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PROBLEMS OF DRINKING WATER SHORTAGE AND ITS POLLUTION AT THE PRESENT STAGE

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Abstract:

This article discusses the problems of pollution and shortage of drinking water at the present stage. An analysis of the problem of pollution and shortage of drinking water in different regions and countries of the world is given. The article examines the factors that pollute rivers and the problems of drinking water shortages and gives recommendations for eliminating them, as well as analyzes the problems of drinking water shortages in the Central Asia region.

Keywords: Water resources, water forum, wastewater, thermal pollution, microorganisms and viruses, desertification, bacteriological pollution.

INTRODUCTION

It is no secret that one of the dangers threatening modern civilization and humanity is an environmental disaster with its many components, including global climate change and the shortage and pollution of drinking water. At the present stage of development, humanity is faced with perhaps the most pressing problem - how to preserve nature and civilization, since no one knows when and in what form this or that catastrophe may occur.

At the present stage, there is a shortage of drinking water throughout the world. The problem of drinking water shortage on Earth is becoming more and more urgent every year. Since the last decade of the twentieth century, the problem of drinking water shortage has been considered as one of the global problems of our time, and as the population of our planet grew, the scale of water consumption, and, accordingly, water shortage, increased significantly, which subsequently began to lead to deteriorating living conditions and slowed down the economic development of countries experiencing a lack of water resources.

Drinking water is critical for improving the well-being of the world's peoples and ecosystems, for agricultural production, for energy generation, and for improving public health. There is no denying that water is essential to life, and access to it is becoming increasingly difficult, especially for the poor and communities that survive on the margins of society with few resources and no political influence. However, it is very important to note that water crises occur in industrialized and developing societies in terms of the quality of water for public consumption (e.g. Flint, Michigan, USA) and in terms of water quantity (e.g. Cape Town, South Africa).

LITERARY RESEARCH

At the present stage, the most vulnerable part of nature and society has become drinking water, which is often intensively polluted. Sewage, pesticides, fertilizers, heavy metals and much more flow into rivers and lakes in huge quantities. According to experts, the level of pollution in rivers such as the Ganges, Mississippi, Rhine, Danube, Volga, Amu Darya, Syr Darya, as well as the Great American and other lakes exceed the maximum permissible standards. According to experts, in some regions of the world, about 80% of all diseases are caused by poor-quality drinking water. If we take into account that water intake structures and water pipelines, which, as a rule, receive water from open reservoirs, show in samples almost 30 percent of contamination in both microbial and chemical conditions, which in turn directly negatively affects the health of the population.

An analysis of the study of problems associated with the lack of drinking water shows that over a long historical period in regions with natural reserves of fresh water, people fully satisfied their needs for water without feeling a shortage of it. However, due to the intensive growth of the population and its industrial activities, the need for water has steadily increased. Currently, it has reached such proportions that in many regions of the planet, and especially in developed industrial areas, an acute problem of shortage of drinking water has arisen. There is also another problem: pollution from runoff and industrial emissions, runoff of fertilizers from fields, and the intrusion of salt water in coastal zones into aquifers due to groundwater pumping. This also significantly reduces drinking water supplies. There is evidence that 1.5 billion people around the world do not have access to clean water.

At the IX World Water Forum (March 2022, Dakar) [1], the main focus was on the following four priority tasks, which were considered relevant both for Africa and the rest of the world:

• safety of water supply and sanitation;

• rational use of water resources to ensure rural development;
• cooperation;
• use of appropriate tools and means, in particular resolving issues of financing and management.

It is also noted that water shortages, poor quality or lack of sanitation facilities have a negative impact on food security, health, gender equality and the living conditions of the poor. Thus, according to the latest UN estimates, in 2020, 2 billion people still did not have access to drinking water at home. 771 million people had to travel at least half an hour from home to a place with safe water, and more than 100 million people around the world drink untreated and poor-quality water. Water is a vital resource that must be conserved. It is critical to food security, biodiversity, health and even peace. This is the vision that prevails in many of the water management and access projects that France supports around the world, in particular on the African continent, which is a priority region for France's activities under its International Water Supply and Sanitation Strategy 2020-2030 y.

In the materials of the 8th World Water Forum [2], UN experts noted that the world is on the verge of a water catastrophe. At the same time, it was stated that every tenth inhabitant of the Earth experiences an acute shortage of drinking water, and this is almost 884 million people. According to UN experts, by 2050. the need for water will increase by 20%. Many countries have already reached their water use limits. And in the near future, the problem of lack of water resources will turn into a political problem, UN experts point out. If nothing is done, then by 2030 almost 5 billion people (about 67% of the planet's population) will remain without satisfactorily purified water. Water shortages in desert and semi-desert regions will cause intense population migration. This is expected to affect between 24 million and 700 million people. In 2017, over 20 million people in the world fled their homes due to a lack of drinking water. The main achievement of the World Water Council is its contribution to raising awareness of global water issues and political mobilization, which it achieved through the World Water Forum. This water forum serves as a stepping stone to global cooperation on water issues. The Forum is a unique platform where the water community and policy and decision makers from all regions of the world can come together, discuss and try to find solutions to achieving water security.

Water resource scarcity [3] is a growing concern in many parts of the world. Population growth, urbanization, increasing demands for irrigated agriculture and poor water management are important factors in water scarcity, exacerbated by the impact of climate change, which is leading to an increase in the frequency and severity of drought. Today, about 2 billion people already live in areas with water scarcity. By 2025, half the world's population is expected to be in this situation. Every 1°C increase in temperature caused by global warming is projected to reduce renewable water resources by 20%. Water scarcity has serious consequences for society and threatens sustainable development. For example, water scarcity can negatively impact the provision of water and sanitation services and impact human health. Insufficient supply of safe drinking water can compromise adequate hygiene and increase the risk of diarrhea. Water scarcity can also limit economic growth by reducing agricultural production, impact the environment and biodiversity by reducing environmental flows needed for healthy ecosystems, and lead to conflict within and between countries and increased migration flows.

According to WHO (World Health Organization) [4], almost 3 billion people on the planet use poor-quality drinking water. In this regard, approximately a quarter of the world's population is at risk of getting sick every year, approximately every tenth person on the planet gets sick, and for this reason, about 4 million children and 18 million adults die every year. An important indicator is the balance of the mineral composition of water, an excess or deficiency of which can lead to the following serious consequences:

• intake of excessive amounts of fluoride compounds into the body through drinking water can cause fluorosis, which affects teeth and bones;
• long-term exposure to arsenic can lead to the development of cancer and skin lesions;
• in addition to iron deficiency, important factors in the occurrence of anemia are a number of infectious diseases associated with poor hygiene of drinking water and sanitation. Also, diseases transmitted by water are hepatitis A, diarrhea, typhoid fever, cholera.

According to the UN, almost 80% of diseases in developing countries, which kill about 3 million people every year, are associated with poor water quality.

As noted in the source [5], issues related to the problem of drinking water scarcity and public health are being discussed throughout the world, and many ideas have been proposed on how to prepare for the predicted shortage of drinking water resources in many countries if climate change continues at the same rate.

According to the source [6], the Arab-Israeli war of 1967 was largely related to the growing demands for water in the Middle East. This problem is also relevant at the present stage. The Jordan River is controlled by Israel, and during dry periods Israel limits water supplies to the Palestinians. During the hot summer of 2016, some 2.8 million Arab West Bank residents and local leaders repeatedly complained of being denied access to fresh water. Israel accuses the Palestinians of being unwilling to negotiate to decide how to upgrade their aging infrastructure. The Jordan River, which flows through Lebanon, Syria, Israel, the West Bank and Jordan, is at the center of one of several ongoing interstate conflicts over water. It has been a source of tension between Israel and the Arab states for more than 60 years.

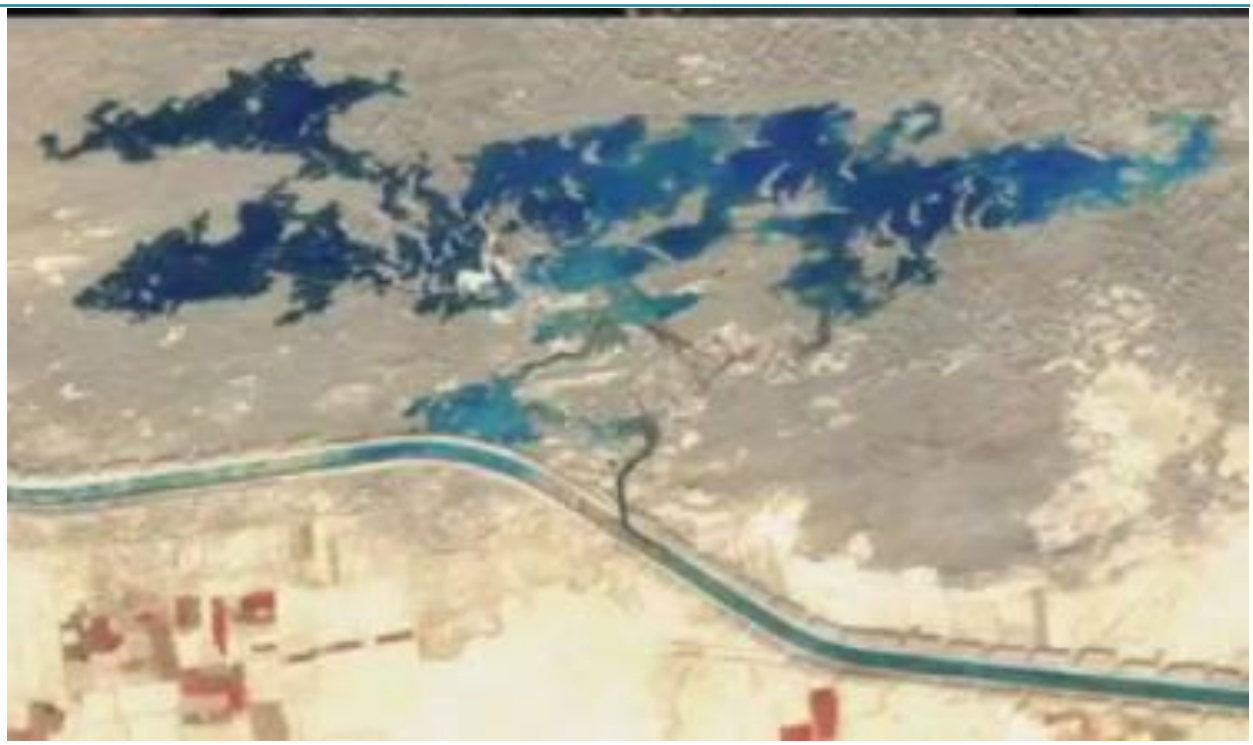

Figure 1. Illustration of the accident on the Kosh-Tepa canal (Afghanistan).

According to the website [7], Central Asia lives in a state of constant water stress, on the basis of which conflicts arise between countries. The first major accident occurred on the Kosh-Tepa canal in Afghanistan, built by the Taliban, which is associated with gloomy prophecies about the future of the Amu Darya. The accident is considered so large that its consequences are visible from space (Fig. 1). Perhaps the canal could not withstand the high water pressure and overflowed into the neighboring territory of Uzbekistan (southwest of Termez). The length of the spill is 9 km. and the water goes into the sand. The saddest thing is that the spill area is increasing. At the same time, experts believe that the Taliban either cannot or do not want to correct the situation. It should be noted that even without any accidents, the Kosh-Tepa canal will take 20% of the total flow of the Amu Darya.

The materials of the site [8] state that due to drought, restrictions on water use have been introduced in 78 departments out of 101 in France. They prescribe fines of 1.5 thousand euros for filling swimming pools with water for washed vehicles.

It should be noted that the main reason for the worsening water problem of all mankind is urbanization. In order to adapt the Earth to its needs, humanity disrupts and pollutes the ecosystem, including drinking water, which contribute to the deterioration of the situation. The problem is also affected by population growth, especially in regions with the most unfavorable situation. The greenhouse effect also makes its contribution - expanses of water evaporate without a trace from the surface of the planet. In addition, every person wastes water thoughtlessly in much larger volumes than he needs.

METHODOLOGY

According to world statistics, in general, excessive and unplanned consumption of drinking water occurs in all regions of the world. The main reasons for this are the rapid development of production and the growth of the world population. The process of reducing unplanned water consumption is no longer possible, since in this case it would be necessary to sharply reduce the production process for the production of material goods and would have to give up many of the benefits of civilization. The shortage of drinking water is also influenced by pollution factors, because the volume of water suitable for consumption is reduced. Therefore, more attention should be paid to maintaining clean water resources. In this regard, we can note that the life and health of all inhabitants of planet Earth depends on its quality.

According to experts, supplies of drinking water are considered limited and are already running out. According to data from the Washington-based World Resources Institute, about a third of the world's population - about 2.6 billion people live in countries with "serious water stress", and 1.7 billion people in 17 countries face "extreme water stress". About a dozen countries in the arid countries of the Middle East are experiencing a very acute shortage of drinking water, and in India the process of drinking water shortage has reached critical levels. All this can lead to fraught consequences in all areas of the national economy - from economic development and deterioration in the health of the country's population. Countries such as Pakistan, Botswana, Turkmenistan and Eritrea also experience extreme water shortages. According to experts, by 2040 at least 33 countries in the world will experience the greatest shortage of drinking water. Human intervention in natural processes has led to the pollution of even such large rivers as the Mississippi, Marilao, Yellow River, Matanza-Riachuelo, Ganges, Dnieper, Danube, Rhine, Volga, Amu Darya, Syr Darya, changing towards a decrease in the volumes of transported water masses (river flow). Water used in agriculture is mostly spent on

evaporation and the formation of plant biomass and, therefore, is not returned to rivers. A very sad situation has developed with the fate of the Aral Sea, which essentially ceased to exist due to excessive withdrawal of water from the Syr Darya and Amu Darya rivers for irrigation.

Limited fresh water supplies are being further reduced due to pollution. The main danger is represented by wastewater (industrial, agricultural and domestic), since a significant part of the used water is returned to water basins in the form of wastewater.

One of the types of pollution of rivers and reservoirs is thermal pollution. Power plants and industrial enterprises often discharge heated water into rivers and reservoirs. This leads to an increase in the water temperature in it. With increasing temperature in rivers and reservoirs, the amount of oxygen decreases, the toxicity of water pollutants increases, and biological balance is disrupted. Along with this, pathogenic microorganisms and viruses begin to rapidly multiply in contaminated water as the temperature rises. Once in drinking water, they can cause outbreaks of various diseases.

In a number of regions, groundwater was an important source of fresh water. Previously, they were considered the purest. But currently, as a result of human economic activity, many sources of groundwater are also subject to pollution. Often this contamination is so great that the water from them has become undrinkable.

It should be noted that with increasing water resource shortages around the world, it is growing mainly for the following reasons. On the one hand, water withdrawal for agriculture is increasing (70% of consumption) to meet the needs of the growing world population. On the other hand, as a result of global warming, glaciers are melting, and previously fertile lands are becoming desertified. UN experts state that a critical situation has developed on earth in the area of the most important natural resources, primarily water, which is already called "blue gold". This is fraught with military conflicts in many regions of the world, primarily in the Middle East and South Asia. According to UN forecasts, by 2040 the world's population will reach nine billion people, while fresh water reserves (based on materials from the Economist Intelligence Unit World Resources Institute) will be able to cover only 70% of humanity's needs (Fig. 2).

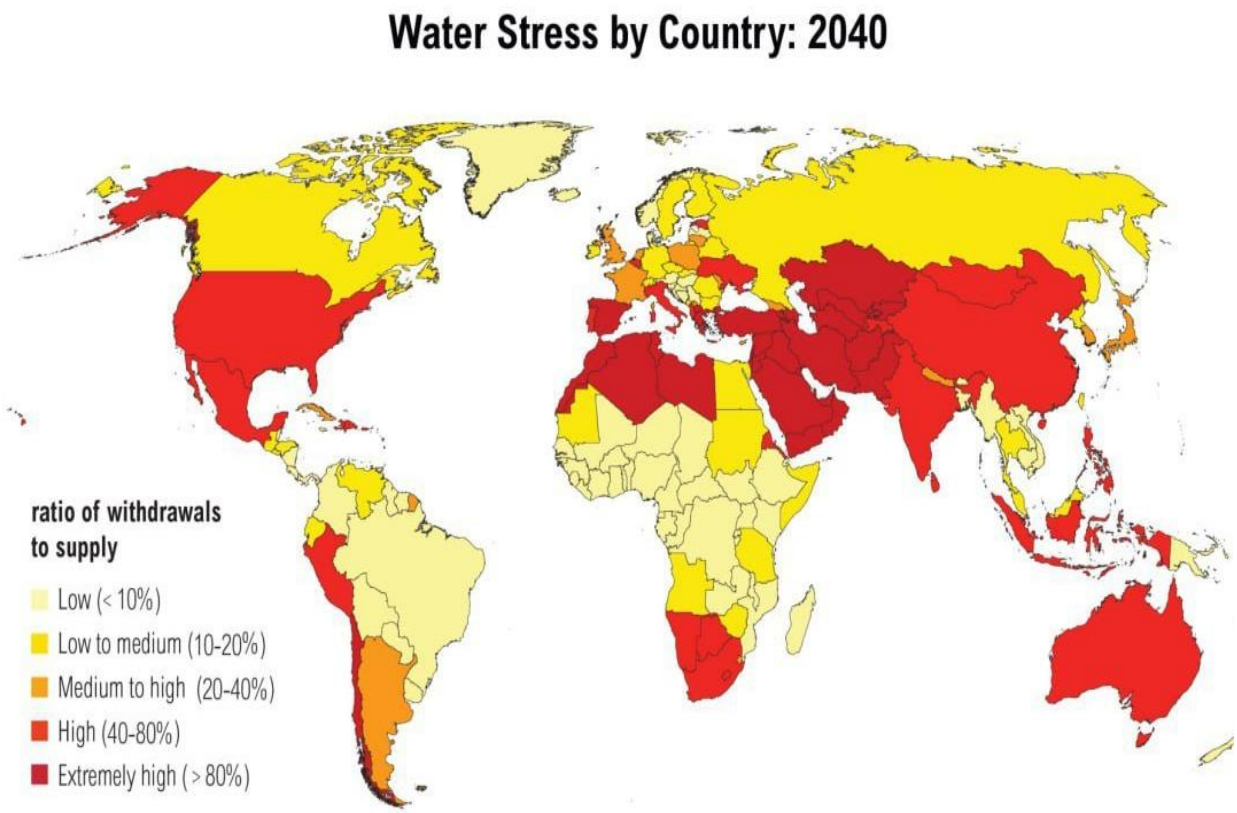

Figure 2. Illustration of increasing water scarcity in countries around the world by 2040.

As can be seen from the figure, the increase in water deficit in the countries of the world by 2040 is highlighted in different colors: dark red - countries with the greatest deficit (more than 80%), red - with high (40-80%), yellow - above average (20-30). %), blue – below average (10-19%), dark – low (less than 10%).

Humanity consumes a huge amount of fresh water for its needs. Its main consumers are industry and agriculture. The most water-intensive industries are mining, steel, chemical, petrochemical, pulp and paper, and food processing. They consume up to 70% of all water spent in industry. The main consumer of fresh water is agriculture: about 60-80% of all fresh water is consumed for its needs.

In most cases, water coming from a well, and often from a municipal water supply system, requires pre-treatment, the purpose of which is to bring the water quality to standard levels. Judging the quality of water and its compliance or non-compliance with established standards can only be done on the basis of the most complete chemical and

bacteriological analysis. Only on the basis of analysis can one make a final conclusion about the problem or set of problems that will have to be dealt with. The main problems with water that users have to deal with are the following:

- The presence of unpleasant taste, odor and color in the water. These three parameters, which are commonly called organoleptic indicators, can be influenced by organic substances in the water, residual chlorine, and hydrogen sulfide.
- Bacteriological contamination. Caused by the presence of various microbes or bacteria in the water. Some of them may pose a direct threat to human health and life, but even relatively harmless bacteria, in the course of their life activity, release organic substances that not only affect the organoleptic characteristics of water, but also, when entering into chemical reactions (for example, with chlorine), are capable of creating toxic and carcinogenic compounds.

It is no secret that the above information does not exhaust the variety of problems associated with pollution and water shortages.

Rivers have always been a source of fresh water. It must be noted that at the present stage they began to transport waste. Waste in the catchment area flows along river beds into the seas and oceans. Most of the used river water is returned to rivers and reservoirs in the form of wastewater. Until now, the growth of wastewater treatment plants has lagged behind the growth of water consumption. And at first glance, this is the root of evil. In reality, everything is much more serious. Even with the most advanced treatment, including biological treatment, all dissolved inorganic substances and up to 10% of organic pollutants remain in the treated wastewater. Such water can again become suitable for consumption only after repeated dilution with pure natural water. At the same time, attention should be paid to the fact that the ratio of the absolute amount of wastewater, even purified, and the water flow of rivers is important for humans.

Water pollution occurs as a result of harmful substances entering any body of water. These substances usually include microorganisms and chemicals such as oil. When pollution enters a body of water, it causes deterioration in water quality and ultimately becomes toxic to humans and the environment. As we know, many things need to be done to protect the environment, one of the very important methods to maintain the health of the environment is to reduce water pollution, for which there are many effective solutions that can help in achieving this goal.

Treatment is an important part of the program to conserve drinking water supplies. In many regions of the planet there is a shortage of safe water, free from infections and harmful substances. There are several ways to neutralize impurities. The traditional chemical method is gradually giving way to the physical one, when water is purified using membrane technologies. In Japan, where "auxiliary waters" are used particularly effectively, rainwater is sterilized by ozonation.

It is known that there is a water cycle. Moisture evaporates from the surface of reservoirs and enters the atmosphere. The process of evaporation purifies the water, which then enters the soil in the form of precipitation, forming groundwater. A considerable part of them again ends up in rivers, lakes, seas and oceans. Part of the precipitation enters water bodies immediately, bypassing intermediate stages. As a result of such a cycle, water is returned in a purified form, so the environmental problem of water pollution is solved by itself.

The issue of providing the population with clean water is directly related to the quality of water supply systems. Because of old pipes, tens of thousands of cubic meters of fresh water are wasted and polluted. Many projects for new water supply systems are now being developed based on scientific discoveries of recent decades. For example, the Japanese company TORAY is researching nanofibers and creating carbon-based nanotubes. In Russia, many Far Eastern enterprises are gradually switching to the use of modern pipes made of high-strength cast iron with a spherical graphite structure, which allows them to preserve water from contamination. Timely implementation of advanced technologies will make it possible to more rationally use the planet's remaining water resources.

The conservation of existing fresh water reserves depends on strict adherence to global environmental standards. It is impossible to stop the activities of many enterprises in light, heavy, metallurgical, chemical and other industries, but modern industrial cleaning systems make it possible to recycle waste from industrial enterprises without harming the environment. Deviations from environmental standards and their violations must be punished with serious fines.

Society is already aware of the need for radical action to solve water problems and alleviate water scarcity. There is a rethinking of the principles of water use and a search for acceptable and adequate measures to overcome established stereotypes in natural resource management. It is noteworthy that it is the lack of water in recent years, when the value of water is felt very acutely, that makes each of us think about what he can do personally to improve the situation and in many ways ensures a return to the traditions of caring for water.

CONCLUSIONS

In conclusion, I would like to note that all countries of the world community need to change their water use strategy at the present stage. Necessity forces us to isolate the anthropogenic water cycle from the natural one. In practice, this means a transition to a closed water supply, to low-water or low-waste, and then to "dry" or waste-free technology, accompanied by a sharp reduction in the volume of water consumption and treated wastewater.

In my opinion, one of the ways to solve the problem of reducing the problem of drinking water shortage is to save water resources by every inhabitant of planet Earth. This will give much more significant results than it seems at first glance. Along with this, it is necessary to improve the technology of water purification and the protection of water from pollution, which will make it possible to repeatedly use this invaluable source for humanity.

At the same time, it is necessary to improve the technical condition of irrigation and collector-drainage networks and improve the reclamation state of irrigated lands, introduce progressive methods and techniques of irrigation, and

introduce drought-resistant and productive varieties of agricultural crops.

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