Monitoring of changes in the water surface and wetland area of the Aral Sea and the Aral Region

SIC specialists are constantly monitoring the state of the Southern Aral Sea and parts of the Greater Aral Sea by using the Landsat 8 OLI images. According to the image from August 27, 2022, the areas of wetlands and open water surface were determined

Figure 1. Western and Eastern parts of the Aral Sea. Landsat 8, 27 August 2022.

Table 1

The area of wetlands, open water surfaces and dried ground* in the Western and Eastern parts of the Aral Sea

	29.04.2022	**23.05.2022**	**08.06.2022**	**18.07.2022**	**27.08.2022**
Western part of the Aral Sea, ha					
Wetland	284 687	5877	15 446	8659	4644
Water surface	220 020	219 193	218 914	216 255	214 563
Dried ground*	56 642	342 097	326 990	336 435	342 143
Eastern part of the Aral Sea, ha					
Wetland	1 292 357	Clouds	Clouds	5173	3845
Water surface	1 624			25,38	145
Dried ground *	202 841			1 496 626	1 492 835
	April	May	June	July	August
Water quota	180	336	391	480	391
Inflow to the Aral Region, Mm^3/month	188	189	162	144	

* bare soil, dense or rare vegetation

Table 2

Areas of wetlands in the Aral Region, ha

Water body	20.03.2022	29.04.2022	23.05.2022	24.06.2022	18.07.2022	27.08.2022
Sudoche	24279.57	2105.35	228.69	17801.2	706.3	335.16
Mejdureche	4637.79	2768.67	30	330.9	21.87	21.9
Rybache	802.98	509.04	0.81	631.3	0.18	0
Muynak	2732.76	1514.34	3.15	101.6	1.08	0.45
Djiltyrbas dam-terminated	11424.78	7184.43	42659.3	6048.45	102.96	32.22
Djiltyrbas (together with former right and left streams)	20224.26	1715.4	98856.77	0	2.52	26.55
Dumalak	2980.62	2012.31	0	64.44	0	0
Makpalkul	1512.18	1157.13	34.65	188.82	126	0
Mashan Karadjar	3557.16	1988.19	17.37	498.9	3.42	24.03
Water surface southward of Muynak	419.58	301.86	9605	48.42	0	0
Water surface along Kazakhdarya river channel	522.27	192.69	4751.5	0	0	0
Zakirkol	133.2	36.09	2790.04	0	0	0
Total:	**73 227.15**	**21 485.5**	**158 977.3**	**25 714.03**	**964.33**	**440.31**

Figure 2 The Aral Region. Landsat 8, 27 August 2022.

Table 3

The area of open water surface in the Aral region, ha

Water body	20.03.2022	29.04.2021	23.05.2022	24.06.2022	18.07.2022	27.08.2022
Sudoche	9182.07	9580.95	9009.99	6374.5	4270.9	1756.7
Mejdureche	2824.47	1788.48	1389	898.9	596.97	1501.2
Rybache	1007	789.48	628.92	44.19	0	0
Muynak	259.02	36.27	23.76	7.2	2.7	2.52
Djiltyrbas dam-terminated	7739.01	5948.1	4813.02	1617.9	1286.1	844.56
Djiltyrbas (together with former right and left streams)	149.22	196.29	94.23	0	8.19	6.84
Dumalak	0.99	0.09	0	0	0	0
Makpalkul	1575.81	815.13	401.58	0	573.3	0
Mashan Karadjar	293.94	181.17	33.57	0.36	7.65	63
Water surface southward of Muynak	0	0.09	0	0	0	0
Water surface along Kazakhdarya river channel	0	0	0	0	0	0
Zakirkol	179.1	57.78	1.26	0	0	0
Total	**23 210.63**	**19393.83**	**16 395.33**	**8 943.05**	**6 745.81**	**4 174.82**

Table 4

Dried ground area* in the Aral Region, ha

Water body	**20.03.2022**	**29.04.2022**	**23.05.2022**	**24.06.2022**	**18.07.2022**	**27.08.2022**
Sudoche	39235.36	61010.7	63458.32	48521.3	67719.8	70605.14
Mejdureche	30321.74	33226.85	36365	36554.2	37165.16	36260.9
Rybache	9683.02	10194.48	10863.27	10817.51	11492.82	11493
Muynak	13172.22	14613.39	16137.09	16055.2	16160.22	16161.03
Djiltyrbas dam-terminated	28308.60	34339.86	401.58	39806.04 493	46083.33 493	46595.61 493
Djiltyrbas (together with former right and left streams)	78577.52	97039.31	5.76	98951	98940.29	98917.61
Dumalak	13068.39	14037.6	16050	15985.56	16050	16050
Makpalkul	5596.01	6711.74	8247.77	8495.18	7984.7	8684
Mashan Karadjar	23349.9	25031.64	27150.06	26701.74	27189.93	27113.97
Water surface southward of Muynak	9185.42	9303.05	0	9556.58	9605	9605
Water surface along Kazakhdarya river channel	4229.23	4558.81	0	4751.5	4751.5	4751.5
Zakirkol	2479	2697.43	0.81	2791.3	2791.3	2791.3
Total	**257 206.41**	**312 764.8**	**178 679.6**	**318 987.1**	**345 934.0**	**349 029.0**

* bare soil, dense or rare vegetation

Notes: From 2012 to 2019, to determine the area of the water surface and wetlands, satellite image data were digitized manually with a comparison of the NDVI index (Normalized Difference Vegetation Index/ Standardized Index of differences in vegetation Cover). Since 2019 SIC ICWC has started using the methodology of water surface and wetlands recognition based on a controlled AWEI pixel value classification (Automated Water Extraction Index). At the beginning of 2022, it was decided to return to the use of the NDVI index, but according to the specified threshold values. The main provisions of past and new approaches are presented below so that users can correctly interpret and compare data from different years.

Until 2022, the total area of the reservoir was defined as the sum of the area of open water surface and the area of wetlands. However, the question of the exact division of the wetlands area in order to distinguish it from the land (dry, degraded lands) remained open. Therefore, since 2022, the use of the NDVI index with refined threshold values has been started, which allow recognizing three categories of surfaces: 1) open water surface, 2) wetlands, 3) land. Their descriptions and threshold values for the NDVI index are given in the table below. In order to further classify water bodies based on the results of the study, NDVI thresholds were selected: < -0.001 for open water, -0.001-0.05 for wetland and > 0.05 for other Earth surface coverings. Currently, the materials (2021 and 2022) on the site have been updated according to an improved methodology. In this regard, there may be some discrepancies when compared with data from previous years.

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