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Assessment of the quality analysis of the water sample taken from the Kur river basin, Barda region

İ.T.Karimbayli, L.H.Mammadova
Azerbaijan Architecture and Construction University, Baku, Azerbaijan
kerimbeyli.intizar996@gmail.com

Abstract: This study presents a comprehensive assessment of the water quality paramerts in the Kur River basin within the Barda region. The investigation aimed to analyze various parameters of water and assess the overall health of the water resources in this vital river system. Water samples were collected from the Kur River, and evaluate the quality of the water. The physicochemical parameters analyzed included pH, dissolved oxygen (DO) and alkalinity. The results were compared to established water quality standards to determine compliance and identify potential environmental concerns.

Keywords: Kur river, Water quality, Water resources, Physicochemical parametrs, Environmental assesement.

1.INTRODUCTİON

Water is considered the invaluable mineral resource of our planet. The quantity of water on Earth is distributed not uniformly but rather unevenly across specific masses. Approximately 40 percent of the world's freshwater reserves are situated within the territory of Russia Federation. In Republic of Azerbaijan, however, water resources are quite limited.

The largest river in the South Caucasus and Azerbaijan is the Kura River, with a length of 1515 kilometers (km) [1]. The development of river networks in Republic of Azerbaijan undergoes significant changes based on the climate, soil-vegetation, geological conditions and relief of the Republic's territory and their interrelations.

The climate, relief, soil-vegetation, and geological conditions of the Republic's territory play a crucial role in the development of river networks in Azerbaijan, leading to significant changes. The river network of Kur river shown below (Fig 1).

The Kur river a length of 848 miles (1,364 km) and encompasses a drainage basin of 72,500 square miles (188,000 sq km). Numerous affluents of the river contribute to hydroelectric power generation, and the Kura is widely utilized for irrigation needs. The watercourse is passable upstream for 300 miles (480 km) until reaching Yevlax, situated just south of Mingeçevir [2]. The Kur River traverses through the territories of Turkey, Georgia, and Azerbaijan, flowing through the Kura-Araks Lowland and ultimately pouring into the Caspian Sea.

Fig.1. Kur River.

Despite Georgia having no direct connection to the Caspian Sea, it plays a crucial role in the pollution of the Kura River. This is primarily due to Georgia not being a party to international water conventions. The main reason for this is Georgia's non-adherence to international water conventions. If Georgia were to join these conventions with certain monitoring measures, it could help deter its contribution to the pollution of the Kura River.

Most rivers passing through Azerbaijani territory become contaminated with various pollutants when entering neighboring countries. In recent times, water quality degradation in Azerbaijan's river basins has reached alarming levels. In the Kura-Araks basin, water quality deterioration has significantly increased, confirmed by the presence of anthropogenic chemical compounds in transborder river basins and the observed sediment accumulation in the Kura Delta in the Caspian Sea. In Georgia, industrial and domestic effluents from cities such as Borjomi, Kareli, Khachuri, Kaspi, Gori, etc., flow into the waters of the Kura River. The Tona River, considered Armenia's most polluted river, merges into the Khrami River in Georgia, which eventually joins the Kur River, contributing to its contamination. The main sources of the Kura's pollution are industrial and domestic effluents from neighboring countries, as well as the runoff of pesticides from agricultural lands during rainfall [3].

Long-term observations of the Kura River indicate that the contamination level exceeds the norm several times (according to the Water Pollution Index, according to the State Standard). The amount of phenols in the Kura River's water composition is 4-8 times higher than the norm, certain compounds are 5-7 times higher, the quantity of petroleum products is 1.2-2.8 times higher, and the amount of biogens is 1.5-3.6 times higher. Industrial effluents, mainly heavy metals (mercury, cadmium, etc.), phenols, petroleum products, etc., are the main contributors to water quality deterioration in the Kura River. In recent times, concerns have been raised about dangerous levels of heavy metals affecting human health. The beneficial water used for food consumption becomes useless, altering the composition of water biodiversity and leading to decreased productivity and fish poisoning. Result of pollution shown below (Fig 2)

Fig.2. Result of pollution.

The reason for the increased pollution of rivers is that the self-cleaning capacity of rivers is less than the amount of organic substances in the river. To solve the problem of water pollution with organic matter and pathogens, it is necessary to reduce the amount of pollutants entering water bodies. It depends on the pH indicator. The pH of the water is considered to be between 6-8. When the pH is equal to 6 in river water, crustaceans, insects and some algae are destroyed. A pH lower than 5 limits the reproduction of aquatic and terrestrial organisms. fish populations disappear completely.

2.EXPERIMENTAL DETAILS

For the sample collection, containers were first washed with distilled water and then rinsed twice with deionized water under laboratory conditions. Subsequently, the sample containers were stored in a 10% nitric acid (HNO_3) solution for 48 hours, followed by two rinses with deionized water and then dried.

The water sample was taken from the Kura River flowing in the territory of Barda city Mammadli village.

Upon collection, laboratory parameters of the water sample were measured, including pH, electrical conductivity (COND), the quantity of Total Dissolved Solids (TDS) and alkalinity.

pH measurement was conducted using a pH meter. Before measurement, the meter's electrode was rinsed twice with distilled water, and the device was calibrated by checking against a standard solution. The pH of the sample was then measured, ensuring that the electrode was rinsed with distilled water before each new measurement.

The measurement of electrical conductivity (conductivity) was carried out using a conductivity meter. Conductivity was measured with the help of conductivity electrodes. The containers used for measurement were washed at least three times with regular water and then with distilled water before drying. Before each new sample measurement, the electrodes were rinsed and cleaned in two separate containers filled with distilled water. To clean the electrode properly, it was first rinsed in the distilled water of the first container, and then in the second container for better cleansing. Before performing the measurement, the sample container was first washed with regular water, then rinsed with distilled water, and finally, the sample was poured into the container for measurement.

The measurement of the quantity of Total Dissolved Solids (TDS) was also conducted using the conductivity meter. For this purpose, the device mode was changed to TDS, and the respective measurement was performed. When conducting measurements with the conductivity meter, the temperature must be recorded. The temperature during the measurement of the water sample from the Kura River was 25.2°C. The result of analysis shows below with table (Tab 1)

Tab 1. Quality parameters of water sample

	pH	CON µs/cm	Alkalinity mg/L	TDS mg/l
Water sample	7.90	840	171,5	504
WHO	6.5–8.5	400	200	300

As can be seen in the table, the water samples taken from the river are relatively higher than the drinking water standards.

The level of the conductivity 2 times more than standarts. Conductivity is a key parameter in assessing the overall quality of water and it can indicate the presence of dissolved ions and salts in water. High conductivity levels is contamination or the presence of undesirable substances.

But the level of the pH is reletivly normal. WHO said that “water has a neutral pH of 7, which indicates that it is neither acidic or basic” [4].

The level of alkalinity in water is a necessary parameter that has implications for various processes and systems. Alkalinity is a measure of a water sample's ability to neutralize acids. Also, in processes like coagulation, flocculation, and sedimentation, maintaining appropriate alkalinity levels can enhance the effectiveness of treatment chemicals and improve the removal of impurities. But as we observed the level of the alkalinity is less than standard but this level can change depend various condition and significant increase in alkalinity can disrupt the balance of the aquatic ecosystem, leading to stress or death of species in marine life.

And another important parameter of water quality is TDS (Total Dissolved Solids). High TDS (Total Dissolved Solids) levels may suggest the presence of various contaminants, such as salts, heavy metals, and other dissolved substances. Elevated TDS can affect the taste, odor, and appearance of water. Excessive TDS in drinking water can be an indication of potential health risks. High concentrations of certain ions and contaminants may have adverse effects on human health. Also the TDS level of the water sample is higher than WHO standards. In general it is possible to say that Kur river is polluted with different contaminants and monitoring and rehabilitation measures should be taken in account.

3. CONCLUSION

In conclusion, the comprehensive water quality analysis conducted on sample taken from the Kura River in the Barda city Mammadli village areas reveals troubling findings, indicating pollution with various contaminants. The rigorous cleaning procedures applied to the sample containers ensured a meticulous collection process, allowing for accurate assessment of key parameters.

The pH measurement of the water sample, though relatively normal at 7.90, suggests neutral conditions within the acceptable range set by the World Health Organization (WHO). However, the electrical conductivity (COND) levels stand out prominently, registering at 840 µs/cm—twice the WHO standard of 400 µs/cm. This elevated conductivity indicates the likely presence of dissolved ions and salts, signaling potential contamination and raising concerns about environmental and health risks. Alkalinity, a critical parameter for neutralizing acids, is measured at 171.5 mg/L, surpassing the WHO standard of 200 mg/L. Additionally, the Total Dissolved Solids (TDS) concentration in the water sample is recorded at 504 mg/L, exceeding the WHO standard of 300 mg/L. This elevated TDS level indicates the potential presence of various contaminants, with implications for taste, odor, and potential health hazards.

Given these findings, it is evident that the Kura River in the sampled locations faces a notable pollution issue, with the high levels of conductivity and TDS pointing to both environmental and health risks. Suitable action is recommended, including continuous monitoring of water quality and the implementation of immediate rehabilitation measures to address and mitigate the impact of pollutants in the river. These measures are crucial not only for preserving the health of the aquatic ecosystem but also for safeguarding the well-being of communities relying on the river as a water source. Comprehensive strategies for pollution control and environmental restoration should be promptly instituted to ensure the long-term sustainability and health of the Kura River.

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