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Zh.S.Mustafayev, L.N. Ryskulbekova

Kazakh National Agrarian University, Almaty, Republic of Kazakhstan.
E-mail: z-mustafa@rambler.ru; ryskulbekova.laura@mail.ru

FUNDAMENTALS OF WATER USE IN THE CATCHMENT AREAS OF THE ILI RIVER BASIN

Abstract. Based on the long-term information and analytical materials «Balkhash-Alakol Basin Inspectorate for Regulation of Use and Protection of Water Resources» of the Committee for Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan, the environmental indicator of specific water availability, which availability high water availability, ensuring sustainable development of economic sectors, but not ensuring the natural and environmental sustainability and safety of functioning of Lake Balkhash, as a geographic water body.

The location in the arid and semi-arid zones, as well as the features of the formation of hydrological flow in the catchment areas of the Ili River basin, which determines the environment-forming system with socio-economic conditions and natural and technogenic objects that determine the level of water supply for water management sites, require the need for coordination of water management in order to prevent possible negative changes in watercourses and reservoirs that perform important environmental functions in the Ili-Balkhash basin, that is, to ensure natural and environmental sustainability and safe functioning of Lake Balkhash as a geographic water body.

Keywords: river, basin, runoff, discharge, catchment, economy, use, water availability, water use, population.

Relevance. In the system of the economy of Kazakhstan, the Ili River basin is a diversified economic complex, which is characterized by environmentally hazardous mining enterprises and non-ferrous metallurgy. On the territory of the basin are also represented mainly engineering enterprises, chemical, food and light industries. Environmentally hazardous enterprises are mainly located in the city of Balkash (copper production), in Taldykorgan (battery factory), Tekeli (mining industry), Kapchagay (construction materials) and Almaty (engineering and metallurgy).

Peculiarities of water use in the catchment areas of the Ili River basin by various sectors of the economy affect the ecological state of the water system, which requires a comprehensive assessment from the standpoint of water consumption in the economy, as their consumer properties are very important for the region.

Purpose of the study - based on the analysis of the natural and socio-economic conditions in the catchment areas of the Ili River basin, identify the problems and tasks of the development of water management in the region.

Objects of study.

The catchment of the Ili River basin, as a single environment-forming environment, is located on the territory of Kazakhstan and the People's Republic of China. At the same time, 65% of the lake's river flow is formed on the adjacent territory of the Xinjiang Uygur Autonomous Region (XUAR) of the People's Republic of China [1].

The catchment of the Ili River basin originates on the Muzart Glaciers in Central Tanirtau (Kazakhstan), the source of the Tekes River and then flows through the territory of the People's Republic of China (PRC), where it merges with the Kunes and Kas rivers, at the 250th km from the confluence it again enters the Republic Kazakhstan, at 1001 km it flows into Lake Balkhash [1].

The total length of the Ili River is 1439 km, within the Republic of Kazakhstan -815 km. The total area of the Ile river basin is 140 thousand km^2, that is, approximately 75% of the catchment area of Lake Balkhash, of which 77400 km^2 are in the territory of the Republic of Kazakhstan. The drainage part of the Ili River basin is located on the territory of the People's Republic of China, where the hydrographic network is quite developed and ranges from 0.60 to 3.00 km / km^2. Its density decreases in the middle and

lower parts of the catchment area of the Ili River basin, i.e. up to 0.01 km / km^2, there are vast expanses completely devoid of surface runoff, only the left-bank part of the catchment area of the Ili River basin is active here. About 30% of the water resources of the Ili River are formed on the territory of the Republic of Kazakhstan. In addition to the Sharyn and Shelek rivers, in the left-bank part of the basin in the middle reaches of the Ili River, it also receives a number of mountain rivers: Turgen, Esik, Talgar, Kaskelen with tributaries Malaya and Bolshaya Almaty. In the right-bank part, the largest tributaries of the Ili River are the Korgas, Usek and Borokhudzir rivers flowing down from the southern slopes of Zhetysu Alatau [1].

Materials and research methods. The studies used the long-term information and analytical materials of the «Balkhash-Alakol Basin Inspectorate for Regulation of the Use and Protection of Water Resources» of the Committee on Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan on the volume of water consumption in the economy of the Ili water basin. The catchment area of the Ili river basin is divided into two sections: the upper and lower reaches of the Ili, which are identified on the basis of geomorphological schematization with administrative division in the context of the districts of the Almaty region (table 1).

Table 1 - Ili basin in the context of water plots with administrative divisions

№	Water plot	№	Administrative districts	Area, km^2
1	Upper Ili	14	Enbekshikazakh	8300,0
		17	Talgar	3700,0
		15	Uyghur	8787,0
		8	Kerbulak	11500,0
		9	Panfilov	10600,0
		13	Kapchagai city	3654,03
Total				46541,03
II	Lower Ili	2	Balkhash	37400,0
		11	Ili	7800,0
Total				45200,0
Total				91741,03

Restrictions on water use in the catchment areas of the Ili River basin, associated with the availability of water resources, are determined not only by the natural characteristics of the formation of river flow, but also by the magnitude of the anthropogenic load on the rivers. To determine the level of water availability I.A. Shiklomanov proposed an indicator of specific water availability (thousand m^3 / year per person or km^3 / year per million people), which determines not only the shortage of water resources, but also allows us to judge the overall state of water resources in the natural conditions of their formation and functioning [2].

The specific water availability indicator (PB) in the catchment areas of river basins is determined by the formula [2]:

$$PB = (W_{op} - W_{бев})/N,$$

Where W_{op} – real water resources of river basins, km^3/year; $W_{бев}$ - irrevocable water consumption, km^3/year; N – population, people.

According to the classification of I.A. Shiklomanova, if the indicator of specific water availability: $PB<1.0$ – catastrophically low water availability; $PB=-1.10-2,00$ – very low water availability; $PB=-2.10-5,00$ – low water availability; $PB=-5.10-10,00$ – average water availability; $PB=-10.10-20,00$ – high water availability; $PB>$ – very high water availability [2].

An analysis of the work to protect and preserve the natural complex of the catchment areas and water bodies shows that the water resources of watercourses and reservoirs cannot be fully used for the needs of economic sectors. A significant part of them must be left in the form of ecological runoff in river systems to preserve ecosystems that ensure the reproduction of valuable aquatic and near-water flora and fauna, i.e., caught meadows, lake systems, and near-water mammals [3, 4, 5, 6]. As a result, there is an urgent need for a quantitative assessment of the water resources reserved in rivers according to environmental criteria, and then the environmental indicator of specific water availability ($ЭPB$) of the catchment areas of river basins is determined by the formula:

$$ЭРВ = \{[W_{ор} \cdot (1 - \alpha_э) - W_{бвв}]\} / N,$$

where $\alpha_э$ – coefficient characterizing the ecological runoff in river systems, which is determined on a spatio-temporal scale.

Research results. Based on the long-term information and analytical materials of the Balkhash-Alakol Basin Inspectorate for regulating the use and protection of water resources of the Committee for Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan, covering the years 2002-2017, we analyzed the use of water resources in the sectors of the economy in the catchment areas of the Ili River basin in the context of water management plots and administrative districts of the Almaty region, including housing and communal services, industry and agriculture (table 2).

In the period under review, from 2002 to 2017, the largest volumes of collected water, i.e. 98.0-98.8%, are used for agricultural needs in the catchment areas of the river basin, 0.30-0.70% are used for production purposes and drinking needs 1.30-1.70%. Thus, the main water consumers in the catchment areas of the Ili River basin are agriculture, that is, regular irrigation, where its need is determined by its location in the semi-arid and arid zones, which are characteristic with high energy resources and low natural moisture in the natural system.

Table 2 - Dynamics of water use by administrative regions in the catchments of the Ili River basin, mln. m^3

Administrative districts	2002	2003	2004	2005	2006	2007	2008	2009
1	2	3	4	5	6	7	8	9
Housing and communal services (services), mln. m^3								
Upper Ili River catchment								
Enbekshikazakh	3,35	2,66	2,70	2,52	2,73	2,45	4,63	4,81
Talgar	4,53	4,88	4,66	4,92	4,70	4,92	4,59	5,66
Uygur	1,04	0,68	0,00	0,00	0,00	0,00	0,00	0,00
Kerbulak	0,64	0,65	0,32	0,27	0,71	0,79	0,83	0,80
Panfilov	1,75	1,83	1,81	2,56	2,73	2,60	3,16	3,11
Kapchagai city	5,00	5,39	5,42	5,62	7,95	7,61	5,56	6,12
Total	16,31	16,09	14,91	15,89	18,82	18,37	18,77	20,50
Lower Ili River catchment								
Balkhash	0,01	0,96	0,00	0,00	0,00	0,00	0,00	0,00
Ili	2,34	5,20	3,53	4,55	5,04	5,26	5,73	7,12
Total	2,35	6,16	3,53	4,55	5,04	5,26	5,73	7,12
Total	18,66	22,25	18,44	20,44	23,86	23,63	24,50	27,62
Industry, mln, m^3								
Upper Ili River catchment								
Enbekshikazakh	0,62	0,87	0,96	1,92	2,04	2,12	1,30	1,11
Talgar	1,08	0,80	1,42	1,54	1,70	1,43	1,74	1,29
Uygur	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Kerbulak	0,02	0,02	0,04	0,01	0,01	0,05	0,03	0,06
Panfilov	0,01	0,00	0,02	0,01	0,01	0,01	0,01	0,01
Kapchagai city	8,90	8,92	9,19	7,55	7,81	7,21	7,42	6,21
Total	10,63	10,61	11,63	11,03	11,57	10,82	10,50	8,68
Lower Ili River catchment								
Balkhash	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Ili	3,90	4,82	5,30	6,23	5,98	4,88	6,55	5,78
Total	3,90	4,82	5,30	6,23	5,98	4,88	6,55	5,78
Total	14,53	15,43	16,96	17,26	17,55	15,70	17,05	14,46
Agriculture, mln, m^3								
Upper Ili River catchment								
Enbekshikazakh	598,8	686,5	816,3	634,4	594,1	514,7	671,0	678,9
Talgar	97,91	86,05	105,5	70,22	97,70	78,50	86,95	121,6
Uygur	148,4	135,1	141,4	134,2	162,3	155,3	133,7	133,9
Kerbulak	109,3	106,1	113,1	119,2	132,9	127,6	133,5	111,7
Panfilov	304,1	317,2	330,5	305,7	322,1	326,7	343,4	366,3
Kapchagai city	25,50	37,95	41,71	43,33	45,38	63,07	66,66	52,80
Total	1284,0	1368,9	1548,5	1307,1	1354,5	1265,9	1435,2	1465,2
Lower Ili River catchment								
Balkhash	628,6	632,3	631,4	631,3	630,1	630,1	630,1	630,1

Continuation of table 2

1	2	3	4	5	6	7	8	9
Ili	29,50	32,19	104,7	68,58	99,3	98,7	108,8	150,1
Total	658,1	644,5	736,1	699,9	729,4	728,8	738,9	780,2
Total	1942,1	2033,4	2284,6	2007,0	2083,9	1994,7	2174,1	2245,4
Administrative districts	Years							
	2010	2011	2012	2013	2014	2015	2016	2017
Housing and communal services (services), mln. m^3								
Upper Ili River catchment								
Enbekshikazakh	4,85	4,45	4,35	5,15	5,42	4,93	4,69	-
Talgar	4,52	5,95	5,49	5,53	5,80	8,26	7,99	-
Uygur	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-
Kerbulak	0,52	0,45	0,45	0,44	0,71	0,65	0,68	-
Panfilov	3,07	2,79	3,20	1,90	3,41	3,92	3,21	-
Kapchagai city	6,76	6,47	6,66	7,00	7,18	6,32	5,86	-
Total	19,72	20,11	20,15	20,02	22,52	24,08	22,43	-
Lower Ili River catchment								
Balkhash	0,00	0,00	0,00	0,00	0,00	0,00	0,41	-
Ili	6,23	5,83	5,67	6,25	5,86	6,24	7,15	-
Total	6,23	5,83	5,67	6,25	5,86	6,24	7,56	-
Total	25,95	25,94	25,82	26,27	28,38	30,32	29,99	-
Industry, mln. m^3								
Upper Ili River catchment								
Enbekshikazakh	0,66	1,15	0,08	1,00	0,84	0,88	1,30	1,31
Talgar	1,41	1,47	1,45	1,63	1,27	1,30	1,60	1,32
Uygur	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Kerbulak	0,07	0,08	0,06	0,05	0,00	0,03	0,00	0,00
Panfilov	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Kapchagai city	9,37	7,88	6,07	5,38	6,54	7,38	12,01	9,54
Total	11,52	10,58	7,66	8,06	8,65	9,59	14,91	12,17
Lower Ili River catchment								
Balkhash	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Ili	5,08	5,38	6,05	7,20	6,35	7,87	8,11	9,10
Total	5,08	5,38	6,05	7,20	6,35	7,87	8,11	9,10
Total	16,60	15,96	13,71	15,26	15,00	17,39	23,02	21,27
Agriculture, mln. m^3								
Upper Ili River catchment								
Enbekshikazakh	560,9	612,4	660,6	622,0	672,1	698,4	695,2	695,1
Talgar	109,5	108,2	110,3	114,8	111,1	108,8	71,4	63,0
Uygur	412,5	152,6	161,1	160,1	161,8	160,2	168,3	147,5
Kerbulak	99,2	108,6	94,7	121,1	122,5	142,3	125,5	114,4
Panfilov	315,5	371,7	351,6	381,1	435,4	490,7	478,7	492,3
Kapchagai city	55,91	64,79	63,64	60,77	66,20	55,86	42,49	53,00
Total	1553,5	1418,3	1441,9	1521,0	1569,1	1656,3	1581,6	1565,3
Lower Ili River catchment								
Balkhash	503,6	500,1	500,1	503,5	504,1	504,1	503,6	503,6
Ili	101,5	103,1	98,3	99,9	88,0	100,0	74,5	77,9
Total	605,1	603,2	598,4	603,4	592,1	604,1	578,1	581,5
Total	2158,6	2021,5	2883,8	2124,4	2161,2	2260,4	2159,7	2146,8

In the directly catchment areas of the Ili River basin, there are 7 administrative districts, i.e. Enbekshikazakh, Talgar, Uygur, Kerbulak, Panfilov, Balkhash and Ili districts of the Almaty region and the city of Kapchagai, where the population over the years from 2002 to 2017 increased from 809252 up to 1048566 people, which must be taken into account when assessing water availability in the context of water management plots (table 3).

Table 3 - Population dynamics by administrative regions in the catchments of the Ili River basin, people

Administrative districts	Years							
	2002	2003	2004	2005	2006	2007	2008	2009
Upper Ili River catchment								
Enbekshikazakh	203964	204142	204517	204703	204845	207041	211510	215528
Talgar	133975	135555	137836	140590	143579	146673	150699	153880
Uygur	63810	63904	63904	63867	63778	63668	63765	64504
Kerbulak	92516	91917	91400	90538	90259	90466	91028	91690
Panfilov	114717	115128	115594	116233	116810	117652	118497	119509
Kapchagai city	45078	45994	47606	50080	50703	51667	53082	54449
Total	654060	658201	660857	666011	669974	545167	688581	641560
Lower Ili River catchment								
Balkhash	30832	30740	60501	30231	30166	30179	30082	30043
Ili	124360	126654	130543	133938	136984	141289	145485	149125
Total	155192	157394	191044	164169	171664	171468	175567	179168
Total	809252	815595	851901	830180	841638	716635	864148	820728
Administrative districts	Years							
	2010	2011	2012	2013	2014	2015	2016	2017
Upper Ili River catchment								
Enbekshikazakh	261283	266616	272637	278552	283556	288022	291950	294446
Talgar	173923	177650	181439	184845	189359	183908	186552	187668
Uygur	61293	61754	61871	62319	62710	63280	63374	63419
Kerbulak	87053	88178	88720	89243	89768	90446	91053	91072
Panfilov	114375	116178	117530	119938	122136	124695	125886	126992
Kapchagai city	53646	54956	56033	56868	57525	59052	60230	60892
Total	751573	765332	778230	791765	805054	809403	819045	824489
Lower Ili River catchment								
Balkhash	30101	30319	30259	30404	30764	31134	31290	31367
Ili	176020	181740	187915	191890	196961	188900	190429	192710
Total	179030	212059	218174	222294	227725	220034	221719	224077
Total	930603	977391	996404	1014059	1032779	1029437	1040764	1048566

Table 4 - Ecological indicators of the specific water supply of the Ili water basin

Years	Ili water basin					
	Upper Ili River catchment			Lower Ili River catchment		
	Real water resources (W_{op}, km^3)	Irrevocable water consumption ($W_{бев}$, km^3)	Specific water availability indicators ($ЭРВ$)	Real water resources (W_{op}, км^3)	Irrevocable water consumption ($W_{бев}$, км^3)	Specific water availability indicators ($ЭРВ$)
2002	17,740	1,311	15,627	21,200	0,664	84,619
2003	16,090	1,396	13,773	18,760	0,655	73,497
2004	13,460	1,575	10,535	17,337	0,745	55,099
2005	13,220	1,334	10,899	15,043	0,704	55,328
2006	13,950	1,385	14,096	15,839	0,743	55,861
2007	13,610	1,295	10,976	14,504	0,739	50,811
2008	9,690	1,464	6,941	13,376	0,751	45,390
2009	12,040	1,494	9,878	12,494	0,787	40,972
2010	18,870	1,585	14,221	22,677	0,616	78,905
2011	14,730	1,446	10,625	18,748	0,614	54,585
2012	10,920	1,470	7,234	13,058	0,610	36,136
2013	10,160	1,549	6,383	13,182	0,617	35,817
2014	8,132	1,600	4,579	11,064	0,604	29,541
2015	12,546	1,670	8,016	11,413	0,618	30,911
2016	19,026	1,619	13,123	21,266	0,594	59,057
2017	14,819			18,114		

To determine the coefficients characteristic of environmental resources, methodological approaches are used to assess the maximum permissible use of water resources and the environment. Zh. S. Mustafayev and K. Zh.Mustafayev [3], where data on quantitative values within 0.35 are given that

are used to determine the environmental indicators of specific water supply in the catchment areas. Ili River.

Based on the data presented in tables 2 and 3 characterizing the level of water use in the sectors of the economy and the population spanning 2002-2017, environmental indicators of specific water availability in the catchment areas of the Ili River basin for water management sites were determined (table 4), which showed that in the upper catchment area of the Ili River, they range from 4.579 to 15.627, which correspond to values from low water availability to high water supply depending on the water content of the river, and in the lower catchment area of the Ili River, their quantitative values range from 29.541 to 84.619, which indicate a very high water supply.

It should be noted that very high water availability in the lower catchment area of the Ili River basin, provided, on the one hand, by the presence of a hydroelectric power station in the Kapshagai reservoir, which ensures guaranteed runoff and, on the other hand, a very low population due to adverse climatic conditions adversely affecting human living conditions.

Conclusions. The location in the arid and semi-arid zones, as well as the features of the formation of hydrological flow in the catchment areas of the Ili River basin, which determines the environment-forming system with socio-economic conditions and natural and technogenic objects that determine the level of water supply for water management sites, require the need for coordination of water management in order to prevent possible negative changes in watercourses and reservoirs that perform important environmental functions in the Ili-Balkhash basin, that is, to ensure natural and environmental sustainability and safe functioning of Lake Balkhash as a geographic water body.

Ж.С. Мұстафаев, Л.М. Рысқұлбекова

Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан

ІЛЕ ӨЗЕНІНІҢ СУ ЖИНАУ АЛАБЫ АЙМАҒЫНДАҒЫ СУ РЕСУРСЫН ПАЙДАЛАНУ ЕРЕКШЕЛІКТЕРІ

Аннотация. Қазақстан Республикасы Ауылшаруашылық министрлігіне қарасты Су ресурстары комитетінің «Балқаш-Алакөл алабының суды реттеп пайдалану және қорғау инспекциясы» мекемесінің 2002-2017 жылдар аралығын қамтитын көпжылдық ақпараттық-талдау мәліметтері негізінде Іле өзенінің су жинау алабының су шаруашылық бөлімшелері аймағына орналасқан Алматы облысының әкімшілік аудандары деңгейіндегі суды пайдаланудың аймақтық ерекшеліктерін анықтау үшін экономика саласының тұрмыстық және өндірістік қызметіне, ауылшаруашылығына пайдаланылған су ресурстарына талдау жасалған.

Су жинау алабы және су нысандарының табиғи кешенін қорғау және сақтау жөніндегі жұмыстарды талдау көрсеткендей, су ағынын және су айдынындағы су ресурстарын экономика саласының қажеттіліктері үшін толығымен пайдалануға болмайтынын көрсетеді. Олардың едәуір бөлігі құнды су және жартылай сулы флора мен фаунаның, яғни шабындық, көл жүйесінің және жартылай сулы сүтқоректілерді көбейтуді қамтамасыз ететін экожүйені сақтау үшін өзен жүйесінде экологиялық ағын түрінде қалдырылуы тиіс.

Қарастырылып отырған кезеңде, 2002 жылдан бастап 2017 жылға дейін өзен су жинау алабы аймағындағы су ресурстарының көп мөлшері, яғни 98,0-98,8% ауылшаруашылық қажеттілігіне, 0,30-0,70% өндірістік және шаруашылық мақсаттарға жұмсалады, ал 1.30-1.70% тұрмыстық қызметке пайдаланылған. Сонымен, Іле өзені су жинау алабы аймағындағы судың негізгі тұтынушысы ауыл шаруашылығы, яғни тұрақты суармалы егістік жүйесі, мұнда оның қажеттілігі аймақтың жоғары энергетикалық ресурстармен және табиғи жүйенің табиғи ылғалдылығымен сипатталатын жартылай құрғақ және құрғақ аймақта орналасуы негізінде анықталады.

Экономика салаларындағы суды пайдалану деңгейін және жергілікті тұрғындар санын сипаттайтын 2002-2017 жылдар аралығындағы көпжылдық мәліметтер негізінде Іле өзені сужинау алабының сушаруашылық бөлімшелерінде судың нақты қолжетімділігінің экологиялық көрсеткіштері анықталды, бұл Іле өзенінің жоғарғы ағысында 4,579-дан 15,627-ге дейін өзгеретінін көрсетеді, ал ол сумен қамтамасыз етудің төменгі деңгейімен жоғарғы деңгейде қамтамасыз етуге дейінгі мәнге сәйкес келеді және Іле өзенінің төменгі ағысында олардың сандық мәні 29,541-ден 84,619-ға дейін өзгереді, бұл аймақтың өте жоғары дәрежеде сумен қамтамасыз етілетінін көрсетеді.

Түйін сөздер: өзен, алап, ағын, су жинау, экономика, пайдалану, сумен қамтамасыз ету, суды пайдалану, тұрғындар.

Ж. С. Мустафаев, Л.М. Рыскулбекова

Казахский национальный аграрный университет, Алматы, Казахстан

ОСНОВЕННОСТИ ВОДОПОЛЬЗОВАНИЯ НА ТЕРРИТОРИЯХ ВОДОСБОРОВ БАССЕЙНА РЕКИ ИЛИ

Аннотация. На основе многолетних информационно-аналитических материалов Балхаш-Алакольской бассейновой инспекции по регулированию использования и охране водных ресурсов Комитета по водным ресурсам Министерства сельского хозяйства Республики Казахстан, охватывающих 2002-2017 годы, проведен анализ использования водных ресурсов в отраслях экономики на территориях водосбора бассейна реки Или в разрезе водохозяйственных участков и административных районов Алматинской области, включающих жилищно-коммунальное хозяйство, промышленность и сельское хозяйство для выявления региональной особенности водопользования.

Анализ работы по охране и сохранению природного комплекса водосборных территорий и водных объектов показывает, что водные ресурсы водотоков и водоемов нельзя целиком использовать на нужды отраслей экономики. Значительную часть их необходимо оставлять в виде экологического стока в речных системах для сохранения экосистем, обеспечивающих воспроизводство ценной водной и околоводной флоры и фауны, то есть пойманных лугов, озерных систем и околоводных млекопитающих.

В рассматриваемый период, с 2002 по 2017 г. – на территориях водосбора бассейна реки наибольшие объемы забранной воды, то есть 98,0-98,8 % используются на сельскохозяйственные нужды, в производственных целях потребляется 0,30-0,70 % и на хозяйственно-питьевые нужды – 1,30-1,70 %. Таким образом, основными водопотребителями в водосборных территориях бассейна реки Или является сельское хозяйство, то есть регулярное орошение, где необходимость его определяется расположением в полуаридной и аридной зонах, характерных с высокими энергетическими ресурсами и низкой естественной увлажненностью природной системы.

На основе данных, характеризующих уровень водопользования в отраслях экономики и численность населения, охватывающих 2002-2017 годы, определены экологические показатели удельной водообеспеченности в водосборных территориях бассейна реки Или по водохозяйственным участкам, которые показали, что верховьях водосбора реки Или, они колеблется от 4,579 до 15,627, что соответствуют значениям от низкой водообеспеченности до высокой водообеспеченности в зависимости от водности реки, а в низовьях водосбора реки Или, их количественные значения колеблются от 29,541 до 84,619, что показывают очень высокую водообеспеченность.

Ключевые слова: река, бассейн, сток, водосбор, экономика, использование, водообеспеченность, водопользование, население.

Information about authors:

Mustafayev Zhumakhan Suleimenovich, Doctor of Technical Sciences, Professor, Professor of the Department «Water Resources and Melioration», Kazakh National Agrarian University; z-mustafa@rambler.ru; https://orcid.org/0000-0003-24258148;

Ryskulbekova Laura Meldakhanovna, Document PhD of the Department «Water Resources and Land Reclamation», Kazakh National Agrarian University; ryskulbekova.laura@mail.ru; https://orcid.org/0000-0002-1374-5920

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