

Table S1 –Meteorological stations

№	Meteorological station	latitude	longitude	Height MS (m)	Height of the barometer (m)
1	Almaty	43°14'21.89"	76°55'58.26"	846.9	846.465
2	Kamenskoye plateau	43°10'53.80"	76°57'57.36"	1316.8	
3	Assy	43°16'24.24"	78°06'25.90"	2215.6	
4	Yesik	43°22'02.10"	77°25'30.43"	944.93	947.830
5	Zhalanash	43°03'03.37"	78°38'50.71"	1698.97	
6	Kapshagai	43°50'30.71"	77°03'18.97"	489.9	491.854
7	Karashoky	43°50'45.27"	77°51'08.23"	491.8	491.573
8	Kegen	43°01'07.98"	79°13'34.21"	1845	
9	Mynzhylki	43°05'16.76"	77°04'37.67"	3017.4	
10	Big Almaty Lake	43°03'33.12"	76°58'55.09"	2516.5	
11	Shelek	43°36'15.50"	78°16'00.24"	606.3	608.126
12	Zharkent	44°09'45.5"	80°02'45.2"	641.0m	643.600

Table S2 –Hydrological stations

№	Hydrologic station	Geographical coordinates		Height	Catchment area, km²
		latitude	longitude		
Rivers with spring flood					
1	Batareika River – Prosveschenets resort house (river mouth)	43 °09 / 42.13 //	77 °02 / 21.87 //	1566,86 m	5,55
2	Butak River – Butak village, the river mouth of the Shybynsai River	43 °10 / 44.33 //	77 °02 / 46.02 //	1469,42 m	17,2
3	Terisbutak stream – river mouth (Almaty city)	43 °07 / 28.10 //	76 °55 / 09.10 //	1362,26 m	31
Rivers with spring and summer floods					
4	Sharyn River – Sarytogai tract	43 °29 / 57.33 //	79 °12 / 44.80 //	762,41 m	7370
5	Turgen River – Tauturgen village	43 °20 / 12.21 //	77 °36 / 57.67 //	1141,79 m	614
6	Kishi Almaty River – Almaty city (river mouth of Butak River, dam)	43 °11 / 23.49 //	76 °59 / 36.04 //	1175,14 m	118
7	Prokhodnaya River – river mouth	43 °06 / 34.20 //	76 °54 / 27.95 //	1422,17 m	82
8	Kaskelen River – Kaskelen city	43 °08 / 05.96 //	76 °36 / 44.59 //	1129,67 m	290
Rivers with summer flood					
9	Usek River – 1.7 km upstream of the valley of the Kishi Usek River	44° 28'	79° 50'	1262,79 m	724
10	Kishi Usek River – 0.2 km upstream from its confluence with the Usek River	44° 27'	79° 49'	1232, 59 m	407
11	Talgar River – Talgar city	43 °17 / 49.99 //	77 °29 / 54.79 //	1190,37 m	444
12	Shelek River – Malybai village	43 °15 / 10.68 //	77 °13 / 0.88 //	862,96 m	4300
13	Ulken Almaty River – 2 km upstream of Big Almaty Lake Ulken Almaty River – 2 km upstream of Big Almaty Lake	43 °26 / 09.22 //	78 °24 / 21.61 //	2654,19 m	71,8
Rivers with spring and summer floods					
14	Ile River – 164 km upstream of Kapchagai HPP	43 °45 / 31.27 //	80 °13 / 53.45 //	483,00 m	85400
15	Ile River – 37 km below Kapchagai HPP (Kapchagai tract)	43 °50 / 15.28 //	78 ° 49 / 43.07 //	427,76 m	111000
16	Ile River – Zhideli river channel – 16 km below the source	44 °07 / 53.69 //	76 °59 / 5.09 //	6.00 m	132850

Table S3 – Runoff distribution for different phases of water regime and climatic periods

Gauging station	Catchment area	Rivers with spring flood															
		Qlong-term ave., m³/s				Winter XII–II				Spring–Summer III–VI				Summer–Autumn VII–XI			
	F, km²	1960–1996	1997–2021	Change in m³/s	Change in %	1960–1996	1997–2021	Change in m³/s	Change in %	1960–1996	1997–2021	Change in m³/s	Change in %	1960–1996	1997–2021	Change in m³/s	Change in %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19
Butak River – Butak village, the river mouth of the Shybynsai River	17,2	0,21	0,25	0,04	19	0,11	0,15	0,04	36	0,32	0,35	0,03	9	0,19	0,23	0,04	21
Batareika River – Prosveschenets resort house (river mouth)	5,55	0,07	0,13	0,06	86	0,03	0,06	0,03	100	0,12	0,21	0,09	75	0,06	0,11	0,05	83
Terisbutak stream – river mouth (Almaty city)	31,0	0,40	40,51	0,11	28	20,0	0,30	0,10	50	0,58	0,67	0,09	16	0,35	0,49	0,14	40
Average				0,07	44			0,06	62			0,07	33			0,08	48
Rivers with spring and summer floods																	
Sharyn River – Sarytogai tract	7370	36,7	46,2	9,5	26	19,2	32,1	12,9	67	46,3	55,1	8,80	19	27,4	36,4	9,00	33
Turgen River – Tauturgen village	614	7,10	7,50	0,4	6	2,90	2,80	–0,10	–3	9,70	10,2	0,50	5	4,20	4,70	0,50	12
Kishi Almaty River – Almaty city (river mouth of Butak River, dam)	118	1,99	2,10	0,1	6	1,04	0,80	–0,20	–23	2,60	2,67	0,07	3	1,40	1,30	–0,10	–7
Prokhodnaya River – river mouth	82,0	1,56	1,60	0,0	3	0,80	0,80	0,00	0	1,98	2,03	0,05	3	1,20	1,20	0,00	0
Kaskelen River – Kaskelen city	290	4,15	4,02	–0,1	–3	2,00	2,00	0,00	0	5,50	5,50	0,00	0	2,90	2,80	–0,10	–3
Average				2,0	7			2,50	8			1,90	6			1,90	7

Table S3 (cont.) – Runoff distribution for different phases of water regime and climatic periods

Gauging station	Catchment area	Rivers with summer flood															
		Qlong-term ave., m ³ /s				Winter XII–II				Spring–Summer III–VI				Summer–Autumn VII–XI			
	F, km ²	1960–1996	1997–2021	Change in m ³ /s	Change in %	1960–1996	1997–2021	Change in m ³ /s	Change in %	1960–1996	1997–2021	Change in m ³ /s	Change in %	1960–1996	1997–2021	Change in m ³ /s	Change in %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19
Shelek River – Malybai village	4300	31,9	47,6	15,7	49	14,8	14,4	–0,40	–3,0	61,7	99,4	37,7	61	14,7	10,4	–4,30	–29
Talgar River – Talgar city	444	10,2	10,7	0,50	5,0	4,10	4,50	0,40	10	17,3	17,8	0,50	3,0	5,50	6,10	0,60	11
Ulken Almaty River – 2 km upstream of Big Almaty Lake	71,8	1,61	2,40	0,80	49	0,52	0,55	0,03	6,0	2,80	4,30	1,50	54	0,90	1,10	0,20	22
Usek River – 1.7 km upstream of the valley of the Kishi Usek River	724	11,7	13,5	1,80	15	3,00	5,80	2,80	93	23,4	25,3	1,90	8,0	3,50	5,60	2,10	60
Kishi Usek River – 0.2 km upstream from its confluence with the Usek River	407	6,15	7,70	1,60	25	2,00	2,90	0,90	45	11,4	14,2	2,80	25	2,80	4,40	1,60	57
Average				4,07	29			0,75	30			8,88	30			0,04	24
Rivers with spring and summer floods																	
Ile River – 164 km upstream of Kapchagai HPP	85400	437	486	49	11	420	475	55	13	663	646	–17,0	–3	287	371	84,0	29
Ile River – 37 km below Kapchagai HPP (Kapchagai tract)	111000	468	599	131	281	454	586	132	29	667	769	102	15	335	486	151	45
Ile River – Zhideli river channel – 16 km below the source	132850	514	612	98	19	497	621	124	25	593	780	187	32	474	555	81,0	17
Average				93	19				22			91,0	15				30



