**IRSTI 70.94.15** **DOI** https://doi.org/10.37884/4-2025/51

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# ASSESSMENT AND ANALYSIS OF THE WATER MANAGEMENT BALANCE OF THE BARTOGAI RESERVOIR IN THE SHELEK RIVER BASIN

*Abstract*

The article discusses modern approaches to assessing and analyzing the water balance of the Bartogai Reservoir, located in the Shelek River basin. The Bartogai Reservoir is located in the Bartogai tract, 175 km from Almaty and 70 km from the village of Shelek. The total design capacity of the reservoir is 320 mln.m$^3$, the dead volume is 70 mln.m$^3$, the useful volume is 250 mln.m$^3$, the dam height is 60 m, the dam length is 325 m, and the length of the connecting dams is 250 m.

A comprehensive analysis of the main elements of the balance was conducted, including inflow, water withdrawals for economic needs, evaporation, filtration losses, and the operating mode of hydraulic structures. The balance covers the period from January to December 2024, with the result as of January 1, 2025. The volume of water at the beginning of 2024 was 184.0 million m$^3$. During the year, the volume fluctuated: the maximum was 296.9 mln.m$^3$ (May–June), and the minimum was 156.1 mln.m$^3$ (November). At the end of the year (January 1, 2025), it was 186.3 mln.m$^3$. By the end of the year, the reservoir level had almost returned to its initial value (an increase of 2.3 mln.m$^3$).

Based on the collected and processed hydrological data, the effectiveness of current water use was assessed and key problems related to uneven water supply and increasing anthropogenic pressure were identified. The results of the study can be used to optimize reservoir operation modes, improve water supply reliability, and conduct long-term planning in the region's water resources sector.

***Keywords:*** water resources, reservoirs, water use, water intake, water balance.

## *Introduction*

The calculation of a water management balance is a fundamental prerequisite for the rational use of water resources and effective economic activity. A water balance determines the amount of water available for use; it confirms whether these resources can meet projected economic development or indicates the presence of a water deficit. It also establishes the principal measures required to address water shortages under various scenarios of water-demand distribution such as reservoir flow regulation, inter-basin water transfers, and other management strategies. In some cases, it also identifies the remaining water volume available for use beyond the study area [1-2].

The water balance of a reservoir consists of inflow and outflow components. The inflow part includes: natural surface runoff ($Q_\beta$); a portion of groundwater withdrawals that are hydraulically unconnected to surface waters ($Q_n$); return, drainage, mine, and wastewater inflows within the basin ($Q_r$); inter-basin water transfers ($Q_{usr}$) and reservoir storage changes over the calculation period ($Q\Delta$).

These storage volumes are later incorporated into the outflow section during reservoir filling or into the inflow section with a negative sign.

The outflow section of the balance typically includes: water withdrawals from the river upstream for irrigation, lake recharge, municipal, and industrial water supply (adjusted for return flows if discharged upstream) ($Q_a$); water diversions to other basins ($Q_{nep}$); water losses through additional evaporation from reservoirs and ponds; losses from groundwater drainage induced by river regulation ($Q_{pon}$d) and downstream releases below the control section ($Q_{opon}$).

These releases are required for maintaining water intakes, ensuring sanitary flow conditions, supporting navigation, and under certain conditions for floodplain and spawning area inundation.

Thus, the general water balance equation can be expressed as [3-5]:

$$Q_{in} + Q_{return} + Q_{transfer} - Q_{loss} - Q_{release} = \Delta S \quad (1)$$

Most of the outflow component is determined by special releases downstream of the control section, set according to the water requirements of different users. Clear discharge requirements currently exist mainly for navigation and irrigation. However, consistent approaches for establishing ecological (environmental) releases are still lacking.

When compiling water balances, it is important to consider all water withdrawals upstream and the required releases downstream. Balances are typically computed in tabular form for flow conditions of varying probabilities (e.g., 50%, 75%, 90%, and 95% reliability) [6].

***Materials and methods***

The Bartogai Reservoir is located in the Bartogai tract, 175 km from Almaty and 70 km from the village of Shelek. The total design capacity of the reservoir is 320 mln.m$^3$, with a dead volume of 70 mln.m$^3$, a usable volume of 250 mln.m$^3$, a dam height of 60 m, a dam length of 325 m, and a connecting dam length of 250 m.

The working spillway consists of two separately located tunnel lines: the left tunnel is 355 m long, the right tunnel is 331 m long, the tunnel diameter is 3.0 m, the outlet head diameter is 2.2 m, the flood discharge is 143 m$^3$/sec, operating flow rate at GMO – 120 m$^3$/sec.

Catastrophic mine spillway diameter – 11.0 m, combined with a construction tunnel length – 402.0 m, flow rate – 282.0 m$^3$/sec. Rock-fill dam with a loamy core height of 60 m.

Currently, the reservoir is in accumulation mode. This work is being carried out in accordance with the Bartogai Reservoir operating mode, as agreed with the Balkhash-Alakol Basin Inspectorate for Water Resource Use and Protection [7].

***Results and discussion***

The Bartogai Reservoir accumulates the flow of the Shelek River and is an important source of water resources for the region. Water consumption from the reservoir includes several main areas: agricultural water supply, water consumption for irrigation of agricultural land, and meeting the needs of the fishing industry.

Water consumption associated with agricultural land irrigation consists of two components: subsurface irrigation through sluicing and sprinkler irrigation. In addition, part of the water resources is distributed through irrigation canals to ensure uniform water supply to agricultural areas. Summary data on the structure and volumes of water use are presented in Diagram 1 and in Table 1.

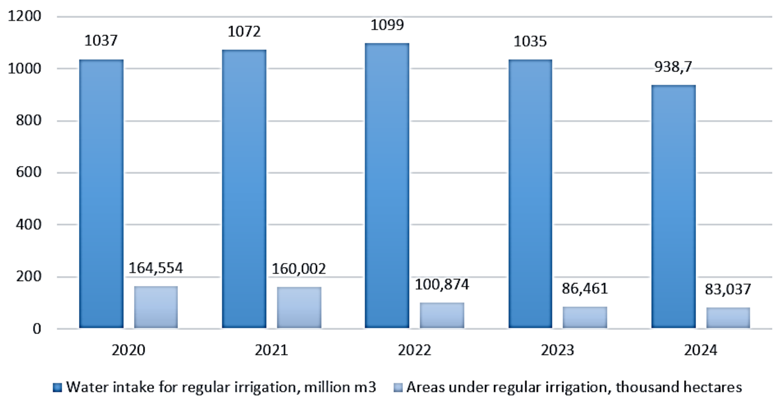


**Figure 1** – Water use for irrigation in the Big Almaty Canal Zone (BAC)

The diagram reflects changes in water abstraction volumes for regular irrigation and areas under regular irrigation for the period 2020-2024.

Overall, over the five-year period under review, there has been a mixed trend in the two indicators. Water intake in 2020–2022 is characterized by a steady upward trend: from 1,037 mln.m³ in 2020 to 1,099 mln.m³ in 2022, which is the maximum value for the period under review. However, in subsequent years, there is a noticeable decrease in water intake: to 1,035 mln.m³ in 2023 and to 938.7 mln.m³ in 2024. Thus, since 2022, there has been a steady downward trend in water consumption.

The area under regular irrigation has been steadily declining throughout the period. While 164,554 thousand hectares were under irrigation in 2020, only 83,037 thousand hectares were under irrigation in 2024, which is about 50% of the levels at the beginning of the period. The most significant reduction occurred in 2022, when the area decreased from 160,002 to 100,874 thousand hectares.

A comparison of the two indicators shows that the reduction in irrigated areas is outpacing the reduction in water abstraction. In 2020–2022, this led to an increase in specific water consumption per hectare, which may indicate increased water capacity of irrigated land, uneven water supply, or reduced water use efficiency. Only starting in 2023 did the reduction in water abstraction become more proportional to the decrease in irrigated areas.

Overall, the data presented indicates a continuing process of water use optimization in conditions of limited water resources and a reduction in irrigated areas. It is important to note that the reduction in water abstraction in 2023–2024 may be the result of both a decrease in demand due to a reduction in area and measures to improve water efficiency or restrictions on water supply during that period.

**Table 1 -** *Water Use of Major Reservoirs from January 1, 2024 to January 1, 2025*

| Region name of reservoir | River or area of formation | Design capaciy, mln. m$^3$ | Volume at the beginning of the period, mln. m$^3$ | Inflow during period, mln. m$^3$ | Expenditure, mln. m$^3$ | | | | | Filling (+) Discharge (-) mln. m$^3$ | Reservoir volume at the end of the period, mln. m$^3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Total | Water intake from the reservoir | Downstream releases | Losses due to evaporation and filtration | Irrigation withdrawal | | |
| | | | last year's reporting period | last year's reporting period | last year's reporting period | last year's reporting period | last year's reporting period | last year's reporting period | last year's reporting period | last year's reporting period | last year's reporting period |
| | | | reporting period of the current year | reporting period of the current year | reporting period of the current year | reporting period of the current year | reporting period of the current year | reporting period of the current year | reporting period of the current year | reporting period of the current year | reporting period of the current year |
| Bartogai | Shelek river | 320 | 195,70 | 973,95 | 985,65 | 952,08 | 952,08 | 33,57 | | -11,70 | 184,0 |
| | | | 184,0 | 1442,82 | 1440,52 | 1395,44 | 1395,44 | 45,08 | | +2,3 | 186,3 |

The actual inflow to the reservoir in 2024 amounted to 1,442.82 mln.m$^3$, which is 468.87 mln.m$^3$s more than last year (973.95 mln.m$^3$).

The actual discharge from the reservoir in 2024 amounted to 1,395.44 mln.m$^3$ (in 2023 – 952.08 million m3), or 443.36 mln.m$^3$ more than in 2023.

The largest volume of water in the reservoir (292.34 mln.m$^3$) was observed on April 21, 2024, at a level of 1066.42.

Water withdrawal from reservoirs for irrigation in 2024 amounted to 677.264 mln.m$^3$, including:

- above the BAC – 77.950 mln.m$^3$ (with a water intake limit of 115.456 mln.m$^3$, efficiency of 0.77%) or 5.327 mln.m$^3$ less in 2023 – 83.277 mln.m$^3$ (83.289 mln.m$^3$);
- according to BAC – 299.735 mln.m$^3$ (with a water intake limit of 365.984 mln.m$^3$, efficiency of 0.69%) or 33.242 mln.m$^3$ less than in 2023 – 332.977 mln.m$^3$;
- below BAC –332.977 mln.m$^3$ (with a water intake limit of 332.992 mln.m$^3$, efficiency of 0.78%) or 8.60 mln.m$^3$ less than in 2022 (341.577).

After analyzing water usage volumes, a water balance for the reservoir was compiled for 2024 (Table 3). Water balances are usually formed based on the results of long-term observations, which allows for the identification of stable trends and patterns in water supply. However, an annual assessment of the water balance provides an operational overview of the current state of water resources, allows for an assessment of the effectiveness of their use, enables the timely identification of deviations from regulatory regimes, and facilitates the necessary management decisions to optimize water use in subsequent years [8-10].

**Table** 3 - *Water Management Balance of the Bartogai Reservoir for 2024*

| № | **name of water balance items** | unit of measurement | months | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | january | february | march | april | may | june | july | august | september | october | november | december | 01.01.2025 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1 | **Reservoir volume at the beginning of the period** | mln. m$^3$ | **184,00** | **214,15** | **239,88** | **268,84** | **296,95** | **290,58** | **235,64** | **168,95** | **188,00** | **195,90** | **193,00** | **156,14** | **184,0** |
| 2 | **Level of reservoirs at the beginning of the period** | m | 1056,91 | 1059,85 | 1062,19 | 1064,67 | 1066,95 | 1066,44 | 1061,82 | 1055,35 | 1057,31 | 1058,10 | 1057,81 | 1053,23 | |
| 3 | **Water inflow into the reservoir** | m$^3$/s | 12.,57 | 11,83 | 12,44 | 16,51 | 62,37 | 60,26 | 82,71 | 110,88 | 69,53 | 48,73 | 35,46 | 22,02 | |
| | | mln. m$^3$ | 33,67 | 29,63 | 33,33 | 42,80 | 167,06 | 156,19 | 221,53 | 296,98 | 180,23 | 130,52 | 91,90 | 58,98 | |
| | | increase | **33,67** | **63,30** | **96,63** | **139,43** | **306,49** | **462,68** | **684,21** | **981,19** | **1161,42** | **1291,94** | **1383,84** | **1442,82** | **1442,82** |
| 4 | **Water losses in reservoirs due to filtration and evaporation** | m$^3$/s | 1,11 | 1,36 | 1,43 | 1,74 | 1,81 | 1,92 | 1,64 | 1,43 | 1,44 | 1,27 | 1,01 | 0,96 | |
| | | mln. m$^3$ | 2,98 | 3,40 | 3,83 | 4,50 | 4,86 | 4,98 | 4,40 | 3,82 | 3,73 | 3,39 | 2,62 | 2,57 | |
| | | increase | **2,98** | **6,38** | **10,21** | **14,71** | **19,57** | **24,55** | **28,95** | **32,77** | **36,50** | **39,89** | **42,51** | **45,08** | **45,08** |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 5 | **Discharge of** | m$^3$/s | 0,20 | 0,20 | 0,20 | 3,93 | 62,94 | 79,53 | 105,97 | 102,34 | 65,05 | 48,55 | 48,67 | 9,80 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **water from the reservoir** | mln. $m^3$ | 0,54 | 0,50 | 0,54 | 10,19 | 168,57 | 206,15 | 283,82 | 274,11 | 168,60 | 130,03 | 126,14 | 26,25 | |
| | | increase | **0,54** | **1,04** | **1,58** | **11,77** | **180,34** | **386,49** | **670,31** | **944,42** | **1113,02** | **1243,05** | **1369,19** | **1395,44** | **1395,44** |
| 6 | **Water volume at the end of the month** | mln. $m^3$ | **214,15** | **239,88** | **268,84** | **296,95** | **290,58** | **235,64** | **168,95** | **188,00** | **195,90** | **193,00** | **156,14** | **186,30** | **186,3** |
| 7 | **Technical water losses along the Shelek River bed** | $m^3/s$ | 0,20 | 0,20 | 0,20 | 3,93 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 0,20 | 0,20 | |
| | | mln. $m^3$ | 0,54 | 0,50 | 0,54 | 10,19 | 2,68 | 2,59 | 2,68 | 2,68 | 2,59 | 2,68 | 0,52 | 0,54 | |
| | | increase | **0,54** | **1,04** | **1,58** | **11,77** | **14,45** | **17,04** | **19,72** | **22,40** | **24,99** | **27,67** | **28,19** | **28,73** | **28,73** |
| 8 | **Sanitary clearance according to BAC** | $m^3/s$ | - | - | - | - | 9,96 | 10,29 | 9,96 | 9,96 | 10,29 | - | - | - | |
| | | mln. $m^3$ | - | - | - | - | 26,674 | 26,674 | 26,67 | 26,67 | 26,67 | - | - | - | |
| | | increase | - | - | - | - | **26,674** | **53,35** | **80,02** | **106,70** | **133,37** | - | - | - | **133,37** |
| 9 | **Water intake above the BAC** | $m^3/s$ | - | - | - | - | 3,66 | 7,81 | 9,76 | 7,04 | 1,13 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 9,807 | 20,245 | 26,13 | 18,85 | 2,92 | - | - | - | - |
| | | increase | - | - | - | - | **9,807** | **30,05** | **56,18** | **75,03** | **77,95** | - | - | - | - |
| 10 | **Water supply above the BAC** | $m^3/s$ | - | - | - | - | 2,83 | 6,09 | 7,56 | 5,46 | 0,86 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 7,572 | 15,782 | 20,25 | 14,62 | 2,23 | - | - | - | - |
| | | increase | - | - | - | - | **7,572** | **23,35** | **43,60** | **58,22** | **60,45** | - | - | - | - |
| 11 | **Losses above the BAC** | $m^3/s$ | - | - | - | - | 0,83 | 1,72 | 2,20 | 1,58 | 0,26 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 2,235 | 4,46 | 5,88 | 4,23 | 0,68 | - | - | - | - |
| | | increase | - | - | - | - | **2,235** | **6,70** | **12,58** | **16,81** | **17,50** | - | - | - | - |
| 12 | **Water intake below the BAC** | $m^3/s$ | - | - | - | - | 18,42 | 24,78 | 28,37 | 32,38 | 9,05 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 49,329 | 64,224 | 75,99 | 86,73 | 23,46 | - | - | - | - |
| | | increase | - | - | - | - | **49,329** | **113,55** | **189,55** | **276,28** | **299,7** | - | - | - | - |
| 13 | **Water supply below the BAC** | $m^3/s$ | - | - | - | - | 12,71 | 17,31 | 20,02 | 22,64 | 6,38 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 34,037 | 44,859 | 53,62 | 60,63 | 16,54 | - | - | - | - |
| | | increase | - | - | - | - | **34,037** | **78,90** | **132,51** | **193,15** | **209,69** | - | - | - | - |
| 14 | **Losses above the BAC** | $m^3/s$ | - | - | - | - | 5,71 | 7,47 | 8,35 | 9,74 | 2,67 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 15,292 | 19,365 | 22,377 | 26,095 | 6,920 | - | - | - | - |
| | | increase | - | - | - | - | **15,292** | **34,66** | **57,03** | **83,13** | **90,05** | - | - | - | - |
| 15 | **Water intake at the BAC** | $m^3/s$ | - | - | - | - | 1,07 | 21,32 | 47,91 | 38,96 | 3,38 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 2,860 | 55,271 | 128,33 | 104,35 | 8,77 | - | - | - | - |
| | | increase | - | - | - | - | **2,860** | **58,13** | **186,46** | **290,81** | **299,58** | - | - | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | **Total water supply at the BAC** | $m^3/s$ | - | - | - | - | 0,86 | 17,33 | 38,82 | 31,61 | 2,76 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 2,318 | 44,925 | 103,97 | 84,67 | 7,16 | - | - | - | - |
| | | increase | - | - | - | - | **2,318** | **47,24** | **151,21** | **235,88** | **243,04** | - | - | - | - |
| 17 | **Losses at the BAC** | $m^3/s$ | - | - | - | - | 0,20 | 3,99 | 9,10 | 7,35 | 0,62 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 0,542 | 10,35 | 24,37 | 19,68 | 1,61 | - | - | - | - |
| | | increase | - | - | - | - | **0,542** | **10,89** | **35,26** | **54,94** | **56,54** | - | - | - | - |
| 18 | **Tausugur branch** | $m^3/s$ | - | - | - | - | 1,07 | 12,30 | 22,63 | 19,97 | 3,07 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | 2,86 | 31,871 | 60,61 | 53,50 | 7,97 | - | - | - | - |
| | | increase | - | - | - | - | **2,860** | **34,731** | **95,341** | **148,837** | **156,803** | - | - | - | - |
| 19 | **Enbekshikazakh branch** | $m^3/s$ | - | - | - | - | - | 7,64 | 19,02 | 15,80 | 0,31 | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | - | 19,802 | 50,94 | 42,33 | 0,80 | - | - | - | - |
| | | increase | - | - | - | - | - | **19,802** | **70,74** | **113,06** | **113,86** | - | - | - | - |
| 20 | **Kaskelen branch** | $m^3/s$ | - | - | - | - | - | 1,39 | 6,27 | 3,18 | - | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | - | 3,598 | 16,79 | 8,53 | - | - | - | - | - |
| | | increase | - | - | - | - | - | **3,598** | **20,39** | **28,91** | - | - | - | - | - |
| 21 | **Water intake at the D. Kunaev branch of the Kazvodkhoz RSE** | $m^3/s$ | - | - | - | - | **23,15** | **53,91** | **86,04** | **78,38** | **13,56** | - | - | - | - |
| | | mln. $m^3$ | - | - | - | - | **62,00** | **139,74** | **230,45** | **209,93** | **35,14** | - | - | - | - |
| | | increase | - | - | - | - | **62,00** | **201,74** | **432,19** | **642,12** | **677,26** | - | - | - | - |

The balance covers the period from January to December 2024, with the total as of January 1, 2025. The volume of water at the beginning of 2024 was 184.0 mln.m³. During the year, the volume fluctuated: the maximum was 296.9 mln.m³ (May–June), and the minimum was 156.1 mln.m³ (November). At the end of the year (January 1, 2025), it was 186.3 mln.m³. By the end of the year, the reservoir level had almost returned to its initial value (an increase of 2.3 mln.m³). The maximum inflow was observed in the summer months (June–August), reaching 981.19 mln.m³ (July). The total annual inflow amounted to 1,442.82 mln.m³. Losses for the year amounted to 45.08 mln.m³, which is about 3.1% of the total inflow. The greatest losses occurred in July–August due to high temperatures. The total discharge from the reservoir amounted to 1,395.44 mln.m³. The peak discharge occurred during the summer period (July–August) – up to 944.42 mln.m³. These discharges were used for irrigation and economic needs.

***Conclusion***

Currently, the water management complex is not operating at its design capacity, which is explained by both changes in the overall environmental situation in the region and the failure of individual hydraulic structures. Despite this, an analysis of the water balance of the reservoir in 2024 shows stable water regime operation. The inflow of water has allowed a stable level to be maintained even with significant discharges, and losses due to evaporation and filtration do not exceed the normative values. The final volume of water is practically equal to the initial volume, which indicates balanced water use.

The results obtained indicate that the current operating regime, although not in line with the original design solutions, provides the necessary degree of stability of water resources. Nevertheless, the identified discrepancies in the technical condition of the structures and the changed natural and climatic conditions require adjustments to the existing approaches to reservoir management. To improve the efficiency and reliability of water use, it is necessary to modernize hydraulic structures, update design operating modes, and introduce regular monitoring systems that take into account current climatic trends.

Thus, the results of the study emphasize the importance of adaptive water management of the Bartogai Reservoir and the need for a comprehensive review of operational strategies to ensure long-term water security in the region.

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## ОЦЕНКА И АНАЛИЗ ВОДОХОЗЯЙСТВЕННОГО БАЛАНСА БАРТОГАЙСКОГО ВОДОХРАНИЛИЩА В БАССЕЙНЕ РЕКИ ШЕЛЕК

***Аннотация***

В статье рассматриваются современные подходы к оценке и анализу водохозяйственного баланса Бартогайского водохранилища, расположенного в бассейне реки Шелек. Бартогайское водохранилище расположено в урочище Бартогай, в 175-и км от г. Алматы и в 70-и км от села

Шелек. Полный проектный объем водохранилища – 320 млн.м$^3$, мертвый объем – 70 млн.м$^3$, полезный объем – 250 млн.м$^3$, высота плотины – 60 м. длина плотины – 325 м, длина сопрягающих дамб – 250 м.

Проведён комплексный анализ основных элементов баланса, включая приток, заборы воды на хозяйственные нужды, испарение, фильтрационные потери и режим работы гидротехнических сооружений. Баланс охватывает период с января по декабрь 2024 года, с итогом на 1 января 2025 года. Объём воды на начало 2024 года – 184,0 млн.м³. В течение года объём колебался: максимальный – 296,9 млн.м³ (май–июнь), минимальный – 156,1 млн.м³ (ноябрь). На конец года (01.01.2025) – 186,3 млн.м³. Уровень водохранилища в конце года практически восстановился до начального значения (увеличение на 2,3 млн.м³).

На основе собранных и обработанных гидрологических данных выполнена оценка эффективности текущего водопользования и выявлены ключевые проблемы, связанные с неравномерностью водообеспеченности и возрастанием антропогенной нагрузки.

Результаты исследования могут быть использованы для оптимизации режимов эксплуатации водохранилища, повышения надёжности водоснабжения и долгосрочного планирования в сфере водных ресурсов региона.

***Ключевые слова***: водные ресурсы, водохранилища, водопользование, водозабор, водохозяйственный баланс.

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**ШЕЛЕК ӨЗЕНІ БАССЕЙНІНДЕГІ БАРТОҒАЙ СУ ҚОЙМАСЫНЫҢ СУ ШАРУАШЫЛЫҒЫ ТЕҢДЕСТІГІН БАҒАЛАУ ЖӘНЕ ТАЛДАУ**

***Аңдатпа***

Мақалада Шелек өзенінің бассейнінде орналасқан Бартоғай су қоймасының су шаруашылығы теңдестігін бағалау мен талдаудың заманауи тәсілдері қарастырылған. Бартоғай су қоймасы Бартоғай шатқалында, Алматы қаласынан 175 км және Шелек ауылынан 70 км жерде орналасқан. Су қоймасының толық жобалық көлемі-320 млн.м$^3$, өлі көлемі - 70 млн.м$^3$, пайдалы көлемі - 250 млн.м$^3$, бөгеттің биіктігі - 60 м, бөгеттің ұзындығы - 325 м, түйісетін бөгеттердің ұзындығы - 250 м.

Теңдестіктің негізгі элементтеріне кешенді талдау жүргізілді, оның ішінде ағын, шаруашылық қажеттіліктерге су алу, булану, сүзу шығындары және гидротехникалық құрылыстардың жұмыс режимі. Теңдестік 2024 жылғы қаңтардан желтоқсанға дейінгі кезеңді қамтиды, 2025 жылғы 1 қаңтардағы қорытындымен. 2024 жылдың басындағы су көлемі – 184,0 млн.м$^3$. Жыл ішінде көлем өзгеріп отырды: максимум – 296,9 млн.м$^3$ (мамыр–маусым), минимум – 156,1 млн.м$^3$ (қараша). Жыл соңына (01.01.2025) - 186,3 млн.м$^3$. Су қоймасының деңгейі жыл соңында іс жүзінде бастапқы мәнге дейін қалпына келді (2,3 млн.м$^3$ ұлғайды).

Жиналған және өңделген гидрологиялық деректер негізінде ағымдағы су пайдаланудың тиімділігін бағалау орындалды және сумен қамтамасыз етудің біркелкі еместігі мен антропогендік жүктеменің ұлғаюына байланысты негізгі мәселелер анықталды.

Зерттеу нәтижелері су қоймасын пайдалану режимдерін оңтайландыру, сумен жабдықтау сенімділігін арттыру және аймақтың су ресурстары саласындағы ұзақ мерзімді жоспарлау үшін пайдаланылуы мүмкін.

***Кілт сөздер:*** су ресурстары, су қоймасы, су пайдалану, су алу, сушаруашылық теңдестік.

**Contributions by authors:** Conceptualization, Data curation – TKM, AAE; Formal analysis – ZhAG; Methodology – AAE, ZhAG; Verification – AAE, TDS; Writing – review and editing – ZhAG, TDS.