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Changes In Natural Geographical Processes In The Mirzachul Region Under The Influence of The Sardoba Reservoir

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Abstract - This article compares and analyzes the state of changes in natural geographical processes in Mirzachul region under the influence of the Sardoba reservoir until 2018, before and after the construction of the reservoir.

Keywords - Mirzachul natural region, natural geographical processes, Sardoba reservoir, microclimate, geological, irrigated agriculture, underground, salinization.

Relevance of the topic: Undoubtedly, the largest reservoir built in the plains of Central Asia, ie in the Mirzachul natural region, is the Sardoba Reservoir. Construction of the reservoir began in 2010 at the site of the central branch of the South Mirzachul Canal and was completed in 2018. If we look at the morphometric dimensions of the huge hydraulic structure, the area is 58.7 km2, water capacity is 922 million m3, maximum depth is 35 m, length is 33 km, height is 33 m. The Sardoba reservoir will irrigate 146.2 thousand hectares of land in Akaltin and Mirzaabad districts of Syrdarya region, Arnasay, Mirzachul and Dustlik districts of Jizzakh region. Construction of a 15-megawatt mini-hydropower plant has also begun at the Sardoba Reservoir.

On the morning of May 1, a dam burst from the Sardoba Reservoir. As a result of the flood, settlements and crops in Sardoba, Akaltin and Mirzaabad districts were damaged. Buildings, roads, communications were destroyed. More than 60,000 people were evacuated from 22 villages in three districts.

Such a tragedy in the reservoir, called "Construction of the Century" - requires a comprehensive study and analysis of the Sardoba Reservoir and its impact on the

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environment. It is no secret that any large-scale construction takes into account the benefits to the economy in the first place. The impact of construction on the surrounding landscape is often underestimated. As a result, the balance between nature and society is disturbed.

The study and assessment of changes in the landscapes of the Mirzachul natural region under the influence of the Sardoba Reservoir remains one of the most pressing issues in Uzbekistan today. Launched in 2018, the Sardoba Reservoir is influencing changes in the environmental landscape components (groundwater, microclimate, soil, flora and fauna).

The construction of the Sardoba reservoir has a micro-impact on the climate of the Mirzachul natural region. During the study, we used meteorological instruments to determine the extent of climate change with the construction of the reservoir, and compared and analyzed the data with the nearest meteorological station, Yangier meteorological station [7; 2019 y].

Thus, in the course of the study, fluctuations in the volume of water in the Sardoba reservoir, water balance, changes in the hydrochemical regime of the reservoir, the composition of salts and their variation depending on water, groundwater, microclimate, natural geographical processes (coastal erosion, swamping, salinization, erosion, drowning, etc.) impact on the surrounding areas of flora and fauna and a comprehensive study of the area as a whole.

Main part: Mirzachul region consists of huge plains in the middle reaches of the Syrdarya basin, from the northern slope of the Turkestan ridge to the Syrdarya River, 70-120 km wide, more than 150 km long from the Farhod Corridor (Khojand Gate) to the Chordara Reservoir. It is bordered by Kazakhstan to the north, the present-day Syrdarya River to the east, Tajikistan to the southeast, Turkestan, Molguzar and Nurata Mountains to the south, and the Kyzylkum Desert to the northwest. The slope of the land surface of the region decreases from 0.006 to 0.002-0.003 to the north, with 0.006 around its southern part - the Havas-Dashtobod railway. The absolute height around the cities of Dashtobod and Zarbdor is 373-385 m, the lowest places are 240 m north of Mirzachul and 230 m on the shores of Lake Tuzkon [5; 696-697 b].

Turkestan, Molguzar and Nurata mountains are located in the south-eastern part of Mirzachul natural region. The highest point of the Turkestan ridge is the Shavkartag peak,

which is 4030 m. The mountains surrounding the natural region from the south rose in the Hercynian fold of the Paleozoic era. They eroded and declined during the Mesozoic era, and the resulting plains were flooded by seawater.

Due to its natural geographical location, the climate of Mirzachul region is unique. If the humid air mass coming from the south and east to the country is blocked by the Tianshan and Pamir-Alay ridges, the cold and humid air mass can easily enter due to the openness of the north and west sides. The climate is sharply continental, with temperature fluctuations during the day and year, and precipitation unevenly distributed between seasons [4; p 182].

The geographical role in the formation of the climate of the Mirzachul natural region, the associated solar radiation, relief and the impact of anthropogenic factors play an important role. The country is characterized by cold winters, hot and dry summers, and atmospheric precipitation mainly in winter and spring. In the territory of the natural region, the annual radiation of the Sun is 150-155 kcal / cm; [1; p 24].

Mirzachul natural land, mainly in irrigated areas, has enough moisture in the soil in summer, and cultural plants that cover the soil thickly have a higher radiation balance than non-irrigated areas. The desert areas of the natural land consume very little of the heat to evaporate during the growing season, and almost all of the amount of radiation goes to heat the air. In irrigated areas, however, it is relatively different. As more heat is lost to the evaporation of water, the heat to heat the air is slightly less [11; S. 20-42].

The average annual temperature in Mirzachul natural region is + 12.5 ° C. The average temperature in July is 26-27 ° C in the north and 28.5-30 ° C in the south. The average January temperature fluctuates from -3-4 ° C, in the southern parts -0.8-1.1 °. The absolute maximum temperature reaches 46-47 ° C. According to L.N. Babushkin (1964) [3; S.5-247], the southern part of Mirzachul is the same as the hottest natural areas in Uzbekistan in terms of summer temperature, and only Surkhandarya natural area lags behind the plains in terms of temperature.

Air temperature in turn also affects soil temperature. In the Mirzachul natural region, the average annual soil temperature is 16 ° C, several degrees higher than the average annual air temperature, and in summer during the day the air temperature warms up to 60-62 ° C. Such a temperature is observed at the top of its 20 cm thickness [10; S.-43].

ISSN 2515-8260 Volume 07, Issue 03, 2020

According to the distribution of precipitation in the Mirzachul natural region, the minimum precipitation is less than 200 mm in the north-west, around 200-300 mm in the central part, and more than 300 mm in the southern part of the mountains [7; 2019].

In the Mirzachul natural region, during the water collection period of the Sardoba Reservoir, in December and January, sometimes severe freezing of the soil is observed. The elemental weather conditions in the area where the Sardoba Reservoir is located are mainly characterized by data from the Yangier meteorological station near the Havas railway station.

In the climatic elements discussed above, changes are observed at the micro level after the construction of the Sardoba Reservoir. The analysis of average, minimum, and maximum temperatures over the years related to air temperature served as clear evidence for our above opinion. In determining the climatic indicators, the years before and after the construction of the reservoir were taken into account and the data of the meteorological station "Yangier" were used as a basis [7; 2019].

Weather data in the area where the Sardoba Reservoir is located were determined using the Yangier meteorological station and stationary observations that are closest to it. Below we compare the weather elements before and after the construction of the reservoir and see the effect of this reservoir on the microclimate conditions, albeit in a short time (see Table 1).

The average temperature per month and annum

Table-1

Years	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Yearly**
2003	5,8	6,2	9,5	13,4	19,9	25,9	29	27,3	22,5	17,6	9,3	3,9	15,9
2004	5,4	5,9	11,4	16,9	24,5	28,1	29,2	28,7	24,1	16,8	8,9	3,7	16,9
2016	-1,2	3,1	10,7	15,9	26,5	29,7	31,2	29,2	23,3	16,6	10,8	3,4	16,6
2017	2,9	2,9	8,8	15,4	24,6	28,1	29,4	26,5	21,5	15,2	10,4	2,4	15,7
2018	2,1	3,8	13,3	16,4	21,4	27,3	29,9	26,0	20,5	13,7	6,7	4,6	15,5
2019	5,6	6,0	12,8	16,3	22,8	26,4	30,8	26,9	20,9	12,6	5,3	6,2	15,3

If the water filling of the reservoir started in 2017, it can be seen that the average annual temperature has decreased by 0.9 ° C since that time compared to the 2016 data. It is not

possible to give accurate data on changes in air temperature due to cross-comparison of 2-year data in the right climate elements. However, according to stationary observations by Yangier meteorological station staff and local residents, it is reported that in the period from 2017 to 2020, the air temperature in the summer months decreased slightly before the reservoir was built.

The volume of precipitation per month and annum

Table -2

Years	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	Yearly
2010	28	32	31	43	4	8	6	2	5	20	30	20	229
2016	0,0	0,0	0,0	0,0	0,0	0,0	9	2	6	27	32	36	112
2017	44	0,0	43	69	15	1	3	0,0	14	14	17	12	234
2018	2	47	68	38	11	12	0,0	0,0	0,0	61	0,0	10	249
2019	9	18	43	106	4	8	0,0	0,0	4	8	29	25	254

The data of Yangier metrological station.2019

An analysis of the data in Table 2 shows that the amount of precipitation in the Sardoba Reservoir area in 2019 increased by 20 mm by 2017. An increase in the amount of precipitation leads to a moderate air temperature.

The maximum temperature

Table-3

Years	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
2010	6	9	15	22	28	34	36	34	29	22	14	8
2017	11	16	24	31	38	41	40	39	36	28	29	15
2018	14	20	30	34	37	40	42	40	35	31	17	15
2019	12	15	25	29	37	40	42	40	37	28	24	14

The data of Yangier metrological station.2019

comparison of the maximum air temperatures according to Table 3 shows that the average air temperature in the period 2010-2018 decreased by 2.0 ° C during the same period, the lowest temperature of the year, the minimum -14.0 ° C to -11 ° C. , more precisely, it can be seen that the temperature moderateed to 3.0 ° C after the reservoir was filled with water.

ISSN 2515-8260 Volume 07, Issue 03, 2020

The construction of the Sardoba Reservoir with an area of 58.7 km2 and a capacity of 922 million m3 in the Mirzachul natural region of the Arid region has also created local winds. The main reason for this is that the differences in the distribution of solar radiation between the reservoir and the land are increasing, and as a result during the day the wind blows from the reservoir to the land, and in the evening, on the contrary, from the land to the reservoir. According to the Yangier meteorological station, wind speeds of breeze type sometimes reach 3-5 m / s in spring.

According to the project, the maximum wave height at the Sardoba reservoir will reach 1.4 m. Observing the waves during a strong wind or storm in a reservoir can help predict situations such as wave height. The wave height can be determined by measuring the wavelength of the wave hitting the slope on a wave-measuring rail or the concrete-reinforced slope of the dam.

The impact of the Sardoba Reservoir on the surrounding soils varies depending on the groundwater level, the distance from the edge of the reservoir, the slope of the surface, the mechanical composition of the soil, the nature of the vegetation. The impact of the reservoir on the surrounding soils is felt from a few tens of meters to several kilometers. With the construction of the reservoir, the groundwater level can also rise and even flow into the reservoir. Until the groundwater reaches this level, its continuous replenishment will take place at the expense of the reservoir. At the same time, according to the State Committee for Ecology and Nature Protection of the Republic of Uzbekistan, the level of mineralization of groundwater in the area where the reservoir is built is 1.5 - 5 g / l [13; p 18].

The construction of the Sardoba Reservoir in the Mirzachul natural region, which has a high level of groundwater mineralization in Uzbekistan, and a large area irrigated with its water will further increase the salinity of groundwater. This is due to the fact that in the irrigated lands of Syrdarya and Jizzakh regions, where irrigation is planned to be irrigated with reservoir water, groundwater is located close to the surface and the level of mineralization is much higher than in other regions. This can be seen in the case of Jizzakh region, which occupies a large area of the Mirzachul natural region (see Table 4). An analysis of irrigated lands in Jizzakh region on the basis of long-term data shows that the area of weak and moderately saline lands is large, while the area of non-saline and strongly saline lands is less in percentage terms. This is due to the fact that irrigated lands are composed mainly of

light gray soils and groundwater is located 3-5 meters below. The higher the groundwater level, the higher the salinity of the soil [9; 2019].

Soil salinity level in Jizzakh region

Table-4

Years	General Irrigated area(hec.)	Percentage	As well as							
			Unsalted (Hec.)	Percentage	Lowsalted (Hec.)	Percentage	Medium Salted (Hec.)	Percentage	Well salted (Hec.)	Percentage (Hec.)
1995	289007	100	50565	14,6	159813	46,1	74589	21,5	4040	11,6
1996	293701	100	60795	17,8	155942	45,8	73579	21,6	3385	9,9
1997	290099	100	51153	14,8	167228	48,5	67858	19,6	3860	11,1
1998	293663	100	50249	14,7	141943	41,6	98657	28,9	2814	8,2
1999	293809	100	37799	11,1	140299	41,2	112575	33,1	3136	9,2
2000	300512	100	43582	13,1	137123	41,2	115389	34,6	4418	13,2
2001	301090	100	45303	13,5	129294	38,8	118272	35,5	8221	24,6
2002	301470	100	45847	13,5	143842	43,0	104109	31,3	7672	22,9
2003	301246	100	49984	14,7	142402	42,7	101138	30,,4	7722	23,1
2004	301241	100	46033	14,8	148988	44,5	98530	29,4	7690	23,1
2005	301018	100	43339	12,9	157710	47,2	92464	27,6	7505	22,5
2006	299840	100	43782	12,8	161640	48,2	87243	28,0	7175	21,2
2007	299514	100	53143	15,8	152739	45,4	86732	25,7	6900	20,6
2008	299853	100	52720	15,5	154161	46,1	86372	25,7	6600	19,7
2009	300052	100	52575	15,6	159975	47,7	81047	24,3	6455	19,2
2010	300057	100	57668	17,1	165460	49,5	70729	21,9	6200	18,6
2011	301135	100	64537	19,2	157264	47,2	73284	23,7	6050	18,1
2012	300849	100	57271	17,1	157911	47,1	79831	23,7	5836	17,4
2013	300643	100	60677	18,0	156226	46,8	78070	23,4	5670	16,8

2014	300565	100	60184	18,0	157795	47,1	77041	23,1	5545	16,5
2015	300568	100	67205	20,1	150930	45,0	76969	22,8	5464	16,2
2016	300547	100	67636	20,1	158667	47,4	68620	20,4	5624	16,8
2017	300356	100	70196	21,0	163102	48,9	61823	18,3	5235	15,6
2018	300355	100	69970	21,7	175602	52,5	49953	14,7	4830	12,0

Data of reclamation expedition of Jizzakh region, 2019

The Sardoba Reservoir is located in the Sardoba, Khavas and Mirzaabad districts, and construction work began in 2010 and was completed in 2018 in the area where the central network of the South Mirzachul Canal flows. Most of the reservoir is located in the Sardoba district, near the village of Kurgantepa.

There are more than 50 reservoirs in the country, and the construction of each reservoir has a specific purpose. The purpose for which the reservoir is being built will depend on the needs of the area. Today, reservoirs are built not only for one purpose, but for different purposes. However, in the conditions of our republic, reservoirs are built mainly for the purpose of water supply to agriculture and development of new lands.

The Sardoba Reservoir, located in the southeastern part of the Mirzachul Nature Reserve, north of the South Mirzachul Canal, 30 km west of Yangier, is about half the size of the Charvak Reservoir. In other words, the capacity of the Sardoba reservoir is 922 million m^3. This is half of the Charvak Reservoir, which has a capacity of 2 billion m^3 with a capacity of slightly less than 1 billion m^3.

Before the construction and commissioning of the Sardoba reservoir in the irrigated areas of Mirzachul natural area, the water supply level was 59.3%, while the construction of the reservoir increased the water supply level by another 34.8%. In general, it was 94.1%. The main purpose of the construction of the reservoir is irrigation, and in the future it is planned to build a small hydroelectric power plant with a capacity of 15 megawatts. This construction work will be carried out in 2019-2021. The future service of the reservoir to us is marked as 100 years. It should be noted that the dam collapse this year shows that there are shortcomings in the engineering work of the reservoir.

The Sardoba Reservoir Basin has the following morphometric elements according to the design in the Normally Filled Water Level (NFWL) mark:

ISSN 2515-8260 Volume 07, Issue 03, 2020

- full capacity of the reservoir - 922 million m3;

- maximum depth - 35 m;

- area - 58.7 km2;

- The total length of the reservoir shoreline is 30.6 km.

The useful water capacity at the first stage was 440.0 km, and the length of the coastline was 17.8 km. The part taken from the center of the Sardoba Reservoir is called the Central Canal Network of the South Mirzachul Canal. The Central Channel is subdivided into the Right and Left Central Channel networks, respectively.

The length of the central network channel is 20 km. It produces 164.0 m³ of water per second. The Central Canal Network of the South Mirzachul Canal supplies water to the central part of Mirzachul. The water permeability of the right and left parts of the central canal is 68.0 m³ / s and 69.0 m³ / s, respectively. Irrigated areas are 65.6 and 65.8 thousand hectares, respectively. The left branch of the central canal irrigates 65.8 thousand hectares of land in Oqoltin district of Syrdarya region, Arnasay and Dustlik districts of Jizzakh region, and 65.6 thousand hectares of land in Mirzabad and Arnasay, Mirzachul and Dustlik districts of Jizzakh region. What we saw above was water coming out of the reservoir through a canal. The water inflow is 164 m³ / s. In addition to the Central Canal, the reservoir also has an additional canal road, the water consumption of which reaches 34 m³ / s.

The construction of the reservoir will be included in the target type of the anthropogenic impact program, and the level and significance of the impact will be much higher in arid climates than in humid zones. In general, the reservoir is built for different purposes in different climatic conditions. Irrigation is the main goal of the Sardoba Reservoir, along with other reservoirs in the country, at a time when the demand for water is very high, which is very important in water management.

The fact that the area is well supplied with water at this level will help improve the performance of diversified farms. “The Sardoba reservoir will create great opportunities for farmers in the region,” the head of state said during his visit to the reservoir on May 17, 2017. In the same year, during the state visit of the President to China, many good agreements were reached in the field of hydropower, which led to an agreement with the country on the

ISSN 2515-8260 Volume 07, Issue 03, 2020

completion of a mini-hydropower plant with a capacity of 15 megawatts near the Sardoba reservoir in 2019-2021. This will allow the Sardoba Reservoir to make a significant contribution not only to improving water supply, but also to the development of the country in the energy sector. In addition, Sardoba Railway Agro-Industrial Complex, a unitary enterprise of Uzbekistan Railways, planned to implement projects specializing in fisheries, animal husbandry, fruit and vegetable processing, dairy products and mixed fodder production.

Such a large-scale hydraulic structure, built in the very center of the Mirzachul region, consisting of wide plains, is expected to become a tourist area that will attract tourists in the future.

Conclusion: The construction of the Sardoba Reservoir in the Mirzachul natural region has a different impact on the environmental landscape and agricultural lands. The assessment of the impact of the reservoir requires the development and implementation of emergency response to man-made and natural disasters, taking into account the characteristics of the natural environment.

After the construction of the Sardoba Reservoir, the water supply of irrigated areas has improved and the productivity of agricultural crops has increased. A total of 146.2 thousand hectares of land in the Syrdarya and Jizzakh regions are directly supplied with water from the Sardoba reservoir. As a result of the indirect impact of the reservoir, it is planned to improve water supply on another 253.8 thousand hectares.

According to estimates, the direct and indirect impact zone of the reservoir is 396.4 thousand hectares. With the construction of this hydraulic structure, the water supply of the lands irrigated by it increased from 69.5% to 92.2%.

Depending on the level of impact of the reservoir, the following zones can be distinguished in the Syrdarya and Jizzakh regions, which are irrigated with its water:

-The direct impact zone of the Sardoba Reservoir. In this region, as mentioned above, 146.2 thousand hectares were irrigated, and the level of water supply increased from 59.3% to 94.1%;

ISSN 2515-8260 Volume 07, Issue 03, 2020

- The southern zone of indirect impact includes an area of 159,000 hectares, which is expected to improve if not irrigated directly with reservoir water. The water supply in this zone increased from 78.9% to 90.6%;

- Indirectly affected areas are the Jizzakh zone, which affects 95,000 hectares in the region. Water supply will improve from 71.3% to 91%.

Changes in landscape components under the direct and indirect influence of irrigated lands are also observed. Changes in the landscape and its component should be monitored on a regular basis. In areas irrigated with Sardoba reservoir water, changes in groundwater levels need to be identified through continuous monitoring.

Rapid rise in groundwater levels occurs rapidly in soils composed mainly of limestone, gravel, and coarse sand with many cracks, while sand and clay soils slow down this process. Rising groundwater levels lead to swamping and flooding of lands in the reservoir area, soil changes, deterioration of the chemical composition of groundwater, and changes in flora and fauna.

Hence, changes in groundwater regime are considered important for water supply, construction and other sectors of the economy. Therefore, it is necessary to establish many hydrological stations and posts around the Sardoba reservoir.

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