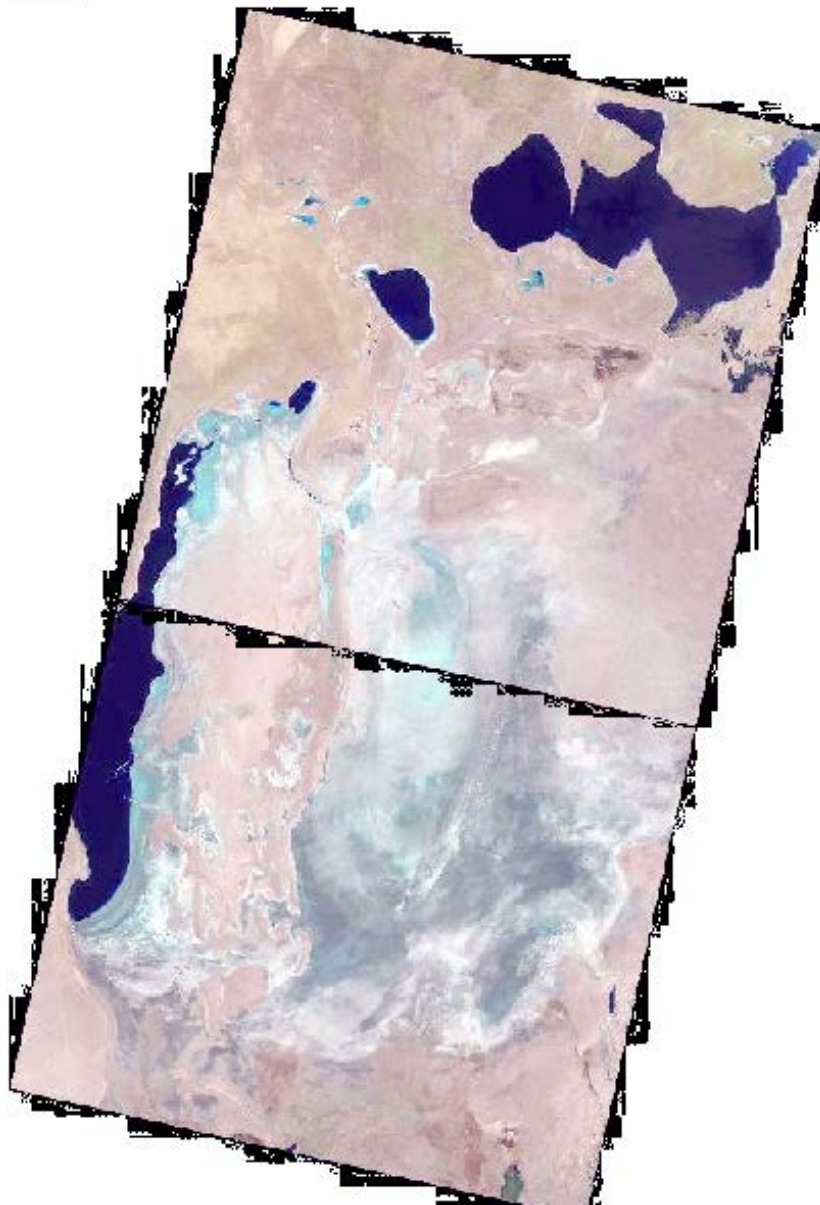


## **Monitoring of changes in the water surface and wetland area of the Aral Sea and the Aral Region**

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 29 April 2022 on the Western part of the Aral Sea allowed having wetland and open water surface areas.



**Figure 1. Western and Eastern parts of the Aral Sea.  
Landsat 8, 29 April 2022.**

**Table 1**

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

	<b>29.04.2022</b>
<i>Western part of the Aral Sea, ha</i>	
Wetland	284 687
Water surface	220 020
Dried ground*	56 642
<i>Eastern part of the Aral Sea, ha</i>	
Wetland	1 292 357
Water surface	1 624
Dried ground *	202 841
	April
Water quota	180
Inflow to the Aral Region, Mm <sup>3</sup> /month	188

\* bare soil, dense or rare vegetation

**Table 2**

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

<b>Water body</b>	<b>16.02.2022</b>	<b>20.03.2022</b>	<b>29.04.2022</b>
Sudoche	29295.81	24279.57	2105.35
Mejdureche	8374.41	4637.79	2768.67
Rybatche	2129.85	802.98	509.04
Muynak	3211.65	2732.76	1514.34
Djiltyrbas dam-terminated	13575.15	11424.78	7184.43
Djiltyrbas (together with former right and left streams)	30675.15	20224.26	1715.4
Dumalak	5032.62	2980.62	2012.31
Makpalkul	1429.38	1512.18	1157.13
Mashan Karadjar	4807.62	3557.16	1988.19
Water surface southward of Muynak	2463.21	419.58	301.86
Water surface along Kazakhdarya river channel	0	522.27	192.69
Zakirkol	274.14	133.2	36.09
<b>Total:</b>	<b>101 268.99</b>	<b>73 227.15</b>	<b>21485.5</b>



**Figure 2 The Aral Region. Landsat 8, 29 April 2022.**

**Table 3****The area of open water surface  
in the Aral region, ha**

<b>Water body</b>	<b>16.02.2022</b>	<b>20.03.2022</b>	<b>29.04.2021</b>
Sudoche	8651.61	9182.07	9580.95
Mejdureche	3597.93	2824.47	1788.48
Rybatche	902.88	1007	789.48
Muynak	323.46	259.02	36.27
Djiltyrbas dam-terminated	7341.39	7739.01	5948.1
Djiltyrbas (together with former right and left streams)	65.97	149.22	196.29
Dumalak	22.32	0.99	0.09
Makpalkul	2195.37	1575.81	815.13
Mashan Karadjar	307.98	293.94	181.17
Water surface southward of Muynak	0.54	0	0.09
Water surface along Kazakhdarya river channel	0	0	0
Zakirkol	208.53	179.1	57.78
<b>Total</b>	<b>23 617.98</b>	<b>23 210.63</b>	<b>19393.83</b>

**Table 4****Dried ground area\* in the Aral Region, ha**

<b>Water body</b>	<b>16.02.2022</b>	<b>20.03.2022</b>	<b>29.04.2022</b>
Sudoche	34749.58	39235.36	61010.7
Mejdureche	25811.66	30321.74	33226.85
Rybatche	8460.27	9683.02	10194.48
Muynak	12628.89	13172.22	14613.39
Djiltyrbas dam-terminated	26555.85	28308.60	34339.86
Djiltyrbas (together with former right and left streams)	68209.88	78577.52	97039.31
Dumalak	10995.06	13068.39	14037.6
Makpalkul	5059.25	5596.01	6711.74
Mashan Karadjar	22085.4	23349.9	25031.64
Water surface southward of Muynak	7141.25	9185.42	9303.05
Water surface along Kazakhdarya river channel	4751.5	4229.23	4558.81
Zakirkol	2308.63	2479	2697.43
<b>Total</b>	<b>228 757.22</b>	<b>257 206.41</b>	<b>312 764.8</b>

\* bare soil, dense or rare vegetation

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.

**Prepared by:**

I. Ruziev