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 19 Fubruary 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, 19 February 2020

Table 1

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

	19.02.2020
Western part of the Aral Sea, ha	
Wetland	**облачно**
Water surface	**облачно**
Eastern part of the Aral Sea, ha	
Wetland	**1 420 530**
Water surface	**76 294**
	Январь
Inflow to the Aral Region, Mm^3/month	**216**

Figure 2 The Aral Region, Landsat 8, 19 February 2020

Table 2

Areas of wetlands in the Aral Region, ha

Water body	Wetland	Water surface
Sudoche	37 422,31	35274,6
Mejdureche	29109,8	8674,2
Rybache	6957,36	4535,64
Muynak	13292,28	2871,72
Djiltyrbas dam-terminated	38971,71	8500,68
Djiltyrbas (together with former right and left streams)	87991,34	10595,66
Dumalak	15497,13	552,87
Makpalkul	7516,16	1167,84
Mashan Karadjar	25727,79	1473,21
Water surface southward of Muynak	9509,51	95,49
Water surface along Kazakhdarya river channel	4751,5	0
Zakirkol	2379,46	411,84
Total:	**279 126,4**	**74 517,8**

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÷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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