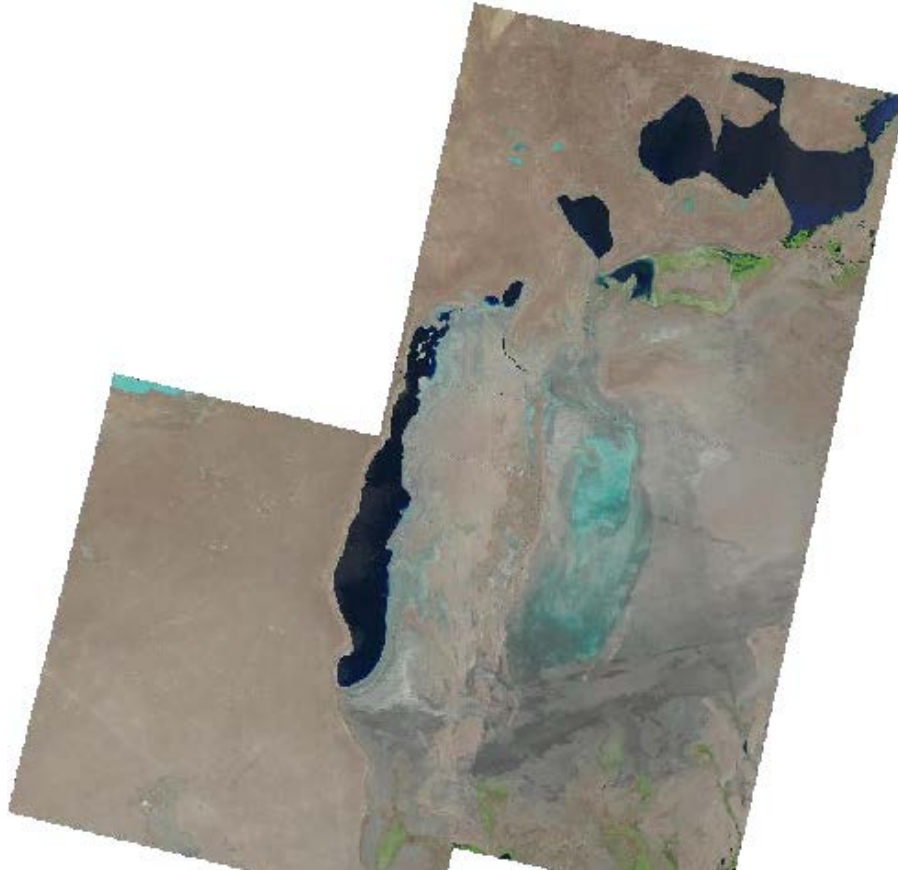


## **Monitoring of changes in the water surface and wetland area of the Aral Sea and the Aral Region**

SIC ICWC made monitoring of changes in the Aral Sea and the Aral Region by using the Landsat 8 OLI images. The images got on 28 July 2020 allowed having wetland and open water surface areas within the boundaries of the Aral Region and the Aral Sea.

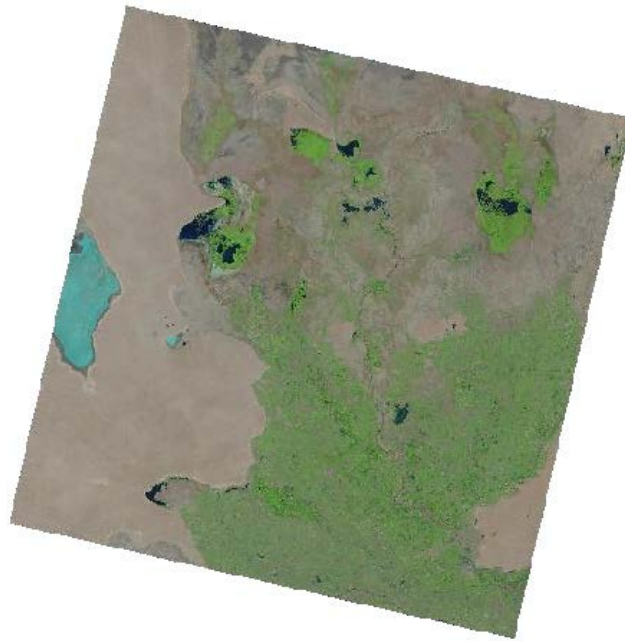


**Figure 1. Western and Eastern parts of the Aral Sea.  
Landsat 8, 12 July 2020**

**Table 1**

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

	<b>19.02.2020</b>	<b>22.03.2020</b>	<b>25.05.2020</b>	<b>10.06.2020</b>	<b>12.07.2020</b>
	<i>Western part of the Aral Sea, ha</i>				
Wetland	clouds	312 526	312 359	314 138	317 639
Water surface	clouds	248 823	248 993	247 212	243 710
	<i>Eastern part of the Aral Sea, ha</i>				
Wetland	1 420 530	1 402 136	1 431 090	1 445 300	1 462 442
Water surface	76 294	94 688	65 733	51 523	34 381
	January	February	April	May	June
Water quota	570	520	594	181	337
Inflow to the Aral Region, Mm <sup>3</sup> /month	216	210	217	210	193



**Figure 2 The Aral Region, Landsat 8, 12 July 2020**

**Table 2****Areas of wetlands in the Aral Region, ha**

<b>Water body</b>	<b>19.02.2020</b>	<b>22.03.2020</b>	<b>25.05.2020</b>	<b>10.06.2020</b>	<b>12.07.2020</b>
Sudoche	37422,31	34828,1	47471,64	51796,53	60811,51
Mejdureche	29109,8	24402,4	32105,02	34195,34	35012,09
Rybatche	6957,36	9341,7	8874,27	9087,16	9547,38
Muynak	13292,28	13251	15151,95	15559,56	15935,52
Djiltyrbas dam-terminated	38971,71	38644,3	42580,52	42792,12	42816,06
Djiltyrbas (together with former right and left streams)	87991,34	92720,3	97239,29	98263,85	98843,05
Dumalak	15497,13	15614,8	15978,9	16031,46	16048,38
Makpalkul	7516,16	7873,4	8282,22	8550,71	8408,69
Mashan Karadjar	25727,79	25972,5	26539,18	26861,97	29976,45
Water surface southward of Muynak	9509,51	9509,3	9605	9605	9605
Water surface along Kazakhdarya river channel	4751,5	4751,5	4751	4751,5	4751,5
Zakirkol	2379,46	2251,7	2783,17	2788,24	2788,3
<b>Total:</b>	<b>279 126,4</b>	<b>282 961,3</b>	<b>311 862,7</b>	<b>320 283,4</b>	<b>331 540,9</b>

**Table 3**

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

<b>Water body</b>	<b>19.02.2020</b>	<b>22.03.2020</b>	<b>25.05.2020</b>	<b>10.06.2020</b>	<b>12.07.2020</b>
Sudoche	35274,6	36724,9	24725,4	20900,5	11885,5
Mejdureche	8674,2	9381,6	5678,98	3588,66	2771,91
Rybatche	4535,64	2151	2618,73	2405,84	1945,62
Muynak	2871,72	2913,0	1012,05	604,44	231,48
Djiltyrbas dam-terminated	8500,68	8828	4891,87	4680,27	4656,33
Djiltyrbas (together with former right and left streams)	10595,66	6230,7	1711,71	687,15	107,95
Dumalak	552,87	435,15	71,1	18,54	1,62
Makpalkul	1167,84	1010,5	401,78	133,29	275,31
Mashan Karadjar	1473,21	1228,5	661,82	339,03	224,55
Water surface southward of Muynak	95,49	95,68	0	0	0
Water surface along Kazakhdarya river channel	0	0	0	0	0
Zakirkol	411,84	593,5	8,13	3,06	3
<b>Total</b>	<b>74 517,84</b>	<b>70 682,8</b>	<b>41 781,53</b>	<b>33 360,75</b>	<b>22 103,5</b>

Since 2019, SIC ICWC has been using a new methodology for detection of water surfaces and wetlands through the controlled classification (Automated Water Extraction Index, AWEI).

The boundaries of water bodies and wetlands (i.e. Sudoche lake system, Mejdureche reservoir, Makpalkul, Djiltyrbas reservoirs, etc.) digitized manually in 2016 were used as a ‘conditional design’ boundaries for statistics on the total open water surface and wetland area of these water bodies (i.e. total water body area = open water area + wetland area).

Such a method minimizes erroneous interpretation/digitization of an area under consideration as the water or land surface (e.g. if plants cover the water’s surface). However, the problem of detecting wetlands, i.e. the possibility to distinguish them from land (dry, degraded land) remained open. Moreover, the wetland areas within the 2016 boundaries have changed considerably over the last years, mainly, towards shrinkage/drying (dry, degraded land replaced wetlands).

Therefore, in early 2022, we undertook a research to improve the 2019 methodology. To this end, we determined the threshold values of open water surface (water depth of 5-25 cm, depending on the rise or fall of water), wetlands (water depth of up to 5 cm, wet and moist soil), and non-water sites (all other land surfaces, except for open water and wetlands) for 10 spectral indices (including NDVI and AWEI).

Based on the research results, we selected the threshold values for NDVI ( $< -0.001$  for open water,  $-0.001 \div 0.05$  for wetland, and  $> 0.05$  for other land surfaces) for further classification of water sites.

By present, the information for 2020 and 2021 have been updated on the base of the improved methodology. In this context, differences can be found when making comparison with the data for the past years.

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