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Environmental Issues: Depletion of Water Resources

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Abstract: This article examines the environmental issue of water resource depletion in the current context of socio-economic development, energy and food production, ecosystem health, and human survival. Particular attention is paid to the shortage of clean water—a deficit considered the most serious environmental challenge for modern cities—and the significant harm this causes to urban residents' health and green spaces. The article analyzes the factors contributing to water depletion and drinking water scarcity, and offers recommendations for addressing these issues in the modern world.
Keywords: fresh water, water resource depletion, "hunger stones," ghost ships, water resources, economic losses, indirect depletion, hydrological and climatic conditions, wetland drainage, wind and water soil erosion.

INTRODUCTION

Water covers two-thirds of our planet. While this quantity is more than sufficient for the entire human population, water conservation is nonetheless considered a critical global issue. The challenge lies in the fact that the vast majority of these water resources are undrinkable—consisting of saltwater—whereas humanity requires fresh water not only for drinking but also for crop cultivation and livestock rearing.

Drinking water scarcity is one of the most pressing issues of our time. This problem is particularly acute in African nations and, to a lesser extent, in the Middle East. These regions experience hot climates with prolonged dry spells, causing existing water bodies to dry up. This shortage is further exacerbated by population growth.

The depletion of water reserves is currently a major global challenge. Over half a billion people worldwide face an acute shortage of water, and experts predict that if current consumption trends continue, two-thirds of the global population will face water scarcity by the 2050s.

LITERARYRESEARCH

Water is one of our planet's most vital resources for sustaining the life processes of all living organisms—whether plants, animals, or humans. With the development of the industrial sector, water has also come to be used in technological processes. For instance, hydroelectric power plants actively utilize the movement of water masses—such as tidal flows—as an energy source; consequently, these plants are typically constructed on rivers with strong currents. In metallurgy, water can serve as a cutting tool in a process known as hydro-abrasive cutting. This process requires large volumes of

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water and generates significant waste. Thus, vast quantities of water are consumed daily, substantially impacting the quality and quantity of available reserves.

Despite efforts to replenish this resource, the rate of water renewal lags significantly behind the rate of consumption. This gives rise to a number of problems affecting every country without exception. As the global population continues to grow, the demand for water resources increases. Intensive water usage leads to various challenges, some of which are particularly critical.

According to the website [1], fresh water (excluding polar ice) accounts for only 0.3% of the total volume of this resource, meaning there is about one cubic kilometer of the liquid available per person.



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Figure 1. Illustration of a dried-up lake on the border between Switzerland and France.

Reports from source [2] highlight alarming news: water sources across Europe are drying up, and water usage restrictions are being imposed. European rivers and bodies of water are visibly receding—a situation unprecedented in the region. In Hungary, the Danube's water level has dropped so drastically that people are walking on sections of the riverbed normally submerged underwater. Operations at the Paks Nuclear Power Plant, which relies on the river for cooling, have even been halted. In Germany, the Rhine has receded to the point where "hunger stones" have emerged—historical warnings of famine following severe droughts and crop failures. The drought has also revealed "ghost ships"; one such vessel had been used for fishing in the 1990s. In Croatia, low water levels have exposed not only sunken ships but also munitions that had lain on the riverbed for decades. In Bulgaria, the Danube's record-low level led to the recovery of mammoth remains from the riverbed. On the Swiss-French border, an entire lake—4 kilometers long and up to 200 meters wide—has nearly dried up (Fig. 1); the site usually attracts thousands of tourists in the summer. In England, the lawns surrounding Stonehenge have scorched, and water levels in 80 percent of rivers are below normal, prompting water usage restrictions for millions of residents.

Projections from source [3] indicate that existing water resources will be insufficient to provide food for nine billion people by 2030. With the global population set to surpass this figure by 2050, the impact of the shortage will be felt sooner rather than later. The issue of clean freshwater scarcity is addressed on the website [4], which notes that a lack of clean fresh water affects sanitary conditions, increases the risk of disease, and lowers the quality of human life.

According to the website [5], experts have highlighted that as resource depletion intensifies, the probability of forest fires rises by 26%, with fire risk reaching as high as 50% in some areas. In the agricultural sector, even a slight reduction in resources leads to significant economic losses.

A World Bank report [6] indicates that humanity loses 324 billion cubic meters of fresh water annually—a volume sufficient to supply 280 million people. This information was reported by the publication *Ekosfera*.

According to the website [7], agriculture is the largest consumer and one of the primary polluters of natural water bodies. It accounts for approximately 72% of global freshwater consumption and contributes to the drying up of water bodies, as well as their contamination with mineral fertilizers, pesticides, and animal waste. Such waste and runoff reduce oxygen levels and promote the proliferation of pathogenic microorganisms.

Methodology

The depletion of water reserves is currently one of humanity's global challenges. More than half a billion people worldwide face acute water shortages; experts predict that if current trends in rising water consumption continue, two-thirds of the global population will face water scarcity by the 2050s.

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Water pollution and scarcity can lead to serious environmental and economic problems for countries and regions across the globe.

Ultimately, the depletion of water resources could lead to the extinction of all life on Earth. Water is virtually the sole source of atmospheric oxygen replenishment, generated through its decomposition during photosynthesis.

Global water demand is rising alongside population growth and the expansion of industrial production, a trend that degrades the environment and depletes Earth's water resources. According to a UN report, more than 400 million people worldwide live in water-scarce areas.

More than a billion people worldwide lack access to clean drinking water, and approximately 850 million people suffer from hunger due to a lack of water for irrigation. Statistics show that two million people—the majority of them children—die annually from diseases linked to the consumption of contaminated drinking water. In developing nations, 75% of all illnesses are associated with the use of water that is unfit for cooking or drinking.

The problem of water depletion and pollution stems from various environmental impacts, particularly those affecting bodies of water. Water depletion occurs when surface water flows drop below minimum acceptable levels or groundwater reserves within a given territory decline. In other words, water depletion represents a mismatch between the rates of water extraction from natural sources and human society's water needs. In addition to direct water extraction, there is also indirect depletion:

- water pollution resulting from economic activity;
- decline in soil fertility due to erosion, among other factors.

Experts identify the following as the primary causes of water resource depletion:

- Increasing intensity of human economic activity.
- Adverse hydrological and climatic conditions.
- Uneven distribution of surface and groundwater sources, leading to intensive water use in densely populated areas.
- Rising water consumption alongside global population growth.
- Significant water losses during use.
- Clogging and pollution of water bodies.

Water source depletion is also influenced by:

- deforestation and the clearing of shrubs in riparian zones and river headwaters;
- plowing of slopes near water bodies;
- draining of wetlands;
- destruction of dams on small water bodies;
- wind and water soil erosion;
- uncontrolled and wasteful use of natural water resources.

The primary consequences of global water depletion include:

- unsanitary conditions and emerging health issues;

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- food shortages;
- international conflicts.

It is worth noting that the planet is drying out, with hundreds of billions of cubic meters of fresh water disappearing annually. Experts attribute this trend to three main factors: rising global temperatures, rapid urbanization, and agricultural irrigation systems. This analysis was conducted using high-resolution imagery for the first time, enabling specialists to assess resource conditions across various regions of the world. The study revealed a three percent decline in renewable water reserves. Scientists noted that the situation is exacerbated by the ready availability of this resource, which has led to its uncontrolled consumption. The most critical situation is found in countries where water lacks an adequate economic valuation and there are no effective policies regulating its use.

A critical situation is unfolding in developing countries. In Africa, drought causes the loss of between 600,000 and 900,000 jobs each season—a figure representing approximately nine percent of annual employment growth. Farmers, women, and the elderly are the hardest hit.

Conclusions

As is well known, the depletion of water reserves, the deterioration of water quality, and water scarcity can lead to increased morbidity and mortality, thereby disrupting the ecological and economic balance. Therefore, people everywhere must pay attention to the quantity and quality of water resources, conserve water at home and at work, and seek solutions to the problem of escalating water depletion.

Based on the foregoing, it can be concluded that the depletion of water reserves and the widening deficit—along with the resulting deterioration of freshwater quality and the reduction of water resources—will lead to an environmental catastrophe and a global economic crisis. In this context, it is essential to draw the attention of the planet's inhabitants to expert recommendations. To address this issue, experts have proposed implementing strict consumption controls via pricing mechanisms, improving the efficiency of water resource utilization, developing recycling and desalination technologies, and rationally redistributing water among various economic sectors.

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