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On the problems of river pollution at the present stage

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Abstract: This article examines the pollution of river ecosystems – vital oases that are increasingly subject to intense contamination across all regions of the globe. In the modern world, these river systems have become one of the most vulnerable components of both the natural environment and human society. Vast quantities of wastewater, pesticides, fertilizers, heavy metals, and other substances flow into rivers and lakes. The article analyzes the problem of river pollution caused by various wastes and contaminants across different regions and countries, and discusses the factors contributing to this pollution as well as the issue of drinking water scarcity.

Keywords: water scarcity, University of York, waste flows, "trash rivers", mineral composition of water, greenhouse effect, "dead zones", toxic waste, river pollution, chemical pollution, industrial effluents.

INTRODUCTION

River pollution is currently occurring in all regions of the world, and the issue is becoming increasingly pressing with each passing year. Since the last decade of the 20th century, river pollution – alongside the related problem of drinking water scarcity – has been recognized as a major global challenge. As the global population has grown, the scale of river pollution and water shortages has expanded significantly; this has led to deteriorating living conditions and hindered economic development in countries facing water scarcity. Consequently, the problem of river pollution has become a matter of growing urgency worldwide.

When observing the flow of a river, we rarely consider the dangers lurking in its waters. Yet, there are rivers that are truly horrifying due to extreme levels of pollution. It is well known that some rivers are dangerous because of the predators inhabiting them, while others are essentially toxic. This article examines the issue of river pollution caused by various types of waste in the modern world.

LITERARY RESEARCH

It should be noted that the growth of the global population is driving an increase in the pollution of rivers and lakes, leading to water shortages that, in turn, further deteriorate living conditions in many countries. Rivers are continuously polluted by sewage – containing human waste and detergents – as well as by waste from chemical plants, metallurgical facilities, and agricultural operations. These pollutants foster the proliferation of pathogenic microflora, which serve as a source of various infectious diseases that pose a threat to public health.

An adverse situation prevails in the coastal zones of the world's seas and oceans, where rivers and canals discharge wastewater. Liquid industrial waste, oil industry by – products, and domestic waste from nearby areas find their way into the world's bodies of water (lakes and seas). Human

interference in natural processes has led to the pollution of even major rivers – such as the Mississippi, Marilao, Yellow River, Matanza–Riachuelo, Ganges, Dnieper, Danube, Rhine, Volga, and others – while simultaneously reducing the volume of water they transport (river discharge).

According to source [1], unless measures are taken, nearly 5 billion people – approximately 67% of the global population – will still lack adequate water treatment by 2030. Currently, the available water per capita is about 750 cubic meters; by 2050, this figure is projected to drop to 450 cubic meters. Under United Nations classifications, up to 80% of the world's countries will fall below the water scarcity threshold. Regions expected to be affected include Africa, the Middle East, northern China, and South Asia.

According to the website [2], the Mississippi River delta in North America – formed by the world's fourth – longest river and a vital natural and economic resource for the U.S. – is one of the most fertile agricultural regions on the planet. Unfortunately, the waters at the Mississippi's mouth are increasingly referred to as "dead zones"; throughout its course from north to south, the river becomes saturated with toxic waste (such as nitrates, benzene, and arsenic), sewage, petroleum products, and general refuse. Due to this catastrophic pollution, the water at the river's mouth becomes choked with algae that consume all available oxygen, and their rampant proliferation leaves other organisms with no chance of survival. The site also lists the world's most polluted rivers: the Sarno (Italy), Marilao (Philippines), Yellow River (China), Jordan (Israel), Yamuna (Jamna), Buriganga (Bangladesh), Matanza–Riachuelo (Argentina), Ganges (India), and Citarum (Indonesia).

According to Johnna Fisher [3], the world's rivers are heavily polluted with various medications and other pharmaceutical products, posing a threat to both the environment and human health; these are the findings of a major study conducted by British scientists. In her work, the author notes that a large–scale study organized by the University of York revealed that traces of paracetamol, medications for epilepsy and diabetes, as well as nicotine and caffeine, are most frequently found in rivers worldwide. The author also highlighted that rivers in countries such as Pakistan, Bolivia, and Ethiopia are the most polluted, while those in Iceland, Norway, and the Amazon basin are the least affected. The University of York study – reported in the *Proceedings of the National Academy of Sciences* – was one of the most extensive in this field, covering 258 rivers across 100 countries and involving over a thousand sampling sites. Furthermore, the report states that antibiotic pollution in rivers can reduce the drugs' effectiveness, as antibiotic–resistant bacteria develop in the contaminated water. This represents one aspect of the significant threat that pharmaceutical pollution in rivers poses to human health.

According to the World Health Organization (WHO) [4], nearly 3 billion people worldwide use unsafe drinking water. Consequently, approximately one – quarter of the global population is at risk of illness, and roughly one in ten people falls ill; this results in the annual deaths of approximately 4 million children and 18 million adults. The mineral balance of water is a crucial factor, as an excess or deficiency of minerals can lead to serious consequences, such as:

•Ingestion of excessive fluoride compounds through drinking water can cause fluorosis, a condition affecting the teeth and bones;

•Prolonged exposure to arsenic can lead to the development of cancer and skin lesions;

•In addition to iron deficiency, a number of infectious diseases linked to poor drinking water hygiene and sanitation are significant causes of anemia; waterborne diseases also include hepatitis A, diarrhea, typhoid fever, and cholera.

Source [5] states that rivers in Pakistan have turned into streams of trash. The same source notes that in December 2025, a video from Pakistan went viral on social media, showing entire

rivers – choked with plastic and waste – flowing through cities. It also mentions that the footage (Fig. 1) shocked European environmentalists accustomed to cleanliness and waste sorting. For Pakistanis themselves, however, such "rivers of trash" have long been a part of everyday life.



Figure 1. Illustration of the process of river pollution by waste in Pakistan.

Methodology

River water is vital for the well – being of populations and ecosystems, as well as for agriculture, energy production, and public health. No one would deny that water is essential for life, yet access to it is becoming increasingly difficult – particularly for the poor and for communities living on the margins of society, possessing meager resources and lacking political influence. Urbanization is widely recognized as a primary driver of the global water crisis. In its efforts to adapt the Earth to its needs, humanity disrupts and pollutes ecosystems, thereby exacerbating the situation. Population growth also contributes to the problem, particularly in regions already facing the most adverse conditions. The greenhouse effect plays a role as well, causing vast quantities of water to evaporate from the planet's surface without a trace. Furthermore, individuals often consume water thoughtlessly, using far more than is actually necessary.

Rivers have always been a source of fresh water. It must be acknowledged, however, that today they also serve as conduits for waste. Ultimately, pollutants from various catchment areas flow along river channels into the seas and oceans. A significant portion of the river water used by humans returns to rivers and other bodies of water as wastewater. To date, the expansion of wastewater treatment facilities has lagged behind the growth in water consumption. At first glance, this appears to be the root of the problem. In reality, the situation is far more serious. Even with the most advanced treatment methods – including biological processes – all dissolved inorganic substances and up to 10% of organic pollutants remain in the treated effluent. Such water can only become fit for consumption again after being heavily diluted with clean, natural water. It is crucial to note that, from a human perspective, the ratio between the absolute volume of wastewater (even if treated) and the river's natural flow is a critical factor.

It is no secret that vast quantities of waste water, pesticides, fertilizers, mercury, arsenic, lead, and other substances find their way into rivers and lakes. Experts report that pollution levels in rivers such as the Danube, Volga, Rhine, and Mississippi, as well as the Great Lakes, exceed permissible limits. Furthermore, in certain regions of the world, approximately 80% of all diseases are attributed to poor – quality water. This is particularly concerning given that water intake facilities and distribution systems –, which typically source water from open bodies—often show contamination levels approaching 30% in terms of both microbial and chemical content, a situation that directly and adversely affects public health.

Current river pollution is driven by a significant decline in water quality resulting from the discharge of chemical waste and the proliferation of pathogenic microorganisms. This issue is directly linked to a failure to implement necessary environmental measures for water purification and disinfection. While chemical contamination often remains invisible due to the substances being dissolved in the water, other forms of pollution – such as oil spills, untreated domestic and industrial effluent, and detergent foam – are readily apparent.

Pollution in river oases occurs when harmful substances enter river systems. These substances typically include microorganisms and chemicals, such as oil and other contaminants. Such pollution degrades water quality, ultimately rendering the water toxic to both humans and the environment. While much remains to be done to protect the environment, reducing pollution in rivers and bodies of water is a crucial step toward maintaining environmental health; fortunately, there are many effective solutions available to help achieve this goal.

Today, we can state with certainty that not a single river in the world remains in an ideal state, as humanity has shown a reckless disregard for nature's gifts. Despite the universal desire for clean, unpolluted rivers, we are confronted with the widespread contamination of waterways by all manner of human waste – a situation that highlights the absurdity of human thought and behavior.

CONCLUSIONS

It follows from the above that humanity treats natural resources with excessive cruelty. Despite being considered a rational being, man fails to properly control his actions. Consequently, situations encountered in everyday life come as a shock to us all – particularly regarding rivers, from which we typically expect freshness and purity.

In conclusion, we would like to note that all nations of the global community must revise their strategies regarding water usage and the preservation of river ecosystems in the current era. In our view, one way to address the problems of river pollution and the associated drinking water shortage is to adopt a responsible approach to water resources and implement clean technologies across all production processes. At the same time, it is essential to tighten enforcement of water quality standards. Ultimately, these measures will yield significant results, thereby enabling us to resolve the environmental issues of river pollution facing us today.

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