



Change in the Amount of Flow between the Tuyamuyin and Samanbay Hydrological Posts of Amudarya

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Abstract: In this article, the calculation of the change in the amount of flow between the Tuyamuyin and Samanbay hydrological posts of the Amudarya was carried out as a result of observations and was analyzed on the basis of this.

Keywords: River, Amu Darya, stream, flow quantity, hydrological post.

Introduction

Since the second half of the last XX century, the influence of anthropogenic factors on the river flow has sharply increased in the Amu Darya Basin. During this period, the development of new lands, the construction of reservoirs and canals in the Amu Darya basin was started. As a result, Amu Darya water is fully subject to human self-esteem, causing a sharp decrease in the amount of flow along the length of the river. The effect of this process is greatly increased, especially in the lower reaches of rivers. One of the pressing issues of the present day is the quantitative accurate assessment of existing water resources and their effective use in the national economy in order to reduce the impact of possible negative consequences.

Objectives and objectives of the study: the main objective of this study is to evaluate the change in the amount of flow between the Tuyamuyin and Samanbay hydrological posts of Amudarya.

Research results and their discussion: as mentioned above, in the second half of the last century, applied research was carried out in the second half of the last century, when assessing the change in the Amu Darya flow by river length, V.E.Chub, Yu.N.Ivanov, F.E.Rubinova, E.K.Kurbanbaev, I.B.Roziev, A.R.Rasulov, F.H. Hikmatov I.A.Shiklomanov, B.E. Adenbaev and other scientists conducted a number of studies [2, 223-b, 4, 145-b, 8, 29-b.]. Each researcher studied this problem in a certain direction, coming to conclusions that correspond to the scope of this study.

With this in mind, in this part of the research work, we will focus on evaluating the change in the amount of flow between the Tuyamuyin and Samanbay hydrological posts of the Amudarya on new hydrological data.

On the basis of the collected data, we studied the change in the amount of flow by the length of the Amu Darya in the assessment, initially dividing it into six accounting periods. Average flow quantities were calculated for each selected account period. Based on the results of the calculation, a graph of the change in Current by the length and time of the Amudarya was drawn. (Photo 1)

As can be seen from the graph, in the Tuyamuyin hydrological post of Amudarya, the amount of flow was equal to 63.1 km^3 in period I (1931-1960), while in Samanbay it was equal to 46.7 km^3 . For this period, the change in the amount of flow over the length of the river was 16.4 km^3 . The next period in decreased to 19.0 km^3 , 22.21 km^3 , 20.9 km^3 , 18.46 km^3 , respectively. The change in the amount of flow over time decreased by 44.2 km^3 in Tuyamuyin between periods and 43.9 km^3 in Samanbay.

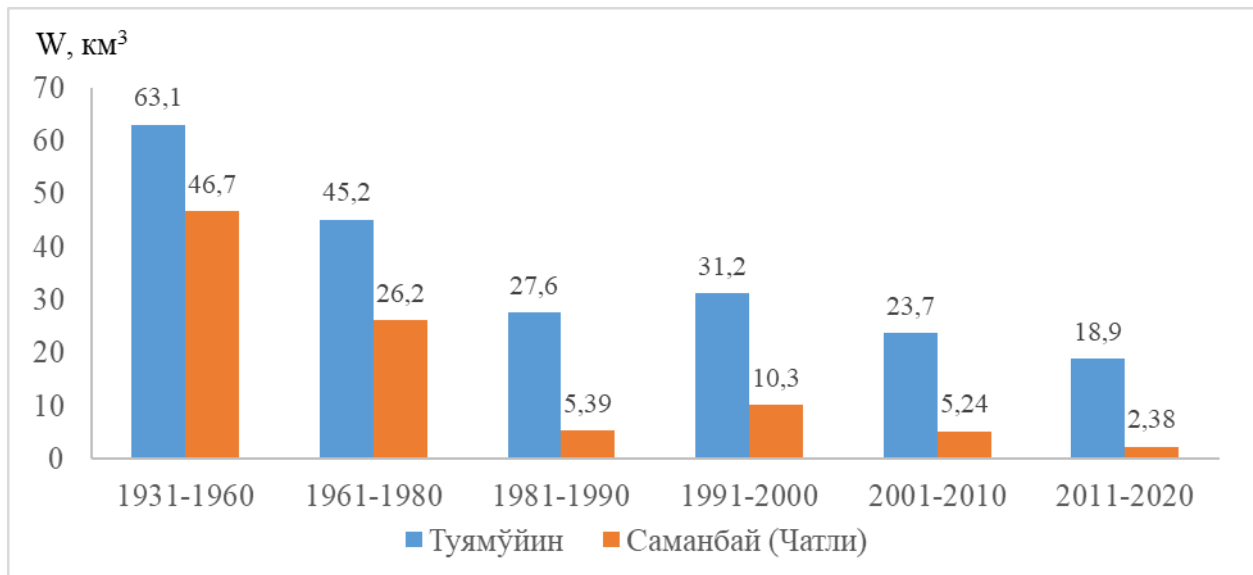


Figure 1. Changes in flow by Amu Darya length and Time account periods (I –conditional natural period (1931-1960), II – the period during which hydraulic structures were built (1961-1980), III – the period when hydraulic structures came into operation (1981-1990), IV – the period of intensification of the influence of anthropogenic factors (1991-2000), V – this account is 2011-2020), km³

In subsequent calculations, the change in the amount of flow by river length and time was carried out, dividing it into separate five-year accounting periods. In this case, the change in the amount of current over the length of the Amu Darya was expressed in percentages in relation to the Tuyamuyin hydrological post. The change in the amount of flow by time was given in percent compared to the first period (1931-1935). The calculation results are presented in Table 1.

Table 1. Flow over five-year account periods change in quantity

Account periods	Toyamoyin			Samanbay (Chatli)		
	W, км ³	Change in flow quantity, in %		W, км ³	Change in flow quantity, in %	
		by length	by time		by length	by time
1931-1935	63,6	100	100	50,4	79,2	100
1936-1940	55,0	100	86,5	40,2	73,1	79,8
1941-1945	71,8	100	112,9	54,0	75,2	107,0
1946-1950	61,7	100	97,0	44,2	71,6	87,7
1951-1955	65,0	100	102,2	48,1	74,0	95,4
1956-1960	61,2	100	96,2	43,9	71,7	87,1
1961-1965	47,3	100	74,4	31,2	65,9	61,9
1966-1970	57,8	100	90,9	39,3	67,9	78,0
1971-1975	38,3	100	60,2	21,3	55,6	42,3
1976-1980	37,2	100	58,5	13,0	34,9	25,8
1981-1985	28,1	100	44,2	3,91	13,9	7,76
1986-1990	27,2	100	42,8	6,84	25,1	13,6
1991-1995	36,7	100	57,7	14,3	38,9	28,4
1996-2000	25,7	100	40,4	6,24	24,2	12,4
2001-2005	26,0	100	40,9	5,96	22,9	11,8
2006-2010	21,4	100	33,7	4,57	21,4	9,07
2011-2015	19,5	100	30,7	3,38	17,3	6,70
2016-2020	18,3	100	28,7	2,28	12,5	4,52
Average	42,3	100	66,5	24,06	49,9	47,7

As can be seen from the data presented in the table, the average variation in the Samanbay hydropost in relation to the Tuyamuyin hydroposti by river length between the accounting periods of the flow amount in Amudarya is more than 50%, the initial period (1931-1935.) at around 79,2%, while in the current period, it fell to 21.4%. In general, the change in the amount of flow between Tuyamuyin and Samanbay hydroposts was in moderation until the 1980s, when it decreased from the norm in subsequent years.

Change in the amount of river flow by time period I (1931-1935.) in relation to the last period (2006-2010), Tuyamuyinda decreased by 63.7% and Samanbay by 90.9%. In the middle account, it decreased by 33.5% in Tuyamuy, and by 52.3% in Samanbay.

Subsequent calculations focused on the change in the amount of flow between the Tuyamuyin and Samanbay hydrological posts, in which the amount of flow (ΔQ) spent in this part of the river acts as the main factor.

Table 2. Change in the amount of flow between Tuyamuyin and Samanbay hydrological posts (period I), M^3 / s

Ordinal number	Years	Toyamoyin	Samanbay	$\Delta Q = Q_T - Q_c$	$Q_c/Q_T * 100 \%$
1	1956	2070	1520	550	73,4
2	1957	1410	980	430	69,5
3	1958	2350	1660	690	70,6
4	1959	2100	1470	630	70,0
5	1960	1770	1330	440	75,1
6	1961	1709	989	720	57,9
7	1962	1390	901	489	64,8
8	1963	1530	1010	520	66,0
9	1964	1820	1240	580	68,1
10	1965	1310	805	505	61,5
11	1966	1660	1130	530	68,1
12	1967	1430	928	502	64,9
13	1968	1620	1092	528	67,4
14	1969	3043	2240	803	73,6
15	1970	1420	1030	390	72,5
16	1971	1080	653	427	60,5
17	1972	1210	773	437	63,9
18	1973	1810	1380	430	76,2
Average		1707	1174	533	68

Table 3. Change in the amount of flow between Tuyamuyin and Samanbay hydrological posts (period II), M^3 / s

Ordinal number	Years	Toyamoyin	Samanbay	$\Delta Q = Q_T - Q_c$	$Q_c/Q_T * 100 \%$
1	1974	785	219	566	27,9
2	1975	1197	360	837	30,1
3	1976	1100	396	704	36
4	1977	1020	320	700	31,4
5	1978	1500	671	829	44,7
6	1979	1230	383	847	31,1
7	1980	1060	294	766	27,7
8	1981	920	218	702	23,7
9	1982	689	10,6	678,4	1,5
10	1983	877	75,2	801,8	8,6

11	1984	1040	253	787	24,3
12	1985	931	70,6	860,4	7,6
13	1986	531	15	516	2,8
14	1987	972	276	696	28,4
15	1988	1280	530	750	41,4
16	1989	580	48,1	531,9	8,3
17	1990	943	217	726	23
18	1991	1090	332	758	30,5
19	1992	1640	765	875	46,6
20	1993	1230	491	739	39,9
21	1994	1350	591	759	43,8
22	1995	674	103	571	15,3
23	1996	865	155	710	17,9
24	1997	526	23,1	502,9	4,4
25	1998	1530	635	895	41,5
26	1999	782	131	651	16,8
27	2000	362	41,7	320,3	11,5
28	2001	298	3,23	294,77	1,1
29	2002	758	95,5	662,5	12,6
30	2003	1020	280	740	27,5
31	2004	762	134	628	17,6
32	2005	1270	424	846	33,4
33	2006	689	85,7	603,3	12,4
34	2007	525	18,1	506,9	3,4
35	2008	352	10,4	341,6	3
36	2009	642	82,9	559,1	12,9
37	2010	1191	528	663	44,3
38	2011	375	39,3	335,7	10,5
39	2012	885	223	662,0	25,2
40	2013	511	50,7	460,3	9,9
41	2014	554	32,2	521,8	5,8
42	2015	765	198	567,0	25,8
43	2016	551	56,3	494,7	11,8
44	2017	818	214,3	603,7	26,2
45	2018	435	10,4	424,6	2,4
46	2019	655	53,1	601,9	8,1
47	2020	450	35,65	414,4	7,9
Average		855,5	217	638,5	20,6

The collected data was divided into two periods. First period (1956-1973.) natural state of flow, second period (1974-2020.), the period of management of the river flow from the human side as a result of the formation and commissioning of hydraulic structures.

In the first period, 68% of the flow from the Tuyamuyin hydrological post of Amudarya to the Samanbay hydrological Post reached the mid account. This condition was around 60% in low-water years, and higher than 73% in most water years. (Table 2-3)

And in the second period we can see that this situation has changed dramatically. During this period, 20.6% of the flow from the Tuyamuyin hydrological post to the Samanbay hydrological Post reached the middle account. in many juicy years, this amount is 40-45%, while in low-water years it does not exceed 5%. (Table 3)

If we compare both periods, then in the low-water years of the first period, the flow from the Tuyamuyin hydrological post to the Samanbay hydrological post is around 60%, and in the multi-water years of the second period, this value does not exceed 46%. Under the strong influence of human activity, the amount of Water spent between the Tuyamuyin and Samanbay hydrological posts of the Amudarya increased from 32% to 79.4% on average.

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