SCIENTIFIC ASSESSMENT OF THE IMPACT OF CURRENT GLOBAL CLIMATE CHANGE ON WATER RESOURCES OF CENTRAL ASIA

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Abstract: Water is the source of life and a necessary source of energy for all living organisms. 3/2 of the Earth's surface is water. But the part that is useful for mankind is very little. The rational use of water is in the hands of man. This article sheds light on the extent to which water and its benefits are carried out today. The ever-increasing threats to the environment demand more information about the world's water resources. Water is one of the main resources on earth. Water is necessary for other life. Water plays a very important role in human life. In particular, its importance is very high in Central Asia. Although the region is rich in fossil fuels and minerals, Central Asia's water resources are limited and unevenly distributed. Water plays a key role in the economy of the five countries of Central Asia. Hydroelectricity is already a viable energy source in mountainous Kyrgyzstan and Tajikistan, while the downstream regions of Uzbekistan, Turkmenistan, and Kazakhstan specialize in growing agricultural crops. Currently, global climate change, the greenhouse effect, and the rapid growth of the economy, in turn, have a great impact on the formation and flow of water resources in Central Asia. In particular, the melting of permafrost, the shortening of the rainfall period, and the increase of the air temperature in the region above the average are occurring.

Key words: permafrost, hydrology, meteorology, global climate change, greenhouse effect, flow.

Introduction. Water resources are sources of water that are useful or potentially useful to humans. Uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually all of these human uses require fresh water. 97% of water on the Earth is salt water, leaving only 3% as fresh water of which slightly over two thirds is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is mainly found as groundwater, with only a small fraction present above ground or in the air. Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily decreasing. Water demand already exceeds supply in many parts of the world and as the world population continues to rise, so too does the water demand. Awareness of the global importance of preserving water for ecosystem services has only recently emerged as, during the 21st century, more than half the world's wetlands have been lost along with their valuable environmental services. Biodiversity-rich freshwater ecosystems are currently declining faster than marine or land ecosystems. The framework for allocating water resources to water users (where such a framework exists) is known as water rights [1].

Water has long been the fundamental concern of Central Asia's peoples. Few parts of the region are naturally water endowed, and it is unevenly distributed geographically. This scarcity has caused people to adapt in both positive and negative ways. Vast power projects and irrigation schemes have diverted most of the water flow, transforming terrain, ecology, and even climate. On the one hand, powerful electrical grids and rich agricultural areas have helped the region flourish; on the other, water, air, land, and biodiversity have been degraded. In this chapter, major river basins, inland seas, lakes, and reservoirs of Central Asia are presented. The substantial economic and ecological benefits they provide are described, along with the threats facing them—and consequently the threats facing the economies and ecology of the country themselves—as a result of human activities.

Research method. There is an estimated 1.866 billion cubic kilometers of water on Earth. About 97% of it is in the form of seas and oceans containing salt water. More than 2% exists as ice sheets and glaciers, and about 1% is in the form of scattered rivers, lakes, groundwater, and water vapor. Almost 97% of the water in the hydrosphere is distributed as seas and oceans. These are all salt water masses. They are not suitable for direct consumption such as drinking, cooking, etc., but are used for industrial and irrigation purposes. Only 3% of the water on earth is fresh water. If we look at the further distribution, almost 66.7% of fresh water alone is found in the form of glaciers and glaciers. About 30.1% is available as groundwater. Only 0.3% of surface water exists directly on the Earth's surface, the remaining 0.9% is available as water vapor and soil water. 0.3% surface water is water that flows like lakes, swamps and rivers. It contains very little as biological water. If all the water on the surface of the earth is combined, it is spherical, so the diameter of this ball of water is about 1385 km. If we take into account the volume, then the earth will be a very small sphere in front of this total. In order to effectively use water resources, it is necessary to know in which ways they are used. It is known that water resources are consumed in two ways: natural and human economic activities, that is, under the influence of anthropogenic factors. Natural consumption of water resources occurs in the following ways: from riverbeds, lakes In the form of evaporation from the bowl, evaporation from the surface of the water, transpiration from the bodies of moisture-loving wild plants, etc. Due to human factors and industrial development, the water resources on earth are sharply decreasing. . Due to this problem, the following new tasks related to water resources and environmental protection appear before the science of hydrology:

1) quantity saving and quality protection of water resources;

2) to study the laws of their change under the influence of natural and anthropogenic factors;

3) the implemented water management activities include land reclamation, irrigation, hydropower, distribution of water resources by region and water resources.

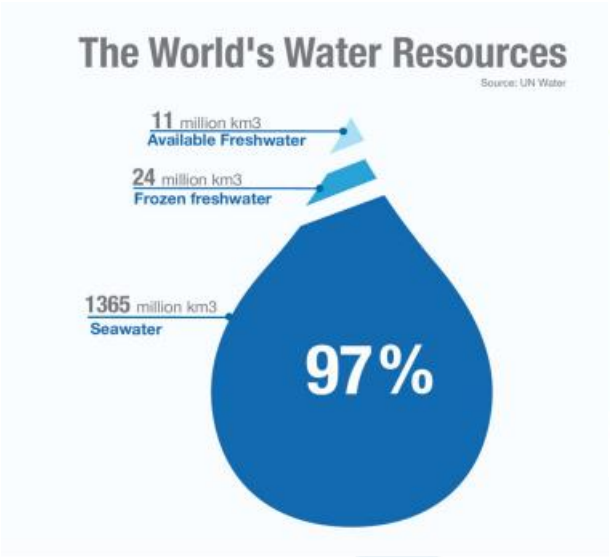

***Figure 1**. The World's Water Resources*

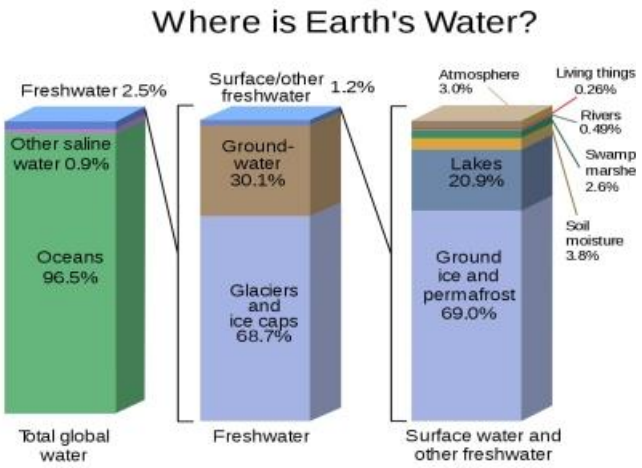

***Figure 2**. Worldwide distribution of water resources*

Central Asia has several hydrological basins, the largest of them being the Aral Sea basin. The area of the basin is 1,778,000 km 2 . Additionally, there are number of interstate basins in Kazakhstan (Ural, Irtysh, Tobol, Yesil, Nura), Kyrgyzstan (Sary-Jaz, Issyk-Kul), as well as the Ily River and Chu-Talas basins in the territories of Kazakhstan and Kyrgyzstan. Besides, three interstate basins are located in the territory of Turkmenistan, the two of which belong to the Large Amu Darya basin–the Murgab and

the Harirud (Tejen). The third basin of the Atrek River is small. Schematic map of hydrological basins located mainly in Kazakhstan and Kyrgyzstan outside the Aral Sea basin is shown in Figure 3.

***Figure 3**. The Aral Sea basin*

The five main river basins in Central Asia are formed by the Amu Darya, Syr Darya, Balkhash-Alakol, Ob-Irtysh, and Ural rivers. Before a large part of the Aral Sea dried up, the Amu Darya and Syr Darya rivers used to flow into it. The rivers of the Balkhash-Alakol basin flow into Lake Balkhash, an inland sea in southeast Kazakhstan. The waters of the Ural basin flow into the Caspian Sea, while those of the Ob-Irtysh basin ultimately flow into the Arctic Ocean. This briefing focuses on the Amu Darya and Syr Darya, by far the two largest rivers of Central Asia (Figure 3).

Between them, the Amu Darya and Syr Darya river basins:

- provide 90 % of the region's river water;
- cover 37 % of the land area of ex-Soviet Central Asia, including most of Kyrgyzstan, Tajikistan and Uzbekistan, as well as large parts of Turkmenistan and Kazakhstan. Some parts of

northern Afghanistan are also within the Amu Darya basin;

- are home to nearly 80 % of Central Asia's population.

Central Asian countries use most of their water for irrigation, and therefore have very high total water consumption. Uzbekistan and Turkmenistan are the biggest users.

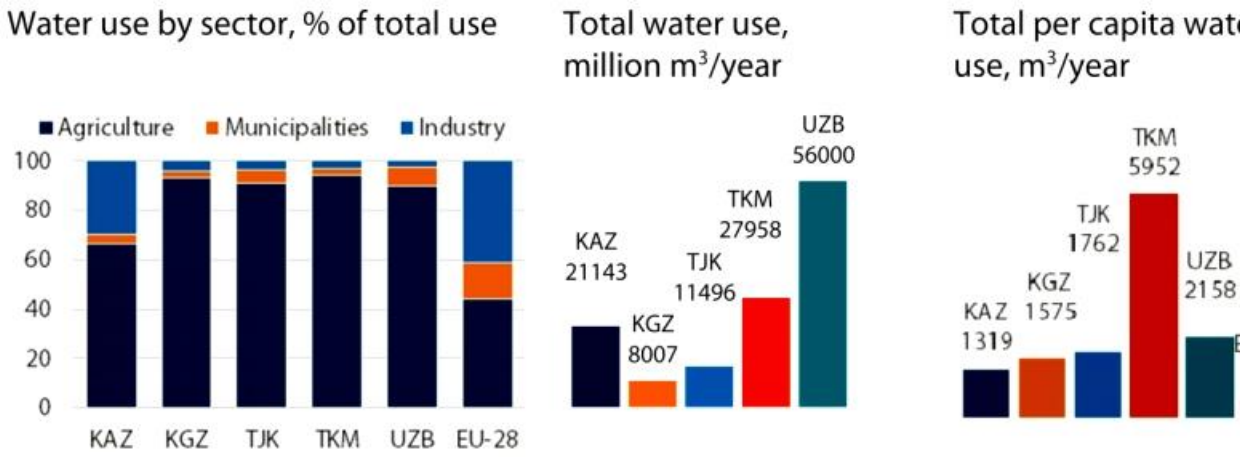

Figure 4*. Water use in Central Asia*

Central Asian countries are major agricultural producers, including of water-intensive crops such as cotton, but with little water coming from rainfall they rely on irrigation. Between them, the five countries have a total irrigated area of some 100 000 km 2 – three times the land area of Belgium, requiring huge amounts of river water. Due to the massive amounts of water used for irrigation, agriculture is by far the biggest water user in Central Asia, and per capita water use in Central Asia is much higher than in European countries.

Environmental impact of water use in Central Asia.

The Aral Sea disaster. Perhaps even more worrying than the political effects of water scarcity is the environmental impact. In the 1950s, Soviet engineers began diverting water from the Amu Darya and Syr Darya rivers to irrigate the Central Asian deserts and enable large-scale cultivation of crops, and cotton in particular. However, the environmental costs of intensive agriculture in fundamentally unsuitable conditions soon became apparent. With less water reaching it, the Aral Sea, once the world's fourth-largest saline lake, began shrinking, and it is now just one-tenth of its former size. Former lakeside towns were left stranded; meanwhile, rising salt concentrations killed off most of the fish in what was left of the lake, depriving fishing communities of their livelihood. Without the steadying influence of a large body of water, the region's climate has become more extreme, with colder winters and hotter summers. As water evaporates, it leaves behind a crust of salt and pesticides (from upstream agriculture); during storms, this is whipped up into toxic dust clouds that cause respiratory and other health problems in neighbouring areas.

Climate change and water resources

According to "Outlook on Climate Change Adaptation in the Central Asian Mountains", Central Asia is already experiencing an overall warming in climate. The comparison of surface temperatures for 1942- 1972 and 1973-2003 shows that the annual average temperature increased by 0.5° C.

According to hydrometeorological centers in the CA countries, the air temperature tends to increase from 1971 to 2015. The average annual air temperature increased every 10 years by: 0.29°C in Uzbekistan (1950–2005); 0.26°C in Kazakhstan (1936–2005); 0.18°C in Turkmenistan (1961–1995); 0.10°C in Tajikistan (1940–2005); and, 0.08°C in Kyrgyzstan (1883–2005). Temperature growth had not a uniform pattern throughout the Central Asia. Higher rates of growth in average annual air temperature were observed in plains, while in mountains these rates are lower and even a decrease in temperature was noted in some cases. Increases in air temperature have more negative than positive aspects, and the latter should be addressed in a comprehensive manner in the context of different ecosystems – mountains, steppes, deserts and their constituent soils. In other words, one should clearly identify how much the temperature would rise in the above ecosystem by 2030-2050 and which fundamental studies should be

carried out to develop various adaptation options (A, B, C) depending on temperature rise trends: 1-2 degrees; 3-4 degrees; and, probably, even 5-6 degrees.

Research results. In the 70s of the last century, an important step was taken in the world to solve the problems of global climate change. In 1972, the Stockholm Declaration of the heads of states was adopted, and it became the basis of today's nature protection policy. However, until now, humanity has been using water incorrectly, and there are even cases of drinking water being used for sewage purposes. Of course, this is a sad situation because while African countries are suffering from water shortage, we are not using water wisely. Today, the rapid development of industry and the increase of harmful gases in the air lead to climate change. This, in turn, leads to the destruction of water and the environment. We can see this phenomenon as an example of the greenhouse effect [2].

The increase in the concentration of greenhouse gases has led to an increase in the natural greenhouse effect and warming of the Earth's surface. If no action is taken, the temperature will increase by 0.3 °C every decade of the next century. Warming, in turn, will lead to the melting of polar ice caps and the rise of the world ocean level by 20 cm on average by 2030 [3].

At the end of the 21st century, it will increase to 65 cm. Data obtained as a result of measurements indicate that the average air temperature has increased by 0.6 ± 0.2 °C since the end of the 19th century. These observations are consistent with the predictions made on the basis of models used to forecast the level of climate warming to date.

The consequences of climate change in Uzbekistan and its neighboring regions include, first of all, changes in agro-climatic and water resources. Changes in them are negatively reflected in the productivity of agricultural crops and the ecological condition of the Aral Sea, especially in the Aral Sea [4]. At the current stage of development, water resources consist of all fresh and moderately mineralized, naturally or artificially sweetened, purified water, and are currently used in all sectors of the national economy and may be used in the future. is index. Water resources have been used on a large scale until now, at the same time, underground water is also used in agriculture and health. Groundwater refers to solid, liquid, gaseous water located between rocks in the earth's crust. Underground in nature. The appearance of water depends on the types of rocks, their composition and properties. In addition, water basins are either formed by natural or artificial accumulation of water on the surface of the earth, or there are slow-flowing or non-flowing water bodies that are created by blocking waterways and building dams. People have started collecting and managing water since ancient times. In recent years, as a result of the negative consequences of global climate change, there are cases of low annual rainfall in our region compared to the standard indicators. This directly requires the use of specific water and resource-saving technologies in the care of agricultural crops. Therefore, it is necessary to distribute the amount of water to the irrigated lands. In the irrigated fields, it is necessary to carry out cultivation and weeding immediately after the soil has recovered.

In the state of high water consumption, that is, when the amount of water entering or leaving each joint is equal, the system is in a stable state. If the working order of any link changes, their output values change or the new set value of the link is reached. Irrigation of irrigation water through resource-saving technologies and reuse of wastewater bioremediation using existing domestic possibilities is considered an urgent problem of today. In this regard, the scientists of our republic have conducted a number of scientific works. Their scientific works are devoted to biological treatment by selecting algae and aquatic plants for biological treatment of wastewater based on the study of the hydrochemical composition of wastewater. Water is the main resource necessary for living, food production, health care, decent life and human development. The volume of fresh water use in the world is increasing year by year, at the same time, many countries are experiencing difficulties in water supply at the level necessary to meet the basic needs of the population for food products and maintain the stability of ecosystems [4-17, 18,19,20,21]

Conclusion. Water is the source of life and development on our planet. Assessing the reliability of water resources is difficult due to the dynamic nature of water and the hydrological variability of time

and space. Internationally, there are problems in predicting annual renewable freshwater availability in allied countries. Assessment of the water problem is the main topic of research. This includes a reliable assessment. Water availability, water quality, water demand and water scarcity. Solving many problems in the world of water management requires a thorough understanding of the physical distribution of water. For example, water-saving technologies are gradually becoming more widespread, helping to reduce water use. The hydrosphere is an important ecological part of the earth. This is an important segment to save all life. Water is a renewable natural resource. But for this, first of all, the reserves of rivers, glaciers and underground water must be unchanged for centuries. Secondly, due to the degree of pollution of natural water under the influence of human economic activity, it should not be higher than the possibility of self-recovery in terms of quality. The main sources of water resources in our country and in Central Asia are rivers, streams, springs, natural clean water in reservoirs, lakes, fresh and moderately mineralized underground water. At the same time, as a result of climate change and a sharp increase in air temperature, the need for drinking water will increase. In addition, the demand for water in agriculture and irrigated land will increase. In order to prevent this problem, it is advisable to use water wisely, process the waste released into the air in industry and production, and use environmentally friendly raw materials as much as possible.

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