеленых инвестиций в Узбекистане. Зеленые инвестиции рассматриваются как важный инструмент использования возобновляемых источников энергии, повышения энергоэффективности, рационального использования ресурсов и обеспечения экологически устойчивого экономического роста. В исследовании проанализированы цели Узбекистана по переходу к зеленой экономике до 2030 года, международные рекомендации и реализуемые энергетические проекты. Также выявлены финансовые, институциональные и информационные проблемы и предложены меры по их решению. Развитие рынка зеленых облигаций, расширение государственно-частного партнерства, стимулирование зеленого кредитования и формирование единых критериев оценки зеленых проектов определены как перспективные направления.

Ключевые слова: *зеленые инвестиции, зеленая экономика, зеленые финансы, возобновляемая энергия, зеленые облигации, экологическая устойчивость, инвестиционный климат, зеленое кредитование, Узбекистан.*

ANNOTATION

This article analyzes the economic importance, opportunities, and challenges of developing green investments in Uzbekistan. Green investments are considered an important tool for using renewable energy sources, improving energy efficiency, rational use of resources, and ensuring environmentally sustainable economic growth. The study analyzes Uzbekistan's goals for transitioning to a green economy by 2030, international recommendations, and ongoing energy projects. It also identifies financial, institutional, and informational challenges and proposes measures to address them. The development of the green bond market, expansion of public-private partnerships, promotion of green lending, and establishment of unified criteria for evaluating green projects are identified as promising areas.

Keywords: *green investments, green economy, green finance, renewable energy, green bonds, environmental sustainability, investment climate, green lending, Uzbekistan.*

KIRISH

Bugungi kunda iqlim o‘zgarishi, tabiiy resurslarning cheklanganligi, energiyaga bo‘lgan talabning ortishi va ekologik muammolarning kuchayishi dunyo mamlakatlari oldiga iqtisodiy rivojlanish modelini qayta ko‘rib chiqish vazifasini qo‘ymoqda. An’anaviy iqtisodiy o‘sish modeli qisqa muddatda yuqori iqtisodiy natijalar berishi mumkin bo‘lsa-da, uzoq muddatda resurslarning kamayishi, atrof-muhitning ifloslanishi va iqlim xatarlarining kuchayishiga olib kelishi mumkin. Shu sababli investitsiya siyosatida ekologik va ijtimoiy omillarni hisobga olish tobora muhim ahamiyat kasb etmoqda.

O‘zbekiston uchun mazkur masala alohida dolzarblik kasb etadi. Mamlakat iqtisodiyotida energiya resurslariga talab yuqori bo‘lib, energetika, sanoat, qishloq xo‘jaligi va transport kabi tarmoqlarda resurslardan samarali foydalanish masalasi muhim hisoblanadi. Jahon banki O‘zbekiston iqtisodiyotining energiya va uglerod sig‘imi nisbatan yuqori ekanligini qayd etib, yashil o‘sishga o‘tish mamlakatning uzoq muddatli iqtisodiy barqarorligi uchun zarurligini ta’kidlaydi.

O‘zbekiston hukumati yashil iqtisodiyotga o‘tishni davlat siyosatining muhim yo‘nalishlaridan biriga aylantirgan. 2019-yilda qabul qilingan 2019-2030-yillarga mo‘ljallangan yashil iqtisodiyotga o‘tish strategiyasi energiya samaradorligini oshirish, qayta tiklanuvchi energiya manbalarini rivojlantirish, tabiiy resurslardan

samarali foydalanish va yashil moliyalashtirish mexanizmlarini rivojlantirish kabi vazifalarni belgilab bergan.[179]

Shu nuqtayi nazardan, O‘zbekistonda yashil investitsiyalarni jalb qilish nafaqat ekologik, balki iqtisodiy va moliyaviy masala hamdir. Yashil loyihalarga yo‘naltirilgan investitsiyalar yangi ishlab chiqarish quvvatlarini yaratish, energiya xarajatlarini kamaytirish, yangi ish o‘rinlarini shakllantirish va mamlakatning investitsion jozibadorligini oshirishga xizmat qilishi mumkin.

TADQIQOT METODOLOGIYASI

Tadqiqotda tizimli tahlil, qiyosiy tahlil, statistik ma’lumotlarni o‘rganish, ilmiy adabiyotlarni tahlil qilish va xalqaro tajribani solishtirish usullaridan foydalanildi. Tadqiqotning asosiy maqsadi O‘zbekistonda yashil investitsiyalarni rivojlantirishga ta’sir qiluvchi omillarni aniqlash va yashil moliyalashtirishni kengaytirish bo‘yicha amaliy mexanizmlarni taklif etishdan iborat.

O‘zbekiston yashil iqtisodiyotga o‘tish jarayonida bir qator muhim strategik maqsadlarni belgilagan. 2019–2030-yillarga mo‘ljallangan strategiyada qayta tiklanuvchi energiya manbalarining elektr energiyasi ishlab chiqarishdagi ulushini oshirish, energiya samaradorligini yaxshilash va iqtisodiyotning uglerod sig‘imini kamaytirish ko‘zda tutilgan.[180]

So‘nggi yillarda qayta tiklanuvchi energetika yo‘nalishida investitsiya faolligi sezilarli darajada oshdi. O‘zbekiston Investitsiyalar bo‘yicha qo‘llanmasida 2024-yilda mamlakatda 2 000 MVt quyosh va 200 MVt shamol energetikasi quvvati ishga tushirilgani qayd etilgan. Ushbu loyihalar yiliga milliardlab kilovatt-soat elektr energiyasi ishlab chiqarish va tabiiy gaz sarfini kamaytirishga xizmat qilishi kutilgan.

Bundan tashqari, kichik gidroenergetika sohasida ham yangi investitsion imkoniyatlar shakllanmoqda. Jahon banki ma’lumotlariga ko‘ra, O‘zbekiston 2026-yilgacha qariyb 3 000 ta kichik gidroelektr stansiyasini tashkil etish orqali o‘rnatilgan quvvatni 160 MVtgacha oshirishni rejalashtirgan. Mazkur loyihalarni moliyalashtirish uchun mahalliy banklar orqali moliyaviy resurslardan foydalanish va xususiy investitsiyalarni jalb qilish mexanizmlari ham ko‘zda tutilgan.

Yashil investitsiyalarning yana bir muhim yo‘nalishi quyosh va shamol energetikasidir. Masalan, Xorazm viloyatida 100 MVt quvvatga ega quyosh elektr stansiyasi loyihasi bo‘yicha Jahon banki davlat kafolati mexanizmini qo‘llab-quvvatlagan. Loyiha yiliga 240 GVt-soatdan ortiq qayta tiklanuvchi energiya ishlab chiqarishi va yiliga 230 ming tonnadan ortiq CO_2 chiqindilarini kamaytirishi kutilgan.

[179] World Bank. *Uzbekistan Country Climate and Development Report*.
[180] Government of Uzbekistan. *Strategy for the Transition to a Green Economy for 2019–2030*

Bu jarayonlar O‘zbekistonda yashil investitsiyalar uchun real bozor shakllanayotganini ko‘rsatadi.

Yashil investitsiyalarning rivojlanishiga qaramay, mamlakatda bir qator tizimli muammolar mavjud.

1) Katta boshlang‘ich kapitalga ehtiyoj

Quyosh va shamol elektr stansiyalari, energiya samarador texnologiyalar, suv tejovchi irrigatsiya tizimlari va ekologik transport loyihalarini amalga oshirish katta miqdordagi boshlang‘ich investitsiyalarni talab qiladi. Bunday loyihalarning ayrimlari uzoq muddatda iqtisodiy jihatdan samarali bo‘lsa-da, investitsiyaning dastlabki bosqichidagi xarajatlar xususiy investorlar uchun muayyan moliyaviy xavflarni yuzaga keltiradi. Shuning uchun davlat tomonidan kafolat, subsidiyalar, soliq imtiyozlari va aralash moliyalashtirish mexanizmlaridan foydalanish muhimdir.

2) Moliyaviy instrumentlarning yetarlicha diversifikatsiya qilinmaganligi

Yashil loyihalarni faqat bank kreditlari hisobidan moliyalashtirish yetarli emas. Yashil obligatsiyalar, yashil kreditlar, sukuk, investitsiya fondlari, davlat-xususiy sheriklik va xalqaro iqlim fondlari kabi instrumentlardan foydalanish imkoniyatlarini kengaytirish lozim.

Jahon banki O‘zbekistonda davlatga qarashli moliyaviy institutlar iqtisodiyotdagi kreditlarning katta qismini taqdim etishini qayd etib, ushbu institutlarni yashil investitsiyalarni safarbar qilishda faolroq ishtirok ettirish katta imkoniyat yaratishini ta’kidlamoqda.

3) Yashil loyihalarni baholashning murakkabligi

Investor uchun loyihaning moliyaviy rentabelligi bilan bir qatorda uning ekologik samaradorligini ham baholash zarur. Masalan, “yashil loyiha” deganda faqat quyosh elektr stansiyasini tushunish yetarli emas. Energiya samaradorligini oshiruvchi texnologiya, suvni tejovchi qishloq xo‘jaligi, chiqindilarni qayta ishlash, ekologik transport yoki energiya tejamkor bino ham yashil investitsiya obyekti bo‘lishi mumkin. Shuning uchun loyihalarni yashil deb tasniflash uchun aniq, shaffof va xalqaro standartlarga mos mezonlar zarur.

4) Xususiy investorlar uchun risklarning yuqoriligi

Yashil loyihalarning ayrimlari yangi texnologiyalarga asoslanganligi sababli investorlar uchun texnologik, valyuta, bozor va tartibga solish xavflari mavjud. Bunday vaziyatda davlat va xalqaro moliya institutlari risklarni qisman o‘z zimmasiga olishi xususiy kapitalni jalb qilish imkoniyatini oshiradi.

Yashil investitsiyalarni faqat ekologik xarajat sifatida baholash noto‘g‘ri. Ular iqtisodiy o‘sishning yangi manbalaridan biriga aylanishi mumkin. Birinchidan, qayta tiklanuvchi energetika rivojlanishi tabiiy gazga bo‘lgan ichki talabni kamaytirishga

yordam beradi. Ikkinchidan, energiya samarador texnologiyalar korxonalar xarajatlarini qisqartiradi. Uchinchidan, yashil loyihalar yangi ish o‘rinlarini yaratadi.

Jahon bankining O‘zbekiston bo‘yicha iqlim va rivojlanish tahliliga ko‘ra, dekarbonizatsiya va iqlimga moslashuvga yo‘naltirilgan investitsiyalar uzoq muddatda katta iqtisodiy foyda keltirishi mumkin. Xususan, qishloq xo‘jaligida iqlimga mos texnologiyalarni joriy qilish hosildorlikni oshirish va suv resurslarini tejash imkonini beradi.

Demak, yashil investitsiyalarni ekologik siyosatning bir qismi sifatida emas, balki milliy iqtisodiy rivojlanish strategiyasining tarkibiy elementi sifatida ko‘rish maqsadga muvofiq.

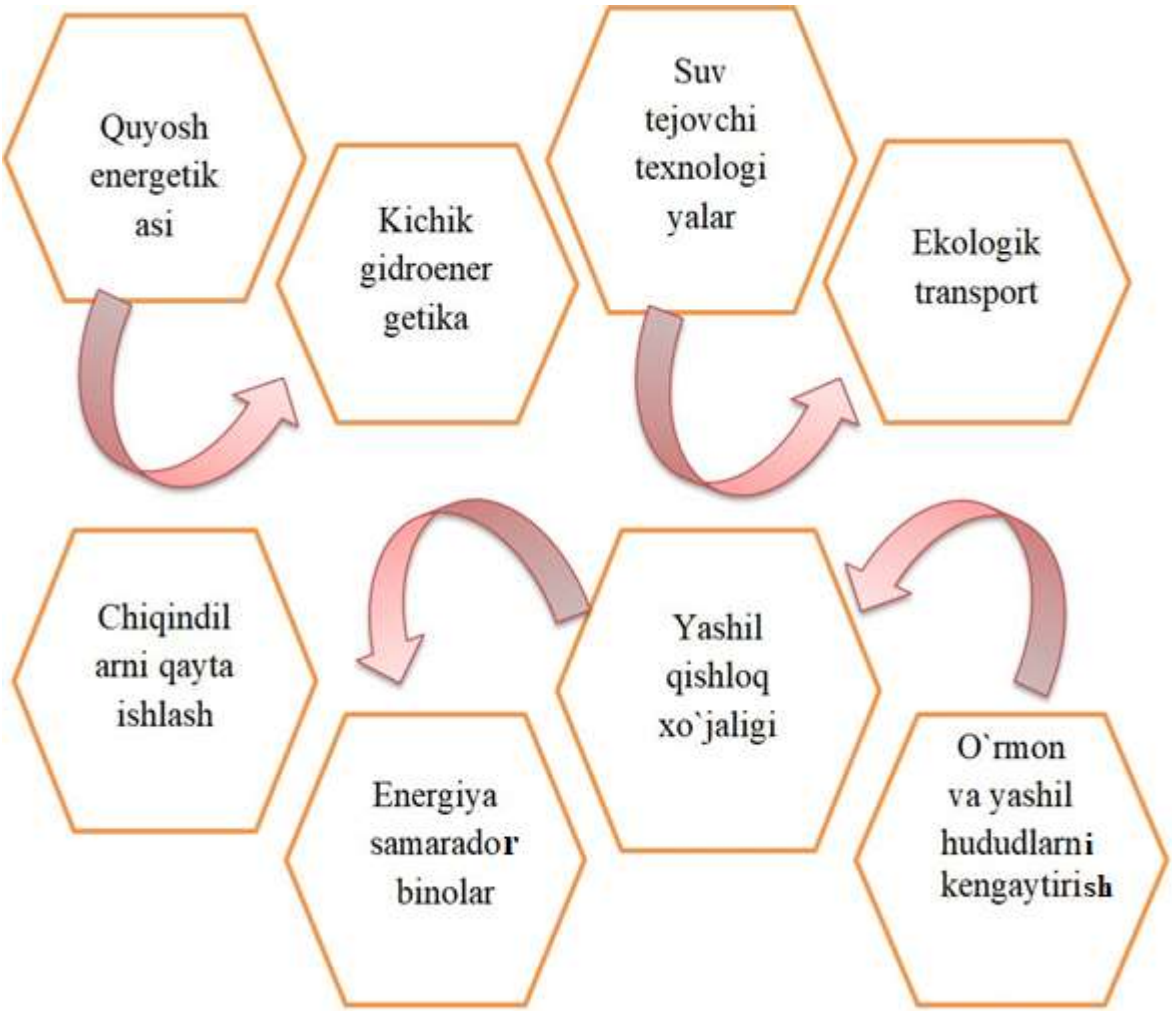
YASHIL INVESTITSIYALARNI KO‘PAYTIRISH BO‘YICHA TAKLIFLAR :

1	**Yashil obligatsiyalar bozorini kengaytirish**	Yashil obligatsiyalar orqali davlat, banklar va yirik korxonalar ekologik loyihalar uchun uzoq muddatli mablag‘ jalb qilishi mumkin. Bunda obligatsiyadan tushgan mablag‘lar faqat qayta tiklanuvchi energiya, energiya samaradorligi, suv tejash, ekologik transport va chiqindilarni qayta ishlash kabi oldindan belgilangan yo‘nalishlarga sarflanishi kerak
2	**Yashil kreditlar uchun imtiyozli mexanizm yaratish**	Tijorat banklari tomonidan ekologik samarador loyihalarga beriladigan kreditlar bo‘yicha foiz stavkalarini pasaytirish yoki davlat tomonidan foiz xarajatlarining bir qismini qoplash mexanizmi joriy etilishi mumkin. Bu, ayniqsa, kichik va o‘rta biznesning yashil texnologiyalarga o‘tishini tezlashtiradi
3	**Davlat-xususiy sheriklikni kuchaytirish**	Yashil infratuzilma loyihalarida davlat va xususiy sektorning moliyaviy imkoniyatlarini birlashtirish maqsadga muvofiq. Davlat yer, infratuzilma yoki kafolat bilan ishtirok etsa, xususiy investor texnologiya va kapitalni taqdim etishi mumkin.

Mazkur sxema hududlarning tabiiy-iqtisodiy xususiyatlaridan kelib chiqib, maxsus investitsiya dasturlarini yashil iqtisodiyotning ustuvor yo‘nalishlariga yo‘naltirish imkoniyatlarini aks ettiradi. Bunda quyosh energetikasi, kichik gidroenergetika, suv va energiya tejovchi texnologiyalar, chiqindilarni qayta ishlash,

ekologik transport hamda yashil hududlarni kengaytirish asosiy yo‘nalishlar sifatida belgilanadi.

Ushbu yo‘nalishlarning amaliy ahamiyati O‘zbekiston tajribasida ham yaqqol ko‘rinadi. Xususan, 2024-yilda mamlakatda 1 000 MW quyosh va 22,7 MW gidroelektr energiya quvvatlari ishga tushirilgan.181 Shu bilan birga, suv tejovchi texnologiyalarni qo‘llash natijasida 2024-yilda 2,5 mlrd m³ suv iqtisod qilingan.[182] 2024-yilda mamlakatda 14,8 mln tonna maishiy chiqindi hosil bo‘lib, uning 6,1 foizi qayta ishlangan. Ekologik transportni rivojlantirish doirasida esa 2030-yilgacha jamoat transportining 80 foizini ekologik toza transportga o‘tkazish maqsadi belgilangan.



Bu yondashuv yashil iqtisodiyotni hududiy rivojlanish bilan bog‘lash imkonini beradi.

[181] O‘zbekiston Respublikasi Energetika vazirligi. *2024-yilda energetika sohasida amalga oshirilgan ishlar haqida ma’lumot*. 03.02.2025

[182] O‘zbekiston Respublikasi Transport vazirligi. *Barqaror va “yashil” kelajak sari intilishimizda transport sohasi muhim rol o‘ynaydi*. 21.11.2024.

TAHLIL VA NATIJA

O‘zbekistonda yashil investitsiyalarni rivojlantirish uchun zarur strategik asos shakllanib bormoqda. Mamlakatning 2030-yilgacha bo‘lgan rivojlanish maqsadlarida barqaror iqtisodiy o‘sish, atrof-muhitni muhofaza qilish va resurslardan samarali foydalanish masalal ari muhim o‘rin egallaydi.[183]

T/r	Ko`rsatkichlar	O`lchov birligi	2022-yil	2024-yil	2026-yil	2028-yil	2030-yil
1.	Yalpi ichki mahsulot birligiga to`g`ri keladigan energiya hajmini kamaytirish (2021-yilga nisbatan)	%	5,0	14,0	22,0	27,0	30,0
2.	Sanoat elektr energiyasi iste`moli, umumiy iste`moldagi ulushi	%	26,0	25,0	23,0	21,0	20,0
3.	Qayta tiklanuvchi energiya manbalarining elektr energiyasning ishlab chiqarish hajmidagi ulushini kengaytirish	%	8,0	9,0	24,3	29,0	30,5
		kVt/s	6,5	8,6	25,0	34,0	40,7
4.	Kichik quvvatli quyosh fotoelektr stansiyalarini qurish	MVt	10,0	150,0	400,0	800,0	1500,0
5.	Yaxshilangan ichimlik suvi manbalaridan foydalanish imkoniyatiga ega aholi, jami aholi soniga nisbatan	%	69,7	80,93	87,12	88,5	92,3
6.	O`rmon fondi hududlarida daraxt va butalar zaxiralarini ko`paytirish	Mln.m3	64,2	68,1	77,0	85,5	92,3
7.	“Yashil makon” loyihasi doirasida shaharlardagi yashil maydonlarni kengaytirish	%	8,3	12,4	15,8	23,8	30,0
8.	Hududlarda yangi 600ta chiqindi to`plash shaxobchalarini tashkil etish	dona	-	50	200	400	600

Jadval ma’lumotlari O‘zbekistonda 2030-yilgacha “yashil” iqtisodiyotga o‘tish jarayoni izchil rivojlanayotganini ko‘rsatadi. YaIM birligiga to‘g‘ri keladigan energiya sarfini 30% ga kamaytirish, qayta tiklanuvchi energiya ulushini 8% dan 30,5% gacha oshirish rejalashtirilgan. Kichik quyosh elektr stansiyalari quvvati esa

[183] https://lex.uz/en/docs/-6303230

10 MVtdan 1500 MVtgacha, ya’ni 150 baravar oshirilishi ko‘zda tutilgan. Shuningdek, yaxshilangan ichimlik suvidan foydalanish imkoniyati 69,7% dan 90% gacha, yashil maydonlar ulushi esa 8,3% dan 30% gacha oshadi. Bu ko‘rsatkichlar energiya samaradorligi, ekologik barqarorlik va aholi hayot sifatini yaxshilash “yashil” iqtisodiyot siyosatining asosiy yo‘nalishlari ekanini ko‘rsatadi.

Ayniqsa, davlat mablag‘larini xususiy investitsiyalarni jalb qiluvchi “katalizator” sifatida ishlatish muhim. Jahon bankining so‘nggi tahlillarida ham davlat moliyaviy institutlari va davlat korxonalarining yashil loyihalarni moliyalashtirishdagi rolini kuchaytirish xususiy kapitalni jalb qilish uchun muhim imkoniyat sifatida ko‘rsatilgan.

Shu sababli O‘zbekiston uchun eng samarali model davlatning barcha yashil loyihalarni o‘zi moliyalashtirishi emas, balki davlat mablag‘i + xalqaro moliya + tijorat banklari + xususiy investorlar kombinatsiyasidan foydalanish bo‘lishi mumkin.

XULOSA

O‘zbekistonda yashil investitsiyalarni rivojlantirish mamlakatning ekologik xavfsizligini ta’minlash bilan birga, iqtisodiy o‘sishning yangi manbalarini shakllantirish imkonini beradi. Qayta tiklanuvchi energetika, suv tejovchi texnologiyalar, energiya samaradorligi, yashil transport va chiqindilarni qayta ishlash kabi yo‘nalishlarga investitsiyalarni oshirish mamlakatning resurs samaradorligini yaxshilashga xizmat qiladi.

Tadqiqot natijalari shuni ko‘rsatadiki, O‘zbekistonda yashil investitsiyalar uchun strategik va institutsional asos shakllangan bo‘lsa-da, moliyalashtirish manbalarini diversifikatsiya qilish, xususiy kapitalni jalb etish va loyiha risklarini kamaytirish bo‘yicha qo‘shimcha choralar zarur.

Maqolada taklif etilgan yashil obligatsiyalar bozorini kengaytirish, yashil kreditlashni rag‘batlantirish, davlat-xususiy sheriklikni kuchaytirish, yashil loyihalarni tasniflash tizimini takomillashtirish va xalqaro moliya institutlari bilan hamkorlikni kengaytirish mexanizmlari ushbu muammolarni hal qilishga xizmat qilishi mumkin.

Umuman olganda, O‘zbekiston uchun yashil investitsiyalar ekologik majburiyat emas, balki raqobatbardosh, resurs tejamkor va uzoq muddatli iqtisodiy o‘sishni ta’minlaydigan investitsion strategiya sifatida qaralishi lozim. Kelgusida yashil moliya bozorining rivojlanishi mamlakatga nafaqat ekologik maqsadlarga erishish, balki yangi texnologiyalarni jalb qilish, yangi ish o‘rinlarini yaratish va xalqaro investitsiya oqimlarini oshirish imkonini beradi.

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SUV RESURSLARINI BOSHQARISHDA INNOVATSION USULLAR SAMARADORLIGI XORJ TAJRIBASI TAHLILI

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ANNOTATSIYA

Suv resurslarini boshqarishda innovatsion usullar samaradorligi qiyosiy tahlil qilindi. Eron, Turkmaniston, Iordaniya va Iroq tajribasi suv olishni nazorat qilish, irrigatsiya yo‘qotishlari, iqtisodiy rag‘bat va institutsional boshqaruvdagi kamchiliklar nuqtai nazaridan baholandi. Isroil, Avstraliya, Marokash va Qozog‘iston tajribasida suv hisobi, qayta foydalanish, raqamli monitoring, infratuzilma modernizatsiyasi va iqtisodiy mexanizmlarning natijadorligi tahlil qilindi. Qiyosiy natijalar asosida O‘zbekiston uchun suv sarfini raqamli hisobga olish, suv tejovchi texnologiyalarni real limitlar bilan bog‘lash hamda suv unumdorligini iqtisodiy ko‘rsatkichlar orqali baholash ustuvor yo‘nalish sifatida belgilandi.

Kalit so‘zlar: *suv resurslari, suv tejash, suv unumdorligi, irrigatsiya, raqamli monitoring, suv hisobi, innovatsion boshqaruv, qiyosiy tahlil.*

ABSTRACT

The article provides a comparative assessment of water resources management efficiency in water-scarce countries. The experiences of Iran, Turkmenistan, Jordan and Iraq are analysed in terms of water abstraction control, irrigation losses, economic incentives and institutional management constraints. The experiences of Israel, Australia, Morocco and Kazakhstan are examined with a focus on water accounting, reuse, digital monitoring, infrastructure modernisation and economic management mechanisms. Based on the comparative results, priority directions for Uzbekistan include digital water accounting, linking water-saving technologies with actual water limits, and evaluating water productivity through economic indicators.

Keywords: *water resources, water saving, water productivity, irrigation, digital monitoring, water accounting, innovative management, comparative analysis.*

KIRISH

Mamlaktimizda suv resurslaridan foydalanish dinamikasi so‘nggi yillarda barqaror pasayish bilan bir qatorda , suv ta’minoti, iqlim sharoiti va iqtisodiy talab ta’sirida o‘zgaruvchan tendensiyani namoyon etmoqda. O‘zbekiston Respublikasi

Milliy statistika qo‘mitasining Suv xo‘jaligi vazirligi ma’lumotlariga asoslangan rasmiy qatoriga ko‘ra, jami suv olish hajmi 2013-yilda 53,98 mlrd m³ ni tashkil etgan bo‘lsa, 2017-yilda 58,92 mlrd m³ gacha oshgan. Keyinchalik ko‘rsatkich 2020-yilda 51,22 mlrd m³, 2021-yilda 43,66 mlrd m³, 2023-yilda 45,96 mlrd m³, 2024-yilda 45,28 mlrd m³ va 2025-yilda 45,53 mlrd m³ ni tashkil etgan. Shunday qilib, 2013–2025-yillarda jami suv olish hajmi qariyb 15,6 foizga kamaygan, biroq 2021-yildan keyin yana 4 foizdan ortiq o‘sish yana kuzatilgan [1]. Bu holat suv iste’molining qisqarishini faqat texnologik samaradorlik natijasi sifatida baholash mumkin emasligini, suv mavjudligi va yillik gidrologik sharoitlarning ta’sirini ham hisobga olish zarurligini ko‘rsatadi.

Muammoning iqtisodiy ahamiyati suv iste’molining tarmoq tarkibida yanada yaqqol namoyon bo‘ladi. O‘zbekistonda qishloq xo‘jaligi jami suv iste’molining qariyb 90 foizini tashkil qiladi. Sug‘oriladigan yerlarning 2,4 mln gektari yoki 56 foizi suvni nasoslar yordamida oladi, irrigatsiyada ishlatilayotgan 1 700 ga yaqin nasos stansiyasi esa yiliga 7,2 mlrd kVt·soat elektr energiyasi iste’mol qiladi. Jahon banki hisob-kitoblarida mamlakat irrigatsiya tizimining umumiy samaradorligi qariyb 40 foiz darajasida baholangan [2]. Demak, suv resurslarini boshqarishdagi yo‘qotishlar faqat suv hajmining kamayishi bilan cheklanmaydi, balki elektr energiyasi sarfi, ekspluatatsiya xarajatlari va qishloq xo‘jaligi mahsuloti tannarxiga ham bevosita ta’sir qiladi.Mazkur sharoit O‘zbekistonda suv tejovchi texnologiyalarni jadal kengaytirishga olib keldi. 2020-yilda bunday texnologiyalar jami sug‘oriladigan maydonlarning atigi 4 foizini qamrab olgan bo‘lsa, 2025-yilda ushbu ulush 50 foizga yetdi. 2020–2024-yillarda suv xo‘jaligi va irrigatsiyani rivojlantirishga 60 trln so‘m byudjet mablag‘i hamda 622 mln AQSH dollari xorijiy investitsiya yo‘naltirildi [4]. 2026-yil fevral holatiga kelib suv tejovchi texnologiyalar qo‘llanayotgan maydon 2,6 mln gektar yoki jami sug‘oriladigan yerlarning 60 foiziga yetgan. Taqqoslash uchun, 2017-yilgacha bunday texnologiyalar atigi 19 ming gektarda mavjud edi. Amaldagi tizimlar hisobiga yillik suv tejalishi 2,5 mlrd m³ darajasiga yetgani qayd etilgan [3].

2026-yilda siyosatning asosiy yo‘nalishi texnologiyalar sonini ko‘paytirishdan tashqari irrigatsiya infratuzilmasidagi yo‘qotishlarni kamaytirish va boshqaruvni raqamlashtirishga qaratildi. Suv tejovchi texnologiyalarni joriy etish uchun 2026-yilda 3,3 trln so‘m, 1 300 km magistral kanallarni betonlashtirish uchun esa yana 3 trln so‘m ajratilishi belgilangan bo‘lib, faqat mazkur betonlashtirish ishlari yiliga qo‘shimcha 500 mln m³ suvni tejashi prognoz qilingan [5]. 2025–2028-yillar dasturida 12 ming meliorativ kuzatuv qudug‘i va 1 750 nasosda avtomatik monitoringni yo‘lga qo‘yish, 12 ta yirik gidrotexnika obyektini raqamli boshqaruvga

o‘tkazish hamda 18 755 ta gidropostni avtomatlashtirish nazarda tutilgan [4].Biroq suv tejovchi texnologiyalar qamrovining 2017-yilgacha bo‘lgan 19 ming gektardan 2026-yilda 2,6 mln gektargacha kengaygani suv resurslarini boshqarish samaradorligi muammosi to‘liq hal qilinganini anglatmaydi. Asosiy masala joriy etilgan texnologiyaning maydoni emas, uning iqtisodiy qaytimi bilan bog‘liq. Ya’ni bir gektarga sarflangan investitsiya qancha kub metr suvni tejashi, suv tejash natijasida qancha elektr energiyasi iqtisod qilinishi, hosildorlik va mahsulot tannarxiga qanday ta’sir ko‘rsatishi hamda texnologiyaning qoplanish muddati qanday ekanligi kompleks baholanishi lozim. Bu ayniqsa dolzarb, chunki Jahon banki prognozlariga ko‘ra, iqlim omillari ta’sirida O‘zbekistonda suv mavjudligi kelgusida 30–40 foizgacha qisqarishi, sug‘orishga bo‘lgan talab esa 25 foizga oshishi mumkin [2].

Bizda masala faqat tomchilatib sug‘orish, raqamli hisoblagich yoki avtomatlashtirilgan boshqaruvni joriy etishda emas, balki texnologik innovatsiyani iqtisodiy rag‘batlantirish va samarali institutsional boshqaruv bilan birlashtirishda namoyon bo‘ladi. Bu jihatdan suv tanqisligi sharoitida turli boshqaruv modellarini shakllantirgan chet el tajribasini qiyosiy o‘rganish muhim ilmiy ahamiyatga ega. Ishning maqsadi suv resurslarini boshqarishda qo‘llanilayotgan innovatsion usullarning iqtisodiy va institutsional samaradorligini qiyosiy baholash hamda ularning bizni sharoitiga moslashtirilishi mumkin bo‘lgan elementlarini aniqlashdan iborat.

TADQIQOT METODOLOGIYASI

Tadqiqot sistematik-qiyosiy review yondashuvi asosida olib borildi. Tahlil uchun 2010–2026-yillarda suv resurslarini boshqarish, suv tejovchi texnologiyalar, raqamli monitoring, qayta foydalanish va institutsional boshqaruvga oid ilmiy maqolalar hamda rasmiy hisobotlar tanlab olindi. Manbalar Scopus, Web of Science, Google Scholar**,** shuningdek World Bank, FAO AQUASTAT, UN-Water, OECD va tegishli davlatlarning suv boshqaruvi organlari ma’lumotlari asosida shakllantirildi. Qidiruvda *water resources management, water-use efficiency, smart water management, precision irrigation, water reuse, digital water, water governance* kalit birikmalaridan foydalanildi.Manbalarni saralashda uch mezon qo‘llanildi: 1) suv tejash yoki suvdan foydalanish samaradorligi bo‘yicha miqdoriy natijaning mavjudligi; 2) innovatsion texnologiya yoki boshqaruv mexanizmining amaliy qo‘llanganligi; 3) natijalarni O‘zbekiston sharoiti bilan qiyoslash imkoniyati. Faqat umumiy tavsif berilgan, natijadorligi miqdoriy asoslanmagan materiallar asosiy qiyosiy tahlilga kiritilmadi.

NATIJALAR VA MUHOKAMA

Tadqiqot uchun davlatlar suv taqchilligi darajasi, sug‘orma dehqonchilikning iqtisodiyotdagi o‘rni, suv manbalariga tushayotgan bosim, suv xo‘jaligida amalga oshirilgan islohotlar va ushbu islohotlarning o‘lchanadigan natijalari asosida tanlandi. Qiyoslashda O‘zbekiston sharoitiga yaqin bo‘lgan qurg‘oqchil hududlar, irrigatsiyaga yuqori darajada bog‘langan iqtisodiyotlar, transchegaraviy suv manbalaridan foydalanadigan mamlakatlar hamda suv tanqisligiga qaramay yuqori boshqaruv natijalariga erishgan davlatlar ustuvor olindi.Tahlil ikki guruhda olib borildi. Birinchi guruhga Eron, Turkmaniston, Iordaniya va Iroq kiritildi. Ushbu davlatlarni birlashtiruvchi jihat suv resurslari cheklangan sharoitda boshqaruvning muayyan bo‘g‘inlarida uzoq vaqt davom etgan kamchiliklarning aniq iqtisodiy yoki ekologik oqibatlarga olib kelganidir. Eron yer osti suvlarining me’yoridan ortiq olinishi, Turkmaniston irrigatsiya tarmoqlaridagi yo‘qotishlar va suvdan foydalanishga iqtisodiy rag‘batning zaifligi, Iordaniya suv ta’minoti tarmoqlaridagi katta yo‘qotishlar, Iroq esa suv taqsimoti va talabni boshqarishdagi institutsional muammolarni tahlil qilish uchun tanlandi.

Ikkinchi guruhga Isroil, Avstraliya, Marokash va Qozog‘iston kiritildi. Ushbu davlatlarda suv cheklovi saqlanib qolgan holda boshqaruv tizimiga aniq hisob, suvni qayta foydalanish, iqtisodiy rag‘batlantirish, suv huquqlarini tartibga solish, irrigatsiya infratuzilmasini modernizatsiya qilish va raqamli monitoring kabi mexanizmlar kiritilgan. Qozog‘iston Markaziy Osiyodagi tabiiy-geografik va irrigatsion sharoitning O‘zbekistonga yaqinligi sababli, Marokash qurg‘oqchil iqlim va irrigatsiyaga bog‘liq qishloq xo‘jaligi sababli, Isroil keskin suv tanqisligi sharoitida resurslarni diversifikatsiya qilgani sababli, Avstraliya esa suv taqsimotida iqtisodiy mexanizmlardan uzoq muddat foydalanayotgani sababli tanlandi.Tahlilning vazifasi qaysi boshqaruv qarori qanday natija berganini aniqlash va O‘zbekiston uchun takrorlanishi mumkin bo‘lgan xatolar hamda moslashtirilishi mumkin bo‘lgan samarali mexanizmlarni ajratishdan iborat.

Birinchi guruh: boshqaruvdagi xatolar va ularning oqibatlari

Eron: suv tejash texnologiyasi suv olish hajmini nazorat qilmaganda

Eron tajribasida asosiy muammo yer osti suvlaridan foydalanish hajmining tabiiy tiklanish imkoniyatidan yuqori darajaga chiqib ketganida namoyon bo‘ladi. 478 subhavza va 30 havza bo‘yicha olib borilgan tadqiqot natijalariga ko‘ra, 2002–2015-yillarda mamlakat yer osti suv zaxiralari qariyb 74 km³ ga kamaygan. Tadqiqotda pasayishning asosiy omili inson faoliyati, ayniqsa qishloq xo‘jaligida yer osti suvlarini intensiv olish bilan bog‘langan [6].Eron misolida texnik sug‘orish samaradorligini oshirish resursning havza miqyosidagi holatini avtomatik ravishda

yaxshilamagan. Fermer bir gektarga kamroq suv ishlatishi mumkin, biroq tejangan suv hisobiga sug‘oriladigan maydon kengaytirilsa yoki qo‘shimcha suv talab qiluvchi ekin yetishtirilsa, suv manbasidan olinadigan jami hajm yuqori darajada qoladi. Shu sababli texnologik modernizatsiya bilan bir vaqtda suv olish limiti, quduqlar hisobi, yer osti suvlarining real vaqt monitoringi va havza bo‘yicha ruxsat etilgan umumiy suv olish chegarasi ishlashi talab etiladi.Demak suv tejovchi texnologiyalarni subsidiyalash natijasini faqat jihozlangan gektar bilan baholash yetarli bo‘lmasligidir. Yakuniy natija suv manbasidan olingan jami hajmning o‘zgarishi orqali ham tekshirilishi zarur.

1-jadval. Suv resurslarini boshqarishda innovatsion usullar samaradorligining qiyosiy tavsifi

Davlat	Guruh	Asosiy holat	Boshqaruv/innovatsion xususiyat
Eron	1-guruh	2002–2015-yillarda yer osti suv zaxiralari ≈74 km³ ga kamaygan [6].	Suv olish hajmi tabiiy tiklanishdan yuqori; havza bo‘yicha nazorat sust.
Turkmaniston		Suv resurslarining ≈90% irrigatsiyaga yo‘naltiriladi; >60% qishloq xo‘jaligi yerlari sho‘rlangan [7].	Eski irrigatsiya texnologiyasi, yo‘qotishlar va sust iqtisodiy rag‘bat.
Iordaniya		Jon boshiga 97 m³/yil; kommunal suvning >50% daromad keltirmaydigan suv [9].	Tarmoq sizib chiqishlari va hisobga olinmagan iste’mol yuqori.
Iroq		Suv ta’minoti 20% kamayishi YAIMni 4% gacha, 6,6 mlrd dollargacha qisqartirishi mumkin [10].	Markazlashgan tizimda muvofiqlashtirish, talabni boshqarish va moliyalashtirish cheklovlari.
Isroil	2-guruh	Oqava suvlarning 94% yig‘ilib tozalanadi, 87% qayta foydalaniladi [11].	Qayta foydalanish, chuchitish, suv hisobi va taqsimotni boshqarish.
Avstraliya		Suv bozorlari resursni yuqori qiymatli foydalanish yo‘nalishlariga o‘tkazgan [12].	Suv huquqlari, barqaror olish limitlari va savdo mexanizmi.
Marokash		Milliy dastur ≈550 ming ga irrigatsiyani modernizatsiya qilishni qamrab olgan [13].	Dala texnologiyasi va suv yetkazib berish infratuzilmasi birga yangilanadi.
Qozog‘iston		812,6 km qoplamali kanal, 2 325 km ikkilamchi kanal va >28 800 gidroinshoot modernizatsiya qilingan [14].	Raqamli monitoring, masofaviy boshqaruv va ekspluatatsiya javobgarligi integratsiyalashgan.

Turkmaniston: katta suv sarfi va past iqtisodiy rag‘batning oqibati

Turkmaniston O‘zbekiston bilan Amudaryo havzasi, qurg‘oqchil iqlim, irrigatsiyaga tayangan dehqonchilik va sovet davridan shakllangan yirik sug‘orish infratuzilmasi jihatidan yaqin qiyosiy mamlakat hisoblanadi. UNECE tahliliga ko‘ra, mamlakat suv resurslarining qariyb 90 foizi irrigatsiyaga yo‘naltirilgan. Eski sug‘orish texnologiyalaridan foydalanish va tarmoqlardagi katta suv yo‘qotishlari sho‘rlanish hamda yerlarning suv bosishi bilan bog‘langan. Tahlil davrida qishloq xo‘jaligi yerlarining 60 foizdan ortig‘ida sho‘rlanish qayd etilgan, ayrim ekinlarning hosildorligi esa o‘n yillik davrda taxminan 25 foizga pasaygan [7].Mazkur holatda iqtisodiy rag‘bat mexanizmi alohida ahamiyatga ega. UNECE bahosida qishloq xo‘jaligi uchun suvning bepul ajratilishi suvni tejashga iqtisodiy motivatsiyani zaiflashtirgan omillardan biri sifatida ko‘rsatilgan [7]. Suvning foydalanuvchi uchun chegaraviy xarajati sezilmasa, fermerning qo‘shimcha suv sarfini kamaytirishga bo‘lgan iqtisodiy qiziqishi pasayadi.

2026-yilda Turkmanistonda boshlangan Milliy suv siyosati dialogida integratsiyalashgan suv resurslarini boshqarish, idoralararo muvofiqlashtirish va xalqaro tajribani moslashtirish yana ustuvor masala sifatida qo‘yildi [8]. Bu holat texnik modernizatsiya bilan bir qatorda iqtisodiy va institutsional mexanizmlarni kuchaytirish zarurati saqlanayotganini ko‘rsatadi.Turkmaniston tajribasining ahamiyati juda yuqori: kanalga ko‘proq suv berish hosildorlikni mutanosib ravishda oshirmaydi. Drenaj holati, sho‘rlanish, suvni hisobga olish va fermerning suvni tejashga iqtisodiy manfaatdorligi birgalikda ishlaganda suvning iqtisodiy qaytimi oshadi.

Iordaniya: yangi suv manbasidan oldin tarmoq yo‘qotishlarini kamaytirish

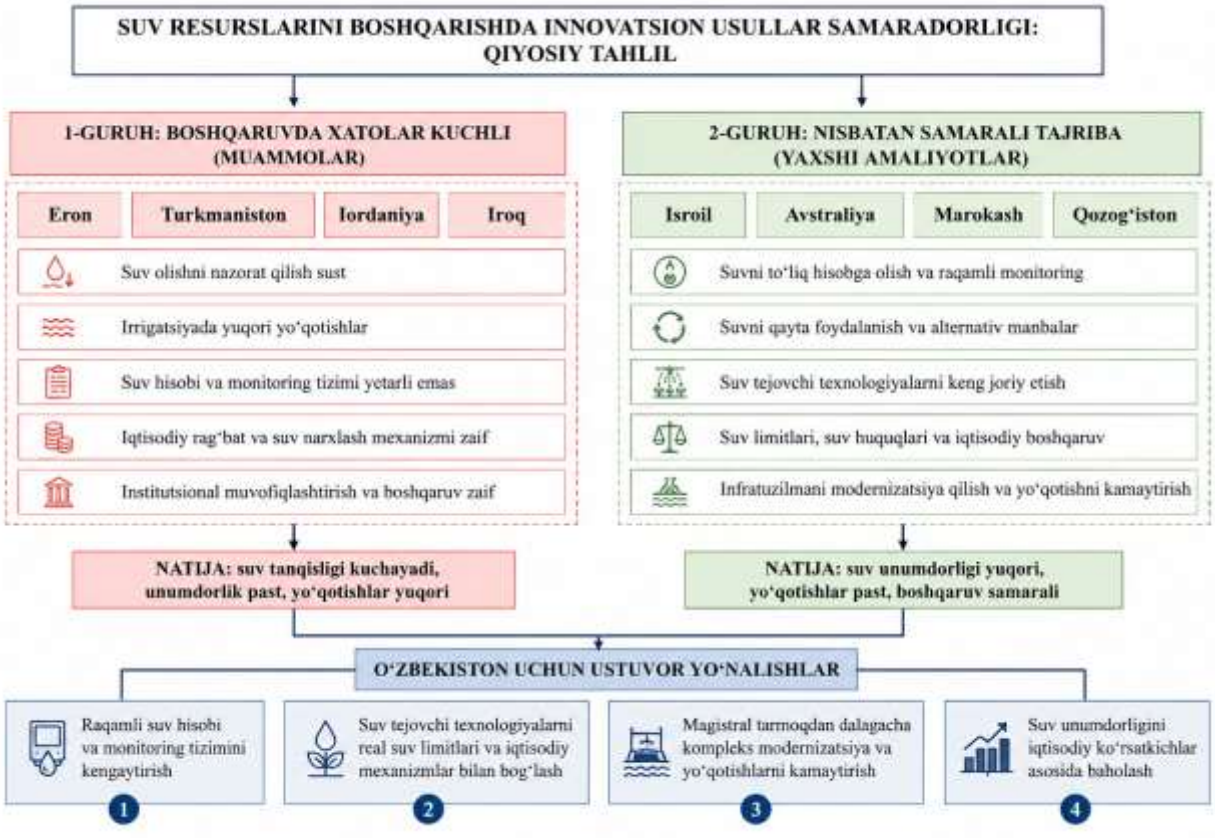
Iordaniyada jon boshiga yillik mavjud suv miqdori 97 m^3 atrofida bo‘lib, xalqaro miqyosda qo‘llaniladigan 500 m^3/yil mutlaq suv tanqisligi chegarasidan besh martadan ko‘proq past. Shu sharoitda kommunal tizimga berilgan suvning 50 foizdan ortig‘i quvurlardagi sizib chiqishlar yoki hisobga olinmagan iste’mol tufayli daromad keltirmaydigan suv toifasiga kiradi [9].Bu ko‘rsatkich investitsiya ustuvorligini tanlashda muhim iqtisodiy mazmunga ega. Yangi suv manbasini yaratish, suvni uzoq masofadan yetkazish yoki chuchitish katta kapital va energiya xarajatini talab qiladi. Mavjud tarmoqdagi yo‘qotish yuqori bo‘lgan sharoitda qo‘shimcha ishlab chiqarilgan suvning ma’lum qismi iste’molchiga yetib bormaydi. Shu sababli Iordaniyada tarmoqdagi sizib chiqishlarni kamaytirish, hisoblagichlar tizimini takomillashtirish va daromad keltirmaydigan suv ulushini pasaytirish suv siyosatining muhim iqtisodiy yo‘nalishiga aylangan. Jahon banki ham ushbu yo‘nalishni suv xavfsizligini yaxshilashdagi asosiy choralar qatoriga kiritadi [9].Tajriba kanal va tarmoqlardagi yo‘qotish miqdorini aniqlamasdan turib suv tejash siyosatining iqtisodiy natijasini

to‘liq baholab bo‘lmasligini ko‘rsatadi. Eng arzon yangi suv manbai ayrim hududlarda mavjud tarmoqda yo‘qotilayotgan suvni saqlab qolish bo‘lishi mumkin.

Iroq: suv tanqisligining makroiqtisodiy qiymati

Iroq tajribasi suv boshqaruvidagi muammolarning mamlakat miqyosidagi iqtisodiy oqibatini ko‘rsatadi. Jahon banki hisob-kitobiga ko‘ra, suv ta’minoti 20 foizga kamayib, bunga qishloq xo‘jaligi hosildorligining pasayishi qo‘shilganda mamlakat real YAIMi 4 foizgacha yoki 6,6 mlrd AQSH dollarigacha qisqarishi mumkin [10].Jahon banki Iroq uchun suv samaradorligini oshirish, suv unumdorligini ko‘tarish, talabni boshqarish, institutsional yechimlar va mintaqaviy hamkorlikni asosiy islohot yo‘nalishlari sifatida ko‘rsatgan [10]. Shu jihatdan Iroq tajribasi suv yetishmovchiligini faqat gidrologik ko‘rsatkich bilan o‘lchashning cheklanganligini ko‘rsatadi. Suv taqchilligi ekin hosildorligi, oziq-ovqat ishlab chiqarishi, fermer daromadi va mamlakat YAIMiga ketma-ket ta’sir qiladi.

Birinchi guruhdagi to‘rtta mamlakat bo‘yicha natijalar boshqaruv xatolarining to‘rt xil mexanizmini ko‘rsatdi: Eronda — me’yoridan ortiq suv olish; Turkmanistonda — irrigatsiya yo‘qotishlari va sust iqtisodiy rag‘bat; Iordaniyada — tarmoq yo‘qotishlari; Iroqda — suv tanqisligini iqtisodiy va institutsional boshqarishdagi zaifliklar.



1-rasm. Suv resurslarini boshqarish samaradorligiga ta’sir etuvchi omillar va O‘zbekiston uchun ustuvor yo‘nalishlar

Ikkinchi guruh: suv cheklovi sharoitida yuqori natija bergan boshqaruv mexanizmlari

Isroil: chuchuk suvga talabni boshqa manbalar bilan qisqartirish

Isroilda suv taqchilligini boshqarishning asosiy natijasi chuchuk suvga bo‘lgan talab tarkibini o‘zgartirish orqali erishilgan. OECD ma’lumotlariga ko‘ra, mamlakatdagi oqava suvlarning qariyb 94 foizi yig‘ilib tozalanadi, 87 foizdan ortig‘i qayta foydalaniladi va uning asosiy qismi qishloq xo‘jaligiga yo‘naltiriladi [11]. Besh yirik dengiz suvini chuchitish zavodi shahar va maishiy ehtiyojlar uchun suvning 80 foizdan ortig‘ini yetkazib beradi [11].Natijada 2000–2018-yillarda qishloq xo‘jaligining jami chuchuk suv olishdagi ulushi 64 foizdan 35 foizgacha kamaygan [11]. Bu o‘zgarish bir vaqtning o‘zida oqava suvni qayta ishlash, chuchitish, suvni narxlash, resurslarni tarmoqlar bo‘yicha taqsimlash va milliy suv uzatish tizimi orqali amalga oshirilgan.

O‘zbekiston uchun Isroildan olinadigan asosiy mexanizm tomchilatib sug‘orish qurilmasining o‘zi bilan chegaralanmaydi. Muhim yo‘nalish — ichimlik sifati talab qilinmaydigan faoliyatlarda qayta ishlangan suvdan foydalanish orqali yuqori sifatli chuchuk suvni boshqa ehtiyojlar uchun saqlash.

Avstraliya: suv hajmini iqtisodiy qiymat bilan bog‘lash

Avstraliyaning Murray–Darling havzasida suv boshqaruvi uzoq muddatli suv huquqlari, havza bo‘yicha ruxsat etilgan suv olish chegaralari va suv savdosi mexanizmlariga asoslanadi. OECD bahosiga ko‘ra, suv bozorlari suvni iqtisodiy qiymati yuqori foydalanish yo‘nalishlariga o‘tkazish imkonini bergan. Suvdan intensiv foydalaniladigan hududlarning katta qismi suv rejalari asosida boshqariladi va ekologik ehtiyojlar uchun alohida suv huquqlari ham shakllantirilgan [12].Avstraliya tajribasi suv bozorining ishlashi uchun uch shartning muhimligini ko‘rsatadi: suv olishning yuqori chegarasi aniq belgilanishi, har bir foydalanuvchining huquqi hisobga olinishi va savdo to‘g‘risidagi ma’lumotlar ochiq bo‘lishi zarur. OECD tahlillari suv bozorlarining murakkab boshqaruv va kuchli ma’muriy infratuzilmani talab qilishini ham qayd etadi [12].Tajribaning mos qismi suvni to‘liq bozor predmetiga aylantirishdan oldingi bosqich bilan bog‘liq: har bir hudud va foydalanuvchi bo‘yicha suv huquqi, limit, real sarf va bir kub metr suv hisobiga yaratilayotgan iqtisodiy qiymatni aniq hisoblash.

Marokash: dala texnologiyasi va magistral infratuzilmani birgalikda modernizatsiya qilish

Marokash qurg‘oqchil iqlim, irrigatsiyaga tayangan agrar ishlab chiqarish va suv tanqisligi jihatidan O‘zbekiston uchun foydali analog hisoblanadi. Mamlakatning Irrigatsiyada suv tejash milliy dasturi qariyb 550 ming gektar maydonda irrigatsiyani

modernizatsiya qilishni ko‘zda tutgan, shundan 220 ming gektari yirik irrigatsiya tizimlariga to‘g‘ri keladi [13].Marokash yondashuvida fermerga tomchilatib sug‘orish uskunasi o‘rnatish bilan birga suv yetkazib berish tizimi ham yangi texnologiyaning talabiga moslashtiriladi. Jahon banki qo‘llab-quvvatlagan dasturlarda suv sarfi, suv unumdorligi va yer osti suvlariga ta’sir alohida monitoring qilinmoqda [13]. Shu asosda texnologik modernizatsiya suv kvotalari va boshqaruv qarorlari bilan bog‘lanmoqda.

O‘zbekiston uchun ushbu tajribaning amaliy ahamiyati quyidagicha: fermer dalasida zamonaviy texnologiya mavjud bo‘lib, magistral va xo‘jaliklararo tarmoq suvni belgilangan vaqtda hamda kerakli hajmda bera olmasa, texnologiyaning iqtisodiy samaradorligi pasayadi. Shuning uchun modernizatsiya suv manbai - magistral kanal - taqsimlash tarmog‘i - fermer dalasi zanjirini to‘liq qamrab olishi kerak.

Qozog‘iston: O‘zbekistonga eng yaqin mintaqaviy modernizatsiya tajribasi

Qozog‘iston tajribasi davlatimiz uchun alohida ahamiyatga ega, chunki ikkala mamlakatning janubiy hududlarida qurg‘oqchil iqlim, transchegaraviy suvga bog‘liqlik, sug‘orma dehqonchilik va uzoq yillar ishlatilgan irrigatsiya infratuzilmasi o‘xshash xususiyatlarga ega.2026-yil iyun holatiga ko‘ra, Jahon banki ishtirokidagi irrigatsiya modernizatsiyasi doirasida Qozog‘istonda 812,6 km qoplamali kanal, 2 325 km ikkilamchi kanal va 28 800 dan ortiq gidrotexnik inshoot rekonstruksiya qilingan [14]. 100 ming gektardan ortiq qishloq xo‘jaligi yerlari yaxshilangan irrigatsiya va drenaj xizmatlari bilan qamrab olingan [14]. Ayrim obyektlarda suv sathi va bosim sensorlari, masofadan boshqariladigan nasoslar va markazlashtirilgan ma’lumot uzatish tizimlari joriy qilingan [14].

Muhim jihat shundaki, Qozog‘istonda qurilish ishlari boshqaruv tizimi bilan bir vaqtda olib borilgan. Loyiha doirasida ekspluatatsiya qo‘llanmalari ishlab chiqilgan, fermerlarning boshqaruvdagi ishtiroki kengaytirilgan va ayrim kooperativlarga infratuzilmani boshqarish hamda saqlash bo‘yicha bevosita mas’uliyat berilgan [14].

Qozog‘iston tajribasidan O‘zbekiston uchun olinadigan asosiy yo‘nalish infratuzilma, raqamli nazorat va ekspluatatsiya javobgarligini bitta loyiha doirasida birlashtirishdir. Kanalni betonlashtirish suv yo‘qotishini kamaytiradi; sensor uning real hajmini ko‘rsatadi; markaziy platforma ma’lumotni yig‘adi; mas’ul operator esa aniqlangan yo‘qotishga tezkor javob beradi. Ushbu to‘rt bo‘g‘inning bir tizimda ishlashi investitsiyaning amaliy natijasini shakllantiradi.

Ikki guruh tahlili suv taqchilligi darajasi bilan boshqaruv samaradorligi o‘rtasida to‘g‘ridan-to‘g‘ri bir xil bog‘lanish mavjud emasligini ko‘rsatdi. Bir xil yoki undan ham og‘ir tabiiy suv tanqisligi sharoitida mamlakatlar keskin farqli natijalarga

erishgan.Birinchi guruh tajribasida to‘rtta xavf aniqlandi: nazorat qilinmagan suv olish, tarmoq yo‘qotishlari, suvni tejashga sust iqtisodiy rag‘bat va institutsional muvofiqlashtirishning yetarli darajada ishlamasligi. Ikkinchi guruhda yuqori natijani shakllantirgan to‘rtta mexanizm aniqlandi: suvni to‘liq hisobga olish, resurs olish hajmini cheklash, iqtisodiy rag‘batni suv sarfi bilan bog‘lash va texnologiyani boshqaruv tizimiga integratsiya qilish.

XULOSA

Qiyosiy tahlil suv resurslarini boshqarish samaradorligi tabiiy suv taqchilligi darajasidan ko‘ra boshqaruv sifati, suv hisobi, iqtisodiy rag‘batlantirish va texnologik yechimlarning o‘zaro bog‘liqligiga kuchliroq bog‘liqligini ko‘rsatdi. Eron, Turkmaniston, Iordaniya va Iroq tajribasida suv olishni nazorat qilishning yetarli darajada ishlamasligi, irrigatsiya va taqsimot tarmoqlaridagi yo‘qotishlar, suvni tejashga iqtisodiy rag‘batning zaifligi hamda institutsional muvofiqlashtirishdagi kamchiliklar resurs bosimini kuchaytirgan.

Isroil, Avstraliya, Marokash va Qozog‘iston tajribasida yuqoriroq natija suv tejovchi texnologiyalarni alohida joriy etish hisobiga shakllanmagan. Natijadorlik suvni aniq hisobga olish, suv olish hajmini tartibga solish, qayta foydalanish, iqtisodiy rag‘batlantirish, irrigatsiya infratuzilmasini modernizatsiya qilish va raqamli monitoringni yagona boshqaruv tizimiga birlashtirish orqali ta’minlangan.Oxrgi o'n yillikda suv tejovchi texnologiyalar qamrovini sezilarli kengaytirgan va irrigatsiya tizimini modernizatsiya qilishni jadallashtirgan. Keyingi bosqichda natijadorlikni o‘rnatilgan texnologiyalar maydoni bilan emas, tejalgan suv hajmi, 1 m^3 suv hisobiga yaratilgan iqtisodiy qiymat, energiya sarfi, hosildorlik o‘zgarishi va investitsiyaning qoplanish muddati orqali baholash zarur.

Tahlil asosida biz uchun to‘rtta ustuvor yo‘nalish ajratildi: suv olish va sarfini to‘liq raqamli hisobga olish; suv tejovchi texnologiyalarni real suv limiti bilan bog‘lash; magistral tarmoqdan fermer dalasigacha bo‘lgan infratuzilmani kompleks modernizatsiya qilish; suvdan foydalanish samaradorligini iqtisodiy natija bilan baholash.Shu asosda suv resurslarini boshqarish siyosatida asosiy mezon texnologiyalar sonini ko‘paytirishdan har bir kub metr suvning iqtisodiy va ekologik qaytimini oshirishga o‘tishi lozim.

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KATTA CHUQURLIKDAGI KARBONAT KOLLEKTORLARDA ANOMAL QATLAM BOSIMLARINING SHAKLLANISH QONUNIYATLARI VA ULARNING GIDRAVLIK TABIATI

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ANNOTATSIYA

Maqolada katta chuqurlikdagi (3000 metrdan ortiq) neft-gaz kollektorlarida anomal qatlam bosimlarining (yuqori va past) shakllanish mexanizmlari, ularning gidravlik-termodinamik tabiati va Qashqadaryo viloyatidagi Alan gaz koni misolida namoyon bo‘lish xususiyatlari tahlil qilingan. Chuqur quduqda ta'sir etuvchi bosimlar tizimi (geostatik, gidrostatik, qatlam, gidrodinamik va differensial bosimlar) ilmiy jihatdan tasniflangan, ularning o‘zaro bog‘liqligi matematik ifodalar orqali asoslangan. Anomallik koeffitsiyenti tushunchasi va uning diapazonlari (0,45 dan 2,10 gacha) yoritilgan. Alan konining boshlang‘ich bosqichida me'yoriy gidrostatik bosimga yaqin bo‘lgani, biroq 40 yildan ortiq ekspluatatsiya natijasida anomal past qatlam bosimi (ANPB, K_a=1,7-1,8 dan pasayib) sharoitiga o‘tgani ko‘rsatilgan. Poristik-darzli muhitlarda ko‘p fazali filtratsiya nazariyasining zamonaviy holati va mavjud gidravlik hisob-kitob usullarining kamchiliklari tahlil qilingan.

Kalit so‘zlar: *anomal qatlam bosimi, gidrostatik bosim, geostatik bosim, anomallik koeffitsiyenti, karbonat kollektor, Alan gaz koni, nolinear filtratsiya.*

KIRISH

Jahon neft-gaz sanoatida burg‘ilash chuqurliklarining barqaror o‘sishi so‘nggi yarim asr davomida geologik-texnik fikrning ustuvor yo‘nalishlaridan biriga aylandi. Agar XX asrning o‘rtalarida 3000 metrdan chuqurroq quduqlar noyob hisoblangan bo‘lsa, hozirgi kunda dunyoning yetakchi neft-gaz provinsiyalarida (Prikaspiy, Meksika ko‘rfazi, Shimoliy dengiz, G‘arbiy Sibir) 5000-7000 metr va undan ortiq chuqurlikdagi quduqlar odatiy amaliyotga aylanib bormoqda. Bunday chuqurliklarga xos bo‘lgan geologik-gidravlik sharoitlar bir qator o‘ziga xos xususiyatlar bilan tavsiflanadi: yuqori litostatik yuklama, kollektorlarning zichlanishi natijasida

g‘ovaklik va o‘tkazuvchanlikning pasayishi, qatlam haroratining ortishi, hamda ko‘p hollarda anomal (me'yordan chetlashgan) qatlam bosimlarining shakllanishi.

O‘zbekiston Respublikasida ushbu muammoning dolzarbligi mamlakatning asosiy neft-gazli hududi - Qashqadaryo viloyati misolida yaqqol namoyon bo‘ladi: hozirgi kunda respublikada qazib chiqarilayotgan tabiiy gazning 88 foizi va neftning 92 foizi aynan shu viloyat hissasiga to‘g‘ri keladi. Viloyat hududidagi Alan gaz koni bunda alohida ilmiy-amaliy ahamiyat kasb etadi. Mazkur maqolaning maqsadi - katta chuqurlikdagi karbonat kollektorlarda anomal qatlam bosimlarining shakllanish qonuniyatlarini, ularning gidravlik-termodinamik tabiatini nazariy jihatdan asoslash va Alan koni misolida amaliy tahlil qilishdan iborat.

Mazkur tadqiqot O‘zbekiston Respublikasi fan va texnologiyalar rivojlanishining ustuvor yo‘nalishlaridan energetika, resurstejamkorlik texnologiyalari hamda tabiiy resurslardan oqilona foydalanish sohalariga tegishli bo‘lib, mamlakat yoqilg‘i-energetika majmuasi barqarorligini ta'minlashning, jumladan mavjud konlarning qoldiq zaxiralarini samarali va xavfsiz o‘zlashtirishning ilmiy-amaliy asoslarini rivojlantirishga xizmat qiladi. O‘zbekiston Respublikasi Prezidentining tegishli farmon va qarorlarida mamlakat energetika xavfsizligini ta'minlash, tabiiy gaz va neft qazib olishni barqarorlashtirish, mavjud konlarning qoldiq zaxiralarini oqilona o‘zlashtirish hamda ilmiy-texnik salohiyatni oshirish borasidagi vazifalar belgilab berilgan bo‘lib, mazkur tadqiqot ushbu vazifalarni bajarishga o‘zining munosib hissasini qo‘shadi.

MAVZUGA OID ADABIYOTLAR TAHLILI

Katta chuqurlikdagi neft-gaz kollektorlarida bosimga bog‘liq nolinear filtratsiya va anomal (yuqori yoki past) qatlam bosimi muammosi jahon ilmiy adabiyotida keng yoritilgan. N.F.Kozlov (1998) Prikaspiy neft-gazli provinsiyasining chuqur joylashgan yengil neft uyumlarini ishlash texnologiyasini optimallashtirishga bag‘ishlangan doktorlik dissertatsiyasida murakkab tuzilgan va chuqur joylashgan qatlamlarning geologik va termobarik xususiyatlarini, shu jumladan yuqori qatlam bosimi va harorati sharoitida flyuidlarning fazaviy holatini batafsil tahlil qilgan.

A.I. Ponomarev (2000) esa past o‘tkazuvchan va qatlamli-noturg‘un karbonat kollektorlarda uglevodorod uyumlarini ishlash samaradorligini oshirishga bag‘ishlangan tadqiqotida ko‘p fazali filtratsiya jarayonlarining o‘ziga xos xususiyatlarini (nisbiy fazaviy o‘tkazuvchanliklar, filtratsiya-sig‘im xossalarining bosimga bog‘liqligi) ilmiy asoslagan. V.A. Mnatsakanov (2010) chuqur quduqlarni burg‘ilashning texnologik muammolariga bag‘ishlangan tadqiqotida bosimlar tizimining (geostatik, gidrostatik, qatlam, gidrodinamik) to‘liq ilmiy tasnifini taklif

qilgan, bu esa mazkur tadqiqotning nazariy asosini shakllantirishda muhim ahamiyat kasb etdi.

Poristik va darzli-kovak muhitlarda flyuidlar filtratsiyasining klassik nazariyasi (Darsi qonuni va uning umumlashtirilgan ko‘rinishlari) gidravlika fanining asosiy yutuqlaridan biri hisoblanadi va K.S. Basniyev, I.A. Charniy, G.I. Barenblatt kabi olimlarning fundamental ishlarida chuqur rivojlantirilgan. Shu bilan birga, O‘zbekiston sharoitida, xususan Buxoro-Xiva neft-gazli provinsiyasining Chorjo‘y tektonik pog‘onasiga tegishli Qashqadaryo viloyati konlari bo‘yicha ham muayyan geologik-texnologik tadqiqotlar olib borilgan, biroq bosimga bog‘liq nolinear filtratsiya jarayonlarini yagona model doirasida tavsiflashga bag‘ishlangan kompleks tadqiqotlar hali yetarli darajada emas.

Shuni alohida ta'kidlash lozimki, mavjud adabiyotlarning aksariyati anomal yuqori qatlam bosimi (AYuQB) muammosiga bag‘ishlangan bo‘lib, uzoq muddatli ekspluatatsiya natijasida yuzaga keladigan anomal past qatlam bosimi (ANPB) muammosi, xususan uning gidravlik-termodinamik jihatlari, nisbatan kam o‘rganilgan. Bu holat, ayniqsa Alan kabi o‘zining ekspluatatsiya tarixi davomida bir bosim rejimidan (me'yoriy gidrostatikka yaqin) ikkinchisiga (ANPB) o‘tgan konlar uchun, alohida ilmiy tadqiqotni taqozo etadi, chunki bunday dinamik jarayonni tavsiflash uchun statik (bitta bosim holatiga mo‘ljallangan) modellar yetarli emas.

TADQIQOT METODOLOGIYASI

Tadqiqotda nazariy tahlil, qiyosiy tahlil va matematik modellashtirish usullaridan foydalanildi. Chuqur quduqda ta'sir etuvchi bosimlar tizimini tasniflash uchun Mnatsakanov (2010) tomonidan taklif etilgan uslubiyot asos qilib olindi va u Alan koni sharoitiga moslashtirildi. Jahon va mahalliy amaliyotdagi chuqur quduqlarning gidrotermodinamik ko‘rsatkichlarini taqqoslash uchun qiyosiy-tahliliy usul qo‘llanildi.

TAHLIL VA NATIJALAR

Bosimlar tizimining tasnifi

Chuqur quduqni burg‘ilash va ishlatish jarayonida “quduq - tog‘ jinslari massivi” tizimida bir vaqtning o‘zida bir-biridan tabiati va kelib chiqishi jihatidan farq qiluvchi bir necha turdagi bosimlar ta'sir ko‘rsatadi. Geostatik bosim (P_g) - tog‘ jinslari massivining o‘z og‘irligi natijasida yuzaga keladigan bosim bo‘lib, quyidagi formula bilan hisoblanadi:

$$P_{gst} = \rho \cdot g \cdot H \qquad (1)$$

bu yerda: ρ - tog‘ jinslarining o‘rtacha zichligi, kg/m³; g - erkin tushish tezlanishi, m/s²; H - qatlamning joylashish chuqurligi, m. Gidrostatik bosim (P_{gst}) - quduqni to‘ldirgan texnologik suyuqlik (burg‘ilash eritmasi) ustunining og‘irligi natijasida yuzaga keladi:

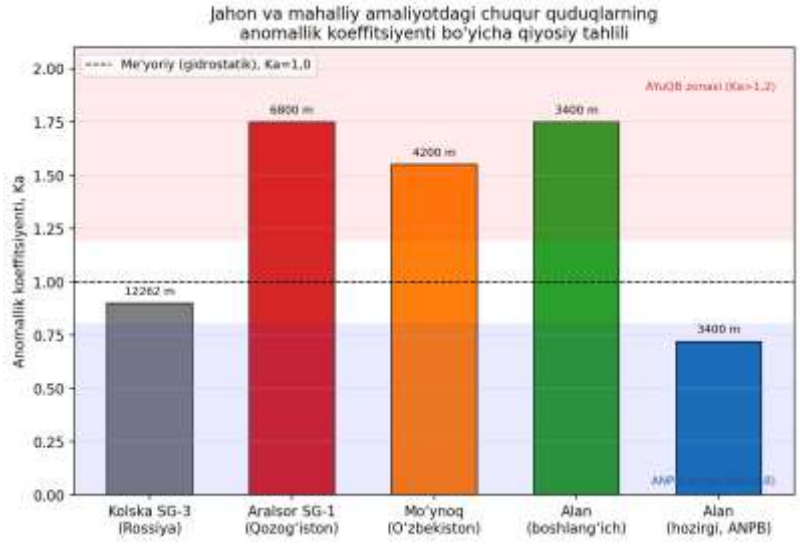
$$P_{gst} = \rho_{be} \cdot g \cdot H \qquad (2)$$

bu yerda: ρ_{be} - burg‘ilash eritmasining zichligi, kg/m³. Qatlam bosimi (P_{qb}) - mahsuldor qatlamdagi flyuidlar tomonidan hosil qilinadigan bosim bo‘lib, mazkur tadqiqotning markaziy parametri hisoblanadi. Qatlam bosimining gidrostatik bosimga nisbati anomallik koeffitsiyenti (K_a) deb ataladi:

$$K_a = P_{qb} / P_{gst} = P_{qb} / (\rho_s \cdot g \cdot H) \qquad (3)$$

bu yerda: ρ_s - suvning zichligi (odatda 1000-1100 kg/m³ deb qabul qilinadi). K_a=1 bo‘lganda qatlam bosimi me'yoriy (gidrostatik) hisoblanadi; K_a>1,2 bo‘lganda - anomal yuqori qatlam bosimi (AYuQB); K_a<0,8 bo‘lganda - anomal past qatlam bosimi (ANPB) haqida gapiriladi. Amaliyotda Ka koeffitsiyenti 0,45 dan 2,10 gacha bo‘lgan keng diapazonda o‘zgarishi mumkin.

Jahon va mahalliy amaliyotning qiyosiy tahlili



1-rasm. Jahon va mahalliy amaliyotdagi chuqur quduqlarning anomallik koeffitsiyenti bo‘yicha qiyosiy tahlili.

Jahon amaliyotidagi eng chuqur ilmiy-tadqiqot va sanoat quduqlarining tahlili anomal bosim hodisasining o‘ziga xosligini yaqqol tasdiqlaydi. Xususan, Kolska superchuqur qudug‘ida (Rossiya, Kola yarim oroli) 12262 metr chuqurlikda ham qatlam bosimi nisbatan me'yoriy (K_a≈0,9) bo‘lgani holda, ancha kamroq chuqurlikdagi Aralsor SG-1 qudug‘ida (Qozog‘iston, Prikaspiy botig‘i) sezilarli anomal yuqori bosim (K_a≈1,75) qayd etilgan. Bu holat shuni ko‘rsatadiki, AYuQB hodisasi bevosita chuqurlikning o‘zi bilan emas, balki konkret cho‘kindi havzaning gidrodinamik yopiqligi (izolyatsiyasi) bilan bog‘liq.

O‘zbekiston sharoitida bunday hodisaning eng yorqin namunasi 2025-2026 yillarda Qoraqalpog‘iston Respublikasi Mo‘ynoq tumanida burg‘ilangan izlov quduqlarida qayd etilgan bo‘lib, respublika amaliyotida ilgari kuzatilmagan darajadagi qatlam bosimi (K_a>1,5) aniqlangan. Qashqadaryo viloyatidagi Alan koni esa, garchi Mo‘ynoqqa qaraganda ancha kamroq chuqurlikda (3200-3600 m) joylashgan bo‘lsa-da, o‘rtacha darajadagi, ammo aniq o‘lchangan va ilmiy jihatdan tekshirilgan AYuQB (K_a=1,7-1,8) ko‘rsatkichiga ega bo‘lgan holda ishga tushirilgan.

Alan koni misolida anomal bosim rejimining evolyutsiyasi

Alan gaz koni Qashqadaryo viloyatida joylashgan bo‘lib, Buxoro-Xiva neft-gazli provinsiyasining Chorjo‘y tektonik pog‘onasiga tegishlidir. Konning mahsuldor qatlamlari yuqori yura davri karbonat (rifogen-shelf) yotqiziqlaridan tashkil topgan bo‘lib, ular XV-HP, XV-P va XV-a1 gorizontlarini o‘z ichiga oladi. Ushbu gorizontlar 3200-3600 metr chuqurlikda joylashgan bo‘lib, ularning ustidan kimmerij-titon davri tuz-angidrit qatlami regional gidrodinamik ekran (qopqoq) vazifasini bajaradi.

Alan konida ushbu izolyatsiya mexanizmi nisbatan zaif namoyon bo‘lgani sababli, kon o‘zlashtirilishning dastlabki bosqichida qatlam bosimi me'yoriy gidrostatik darajaga yaqin bo‘lgan (K_a=1,7-1,8 - dastlabki qiymat sifatida qayd etilgan yuqori chegara); konning 40 yildan ortiq davom etgan ekspluatatsiyasi natijasida esa bosim izchil pasayib, hozirgi kunda anomal past qatlam bosimi (ANPB) sharoitiga o‘tgan. Bunga qo‘shimcha ravishda, qatlam harorati ham yuqori (115°C) bo‘lib, past bosim va yuqori harorat birgalikda flyuidlar filtratsiyasi jarayonini sezilarli darajada murakkablashtiradi.

Konning mahsuldor qatlamlari uchun boshlang‘ich g‘ovaklik 16,3%, gaz o‘tkazuvchanligi esa 85 mD ni tashkil etadi. Uyum maydonining uzunligi 7,3 km, eni 3,7 km, mahsuldor qatlam qalinligi esa o‘rtacha 365 m ni tashkil etadi. Konning uzoq muddat ishlatilishi natijasida qatlam va quduq usti bosimining tabiiy pasayishi kuzatilgan bo‘lib, bu holat konni yangi loyiha asosida, sun'iy ko‘tarish tizimi yordamida ishlatishga o‘tishni taqozo etgan.

Alan koniga tutash Zevarda, Ko‘kdumaloq va Sho‘rtan konlari ham xuddi shunday geologik-tektonik sharoitda, bir xil regional tuz-angidrit qopqog‘i ostida joylashgan bo‘lib, ular tadqiqot natijalarini kengroq mintaqaviy miqyosda tekshirish va amaliy tavsiyalarni umumlashtirish uchun qo‘shimcha tayanch obyektlar sifatida qaraladi. Ushbu konlarning aksariyati o‘zlashtirishning dastlabki bosqichida yuqori AYuQB toifasiga (K_a=1,40-1,75) kiruvchi anomallik koeffitsiyentlariga ega bo‘lgan, bu esa Alan koni bilan qiyosiy tahlil o‘tkazish imkoniyatini beradi.

Gidrodinamik va differensial bosimlarning ta'siri

Gidrodinamik bosim (P_{gd}) - burg‘ilash eritmasi harakatlanayotganda yuzaga keladigan qo‘shimcha bosim bo‘lib, gidravlik qarshiliklar tufayli hosil bo‘ladi:

$$P_{gd} = P_{gst} + \Delta P_d \qquad (4)$$

bu yerda: ΔP_d - sirkulyatsiya tizimidagi gidravlik qarshiliklar natijasida yuzaga keladigan bosim o‘zgarishi. Differensial bosim (ΔP_{dif}) - quduqdagi bosim bilan qatlam bosimi o‘rtasidagi farq bo‘lib, quduqning texnologik holatini belgilaydi:

$$\Delta P_{dif} = P_{gst} - P_{qb} \qquad (5)$$

bu yerda: P_{gst} - quduqdagi (ustun) bosim. $\Delta P_{dif}>0$ bo‘lganda repressiya rejimi, $\Delta P_{dif}<0$ bo‘lganda esa depressiya rejimi yuzaga keladi. Aynan shu differensial bosimning noto‘g‘ri boshqarilishi AYuQB sharoitida flyuidlar otilib chiqishi, qatlamlarni yutilishi va boshqa avariyaviy holatlarning asosiy sababi hisoblanadi. Alan koni kabi ANPB sharoitiga o‘tgan konlarda esa, aksincha, depressiya rejimining nazoratsiz oshib ketishi kollektor qismlarining beqarorlanishiga olib kelishi mumkin.

XULOSA

O‘tkazilgan tahlil natijasida quyidagi xulosalarga kelindi. Birinchidan, katta chuqurlikdagi neft-gaz kollektorlarida qatlam bosimining anomal shakllanishi to‘rtta asosiy mexanizm (kompaksion, gidrodinamik izolyatsiya, termik kengayish, tektonik siqilish) bilan bog‘liq bo‘lib, bu mexanizmlarning nisbati konkret geologik sharoitga qarab farqlanadi. Ikkinchidan, Alan koni sharoitida ushbu mexanizmlarning nisbatan zaif kombinatsiyasi kon boshlang‘ich bosimining me'yoriy shakllanishiga olib kelgani, uzoq muddatli ekspluatatsiya esa uni anomal past bosim sharoitiga olib kelgani aniqlandi. Uchinchidan, chuqur quduqda ta'sir etuvchi bosimlar tizimining (geostatik, gidrostatik, qatlam, gidrodinamik va differensial) to‘liq nazariy tasnifi ishlab chiqildi va Alan koni misolida amaliy tasdiqlandi.

Olingan natijalar katta chuqurlikdagi karbonat kollektorlarda bosimga bog‘liq nolinear filtratsiya qonuniyatlarini keyingi bosqichda matematik modellashtirish uchun ishonchli nazariy-metodologik asos yaratadi. Bu esa mazkur tadqiqot doirasida ishlab chiqilishi rejalashtirilgan gidravlik modelning fizik jihatdan asoslanganligini ta'minlaydi.

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NEFT-GAZ SANOATI OQAVA SUVLARINI TOZALASH VA TRANSPORT TIZIMLARINI KORROZIYADAN HIMOYALASHNING KOMPLEKS TEXNOLOGIYASI

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ANNOTATSIYA

Maqolada neft-gaz sanoati oqava suvlarini tozalash jarayoni bilan tozalash-transport tizimining korroziyaviy holati o‘rtasidagi o‘zaro bog‘liqlik tadqiq etilgan. Tozalash samaradorligi bilan korroziya tezligi o‘rtasidagi bog‘liqlik monoton emas, balki ekstremal xarakterga ega ekanligi eksperimental aniqlangan: samaradorlikning 0 dan 30 % gacha ortishi korroziya tezligini 0,633 dan 0,470 mm/yilgacha pasaytiradi, undan keyingi ortishi esa uni 95,6 % da 1,027 mm/yilgacha ko‘taradi. Shu asosda tozalash va korroziyadan himoyalash jarayonlarini muvofiqlashtiruvchi yetti bosqichli kompleks texnologik sxema ishlab chiqilgan. Unumdorligi 6,0 m³/soat bo‘lgan yarim sanoat qurilmasida 8 oy davomida o‘tkazilgan sinovlar korroziya tezligini 1,048 dan 0,082 mm/yilgacha, ya’ni 12,8 barobar kamaytirish, tozalash ko‘rsatkichlarini esa me’yoriy talablar doirasida saqlash mumkinligini tasdiqladi. Loyihaning diskontlangan qoplanish muddati 1,8 yilni, yillik iqtisodiy samara 3 941 mln so‘mni tashkil etadi.

Kalit so‘zlar: *oqava suvlarni tozalash, ichki korroziya, tozalash samaradorligi, korroziya ingibitori, yopiq tsikl, pitting, texnik-iqtisodiy samaradorlik.*

KIRISH

Neft va gaz konlarining ekspluatatsiya muddati ortishi bilan quduq mahsulotidagi suv ulushi ortib boradi va suv bilan bog‘liq texnologik jarayonlar korxona xarajatlarining sezilarli qismini tashkil qila boshlaydi. Hosil bo‘lgan oqava suvlar tozalanib, qatlam bosimini ushlab turish tizimiga qaytariladi. Ushbu zanjirda ikkita muhandislik vazifasi bir xil suyuqlik ustida bajariladi: suvni tozalash va uni uzatuvchi metall tizimni korroziyadan himoyalash. Amaliyotda bu ikki vazifa turli xizmatlar tomonidan, turli o‘lchov birliklarida va, qoida tariqasida, turli namunalarda hal qilinadi.

Bir qator kuzatuvlar bunday ajratishning sun’iy ekanligini ko‘rsatadi. Temir va alyuminiy tuzlari asosidagi koagulyantlar suvga sulfat kiritadi va bufer sig‘imini

pasaytiradi; flotatsiya bosqichi ilgari deaeratsiyalangan suvni kislorod bilan to‘yintiradi; mikrobiologik faollikni bostirish uchun qo‘llaniladigan oksidlovchi biosidlar esa uglerodli po‘lat uchun kuchli depassivatsiyalovchi agent hisoblanadi. Aksincha, quvur devoridan ajralgan korroziya mahsulotlari suvga temir gidroksidi va sulfidi ko‘rinishida qaytib, tozalash inshootining kirish yukini oshiradi. Natijada yopiq tsikl vujudga keladi, biroq uning kuchaytirish koeffitsienti shu paytgacha miqdoriy baholanmagan.

Mazkur ishning maqsadi tozalash samaradorligi bilan korroziya tezligi o‘rtasidagi miqdoriy bog‘liqlikni aniqlash, uni tavsiflovchi model qurish va shu asosda ikkala vazifani yagona texnologik oqimda hal qiluvchi sxemani ishlab chiqishdan iborat.

Tadqiqot obyekti va usullari

Tadqiqot obyekti sifatida Qashqadaryo viloyatidagi gazokondensat konining suv-texnologik infratuzilmasi tanlandi. Tozalash-transport zanjirining oltita xarakterli nuqtasidan yil davomida to‘rt marta, uch takrorlanishda 72 ta namuna olinib, 16 ta ko‘rsatkich bo‘yicha tahlil qilindi. Namuna olish O‘z DSt ISO 5667 va GOST 31861-2012 talablariga muvofiq bajarildi; korroziya sinovlari uchun mo‘ljallangan qism argon bilan deaeratsiyalanib, real quvur ichidagi kislorodsiz muhit takrorlandi.

Korroziya sinovlari GOST 9.905 va ASTM G1 bo‘yicha 50×20×3 mm o‘lchamdagi St3sp, 20 va 09G2S po‘lat namunalarida, 25 va 60 °C haroratlarda, 240 soat davomida o‘tkazildi. Massa yo‘qotish tezligi K, g/(m²·soat), chuqurlik ko‘rsatkichiga aylantirildi:

$$K_{ch} = 8{,}76 \cdot K/\rho,\ \text{mm/yil}$$

Tizimning haqiqiy ishonchliligi lokal buzilish bilan belgilangani sababli javob o‘zgaruvchisi sifatida nuqtali korroziyani hisobga oluvchi tuzatilgan tezlik qabul qilindi:

$$K^* = K_{ch} \cdot (1 + 0{,}25 \cdot P_k)$$

Elektrokimyoviy o‘lchovlar uch elektrodli yacheykada bajarildi; korroziya toki zichligi Tafel kesishmalari bilan, polarizatsiya qarshiligi esa Shtern–Geri tenglamasi bo‘yicha aniqlandi:

$$R_p = b_a \cdot b_k / [2{,}303 \cdot i_{kor} \cdot (b_a + b_k)]$$

Umumlashgan tozalash samaradorligi ifloslantiruvchi komponentlar bo‘yicha chiqarib tashlash darajalarining vaznli o‘rtachasi sifatida hisoblandi:

$$E = \Sigma\, \alpha_i \cdot [(C_{i,kir} - C_{i,chiq})/C_{i,kir}] \cdot 100\ \%$$

bunda vazn koeffitsientlari neft mahsulotlari uchun 0,35; muallaq moddalar uchun 0,25; KKT uchun 0,25; sirt-faol moddalar uchun 0,15 qilib qabul qilindi. Regressiya Levenberg–Markvardt algoritmi bilan bajarilib, modelning adekvatligi

Fisher, koeffitsientlarning ahamiyatliligi esa Styudent mezoni bo‘yicha 95 % ishonch darajasida tekshirildi.

Natijalar va ularning tahlili

Tozalash darajasi va korroziya tezligi o‘rtasidagi bog‘liqlik

Tozalash samaradorligining sakkizta darajasi flotatsiya davomiyligi, koagulyant dozasi va aeratsiya intensivligini o‘zgartirish yo‘li bilan yaratildi. Natijalar 1-jadvalda keltirilgan.

1-jadval

Tozalash samaradorligi va korroziya tezligi o‘rtasidagi bog‘liqlik (20-po‘lat, 40 °C)

Rejim	E, %	Neft mahs., mg/dm³	Erigan O_2, mg/dm³	SO_4^{2-}, mg/dm³	K*, mm/yil
R-0	0	164	0,2	620	0,633
R-1	38,4	101	0,6	648	0,478
R-2	52,7	78	1,1	694	0,549
R-3	64,1	59	1,8	761	0,641
R-4	73,6	43	2,6	852	0,726
R-5	82,4	31	3,4	981	0,844
R-6	89,8	21	4,1	1140	0,938
R-7	95,6	12	4,8	1246	1,027

Bog‘liqlik monoton emas, balki ekstremal xarakterga ega. Uni eng yaxshi tavsiflovchi model – ikki komponentli additiv model:

$$K^* = K_1 \cdot \exp(-\beta \cdot E) + K_2 \cdot E^{\gamma}$$

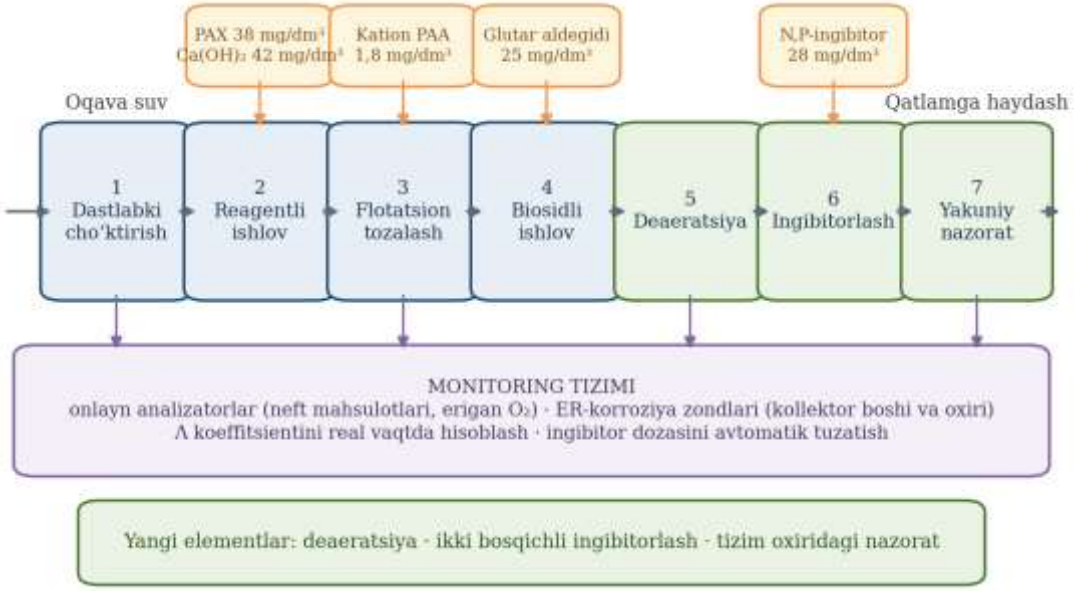
bunda birinchi had neft plyonkasining himoya ta’sirining yo‘qolishini, ikkinchi had esa tozalash jarayoni kiritadigan yangi korroziyaviy omillarning to‘planishini tavsiflaydi. Identifikatsiya natijasida K_1 = 0,633 mm/yil, β = 0,01901 $\%^{-1}$, K_2 = $2{,}302 \cdot 10^{-4}$ mm/yil, γ = 1,820 qiymatlari olindi (R^2 = 0,999). Darajali ko‘rsatkichning birdan katta bo‘lishi yangi omillarning additiv emas, balki o‘zaro kuchaytiruvchi ta’sir ko‘rsatishini bildiradi. dK*/dE = 0 shartidan E_{opt} = 30,0 % va K*_min = 0,470 mm/yil kelib chiqadi.

Omillarni alohida-alohida «o‘chirish» yo‘li bilan ularning hissasi ajratildi: erigan kislorod 34,7 %, koagulyant kiritgan sulfat-ionlar 25,3 %, neft plyonkasining yo‘qolishi 23,0 %, qoldiq oksidlovchilar 11,2 %. Birinchi ikki omil texnologik yo‘l bilan bartaraf etiladi, uchinchisi esa faqat ingibitorning adsorbsion plyonkasi bilan kompensatsiyalanishi mumkin.

Kompleks texnologik sxema

Olingan natijalar asosida yetti bosqichli kompleks sxema ishlab chiqildi (1-rasm). Undagi uchta element an’anaviy sxemalarda mavjud emas: vakuum-deaeratsiya, ikki bosqichli ingibitorlash va tizimning yakuniy nuqtasidagi nazorat.

Bosqichlarning ketma-ketligi funksional jihatdan asoslangan: biosid deaeratsiyadan oldin, deaeratsiya esa ingibitorlashdan oldin joylashtirilgan.

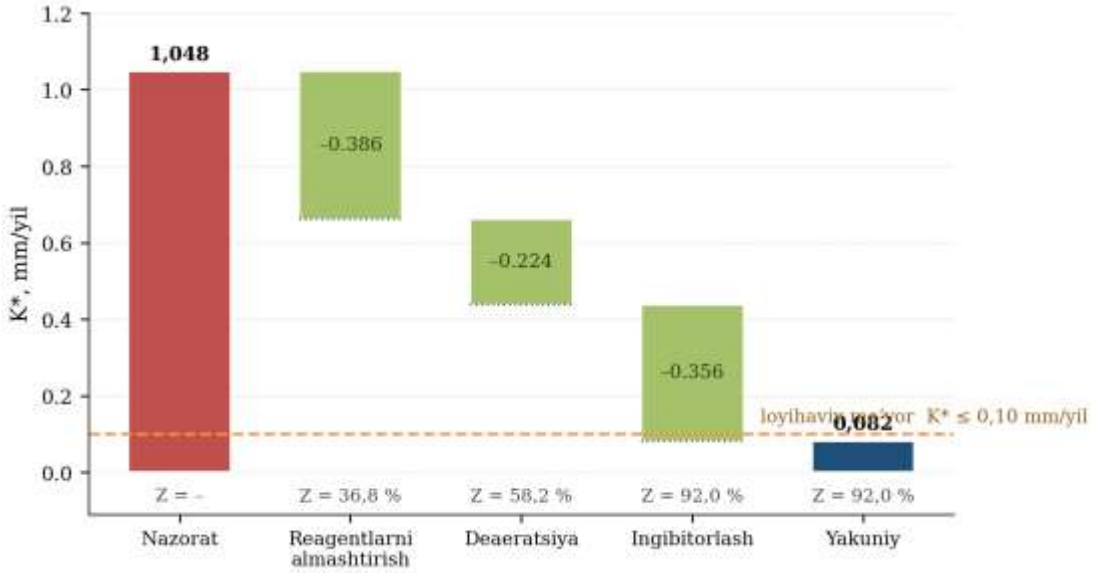


1-rasm. Kompleks tozalash-himoya texnologik sxemasi

Reagentlar ikki mezon – tozalash samaradorligi va korroziyaviy «narx» bo‘yicha tanlandi. Bir mezonli baholashda temir(III) xlorid eng yaxshi natija beradi, ikki mezonli baholashda esa u oxirgi o‘ringa tushadi va polialyuminiy xlorid afzal bo‘lib chiqadi. pH tuzatgich sifatida so‘ndirilgan ohak tanlandi: u ingibitor bilan sinergetik juftlik hosil qilib, himoya darajasini 90,1 dan 93,4 % gacha oshiradi va qo‘shimcha xarajat talab qilmaydi.

Yarim sanoat sinovlari

Unumdorligi 6,0 m³/soat bo‘lgan qurilmada 8 oy davomida to‘rt bosqichli sinovlar o‘tkazildi. Har bir chora-tadbirning hissasi ajratildi (2-rasm): reagentlarni almashtirish korroziya tezligini 36,8 % ga, deaeratsiyani qo‘shish yana 21,4 foiz punktga, ingibitorlash yana 33,8 foiz punktga kamaytirdi.



2-rasm. Chora-tadbirlarning korroziya tezligiga bosqichma-bosqich ta’siri

2-jadval

Yarim sanoat sinovlarining natijalari

Ko‘rsatkich	Nazorat	To‘liq kompleks	Me’yor
Korroziya tezligi K*, mm/yil	1,048	0,082	≤ 0,10
Pitting koeffitsienti P_k	4,6	2,8	–
Tozalash samaradorligi E, %	94,8	89,6	≥ 88
Neft mahsulotlari, mg/dm³	13,4	18,6	≤ 20
Muallaq moddalar, mg/dm³	21,6	23,8	≤ 30
Umumiy temir, mg/dm³	3,8	0,68	≤ 1,0
Erigan kislorod, mg/dm³	3,6	0,24	≤ 0,5
Tsikl koeffitsienti Λ	1,31	0,16	< 0,3

Diqqatga sazovor jihat shundaki, tozalash samaradorligi 94,8 dan 89,6 % gacha ataylab pasaytirilgan bo‘lsa-da, barcha me’yoriy ko‘rsatkichlar bajarildi, korroziya bilan bog‘liq ko‘rsatkichlar esa keskin yaxshilandi. Bu ishning asosiy amaliy xulosasini tasdiqlaydi: tozalash chuqurligini me’yor bilan cheklab, ozod bo‘lgan resursni korroziyaga qarshi himoyaga yo‘naltirish tizim ishonchliligini bir tartibga oshiradi.

Texnik-iqtisodiy samaradorlik

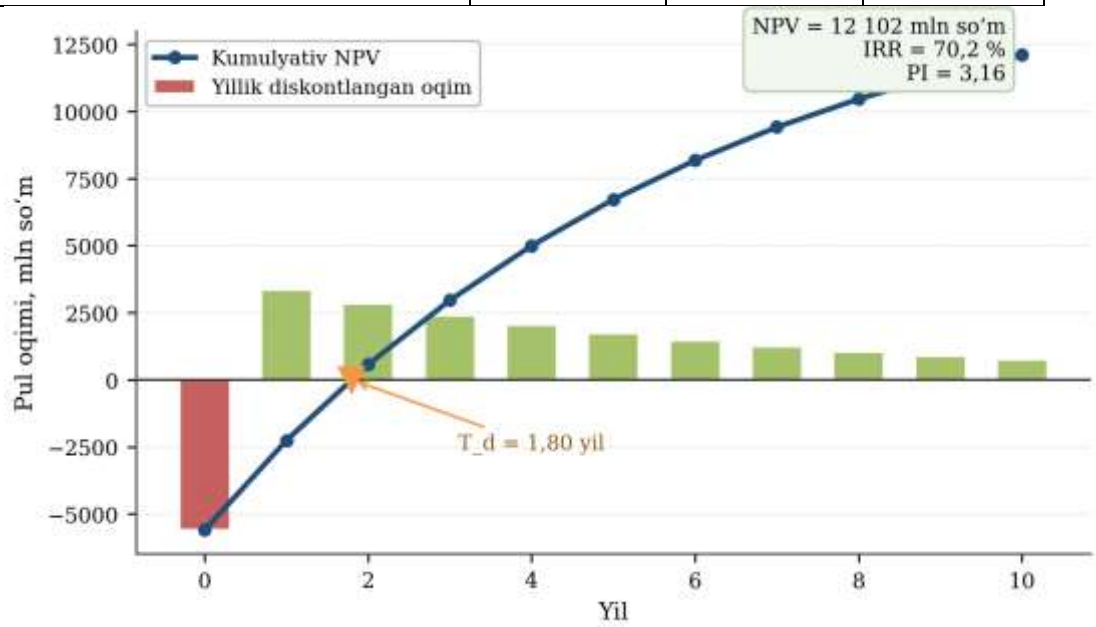
Unumdorligi 1,2 mln m³/yil bo‘lgan tizim uchun bajarilgan hisob natijalari 3-jadvalda keltirilgan. Samaraning 94,1 % i ikkita yuqori ishonchli manbadan – ta’mirlash ishlarining kamayishi va uskunalar almashtirishning qisqarishidan shakllanadi.

3-jadval

Yillik ekspluatatsion xarajatlarning taqqoslanishi, mln so‘m

Xarajat moddasi	An’anaviy	Kompleks	Farq

Xarajat moddasi	An’anaviy	Kompleks	Farq
Reagentlar (koagulyant, flokulyant, pH)	1240	840	–400
Biosid va korroziya ingibitori	–	778	+778
Elektr energiyasi	494	583	+89
Ta’mirlash-tiklash ishlari	2840	480	–2360
Quvur va uskunalarni almashtirish	1960	230	–1730
Avariya va ekologik to‘lovlar	640	82	–558
Monitoring tizimiga servis	–	240	+240
JAMI	7174	3233	–3941



3-rasm. Loyihaning diskontlangan pul oqimi va kumulyativ NPV

Kapital qo‘yilmalar 5 600 mln so‘mni, yillik sof tejamkorlik 3 941 mln so‘mni tashkil etadi. Diskontlangan qoplanish muddati (i = 18 %) 1,80 yil, sof joriy qiymat 12 102 mln so‘m, ichki foyda normasi 70,2 %, rentabellik indeksi 3,16. Sezuvchanlik tahlili eng noqulay stsenariyda ham (kapital +30 %, korroziya samarasi –30 %) qoplanish muddati 3,7 yildan oshmasligini ko‘rsatdi.

XULOSA

1. Tozalash samaradorligi bilan korroziya tezligi o‘rtasidagi bog‘liqlik ekstremal xarakterga ega: E = 30,0 % da minimum kuzatiladi, E = 95,6 % da esa korroziya tezligi tozalashsiz holatdagidan 1,62 barobar, minimal qiymatdan 2,19 barobar yuqori bo‘ladi.

2. Bog‘liqlik ikki komponentli additiv model bilan R^2 = 0,999 aniqlikda tavsiflanadi; γ = 1,820 darajali ko‘rsatkichi yangi korroziyaviy omillarning o‘zaro kuchaytiruvchi ta’sirini aks ettiradi.

3. Ishlab chiqilgan yetti bosqichli kompleks sxema yarim sanoat sinovlarida korroziya tezligini 12,8 barobar kamaytirdi, tozalash ko‘rsatkichlari esa me’yoriy talablar doirasida saqlanib qoldi; tsikl koeffitsienti Λ 1,31 dan 0,16 gacha pasaydi.

4. Loyihaning diskontlangan qoplanish muddati 1,80 yil, yillik iqtisodiy samara 3 941 mln so‘m, ichki foyda normasi 70,2 % ni tashkil etadi.

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UO‘K 628.14:621.671

QARSHI SHAHRI SUV TA’MINOTI NASOS PARKINING ENERGIYA SAMARADORLIGINI CHASTOTALI BOSHQARUV ASOSIDA OSHIRISH

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ANNOTATSIYA

Maqolada Qarshi shahri markazlashtirilgan suv ta’minoti tizimidagi nasos parkining tarkibi, pasport ko‘rsatkichlari va energiya samaradorligi tahlil qilingan hamda chastotali boshqaruvni (VFD) joriy etishdan olinadigan energiya tejash miqdori asoslangan. «Qashqadaryo suv ta’minoti» AJ Qarshi shahar bo‘limining birlamchi hujjatlari asosida 39 ta inshootdagi 164 ta nasos agregati (156 tasi soz, 8 tasi nosoz) inventarizatsiya qilindi. Tizimda eng ko‘p tarqalgan NSC200-150-460 rusumli nasos misolida nasos va quvur tavsifnomalarining kesishishi bo‘yicha ish nuqtasi aniqlanib, o‘xshashlik (affinlik) qonunlari asosida beshta chastota rejimi uchun val quvvati hisoblandi. Nisbiy aylanish chastotasini 8 % ga (s = 0,92 gacha) kamaytirish agregat quvvatini 23,9 % ga kamaytirishi, bunda nasosning foydali ish koeffitsiyenti 0,77 dan 0,75 gacha, ya’ni deyarli o‘zgarmasligi ko‘rsatildi. Tizim miqyosida hisoblangan tejash 17,7 % ni tashkil etadi; ehtiyotkorlik prinsipi bo‘yicha 14,7 % qabul qilinganda yillik tejash 503,9 ming kVt·soatga yoki 0,50 mlrd so‘mga teng bo‘ladi.

Kalit so‘zlar: *suv taqsimlash tarmog‘i, nasos agregati, chastotali boshqaruv, o‘xshashlik qonunlari, ish nuqtasi, energiya samaradorligi, foydali ish koeffitsiyenti, energiya tejash, Qarshi shahri.*

АННОТАЦИЯ

В статье проанализированы состав, паспортные показатели и энергетическая эффективность насосного парка централизованной системы водоснабжения города Карши, а также обоснована величина экономии электроэнергии от внедрения частотного регулирования (ЧРП). По первичным документам Каршинского городского отделения АО «Кашкадарьё сув таъминоти» инвентаризованы 164 насосных агрегата на 39 сооружениях (156 исправных, 8 неисправных). На примере наиболее распространённого насоса

NSC200-150-460 рабочая точка определена как пересечение характеристик насоса и трубопровода, а мощность на валу рассчитана для пяти режимов частоты по законам подобия. Показано, что снижение относительной частоты вращения на 8 % (до s = 0,92) уменьшает потребляемую мощность агрегата на 23,9 % при практически неизменном КПД (с 0,77 до 0,75). Расчётная экономия по системе составляет 17,7 %; при консервативно принятом значении 14,7 % годовая экономия равна 503,9 тыс. кВт·ч, или 0,50 млрд сумов.

Ключевые слова: *водораспределительная сеть, насосный агрегат, частотное регулирование, законы подобия, рабочая точка, энергоэффективность, КПД, экономия электроэнергии, город Карши.*

ABSTRACT

The paper analyses the composition, nameplate parameters and energy efficiency of the pumping fleet of the centralised water supply system of Karshi city and substantiates the electricity saving achievable through variable-frequency drive (VFD) control. Based on the primary records of the Karshi city branch of «Qashqadaryo suv ta'minoti» JSC, 164 pump units at 39 facilities were inventoried (156 serviceable, 8 out of order). For the most widespread unit, NSC200-150-460, the operating point was determined as the intersection of the pump and system curves, and the shaft power was computed for five speed settings using the affinity laws. Reducing the relative speed by 8 % (to s = 0.92) lowers the unit power by 23.9 % while the pump efficiency remains virtually unchanged (0.77 to 0.75). The system-wide computed saving is 17.7 %; with the conservatively adopted value of 14.7 % the annual saving equals 503.9 thousand kWh, or 0.50 billion soums.

Keywords*: water distribution network, pump unit, variable-frequency drive, affinity laws, operating point, energy efficiency, pump efficiency, energy saving, Karshi city.*

KIRISH

Suv ta'minoti kommunal xo'jalikning eng energiya talab qiluvchi tarmoqlaridan biridir. Qurg'oqchil mintaqalarda, jumladan Markaziy Osiyoda, yer usti suv manbalari cheklangan bo'lib, suvning katta qismi sezilarli chuqurlikdan ko'tariladi; natijada suvni olish, tozalash va taqsimlashga sarflanadigan elektr energiyasi korxona ekspluatatsiya xarajatlarining ustuvor qismini tashkil etadi [1, 2]. Shu bois nasos uskunalarining ish rejimini optimallashtirish nafaqat texnik, balki bevosita iqtisodiy masaladir.

O'zbekiston Respublikasi Prezidentining 2022-yil 24-maydagi PQ-257-son va 2023-yil 24-oktabrdagi PQ-343-son qarorlarida ichimlik suv ta'minoti tizimlarida

energiya sarfini kamaytirish, nasos uskunalarini zamonaviylashtirish hamda avtomatlashtirilgan boshqaruv tizimlarini joriy etish vazifalari belgilangan [3, 4]. Amaldagi QMQ 2.04.02-19 qurilish me'yori ham suv bosimi va sarfini avtomatlashtirilgan boshqarish vositalarini qo'llashni talab etadi [5].

Nasos stansiyalarida energiya isrofining ikkita asosiy sababi mavjud. Birinchisi - uskunaning texnik eskirishi, ya'ni ish g'ildiragining yeyilishi, zichlagichlardagi yo'qotishlar va dvigatelning past foydali ish koeffitsiyenti. Ikkinchisi - agregatning noqulay rejimda ishlatilishi: nasos doimiy aylanish chastotasida, iste'mol grafigidan qat'i nazar bir xil napor yaratib ishlaydi va ortiqcha napor zadvijkada bo'g'iladi. Ikkinchi sabab ko'pincha e'tibordan chetda qoladi, holbuki uni bartaraf etish kapital xarajat talab qiladigan uskuna almashtirishdan ancha arzonga tushadi [6, 7].

Chastotali boshqaruvning nazariy asosini o'xshashlik (affinlik) qonunlari tashkil etadi: nasos unumdorligi aylanish chastotasiga to'g'ri proporsional, napor uning kvadratiga, val quvvati esa kubiga proporsionaldir. Shu sababli chastotani nisbatan kichik miqdorda kamaytirish quvvat sarfini sezilarli darajada kamaytiradi. Bu qonuniyat adabiyotda keng o'rganilgan [8-10], biroq statik napor mavjud bo'lgan real tizimlarda ish nuqtasi sof affinlik parabolasi bo'ylab siljimaydi va tejash miqdorini faqat kubik qoidaning o'zi bilan baholash xatolikka olib keladi.

Mazkur maqolaning maqsadi - Qarshi shahri suv ta'minoti tizimi misolida nasos parkining haqiqiy tarkibi va pasport ko'rsatkichlaridan kelib chiqib, chastotali boshqaruvdan olinadigan energiya tejash miqdorini nasos va tizim tavsifnomalarining o'zaro joylashuvini hisobga olgan holda asoslashdir. Tadqiqotning amaliy ahamiyati shundaki, olingan natijalar korxona uchun sarmoya kiritish ustuvorligini belgilash imkonini beradi.

Tadqiqot obyekti, dastlabki ma'lumotlar va usullar

Tadqiqot obyekti - Qarshi shahri markazlashtirilgan ichimlik suv ta'minoti tizimining nasos xo'jaligi. Shahar Qashqadaryo viloyatining ma'muriy markazi bo'lib, aholisi 321,7 ming kishini tashkil etadi; tarmoqqa sutkasiga o'rtacha 72,5 ming m³ suv uzatiladi. Dastlabki ma'lumotlar sifatida «Qashqadaryo suv ta'minoti» AJ Qarshi shahar bo'limining ikkita birlamchi hujjati olindi: «Tasarrufida bo'lgan suv olish va uzatish inshootlaridagi nasos agregatlari to'g'risida ma'lumot» hamda nasos stansiyalarining oylik elektr energiyasi sarfi to'g'risidagi hisobot. Bundan tashqari, dala tekshiruvi davomida nasos va dvigatel pasport yorliqlarining suratlari olindi va ular asosida agregatlarning haqiqiy ko'rsatkichlari aniqlashtirildi.

Nasosning quvvati (1) ifoda bilan aniqlanadi:

$$N = \rho \cdot g \cdot Q \cdot H / \eta \qquad (1)$$

bu yerda: N - val quvvati, Vt; ρ - suvning zichligi, kg/m³; g - erkin tushish tezlanishi, m/s²; Q - unumdorlik, m³/s; H - napor, m; η - nasosning foydali ish koeffitsiyenti.

Nasosning Q-H tavsifnomasi eng yaxshi ish nuqtasi (BEP) va yopiq zadvijkadagi napor bo‘yicha kvadratik ko‘rinishda approksimatsiya qilindi:

$$H = s^2 \cdot H_0 - a \cdot Q^2 \qquad (2)$$

bu yerda: H_0 - yopiq zadvijkadagi napor (nominal chastotada), m; s - nasosning nisbiy aylanish chastotasi; a - tavsifnoma koeffitsiyenti.

Tizim (quvur) tavsifnomasi statik napor va gidravlik qarshilikdan iborat:

$$H\_c = H\_st + k \cdot Q^2 \qquad (3)$$

bu yerda: H_st - statik (geodezik va erkin) napor, m; k - tarmoqning gidravlik qarshilik koeffitsiyenti, s²/m⁵.

Nasosning haqiqiy ish nuqtasi (2) va (3) tavsifnomalarning kesishishi sifatida topiladi. Chastotali boshqaruvda parametrlar o‘xshashlik qonunlariga bo‘ysunadi: Q ~ s, H ~ s², N ~ s³. Biroq statik napor mavjud bo‘lganda ish nuqtasi sof affinlik parabolasi bo‘ylab emas, balki tizim tavsifnomasi bo‘ylab siljiydi, shu sababli har bir chastota qiymati uchun kesishish nuqtasi alohida hisoblandi. Hisoblar Python muhitida bajarildi; tarmoqning gidravlik modeli EPANET 2.2 hisoblash yadrosi asosida, WNTR kutubxonasi yordamida qurildi [11, 12].

Hisobda quyidagi qiymatlar qabul qilindi: H_0 = 60 m, Q_BEP = 320 m³/soat, H_BEP = 50 m, H_st = 25 m. Statik napor qiymati Qarshi shahri relyefidan kelib chiqib belgilandi: o‘lchov nuqtalarining geodezik balandliklari 373,5 m dan 394,9 m gacha oraliqda o‘zgaradi, ya’ni shahar bo‘yicha balandliklar farqi 21,4 m ni tashkil etadi.

1-jadval. Qarshi shahri tizimida qo‘llanilayotgan asosiy nasos agregatlarining pasport ko‘rsatkichlari

Nasos markasi	Q, m³/soat	H, m	n, ayl/min	η, %	Dvigatel quvvati, kVt	Qo‘llanish sohasi
NSC200-150-460 (CNP)	320	50	1 490	77	75	Asosiy uzatish inshootlari
D320-50	320	50	1 450	—	55-75	Bosh suv inshootlari
NIS100-65-200 (CNP)	100	50	2 950	—	30	O‘rta va kichik inshootlar
K100-65-200	40-140	40-60	2 900	≈ 70	18,5-30	Kichik zona nasoslari
K80-50, K100-80-160	50-100	32-50	2 900	≈ 65-70	15-30	Mahalliy ko‘tarish

CDL/CDLF turkumi	22-150	30-40	2 900	—	15-37	Bosim oshirish, ko‘p bosqichli
GRUNDFOS LS350-450 SINL	—	—	1 480	—	45-190	3-balandlik nasos stansiyasi

Natijalar va ularning tahlili

Nasos parkining tarkibi va texnik holati. Birlamchi hujjatga ko‘ra Qarshi shahar bo‘limi tasarrufida jami 164 ta nasos agregati mavjud bo‘lib, ularning 156 tasi soz, 8 tasi nosoz holatda; shundan 24 tasi gorizontal turdagi nasoslardir. Agregatlar 39 ta suv olish va uzatish inshooti bo‘ylab taqsimlangan. Nosoz agregatlar ulushi 4,9 % ni tashkil etadi, bu suv ta’minoti korxonalari uchun qoniqarli ko‘rsatkich hisoblanadi.

Nasos parkining eng muhim xususiyati - uning nisbatan yangiligi. O‘rnatish yillari 2002-yildan 2025-yilgacha oraliqni qamrab olsa-da, agregatlarning katta qismi 2023-2025-yillarda o‘rnatilgan. Bu holat tadqiqot uchun printsipial ahamiyatga ega: energiya isrofining asosiy manbai nasoslarning texnik eskirishi emas, balki ularning ish rejimidir. Boshqacha aytganda, tizimda zamonaviy va yuqori foydali ish koeffitsiyentiga ega nasoslar noqulay rejimda ishlatilmoqda; bu esa chastotali boshqaruvni joriy etishning samarasini yanada oshiradi, chunki uskunani almashtirish emas, balki uni boshqarish tizimini qo‘shish kifoya.

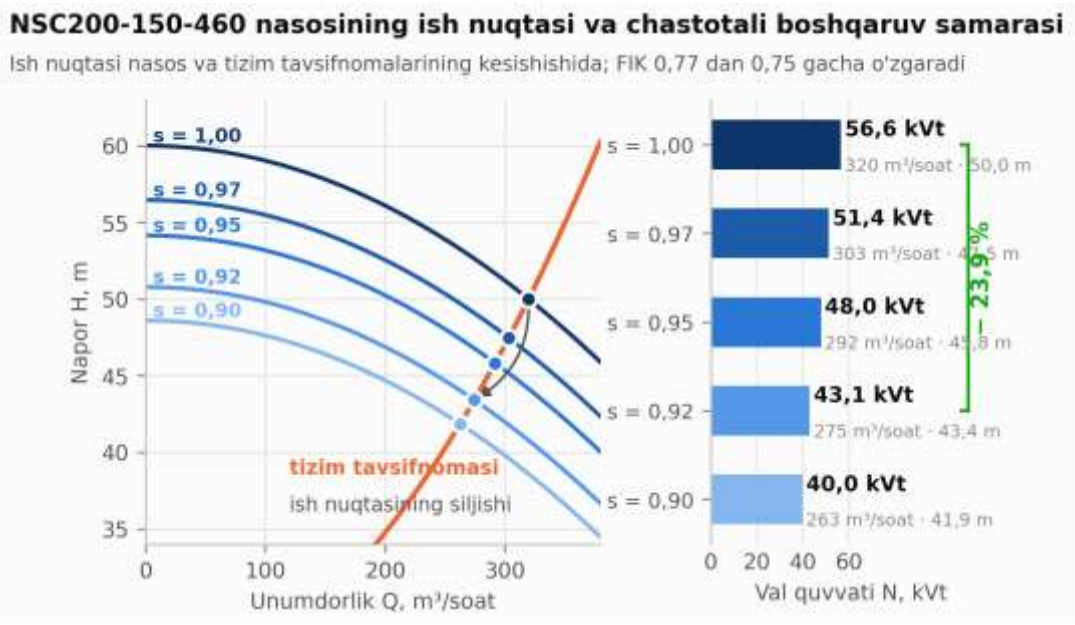
Tizimda qo‘llanilayotgan asosiy nasos markalarining pasport ko‘rsatkichlari 1-jadvalda keltirilgan. Eng ko‘p tarqalgan va tizimning asosiy yukini ko‘taruvchi marka - NSC200-150-460 rusumli, bir bosqichli, ikki tomonlama so‘rishli markazdan qochma nasosdir. Dala tekshiruvida olingan pasport yorliqlariga ko‘ra ushbu agregat quyidagi ko‘rsatkichlarga ega: unumdorlik 320 m^3/soat, napor 50 m, aylanishlar chastotasi 1 490 ayl/min, foydali ish koeffitsiyenti 77 %, kavitatsiya zaxirasi (NPSHr) 2,5 m, ish g‘ildiragi diametri 342 mm, quvvat 75 kVt. Uni harakatga keltiruvchi IE2-280S-4 rusumli asinxron dvigatelning quvvati 75 kVt, kuchlanishi 380 V, toki 139 A, quvvat koeffitsiyenti cos φ = 0,87, foydali ish koeffitsiyenti 94,0 %, himoya darajasi IP55.

(1) ifodaga muvofiq eng yaxshi ish nuqtasidagi val quvvati N = 1 000 · 9,81 · (320/3 600) · 50 / 0,77 = 56,6 kVt ni tashkil etadi. Dvigatelning nominal quvvati 75 kVt bo‘lgani bois quvvat zaxirasi 32 % ga teng. Bunday zaxira, bir tomondan, agregatning ishonchli ishlashini ta’minlasa, ikkinchi tomondan, uni chastotali boshqaruv orqali kengroq oraliqda rostlash imkoniyati borligini ko‘rsatadi.

Ish nuqtasi va chastotali boshqaruv samarasi. (2) va (3) tavsifnomalarning kesishishi bo‘yicha beshta chastota rejimi uchun ish nuqtasi va val quvvati hisoblandi; natijalar 2-jadvalda va 1-rasmda keltirilgan.

2-jadval. NSC200-150-460 nasosining turli aylanish chastotalaridagi ish nuqtasi va quvvat sarfi

Nisbiy chastotas	Unumdorlik Q, m³/soat	Napor H, m	FIK η	Val quvvati N, kVt	Energiya tejash, %
1,00 (nominal)	320,0	50,0	0,770	56,6	—
0,97	303,4	47,5	0,764	51,4	9,3
0,95	292,0	45,8	0,760	48,0	15,3
0,92	274,7	43,4	0,754	43,1	23,9
0,90	262,8	41,9	0,750	40,0	29,4



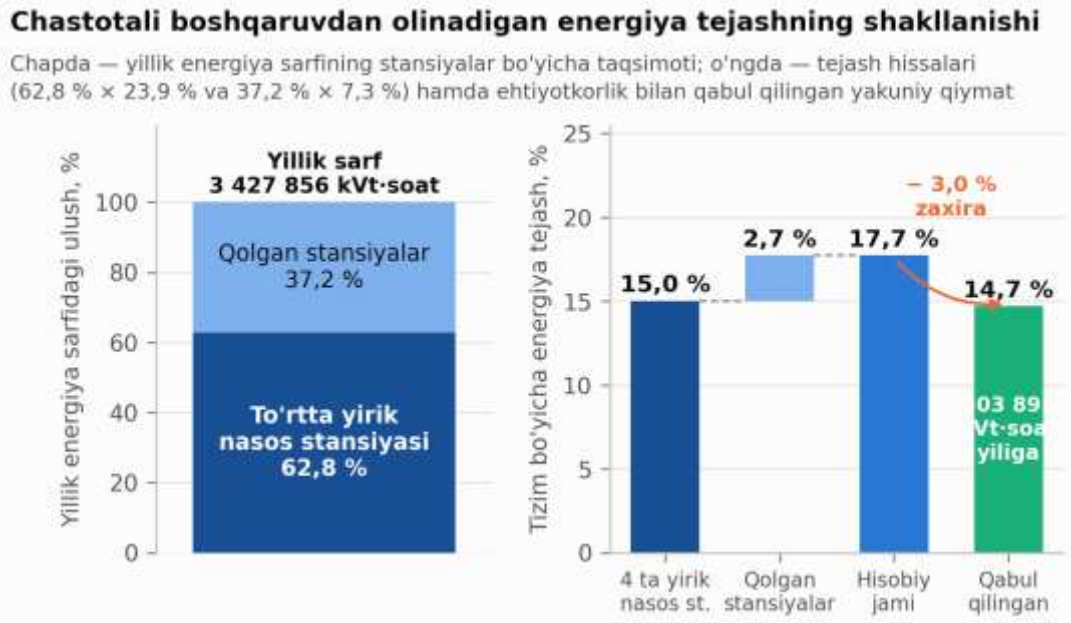
1-rasm. NSC200-150-460 nasosining ish nuqtasi va chastotali boshqaruv samarasi: chapda - nasos va tizim tavsifnomalarining kesishishi, o‘ngda - val quvvatining chastotaga bog‘liqligi

2-jadvaldan ko‘rinadiki, aylanish chastotasini atigi 8 % ga (s = 0,92 gacha) kamaytirish agregat quvvati sarfini 23,9 % ga kamaytiradi; bunda napor 50 m dan 43,4 m gacha tushadi, unumdorlik esa 320 dan 274,7 m³/soatgacha kamayadi. Bunday keskin samara quvvatning chastotaga kubik bog‘liqligi bilan izohlanadi. Muhim jihat shundaki, chastota kamayganda ish nuqtasi eng yaxshi samaradorlik zonasidan uzoqlashmaydi va nasosning foydali ish koeffitsiyenti deyarli o‘zgarishsiz - 0,77 dan 0,75 gacha - qoladi. Aynan shu holat chastotali boshqaruvni zadvijka bilan bo‘g‘ish usulidan tubdan ustun qiladi: bo‘g‘ishda ortiqcha napor foydasiz gidravlik qarshilikda so‘nadi va nasos o‘z tavsifnomasi bo‘ylab past unumdorlik tomonga siljib, foydali ish koeffitsiyentini yo‘qotadi.

Shuni ta’kidlash lozimki, chastotani 0,90 dan pastga tushirish maqsadga muvofiq emas: birinchidan, napor statik naporga (25 m) yaqinlashib boradi va

unumdorlikning keskin pasayishi kuzatiladi; ikkinchidan, past chastotalarda dvigatelning sovishi yomonlashadi hamda chastota o‘zgartkichning garmonik buzilishlari ortadi. Shu sababli amaliy ish oralig‘i sifatida s = 0,90-0,95 tavsiya etiladi.

Tizim miqyosidagi energiya tejash. Bitta agregat uchun olingan natijani butun tizimga keltirish uchun stansiyalarning energiya iste’molidagi ulushi hisobga olindi. Chastotali boshqaruv joriy etilishi rejalashtirilgan to‘rtta yirik nasos stansiyasi tizim energiya iste’molining 62,8 % ini tashkil etadi; ularda s = 0,92 rejimida 23,9 % tejash olinadi, bu tizim bo‘yicha 15,0 % ni beradi. Qolgan stansiyalarda esa faqat uzatiladigan suv hajmining kamayishi hisobiga 7,3 % tejash yuzaga keladi, ya’ni tizim bo‘yicha yana 2,7 %. Jami hisoblangan tejash 17,7 % ni tashkil etadi (1-rasm, 2-rasm).

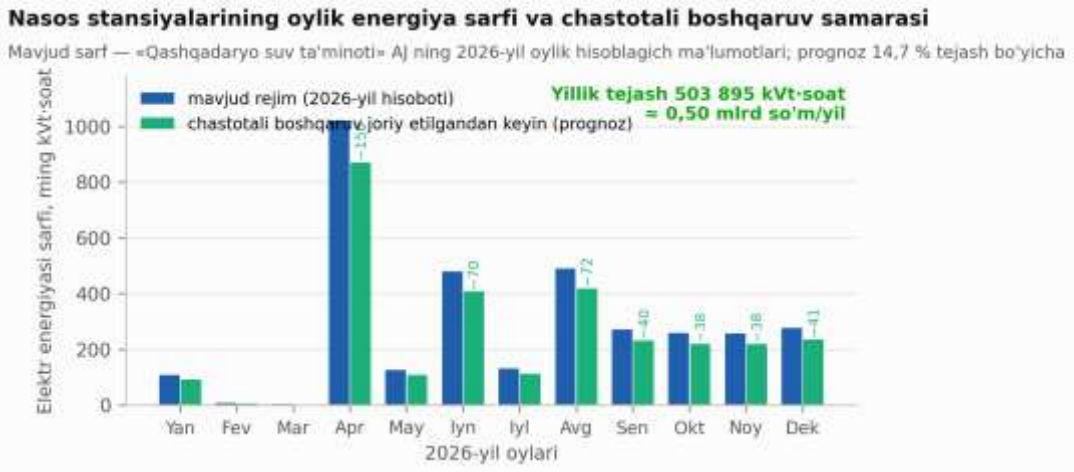


2-rasm. Chastotali boshqaruvdan olinadigan energiya tejashning shakllanishi: stansiyalarning energiya iste’molidagi ulushi va tejash hissalari

Keyingi hisob-kitoblarda energiya tejash ko‘rsatkichi 14,7 % darajasida, ya’ni pasport tavsiflari bo‘yicha olingan qiymatdan 3,0 % ga pastroq qabul qilindi. Bunday ehtiyotkor yondashuv ikki sababga asoslanadi. Birinchidan, barcha stansiyalarni bir vaqtda s = 0,92 rejimiga o‘tkazish amalda mumkin emas - joriy etish bosqichma-bosqich amalga oshiriladi. Ikkinchidan, iste’molning sutkalik notekisligi tufayli maksimal iste’mol soatlarida chastotani kamaytirish imkoniyati cheklangan: bu soatlarda nasos nominal rejimga yaqin ishlashi kerak. Shunday qilib, pasport ma’lumotlari asosidagi mustaqil hisob qabul qilingan tejash ko‘rsatkichining asossiz oshirilmaganini, aksincha zaxira bilan belgilanganini tasdiqlaydi.

Oylik dinamika va iqtisodiy baho. Korxona hisoboti bo‘yicha nasos stansiyalarining yillik elektr energiyasi sarfi 3 427 856 kVt·soatni, unga sarflangan mablag‘ esa 3 314,0 mln so‘mni tashkil etadi. 14,7 % tejash yillik hisobda 503,9

ming kVt·soatga yoki amaldagi 1 000 so‘m/kVt·soat tarifi bo‘yicha 0,50 mlrd so‘mga teng bo‘ladi (3-rasm). Solishtirish uchun: bu mablag‘ o‘rtacha quvvati 75 kVt bo‘lgan yangi nasos agregatlarining o‘nlab donasini sotib olish uchun yetarli.



3-rasm. Nasos stansiyalarining oylik energiya sarfi va chastotali boshqaruv joriy etilgandan keyingi prognoz

3-rasmdan yana bir muhim jihat ko‘rinadi: oylik sarfning o‘zgaruvchanlik koeffitsiyenti 98 % ni tashkil etadi, ya’ni oylar bo‘yicha qayd etilgan sarf texnologik jihatdan izohlab bo‘lmaydigan darajada keskin farq qiladi. Xususan, fevral va mart oylarida qayd etilgan sarf (mos ravishda 6 661 va 3 182 kVt·soat) real ehtiyojdan o‘nlab barobar kam, aprel oyidagi 1 021 076 kVt·soat esa yillik sarfning 29,8 % ini bir oyda qamrab oladi. Bu hisob-o‘lchov va hisobot tizimidagi uzilishlarni ko‘rsatadi: ayrim oylarning sarfi keyingi oyga o‘tkazib yozilgan. Shu bois chastotali boshqaruvni joriy etish bilan bir vaqtda nasos stansiyalarida energiya hisobini avtomatlashtirish - telemetriya va SCADA tizimlarini o‘rnatish - zarur, aks holda erishilgan tejashni hujjatlashtirib bo‘lmaydi.

MUHOKAMA

Olingan natijalar xalqaro amaliyot bilan yaxshi mos keladi. A. Marchi, A. Simpson va N. Ertugrul tomonidan o‘tkazilgan tadqiqotda o‘zgaruvchan tezlikli nasoslarning samaradorligi tahlil qilinib, tezlikni kamaytirishda umumiy foydali ish koeffitsiyentining saqlanib qolishi shart ekanligi ko‘rsatilgan [8]. C.X. Briceño-León va hammualliflar turli boshqaruv strategiyalarini taqqoslab, statik napor yuqori bo‘lgan tizimlarda chastotali boshqaruvning samarasi kamayishini aniqlaganlar [9]. Bizning holatda statik napor 25 m ni, ya’ni nominal napor (50 m) ning yarmini tashkil etadi; aynan shu sababli tejash sof kubik qoidadan (s = 0,92 uchun 22,1 %) biroz yuqori (23,9 %) chiqdi, chunki chastota kamayganda unumdorlik ham kamayadi va quvvat ikki omil hisobiga pasayadi.

Shu bilan birga, chastotali boshqaruvning eng katta samarasi u bosim rejimini boshqarish bilan birgalikda qo‘llanilganda olinadi. Ortiqcha bosim nafaqat energiya

isrofiga, balki suv yo‘qotishlarining ortishiga ham olib keladi: bosim va oqib chiqishlar orasidagi bog‘liqlik FAVAD kontseptsiyasi bo‘yicha darajali funksiya bilan ifodalanadi va Qarshi shahri tarmog‘i uchun eksperimental aniqlangan N_1 ko‘rsatkichi 1,205 ga teng [13, 14]. Demak bosimni 20 % ga pasaytirish suv yo‘qotishlarini 24 % ga kamaytiradi. Nasos chastotasini kamaytirish esa aynan shu bosim pasayishini keltirib chiqaradi, ya’ni bitta tadbir bir vaqtning o‘zida ikki turdagi yo‘qotishni kamaytiradi [15].

Tadqiqotning cheklovlari sifatida quyidagilarni qayd etish lozim. Birinchidan, hisob barqaror gidravlik rejim uchun bajarilgan; o‘tkinchi jarayonlar va gidravlik zarba modellashtirilmagan. Ikkinchidan, nasos tavsifnomasi ikki nuqta bo‘yicha approksimatsiya qilingan - to‘liq zavod tavsifnomasi mavjud bo‘lganda aniqlik ortadi. Uchinchidan, chastota o‘zgartkichning o‘z yo‘qotishlari (odatda 2-4 %) hisobga olinmagan; ular hisobga olinsa, sof tejash bir necha foizga kamayadi, biroq bu qabul qilingan 3,0 % zaxira doirasida qoladi.

XULOSALAR

1. Qarshi shahri suv ta’minoti tizimida 39 ta inshootda jami 164 ta nasos agregati mavjud bo‘lib, ularning 95,1 % i soz holatda va katta qismi so‘nggi uch yilda o‘rnatilgan. Demak energiya isrofining asosiy sababi uskunaning eskirishi emas, balki uning boshqarilmaydigan ish rejimidir.

2. Eng ko‘p tarqalgan NSC200-150-460 rusumli nasos uchun nasos va tizim tavsifnomalarining kesishishi bo‘yicha aniqlangan ish nuqtasi tahlili shuni ko‘rsatdiki, nisbiy aylanish chastotasini 8 % ga kamaytirish val quvvatini 23,9 % ga kamaytiradi, bunda nasosning foydali ish koeffitsiyenti 0,77 dan 0,75 gacha, ya’ni atigi 2,6 % ga o‘zgaradi.

3. Stansiyalarning energiya iste’molidagi ulushi hisobga olinganda tizim bo‘yicha hisobiy tejash 17,7 % ni tashkil etadi. Bosqichma-bosqich joriy etish va iste’molning sutkalik notekisligi hisobga olinib, amaliy hisob-kitoblarga 14,7 % qiymati qabul qilindi; bu yillik hisobda 503,9 ming kVt·soat yoki 0,50 mlrd so‘m tejashni beradi.

4. Chastotali boshqaruvni joriy etish nasos stansiyalarida energiya hisobini avtomatlashtirish bilan birga olib borilishi kerak: mavjud oylik hisobot ma’lumotlarining o‘zgaruvchanlik koeffitsiyenti 98 % ga teng bo‘lib, bunday ma’lumotlar asosida erishilgan tejashni ishonchli hujjatlashtirib bo‘lmaydi.

5. Chastotali boshqaruv bosim zonalarini boshqarish bilan birgalikda qo‘llanilganda eng katta samara beradi, chunki bitta tadbir bir vaqtning o‘zida energiya sarfini va bosimga bog‘liq suv yo‘qotishlarini kamaytiradi.

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ALAN GAZ KONI MISOLIDA ISHLAB CHIQILGAN GIDRAVLIK HISOB USULLARINING AMALIY TATBIQI VA TEXNIK-IQTISODIY SAMARADORLIGI

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ANNOTATSIYA

Maqolada bosimga bog‘liq nolinear filtratsiya nazariyasi asosida ishlab chiqilgan gidravlik hisob usullarining Qashqadaryo viloyatidagi Alan gaz koni misolida amaliy tatbiqi va texnik-iqtisodiy samaradorligi tahlil qilingan. Quduqning mahsuldorlik egri chizig‘i (IPR) hisoblab chiqilgan va texnik-iqtisodiy optimal ishlash rejimi (Q_{opt}≈336 ming m³/kun) aniqlangan. Konni to‘liq o‘zlashtirish uchun optimal quduqlar soni (13 ta) texnik-iqtisodiy hisob-kitoblar asosida belgilangan. An'anaviy (klassik Darsi modeliga asoslangan) va taklif etilgan yondashuvlar bo‘yicha 10 yillik davrni qamrab oluvchi sof joriy qiymat (NPV) hisob-kitoblari solishtirilgan, natijada taklif etilgan yondashuv 5 mln AQSH dollari miqdorida yuqori NPV va 21% umumiy iqtisodiy samaradorlik oshishini ta'minlashi ko‘rsatilgan. Monte-Karlo simulyatsiyasi asosida iqtisodiy xatarlar baholangan, burg‘ilash xatarlarining 32% ga, jihozlar resursidan foydalanishning 15% ga yaxshilanishi asoslangan. Ekologik xavfsizlik jihatlari va konni Qashqadaryo viloyatidagi boshqa konlarga (Zevarda, Ko‘kdumaloq, Sho‘rtan) tatbiq etish imkoniyatlari ham yoritilgan.

Kalit so‘zlar: *gidravlik hisob-kitob, mahsuldorlik egri chizig‘i, optimal debit, sof joriy qiymat, texnik-iqtisodiy samaradorlik, Monte-Karlo simulyatsiyasi, Alan gaz koni.*

KIRISH

Neft-gaz konlarini o‘zlashtirishning iqtisodiy samaradorligi bevosita ularning gidravlik xususiyatlarini qanchalik to‘g‘ri bashorat qila olishimizga bog‘liq bo‘lib qoladi, chunki noaniq bashorat quduqlarni haddan tashqari yoki yetarlicha bo‘lmagan quvvat bilan loyihalashga, natijada esa moliyaviy yo‘qotishlarga olib keladi. Mazkur maqolaning maqsadi - bosimga bog‘liq nolinear filtratsiya nazariyasi asosida ishlab chiqilgan va eksperimental yo‘l bilan asoslangan gidravlik model yordamida Alan

gaz koni uchun amaliy hisob-kitoblarni bajarish, quduqlarni loyihalash va ishlatish bo‘yicha amaliy tavsiyalar shakllantirish, hamda taklif etilgan yondashuvning texnik-iqtisodiy va ekologik samaradorligini baholashdan iborat.

Ma'lumki, bosim rejimini hisobga olmagan noto‘g‘ri gidravlik hisob-kitoblar nafaqat iqtisodiy zarar, balki jiddiy ekologik xavflarni ham keltirib chiqarishi mumkin - bular jumladan nazoratsiz gaz otilib chiqishi (yuqori bosimli konlarda) yoki mahsuldorlikning keskin pasayishi (past bosimli konlarda). Shu sababli, ishlab chiqilgan gidravlik modelning amaliy tatbiqi va uning iqtisodiy hamda ekologik samaradorligini har tomonlama baholash muhim ilmiy-amaliy ahamiyat kasb etadi.

Mazkur tadqiqot O‘zbekiston Respublikasi fan va texnologiyalar rivojlanishining ustuvor yo‘nalishlaridan energetika, resurstejamkorlik texnologiyalari hamda tabiiy resurslardan oqilona foydalanish sohalariga tegishli bo‘lib, mamlakat yoqilg‘i-energetika majmuasi barqarorligini ta'minlashning ilmiy-amaliy asoslarini rivojlantirishga xizmat qiladi. Tadqiqot natijalari mamlakat energetika xavfsizligi strategiyasida belgilangan ichki gaz ta'minotini barqarorlashtirish vazifasiga hissa qo‘shadi.

Mavzuga oid adabiyotlar tahlili

Neft-gaz konlarini gidravlik hisob-kitoblar asosida optimal ishlatish masalalari jahon ilmiy adabiyotida keng yoritilgan. Ayniqsa, quduqning mahsuldorlik egri chizig‘i (Inflow Performance Relationship, IPR) tushunchasi va uni hisoblash usullari neft-gaz muhandisligining klassik vositalaridan biri hisoblanadi. N.F.Kozlov (1998) va A.I.Ponomarev (2000) o‘z tadqiqotlarida past o‘tkazuvchan va murakkab tuzilgan kollektorlarda quduqlarni loyihalashning texnik-iqtisodiy jihatlarini tahlil qilgan.

Shu bilan birga, mavjud adabiyotlarda gidravlik model aniqligining bevosita iqtisodiy natijalarga (sof joriy qiymat, iqtisodiy xatarlar) ta'sirini miqdoriy jihatdan bog‘lovchi kompleks tadqiqotlar nisbatan kam uchraydi. Ayniqsa, Monte-Karlo simulyatsiyasi kabi stoxastik usullarni gidravlik model aniqligi bilan iqtisodiy xatarlarni baholashni birlashtirgan holda qo‘llash, O‘zbekiston sharoitidagi konlar misolida amalda kam qo‘llanilgan bo‘lib, bu mazkur tadqiqotning ilmiy yangiligini belgilaydi.

Tadqiqot metodologiyasi

Tadqiqotda avvalgi bosqichlarda ishlab chiqilgan va eksperimental yo‘l bilan asoslangan gidravlik model asos qilib olindi. Amaliy hisob-kitoblar uchun quduqning mahsuldorlik egri chizig‘i (IPR) taklif etilgan model va klassik Darsi modeli bo‘yicha alohida-alohida hisoblanib, taqqoslandi. Texnik-iqtisodiy optimal ishlash rejimini aniqlash uchun daromad va xarajatlar (energiya sarfi, jihozlarning tezlashgan eskirishi) o‘rtasidagi farq - sof foyda - maksimal qiymatga erishadigan debit qidirildi.

Iqtisodiy samaradorlikni baholash uchun ikki stsenariy - an'anaviy (klassik Darsi modeliga asoslangan) va taklif etilgan (Forchheymer tuzatishi va dinamik filtratsion-sig‘im modeli bilan) yondashuvlar - bo‘yicha 10 yillik davrni qamrab oluvchi sof joriy qiymat (NPV) hisob-kitoblari amalga oshirildi. Iqtisodiy xatarlarni baholash uchun Monte-Karlo simulyatsiyasi (2000 tasodifiy stsenariy) qo‘llanildi, unda gaz narxining o‘zgaruvchanligi va texnik xarajatlarning tebranishi hisobga olindi.

Bundan tashqari, ikki yondashuvning turli bozor sharoitlaridagi (gaz narxi va diskont stavkasining o‘zgarishi) barqarorligini baholash uchun sezgirlik tahlili o‘tkazildi. Jihozlarni texnik xizmat ko‘rsatish xarajatlarini baholash uchun ikkala yondashuv bo‘yicha yillik xarajatlarning 10 yillik dinamikasi hisoblab chiqildi. Konni to‘liq o‘zlashtirish uchun zarur bo‘lgan quduqlar sonini aniqlash maqsadida, quduqlar sonining ortishi bilan umumiy NPV ning o‘zgarish tendensiyasi tahlil qilindi, bunda qatlamning cheklangan energetik salohiyati va kapital xarajatlarning o‘sishi ikki qarama-qarshi omil sifatida hisobga olindi.

Tahlil va natijalar

Mahsuldorlik egri chizig‘i va optimal ishlash rejimi

Ishlab chiqilgan hamda eksperimental yo‘l bilan asoslangan gidravlik model asosida, Alan gaz koni quduqlari uchun amaliy hisob-kitoblar bajarildi. Birinchi navbatda, quduqning mahsuldorlik egri chizig‘i (IPR) hisoblandi - bu egri chiziq quduq tubi bosimi va gaz debiti o‘rtasidagi bog‘liqlikni ifodalaydi hamda quduqni loyihalash va ishlatish rejimini tanlashning asosiy vositasi hisoblanadi.

Past depressiyalarda (yuqori quduq tubi bosimlarida) ikkala model natijalari deyarli mos keladi, biroq depressiya ortishi (debit oshishi) bilan farq sezilarli darajada kattalashadi - bu Forchheymer tipidagi nolinear qarshilikning yuqori filtratsiya tezliklaridagi ustuvor ta'sirini aks ettiradi. Bu farq amaliy jihatdan muhim: agar quduqni loyihalashda klassik Darsi modeli qo‘llanilsa, yuqori debit rejimlarida haqiqiy quduq tubi bosimi hisoblangandan past bo‘ladi, bu esa noto‘g‘ri texnologik qarorlarga (masalan, ortiqcha quvvatli kompressor tanlashga) olib kelishi mumkin. Hisoblash natijalariga ko‘ra, Alan koni sharoiti uchun optimal debit taxminan 336 ming m^3/kun ni tashkil etadi; bu qiymatdan yuqori debitlarda energiya sarfi va jihozlarga tushadigan yuklama ortishi hisobiga sof foyda pasaya boshlaydi.

Quduqlarni loyihalash va burg‘ilash bo‘yicha amaliy tavsiyalar

Ishlab chiqilgan gidravlik model asosida, Alan koni va unga o‘xshash geologik sharoitga ega konlarda (Zevarda, Ko‘kdumaloq, Sho‘rtan) yangi quduqlarni loyihalash va burg‘ilash uchun bir qator amaliy tavsiyalar shakllantirildi. Tavsiya etilgan konstruksiyaning asosiy o‘ziga xos jihati - oraliq (texnik) kolonnaning kimmerij-titon tuz-angidrit qopqog‘i to‘liq qamrab olingan holda, mahsuldor

qatlamdan yuqorida mahkamlanishi, bu esa burg‘ilash jarayonida qopqoq qatlamining beqarorlanishi va undan yuqorida joylashgan boshqa gorizontlarga bosim ta'sirining oldini oladi.

Bundan tashqari, ekspluatatsion kolonna bosim rejimiga mos maxsus filtr bilan jihozlanishi, ustki jihozlanish esa loyihalash bosqichidagi eng yuqori kutilayotgan bosimga (kamida 1,5 baravar xavfsizlik zaxirasi bilan) mo‘ljallangan armatura bilan ta'minlanishi tavsiya etiladi. Model asosida hisoblangan bosim pasayishi dinamikasidan foydalanib, quduq tubi bosimi tabiiy oqim rejimi uchun kritik chegaraga yetadigan taxminiy muddat aniqlandi. Bu yondashuv, klassik Darsi modeliga asoslangan an'anaviy bashoratlarga qaraganda, sun'iy ko‘tarish tizimiga o‘tish muddatini aniqroq (o‘rtacha 1,5-2 yilga farqlanadigan aniqlik bilan) belgilash imkonini beradi.

Texnik-iqtisodiy samaradorlikni baholash

Taklif etilgan model asosidagi yondashuv butun loyiha davomida yuqoriroq kumulyativ NPV ko‘rsatkichini ta'minlaydi, bu farq loyihaning 5-yilidan boshlab yanada aniqroq namoyon bo‘ladi va 10-yil oxiriga kelib taxminan 5 mln AQSH dollarini tashkil etadi. Bu farqning asosiy manbai - quduqlarni to‘g‘ri (optimal) rejimda ishlatish, burg‘ilash avariyalarining kamayishi hamda sun'iy ko‘tarish tizimiga o‘tish muddatining aniqroq bashoratlanishi hisobiga xarajatlarning kamayishi va daromadning barqarorlashishidir.

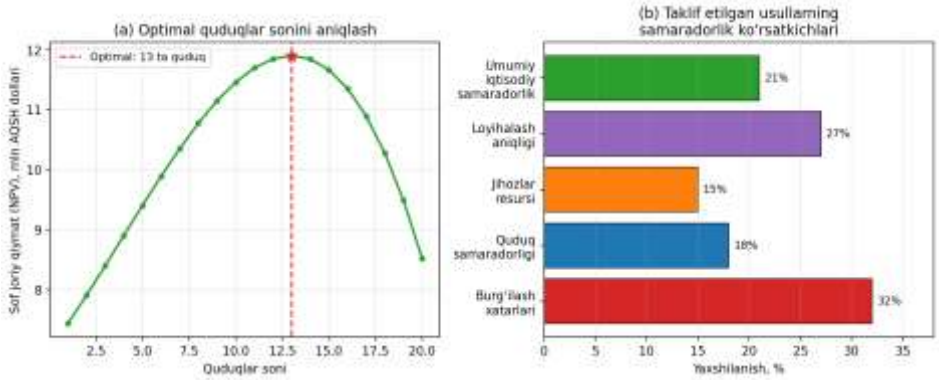
Taklif etilgan usullarni qo‘llash natijasida turli yo‘nalishlar bo‘yicha erishilgan foizli yaxshilanishlar quyidagicha: burg‘ilash xatarlarining kamayishi - 32%, quduq samaradorligining oshishi - 18%, jihozlar resursidan foydalanishning yaxshilanishi - 15%, loyihalash aniqligining oshishi - 27%, umumiy iqtisodiy samaradorlik esa - 21% ni tashkil etadi. Monte-Karlo simulyatsiyasi (2000 tasodifiy stsenariy) natijalariga ko‘ra, taklif etilgan yondashuvning NPV taqsimoti nafaqat yuqoriroq o‘rtacha qiymatga (11,9 mln AQSH dollariga qarshi 6,8 mln AQSH dollari), balki ancha tor (kam tarqalgan) taqsimotga ega, bu esa uning natijalarining barqarorroq va bashoratlanadigan ekanligini ko‘rsatadi.

Hattoki eng yomon stsenariy (P5 protsentili) bo‘yicha ham taklif etilgan yondashuv (9,3 mln AQSH dollari) an'anaviy yondashuvning o‘rtacha natijasidan (P50, 6,8 mln AQSH dollari) yuqori bo‘lib chiqadi. Bu natija taklif etilgan gidravlik modelga asoslangan yondashuvning nafaqat o‘rtacha samaradorlik, balki xatarni boshqarish nuqtai nazaridan ham sezilarli ustunligini tasdiqlaydi. Gaz narxi va diskont stavkasiga sezgirlik tahlili shuni ko‘rsatdiki, taklif etilgan yondashuv barcha bozor sharoitlarida (narx va diskont stavkasining turli qiymatlarida) an'anaviy

yondashuvdan yuqori NPV ko‘rsatadi, bu esa uning turli iqtisodiy sharoitlarda barqaror samaradorlikka ega ekanligini tasdiqlaydi.

Jihozlarni texnik xizmat ko‘rsatish xarajatlarini tahlil qilish shuni ko‘rsatdiki, an'anaviy (nooptimal) rejimda ishlatilgan jihozlarning texnik xizmat ko‘rsatish xarajati vaqt o‘tishi bilan tezlashgan (kvadratik) sur'atda o‘sib boradi, taklif etilgan optimal rejimda esa bu o‘sish ancha sekinroq kechadi. 10 yillik davr davomida jamlangan farq taxminan 8-10 mln AQSH dollarini tashkil etadi, bu esa NPV farqiga qo‘shimcha ravishda, taklif etilgan yondashuvning umumiy iqtisodiy samaradorligini yanada oshiradi.

Optimal quduqlar sonini aniqlash



1-rasm. (a) Optimal quduqlar sonini aniqlash; (b) taklif etilgan usullarning samaradorlik ko‘rsatkichlari.

Konni to‘liq o‘zlashtirish rejasini shakllantirishda nafaqat bitta quduqning optimal debiti, balki konning umumiy ishlatilishi uchun zarur bo‘lgan quduqlar sonini ham aniqlash muhim ahamiyatga ega. Quduqlar soni ortishi bilan NPV boshida tez o‘sadi, keyin esa 13 ta quduq atrofida maksimal qiymatga erishib, undan keyin qatlamning cheklangan energetik salohiyati va kapital xarajatlarning davomiy o‘sishi hisobiga asta-sekin pasaya boshlaydi. Shu asosda, Alan konini to‘liq o‘zlashtirish uchun 13 ta quduqdan iborat quduqlar tarmog‘ini barpo etish tavsiya etiladi. Ushbu son ishlab chiqilgan gidravlik modelning quduqlar orasidagi gidrodinamik interferensiyani ham hisobga oluvchi hisob-kitobi asosida aniqlangan bo‘lib, u klassik (interferensiyani hisobga olmaydigan) hisob usullariga nisbatan aniqroq natija beradi.

Ekologik xavfsizlik va boshqa konlarga tatbiq etish imkoniyati

Ishlab chiqilgan gidravlik model, bosimni aniqroq bashorat qilish orqali, nazoratsiz gaz otilib chiqishi yoki mahsuldorlikning keskin pasayishi kabi xavflarni sezilarli darajada kamaytirish imkonini beradi. Bosimni aniqroq bashoratlash orqali burg‘ilash jarayonida gidravlik yorilish va gaz otilib chiqishi kabi avariyaviy

holatlarning oldini olish mumkin. Bundan tashqari, quduqlarni optimal rejimda ishlatish energiya sarfini kamaytirish orqali bilvosita issiqxona gazlari chiqindisining qisqarishiga ham hissa qo‘shadi.

Ishlab chiqilgan gidravlik modelning nafaqat Alan koni uchun, balki geologik jihatdan o‘xshash boshqa konlar uchun ham qo‘llanilishi mumkinligini baholash amaliy ahamiyatga ega. Alan koniga tutash Zevarda, Ko‘kdumaloq (chuqur qism) va Sho‘rtan konlarining mavjud geologik-gidrodinamik ma'lumotlari asosida taxminiy hisob-kitoblar amalga oshirildi. Shu asosda, Alan koni uchun ishlab chiqilgan model, tegishli tuzatuvchi koeffitsiyentlarni har bir konkret kon uchun qayta kalibrlashtirish sharti bilan, ushbu konlarda ham dastlabki (taxminiy) baholash vositasi sifatida qo‘llanilishi mumkin.

XULOSA

O‘tkazilgan tadqiqot natijasida quyidagi xulosalarga kelindi. Birinchidan, ishlab chiqilgan gidravlik model asosida Alan gaz koni uchun amaliy gidravlik hisob-kitoblar (mahsuldorlik egri chizig‘i, optimal ishlash rejimi $Q_{opt}\approx336$ ming m³/kun) bajarildi. Ikkinchidan, konning joriy bosim rejimiga mos quduqlarni loyihalash va burg‘ilash bo‘yicha amaliy tavsiyalar ishlab chiqildi, jumladan tavsiya etilgan quduq konstruksiyasi sxemasi taklif qilindi. Uchinchidan, taklif etilgan yondashuvning texnik-iqtisodiy va ekologik samaradorligi baholandi: 10 yillik davr uchun kumulyativ sof joriy qiymat bo‘yicha taxminan 5 mln AQSH dollari farq, umumiy iqtisodiy samaradorlikning 21% ga oshishi, burg‘ilash avariyalari xatarining 32% ga kamayishi asoslandi.

Olingan natijalar Qashqadaryo viloyatining boshqa geologik jihatdan o‘xshash konlari (Zevarda, Ko‘kdumaloq, Sho‘rtan), shuningdek O‘zbekiston Respublikasining boshqa chuqur va yuqori bosimli neft-gaz konlarini ishlashda ham qo‘llanilishi mumkin. Amaliy ahamiyati Alan gaz konini va unga o‘xshash Qashqadaryo viloyati konlarini samaraliroq va xavfsizroq o‘zlashtirish imkoniyatida namoyon bo‘ladi, bu esa, o‘z navbatida, O‘zbekiston Respublikasining energetika xavfsizligini mustahkamlashga o‘zining munosib hissasini qo‘shadi.

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SUV TAQSIMLASH TARMOG‘INING GIDRAVLIK MODELINI DALA O‘LCHOVLARI ASOSIDA KALIBRLASH METODIKASI

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ANNOTATSIYA

Maqolada birlamchi ma’lumotlari to‘liq bo‘lmagan shahar suv taqsimlash tarmoqlari uchun gidravlik modelni dala o‘lchovlari asosida kalibrlashning olti bosqichli metodikasi taklif etilgan va u Qarshi shahri tarmog‘ida sinovdan o‘tkazilgan. Metodika uchta o‘zaro bog‘liq o‘lchov turini birlashtiradi: sakkiz nuqtada bosimning yetti sutkalik uzluksiz yozuvi, ajratilgan zonada minimal tungi sarfni (MNF) aniqlash va bosim bosqichlari bo‘yicha tungi sinov. O‘lchovlar 2025-yil 5-12-oktabr kunlarida bajarildi. Tarmoq bo‘yicha o‘rtacha bosim 41,5 m ni, maksimal bosim past zonada 57,7 m ni tashkil etdi; sutkalik tebranish bosh nasos stansiyalari chiqishida 5 m atrofida, past zonalarda esa 14-17 m ga yetdi. Minimal tungi sarf 27,1 m³/soatga teng bo‘lib, undan fizik yo‘qotish 25,1 m³/soat yoki bir ulanishga soatiga 20,9 litr ajratildi. Logarifmik koordinatalardagi regressiya bo‘yicha bosim-yo‘qotish ko‘rsatkichi $N_1 = 1{,}205 \pm 0{,}037$ ($R^2 > 0{,}998$) aniqlandi. Model kalibrlangandan so‘ng o‘rtacha kvadratik xatolik 7,49 m dan 0,56 m gacha kamaydi, barcha qoldiqlar ±1 m koridoridan chiqmadi.

Kalit so‘zlar: *gidravlik model, kalibrlash, dala o‘lchovlari, bosim data-loggeri, minimal tungi sarf, FAVAD, N_1 ko‘rsatkichi, RMSE, EPANET, Qarshi shahri.*

АННОТАЦИЯ

В статье предложена шестиэтапная методика калибровки гидравлической модели городской водораспределительной сети по данным натурных измерений, апробированная на сети города Карши в условиях неполноты исходных данных. Методика объединяет три взаимосвязанных вида измерений: семисуточную непрерывную запись давления в восьми точках, определение минимального ночного расхода (MNF) в изолированной зоне и ночное ступенчатое испытание по давлению. Измерения выполнены 5-12 октября 2025 года. Среднее давление по сети составило 41,5 м, максимальное в нижней зоне - 57,7 м; суточные колебания на выходе головных насосных станций - около 5 м, в нижних зонах - 14-17 м. Минимальный ночной расход равен 27,1 м³/ч, из которого выделены физические потери 25,1 м³/ч, или 20,9 л

на присоединение в час. По регрессии в логарифмических координатах получен показатель N_1 = 1,205 ± 0,037 (R^2 > 0,998). После калибровки среднеквадратичная ошибка снизилась с 7,49 м до 0,56 м.

Ключевые слова: *гидравлическая модель, калибровка, натурные измерения, регистратор давления, минимальный ночной расход, FAVAD, показатель N_1, RMSE, EPANET, город Карши.*

ABSTRACT

The paper proposes a six-stage methodology for calibrating the hydraulic model of an urban water distribution network from field measurements, and tests it on the Karshi city network under conditions of incomplete input data. The methodology combines three interrelated measurement types: seven-day continuous pressure logging at eight points, minimum night flow (MNF) measurement in an isolated zone, and a night-time stepped pressure test. Measurements were carried out on 5-12 October 2025. The network-average pressure was 41.5 m and the maximum pressure in the low zone 57.7 m; the daily fluctuation was about 5 m at the outlets of the head pumping stations and 14-17 m in the low zones. The minimum night flow was 27.1 m^3/h, from which a physical loss of 25.1 m^3/h, or 20.9 litres per connection per hour, was separated. Regression in logarithmic coordinates yielded a pressure-leakage exponent N_1 = 1.205 ± 0.037 (R^2 > 0.998). After calibration the root-mean-square error fell from 7.49 m to 0.56 m, with all residuals inside a ±1 m band.

Keywords*: hydraulic model, calibration, field measurements, pressure logger, minimum night flow, FAVAD, N_1 exponent, RMSE, EPANET, Karshi city.*

KIRISH

Shahar suv taqsimlash tarmog‘ining gidravlik modeli bosim rejimini boshqarish, yo‘qotishlarni kamaytirish va rekonstruksiya variantlarini asoslashning asosiy vositasidir. Biroq model faqat u haqiqiy tarmoqning holatini yetarli aniqlikda aks ettirgandagina qaror qabul qilish uchun yaroqli bo‘ladi. Bu esa kalibrlash - model parametrlarini o‘lchangan qiymatlarga moslashtirish - jarayonini talab etadi [1-3].

Kalibrlash muammosi klassik ishlarda batafsil o‘rganilgan. T.M. Walski model parametrlarini bosqichma-bosqich sozlash usulini taklif etgan [1], L.E. Ormsbee va D.J. Wood oshkora kalibrlash algoritmini ishlab chiqqan [2], K.E. Lansey va C. Basnet esa masalani parametrlarni baholashning umumiy masalasi sifatida qo‘ygan [3]. Z.S. Kapelan va hammualliflari Bayes yondashuvini qo‘llab, kalibrlash natijasining noaniqligini miqdoriy baholash imkonini bergan [4]. A. Ostfeld boshchiligidagi xalqaro «Battle of the Water Calibration Networks» tanlovi turli kalibrlash usullarini yagona ma’lumotlar to‘plamida taqqoslab, natija sifatini belgilovchi asosiy omil - algoritm emas, balki o‘lchov ma’lumotlarining hajmi va sifati ekanligini ko‘rsatdi [5].

Rivojlanayotgan mamlakatlarning eskirgan tarmoqlarida vaziyat murakkablashadi: abonentlar hisoblagichlari to‘liq emas, tarmoqning raqamli xaritasi to‘liq atributlarga ega bo‘lmaydi, telemetriya esa ko‘pincha umuman yo‘q. Bunday sharoitda kalibrlash uchun zarur ma’lumotni faqat maqsadli dala o‘lchovlari berishi mumkin. Bundan tashqari, yo‘qotishlari yuqori tarmoqlarda talabni bosimdan mustaqil deb hisoblash mumkin emas: oqib chiqishlar bevosita bosimga bog‘liq bo‘lgani uchun model bosimga bog‘liq talab (Pressure-Dependent Demand, PDD) rejimida qurilishi va yo‘qotishlar FAVAD kontseptsiyasiga muvofiq darajali funksiya bilan ifodalanishi kerak [6-8].

Mazkur maqolaning maqsadi - kam ma’lumotli sharoitda ishlaydigan hududiy suv ta’minoti korxonalari uchun amaliy jihatdan qo‘llanilishi mumkin bo‘lgan, uchta o‘lchov turini birlashtiruvchi kalibrlash metodikasini bayon etish va uni Qarshi shahri tarmog‘i misolida sinovdan o‘tkazishdir. Metodikaning o‘ziga xosligi shundaki, u modelning geometrik va gidravlik parametrlarini emas, balki bosim-yo‘qotish bog‘liqligining ko‘rsatkichini ham eksperimental aniqlaydi va shu bilan kalibrlash natijasini adabiyotdan olingan taxminiy qiymatlarga bog‘liqlikdan xalos qiladi.

Tadqiqot obyekti va metodika

Tadqiqot obyekti - Qarshi shahri markazlashtirilgan ichimlik suv taqsimlash tarmog‘i. Tarmoqning umumiy uzunligi 361,2 km, u 4 516 ta segmentdan iborat; shaharga sutkasiga o‘rtacha 72,5 ming m³ suv uzatiladi, aholi soni 321,7 ming kishi. Relyef sezilarli notekis: o‘lchov nuqtalarining geodezik balandliklari 373,5 m dan 394,9 m gacha o‘zgaradi.

Taklif etilayotgan metodika olti bosqichdan iborat bo‘lib, uning sxemasi 1-rasmda keltirilgan. Metodikaning mantiqiy asosi quyidagicha: bosimning fazoviy va vaqt bo‘yicha taqsimoti modelning geometrik va gidravlik parametrlarini sozlash uchun, minimal tungi sarf esa yo‘qotishlarning fizik qismini ajratish va emitterlar koeffitsiyentini baholash uchun ma’lumot beradi; tungi bosim sinovi esa bu ikki ma’lumot to‘plamini bog‘lovchi N_1 ko‘rsatkichini aniqlaydi.



1-rasm. Dala o‘lchovlari va gidravlik modelni kalibrlash metodikasining bosqichlari

Modelning adekvatligini miqdoriy baholash uchun o‘lchangan va hisoblangan bosimlar orasidagi o‘rtacha kvadratik xatolikdan foydalanildi:

$$RMSE = \sqrt{(\Sigma (P\_o,i - P\_h,i)^2 / n)} \quad (1)$$

bu yerda: P_o,i - i-o‘lchov nuqtasidagi o‘lchangan bosim, m; P_h,i - o‘sha nuqtadagi hisoblangan bosim, m; n - o‘lchov nuqtalari soni.

Fizik yo‘qotish minimal tungi sarfdan qonuniy tungi iste’molni ayirish yo‘li bilan aniqlanadi:

$$L = MNF - Q\_qon, \quad Q\_qon = q\_u \cdot N\_u \quad (2)$$

bu yerda: MNF - minimal tungi sarf, m³/soat; q_u - bitta ulanishga to‘g‘ri keladigan qonuniy tungi iste’mol me’yori (xalqaro amaliyotda 1,7 l/ulanish·soat); N_u - zonadagi ulanishlar soni.

Bosim va oqib chiqish orasidagi bog‘liqlik FAVAD kontseptsiyasiga muvofiq darajali funksiya bilan ifodalanadi, uning ko‘rsatkichi esa logarifmik koordinatalardagi chiziqli regressiya bo‘yicha topiladi:

$$L = C \cdot P^{N_1} \rightarrow \ln L = \ln C + N_1 \cdot \ln P \quad (3)$$

Tarmoqning gidravlik modeli EPANET 2.2 hisoblash yadrosi asosida, Python muhitidagi WNTR kutubxonasi yordamida qurildi [9, 10]; yo‘qotishlar har bir tugunga qo‘shilgan emitterlar orqali, eksponenti N_1 ga teng deb modellashtirildi. Kalibrlashda ikki sozlash parametri - quvur g‘adir-budurligi ko‘paytuvchisi a_R va tugun yo‘qotish koeffitsiyenti ko‘paytuvchisi a_C - (1) ifodadagi RMSE minimal bo‘lguncha avtomatik sozlandi.

O‘lchov asboblari sifatida o‘lchov oralig‘i 0-16 bar bo‘lgan bosim data-loggerlari (yozuv qadami 5 daqiqa), zona kirishida ultratovushli oqim o‘lchagich va bosim datchigi, geodezik balandliklarni aniqlash uchun GPS qabul qilgichi ishlatildi. Barcha

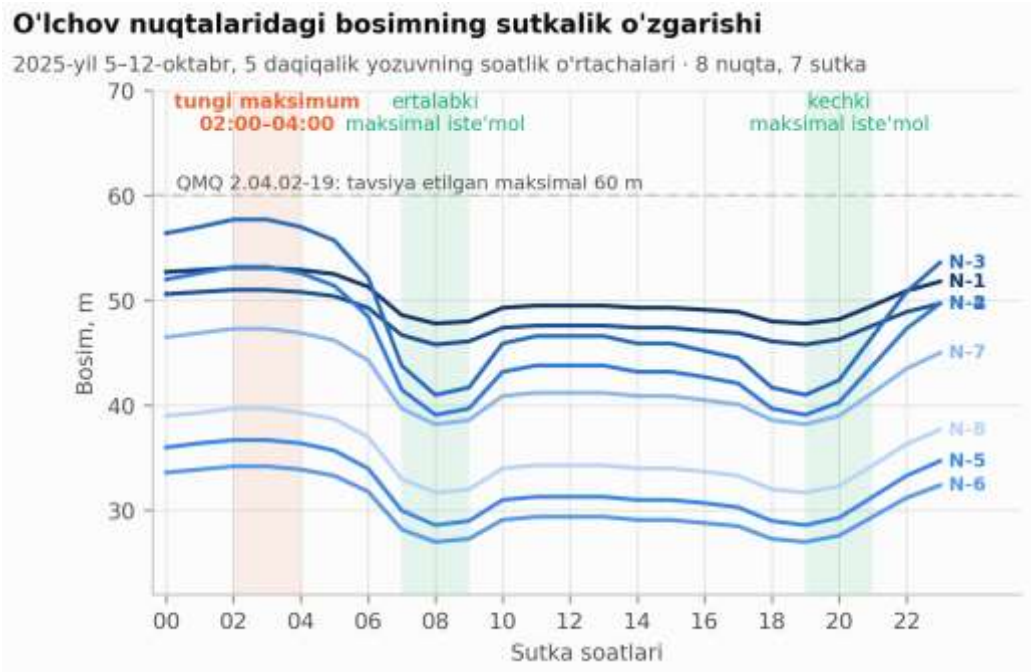
asboblarning soati yagona manbaga sinxronlandi, bu turli nuqtalardagi yozuvlarni bir vaqt shkalasiga keltirish imkonini berdi.

Natijalar va ularning tahlili

Bosimning fazoviy va sutkalik taqsimoti. Yetti sutka davomida har bir nuqtada 2 016 ta yozuv qayd etildi; umumiy hajm 16 128 ta o‘lchovni tashkil etdi. Nuqtalarning tavsifi va olingan bosim ko‘rsatkichlari 1-jadvalda, bosimning sutkalik o‘zgarishi esa 2-rasmda keltirilgan.

1-jadval. Dala o‘lchovlari nuqtalarining tavsifi va olingan bosim ko‘rsatkichlari

№	O‘lchov nuqtasi	Geodezik balandlik, m	P_min, m	P_max, m	P_o‘rt, m	ΔP, m
N-1	3-podyom Nasos-2 chiqishi	373,5	47,8	53,1	50,1	5,3
N-2	3-podyom Nasos-1 chiqishi	376,4	45,8	51,0	48,2	5,2
N-3	«Shayxali» — past zona	374,8	41,0	57,7	48,5	16,7
N-4	«Temiryo‘lchi» — past zona	379,2	39,1	53,2	45,4	14,1
N-5	«Paxtazor» — yuqori zona	392,6	28,6	36,7	32,2	8,1
N-6	Kritik nuqta	394,9	27,0	34,2	30,2	7,2
N-7	Magistral oraliq tugun	381,0	38,2	47,3	42,3	9,1
N-8	Rezervuar chiqishi	389,4	31,7	39,7	35,2	8,0
	Tarmoq bo‘yicha	373,5-394,9	27,0	57,7	41,5	—



2-rasm. O‘lchov nuqtalaridagi bosimning sutkalik o‘zgarishi (2025-yil oktabr)

Jadval va rasmdan uchta muhim xulosa kelib chiqadi. Birinchidan, tarmoqdagi o‘rtacha bosim 41,5 m ni tashkil etadi. Ikkinchidan, maksimal bosim past zonada tungi soatlarda 57,7 m ga yetadi, ya’ni QMQ 2.04.02-19 tavsiya etadigan 60 m chegarasiga yaqinlashadi [11] - bu ortiqcha bosimning mavjudligini bevosita hujjatlashtiradi. Uchinchidan, sutkalik tebranish ΔP nuqtaga qarab keskin farq qiladi:

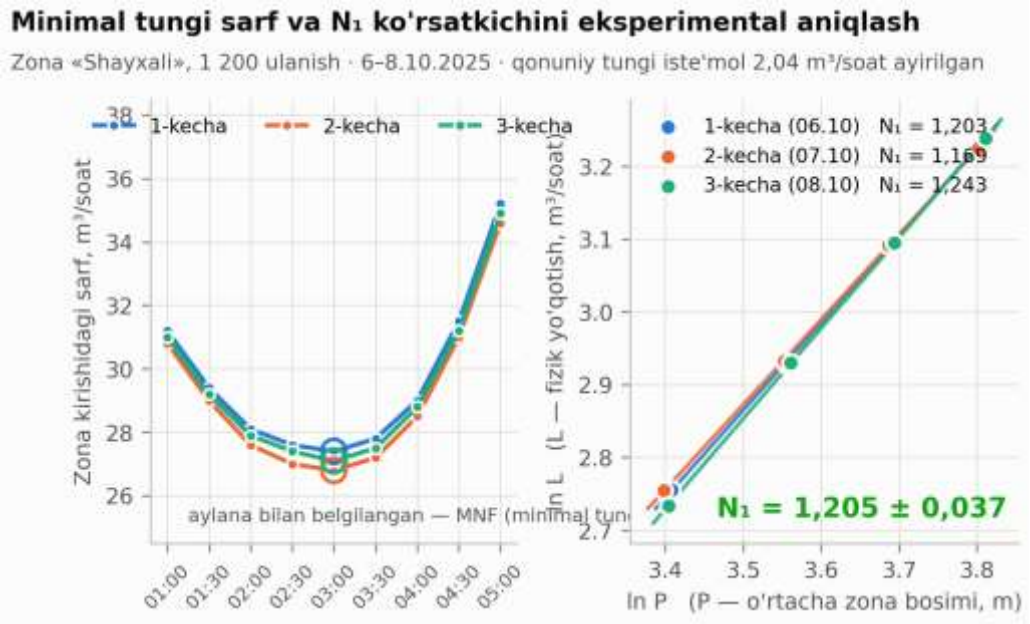
bosh nasos stansiyalari chiqishida atigi 5 m atrofida bo‘lsa, past zonalarda 14-17 m ga yetadi. Aynan shu farq past zonalarda bosimni rostlovchi klapan (PRV) o‘rnatish zaruriyatini eksperimental asoslaydi [12, 13]. Nuqtalarning geodezik balandliklari va o‘lchangan bosimlari o‘zaro izchil: gidravlik chiziq barcha nuqtada 423-425 m oralig‘ida bo‘lib, farq magistral bo‘ylab napor yo‘qotilishiga to‘g‘ri keladi - bu o‘lchovlarning ichki uyg‘unligini tasdiqlaydi.

Minimal tungi sarf va N_1 ko‘rsatkichi. MNF ni aniqlash uchun «Shayxali» hududidagi 1 200 ta ulanishni qamrab oluvchi zona tanlandi va gidravlik jihatdan izolyatsiyalandi. Uch kecha davomida 01:00-05:00 oralig‘ida sarf 30 daqiqalik qadam bilan qayd etildi. Minimal tungi sarf har uchala kechada 03:00 atrofiga to‘g‘ri keldi va 26,8-27,4 m^3/soat oralig‘ida bo‘ldi. (2) ifodaga muvofiq qonuniy tungi iste’mol 2,04 m^3/soatni tashkil etadi; demak fizik yo‘qotish o‘rtacha 25,1 m^3/soatga, ya’ni bir ulanishga soatiga 20,9 litrga teng. Bu ko‘rsatkich xalqaro amaliyotda yuqori hisoblanadigan 10 l/ulanish·soat chegarasidan ikki barobar katta [14].

N_1 ni aniqlash uchun har kecha zona kirishidagi bosim to‘rt bosqichda pasaytirildi. Har bir bosqichda bosim gidravlik zarbaning oldini olish uchun 5-10 daqiqa davomida sekin o‘zgartirilib, so‘ng 20-30 daqiqa barqarorlashtirildi va oxirgi 15-20 daqiqaning o‘rtacha qiymatlari qayd etildi. O‘rtacha zona bosimi 45 m dan 30 m gacha tushirildi; kritik nuqtadagi bosim ruxsat etilgan minimal napordan past tushmasligi uzluksiz nazorat qilindi. Har bir kecha oxirida rejim tiklanib, sarfning boshlang‘ich qiymatga qaytgani tekshirildi. Birinchi kecha natijalari 2-jadvalda keltirilgan.

2-jadval. N_1 ni aniqlash bo‘yicha tungi sinov natijalari (1-kecha, 2025-yil 6-oktabr)

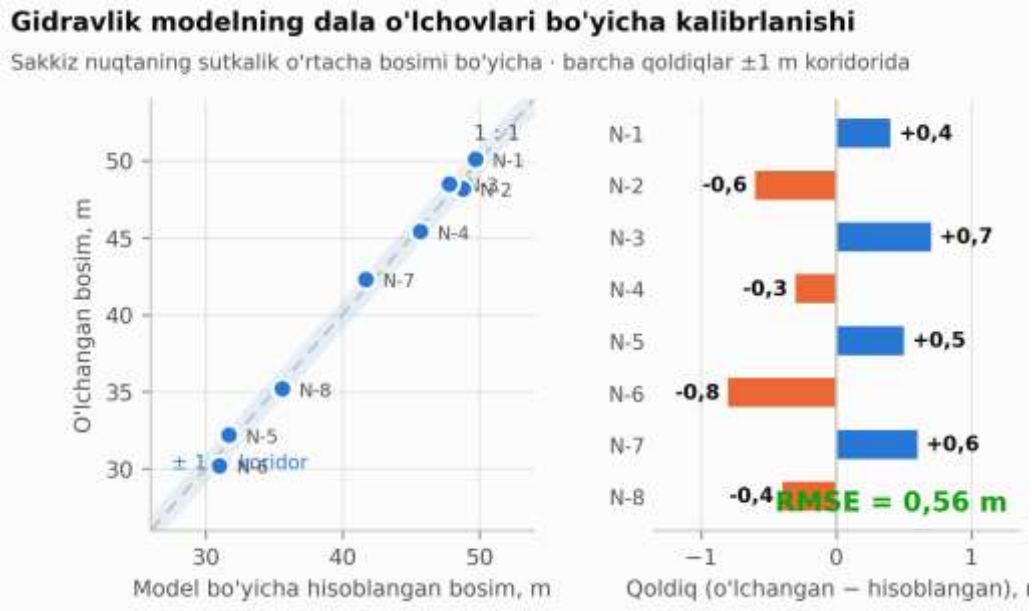
Bosqich	Vaqt	P kirish, m	P AZP, m	P kritik, m	Q, m^3/soat	L = Q − Q_qon, m^3/soat	Oraliq N_1
0 — asos	01:00–01:40	52,0	45,0	36,0	27,40	25,36	—
1	01:40–02:20	46,8	40,1	31,1	24,18	22,14	1,192
2	02:20–03:00	41,0	35,0	26,0	20,72	18,68	1,215
3	03:00–03:40	35,4	30,2	21,2	17,77	15,73	1,199
4 — nazorat	03:40–04:20	52,1	45,1	36,1	27,45	25,41	tiklandi



3-rasm. Minimal tungi sarf va N_1 ko‘rsatkichini eksperimental aniqlash: chapda - tungi sarfning o‘zgarishi, o‘ngda - logarifmik koordinatalardagi regressiya

(3) ifodaga muvofiq logarifmik koordinatalarda qurilgan chiziqli regressiya bo‘yicha uch kecha uchun N_1 ning qiymatlari mos ravishda 1,203; 1,169 va 1,243 ni tashkil etdi; determinatsiya koeffitsiyenti barcha holatda $R^2 > 0,998$ bo‘ldi. Yakuniy natija $N_1 = 1,205 \pm 0,037$ ga teng. Olingan qiymat birdan sezilarli yuqori bo‘lib, bu tarmoqda polietilen quvurlar va bo‘ylama yoriqlarning ustunligini ko‘rsatadi: bunday teshiklar bosim ortganda elastik ravishda kengayadi va oqim klassik teshik formulasidagi P^0,5 emas, balki undan ancha tez ortadi [7, 8].

Modelni kalibrlash natijalari. Aniqlangan N_1 qiymati emitter eksponenti sifatida modelga kiritilgandan so‘ng a_R va a_C parametrlari (1) ifodadagi RMSE minimal bo‘lguncha sozlandi. Kalibrlash natijasida boshlang‘ich RMSE = 7,49 m dan yakuniy RMSE = 0,56 m gacha kamaydi; sozlash parametrlari a_R = 0,84 va a_C = 1,58 qiymatlarini oldi. Qoldiqlarning eng kattasi 0,8 m ni tashkil etib, barcha sakkiz nuqtada ±1 m koridoridan chiqmadi (4-rasm). a_C > 1 bo‘lishi modelga dastlab kiritilgan yo‘qotish koeffitsiyentlari haqiqiy qiymatdan past baholanganini, a_R < 1 esa quvurlarning gidravlik qarshiligi taxmin qilinganidan biroz kichik ekanligini bildiradi.



4-rasm. Gidravlik modelning dala o‘lchovlari bo‘yicha kalibrlanishi: chapda - o‘lchangan va hisoblangan bosimlarning taqqoslanishi, o‘ngda - qoldiqlar

Muhokama

Olingan N_1 = 1,205 qiymati xalqaro tadqiqotlar natijalari bilan yaxshi mos keladi. A.O. Lambert real tarmoqlar uchun N_1 ning odatiy oralig‘i 0,5-2,5 ekanligini, aralash materialli tarmoqlar uchun esa 1,0 ga yaqin qiymatlar xarakterli ekanligini ko‘rsatgan [6]. J.E. van Zyl va A.M. Cassa elastik deformatsiyalanuvchi yoriqlar uchun N_1 ning 1,5 gacha ko‘tarilishini nazariy asoslaganlar [7]. Bizning natijamiz shu oraliqning o‘rta qismida joylashgan, bu esa Qarshi tarmog‘ida ham qattiq (metall quvurlardagi teshiklar), ham elastik (polietilen quvurlardagi bo‘ylama yoriqlar) yo‘qotish yo‘llarining birgalikda mavjudligini bildiradi.

Metodikaning muhim amaliy natijasi shundaki, u korxona hisobotidagi yo‘qotish darajasi bilan suv balansi bo‘yicha hisoblangan qiymat orasidagi ziddiyatni hal qiladi. Qarshi shahri bo‘yicha korxona hisoboti 31 % yo‘qotishni ko‘rsatadi, hisobga olingan sotuv hajmi bo‘yicha hisoblangan daromadsiz suv (NRW) darajasi esa 59,3 % ga teng. Minimal tungi sarf tahlili yo‘qotishning fizik qismini bevosita o‘lchash imkonini berdi: u zona darajasida umumiy tungi sarfning 92,5 % ini tashkil etadi. Bu korxona hisobotidagi 31 % aynan fizik yo‘qotishni ifodalashini, qolgan qismi esa hisob-o‘lchov tizimidagi kamchiliklar bilan bog‘liq tijoriy yo‘qotish ekanligini tasdiqlaydi. Bunday ajratish muhim, chunki fizik va tijoriy yo‘qotishlar mutlaqo turli chora-tadbirlarni talab qiladi: birinchisi bosimni boshqarish va tarmoqni ta’mirlashni, ikkinchisi esa hisoblagichlarni almashtirish va hisob-kitob tizimini tartibga solishni [14, 15].

Metodikaning cheklovlari quyidagilardan iborat. Birinchidan, sakkizta o‘lchov nuqtasi 361 km uzunlikdagi tarmoq uchun minimal to‘plam hisoblanadi; nuqtalar sonini oshirish kalibrlash aniqligini yanada yaxshilaydi, biroq amalda asboblar soni

bilan cheklanadi. Ikkinchidan, N_1 bitta zonada aniqlangan va butun tarmoq uchun bir xil deb qabul qilingan; turli zonalarda quvur materiali tarkibi farq qilgani bois bu soddalashtirish ma’lum xatolik kiritadi. Uchinchidan, kalibrlash barqaror rejim uchun bajarilgan; o‘tkinchi jarayonlar hisobga olinmagan. Kelgusi tadqiqotlarda N_1 ni har bir bosim zonasi uchun alohida aniqlash va kalibrlash natijasining noaniqligini Bayes yondashuvi bilan baholash ko‘zda tutilgan [4].

Xulosalar

1. Kam ma’lumotli sharoitda ishlaydigan shahar suv taqsimlash tarmoqlari uchun uchta o‘lchov turini - bosimning uzluksiz yozuvi, minimal tungi sarf va bosim bosqichlari bo‘yicha tungi sinovni - birlashtiruvchi olti bosqichli kalibrlash metodikasi taklif etildi va Qarshi shahri tarmog‘ida sinovdan o‘tkazildi.

2. O‘lchovlar tarmoqdagi o‘rtacha bosim 41,5 m ni, past zonadagi maksimal tungi bosim esa 57,7 m ni tashkil etishini ko‘rsatdi. Sutkalik tebranishning zonalar bo‘yicha keskin farqi (bosh stansiyalarda 5 m, past zonalarda 14-17 m) bosimni rostlovchi klapanlar o‘rnatish zaruriyatini eksperimental asoslaydi.

3. Minimal tungi sarf 27,1 m^3/soat, undan ajratilgan fizik yo‘qotish 25,1 m^3/soat yoki bir ulanishga soatiga 20,9 litrga teng bo‘lib, xalqaro amaliyotdagi yuqori chegaradan ikki barobar katta.

4. Bosim-yo‘qotish ko‘rsatkichi eksperimental yo‘l bilan $N_1 = 1{,}205 \pm 0{,}037$ ($R^2 > 0{,}998$) qiymatida aniqlandi. Bu adabiyotda aralash materialli tarmoqlar uchun keltirilgan qiymatlar bilan mos keladi va model natijalarini taxminiy qiymatlarga bog‘liqlikdan xalos qiladi.

5. Kalibrlash natijasida o‘rtacha kvadratik xatolik 7,49 m dan 0,56 m gacha kamaydi va barcha qoldiqlar ±1 m koridorida qoldi. Bu model tarmoqning haqiqiy gidravlik holatini bosim rejimini boshqarish variantlarini hisoblash uchun yetarli aniqlikda ifodalashini ko‘rsatadi.

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МАЖБУРИЯТНИ ЛОЗИМ ДАРАЖАДА ВА РЕАЛ БАЖАРИШНИНГ АЙРИМ МАСАЛАЛАРИ

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АННОТАЦИЯ

Ушбу мақолада фуқаролик ҳуқуқида мажбуриятларни лозим даражада ва реал бажариш принципларининг назарий-ҳуқуқий мазмуни ҳамда уларнинг ўзаро нисбати таҳлил қилинади. Мажбуриятни лозим даражада бажаришнинг асосий шартлари, реал бажариш принципининг мазмуни ва унинг мажбурият муносабатларининг нормал ҳамда бузилган ҳолатларида намоён бўлиш хусусиятлари ёритилади. Шунингдек, мазкур принципларнинг фуқаролик ҳуқуқи доктринасидаги турли назарий ёндашувлари таҳлил қилиниб, уларнинг мустақил, бироқ ўзаро чамбарчас боғлиқ ҳуқуқий принсиплар еканлиги асослантирилади. Мақолада мажбурият бузилган тақдирда уни натура шаклида бажариш масалалари ҳамда зарар ва неустойка тўлашнинг реал бажариш принципига таъсири ўрганилиб, амалдаги фуқаролик қонунчилигини такомиллаштиришга оид айрим таклифлар илгари сурилади.

Калит сўзлар: *мажбурият, мажбуриятни бажариш, лозим даражада бажариш, реал бажариш, натура шаклида бажариш, мажбуриятни бузиш, кредитор, қарздор, зарар, неустойка, фуқаролик-ҳуқуқий жавобгарлик, мажбурият ҳуқуқи.*

ANNOTATION

This article analyzes the theoretical and legal content of the principles of proper and real performance of obligations in civil law and their interrelationship. The main conditions for proper performance of an obligation, the content of the principle of real performance and its features of manifestation in normal and violated cases of obligation relations are highlighted. Also, various theoretical approaches to these principles in the doctrine of civil law are analyzed, and their existence as independent, but closely related legal principles is substantiated. The article studies the issues of performance in kind in case of violation of an obligation and the impact of payment of damages and penalties on the principle of real performance, and puts forward some proposals for improving current civil legislation.

Keywords*: obligation, performance of an obligation, proper performance, real performance, performance in kind, violation of an obligation, creditor, debtor, damage, penalties, civil liability, law of obligations.*

КИРИШ

Ҳар қандай мажбурият муносабатининг асосий мақсади унда иштирок этувчи тарафларнинг қонуний манфаат ва эҳтиёжларини тегишли даражада таъминлашдан иборат. Мазкур мақсадга эришиш эса, энг аввало, мажбуриятнинг белгиланган талабларга мувофиқ ҳамда амалда тўлиқ бажарилишини тақозо этади. Шу нуқтаи назардан Ўзбекистон Республикаси Фуқаролик кодекси (кейинги ўринларда – ФК) мажбуриятларни бажаришнинг икки муҳим ва ўзаро узвий боғлиқ асосини – лозим даражада бажариш ҳамда реал бажариш принципларини мустаҳкамлайди. Ушбу принциплар мажбурият ҳуқуқининг амалий самарадорлигини таъминлашда муҳим ўрин тутади.

Мажбуриятни лозим даражада бажариш принципининг моҳияти шундаки, мажбурият фақат бажарилган бўлиши билан чекланмасдан, балки у тегишли субъект томонидан, белгиланган жойда, белгиланган муддатда, тегишли предметга нисбатан ва назарда тутилган усулда амалга оширилиши лозим. Демак, мажбуриятни бажаришнинг ҳар бир элементи қонун, шартнома ёки ҳуқуқий муносабатнинг хусусиятидан келиб чиқадиган талабларга мувофиқ бўлиши зарур.

Мазкур қоида ФКнинг 236-моддасида умумий принцип сифатида ифодаланган. Унга кўра, мажбуриятлар, аввало, мажбурият мазмуни ва шартларига, шунингдек қонун ва бошқа норматив-ҳуқуқий ҳужжатлар талабларига мувофиқ равишда бажарилиши керак. Агар мажбуриятнинг муайян шартлари ёки уни бажаришга нисбатан бевосита норматив талаблар мавжуд бўлмаса, у ҳолда иш муомаласи одатлари ёки одатда қўйиладиган бошқа талаблардан келиб чиқилади. Шу маънода, 236-модда мажбуриятни бажаришнинг умумий ҳуқуқий мезонини белгилаб, унинг бошқа махсус қоидалари учун асос вазифасини бажаради.

ФКнинг 21-бобида назарда тутилган қоидаларнинг аксарияти ҳам айнан мажбуриятларни лозим даражада бажариш принципини конкретлаштиришга қаратилган. Хусусан, ФКнинг 240-моддаси мажбуриятни тегишли шахс фойдасига бажариш масаласини, 241-модда эса уни тегишли шахс томонидан бажариш имкониятини тартибга солади. 242 ва 243-моддаларда мажбуриятни бажариш муддати, 246-моддада уни бажариш жойи, 245 ва 250-моддаларда эса мажбурият предметига доир талаблар белгиланади. Шунингдек, 239, 249, 252, 253 ва 254-моддалар мажбуриятни бажариш усули ва тартиби билан боғлиқ бир қатор ҳуқуқий масалаларни қамраб олади.

Айрим турдаги мажбуриятлар бўйича эса уларнинг хусусиятидан келиб чиққан ҳолда махсус талаблар ФКнинг иккинчи қисмида мустаҳкамланган.

Бундай махсус нормалар умумий қоидаларни инкор этмайди, аксинча, муайян шартномавий ёки бошқа мажбуриятнинг предмети, субъектлари ва мақсадини ҳисобга олган ҳолда лозим даражада бажариш принципининг мазмунини аниқлаштиради.

Юридик адабиётларда мажбуриятни ким томонидан ва кимга, қачон, қаерда, қандай предмет билан ҳамда қайси усулда бажарилишига оид талаблар одатда “мажбуриятни бажариш шартлари” сифатида тавсифланади [184] . Мажбурият лозим даражада бажарилган деб эътироф этилиши учун мазкур шартларнинг барчасига бир вақтнинг ўзида риоя қилиниши талаб этилади. Чунки улардан ҳатто биттасига риоя қилинмаслиги ҳам мажбуриятни бажаришда нуқсон мавжудлигини англатиб, уни ненадлежащий, яъни лозим даражада бажарилмаган деб баҳолаш учун асос бўлиши мумкин.

Шу билан бирга, лозим даражада бажариш принципи фақат қарздорга нисбатан қўйиладиган талаб сифатида тушунилмаслиги лозим. Мажбурият муносабати икки томонлама ҳуқуқий алоқа эканлиги сабабли, ушбу принцип кредиторнинг хатти-ҳаракатларига ҳам дахл қилади. Яъни кредитор ҳам мажбуриятнинг тўғри бажарилиши учун зарур бўлган ҳаракатларни амалга ошириши, бажаришни қабул қилиши, зарур маълумот ва кўмакни тақдим этиши ҳамда ўз хатти-ҳаракатлари билан мажбуриятни бажаришга асоссиз тўсқинлик қилмаслиги керак[185]. Шу сабабли мажбуриятнинг лозим даражада бажарилиши қарздор ва кредиторнинг ўзаро мувофиқ ва ҳуқуқий жиҳатдан тўғри хулқ-атвори натижаси сифатида намоён бўлади.

Шундай қилиб, мажбуриятни лозим даражада бажариш унинг ҳуқуқий мақсадига эришишнинг асосий шарти ҳисобланади. Барча зарур талабларга мувофиқ амалга оширилган ижро кредиторнинг манфаатини тўлиқ қондириш билан бирга, қарздорни мажбурият доирасидаги тегишли вазифалардан озод қилади ва, умумий қоидага кўра, мажбуриятнинг бекор бўлишига олиб келади. Шу жиҳатдан лозим даражада бажариш принципи мажбурият ҳуқуқида нафақат ижро жараёнини белгилайдиган техник қоида, балки мажбурият муносабатининг мақсадга мувофиқ ва самарали якунланишини таъминловчи фундаментал ҳуқуқий принцип сифатида намоён бўлади.

Айрим ҳуқуқшунос олимлар мажбуриятни лозим даражада бажариш принципини мажбурият ҳуқуқининг етакчи ва асосий принципи сифатида баҳолайдилар. Бундай ёндашувнинг асосий сабаби шундаки, қонун чиқарувчи мажбуриятнинг бекор бўлишини, энг аввало, унинг лозим даражада

[184] Зокиров И.Б. Фуқаролик ҳуқуқи: Дарслик. I қисм. И.Б.Зокиров; Масъул муҳаррир: Ҳ.Раҳмонқулов: Қайта ишланган ва тўлдирилган бешинчи нашр. – Тошкен: ТДЮИ нашриёти, 2009. – 499 б.
[185] Fuqarolik huquqi: Darslik. I qism/ Mualliflar jamoasi – T.: TDYU nashriyoti, 2016. – 226 b.

бажарилиши билан боғлайди. Мазкур нуқтаи назар тарафдорларининг фикрича, лозим даражада бажариш принципи ўз мазмунига кўра мажбуриятларни ижро этишга оид бошқа муҳим принципларни ҳам қамраб олади. Жумладан, унга реал бажариш принципи, мажбуриятни бажаришдан бир томонлама бош тортишга йўл қўйилмаслиги принципи, тарафларнинг ҳамкорлиги ҳамда ҳалоллик принциплари киритилади.

Ушбу қарашни асослашда олимлар шу ҳолатга эътибор қаратадиларки, ҳар қандай лозим даражада амалга оширилган ижро, одатда, айни вақтда реал ижро ҳам ҳисобланади. Бундай ижро мажбуриятни бажаришдан бир томонлама воз кечишга йўл қўймаслик талабини бузмайди, тарафлар ўртасидаги зарур ҳамкорликка асосланади ва ҳалоллик мезонларига мувофиқ амалга оширилади. Шу маънода, лозим даражада бажариш принципи айрим муаллифлар томонидан бошқа ижро принципларини бирлаштирувчи умумий ҳуқуқий конструкция сифатида баҳоланади[186].

Мажбуриятларни бажаришнинг иккинчи муҳим принципи сифатида реал бажариш принципи эътироф этилади. Мазкур принцип юридик адабиётларда энг кўп муҳокама қилинадиган ва мазмуни юзасидан турли ёндашувлар мавжуд бўлган институтлардан бири ҳисобланади. Реал бажариш деганда, қарздорнинг мажбурият мазмунини ташкил этувчи муайян ҳаракатларни айнан бажариши ёки, аксинча, мажбурият унинг муайян ҳаракатдан тийилишини назарда тутса, ана шундай ҳаракатни содир этмаслиги тушунилади.

Бошқача айтганда, реал бажариш принципи кредитор манфаатини фақат пул шаклидаги компенсация орқали эмас, балки мажбурият предметини амалда тақдим этиш, ишни бажариш, хизмат кўрсатиш ёки муайян ҳаракатдан тийилиш орқали қондиришни назарда тутади. Шу боис зарарни қоплаш ёки неустойка тўлаш мажбуриятнинг асл мазмуни ўрнини ҳар доим ҳам тўлиқ босмайди. Тарафлар шартнома тузиш орқали кўзлаган иқтисодий ва ҳуқуқий натижага кўп ҳолларда айнан мажбуриятнинг натура шаклида бажарилиши орқали эришилади.

Шу жиҳатдан реал бажариш принципи замонавий фуқаролик ҳуқуқида ҳам ўз аҳамиятини йўқотмаган. Унинг амалий зарурати, айниқса, кредитор учун мажбурият предметининг ўзи муҳим бўлган ҳолларда яққол намоён бўлади. Масалан, муайян индивидуал ашёни топшириш, шартномада назарда тутилган ишни бажариш ёки ўзига хос хизматни кўрсатиш ўрнига фақат зарарни пул билан қоплаш кредиторнинг дастлабки манфаатини тўлиқ таъминламаслиги мумкин. Шу сабабли реал бажариш принципини фақат социалистик маъмурий-

[186] Сарбаш С.В. Исполнение договорного обязательства. – М.: Статут, 2005. – 25 с.

режали иқтисодиётга хос бўлган ва бозор иқтисодиёти шароитида иқтисодий асосини йўқотадиган принцип сифатида баҳолашга қаратилган қарашлар етарлича асосланган деб бўлмайди. А.А. Павлов ва бошқа айрим олимлар томонидан илгари сурилган бундай нуқтаи назарлар юридик адабиётларда баҳс-мунозараларга сабаб бўлган[187].

Реал бажариш принципининг амал қилиш доираси масаласи ҳам фуқаролик ҳуқуқи доктринасида ягона ечимга эга эмас. Айрим муаллифлар ушбу принципни мажбурият бузилганидан кейин кредиторнинг қарздордан мажбуриятни натура шаклида бажаришни талаб қилиш ҳуқуқи билан боғлайдилар. Бунда қарздордан неустойка ундирилган ёки зарар қопланган бўлса ҳам, мажбуриятни асл ҳолича бажариш талаби сақланиб қолиши мумкин. Шу асосда мазкур олимлар реал бажариш принципининг амал қилишини асосан мажбурият муносабатининг нормал кечиши бузилган, яъни унинг аномал ривожланиш босқичига боғлайдилар[188].

Н.И. Краснов эса бу масалага нисбатан ўзига хос ёндашувни илгари суради. Унинг фикрича, реал бажариш принципи мажбурият муносабатининг барча босқичларида амал қилади, бироқ унинг ҳуқуқий ифодаси турлича бўлади. Мажбурият нормал тарзда ривожланаётган даврда реал бажариш лозим даражада бажаришнинг таркибий талабларидан бири сифатида намоён бўлади. Қарздор томонидан мажбурият бузилганидан кейин эса у мустақил ҳуқуқий талаб мазмунини касб этиб, кредиторга мажбуриятни айнан натура шаклида бажаришни талаб қилиш имконини беради. Демак, Н.И. Краснов концепциясига кўра, реал бажариш принципи мажбуриятнинг нормал ҳолатида умумий ижро механизмининг элементи бўлса, ҳуқуқбузарлик содир этилганидан кейин мустақил ҳимоя воситаси сифатида намоён бўлади[189].

Фикримизча, реал бажариш принципини фақат мажбурият бузилганидан кейин қўлланиладиган талаб сифатида тушуниш унинг мазмунини асоссиз равишда торайтириб юборади. Зеро, мажбурият вужудга келган пайтдан бошлаб қарздор зиммасида уни айнан келишилган мазмунда бажариш вазифаси мавжуд бўлади. Мажбурият бузилганидан кейин эса мазкур принцип янги мазмун касб этиб, кредиторнинг бузилган ҳуқуқини тиклашга хизмат қилувчи мажбурий ижро талаби сифатида намоён бўлиши мумкин. Шу боис реал бажариш принципини мажбуриятнинг ҳам нормал, ҳам бузилган ҳолатдаги

[187] Павлов А.А. Присуждение к исполнению обязанности как способ защиты гражданских прав. – СПб.: Юридический Центр Пресс, 2001. – 35 с.
[188] Majburiyat huquqi. Darslik. O.Okyulov, N.Imomov, Y. Xodjiyev, A.Ibrohimov, B.Koryog‘diyev. – Toshkent: “Dimal” nashriyoti, 2026-y. – 84 b.
[189] Краснов Н. И. Реальное исполнение договорных обязательств между организациями. – М.: Юридлит , 2009. – 16 с.

ривожланиш босқичларини қамраб олувчи умумий фуқаролик-ҳуқуқий принцип сифатида талқин қилиш мақсадга мувофиқдир.

Юқоридаги ёндашув муайян даражада баҳсли ҳисобланади, чунки у реал бажариш принципининг умумий амал қилиш хусусиятини чеклаб қўяди. Аслида эса мазкур принцип мажбурият муносабати ривожининг фақат муайян босқичига эмас, балки унинг бутун амал қилиш жараёнига дахлдор бўлиб, ҳам мажбурият одатий тарзда бажарилаётган ҳолатда, ҳам у бузилганидан кейин ўз аҳамиятини сақлаб қолади. Бироқ ушбу икки босқичда унинг ҳуқуқий ифодаси бир хил эмас. Мажбурият нормал равишда бажарилаётган даврда реал бажариш лозим даражада бажаришнинг таркибий қисми сифатида намоён бўлиб, қарздордан мажбурият предметини айнан келишилган шакл ва мазмунда тақдим этишни талаб қилади. Мажбурият бузилганидан кейин эса реал бажариш алоҳида ҳуқуқий талаб сифатида намоён бўлиб, қарздор зиммасида мажбуриятни натура шаклида ижро этиш вазифасини сақлаб қолиши мумкин. О.С. Иоффе, В.С. Толстой ва бошқа қатор олимлар ҳам реал бажариш принципининг ана шундай икки босқичли мазмунини қўллаб-қувватлайдилар[190].

ФКнинг 21-бобида белгиланган мажбуриятларни бажаришга оид умумий қоидалар мазмунан мажбуриятни имкон қадар натура шаклида ижро этишга йўналтирилган. Реал бажариш принципининг умумий қоидаси ФК биринчи қисмининг 396-моддасида ифодаланган бўлиб, унинг мазмуни Кодекснинг иккинчи қисмида муайян турдаги фуқаролик-ҳуқуқий мажбуриятларни тартибга солувчи махсус нормалар орқали янада конкретлаштирилади.

Шу билан бирга, амалдаги фуқаролик қонунчилигида реал бажариш принципининг таъсир доираси аввалги қонунчиликка нисбатан маълум даражада чекланганлигини кўриш мумкин. Хусусан, ФК 330-моддасининг биринчи қисмига мувофиқ, мажбурият лозим даражада бажарилмаган тақдирда зарарни қоплаш ва неустойка тўлаш, агар қонун ёки шартномада бошқача тартиб назарда тутилмаган бўлса, қарздорни мажбуриятни натура шаклида бажаришдан озод қилмайди. Демак, қарздор мажбуриятни қисман ёки нуқсонлар билан бажарган бўлса, унга нисбатан мулкий жавобгарлик чоралари қўлланилган тақдирда ҳам асосий мажбуриятни амалда бажариш талаби сақланиб қолади.

Бироқ худди шу модданинг икинчи қисмида бошқача ҳуқуқий оқибат белгиланган. Унга кўра, мажбурият умуман бажарилмаган ҳолларда зарарни қоплаш ва уни бажармаслик учун белгиланган неустойкани тўлаш, қонун ёки

[190] Иоффе О.С. Избранные труды. В 4-х т. Т. 3. СПб.: Юридический центр Пресс, 2004. – 111 с; Толстой В.С. Исполнение обязательства. – М.: Юридическая литература, 2003. – 33 с.

шартномада бошқа қоида назарда тутилмаган бўлса, қарздорни мажбуриятни натура шаклида бажаришдан озод этади. Шу тариқа қонун чиқарувчи мажбуриятни умуман бажармаслик билан уни лозим даражада бажармаслик ўртасида реал ижро нуқтаи назаридан турлича ҳуқуқий режим ўрнатади.

Мазкур қоидалардан келиб чиқадики, реал бажариш принципининг амал қилиш даражаси мажбурият бузилишининг характерига бевосита боғлиқ. Агар мажбурият муайян нуқсонлар билан бажарилган бўлса, қарздор жавобгарлик чораларини қўллаш билан бир вақтда уни натура шаклида тўлиқ ва тегишли даражада бажаришга ҳам мажбур бўлиб қолади. Агар у мажбуриятни умуман бажармаган бўлса, зарар ва неустойкани қоплаш натижасида, умумий қоидага кўра, натура шаклида ижро этиш вазифасидан озод қилиниши мумкин.

Бундай ёндашув амалиётда муайян ҳуқуқий номутаносибликни келтириб чиқаради. Чунки мажбуриятни бажаришга ҳаракат қилган, бироқ уни белгиланган талабларга тўлиқ мувофиқ равишда ижро эта олмаган қарздор, айрим ҳолларда, мажбуриятни умуман бажармаган қарздорга нисбатан оғирроқ ҳуқуқий ҳолатга тушиб қолиши мумкин. Биринчи ҳолатда қарздордан ҳам зарар ёки неустойка ундирилиши, ҳам асосий мажбуриятни натура шаклида ижро этиш талаб қилиниши мумкин бўлса, иккинчи ҳолатда пул компенсациясини тўлаш уни натура шаклидаги ижродан озод этиши эҳтимоли мавжуд.

Фикримизча, бундай фарқ реал бажариш принципининг мантиғи ва мажбурият ҳуқуқидаги адолат мезонлари билан ҳар доим ҳам тўлиқ мувофиқ келмайди. Зеро, мажбуриятни бузган шахснинг ҳуқуқий ҳолати фақат бузилиш шаклига қараб эмас, балки кредитор манфаатининг қай даражада тиклангани, натура шаклидаги ижронинг ҳали ҳам мумкинлиги ва мақсадга мувофиқлиги, шунингдек тарафлар ўртасидаги манфаатлар мувозанатидан келиб чиққан ҳолда белгиланиши лозим. Шу сабабли ФК 330-моддаси қоидаларини қайта кўриб чиқиш ҳамда мажбуриятни умуман бажармаслик ва лозим даражада бажармаслик ҳолатлари учун натура шаклида ижро этишнинг ҳуқуқий оқибатларини янада изчил ва мутаносиб тарзда белгилаш мақсадга мувофиқ бўлар эди.

Бунда бир хил ҳуқуқий оқибатларни механик равишда ҳар икки ҳолатга татбиқ этишдан кўра, кредиторнинг мажбуриятни натура шаклида бажаришга бўлган реал манфаати, ижронинг объектив имконияти ва компенсация воситалари орқали унинг манфаати тўлиқ тикланиши мумкин ёки мумкин эмаслиги асосий мезон сифатида олиниши лозим. Ана шундай ёндашув реал бажариш принципини замонавий бозор муносабатлари шароитида янада самарали ва адолатли қўллаш имконини беради.

Шундай қилиб, мажбуриятни реал бажариш принципи мажбурият ҳуқуқининг асосий принципларидан бири сифатида эътироф этилган бўлса-да, амалда унинг қўлланиш доираси муайян даражада чекланган. Хусусан, умумий қоида сифатида мазкур принцип, аввало, мажбурият лозим даражада бажарилмаган ҳолатларга нисбатан тўлиқроқ намоён бўлади. Шу билан бирга, унинг таъсирчанлиги кредиторга реал ижрони талаб қилиш ёки уни пул шаклидаги компенсация билан алмаштириш имконияти берилгани, шунингдек тегишли ҳуқуқий нормаларнинг диспозитив хусусиятга эгалиги билан ҳам маълум даражада сусайтирилган. Бошқача айтганда, замонавий мажбурият ҳуқуқида реал бажариш мутлақ ва истисносиз талаб сифатида эмас, балки кредитор манфаати, шартнома шартлари ҳамда қонун ҳужжатларида белгиланган истиснолар билан уйғунлашган ҳолда амал қилади.

Юқоридаги таҳлиллар мажбуриятларни лозим даражада ва реал бажариш принципларининг фуқаролик муомаласида алоҳида аҳамиятга эга эканини кўрсатади. Ушбу принципларга риоя қилиниши шартномавий интизомни мустаҳкамлайди, тарафларнинг қонуний кутилмаларини таъминлайди, мажбурият муносабатларининг барқарорлигини оширади ҳамда фуқаролик муомаласида ишонч муҳитини шакллантиради. Шу маънода, мазкур принципларнинг қонунчиликда мустаҳкамланиши билан бир қаторда, уларнинг амалда самарали таъминланиши ҳам муҳим аҳамият касб этади.

Бироқ лозим даражада бажариш ва реал бажариш принципларининг ўзаро нисбати, уларнинг мустақиллиги ёки бири иккинчисини қамраб олиши масаласи фуқаролик ҳуқуқи доктринасида ҳанузгача баҳсли бўлиб қолмоқда. Ушбу масала юзасидан олимлар томонидан бир-биридан фарқ қилувчи бир нечта назарий ёндашувлар илгари сурилган.

Биринчи ёндашув тарафдорлари лозим даражада бажариш ва реал бажариш принципларини мазмунан бир-бирига яқин, ҳатто айрим ҳолларда айнан бир хил ҳуқуқий тушунчалар сифатида баҳолайдилар [191]. Уларнинг нуқтаи назаридан, мажбурият ҳақиқатан ва тўлиқ ижро этилган бўлса, бундай ижро бир вақтнинг ўзида ҳам реал, ҳам лозим даражада бажарилган ҳисобланади.

Иккинчи гуруҳ олимлар эса ушбу принципларни мустақил ҳуқуқий категориялар сифатида ажратадилар. Уларнинг фикрича, реал бажариш принципининг асосий хусусияти шундаки, мажбуриятнинг асл предметини натура шаклида бажариш пул тўлови, зарарни қоплаш ёки бошқа компенсацион

[191] Раҳмонқулов Ҳожи-Акбар. Мажбурият ҳуқуқи (умумий қоидалар) /Ҳуқуқшунослик ихтисоси бўйича олий ўқув юртлари "Хусусий ҳуқуқ" йўналиши магистратура талабалари учун. – Тошкент: ТДЮИ, 2005 й. – 59 б.

восита билан алмаштирилмаслиги лозим. Демак, мазкур ёндашувда реал бажаришнинг марказида кредиторга мажбурият бўйича айнан ваъда қилинган натижани бериш ғояси туради.

Учинчи ёндашувга кўра, реал бажариш принципи лозим даражада бажариш принципининг таркибий қисми ҳисобланади. Хусусан, Д.Гришин мажбуриятни лозим даражада бажариш талаби ўз мазмунига кўра уни натура шаклида бажаришни ҳам қамраб олишини таъкидлайди[192]. Бундай нуқтаи назардан қаралганда, реал ижро мустақил умумий принцип эмас, балки лозим даражада ижро этишнинг зарур элементларидан бири сифатида намоён бўлади.

Тўртинчи ёндашув тарафдорлари, жумладан И.Ю.Шумейко, аксинча, реал бажариш принципини кенгроқ мазмунда тушунадилар ва лозим даражада бажаришни унинг таркибига киритадилар[193]. Бу концепцияга мувофиқ, мажбуриятни реал бажариш нафақат унинг предметини амалда тақдим этишни, балки ижронинг барча зарур шартларига – муддат, жой, усул, субъект ва бошқа талабларга мувофиқ бўлишини ҳам назарда тутади.

ХУЛОСА

Фикримизча, лозим даражада бажариш ва реал бажариш принципларининг ҳар бири мустақил ҳуқуқий мазмунга эга бўлиб, улардан бирини иккинчисига нисбатан устувор ёки қамраб олувчи принцип сифатида баҳолаш етарлича асосли эмас. Мазкур принциплар бир-бири билан чамбарчас боғланган ва ўзаро шартланган бўлса-да, уларнинг ҳуқуқий вазифаси бир хил эмас. Реал бажариш, энг аввало, мажбурият мазмунини ташкил этувчи ҳаракатнинг амалда содир этилишини талаб қилса, лозим даражада бажариш ушбу ҳаракатнинг қонун, шартнома ва бошқа белгиланган талабларга мувофиқ тарзда амалга оширилишини ифодалайди.

Шу боис кўп ҳолларда мазкур икки принцип бир вақтнинг ўзида намоён бўлади. Мажбурият натура шаклида бажарилиб, барча зарур шартларга риоя қилинган бўлса, реал ва лозим даражада бажариш ўзаро мос келади. Бироқ айрим вазиятларда реал ижро мавжуд бўлса-да, уни лозим даражадаги ижро деб баҳолаш мумкин эмас. Масалан, қарздор шартномада назарда тутилган мол-мулкни кредиторга ҳақиқатда топширган, яъни мажбуриятни натура шаклида ижро этган бўлиши мумкин, бироқ мол-мулк белгиланган муддатдан

[192] Гришин Д. Теоретические и практические аспекты исполнения обязательств в натуре // ЭЖ-Юрист. 2001. – № 32. – С. 10.
[193] Шумейко И.Ю. Принципы надлежащего и реального исполнения обязательств // file:///C:/Users/99897/Downloads/printsipy-nadlezhaschego-i-realnogo-ispolneniya-obyazatelstv.pdf

кечиктириб берилса, бундай ижро реал ҳисобланади, аммо лозим даражада бажарилган деб эътироф этилмайди.

Шундан келиб чиқиб, реал бажариш ва лозим даражада бажариш принципларини мазмунан бир-бирига яқин, аммо ҳуқуқий вазифаси ва баҳолаш мезонлари бўйича мустақил принциплар сифатида эътироф этиш мақсадга мувофиқ. Уларнинг ўзаро уйғун амал қилиши мажбурият муносабатининг асосий мақсади – кредитор манфаатини амалда ва тегишли сифатда таъминлашга хизмат қилади.

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ОБОСНОВАНИЕ ГРАНИЧНЫХ ЗНАЧЕНИЙ ПЕТРОФИЗИЧЕСКИХ ПОКАЗАТЕЛЕЙ КАРБОНАТНЫХ КОЛЛЕКТОРОВ БУХАРО-ХИВИНСКОГО РЕГИОНА

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АННОТАЦИЯ

В работе рассмотрены методы определения граничных значений пористости, проницаемости и водонасыщенности для сложнопостроенных карбонатных коллекторов Бухаро-Хивинского региона. Сопоставлены подходы, основанные на керновых зависимостях, подвижности флюида, характеристиках порового пространства, данных ГИС и испытаний скважин. Анализ показывает, что единое граничное значение недостаточно надёжно для трещинных и кавернозных разностей, где одинаковая пористость может соответствовать существенно различной проницаемости. Предложен дифференцированный подход по сочетанию «петротип × фациальная зона» с совместным использованием керна, ГИС и промысловых данных.

Ключевые слова: *карбонатный коллектор; граничное значение; пористость; проницаемость; петротип; фациальная зона; ГИС; Бухаро-Хивинский регион.*

ANNOTATSIYA

Ishda Buxoro-Xiva mintaqasidagi murakkab tuzilgan karbonat kollektorlar uchun g‘ovaklik, o‘tkazuvchanlik va suvga to‘yinganlikning chegaraviy qiymatlarini aniqlash usullari tahlil qilindi. Kern bog‘lanishlari, flyuid harakatchanligi, g‘ovak muhiti xususiyatlari, quduqlarning geofizik tadqiqotlari va sinov natijalariga asoslangan yondashuvlar o‘zaro solishtirildi. Tahlil yoriqli va kavernoz jinslarda yagona chegaraviy qiymat yetarli aniqlik bermasligini ko‘rsatdi. Kollektorlarni «petrotip × fatsial zona» bo‘yicha ajratish hamda kern, quduq geofizik tadqiqotlari va sinov ma’lumotlarini birgalikda qo‘llashga asoslangan differensial yondashuv taklif etildi.

Kalit so‘zlar: *karbonat kollektor; chegaraviy qiymat; g‘ovaklik; o‘tkazuvchanlik; petrotip; fatsial zona; quduq geofizik tadqiqotlari; Buxoro-Xiva mintaqasi.*

ABSTRACT

The paper examines methods for determining porosity, permeability and water-saturation cutoffs in complex carbonate reservoirs of the Bukhara-Khiva region. Approaches based on core relationships, fluid mobility, pore-space characteristics, well logs and well-test results are compared. The analysis shows that a single cutoff is unreliable for fractured and vuggy carbonates, where similar porosity may correspond to markedly different permeability. A differentiated workflow is proposed for combined petrophysical type and facies-zone classes, integrating core, well-log and well-test data.

Keywords: *carbonate reservoir; cutoff value; porosity; permeability; petrophysical type; facies zone; well logging; Bukhara-Khiva region.*

ВВЕДЕНИЕ

Граничные значения пористости, проницаемости и водонасыщенности определяют, какие интервалы включаются в эффективную толщину и подсчёт запасов. Для месторождений на поздней стадии разработки точность этих параметров особенно важна: ошибочный порог может исключить из оценки часть продуктивного разреза [1].

Единой стандартизированной методики выбора граничных значений нет. В практике используются разные критерии отсечения, а результат зависит от принятого параметра и способа его обоснования [1]. Для карбонатных коллекторов эта проблема усиливается из-за сочетания матричной, каверновой и трещинной пустотности, поэтому одна зависимость «пористость - проницаемость» не описывает весь разрез с одинаковой точностью [2, 3].

Для неоднородных коллекторов применяются комплексные петрофизические методы и модели, учитывающие несколько признаков одновременно. В опубликованных исследованиях ансамблевые алгоритмы использовались для прогноза проницаемости по керну и данным ГИС [4], а отдельные модели для разных петротипов -для карбонатных резервуаров [5]. Их практическая ценность определяется не самим алгоритмом, а качеством исходной петрофизической классификации и проверкой результатов по независимым данным.

В Бухаро-Хивинском регионе геологическое строение юрской карбонатной формации изучено достаточно подробно [6–8], однако опубликованных региональных данных недостаточно для обоснования единых количественных отсечек по всем типам коллекторов. В производственной оценке это создаёт

риск объединения пород с различным строением пустотного пространства и разными фильтрационными свойствами.

Цель работы -оценить применимость существующих способов определения граничных петрофизических значений к карбонатным коллекторам Бухаро-Хивинского региона и сформировать основу дифференцированного регионального подхода.

МАТЕРИАЛЫ И МЕТОДЫ

Информационную базу составили 19 опубликованных работ по методам определения граничных значений и по геолого-петрофизическому строению юрских карбонатных отложений Бухаро-Хивинского региона. Для методической части использованы исследования по граничным значениям [1, 9, 10], оценке карбонатных коллекторов [2, 3, 11], петротипизации и прогнозу фильтрационных свойств [4, 5, 12–15]. Региональные сведения сопоставлялись по работам [6–8, 16–18].

Источники отбирались по прямой связи с задачей исследования, наличию описанной методики и возможности проверить происхождение численных характеристик. Для региональных публикаций дополнительно прослеживались первичные ссылки, поскольку часть приведённых характеристик была получена не на объектах Бухаро-Хивинского региона.

Анализ включал сопоставление критериев отсечения по проницаемости, подвижности флюида и характеристикам порового пространства; оценку применимости этих критериев к трещинным и кавернозным карбонатам; проверку происхождения опубликованных региональных зависимостей; сопоставительное построение зависимостей «пористость -проницаемость» для разных объектов. График на рис. 3 построен в MATLAB R2023b по уравнениям из источника [16] в диапазоне пористости 2–20% с логарифмической шкалой проницаемости.

Рисунки 1, 2 и 4 являются принципиальными схемами и не содержат новых измерений. Работа имеет обзорно-методический характер: лабораторные исследования керна и самостоятельная интерпретация первичных материалов ГИС не проводились, поэтому предложенный подход требует последующей проверки на фактических данных месторождений.

РЕЗУЛЬТАТЫ И ОБСУЖДЕНИЕ

В большинстве традиционных схем исходной отсечкой служит проницаемость. Для нефтяных залежей в литературе часто рассматривается диапазон 0,1–1,0 мД, а для газовых объектов -более низкие значения [1]. Более обоснованным является критерий подвижности флюида K/μ: он учитывает

одновременно проницаемость породы и вязкость флюида. Порог подвижности около 1,0 мД/сП позволяет рассчитывать граничную проницаемость с учётом конкретных пластовых условий [9].

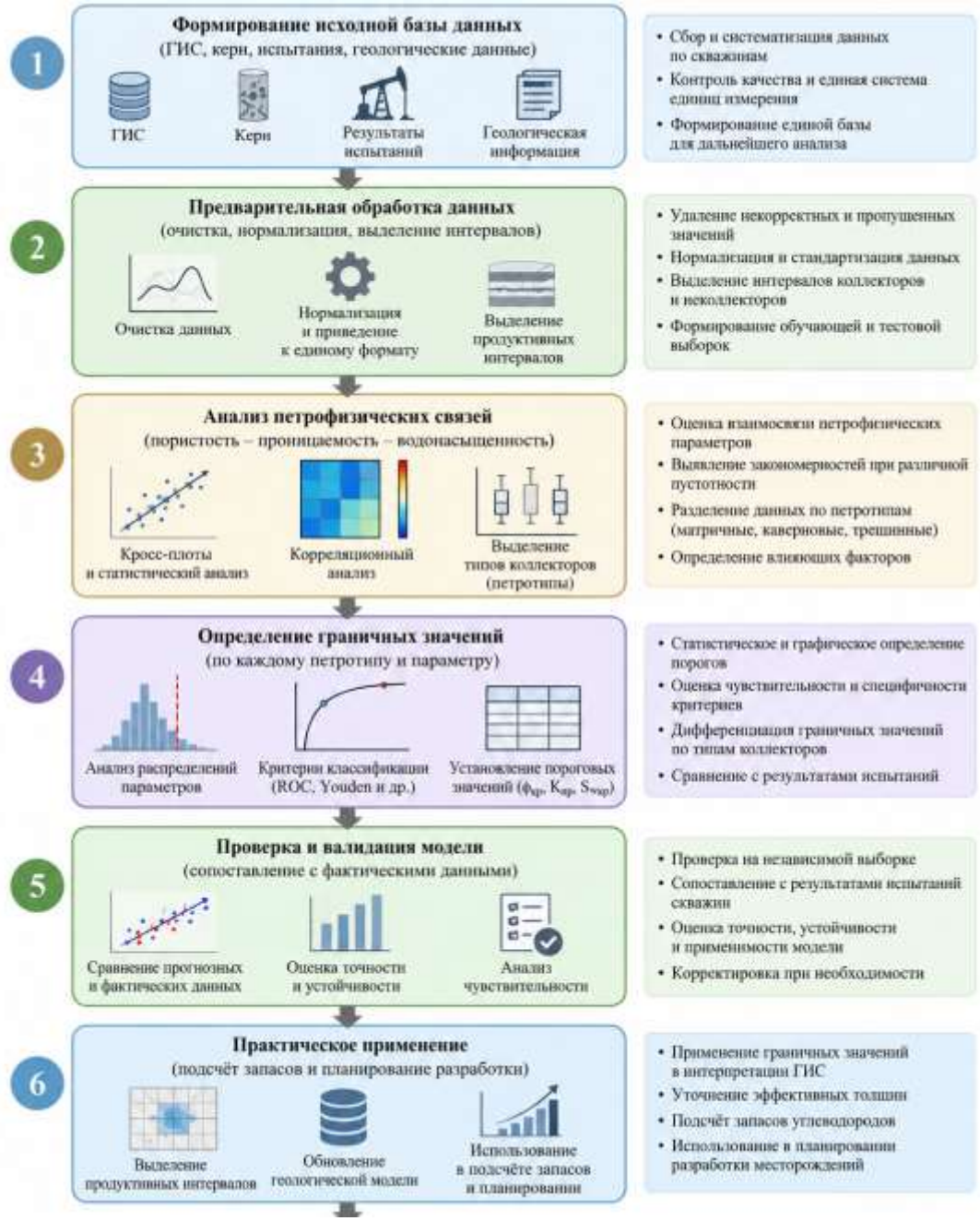


Рис. 1. Обобщённый алгоритм последовательного определения граничных значений (по данным [1])

Граничную пористость обычно получают по керновому кросс-плоту «пористость -проницаемость». При квадрантном методе выбирается такая отсечка, при которой минимальна суммарная вероятность ошибочного отнесения образцов к коллектору или неколлектору [10]. Недостаток проявляется в области низкой пористости: при выполаживании регрессионной

зависимости расчётная отсечка может быть завышена, и часть потенциально продуктивных интервалов исключается из подсчёта [1].

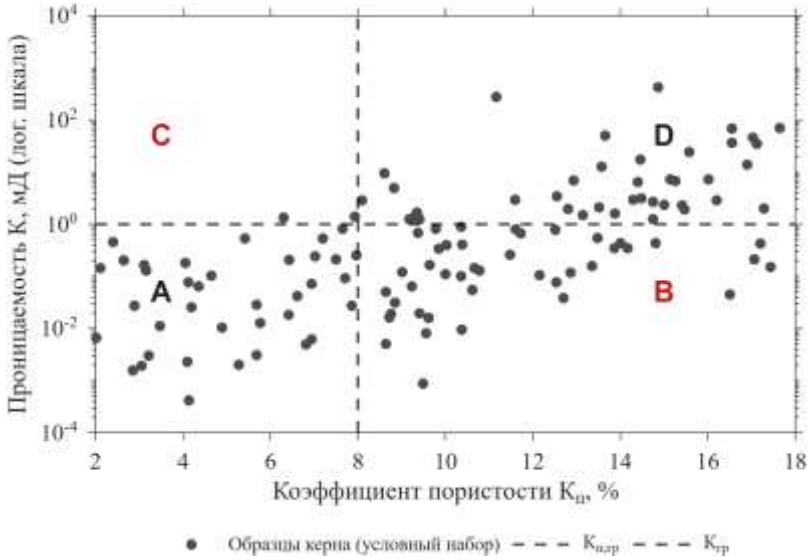


Рис. 2. Квадрантный метод определения граничного значения пористости (принципиальная схема; точки -условный иллюстративный набор). A - неколлектор определён верно; B -коллектор ошибочно отнесён к неколлектору; C -неколлектор ошибочно отнесён к коллектору; D -коллектор определён верно

Другой способ использует билинейную зависимость эквивалентного диаметра порового канала от пористости и связывает отсечку с потерей способности поровой системы обеспечивать фильтрацию [11]. При дефиците керновых данных иногда применяются значения по аналогам или обобщённые диапазоны; для нефтенасыщенных карбонатов приводятся ориентиры 2–4% пористости [1]. Такие значения могут использоваться только как предварительные и требуют проверки для конкретного типа породы.

Для трещинных и кавернозно-трещинных карбонатов матричная проницаемость сама по себе не определяет продуктивность. Интервал с матричной проницаемостью порядка 0,01 мД может давать промышленный приток при развитой системе естественных трещин. Поэтому пористость и матричная проницаемость не всегда подходят как самостоятельные критерии отсечения; в отдельных методиках дополнительно учитываются водонасыщенность и глинистость [3].

Для карбонатных объектов более надёжны методы, разделяющие вклад разных типов пустотности. Подход на основе граничного T2 по данным ядерно-магнитного каротажа в сочетании с капилляриметрией и испытаниями пластов позволяет отдельно оценивать матричную, каверновую и трещинную составляющие [2]. На неоднородных карбонатных месторождениях также

требуется совместное использование керновых кросс-плотов, петрографии и результатов опробования скважин [19].

Модели прогноза проницаемости по нескольким признакам полезны там, где линейная регрессия не отражает неоднородность разреза. Ансамблевые методы показали более высокую точность по сравнению с классической регрессией на совмещённых данных керна и ГИС [4], а петротип-ориентированные модели применялись непосредственно для карбонатных резервуаров [5]. Сходная логика используется при оценке неопределённости net-pay cut-off [12], разделении пор по двум T2-отсечкам [13] и поиске пропущенных продуктивных интервалов [14].

В Бухаро-Хивинском регионе юрская карбонатная формация представлена депрессионной, рифовой и зарифовой лагунной фациальными зонами [16]. Различия между ними затрагивают не только литологию, но и строение пустотного пространства, мощность продуктивных интервалов и характер фильтрации.

Нижний горизонт депрессионной фации при пористости менее 2–3% и практически нулевой матричной проницаемости может быть продуктивным за счёт трещиноватости [16]. В рифовой зоне мощность продуктивных горизонтов изменяется от нулевых значений на гребне до более 150 м в тыловой части рифовой постройки [16]. Такая изменчивость связана с различиями фациальной обстановки и тектонического контроля, влияющими на формирование биогермных и рифовых тел и их фильтрационно-ёмкостные свойства [17].

Проверка происхождения опубликованных численных характеристик выявила важное ограничение региональной базы. В работе [16] диапазоны свойств для порового, порово-кавернозного, каверново-порового, трещинно-кавернозного и трещинного типов приведены со ссылкой на рифовые резервуары Пермского Прикамья [18]. Экспоненциальные зависимости Кпр = f(Кп) для месторождения Сургиль относятся к терригенному юрскому разрезу Устюртского региона. Карбонатный разрез Бухаро-Хивинского региона в том же источнике характеризуют степенные зависимости для порово-трещинного и трещинно-порового типов месторождения Оккул [16].

Следовательно, прямое использование всех опубликованных диапазонов как региональных нормативов некорректно. Для обоснования отсечек необходима собственная петрофизическая выборка по месторождениям Бухаро-Хивинского региона с разделением данных по типу пустотности и фациальной принадлежности.

Сопоставление зависимостей на рис. 3 показывает, что при пористости 10% расчётная проницаемость для разных типов пород отличается более чем на порядок. Это расхождение подтверждает ограниченность единой зависимости и упрощённой двухтипной классификации «порово-трещинный / трещинно-поровый», применяемой в региональных обобщениях [16].

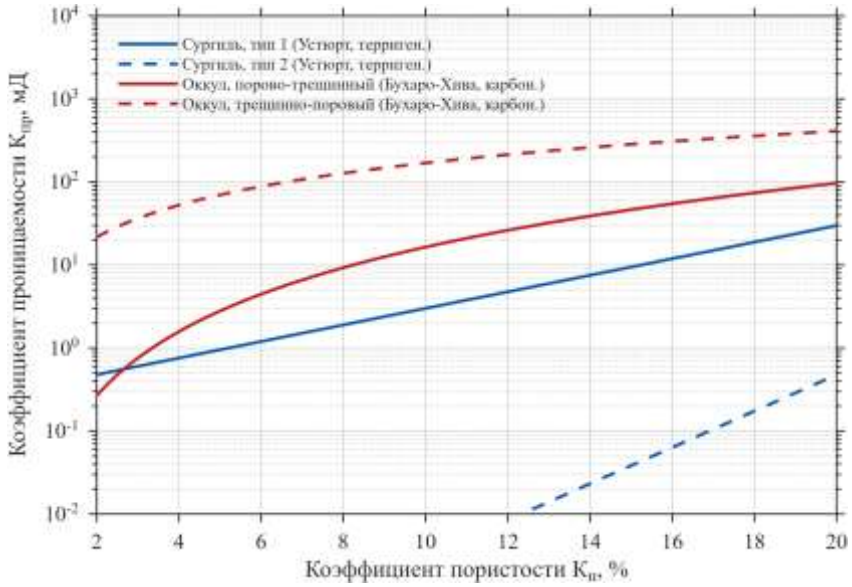


Рис. 3. Сопоставление опубликованных зависимостей Кпр = f(Кп) для месторождений Сургиль (Устюртский регион, терригенный разрез) и Оккул (Бухаро-Хивинский регион, карбонатный разрез); построено по уравнениям, приведённым в [16]

Главная причина расхождений -объединение в одном кросс-плоте пород с разным типом пустотного пространства. Общая регрессия в таком случае отражает среднее статистическое соотношение, а не устойчивую физическую связь для каждого петротипа. При одинаковой пористости поровые и трещинные разновидности могут иметь существенно различную проницаемость, поэтому единая отсечка снижает точность классификации.

Дополнительная неопределённость связана с представительностью керна. Трещинные и кавернозные интервалы хуже сохраняются при бурении и подъёме, поэтому керновая выборка может быть смещена в сторону более устойчивых поровых разностей. По этой причине параметры, рассчитанные только по керну, необходимо проверять по ГИС и результатам испытаний скважин.

Упрощённая классификация также объединяет внутри одной группы породы с разными фильтрационными свойствами. Если фактический разрез включает несколько типов пустотности, общий порог пористости или проницаемости для всей группы не обеспечивает одинаковой достоверности.

Для региона целесообразно определять граничные значения по сочетанию «петротип × фациальная зона». Петротип можно выделять по гидравлическим единицам потока [15] или сопоставимой петрофизической классификации, а фациальное разделение учитывать по депрессионной, рифовой и лагунной обстановкам. Такая единица анализа лучше соответствует реальному строению карбонатного разреза, чем единая отсечка для месторождения или региона.

Расчёт должен опираться на согласование трёх групп данных. Керн задаёт количественные петрофизические связи, ГИС обеспечивает непрерывную характеристику разреза, а испытания скважин проверяют фактическую продуктивность в пластовых условиях. Ни один источник не заменяет остальные: достоверность определяется их взаимной калибровкой.

При достаточном объёме данных отдельные прогнозные модели могут строиться для каждого сочетания петротипа и фации. Их следует использовать как вспомогательный инструмент внутри физически интерпретируемой петрофизической схемы. Практически значим вариант, при котором прогнозируются отдельные параметры классической модели -например, показатель цементации в уравнении Арчи, -а расчёт водонасыщенности сохраняет физическую основу.

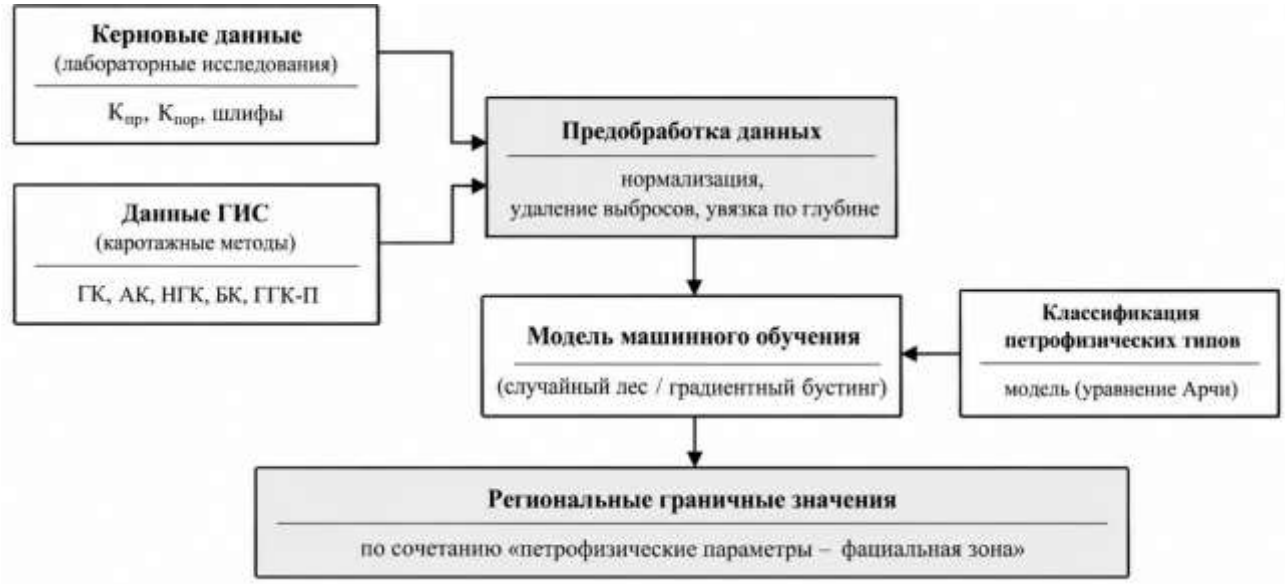


Рис. 4. Схема гибридного алгоритма определения региональных граничных значений, объединяющего керновые данные, материалы ГИС, машинное обучение и классическое уравнение Арчи

Преимущество дифференцированной схемы состоит в том, что она не усредняет разнородные петротипы и может быть реализована преимущественно на стандартном комплексе керновых и каротажных данных. Специализированные исследования, включая ЯМК и электрические

микросканеры, повышают информативность, но их отсутствие не исключает поэтапной региональной калибровки по существующему фонду скважин.

Основное ограничение исследования -отсутствие собственного массива керна, первичных материалов ГИС и результатов испытаний по конкретным месторождениям. Поэтому предложенная схема обоснована методически, но её численные отсечки пока не верифицированы. Дополнительное ограничение связано с тем, что часть опубликованных региональных характеристик основана на геологических аналогах, а не на единой базе данных Бухаро-Хивинского региона.

Следующий этап должен включать формирование региональной базы керновых и промысловых данных, группировку по петротипам и фациальным зонам, расчёт собственных зависимостей «пористость -проницаемость» и проверку полученных отсечек по независимым испытаниям скважин. Для трещинных разностей особенно важно компенсировать недостаточную представленность керна материалами ГИС и данными о фактических притоках.

ЗАКЛЮЧЕНИЕ

Единая граничная величина пористости или проницаемости не может одинаково надёжно характеризовать все карбонатные коллекторы Бухаро-Хивинского региона. Трещинная и кавернозная составляющие нарушают прямую связь между матричной пористостью, матричной проницаемостью и фактической продуктивностью.

Опубликованные региональные обобщения содержат данные, заимствованные по геологическим аналогам из Пермского Прикамья и Устюртского региона [16, 18]. Для количественного обоснования отсечек требуется собственная региональная база, в которой происхождение каждого набора петрофизических параметров прослеживается до конкретного типа пород и объекта.

Наиболее обоснованной является дифференциация по сочетанию «петротип × фациальная зона» с совместным использованием керна, ГИС и результатов испытаний скважин. Прогнозные алгоритмы могут дополнять такую схему, но итоговые параметры должны сохранять физическую интерпретируемость и проверяться на независимых данных.

Практическая задача дальнейших исследований -проверить предложенную схему на фактическом материале месторождений региона и определить локальные граничные значения для выделенных групп коллекторов. Это позволит обоснованнее оценивать интервалы, которые при укрупнённой классификации могут быть отнесены к неколлекторам.

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CALCULATION OF THE DIMENSIONS OF THE LOCAL SCOUR ZONE IN A LOWER-POOL SECTION COMPOSED OF COHESIVE AND NON-COHESIVE SOILS

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ABSTRACT

The scour process in channels composed of cohesive and non-cohesive soils remains one of the least investigated and most complex problems in the dynamics of open-channel flows. The difficulty of studying and accurately describing this phenomenon is primarily related to the significant variability of the physicomechanical properties of cohesive soils. Unlike non-cohesive materials, cohesive soils exhibit complex structural, strength, and deformation characteristics, which considerably affect their resistance to erosion and the development of scour. In addition, the theoretical description of the scour process requires consideration of numerous interacting hydraulic and soil-mechanical factors, making the development of reliable mathematical models particularly challenging. Experimental

investigations are also complicated by the heterogeneous structure of cohesive soils and the difficulty of reproducing their natural conditions in laboratory environments. The problem becomes considerably more complicated when scour of cohesive soil is investigated downstream of a hydraulic jump in the lower pool of hydraulic structures. In this region, the flow is characterized by intense turbulence, significant fluctuations in velocity and pressure, and the formation of large-scale vortical structures. Such conditions create a complex macroturbulent flow zone in which erosion and sediment transport processes interact dynamically. Therefore, a comprehensive investigation of cohesive-soil scour in this zone requires combined theoretical and experimental approaches to establish the main governing relationships and improve the accuracy of hydraulic calculations.

Keywords: *Longitudinal velocity pulsations, local scour zone, lower pool, cohesive and non-cohesive soils.*

INTRODUCTION

We proceed to an analysis of the studies conducted on local scour in a lower-pool section composed of cohesive and non-cohesive soils. In the first series of experiments, mean velocities along the eroded surface were measured beginning from the flow emerging from the riprap section. Measurement points were established at distances of 0.55, 1.0, 1.5, and 4 m from the end of the riprap section. To determine the permissible non-scouring flow velocities, the discharge in the experiments was varied from 0.6 to 3.0 l/s. Accordingly, the mean velocities varied from 0.14 to 1.7 m/s. The experiments lasted for 10–20 h. When an experiment was temporarily interrupted, the cohesive-soil specimen was tightly covered with a cotton-like material to retain moisture. This procedure preserved the physicomechanical properties of the cohesive soil throughout the experiment. The experiments were terminated when the scour reached the bottom of the test container. This limitation was imposed because of the difficulty associated with preparing the cohesive and non-cohesive soils and with the weight of the container containing the soil.

MATERIALS AND METHODS.

For all experiments, the mechanism of formation of the local scour hole was nearly identical and differed only in terms of the scour volume and the time required for stabilization.

7L experiment lasted 20 h (Table 1.1); significant surface-layer disturbances began to appear after seven hours of exposure to a flow with a discharge of 18 L/s,

while the volume of eroded soil amounted to $\frac{V_{yuv}}{V_{kass}} = 0,03$. The volume of the test container was $V = 0,034 m^3$. When the discharge was increased to 24 L/s and the duration to 11 h, the scour amounted to $\frac{V_{yuv}}{V_{kass}} = 0,1$, after which uniform scour began over time once the scour limit had been established, and for the experiment considered here the process stabilized after 20 h.

Figures 1.1–1.5 show the variation of the total volume of cohesive soil as a function of dimensionless time $\frac{V_{yuv}}{V_{kass}} = f\left(\frac{t}{t_{\max}}\right)$, dimensionless discharge $\frac{Q}{Q_{\max}} = f\left(\frac{V_{yuv}}{V_{kass}}\right)$ and scour depth as a function of dimensionless discharge $\frac{Q}{Q_{\max}} = f\left(\frac{h_{yu}}{h_{yu\,max}}\right)$.

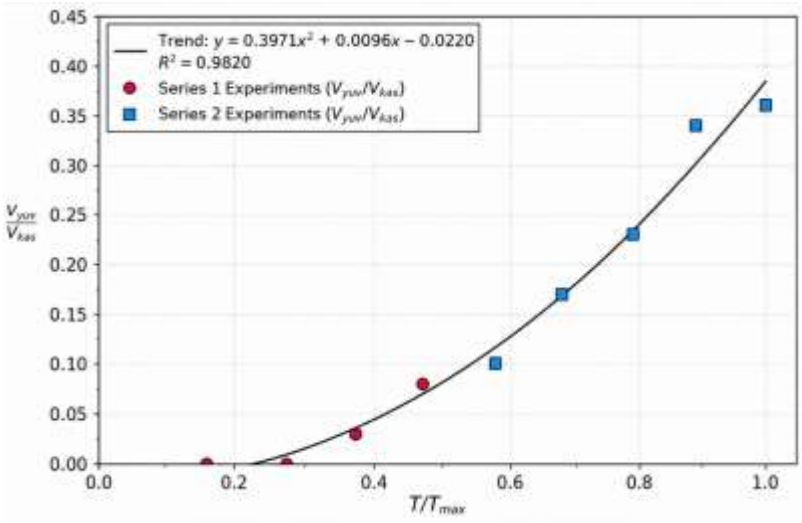


Fig. 1.1. Relationship between the volume of cohesive soil and time $\frac{V_{yuv}}{V_{kass}} = f\left(\frac{t}{t_{\max}}\right)$

Table 1.1

7L experiment data

Experiment No.	Q m^3/s	Experiment duration, h	h_{yu} Scour depth, cm	$h_{yu\,max}$ Maximum scour depth, cm	$\frac{h_{yu}}{h_{yu\,max}}$	Total experiment time, h	$\frac{T}{T\,max}$	V_{yuv} Scoured volume, m³	$\frac{V_{yuv}}{V_{kas}}$	$\frac{Q}{Q_{max}}$	$\frac{d_0}{d_{0max}}$	d_0 mm
7L	0,006	3	-	-	-	3	0.16	-	0.00	0.22	No scour	-
	0,012	2	-	-	-	5	0.26	-	0.00	0.44	No scour	-
	0,018	2	3,5	8,54	0,41	7	0.37	0.001	0.03	0.67	0,35	10
	0,024	2	6,0	8,45	0,71	9	0.47	0.002	0.08	0.89		
	0,027	2	6,5	8,55	0,76	11	0.58	0.003	0.10	1.09	0,6	12
	0,027	2	7,5	8,52	0,88	13	0.68	0.006	0.17	1.00		
	0,027	2	8,5	8,5	1,0	15	0.79	0.009	0.23	1.00	1,0	20
	0,027	2	8,5	8,5	1,0	17	0.89	0.012	0.34	1.00		
	0,027	2	8.5	8,5	1,0	19	1.00	0.12	0.36	1.00	0,9	8

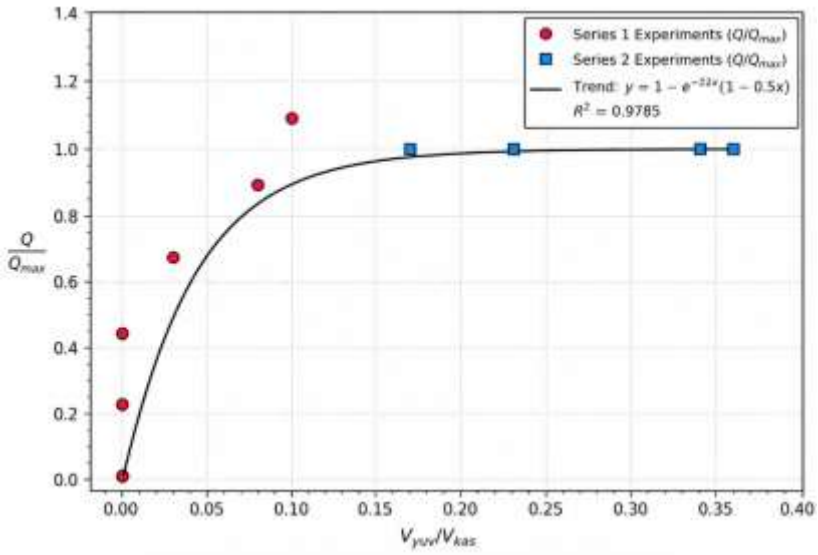


Fig. 1.2. Relationship between the volume of cohesive-soil scour and water discharge $\frac{Q}{Q_{\max}} = f\left(\frac{V_{yuv}}{V_{kass}}\right)$

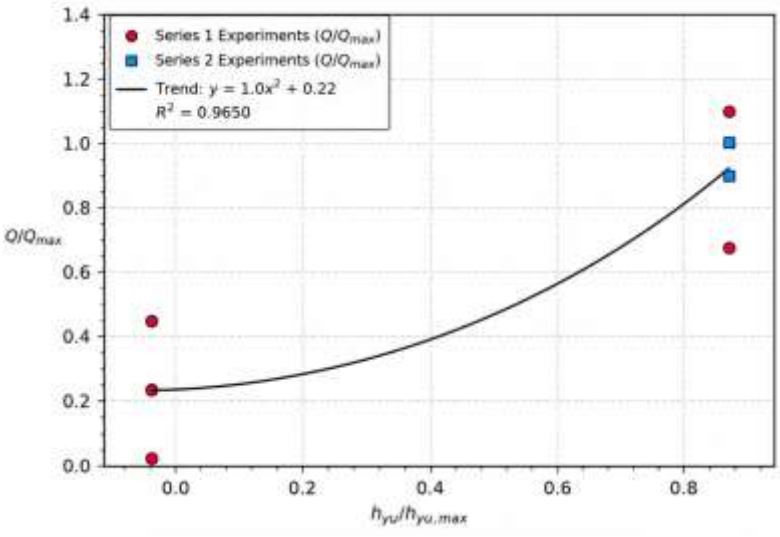


Fig. 1.3. Relationship between cohesive-soil scour depth and water

$$\textbf{discharge}\ \frac{Q}{Q_{\max}} = f\left(\frac{h_{yu}}{h_{yu\,max}}\right)$$

RESULTS AND DISCUSSION.

This process affects local areas of the surface and ceases after a rough surface with a distinct structural configuration has formed. In the lower pool, as the flow velocity increases, scour begins from the aggregate exposed to the flow, which results in an increase in frontal and lifting forces. Under these conditions, the portion of the aggregate facing the flow causes an increase in the pulsations of the lifting forces. The increase in the pulsating forces of the flow intensifies vibration and dynamic forces acting on the aggregate. As a result, the roughness is gradually disrupted, and eventually the aggregates begin to detach when the resultant active forces exceed the passive forces (Fig. 1.4). A certain regularity was observed in the process of aggregate detachment within the scour hole during the experiments.



Fig. 1.4. Scour of cohesive soil in the lower pool

was observed. In fact, when the scouring velocity of the flow was established, the diameter of the detached aggregates was 2–4 mm. Subsequently, as the scour hole developed (after 10 h), the aggregate size increased to 10–12 mm and, at the corresponding values in most experiments, $T/T_{\max} \approx 0,6...0,8$ reached a maximum of 20 mm (Fig. 1.5).

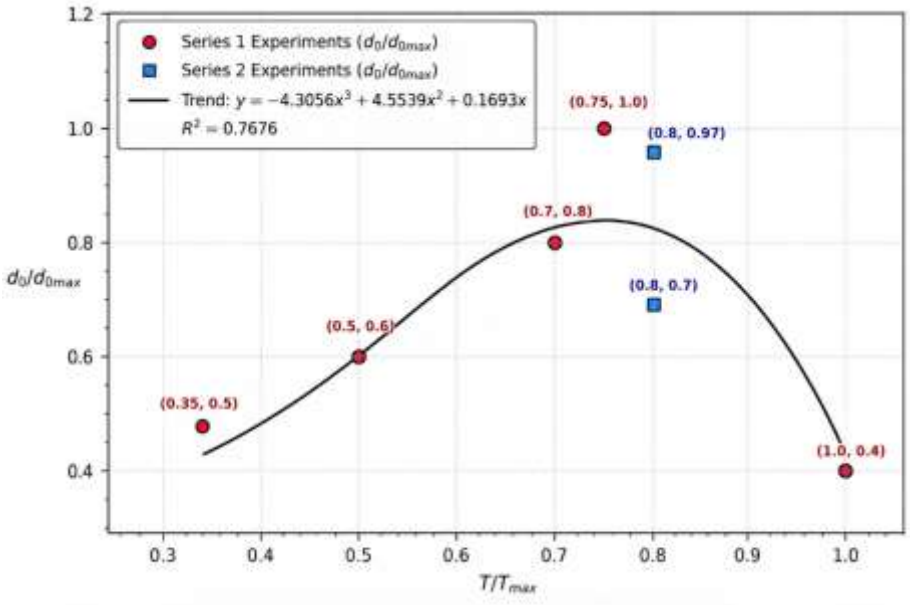


Fig. 1.5. Relationship between cohesive-soil aggregate detachment and time

$$\frac{d_0}{d_{0max}} = f\left(\frac{T}{T_{\max}}\right)$$

Subsequently, the scour process generally stabilized, and the size of the detached aggregates reached its minimum value. When the scour hole became fully

stabilized (in practice, the experiments were conducted for up to 50 h), aggregate detachment became random in nature, while the aggregate diameter remained minimal.

A characteristic feature of aggregate differentiation is that, during formation of the scour hole, the kinematic structure of the flow is re-established in the bottom region of the hole. Longitudinal vortices develop, and under these conditions the dimensions of the aggregates detached from the scour hole reach $d \approx 0{,}1L_b$ (Fig. 1.1). Here, L_b denotes the geometric scale of the vortex in the bottom region. Similar results were obtained in subsequent experiments. The diameter of the detached aggregates reached a maximum value and then gradually decreased (Fig. 1.5). The experiment was terminated when the scour reached the bottom of the test container because this would otherwise alter the experimental conditions. Analysis of the experimental data showed that, at the initial stage of the scour hole, small-diameter aggregates begin to detach from the soil mass, initiating the local scour process. This intensive process develops along the length from the head of the scour hole until the scour depth reaches its maximum value.

It was established that the size of the aggregates detached from cohesive soil can be considered to be 2–4 mm only during the initial stage of scour, provided that equilibrium is maintained or the actual flow velocity only slightly exceeds the non-scouring velocity. Subsequently, during formation of the scour hole, their size increases by a factor of five to six. In this case, the scour mechanism is determined not only by the mean velocities in the scour hole but also by the scales of turbulent vortices. Thereafter, as the scour hole stabilizes, the size of the detached aggregates decreases and returns to its initial value.

The methodology developed to study the scour resistance of soils can be used for the following purposes:

-further investigation of the scour patterns of cohesive soils forming the lower pool and development of methods for predicting their scour resistance;

-assessment of the scour resistance of cohesive soils in the construction zones of low- and medium-head hydraulic structures;

-assessment of the potential safety hazards associated with scour of cohesive banks and development of measures to improve the reliability of the lower-pool operating regime.

CONCLUSION.

1. As a result of the predominance of general scour during channel deformation and the associated lowering of the water level in the lower pool, deepening of the

local scour hole occurs near hydraulic structures. Changes in the shape of the local scour hole, as well as deposition in the channel of material transported from the scour depression, alter the flow plan in the flow-expansion zone, which in turn leads to reformation of the channel in this section.

2. Experiments established that the scour resistance of cohesive soils depends on the geometric dimensions of the specimens and decreases as their surface area increases. This may be explained by the probable fatigue-related nature of failure of the cohesive-soil surface during scour.

3. The influence of mean scour velocities over the depth and near the bottom on the development of a local scour hole in cohesive soil was evaluated.

4. Based on the conducted studies, a method was developed for calculating local bottom deformations in the lower pool of water-discharge structures. The stabilization time of the scour process was taken into account. An approximate solution was obtained for determining the location and maximum depth of the scour hole.

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“UZBEKISTAN GTL” MCHJ TEXNOLOGIK CHIQINDILARINI MODIFIKATSIYA QILISH ORQALI KOMPLEKS XOSSALARGA EGA BO‘LGAN POLIMER KOMPOZITSION MATERIALLAR OLISH VA QO‘LLASH

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ANNOTATSIYA

Ushbu maqolada «Uzbekistan GTL» MChJda Fischer–Tropsch texnologiyasi asosida sintetik suyuq uglevodorodlar ishlab chiqarish jarayonida hosil bo‘ladigan texnologik ikkilamchi materiallardan polimer kompozitsion materiallar olishda foydalanish imkoniyatlari ilmiy adabiyotlar tahlili asosida o‘rganildi. Tadqiqotning maqsadi yangi eksperimental natijalar olish, mavjud ilmiy ishlanmalarni tizimlashtirish, texnologik chiqindilarning fizik-kimyoviy tabiatini baholash va istiqbolli qayta foydalanish yo‘nalishlarini aniqlashdan iborat. Tahlil ikkilamchi materiallarni shartli ravishda ikki guruhga – “mineral tabiatli fraksiya” va “uglevodorodli fraksiya (FT-wax)” ga - ajratish maqsadga muvofiqligini ko‘rsatdi. Mineral fraksiya tarkibidagi SiO_2, Al_2O_3, CaO kabi oksidlar uni PP, PE va PVC uchun potensial to‘ldirgich sifatida ko‘rish imkonini beradi, biroq yakuniy natija zarracha o‘lchami, sirt energiyasi hamda silan, stearat kabi moddalar bilan modifikatsiyaga bog‘liq. Hindiston, Janubiy Afrika, Italiya, Turkiya, Koreya Respublikasi, Yaponiya va boshqa mamlakatlar tadqiqotlari tahlili asosida «Uzbekistan GTL» uchun texnologik chiqindilarni yagona massa sifatida emas, balki fizik-kimyoviy tabiatiga ko‘ra fraksiyalab, har bir fraksiya uchun mos texnologiyani tanlash zarur ekanligi taklif etildi.

Kalit so‘zlar: *Uzbekistan GTL, Fischer–Tropsch, texnologik chiqindilar, FT-wax, perlit, mineral to‘ldirgich, polimer kompozit, PVC, PP, PE, sirt modifikatsiyasi, silan, kalsiy stearat, interfeys adgeziyasi, qayta ishlash.*

АННОТАЦИЯ

В данной статье на основе анализа научной литературы рассмотрены возможности использования технологических вторичных материалов, образующихся при производстве синтетических жидких углеводородов по технологии Фишера–Тропша на ООО «Uzbekistan GTL», для получения полимерных композиционных материалов. Целью работы является получение новых экспериментальных данных, систематизация имеющихся научных разработок, оценка физико-химической природы технологических отходов и определение перспективных направлений их повторного использования. Анализ показал целесообразность условного разделения вторичных материалов на две группы — «фракцию минеральной природы» и «углеводородную фракцию (FT-wax)». Наличие в минеральной фракции оксидов SiO_2, Al_2O_3, CaO позволяет рассматривать её как потенциальный наполнитель для PP, PE и PVC, однако конечный результат зависит от размера частиц, поверхностной энергии, а также модификации силанами, стеаратами. На основе анализа исследований учёных Индии, ЮАР, Италии, Турции, Республики Корея, Японии и других стран для «Uzbekistan GTL» предлагается не перерабатывать отходы как единую массу, а фракционировать их по физико-химической природе с выбором соответствующей технологии для каждой фракции.

Ключевые слова: *Uzbekistan GTL, Фишер–Тропш, технологические отходы, FT-wax, перлит, минеральный наполнитель, полимерный композит, ПВХ, ПП, ПЭ, модификация поверхности, силан, стеарат кальция, адгезия на границе раздела, переработка.*

ABSTRACT

This article examines, on the basis of a scientific literature review, the possibilities of using technological secondary materials generated during the production of synthetic liquid hydrocarbons via Fischer–Tropsch technology at Uzbekistan GTL LLC for the manufacture of polymer composite materials. The aim of the study is not to obtain new experimental data, but to systematize existing scientific findings, assess the physicochemical nature of the technological waste, and identify promising directions for its reuse. The analysis showed that it is reasonable to conditionally divide the secondary materials into two groups - a "mineral-natured fraction" and a "hydrocarbon fraction (FT-wax)". The presence of oxides such as SiO_2, Al_2O_3 and CaO in the mineral fraction allows it to be regarded as a potential filler for PP, PE and PVC, although the final outcome depends on particle size, surface energy, and modification with silanes, stearates or titanates. Based on

research from India, South Africa, Italy, Turkey, the Republic of Korea, Japan and other countries, it is proposed that, for Uzbekistan GTL, the technological waste should not be processed as a single mass but fractionated according to its physicochemical nature, with a suitable technology selected for each fraction.

Keywords: *Uzbekistan GTL, Fischer–Tropsch, technological waste, FT-wax, perlite, mineral filler, polymer composite, PVC, PP, PE, surface modification, silane, calcium stearate, interfacial adhesion, recycling.*

KIRISH

Sanoat ishlab chiqarishining rivojlanishi natijasida hosil bo‘ladigan ikkilamchi materiallarni qayta ishlash va ularga qo‘shimcha qiymat berish zamonaviy materialshunoslikning muhim yo‘nalishlaridan biridir. Ayniqsa, mineral tarkibli sanoat chiqindilarini polimer kompozitsion materiallarda to‘ldirgich sifatida qo‘llash bir vaqtning o‘zida ikki masalani - chiqindilarni utilizatsiya qilish va yangi funksional materiallar olish masalasini - hal qilish imkonini beradi.

Girge va hammualliflar sanoat chiqindilari bilan to‘ldirilgan polimer kompozitlar bo‘yicha sharhida fly ash, red mud, blast-furnace slag va Linz–Donawitz slag kabi materiallarning polimer matritsalarida qo‘llanilishini tahlil qilgan. Mualliflar to‘ldirgichning zarracha o‘lchami, zarracha taqsimoti, solishtirma sirt maydoni va polimer bilan interfeys o‘zaro ta’siri kompozit xossalarini belgilovchi muhim omillar ekanini ko‘rsatgan [1].

Taurino, Bondioli va Messori tomonidan amalga oshirilgan keng qamrovli sharhda esa turli xil chiqindilarni polimer matritsalarida qayta ishlatishning ekologik va texnologik jihatlari tahlil qilingan. Mualliflar ko‘plab chiqindi to‘ldirgichlarda polimer bilan adgeziyani yaxshilash uchun sirtga oldindan ishlov berish talab qilinishini ta’kidlagan [2].

2025-yilda Muthukutti va hammualliflar tomonidan chop etilgan sharhda ham metall bo‘lmagan sanoat chiqindilarini polimer kompozitlarda qo‘llashning istiqbollari ko‘rib chiqilib, chiqindilarni polimer matritsasiga kiritish aylana iqtisodiyoti va barqaror materiallar ishlab chiqarish uchun istiqbolli yo‘nalish sifatida baholangan [3].

Mazkur ilmiy yo‘nalish «Uzbekistan GTL» MChJ uchun ham dolzarbdir. Korxonada Fischer–Tropsch texnologiyasi asosida tabiiy gazdan sintetik suyuq uglevodorodlar ishlab chiqariladi. Bunday texnologik tizimlarda katalizator, adsorbent, filtr materiallari, mineral yordamchi materiallar va uglevodorodli yuqori molekulyar fraksiyalar bilan bog‘liq ikkilamchi materiallar hosil bo‘lishi mumkin.

Shu sababli ushbu maqolada asosiy e’tibor “polimer chiqindisini shunchaki yo‘q qilish” emas, balki uning fizik-kimyoviy tabiatini aniqlash, mos polimer matritsasini tanlash, zarur bo‘lsa sirtini modifikatsiyalash va funksional kompozit olish zanjiriga qaratiladi.

MATERIALLAR VA USLUBLAR

Mazkur ish eksperimental tadqiqot emas, balki ilmiy adabiyotlar asosidagi tahliliy tadqiqot sifatida olib borildi. Adabiyotlar tahlilida ilmiy maqolalarning eksperimental natijalari va xulosalari asos qilib olindi. Shu sababli maqolada UzGTLning konkret chiqindisi uchun laboratoriya tahlilisiz aniq kimyoviy tarkib yoki optimal retseptura qat’iy qiymat sifatida berilmaydi.

Tahlilning asosiy yo‘nalishlari quyidagilardan iborat: sanoat chiqindilarining polimer kompozitlarda qo‘llanilishi; mineral to‘ldirgichlarning fizik-kimyoviy xususiyatlari; polimer–to‘ldirgich interfeysi; sirt modifikatsiyasi; perlitning polimer kompozitlarda qo‘llanilishi; Fischer–Tropsch waxning polietilen bilan o‘zaro ta’siri; UzGTL sharoitida istiqbolli texnologik yo‘nalishni tanlash.

Maqoladagi eng muhim metodologik yondashuv - barcha chiqindilarni “polimer chiqindisi” deb atamaslikdir. Texnologik ikkilamchi materiallarni shartli ravishda ikki guruhga ajratish mumkin: “mineral tabiatli fraksiya” va “uglevodorodli fraksiya”.

Mineral tabiatli fraksiyaga mineral adsorbentlar, perlit asosidagi materiallar, filtr materiallarining mineral qoldiqlari yoki tarkibida silikat va metall oksidlari bo‘lgan boshqa qattiq materiallar kirishi mumkin. Bunday materiallarda SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO kabi oksidlarning mavjudligi ehtimoli materialning kelib chiqishiga bog‘liq.



1-rasm. “Uzbekistan GTL” MChJ dagi mineral tabiatli fraksiya namunasining tashqi ko‘rinishi.

Uglevodorodli fraksiyaga Fischer–Tropsch wax va yuqori molekulali parafinli uglevodorodlar kirishi mumkin. Bu fraksiya mineral to‘ldirgich sifatida emas, balki organik qo‘shimcha sifatida baholanishi kerak.

Mineral materialning polimer kompozit uchun yaroqliligi faqat uning umumiy kimyoviy tarkibi bilan belgilanmasligi ilmiy manbalarni o‘rganish mobaynida aniqlandi. Asosiy parametrlar sifatida quyidagilar qabul qilindi: kimyoviy tarkib; zarracha o‘lchami; zarracha shakli; zarracha o‘lchamlarining taqsimoti; solishtirma sirt maydoni; g‘ovaklik; namlik; sirt energiyasi; sirtning gidrofil yoki gidrofob xususiyati; termik barqarorlik; kristall yoki amorf holat; polimer bilan adgeziya.

Shuning uchun UzGTL chiqindisini kompozit uchun xomashyo sifatida baholashdan oldin quyidagi uslublarni qo‘llash maqsadga muvofiq deb belgilandi: XRF - elementar/oksid tarkibini; XRD - mineral fazalarni; FTIR - funksional guruhlarni; SEM - zarracha morfologiyasini; TGA/DSC - termik xususiyatlarni aniqlash uchun.

Olingan kompozit materiallar uchun tavsiya etilgan baholash uslublari qatoriga SEM (morfologik tuzilish va polimer – to‘ldirgich o‘zaro ta'siri), tensile/flexural/impact strength sinovlari (mexanik xossalar), TGA/DSC (termik barqarorlik) hamda suv shimuvchanligini aniqlash usullari kiritildi. Shu tarzda tanlangan uslublar keyingi bosqichlarda materiallarning polimer kompozitlar tarkibida qo‘llanilish imkoniyatini baholash uchun asos bo‘lib xizmat qiladi.

NATIJALAR VA MUHOKAMA

Girge va hammualliflar aynan zarracha o‘lchami, o‘lcham taqsimoti, solishtirma sirt maydoni va filler–polimer interfeysi sanoat chiqindilari bilan to‘ldirilgan kompozitlarning xususiyatlarini belgilashini ko‘rsatgan [1]. Bu xulosa UzGTL uchun muhim, chunki bir xil kimyoviy tarkibga ega bo‘lgan ikkita mineral material zarracha o‘lchami va sirt holati tufayli polimer bilan butunlay boshqa natija berishi mumkin.

Mineral to‘ldirgich va polimer matritsasi o‘rtasidagi o‘zaro ta'sir kompozitning yakuniy xususiyatlarini belgilovchi asosiy omillardan biridir. Masalan, polipropilen (PP) nisbatan gidrofob polimer bo‘lsa, ko‘plab mineral oksidlar va silikatlarning yuzasi qutbli bo‘ladi. Natijada "Polimer" – "Filler" interfeysida adgeziya yetarli bo‘lmasa, yuklanish polimer matritsasidan mineral zarrachaga samarali uzatilmaydi. Buning oqibatida "yomon dispersiya" → "aglomeratsiya" → "mikrobo‘shliqlar" → "kuchlanish konsentratsiyasi" → "xossalarning yomonlashuvi" kuzatilishi mumkin.

Taurino va hammualliflar chiqindi asosidagi to‘ldirgichlarda sirtga oldindan ishlov berish ko‘p hollarda polimer bilan adgeziyani yaxshilash uchun zarur ekanini ko‘rsatgan [2]. Mineral to‘ldirgichlarni modifikatsiyalashning asosiy maqsadi polimer va to‘ldirgich o‘rtasidagi interfeysni yaxshilashdir. Adabiyotlarda quyidagi usullar keng uchraydi: mexanik maydalash; quritish; termik aktivatsiya; stearin kislotasi bilan ishlov berish; kalsiy stearat yoki boshqa stearatlar; titanate coupling

agent; silan coupling agent; aminofunksional silanlar; malein angidrid bilan funksionallashtirilgan polimerlar.

Silan birikmalarining umumiy ko‘rinishi:

$R - Si(OR')_3$

Masalan, APTES:

$H_2N - (CH_2)_3 - Si(OC_2H_5)_3$

Suv ishtirokida silan gidrolizlanishi mumkin:

$Si(OR')_3 + 3H_2O \rightarrow Si(OH)_3 + 3R'OH$

Keyinchalik mineral sirtidagi gidroksil guruhlari bilan kondensatsiya jarayoni sodir bo‘lishi mumkin:

Filler–OH + $HO–Si \rightarrow$ Filler–O–Si + H_2O

Shunday qilib, mineral sirtning kimyoviy xususiyati o‘zgartiriladi.

Lee va hammualliflar silan bilan modifikatsiyalangan nanosilika/PP kompozitlarini tadqiq qilib, APTES bilan ishlov berilgan nanosilika eng yaxshi dispersiyalardan birini ko‘rsatganini va mexanik xususiyatlar yaxshilanganini aniqlagan [4].

Koreyalik Lee, Kim, Ryu, Baeck va Shim jamoasi esa silica/PP kompozitlarida epoksi, amino va metakriloksi funksional silanlarni solishtirgan. Ularning tadqiqotida quruq usulda amino-funksional silan bilan ishlov berilgan tizim eng yuqori mexanik va termik ko‘rsatkichlarni bergan [5].

2026-yilda Mochizuki, Shitamatsu, Nakaya va Ohshita tomonidan bajarilgan yangi tadqiqotda esa PP/silica kompozitlarida APTES va HMDS modifikatsiyalarining interfeys xususiyatlariga ta'siri o‘rganilgan. Mualliflar sirt funksional guruhlari polimer–to‘ldirgich o‘zaro ta'siri va mexanik xususiyatlarga sezilarli ta'sir qilishini ko‘rsatgan [6].

Mineral to‘ldirgichlarni stearik kislota yoki stearatlar bilan modifikatsiyalash ham keng qo‘llaniladi. Price va Ansari kalsiy karbonat sirtini stearik kislota bilan modifikatsiyalab, sirtning qutbliligini kamaytirish mumkinligini ko‘rsatgan. Ularning ishida filler sirt energiyasi bilan PP kompozitining mexanik xususiyatlari o‘rtasida bog‘liqlik aniqlangan [7].

Mareri va hammualliflar PP/kaolin tizimida sirt ishlovining ta'sirini o‘rganib, modifikatsiya zarrachalarning dispersiyasini yaxshilashi va zarba mustahkamligiga ijobiy ta'sir qilishi mumkinligini ko‘rsatgan [8].

Ersoy va Köse esa $CaCO_3$/PP tizimida reaktiv va noreaktiv sirt ishlovlarini taqqoslab, sirt modifikatsiyasi fillerning gidrofobligini oshirishi va interfeys xususiyatlarini yaxshilashi mumkinligini aniqlagan [9].

Sanoat chiqindilaridan olingan mineral to‘ldirgichlarning PP va PE bilan qo‘llanilishi bo‘yicha katta tajriba mavjud. Akinci, Akbulut va Yilmaz red mudni isotaktik PP uchun to‘ldirgich sifatida o‘rgangan. Tadqiqotda red mud miqdori ortishi bilan qattiqlik oshgan, biroq tensile va flexural strength ayrim tarkiblarda pasaygan [10]. Zhang va hammualliflar red mud/PP kompozitlarining mexanik va termik xususiyatlarini o‘rgangan [11].

Bu natijalar muhim bir ilmiy xulosani ko‘rsatadi: mineral chiqindini polimerga qo‘shishning o‘zi kompozitning barcha mexanik xususiyatlarini avtomatik ravishda yaxshilamaydi. To‘ldirgich miqdori ortishi bilan qattiqlik yoki modul oshishi mumkin, lekin zarba mustahkamligi yoki cho‘zilish kamayishi ehtimoli ham mavjud.

Fly ash sanoat chiqindilarining polimer kompozitlarda eng ko‘p o‘rganilgan turlaridan biridir. 2024-yilda PE/fly ash tizimini o‘rgangan tadqiqotchilar fly ash qo‘shilgan polietilen asosidagi materiallarda mexanik xususiyatlar va kristallik o‘zgarishini ko‘rsatgan [12]. Caban va Gnatowski HDPE/fly ash kompozitlarini 5, 10 va 15 wt.% fly ash bilan o‘rganib, fly ashning polimer strukturasiga va termik xususiyatlariga ta'sirini ko‘rsatgan [13]. Ge va hammualliflar esa waste PP/fly ash/waste stone powder kompozitlarini tayyorlab, sanoat chiqindilarini birgalikda qayta ishlatish imkoniyatini ko‘rsatgan [14]. 2023-yilda PP/fly ash kompozitlarini o‘rgangan tadqiqotda fly ash qo‘shilishi ayrim mexanik ko‘rsatkichlarni yaxshilagani qayd etilgan [15].

Mineral to‘ldirgichni faqat uning o‘zini modifikatsiyalash shart emas. Ba'zan polimerning o‘zi compatibilizer sifatida funksionallashtiriladi, masalan, malein angidrid bilan funksionallashtirilgan polipropilen (PP-g-MA). Fly ash/PP tizimini o‘rgangan tadqiqotchilar PPga malein angidrid funksional guruhlarini kiritish orqali interfeys xususiyatlarini boshqarishni o‘rgangan [16]. Bu yondashuv kelajakda UzGTL mineral fraksiyasi uchun ham ko‘rib chiqilishi mumkin. Biroq birinchi bosqichda qaysi modifikator eng samarali ekanini laboratoriya tajribasisiz qat'iy belgilash to‘g‘ri emas.

Perlit - asosan aluminosilikat tabiatli mineral material bo‘lib, g‘ovak strukturasi va past zichligi sababli issiqlik izolyatsiyasi hamda kompozit materiallar uchun qiziqarli to‘ldirgich hisoblanadi. 2024-yilda Çavdaroğlu, Olgun va Altuncu expanded perlit/EPDM kompozitlarini o‘rgangan. Ular 15 phr expanded perlit qo‘shilganda qattiqlik va crosslink density oshganini, shuningdek issiqlik o‘tkazuvchanligi kamayganini ko‘rsatgan [17]. 2025-yilda Yeşilyurt PP kompozitlarida oddiy perlit, expanded perlit, silanlangan expanded perlit va talcni taqqoslagan [18].

Bu tadqiqot UzGTL uchun ayniqsa qiziq, chunki agar korxonada perlitga oid texnologik qoldiq mavjud bo‘lsa, uning polimer matritsasida mineral to‘ldirgich

sifatida ishlatilishi ilmiy jihatdan asoslanishi mumkin. Biroq bu yerda muhim farq mavjud: tijorat perlitining xossalari UzGTL texnologik perlit qoldig‘ining xossalariga teng bo‘la olmaydi. Shuning uchun aynan UzGTL materialining tarkibi va sirt xususiyatlari alohida aniqlanishi kerak.

Mineral to‘ldirgichning zarracha o‘lchami kamaygani sari uning solishtirma sirt maydoni oshadi. Nazariy jihatdan:

$$A_s \sim \frac{1}{d},$$

bu yerda: A_s — solishtirma sirt maydoni; d — xarakterli zarracha diametri.

Demak, zarracha o‘lchamining kamayishi polimer bilan kontakt yuzasini oshirishi mumkin. Biroq zarracha juda mayda bo‘lsa, Van-der-Vaals kuchlari va sirt energiyasi sababli aglomeratsiya ham kuchayishi mumkin. Shuning uchun ham "kichik zarracha har doim yaxshi kompozit" deb aytish noto‘g‘ri bo‘ladi. Optimal natija zarracha o‘lchami, dispersiya, sirt modifikatsiyasi va polimer turining birgalikdagi ta'siriga bog‘liq. Švehlová va Polouček PP/talc kompozitlarida filler miqdori va zarracha o‘lchamining mexanik xossalarga ta'sirini ko‘rsatgan [19]. Racca va hammualliflar PP/talc kompozitlarida masterbatch orqali kiritilgan va kichikroq zarrachali fillerning dispersiyasi yaxshiroq bo‘lishini ko‘rsatgan [20].

Maqoladagi ikkinchi asosiy yo‘nalish - Fischer–Tropsch wax hisoblanadi. Bu materialni mineral to‘ldirgich bilan bir xil mexanizm orqali baholash ilmiy jihatdan noto‘g‘ri. FT-wax yuqori molekulali parafinli uglevodorodlar fraksiyasi bo‘lib, uning asosiy ahamiyati polietilen kabi polimerlar bilan fizik aralashma hosil qilish va ularning qayta ishlanish xususiyatlariga ta'sir qilish bilan bog‘liq.

Mhlabeni, Ngobese, Ramjee va Focke Janubiy Afrikaning University of Pretoria jamoasi bilan LLDPE va FT-wax aralashmalarini o‘rgangan [21]. Ular DSC va reologik tadqiqotlar orqali FT-wax va LLDPE eritilgan holatda yuqori darajada moslashishini ko‘rsatgan. Ularning xulosasiga ko‘ra, eritilgan holatda tizim amalda miscible, qattiq holatda esa ikki fazali va qisman kompatibil morfologiyaga ega bo‘ladi [21].

Mhlabeni va hammualliflar FT-wax/LLDPE aralashmalarining zero-shear viscosity xususiyatlarini o‘rgangan. Ular Friedman–Porter aralashtirish tenglamasidan foydalangan:

$$\eta = \left(w_p \eta_p^{1/\alpha} + w_w \eta_w^{1/\alpha}\right)^{\alpha}$$

bu yerda: η - aralashmaning qovushqoqligi; w_p - polimer massaviy ulushi; w_w - wax massaviy ulushi; η_p - polimer qovushqoqligi; η_w - wax qovushqoqligi; α - empirik aralashtirish parametri.

Tadqiqotda α = 3,4 qiymati zero-shear viscosity ma'lumotlarini tavsiflashda qo‘llangan [21]. Bu formula UzGTL uchun hozircha hisob-kitob qilish vositasi sifatida emas, balki FT-waxning PE bilan fizik aralashish mexanizmini tushuntiruvchi ilmiy asos sifatida ahamiyatlidir.

Mhlabeni, Ramjee, López, Díaz-Díaz, Artiaga va Focke tomonidan keyingi tadqiqotda FT-wax/high-flow LLDPE tizimi chuqurroq o‘rganilgan [22]. Tadqiqotda 170 °C da reologik xususiyatlar ham o‘rganilgan. FT-wax miqdori oshishi bilan: LLDPE kristallanishi kechikishi; umumiy kristallik kamayishi; PE-rich fazadagi kristallitlar o‘lchami kamayishi kuzatilgan. Mualliflar FT-wax va LLDPE eritilgan holatda samarali aralashishini, qattiq holatda esa qisman kompatibil bo‘lishini xulosa qilgan [22].

Bu natija «Uzbekistan GTL» uchun alohida ahamiyatga ega: agar FT-wax texnologik ikkilamchi material sifatida olinadigan b lsa, uni mineral filler emas, PE/LLDPE tizimi uchun funksional processing aid sifatida o‘rganish ilmiy jihatdan mantiqiyroq.

Yuqorida tahlil qilingan tadqiqotlarning qisqacha qiyosiy ko‘rinishi quyidagi jadvalda keltirilgan:

1-jadval

Olimlar	Davlat	Tadqiqot obyekti	Asosiy xulosa
A. Girge, V. Goel, G. Gupta va boshq. [1]	Hindiston va xalqaro jamoa	Sanoat chiqindilari / polimer kompozitlar	Chiqindilar mineral filler sifatida qo‘llanishi; zarracha o‘lchami, sirt va interfeys muhim
R. Taurino, F. Bondioli, M. Messori [2]	Italiya	Turli chiqindi / polimer kompozitlar	Sirtga oldindan ishlov berish ko‘p hollarda adgeziyani yaxshilaydi
G.P. Muthukutti va boshq. [3]	Tailand/Hindiston va xalqaro jamoa	Metall bo‘lmagan sanoat chiqindilari	Industrial waste filler kompozitlar aylana iqtisodiyoti uchun istiqbolli
O.H. Lin, H.M. Akil, Z.A.M. Ishak [4]	Malayziya	Silanlangan nanosilika / PP	APTES dispersiya va mexanik xossalarga ijobiy ta’sir ko‘rsatgan
M. Lee, Y. Kim, H. Ryu va boshq. [5]	Janubiy Koreya	Silika / PP	Amino-silan bilan ishlov berish yaxshi mexanik va termik natija bergan
Y. Mochizuki, K. Shitamatsu, T. Nakaya, J. Ohshita [6]	Yaponiya	Modifikatsiyalangan silika / PP	Sirt funksional guruhlari interfeys va kristallanishga kuchli ta’sir qiladi

Olimlar	Davlat	Tadqiqot obyekti	Asosiy xulosa
G.J. Price, D.M. Ansari [7]	Buyuk Britaniya	Modifikatsiyalangan $CaCO_3$ / PP	Stearik kislota sirt energiyasini o‘zgartirib, mexanik xossalarga ta’sir qiladi
P. Mareri va boshq. [8]	Fransiya	Kaolin / PP	Sirt ishlovi dispersiya va zarba xossalarini yaxshilashi mumkin
O. Ersoy, H. Köse [9]	Turkiya	$CaCO_3$ / PP	Reaktiv va noreaktiv sirt modifikatsiyasi interfeysni o‘zgartiradi
A. Akinci, H. Akbulut, F. Yilmaz [10]	Turkiya	Red mud / PP	Filler ortishi qattiqlikni oshirgan, ayrim mexanik ko‘rsatkichlar pasaygan
Y. Zhang va boshq. [11]	Xitoy	Red mud / PP	—
S. Satapathy, A. Nag, G.B. Nando [12]	Hindiston	Fly ash / waste PE	Fly ash miqdori va modifikatsiya kompozit xossalariga ta'sir qiladi
R. Caban, A. Gnatowski [13]	Polsha	Fly ash / HDPE	Fly ash PEning struktura va termik xususiyatlarini o‘zgartiradi
J.C. Ge va boshq. [14]	Janubiy Koreya	Waste PP / fly ash/stone powder	Bir nechta chiqindini bir kompozitda qayta ishlatish mumkin
PP/fly ash tadqiqotchilari [15]	Yevropa	PP / fly ash	Fly ash ayrim mexanik xususiyatlarni yaxshilashi mumkin
M. Ferreira va boshq. [16]	Xalqaro	Fly ash / PP / MAPP	Malein angidrid funksionallashtirilgan PP interfeysni boshqarish vositasi
C. Çavdaroğlu, U. Olgun, E. Altuncu [17]	Turkiya	Expanded perlite / EPDM	Perlit qattiqlik, termik barqarorlik va izolyatsiyani yaxshilagan
A. Yeşilyurt [18]	Turkiya	Perlite / expanded perlite / silanized perlite/PP	Perlit PP kompozitlari uchun istiqbolli mineral filler

Olimlar	Davlat	Tadqiqot obyekti	Asosiy xulosa
E. Švehlová, E. Polouček [19]	Chexiya	Talc / PP	Filler miqdori va zarracha o‘lchami mexanik xossalarga kuchli ta'sir qiladi
T. Mhlabeni, C. Ngobese, S. Ramjee, W. Focke [21]	Janubiy Afrika	FT-wax / LLDPE	FT-wax eritmada LLDPE bilan mos; processing aid sifatida istiqbolli
T. Mhlabeni va boshq. [22]	Janubiy Afika/Ispaniya	FT-wax / high-flow LLDPE	Wax kristallanish va reologik xususiyatlarni o‘zgartiradi

Adabiyotlar tahliliga ko‘ra, «Uzbekistan GTL» sharoitida eng maqbul yondashuv - barcha texnologik ikkilamchi materiallarni bitta kompozitga birlashtirish emas, balki ularni fraksiyalab qayta foydalanishdir. Agar chiqindi tarkibi silikat/aluminosilikat mineral komponentlarga boy bo‘lsa, quyidagi sxema istiqbolli hisoblanadi:

Chiqindi → quritish → maydalash → fraksiyalash → sirt modifikatsiyasi → PP/PVC/PE

Bu yo‘nalishda birinchi navbatda PP va PVCni o‘rganish maqsadga muvofiq, chunki mavjud adabiyotlarda PP/silica, PP/fly ash, PP/red mud, PP/perlite va PVC/mineral filler tizimlari bo‘yicha yetarlicha ilmiy tajriba mavjud.

FT-wax uchun quyidagi yo‘nalish tavsiya etiladi:

FT-wax → tozalash → fraksiyalash → LLDPE/PE bilan melt-blending

Bu taklif Mhlabeni va hammualliflarning FT-wax/LLDPE bo‘yicha ishlari bilan bevosita asoslanadi [21, 22]. Bu yerda UzGTL uchun juda qiziq texnologik jihat mavjud: UzGTLning o‘zi Fischer–Tropsch texnologiyasidan foydalanadi, demak korxonada hosil bo‘ladigan FT-waxning o‘ziga xos xususiyatlarini boshqa polimer waxlaridan farqli ravishda o‘rganish mumkin. Pretoria universiteti tadqiqotchilari esa FT-waxni aynan LLDPE bilan aralashtirib, uning qovushqoqligi, erish xususiyati, kristallanishi, morfologiyasi va processing aid sifatidagi imkoniyatini o‘rgangan [21, 22].

Tadqiqotda foydalaniladigan materiallarni tavsiflash uchun, avvalo, mineral chiqindi, FT-wax va ular asosida olinadigan kompozit materiallarning asosiy fizik-kimyoviy va mexanik xususiyatlarini aniqlash zarur. Mineral chiqindi uchun uning elementar va mineral tarkibi XRF hamda XRD usullari yordamida aniqlanishi, funksional guruhlari FTIR tahlili orqali o‘rganilishi, zarrachalar morfologiyasi SEM yordamida baholanishi lozim. Shuningdek, zarracha o‘lchami, namlik miqdori,

solishtirma sirt maydoni va termik barqarorligi TGA usuli orqali aniqlanishi muhim hisoblanadi.

FT-wax uchun erish va kristallanish haroratlari, molekulyar massa taqsimoti, viskozligi hamda kimyoviy tuzilishi FTIR usuli yordamida aniqlanishi mumkin. Bundan tashqari, uning termik va fazaviy xususiyatlarini baholash uchun TGA/DSC tahlillaridan foydalanish maqsadga muvofiq. Olingan kompozit materiallar uchun esa SEM yordamida morfologik tuzilish va polimer–to‘ldirgich o‘zaro ta'siri o‘rganiladi. Materialning cho‘zilishdagi mustahkamligi (tensile strength), egilishdagi mustahkamligi (flexural strength) va zarbiy mustahkamligi (impact strength) aniqlanadi. Shuningdek, kompozitlarning termik barqarorligi TGA/DSC tahlillari hamda ekspluatatsion xususiyatlaridan biri bo‘lgan suv shimuvchanligi orqali baholanadi.

Mazkur maqola keyingi ilmiy ishlar uchun uchta asosiy yo‘nalishni shakllantiradi: 1) UzGTL mineral chiqindisini XRF, XRD, FTIR, SEM va TGA usullari yordamida tavsiflash; 2) mineral chiqindi asosida "UzGTL mineral filler" + PP yoki "UzGTL mineral filler" + PVC kompozitlarini olish va o‘rganish; 3) "UzGTL FT-wax" + LLDPE tizimida reologiya, DSC, TGA va mexanik xususiyatlarni o‘rganish. Shunday qilib, keyingi maqolalar mos ravishda adabiyotlar tahlili va ilmiy asos, UzGTL chiqindisining fizik-kimyoviy tavsifi, mineral filler/polimer kompoziti hamda FT-wax/LLDPE tizimiga bag‘ishlanishi mumkin.

Texnologik ikkilamchi materiallarni qayta ishlashning korxona uchun bir nechta potensial afzalliklari mavjud. Birinchidan, chiqindini utilizatsiya qilish bilan bog‘liq xarajatlarni kamaytirish imkoniyati paydo bo‘ladi. Ikkinchidan, chiqindi tarkibidagi foydali mineral yoki uglevodorod komponentlardan ikkilamchi xomashyo sifatida foydalanish mumkin. Uchinchidan, mahalliy polimer sanoati uchun yangi to‘ldirgich yoki funksional qo‘shimcha manbai shakllanishi mumkin. To‘rtinchidan, chiqindini qayta ishlash korxonaning aylana iqtisodiyoti tamoyillariga mosligini oshiradi. Beshinchidan, agar mahalliy xomashyo asosida talab qilinadigan xususiyatlarga ega kompozit material ishlab chiqilsa, import qilinadigan ayrim mineral filler yoki processing aidlarning o‘rnini bosish imkoniyati paydo bo‘lishi mumkin. Shu bilan birga, iqtisodiy foyda faqat chiqindini kompozitga qo‘shish bilan avtomatik ravishda yuzaga kelmaydi - quritish, maydalash, fraksiyalash, modifikatsiya, transport va nazorat xarajatlari ham hisobga olinishi kerak.

Ilmiy adabiyotlar shuni ko‘rsatadiki, sanoat chiqindilarini polimer kompozitlarda qo‘llash bo‘yicha katta tajriba mavjud bo‘lsa-da, har bir chiqindining individual xususiyatlari alohida baholanishi kerak. Masalan, red mud/PP tizimida filler miqdorining oshishi qattiqlikni oshirgan bo‘lsa-da, ayrim mexanik

ko‘rsatkichlarni pasaytirgan [10]. Fly ash/PE tizimlarida esa filler miqdori va zarracha xususiyatlari polimerning kristallik va mexanik xususiyatlariga ta'sir qilgan [12, 13]. Silica/PP tizimlarida sirt modifikatsiyasi interfeysni yaxshilashi ko‘rsatilgan [4–6]. Perlit asosidagi kompozitlarda esa termik va mexanik xususiyatlarning yaxshilanishi kuzatilgan [17, 18]. FT-wax/LLDPE tizimlarida esa vaziyat butunlay boshqacha: wax qattiq mineral filler emas, balki polimerning reologik va kristallanish xususiyatlarini o‘zgartiruvchi organik qo‘shimcha sifatida ishlaydi [21, 22].

Demak, «UzGTL chiqindisini polimerga qo‘shish» degan umumiy yondashuv o‘rniga quyidagi ketma-ketlikni qo‘llash ilmiy jihatdan to‘g‘riroqdir: "Qaysi chiqindi? → qanday kimyoviy tabiatga ega? → qaysi polimer bilan mos? → sirtiga ishlov kerakmi? → qanday funksional vazifani bajaradi?"

XULOSA

Ilmiy adabiyotlar tahlili «Uzbekistan GTL» MChJ dagi mavjud texnologik chiqindilarni polimer kompozitsion materiallarda qayta foydalanish uchun yetarli ilmiy asos mavjudligini ko‘rsatadi. Biroq barcha texnologik chiqindilarni yagona "polimer chiqindisi" sifatida ko‘rish to‘g‘ri emas - ularning mineral va uglevodorodli komponentlarini fizik-kimyoviy tabiatiga ko‘ra alohida baholash zarur.

Mineral fraksiyalar tarkibidagi silikat va metall oksidlari ularni PP, PE va PVC kabi polimerlar uchun potensial to‘ldirgich sifatida ko‘rib chiqish imkonini beradi. Bunda zarracha o‘lchami, sirt maydoni, namlik, mineral tarkib, sirt energiyasi va polimer bilan adgeziya asosiy parametrlar hisoblanadi. Ilmiy tadqiqotlar mineral fillerlarning sirtini silanlar, stearatlar yoki boshqa modifikatorlar yordamida o‘zgartirish polimer–filler interfeysini yaxshilashi mumkinligini ko‘rsatadi [4-9]. Perlit asosidagi tadqiqotlar esa bunday aluminosilikat materiallardan polimer kompozitlarda foydalanish mumkinligini ko‘rsatmoqda [17, 18].

Fischer–Tropsch wax uchun esa boshqa yondashuv talab etiladi. Mhlabeni, Ramjee, Focke va hammualliflarning Janubiy Afrika va Ispaniyadagi tadqiqotlari FT-waxning LLDPE bilan eritilgan holatda yuqori moslashuvini va qattiq holatda qisman kompatibil xususiyatini ko‘rsatgan [21, 22].

Shu asosda «Uzbekistan GTL» uchun eng maqbul boshlang‘ich ilmiy-texnologik yo‘nalish sifatida texnologik ikkilamchi materiallarni avval fraksiyalash, mineral fraksiyani polimer kompozitlar uchun to‘ldirgich sifatida, FT-waxni esa PE/LLDPE tizimlarida funksional processing aid sifatida alohida o‘rganish taklif etiladi. Mazkur yondashuv yangi texnologik jarayonni birdaniga yaratishni emas, balki mavjud materiallarning fizik-kimyoviy tabiatini aniqlashdan boshlanadi. Shu

sababli u «Uzbekistan GTL» sharoitida bosqichma-bosqich amalga oshirilishi mumkin bo‘lgan ilmiy yo‘nalish sifatida qaraladi.

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TARIXIY ROMAN ZAMON VA MAKON KONTEKSTIDA

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ANNOTATSIYA

Maqolada zamon va makon kontekstida tarixiy roman masalasi ko‘rib chiqilgan. Unda badiiy zamon va makonning shakllari, tiplari, ifoda usullari, turlari hamda xronotopning folklor, real, milliy, fantastik va psixologik kabi turlari tarixiy roman muhitida tahlil qilingan.

Kalit so‘zlar: *badiiy zamonning shakllari, tiplari, ifoda usullari, badiiy makon turlari, xronotopning turlari.*

АННОТАЦИЯ

В статье рассматривается вопрос исторического романа в контексте время и пространства. Также анализируются формы, типы, способы выражения, виды художественного время и пространства, также виды хронотопа такие как фольклор, реал, национальный, фантастический и психологический на фоне исторического романа.

Ключевые слова: *формы, типы, способы выражения художественного время, виды пространства, виды хронотопа.*

KIRISH

Tarixiy roman – badiiy tafakkur bilan tarixiy voqelik o‘rtasidagi murakkab munosabatlar mahsulidir. Unda muallif muayyan davr ruhini, ijtimoiy muhitni, inson taqdirini o‘sha zamon va makon manzarasini badiiy obrazlar orqali qayta yaratadi. Zamon va makon tarixiy romanning asosiy poetik unsurlaridan bo‘lib, ular asarning mazmunini, badiiy-g‘oyaviy vazifasini belgilaydi va qahramonlar harakatlarining mazmunini, voqealar rivojining mohiyatini tushuntiradi, syujetni ma’no bilan ta’minlaydi.

Zamon voqea-hodisalarning qachon va qaysi vaqt oralig’ida bo’lib o’tganligini belgilab beruvchi tushuncha bo’lib, adabiyotda ishlatiladigan badiiy zamon astromonik vaqt tushunchasidan o’zining individual xususiyatlari bilan ajralib turadi.

Adabiyotshunoslar orasida **zamon turlari** haqida quyidagi uch xil tasavvur shakllangan:

1. Turkumli zamon – bir xildagi voqea-hodisalarning ketma-ket kelishi sifatida idrok qilinadigan tushuncha;

2. To’g’ri chiziqli zamon – harakat yo’nalishi o’tmishdan hozir orqali kelajakka intilgan vaqt tushunchasi;

3. Halqali zamon – yaxlit vaqt koordinatasida o’tgan, hozirgi va kelasi zamonlar mavjud bo’lsada, zamon o’z qonuniyatlariga ko’ra ibtido va intiho nuqtalarining tutash halqasidan iborat, bu halqa zamonning abadiy davom etishini ta’minlaydi, degan tushuncha.[194] Zamonning to’g’ri chiziqli tipi uzluksizligi, abadiyligi, tartibliligi va o’lchamliligi bilan xarakterlanadi.

Badiiy zamon masalasi bo’yicha turli nazariy-konseptual qarashlar, talqin va yondashuvlar mavjud. Adabiyotda badiiy o’zlashtirilgan zamon va makon munosabatlarining o’zaro muhim aloqasini **xronotop** deb tariflagan Baxtin adabiy-badiiy xronotopda zamon va makon belgilari aniq yaxlitlikda uyg’unlashishini ta’kidlab o’tadi. Uning fikricha, zamon zichlashadi, makon esa zamon, syujet, tarix harakatlariga tortiladi. Zamonning ko’rinish belgi-alomatlari makonda namoyon bo’ladi, makon esa zamon orqali anglanadi va o’lchanadi.[195]

Badiiy zamon va makonga o’zbek adabiyotshunosi T.Boboyev “zamon va makon badiiy syujetning tarkibiy qismi yoki unsurlaridan biri emas, balki uning omili, hayotiyligi va haqqoniyligi manbaidir. Zamon va makon syujetga o’z muhrini bosadi, uni jonlantiradi, ta’sirchanligini oshiradi, sermazmun qiladi”,[196] deb ta’rif bersa, adabiyotshunos B.To’rayeva “Badiiy zamon tor ma’noda voqea va hodisalarning zamon bilan bog’liq ketma-ketligi, to’plami va jadalligini ifodalovchi kompozitsiya unsurlaridan biri”,[197] deb ta’rif beradi. Uning so’zlariga ko’ra, “Badiiy zamon asardagi badiiy obrazlarni tavsiflovchi va muallifning dunyo tuzilishi haqidagi tasavvuri, dunyoqarashi, olamni qay darajada idrok qilishini aks ettiruvchi badiiy asardagi hikoya qilish sur’atidir”.[198]

Shuningdek, xorijiy adabiyotshunos olimlar tomonidan ham **badiiy zamon va makonga turlicha ta’riflar** berilgan. Jumladan, badiiy zamonni A.Esalnek “u yoki bu davrda istalgan doiradagi insonlarning hayot tarzini ifodalab beruvchi aniq bir ijtimoiy-tarixiy hodisalarning yuz berish zamoni”[199], deb tariflasa, A.Pavel’yeva uni

[194] To’rayeva B.B., Tarixiy romanlarda badiiy zamon muammosi (O.Yoqubov va P.Qodirov romanlari misolida), Toshkent-2018y, PhD diss., 13-bet, umumiy 160 bet.
[195] Бахтин М.М., Вопросы и литературе и эстетики, Москва-1975, С. 234-235.
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[198] To’rayeva B.B., Tarixiy romanlarda badiiy zamon muammosi (O.Yoqubov va P.Qodirov romanlari misolida), Toshkent-2018y, PhD diss., B. 18.
[199] Эсалнек А.Я., Хронотоп в эпическом произведении//Основы литературоведения. Анализ художественного произведения: Практикум. – М.: Флинта: “Наука”, 2003. С 110-119.

“hikoya qilish, ya’ni yuz berayotgan voqealar haqida so’zlab berish zamoni”[200], deb ataydi.

Asarlarda ishlatilgan makon real makonga to’g’ri kelishi mumkin, lekin badiiy zamon astronomik zamonga to’g’ri kelmaydi. Chunki badiiy zamon tezlashishi, sekinlashishi, to’xtashi va hatto ortga qaytishi mumkin. M.Kogan aytganidek, “Zamon zich tig’izlanishi, cho’zilishi, to’xtashi va ortga qaytishi mumkin. Ana shu asosda badiiy shartlilik, deb atalmish badiiy shakl bilan real shakl o’rtasida farq paydo bo’ladi.”[201]

Badiiy zamon syujet voqealari bilan bog’liq bo’lganligi sababli voqealarning boshlanishi, rivoji va yakuni uchun sarflangan vaqtning o’ziga xos ko’rinishi sifatida namoyon bo’ladi. Shuning uchun badiiy zamonni asarning tarkibiy qismi nuqtai nazaridan syujet zamoni va kompozitsiya zamoniga ajratish mumkin. Kompozitsiya zamoni ko’pgina tadqiqotlarda muallif zamoni deb ham ataladi.

Muallif zamoni yozuvchining yoki to’qima obraz sifatida kiritilgan hikoyachining ijodiy davridir. Baxtinning fikriga ko’ra, muallif-ijodkor o’z zamonida erkin harakat qiladi, u o’z hikoyasini zamonning obyektiv oqimini buzmagan holda oxiridan, o’rtasidan, tasvir etayotgan voqeasining istalgan onidan boshlashi mumkin.[202]

Muallif zamoni bilan syujet zamoni jiddiy farqlanishi tarixiy romanlarda muallif hikoya zamonidan ancha o’zib ketgandagina ro’y beradi. Fantastik romanlardagidek hikoya zamonidan kelajakka tomon o’zib ketish tarixiy romanlarda deyarli uchramaydi.

Shuningdek, adabiyotda konseptual va perseptual zamon tushunchalari ham mavjud bo’lib, konseptual zamon – tashqi reallikni kitobxon uchun mos shakllarda modellashtirilgan, uning ongida shakllantirilgan, dunyoqarash asosida interpretatsiya qilinadigan vaqt tushunchasi bo’lsa, perseptual zamon – subyektiv, ya’ni o’quvchi ongida vaqt o’tishini his qilish, idrok etish jarayonidir. Bu obyektiv (fizikaviy) vaqtdan farq qilib, insonning ruhiy holati, his-tuyg’ulari, e’tibori va xotirasiga bog’liqdir.[203] Konseptual zamon insonning dunyo va o’zining voqelikdagi o’rnini anglashida asosiy rol o’ynaydi.

Shuni ham ta’kidlab o’tish kerakki, badiiy zamon turli janrlarda turlicha ko’rinishga ega. Masalan, xalq og’zaki ijodida badiiy zamon aksariyat hollarda ikkiga bo’linadi. O’zbek tadqiqotchisi K.Qodirov “O’zbek sehrli ertaklarida zamon

[200] Павелъева А. К., Концепции, формы и свойства художественного времени в литературном произведении. – С.133-148. http//journals.hnpu.edu.
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[202] Бахтин М.М., Литературно-критические статьи.// сост. С.Бочаров И В.Кожинов, - М., Наука, 1986. – С. 287.
[203] Panasenko N., Interrelations between Literary Time and Space in Prosaic texts://www.pulib.sk/elpub2

va makon talqini” nomli dissertatsiyasida o’zbek xalq ertaklarida badiiy zamonning ertakchining “endi gapni Suvonxondan eshiting” kabi kirish qismi – real vaqt va ertak syujeti voqealari uchun ajratilgan muddat – epik zamon singari turlarini keltiradi.[204]

Folklorshunos S.Mirzayeva esa o’z tadqiqotida “badiiy zamon doim cheksiz real zamonning muayyan qismidan tashkil topadi va bu muddat ijodkor maqsadi, ideali, niyati orqali tayin etiladi”,[205] deb xulosa qiladi.

Badiiy zamon yaxlit tizim sifatida bir qancha **adabiy-estetik kategoriyalar**ga ega. Badiiy zamon tizimi o’zining shakli, tipi va ifoda usullari kabi kategoriyalardan tarkib topgan.

Badiiy zamon shakllari zamonning vaqt ma’nosini ifodalashga ixtisoslashgan bo’lib, **hozirgi, o’tgan** va **kelasi** zamon shakllariga ega. Tadqiqotchi B.To’rayevaning fikriga ko’ra, “har bir obraz, ayniqsa, bosh qahramonlar o’zlarini to’liq hozirgi zamonda namoyon etishadi. Shu jihatdan hozirgi zamon tamoyili bosh, hukmron maqomga ega.”[206] Lekin tarixiy roman o’zining mazmun-mohiyati bilan o’tgan zamonni talab qiladi va unda bo’lib o’tgan voqea-hodisalarning ifodasi grammatik kategoriyalardan tortib badiiy tasvir vositalarigacha o’tgan zamonda namoyon bo’ladi.

Bular qatoriga tarixiy romanlarda ko’p ishlatiladigan o’tmishning muhim bir tarixiy bosqichida ma’lum bir hududda (makonda) sodir bo’lgan voqealarni, jarayonlarni ifodalash uchun **tarixiy zamon** tushunchasini ham qo’shish mumkin. Badiiy zamonning bu shakli tarixiy romanlarda muallifning qadimgi davrdagi muhitni bayon qilishi uchun keng imkoniyatlarni ochib beradi.

Tarixiy biografik romanlarda esa asar qahramonining shaxs sifatida shakllanishini ifodalash uchun badiiy zamonning **biografik zamon** shakli ishlatiladi. Zamonning bunday shaklida qahramonning tug’ilishidan tortib uning vafotigacha bo’lgan davrni qamrab olish imkoniyati mavjud. Lekin aksariyat tarixiy romanlarda qahramonning hayotida ro’y bergan muhim voqea biografik zamonning boshlanish nuqtasi sifatida olinadi va uning shaxs sifatida ulg’ayishi, ma’naviy kamoloti va o’z xalqi yoki insoniyatr tarixida qoldirgan yorqin izi asar g’oyasi (tadqiqot obyekti) sifatida olinadi.

Badiiy zamonning yuqorida keltirilgan so’nggi ikki shakli hali adabiyotshunos olimlar oldida badiiy zamon shakllari yuzasidan ilmiy-nazariy tadqiqotlar olib borish va badiiy zamon shakllari tushunchasini tizimlashtirish vazifasi turganini bildiradi.

[204] Qodirov K.N., O’zbek sehrli ertaklarida zamon va makon talqini, nomz. diss., 12-bet, Toshkent-2004, B.167.
[205] Mirzayeva S.R., O’zbek xalq romanik dostonlari poetikasi, dok. diss., 90-bet, Toshkent-2004, B.256.
[206] To’rayeva B.B., Tarixiy romanlarda badiiy zamon muammosi (O.Yoqubov va P.Qodirov romanlari misolida), Toshkent-2018y, PhD diss., B. 24.

Badiiy zamon tiplari adabiy janrlar turlariga bog'liq bo'lib, turli janrlarda badiiy zamon turlicha aks etadi. Shundan kelib chiqib, zamonning epik, lirik va dramatik tiplari mavjud. Badiiy zamonning **lirik** tipi she'riyatdagi zamon qatlamlarini o'z ichiga oladigan, lirik qahramonning his-tuyg'ulari zamoni hisoblansa, **dramatik** tip sahna asarlaridagi zamonni ifodalaydi. Badiiy zamonning uchinchi va eng yirik tipi **epik** tip bo'lib, tarixiy romanlardagi zamon ham badiiy zamonning shu tipiga mansub bo'ladi. Tarixiy romanlarda umumiy g'oyaviy konsepsiya va yozuvchi maqsadidan kelib chiqib badiiy epik zamonni erkin qo'llash imkoniyati mavjud. Masalan, yozuvchi tarixiy romanda real zamondagi o'nlab yillarda sodir bo'lgan voqeani sanoqli kunlarga moslab zichlashi mumkin. Pushtu tilidagi tarixiy romanlarda epik zamon aksariyat hollarda pushtun xalqining asrlar davomida bosqinchilarga qarshi kurashlari aks etgan real tarixiy zamonning katta va murakkab davrini qamrab oladi. Bunga ingliz-afg'on urushlariga, sovet-afg'on urushiga bag'ishlangan tarixiy romanlarni misol bo'la oladi. Shu bilan birga, real tarixiy zamon jihatdan qisqa vaqtni qamrab olgan "Abdaliy qilichi" kabi tarixiy romanlar ham mavjud.

Badiiy zamonning ifoda usullari asar kompozitsiyasining xarakterini, syujet yo'nalishning mohiyatini belgilab beradi. Badiiy zamonning ifoda usullarining retrospeksiya, prospeksiya, retardatsiya kabi turlari mavjud.

Retrospeksiya – zamonning ortga qaytishi hodisasi bo'lib, romanda qahramon tarixini batafsil yoritib berish uchun qo'llaniladi. Retrospeksiyada zamon shakllaridan asosan o'tgan va hozirgi zamon munosabatga kirishadi.

Tarixiy romanlarda badiiy zamon usullarini tadqiq qilish shuni ko'rsatadiki, retrospeksiyaning o'zini bir necha tarkibiy qismlarga ajratish mumkin. Ular orasida rekrospekt, flashback va analepsis retrospeksiyaning eng munim uch turi hisoblanadi.

1. Retrospekt – asar syujetidagi voqealar rivojini to'xtatib, qahramonning shaxsiyati shakllanishiga sabab bo'lgan o'tmishdagi voqealarga qaytish hodisasi. Butun boshli syujet o'tmishda voqealarni eslash asosiga qurilishi mumkin. Bunday uzoq muddatli ortga qaytish natijasida retrospektiv syujet vujudga keladi;
2. Flashback – qahramonning ichki dunyosini ochib berish uchun o'tmishni eslashi natijasida syujetdagi zamon hozirgi zamondan o'tgan zamonga to'satdan qaytish hodisasi. Flashbackda ortga qaytish qisqa muddatli bo'lganligi sababli syujet yaxlitligiga jiddiy ta'sir ko'rsatmaydi;
3. Analepsis. (yunoncha "tiklash" ma'nosini bildiradi, hodisaning sababini aniqlash uchun o'tmishdagi voqeani qayta tiklash hodisasi);

M.Merkulovaning fikriga ko'ra "hozirgi zamon adabiyotshunosligida "o'tmishga nazar" tushunchasi uch umummazmunda ma'lum: retrospeksiya

(retrospekt), flashback, analepsis” [207] . Har bir tushuncha “kelajakka nazar” ma’nosidagi o’zining antonimik, ya’ni zid juftligiga ega: retrospeksiya - prospeksiya, flashback - flashforward, analeps – proleps. Retrospeksiya syujetni ortga [208] , prospeksiya esa oldinga qarab rijovlantiradi.

Prospeksiya – voqea-hodisalarning kelajakka yo’nalganligini ifodalaydi va aksariyat hollarda kelasi va hozirgi zamon shakllarining munosabatga kirishishi natijasida hosil bo’ladi.

Retardatsiya – badiiy zamonning sekinlashishi hodisasi bo’lib, romanlarda syujet va kompozitsiyaning mutanosibligini, ular orasidagi muvozanatni saqlash maqsadida syujet voqealarini sekinlashtiradi.

Tarixiy romanda yozuvchining ijodiy niyatidan kelib chiquvchi badiiy zamon asarning umumiy g’oyaviy-badiiy konsepsiyasi, murakkab syujet-kompozitsion qurilishi, tasvir shaklining o’zi bilan bevosita bog’liq bo’ladi. Shu ma’noda roman zamoni epik syujet va kompozitsiyaning kategoriyasi sifatida namoyon bo’ladi.[209]

O’zbek tadqiqotchisi B.To’rayeva tarixiy romanlarda zamon muammosini ikki turga bo’ladi. Uning fikricha, “Tarixiy nosirchilikda roman zamoni va tarixiy zamon bevosita tasvirning shakllari hisoblanadi. Ularda, asosan, tarixiy zamon mundarijasidagi epik zamon qamrovining ikki xili ko’zga tashlanadi. Biri – xalqning asrlar davomidagi kurashi va taqdiri badiiy-epik aksini topgan romanlar yoki roman shakllari. Ular epik zamonning katta va murakkab qatlamlarini qamrab olishadi.

Ikkinchi xili – nisbatan qisqa tarixiy davrni tasvirlagan epik asarlar. Zamon qamrovi tarixan cheklangan bo’lsada, lekin shu nisbatan zich-tig’iz zamonda el-yurtning tarixiy qismati, adabiy qahramonlarning butun bir fojeiy taqdir yo’llari badiiylashtiriladi.”[210]

Tarixiy romanlardagi badiiy zamonning barcha shakllarini syujet zamoni o’zining murakkab tizimida qamrab oladi. Agar tarixiy romanda syujet liniyasi ikki va undan ko’p bo’lsa, syujetlar zamoni ham parallel ravishda rivojlanib boradi. Tarixiy romandagi badiiy zamon syujet turiga ham bevosita bog’liq. Tarixiy roman xronikali syujet turida yozilgan bo’lsa, badiiy zamon ham voqealar rivojiga mos ravishda tartib bilan ketma-ketlikda rivojlanib boradi. Bunday syujet turida badiiy zamon istalgancha kengaytirilishi mumkin. Bu syujet turi parallel badiiy zamonda

[207] Меркулова М.Г., Ретроспекция в английской “новой драме” конца 19 – начала 20 века: истоки и функционирование. – М.: Прометей, 2006. – С.30-31.
[208] Selmistraitis L. Prospection and retrospection in “The Great Gatsby” by F.S.Fitzgerald. Zmogus ir zodis, 2002. – № 3. – P.51-58.
[209] To’rayeva B.B., Tarixiy romanlarda badiiy zamon muammosi (O.Yoqubov va P.Qodirov romanlari misolida), Toshkent-2018y, PhD diss., 28-bet, umumiy 160 bet.
[210] To’rayeva B.B., Tarixiy romanlarda badiiy zamon muammosi (O.Yoqubov va P.Qodirov romanlari misolida), Toshkent-2018y, PhD diss., 30-bet, umumiy 160 bet

ro’y berayotgan voqea-hodisalarni tasvirlashda ham ancha qulay. Unda badiiy zamonda ortga qaytish – retrospeksiya usulini ham samarali qo’llash mumkin.

Syujet badiiy zamonning me’yor va mutanosibligi, adabiy-estetik samaradorligi roman kompozitsiyasida o’z aksini topadi. Tarixiy romandagi badiiy zamon uning konsepsiyasiga moslashishi kompozitsiyaning tuzilishiga ta’sir ko’rsatadi. Yozuvchi badiiy zamonni qanday ifodalashi kompozitsiyadagi boblar, fasllar va bo’limlarning o’zaro munosabatiga uzviy bog’liq. Pushtu tilidagi tarixiy romanlarda yozuvchilar o’z konsepsiyalaridan kelib chiqqan holda kompozitsiyaning turli shakllaridan foydalandilar. Masalan, I.Atoyining “Osiyo yuragida to’fon” romani kompozitsion tuzilish jihatdan muqaddima (سریزه - [sariza]), 27 fasl hamda izohlar va foydalanilgan adabiyotlar (توضیحات او مراجع - [tavzihot av maroje’])dan iborat. Umuman olganda I.Atoyining tarixiy romanlarida badiiy zamondagi sanalar aksariyat hollarda tarixiy haqiqatga uyg’unlikda qo’llanilgan. (Gandamak shartnomasi sana, Kvanyariyning o’ldirilishi sanasi va hokazo)

Pashtu tarixiy romanlarida metaforik zamon turi ham qo’llanilgan bo’lib, u tasvirlanayotgan obyektning sifatini bo’rttirib ko’rsatishga xizmat qiladi. Masalan, “osmondagi o’n to’rt kunlik oy” iborasidagi metaforik zamon, yani “14 kun” oyning chiroyini bo’rttirib ko’rsatishga xizmat qilmoqda.

Badiiy makon badiiy asarning voqealari sodir bo’lgan joyni anglatadi. U ham badiiy zamon kabi asarning g’oyaviy xususiyatlarini ochib beruvchi, syujetning idrok etilishi va kompozitsiyaning to’g’ri shakllanishini ta’minlovchi adabiy-estetik kategoriya bo’lib, asarning badiiy jihatdan yetuk bo’lishiga xizmat qiladi. Chunki asar qahramonlari shu aynan shu makonda yashaydilar va faoliyat ko’rsatadilar.

Badiiy asarlarda badiiy makon tasviri muallif maqsadiga bog’liq holda ikki xil ifodalanadi. Birinchisi asar qahramonining tashqi muhit, jamiyat, olam, borliq bilan munosabatini ifodalovchi **makromakon** bo’lsa, ikkinchisi uning ichki his-tuyg’ularini, ruhiy olamini ifodalovchi **mikromakon** hisoblanadi.

Badiiy makon haqida fikr yuritar ekan rus tadqiqotchisi T.Motilyeva badiiy makonning ham tobora umumiylashib borayotganiga e’tibor qaratadi: “zamonaviy adabiy qahramonlar badiiy makonda yanada shiddatli harakatlanmoqdalar, muayyan shaxsning taqdiri dunyoning boshqa tomonlarida sodir bo’layotgan voqealarga tobora ko’proq bog’liq bo’lib bormoqda”.[211]

Badiiy makon umumiy yaxlit joy tasvirini aks ettiruvchi tog’, cho’l, dasht, dengiz kabi turli geografik birliklar, shakllar (g’or, yo’l, choh, tuzoq), narsa-buyumlar

[211] Мотилева Т.Л. О времени и пространстве в современном зарубежном романе// ритм, пространство и время в литературе и искусстве: Сб./Отв.ред.Б.Ф.Эгоров. – Ленинград: наука, 1974. – С.199.

(poyezd, mashina, sandiq, quti) va inson ichki dunyosi (ko'ngil, hayol, xotira) kabi tushunchalardan tashkil topishi mumkin.

Badiiy makon turlari tadqiqotchi B.To'rayeva ishlarida gorizontal, vertikal, tashqi (ochiq), ichki (yopiq), dinamik, turg'un va taraqqiyot makoni sifatida umumiy tarzda keltirib o'tilgan. Lekin bu turlar nima asosida tanlanganligi ochiq qoldirilgan va tasniflanmagan.

Mazkur badiiy makon turlarini tadqiqot obyekti bo'lgan tarixiy romanlar tahlillari asosida takomillashtirgan holda quyidagicha tasniflash mumkin.

Geografik nuqtai nazaridan badiiy makon turlari gorizontal va vertical turlarga bo'linadi. **Gorizontal badiiy makon** – dunyoning janub, shimol, sharq va g'arb kabi geografik hamda inson yoki badiiy obrazga nisbatan o'ng, chap, old va orqa tomonlarni bildiradi. Bu gorizontal makonlar majoziy ma'nolarda ham ishlatilishi mumkin. Masalan, pushtu tilidagi ayrim tarixiy romanlarda boshqa tillarda bo'lgani kabi sharq – Osiyo, g'arb esa Yevropa qit'asini ifodalab kelgan.

Vertikal badiiy makon – geografik jihatdan yuqoriga qarab dasht, tog', cho'qqi, osmon, pastga qarab yerto'la, lahim, dengiz tubi kabi geografik tushunchalarni ifodalaydi. Inson yoki badiiy obrazga nisbatan vertikal makon masalasiga pushtu tarixiy romanlarida ko'proq mikromakon tomonidan yondashuvni ko'rishimiz mumkin. Unda yozuvchilar qahramonlarning ma'naviyatiga qarab ularni yuqori (ijobiy) va tuban (salbiy) darajalarga ajratadilar. Lekin ayrim hollarda insonlarga nisbatan makromakon jihatidan ham misollar ko'zga tashlanadi. Masalan, I.Atoiyning "Osiyo yuragida to'fon" romanidagi "Mirrix o'g'lonlari" nomli faslda amirning xos soqchilari bo'ylari baland, alp kelbatli jangchilar sifatida tasvirlanadi.

Hududiy jihatdan badiiy makon ochiq va yopiq turlarga bo'linadi. **Ochiq badiiy makon** – dala, adir, cho'l, dengiz, ummon va sahro kabi aniq hududiy chegaraga ega bo'lmagan ochiq joylar. Pushtu tarixiy romanlarida ham umumsharq adabiyotidagi kabi ushbu badiiy makonlar ramziy ma'nolarga ega. Masalan, ummon – kenglik, sahro – sinov ma'nolarini ifodalaydi. Shuningdek, faqatgna pushtunlarning o'zigagina xos bo'lgan ramziy birliklar ham mavjud. Adirlardan iborat bo'lgan Mayvand kengligi yoki Panipat tekisligi afg'onlar uchun "jang maydoni" timsolini ifodalaydi. Sababi bu ikki ochiq hududda Afg'oniston tarixidagi muhim janglar bo'lib o'tgan.

Yopiq badiiy makon – aniq chegaralarga ega bo'lgan yopiq joy va buyumlar. Masalan, jang maydonidagi chodirlar, o'tov, uy, hovli, qasr, saroy, sandal, sandiq va quti. Ayrim tadqiqotchilar yopiq badiiy makonni ichki badiiy makon deb ham nomlaydilar va uni insonning ichki olamini aks ettiruvchi makon sifatida ham talqin qiladilar. Pushtun tarixiy romanlarida buni G'ulom G'avs Xaybariyning "Abdaliy

qilichi” romanida ko’rishimiz mumkin. Hindistonga borib joylashgan Ahmadshoh Abdaliyni ko’rishga kelgan hind maxarojalari uning askarlarniki kabi oddiy chodirda tunashini ko‘rib hayratlanishadi. Bu muallif tomonidan Ahmadshohning kamtarin, mehribon, tanti va insonparvar shaxs sifatida tasvirlash vositasi edi. Xaybariy hind maxarojalarining hashamatga o‘chligini ularning ma’naviy kamchiligi sifatida izohlaydi va ular haqida “insonning buyukligi baland qasrlar va saroylarda, tilla va ipak liboslarda emas, uning ma’naviyatida, fikrlarida va xatti-harakatida namoyon bo‘lishi to‘g‘risida tasavvurga ham ega emasdilar”[212], deb xulosa chiqaradi.

Harakat nuqtai nazaridan badiiy makonni dinamik va turg’un makonlarga ajratib ko’rsatish mumkin. **Dinamik badiiy makon** – o’zgaruvchan va harakatdagi badiiy makonga aytiladi. Bunga yo’l, sharshara va daryoni misol keltirish mumkin. ramziy ma’noda esa bu makonlar inson hayotining ma’lum jihatlariga ishora qiladi. Masalan, yo’l – insonning taqdiri, sharshara – hayotining jo’shqin pallasi va daryo – bir soat ham to’xtamasdan o’tib ketayotgan umrini bildiradi.

Turg’un badiiy makon – tog’lar, o’rmonlar kabi harakatlanmaydigan, o’zgarmas joylar bilan ifodalanadi. Ko’pgina sharq xalqlari adabiyotida tog’lar ulug’vorlik ma’nolarini ifodalasa, afg’on adabiyotida to’glar himoya, panoh, tabiiy mudofaa istehkomi ma’nolariga ega. Bu afg’on tarixining ko’p qismi janglardan iborat bo’lganligi va ular tog’lar imkoniyatidan unumli foydalanganligi natijasida shakllangan deyish mumkin. Sa’duddin Shpunning “Tog’dagi do’stlar” romani buning yaqqol misolidir.

Sivilizatsiya nuqtai nazaridan badiiy makonni an’anaviy va zamonaviy turlarga bo’lish mumkin. **An’anaviy badiiy makon** asosan tabiat qo’ynidagi joylardan tashkil topgan bo’lsa ham, ular inson qo’li yoki mehnati bilan yaratilgan bo’ladi. Asarlardagi ayrim voqea-hodisalar dalalar, guzarlar, yaylovlar yoki keng ochiq maydon va mintaqalarda ro’y beradi. Pushtu tarixiy romanlarida yana bir o’ziga xoslik ko’zga tashlanadi. Bu tog’ yonbag’irlaridagi odamlar tomonidan yashash uchun o’yilgan g’orlar. Sa’diddin Shpunning “G’ordagi do’stlar” romani qahramoni xuddi shunday g’orda – badiiy makonda uzoq muddat hayot kechiradi.

Zamonaviy badiiy makon – insoniyat tamadduni hosilasi sifatida paydo bo’lgan shahar-u qishloqlar, turli mamlakatlar, davlatlar, yirik imperiyalar, shuningdek, insoniyat tomonidan yaratilgan Tojmahal, Registon kabi madaniy obidalardan iborat. Zamonaviy badiiy makonning o’zini agrar va industrial tarzida yana tarkibiy qismlarga bo’lish mumkin.

Tarixiy romanlarda makon masalasini tadqiq qilar ekan, dog’istonlik tadqiqotchi P.Ramazanova xronotoplar ramziy ma’noda turli timsollarni

[212] غلام غوث خيبري ، ابدالی توره ، کندهار- 1389 ش ، 55 مخ

aks ettirishiga e’tibor qaratadi. Masalan, dog’istonlik yozuvchilar tarixiy romanlarida badiiy zamonlar “tun” – “ayriliq”, “baxor” – “sevgi”ni ifodalasa, makon ma’nosidagi “o’rmon” – “ozodlik”, “yo’l” – “hayotiy maktab” timsollari sifatida ishlatiladi.[213]

Pashtu tarixiy romanlaridagi badiiy makonlar real makonlarga to’g’ri keladi. Ular aksariyat hollarda hozirda ham Afg’oniston, Eron, Pokiston va Hindiston hududlarida mavjud shaharlar, viloyatlar yoki mintaqalar nomlari tarzida keladi. Ayrimlari esa tarixda mavjud bo’lgan, lekin bugungi kungacha saqlanib qolmagan joy nomlaridir.

Badiiy zamon va makonning o’zaro uyg’unligini ta’minlaydigan **xronotop** insonning olam bilan munosabatlari ko’lami jihatidan uchga bo’linadi: megaxronotop, makroxronotop va mikroxronotop.

1. **Megaxronotop** – insonning borliq bilan munosabati zamon va makon muhitida ifodalanadi. Tarixiy romanlarda umumiy zamon va makon ko’lamini qamrab oladi. Megaxronotopning ko’lami keng bo’lganligi sababli barcha romanlarda ham uni uchratmaymiz. Megaxronotopni asarning g’oyasiga aylantira olish yozuvchining mahoratiga bog’liq.

2. **Makroxronotop** – zamon va makon muhitida insonning real hayotda sodir bo’layotgan voqealarga munosabati aks ettiriladi. Makroxronotop yordamida yozuvchi butun bir mamlakatdagi ijtimoiy-tarixiy muhitni, insonning jamiyat bilan o’zaro munosabatini qamrab oladi.

3. **Mikroxronotop** – insonning ruhiyati, ichki olamidagi o’zaro ziddiyatlar zamon va makonga olib chiqiladi. Mikroxronotop ko’pincha obrazni chuqurroq ochish, uning ichki kechinmalarini tasvirlash uchun ishlatiladi.

Xronotopning real, milliy, folklor, fantastik va psixologik kabi o’ndan ortiq turlari mavjud. Tarixiy romanlarda asosan quyidagi xronotop turlari uchraydi.

Real xronotop – tarixiy romanlardagi real xronotop tarixiy voqealarning ketma-ketligidan tashqari ularning tarixiy haqiqatga mos kelishiga, syujet voqealarining ishonchliligiga asoslanadi.

Milliy xronotop – millatning mentaliteti, dunyoqarashi, diniy e’tiqodi, urf-odatlarini namoyon qiluvchi badiiy-estetik tushuncha bo’lib, millatning ma’naviyati bilan birgalikda uning ijtimoiy-ahloqiy muammolarini ham tadqiq qiladi.

Folklor xronotopi – asarda rivoyat, afsona, maqol va matal kabi folklorga tegishli badiiy-poetik imkoniyatlarni ishlatish oqibatida shakllantiriladi.

Fantastik xronotop – turli voqealarni realistik qoliplardan chiqarib, xayoliy zamon va makon uyg’unligida bayon qiladi. Bu muallifga syujetni erkin tasvirlash

[213] Рамазанова П.К., Хронотоп в дагестанском историческом романе. Автореф., дисс, канд., Махачкала, 2005. С. 12-26.

imkonini beradi va o’quvchini yozuvchi tomonidan yaratilgan xayoliy olamga yetaklaydi. Bu asosan kelajakka qaratilgan futuristik zamon-makon tasvirida keng ishlatilsa-da, tarixiy romanlarda ham fantastik xronotoplarga murojaat qilish hollari uchrab turadi.

Psixologik xronotop – aksariyat hollarda ruhiy kechinmalar, ichki monolog, peyzaj bilan ifodalanadi. Tarixiy romanlarda aksariyat tush bilan bog’liq xronotoplar ro’y beradigan hodisalardan ogohlantirish sifatida qo’llaniladi.

Shuningdek, tarixiy romanlarda ko’proq **tarixiy-ijtimoiy xronotop** – asar voqealari kechayotgan aniq tarixiy davr, makon va ijtimoiy muhit tushunnchasini ifodalaydigan xronotop turi ham mavjud.

Tarixiy romanlarda **psixologizm** – muhim tarixiy voqealar emas, qahramonlarning ruhiy holati, ichki kechinmalari asosiy fonga chiqishi.

Xulosa o’rnida aytish mumkinki, tarixiy romanlar doirasida shiddatli jang voqealari, xususan, milliy qahramonlar bilan bosqinchilar o’rtasidagi jangovar harakatlarda yuzaga kelgan vaziyat yoki muammolar ma’lum badiiy zamon muddatida hal bo’ladi. Pashtu tarixiy romanlarida jang epizodlarining muddati real vaqtga teng keladigan oddiy badiiy zamon me’yorida tasvirlanadi. Badiiy zamonning nisbiyligi tarixiy shaxslar va voqealarni roman talablariga moslashtirishda qo’l keladi.

Pashtu tarixiy romanlarida badiiy zamonlar yil fasllari (baxor, yoz, kuz, qish), kun qismlari (tong, saxar, chosh payti, tun) va namoz vaqtlari bilan (bomdod, asr, shom, shomdan keyin tarzida) ifodalanadi.

BUXORO O‘ZBEK SHEVASIDA MORFOSINTAKTIK VA SEMANTIK KOPIYALASHNING NAMOYON BO‘LISH SHAKLLARI

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ANNOTATSIYA

Ushbu maqolada Buxoro vohasidagi o‘zbek-tojik ikki tilliligi sharoitida o‘zbek shevasi va so‘zlashuv nutqida sodir bo‘layotgan morfosintaktik va semantik o‘zgarishlar Lars Yoxansonning "Kod-kopiyalash nazariyasi" (Code-Copying Framework) doirasida tadqiq etiladi. Tadqiqotda tojik tilidan o‘zbek shevasiga grammatik modellar va strukturaviy nusxalarning o‘tishi (global hamda qismatli-kombinatorial va semantik kopiyalash) mantiqiy-tipologik jihatdan tahlil qilindi. Tadqiqot natijalari Buxoro o‘zbek shevasida izofatli qurilmalar, ergash gapli analitik konstruksiyalar, ko‘makchi fe’lli va aspektual tizimlar hamda inkor shakllarida tojik tili grammatik modelining chuqur iz qoldirganligini ko‘rsatadi.

Kalit so‘zlar: *kontakt tilshunoslik, Buxoro o‘zbek shevasi, Lars Yoxanson, Kod-kopiyalash nazariyasi, global kopiyalash, qismatli kopiyalash, morfosintaks, semantik kopiyalash.*

ABSTRACT

This article investigates morphosyntactic and semantic changes in the Bukhara Uzbek dialect resulting from Uzbek-Tajik bilingualism, using Lars Johanson's Code-Copying Framework. Through typology and contact linguistics methodologies, the study analyzes the transfer of grammatical models and structural copies from Tajik into the Uzbek dialect (global, selective-combinatorial, and semantic copying). The findings demonstrate that Tajik grammatical patterns have deeply influenced izafat structures, analytic subordinate clauses, auxiliary verb aspectual systems, and negation markers in Bukhara Uzbek.

Keywords: *contact linguistics, Bukhara Uzbek dialect, Lars Johanson, Code-Copying Framework, global copying, selective copying, morphosyntax, semantic copying.*

KIRISH (INTRODUCTION)

Mintaqaviy til muloqoti (*areal contact linguistics*) jarayonida turli tipologik oilalarga mansub tillarning o‘zaro ta’siri lingvistik tadqiqotlarning eng dolzarb yo‘nalishlaridan biri hisoblanadi. Markaziy Osiyoning qadimiy madaniy-ma’rifiy

markazlaridan biri bo‘lgan Buxoro vohasi asrlar davomida turkiy (o‘zbek) va eroniy (tojik) tillarining o‘zaro yaqin va intensiv muloqot hududi bo‘lib kelgan. Ushbu hududdagi o‘zbek-tojik bilingvizmi va diglossik holati so‘zlashuv nutqida hamda mahalliy shevada chuqur grammatik o‘zgarishlarni keltirib chiqargan.

O‘zbek adabiy tili agglyutinativ va SOV (*Subject-Object-Verb*) tartibiga, tojik tili esa flektiv-izofatli hamda SVO/SOV moslashuvchan tartibiga ega. Ushbu tipologik qarama-qarshilikka qaramasdan, Buxoro o‘zbek shevasida tojik tili grammatik modellarining singib ketishi va strukturaviy yaqinlashuv (*structural convergence*) yaqqol kuzatiladi.

An’anaviy tilshunoslikda (Ye.D.Polivanov, A.K.Borovkov, V.V.Reshetov, Sh.Shoabdurahmonov va b.) kontakt tillar ta’siri asosan "substrat", "superstrat" va "kalka" tushunchalari orqali izohlangan. Biroq zamonaviy kontakt tilshunoslikda shved turkologi Lars Yoxanson (*Lars Johanson*) tomonidan taklif etilgan **Kod-kopiyalash nazariyasi (*Code-Copying Framework*)** til kontaktlarini tahlil qilishda eng moslashuvchan va aniq analitik vosita hisoblanadi.

Ushbu nazariyaga ko‘ra, ikkitilli muloqotda bir til (**Asl kod** ya’ni *Buxoro o‘zbek shevasi*) ikkinchi tildan (**Model kod** ya’ni *tojik tili*) elementlarni "nusxalaydi" (*copying*). Yoxanson kopiyalashni ikki asosiy turga ajratadi:

1. **Global kopiyalash (*Global copying*):** Model koddagi birlikning shakli, ma’nosi va funksiyasi yaxlit holda Asl kodga o‘tadi.
2. **Qismatli/Tanlanma kopiyalash (*Selective copying*):** Model koddan faqat muayyan belgi va xususiyatlar — sintaktik tartib (*combinatorial*), semantika (*semantic*) yoki formal belgilar nusxalanib, Asl kodning o‘z materiallari orqali ifodalanadi.

Ushbu tadqiqotning maqsadi Lars Yoxansonning Kod-kopiyalash nazariyasi asosida Buxoro o‘zbek shevasidagi morfosintaktik va semantik-grammatik o o‘zgarishlarning namoyon bo‘lish shakllarini aniqlash, tasniflash hamda ularning shakllanish mexanizmlarini yoritib berishdan iborat.

TADQIQOT METODLARI (METHODS)

Tadqiqotning empirik bazasini Buxoro shahri hamda unga tutash tumanlar (Buxoro, Kogon, G‘ijduvon, Vobkent) hududida yashovchi, o‘zbek va tojik tillarida erkin muloqot qila oladigan 40 nafar retsipiyentning jonli so‘zlashuv nutqi va dialektal materiallari tashkil etadi.

Dala-tadqiqoti va audioyozuv: Turli yosh qatlamlariga mansub bilingvlardan 25 soatlik spontan va yarim-strukturalashgan audioyozuvlar to‘plandi.

Transkripsiyalash: Audio-materiallar xalqaro lingvistik transkripsiya qoidalariga muvofiq matnlashtirildi va maxsus so‘zlashuv korpusi (*spoken corpus*) ko‘rinishiga keltirildi.

Morfosintaktik tahlil: Shevadagi so‘z birikmalari va gap qurilmalari tuzilishini aniqlash.

Qiyosiy-tipologik metod: Buxoro o‘zbek shevasidagi ibora va iboralarni o‘zbek adabiy tili hamda tojik tili (so‘zlashuv va adabiy shakli) bilan uch tomonlama (*triangulation*) solishtirish.

Kod-kopiyalash modellari tahlili: Har bir grammatik hodisani *Global Copy*, *Selective Combinatorial Copy* va *Selective Semantic Copy* kategoriyalari bo‘yicha tasniflash.

TADQIQOT NATIJALARI (RESULTS)

Buxoro o‘zbek shevasi va so‘zlashuv nutqini tahlil qilish natijasida morfosintaktik va semantik kopiyalashning quyidagi asosiy namoyon bo‘lish shakllari va mexanizmlari aniqlandi.

A. Izofatli va teskari tartibli so‘z birikmalarining qismatli kopiyalanishi

O‘zbek adabiy tilida aniqlovchi va aniqlanmish munosabati strictly Aniqlovchi + Aniqlanmish tartibida bo‘ladi (*katta uy*). Buxoro o‘zbek shevasida esa tojik tilidagi izofatli qurilma (*Aniqlanmish + -i + Aniqlovchi*) modelining **qismatli kombinatorial kopiyalanishi (*selective combinatorial copy*)** faol qo‘llaniladi:

1. **Gibrid-izofatli model:**

*Tojikcha model:*odami xub (*yaxshi odam*)

Buxoro o‘zbek shevasi: odami yaxshi

Tahlil: Tojikcha -i izofat ko‘rsatkichi va sintaktik tartib nusxalangan, biroq aniqlovchi sifatida o‘zbekcha *yaxshi* leksik birligi tanlangan.

2. **Egalik affiksi orqali izofat modelini kopiyalash:**

Buxoro o‘zbek shevasi: qizi katta (Adabiy o‘zbekcha: *katta qiz*).

Tahlil: So‘z tartibi tojikcha model bo‘yicha Aniqlanmish + Aniqlovchi ga o‘zgargan. Izofat affiksi o‘rniga o‘zbekcha egalik qo‘shimchasi (-i) saqlangan.

B. Predlog va kelshikli qurilmalarning funksional kopiyalanishi

O‘zbek tili postpozitiv (ketma-ket keluvchi kelshik va ko‘makchilar) xarakterga ega. Buxoro o‘zbek shevasida esa tojikcha predloglarning o‘zi to‘g‘ridan-to‘g‘ri nusxalanadi yoki ularning sintaktik funksiyasi o‘zbekcha kelshiklarga yuklanadi:

Global Copy (Predlog o‘zlashuvi): Tojikcha *"ba"* yoki *"az"* predloglarining o‘zbekcha fe’llar bilan qo‘llanishi:

Ba maktab ketdim (Tojikcha: *Ba maktab raftam*).

Selective Copy (Kelshik semantikasining kengayishi): Tojikcha *"az"* (dan) va *"ba"* (ga) predloglarining semantik diapazoni o‘zbekcha -dan va -ga kelshiklariga to‘liq yuklangan.

O‘zbek adabiy tilida ergash gaplar ko‘pincha fe’lning sifatdosh, ravishdosh, shart shakllari orqali sintetik usulda shakllanadi (*U kelganda, men ketgan edim*). Buxoro o‘zbek shevasida esa tojik tiliga xos analitik va bog‘lovchili model ustunlik qiladi.

***"Ki"* bog‘lovchisining global kopiyalanishi va SVO tartibi**

Tojikcha *"ki"* bog‘lovchisi **Global Copy** sifatida Buxoro o‘zbek shevasiga to‘liq kirib kelgan. Bu holat o‘zbek tilining an’anaviy SOV (*Subyekt-Obyekt-Fe’l*) tartibini eroniy tillarga xos SVO va gibrid modellarga o‘zgartiradi:

To‘ldiruvchi ergash gap:

Adabiy o‘zbekcha (Sintetik): Men uning kelganini ko‘rdim.

Buxoro o‘zbek shevasi (Analitik): **Men ko‘rdimki, u keldi.** (Tojikcha: *Man didam, ki u omad*).

Payt va sabab ergash gap:

Buxoro o‘zbek shevasi: **Bormadimki, yag‘mur yog‘di.**

[Bosh gap (SVO)] + [ki (Global Copy)] + [Ergash gap]

3.3. Fe’l aspekt-zamon va modallik tizimidagi semantik kopiyalash (*Semantic Copying*)

Tojik tili fe’l tizimi aspektual (harakatning bajarilish tarzi va davomiyligi) jihatdan juda boy. Buxoro o‘zbek shevasida fe’l analitik shakllari va ko‘makchi fe’lli birikmalar tojikcha fe’l aspektlariga semantik jihatdan moslashtirilgan (*selective semantic copy*).

Hozirgi davomli zamon va aspektual moslik

Tojik tilida hozirgi davomli zamon fe’li *"istodan"* (turmoq) ko‘makchi fe’li orqali shakllanadi (*man xonda istodam*). Buxoro o‘zbek shevasida adabiy dagi -yap / -yotib affikslari o‘rniga -ib + turibman/o‘tiribman/yotibman analitik birikmalari tojikcha aspektual modelni to‘liq semantik nusxalaydi:

Tojikcha model : Man kor karda istodam.

*Buxoro o‘zbek shevasi :*Men ish qilib turibman. (Adabiy o‘zbekcha: *Men ishlayapman*).

*Tojikcha model :*U omada istodaast.

Buxoro o‘zbek shevasi (α): U kelib turibdi.

Inkor va modallik shakllaridagi kopiyalar

Tojik tilida inkor prefiksal (*na-/ne-*) shakllanadi. Buxoro shevasida ushbu modelning **qismatli va aralash kopiyalari** uchraydi:

Takroriy inkor: **Na keldi, na yozdi** (Tojikcha: *Na omad, na navisht*).

Gibrid inkor (Double negation): **Nishesta yo‘q** (Tojikcha *nishesta* [o‘tirgani yo‘q] + o‘zbekcha *yo‘q*).

MUHOKAMA (DISCUSSION)

Tadqiqot natijalari Buxoro o‘zbek shevasida tojik tili grammatik ta’siri shunchaki leksik o‘zlashmalar bilan cheklanib qolmasdan, **chuqur morfosintaktik va semantik kopiyalash** darajasiga etganini ko‘rsatadi.

4.1. Kopiyalash turlarining qiyosiy dinamikasi

Grammatik Hodisa	**Kopiyalash Turi (Lars Johanson)**	**Model Til (Tojik tili)**	**Asl Kod (Buxoro O‘zbek Shevasi)**
**Ergash gapda *"ki"* **	Global Copy	*ki*	*ki* (keng qo‘llaniladi)
Izofatli tartib	Selective (Combinatorial)	*odami xub*	*odami yaxshi / qizi katta*
Fe’l Aspektual ma’nosi	Selective (Semantic)	*karda istodam*	*qilib turibman*
Inkor shakllari	Mixed (Global + Selective)	*na omad*	*na keldi / nishesta yo‘q*

Turkiy va eroniy tillarning tipologik jihatdan turli guruhlarga mansubligiga qaramasdan, Buxoro bilingvlari nutqida ikki tilning grammatik mexanizmlari o‘rtasida "simmetriya" hosil bo‘lgan. O‘zbek so‘zlashuv nutqi tojik tilining analitik va izofatli qurilmalarini osongina qabul qiladi.

Sotsiolingvistik tahlillar shuni ko‘rsatadiki, **katta va o‘rta yoshli** bilingvlar nutqida grammatik kopiyalash darajasi yoshlarga nisbatan yuqori va barqarordir. Bu holat ko‘rilgan grammatik o‘zgarishlarning vaqtinchalik nutqiy hodisa emas, balki sheva tizimiga singgan barqaror lisoniy hodisa ekanligini tasdiqlaydi.

XULOSA (CONCLUSION)

1. Lars Yoxansonning "Kod-kopiyalash nazariyasi" Buxoro o‘zbek-tojik bilingvizmida yuz berayotgan grammatik o‘zgarishlarni tahlil qilish va ularni global hamda qismatli (kombinatorial, semantik) turlarga ajratish uchun eng maqbul metodologik asos hisoblanadi.

2. Buxoro o‘zbek shevasida morfosintaktik va semantik kopiyalash, asosan, izofatli so‘z birikmalari tartibida (Aniqlanmish + Aniqlovchi), analitik ergash gaplarda (*ki* bog‘lovchisi), fe’l aspektual tizimida (-ib turibman) va inkor qurilmalarida namoyon bo‘ladi.

3. Buxoro o‘zbek shevasida an’anaviy turkiy agglyutinativ va sintetik xarakter kuchsizlanib, eroniy tillarga xos analitizm va izofatli-flektiv tendensiyalar kuchaygan. Bu holat ikki tipologik har xil til muloqoti natijasida yuzaga keladigan **struktural yaqinlashuv (*structural convergence*)** hodisasining yorqin dalilidir.

4. Tadqiqot natijalari o‘zbek dialektologiyasi, kontakt tilshunoslik, turkologiya va ta’lim amaliyotida Buxoro hududida o‘zbek adabiy tili me’yorlarini o‘qitish metodikasini takomillashtirish uchun ilmiy-amaliy manba bo‘lib xizmat qiladi.

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ОТНОСИТЕЛЬНО ПОНЯТИЯ ГРАММАТИЧЕСКАЯ КОНСТРУКЦИЯ В КИТАЙСКОМ ЯЗЫКЕ

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АННОТАЦИЯ

В данной статье рассмотрены грамматические конструкции и их виды также выделены различия между грамматическими конструкции, рамочными конструкциями и предложно-послеложными конструкциями. Были рассмотрены более частотные и менее частотные конструкции. В настоящее время во всем мире происходят глобальные интеграционные процессы, все чаще современное общество сталкивается с необходимостью решения проблем взаимовлияния различных культур и сохранения культурного многообразия планеты. Показательным примером таких процессов выступают узбекско - китайские отношения, которые вступили сегодня в новую фазу поступательного развития экономического, научно-технического и культурного сотрудничества. Активизация узбекско - китайских отношений вызвала потребность в формировании специалистов, владеющих китайским языком для профессиональных целей, специалистов-китаеведов. В связи с этим возникла необходимость совершенствования подготовки профессиональных кадров в области владения китайским языком на уровне, приближающемся к уровню владения речью образованным носителем языка.

В настоящее время одним из приоритетных направлений лингвистических исследований остаётся взаимосвязь языка и культуры, которая составляет предмет изучения таких наук, как лингвокультурология и лингвострановедение. Значительное внимание этим аспектам уделяется и в современной методике преподавания китайского языка как иностранного.

Ключевые слова: *грамматические конструкции, рамочные конструкции, предложно-послеложные конструкции, синтаксис, специальные служебные слова, послелог.*

ABSTRACT

This article discusses grammatical constructions and their types; the differences between grammatical constructions, frame constructions, and prepositional sentences are also highlighted. More frequent and less frequency designs were considered.

Currently, global integration processes are taking place around the world, more and more modern society is faced with the need to solve the problems of the mutual influence of different cultures and preserve the cultural diversity of the planet. An illustrative example of such processes is the Uzbek-Chinese relations, which today entered a new phase of the gradual development of economic, scientific, technical and cultural cooperation. The intensification of Uzbek-Chinese relations has necessitated the formation of specialists who speak the Chinese language for professional purposes, experts in Chinese studies. In this regard, the need arose to improve the training of professional personnel in the field of Chinese language proficiency at a level approaching the level of proficiency in speech by an educated native speaker.

Currently, one of the priority areas of linguistic research remains the relationship between language and culture, which is the subject of study of such sciences as linguoculturology and linguistic studies. Considerable attention is paid to these aspects in the modern methodology of teaching Chinese as a foreign language.

Keywords: *grammatical constructions, frame constructions, prepositional sentences, syntax, special service words, postposition.*

ВВЕДЕНИЕ

Широкое развитие и изучение китайского языка, переводческая деятельность, вопросы изучения теории китайского языкознания и связанные с этим направлением работы показывают необходимость изучения данной темы. Необходимо отметить, что типологические особенности китайского языка предполагают широкое использование грамматических конструкция для выражения определенных грамматических значений. Поскольку морфологические средства языка китайского языка ограничены и используются довольно редко, то языку приходиться делать основной упор на порядок слов в предложении и устоявшиеся грамматические конструкции. Такое положение дел резко повышает значимость грамматических конструкций в китайском языке, поэтому и есть необходимость их отдельного изучения для полного овладения китайским языком. Все это указывает на актуальность нашей работы.

Целью данной статьи является изучение истории вопроса о грамматических конструкциях в китайском языке.

В этой связи были выделены следующие **задачи**: рассмотреть подходы к изучению грамматических конструкций; проблемы, которые были поставлены

и решены исследователями; а также классификации грамматических конструкций, которые были выделены в науке.

Основная часть. В лингвистике грамматическая конструкция - это любая синтаксическая строка слов, варьирующаяся от предложений над фразовыми структурами до определенных сложных лексем, таких как фразовые глаголы. Грамматические конструкции составляют основную единицу обучения в построении грамматических теорий.

Синтаксис - это раздел языкознания, предметом изучения которого является синтаксический строй языка, т.е. его синтаксические единицы и связи и отношения между ними. Включает в себя две основные части: учение о словосочетании, учение о предложении. Объект изучения синтаксиса – словосочетание и предложение; в настоящее время выделяется обособленно простое предложение, сложное, текст, слово, словоформа.[214]

Синтаксические единицы - это конструкции, в которых их элементы (компоненты) объединены синтаксическими связями и отношениями. В составе синтаксических единиц изменяемые слова используются в одной из своих форм (словоформ), которые в совокупности образуют морфологическую парадигму слова.

В грамматической системе китайского языка синтаксису, как само владеющей сфере речевого выражения принадлежит ведущая роль и он явно доминирует над морфологией. Синтаксис путунхуа - это широко разветвленная система разнообразных средств и приёмов, обозначающих структурные связи и выражающих грамматические отношения, как в простом предложении, так и в сложных синтаксических построениях.

Современный китайский язык располагает богатейшим арсеналом служебных слов. Достаточно сказать, что в китайском предложении, представленном в путунхуа многочисленным и разнообразными структурно-семантическими типами. Только союзов насчитывается более двухсот, не считая служебных слов других классов. Именно в сфере китайского предложения в полной мере проявляется богатство синтаксических средств, некоторые из которых характеризируются своеобразием. Отражающим самобытность и специфику китайского языка.

Синтаксис распадается на два больших раздела, соответственно содержащих описание и объяснение словосочетаний и предложений. Словосочетание соотносится с понятием, предложение — с суждением.

[214] Горелов В. И. Теоретическая грамматика китайского языка: Учеб. пособие для студентов пед. — М.: Просвещение, 1989г. С.95

Понятие и суждение — категории логические, словосочетание и предложение — категории грамматические.

Словосочетание — синтаксическая единица номинативного назначения, тогда как предложение представляет собой синтаксическую единицу, выполняющую коммуникативную функцию.[215]

Таким образом, синтаксис — это система некоммуникативных и коммуникативных единиц языка.

Основные синтаксические единицы китайского языка — это словосочетание, простое предложение, часть усложненного предложения, усложненное предложение, часть сложного предложения, сложное предложение.

Синтаксическая единица представляет собой единство составляющих частей, которые находятся в определенных смысловых отношениях. В китайском языке основными средствами обозначения синтаксических связей и выражения синтаксических значений являются словопорядок, интонация, служебные слова, а также специальные (типизированные) лексические элементы.

Для словосочетаний и предложений китайского языка характерны структурная простота, стройность и четкостьвнутренней организации.

Китайский лингвист Линь Юйвэнь следующим образом характеризует свойства и особенности синтаксических построений в китайском языке. Абсолютное большинство слов китайского языка — однослоги и двуслоги. Это создает возможность использования вполной мере синтаксических структур, обладающих стройной исимметричной организацией, и синтаксических структур, для которых характерно переплетение и скрещивание компонентов. Синтаксические структуры первого типа не только могут сочетаться между собой, но вместе с тем могут также объединяться с синтаксическими построениями второго типа, тем самым обогащая и делая многообразным китайский язык.[216]

Становление лингвистики как самостоятельной научной дисциплины в Китае имело своим теоретическим основанием применение к описанию китайского языка системы научных понятий традиционного европейского языкознания.

[215] Иногда указывают, что предложение наряду с коммуникативной функцией вы- полняет также и функцию номинативную, которая выражается в обозначении предложением определенной ситуации, отрезка действительности (см., например: *ГакВ.Г.*Теоретическая грамматика французского языка: Синтаксис. — М., 1981.-С. 58).

[216]**林裕文**。词汇、语法、修辞。上海，1957**年**，87页。

Первое собственно лингвистическое и систематическое описание китайской грамматики — книга китайского ученого МаЦзяньчжуна «Грамматический компендиум Ма-ши» («MashiWentong») - вышло в свет в 1898 г. Объектом описания МаЦзяньчжуна был древнекитайский язык.

Одним из важнейших средств формальной организации синтаксических единиц китайского языка является рамочная конструкция, называемая иногда грамматическими конструкциями.

Конструкция — это синтаксическое целое (словосочетание, оборот), в состав которого входят объединённые в речи языковые единицы, сочетающиеся друг с другом благодаря присущим им грамматическим свойствам.

Согласно В.И. Горелову, «конструкция — это синтаксическое целое (словосочетание, оборот), в состав которого входят объединённые в речи языковые единицы, сочетающиеся друг с другом благодаря присущим им грамматическим свойствам».(Горелов , 1989 : 95). По его мнению, в лингвистике грамматическая конструкция - это любая синтаксическая строка слов, варьирующаяся от предложений доопределенных сложных лексем. Грамматические конструкции составляют основную единицу в построении грамматических теорий. Предложно-послеложные конструкции — это понятие условное обычно в научных исследованиях этот термин встречается довольно редко, однако многие исследователи, изучая это понятие, применяют другие термины, в частности: грамматические, рамочные конструкции, предложно-послеложные конструкции.[217]

Одним из важных терминов формальной организации синтаксических единиц китайского языка является рамочная конструкция, называемая иногда замыканием. Она создается посредством дистантного расположения формальных элементов (служебных слов и специальных лексических элементов), тесно связанных между собой в функционально-синтаксическом отношении. Это своеобразные 'единства , расположенные во фразе на расстоянии друг от друга. (Горелов В. И. 1989:95).]

По мнению В.И.Горелова, рамочная конструкция четко обозначает границы лексических образований (слов и словосочетаний), функционирующих в качестве членов предложения. Вместе с тем она служит также формальным средством обозначения частей сложных синтаксических единиц. В этой связи он выделил следующие рамочные конструкции : 在。。。以 前 zai。。。yiqian - *до того как;* 在。。。以 后 zai yi。。。hou *после того как*，在。。。之 前

[217] Горелов В.И. Теоретическая грамматика китайского языка: Учеб. пособие для студентов пед. ив-тов по спец. «Иностр. яз.» — М.: Просвещение, 1989г. – 318с.

zai。。。qiantou *впереди; и* приводит несколько примеров с использованием этих конструкций, образуемых сочетанием предлогов с послелогами:

1 形 容 词 可 以 在 名 词 之 前，也 可 以 在 名 词 之 后 。Xingrongci keyi zai mingci zhiqian，ye keyi zai mingci zhihou。- *Прилагательное может стоять как перед существительным, так и после существительного.*
2 在 我 进 小 学 以 前，他 已 经 在 大 学 毕 了 业 。Zai wo jin xiaoxue yiqian，ta yijing zai daxue biyele. - *До того как я поступил в начальную школу, он уже окончил высшее учебное заведение.* [218]

Что касается термина «грамматические конструкции», то мы встречаем его Н.И. Тяпкиной , которая понимает под этим термином служебные слова находящиеся друг от друга дистантно, и включают в себя необходимый лексический элемент для выражения определенного грамматического значения.

По её мнению, грамматические конструкции ,как правило, состоят из нескольких языковых единиц, иначе говоря грамматических средств. Многие конструкции в китайском языке представляют собой связку, состоящую из предлога, послелога и еще какой-нибудь лексической единицы .（Тяпкина 1954:159.）[219]

Как отмечает исследователь, к ним относятся конструкции выражающие временные, целевые, причинные, условные, уступительные, результативные отношения, а также отношения сходства.

Вместе с тем есть мнение о том, что нужно отличать более частотные и менее частотные конструкции. Так, как отмечает Е.И.Шутова,в современном китайском языке наиболее распространенными являются конструкции, выражающие целевые отношения и отношения сходства. [Шутова , 1991: 68 - 70.][220]

Она остановилась на наиболее частотных , по её мнению , конструкциях. К ним она отнесла:

1.Сочетания предлогов с послелогами: 在…以 前 – *до того как, перед темкак, прежде чем, раньше чем*; 在…以 后 – *после того как*; 自 从…以 来 – *со временем;*

Возможно также сочетание 自 从…以 后 zicong…yihou, совмещающее в себе два значения: *с тех пор как* и *после того как*. Вместе с этим она также

[218] Горелов В.И. Грамматика китайского языка. – М.: Просвещение,1974г. – С. 147.
[219] Тяпкина Н.И. Послелоги в китайском языке. –М.: Акад. Наук СССР.Ин-т востоковедения,1954г.– С.159.
[220] Шутова Е.И. Синтаксис современного китайского языка.–М.:Главная редакция восточной литературы издательства «Наука», 1991г.

указала на некоторые из специальных знаменательных слов , посредством которых придаточная часть, указывающая время, соединяется с основной частью предложения: 时 shi, 时 候 shihou — *время;*每 逢 meifeng — *каждый раз, всякий раз;* 等 到 dengdao, 及 至 j izhi — *с наступлением.*

2. Конструкции, выражающие одновременность действий.

В этом случае то, о чём говорится в основной части предложения, совпадает по времени с тем, о чем сообщается в придаточном предложении,

1 每 逢 到 剧 场 去 的 时 候，我 总 带 他 去 。Meifeng dao juchang qu de shihou，wo zongdai ta qu。

Каждый раз, отправляясь в театр (дословно: ***каждый раз, когда*** *отправляюсь в театр), я всегда беру его с собой.*

3. Конструкции, выражающие предшествование одного действия к другому. В предложениях данной разновидности то, о чем говорится в основной части, предшествует во времени тому, о чем сообщается в придаточном части предложении: ср:.

1 没 进 大 学 以 前，他 在 工 厂 里 工 作 两 年 。Meijin daxue yiqian，ta zai gongchang li gongzuo liangnian。*До того как поступить в высшее учебное заведение (до поступления в высшее учебное заведение), он два года работал на заводе.*

4. Конструкции выражающие тождество. К этой разновидности относятся предложения, между частями которых посредством сравнения устанавливается тождество. Конструкция указанного типа присоединяется к сказуемому основной части предложения посредством следующих сложных союзов: 像。。。一 样 xiang。。。yiyang，像。。。一 般 xiang。。。yiban，好像。。。一 样 haoxiang。。。yiyang，如 同。。。一 样 rutong。。。yiyang - *как, точно, точно как.*

Исследователи приводят в этой связи следующие примеры на употребление предложений этого типа:

1. 德 华 像 一 个 女 孩 子 一 般 谦 逊 地 说 。Dehua xiang yige nu haizi yiban qianxun de shuo。

Дэхуа, точно как девушка застенчиво сказал .

2. 机 枪 子 弹 像 风 一 样 从 他 们 头 项 穿 过 去 。Jiqiang zidan xiang feng yiyang cong tamen touxiang chuan guoqu. *Пулеметные пули, как ветер, проносились над их головами.*

ЗАКЛЮЧЕНИЕ

Грамматические конструкции как правило состоят из нескольких языковых единиц, иначе говоря грамматических средств. Что касается китайского языка, то многие конструкции представляют собой связку состоящую из предлога, послелога и еще какой-нибудь лексической единицы для уточнения.

Под грамматической конструкцией подразумевается служебные слова которые находиться друг от друга на дистантно и вбирает в себя необходимый лексический элемент для выражения определенного грамматического значения.

Исходя из статьи можно сделать следующие выводы:

1. Грамматические конструкции в рассмотренных научных источниках называются либо рамочными; либо предложно-послеложными, либо грамматическими конструкциями .

2.Ученные выделили различия между конструкциями .К ним отнесены рамочные конструкции с чётко обозначенными границами начала и конца; предложно-послеложные конструкции, включающие предлог и послелог. Что касается грамматических конструкций ,то в них употребляется ,как послелог, так и союз или другие части речи.

3. Предложены семантические классификации этих конструкций :временные, целевые, причинные, условные, уступительные, результативные , а также конструкции сходства.

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