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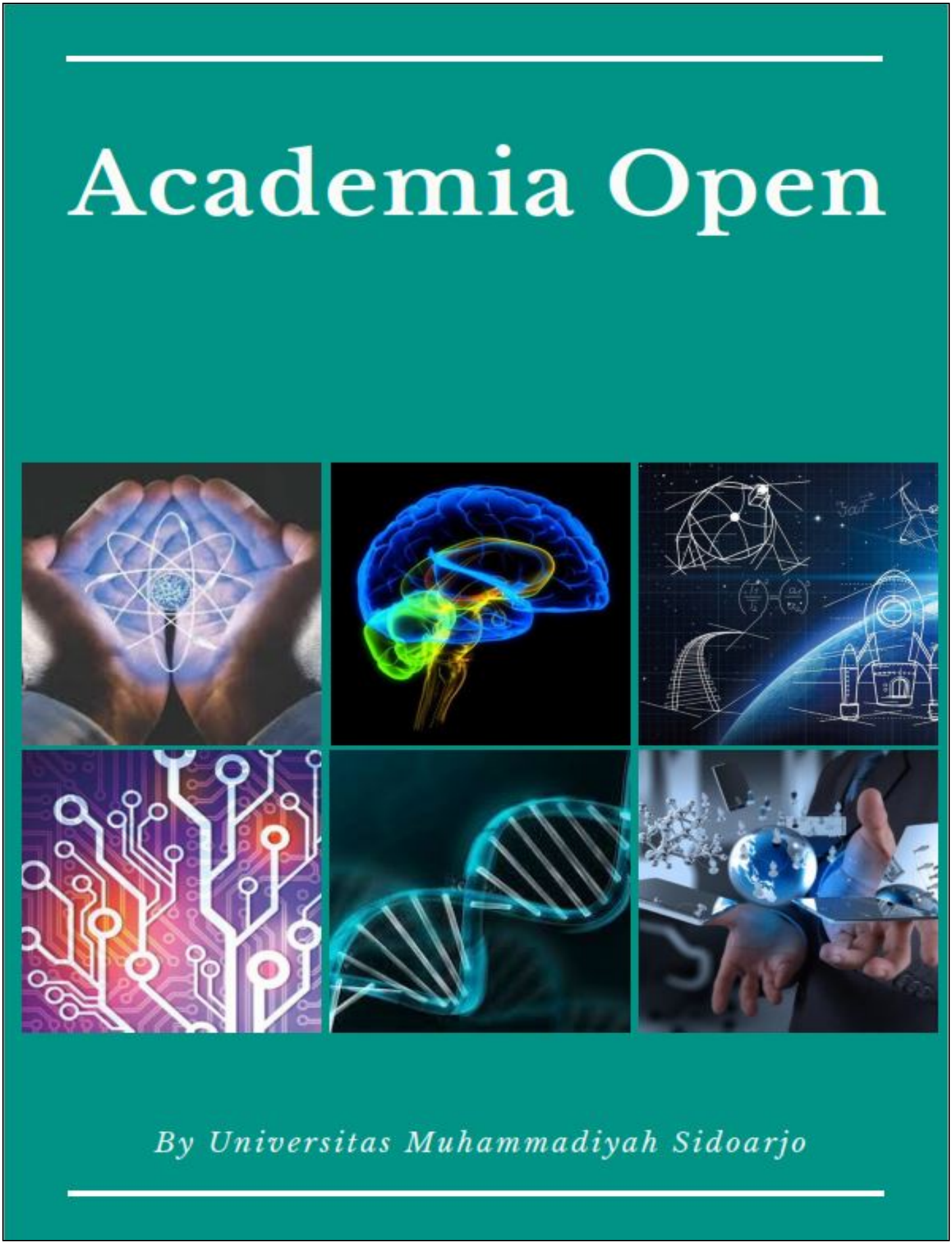

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Environmental Changes of the Temirnik River in Rostov-on-Don

Perubahan Lingkungan Sungai Temirnik di Rostov-on-Don

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Abstract

General Background: The increasing anthropogenic impact on river ecosystems has raised concerns about water quality and its effects on surrounding communities. **Specific Background:** This study focuses on the Temirnik River, located in the northern part of the city, particularly assessing pollution levels in the beaches of "Druzhba" and "Surp Khash." Historical data from 2000-2001 and recent analyses from 2017-2019 reveal significant fluctuations in chemical and biological toxicity. **Knowledge Gap:** While previous studies have documented pollution levels, a comprehensive comparison of historical and recent data to understand long-term changes and community impacts remains insufficiently explored. **Aims:** This study aims to track changes in pollution levels over time, evaluate the chemical and biological toxicity, and assess the anthropogenic impacts on the Temirnik River. **Results:** Chemical analysis revealed increased hardness of water due to the accumulation of calcium and magnesium sulfates and chlorides. The river, heavily impacted by untreated industrial and municipal waste, showed high toxicity levels, especially in the years 2017-2019. Bioassays using Chlorella vulgaris, Raphanus sativus, and Daphnia magna confirmed these findings. **Novelty:** This study provides a detailed comparative analysis of historical and contemporary pollution data, highlighting the persistent and worsening impact of anthropogenic activities on the Temirnik River. **Implications:** The findings underscore the critical need for ongoing monitoring and intervention to mitigate pollution. They advocate for implementing effective cleaning operations and regulatory measures to protect water quality and community health.

Highlights:

1. Increased water hardness from industrial and municipal waste.
2. Persistent high toxicity levels impacting ecosystems.
3. Urgent need for continuous monitoring and pollution control.

Keywords: Temirnik River, chemical pollution, biological toxicity, historical data, anthropogenic impact

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Introduction

The recent significant deterioration of the problem of clean water for drinking, technical and household purposes in Rostov-on-Don and the Southern Region as a whole has made it necessary to review the literature of previous years to track the state of pollution and its dynamics. This is due to the large discharge of wastewater that has not reached the required degree of purification. At the same time, a significant part of the pollution occurring in water bodies is of technogenic (anthropogenic) origin; many impurities in river water exceed the permissible level and are often toxic [1].While the urban section of the Temirnik River (Rostov-on-Don, Southern Federal District) is under anthropogenic pressure. During the investigation of water toxicity by bioanalytical method, a clear drawback of using one bioassay was revealed. In [6], a set of bioassays was used.

In this context, our review and analytical study of the data of chemical analysis of the waters of the Temirnik River is of importance for assessing the type and degree of their pollution by industrial and household waste and identifying the most dangerous and their harmfulness causes.

The assessment of toxicity based on only one bioassay, the most sensitive, is unacceptable. The toxicity assessment was carried out according to the scale developed by the authors. The scale takes into account the results of assessing the level of toxicity according to each bioassay, and classifies the water quality according to the approved categories of hydrochemistry.

Methods

Study area

Most of study area belong to the Temirnik river in the northern part of the city. This is the area of the beaches "Druzhba", "Surp Khash". Toxicity assessed in section of the Temirnik River in Southern District of city.

Methodology

The basis of this study is the chemical and analytical data obtained from refrence [5] in 2000-2001. The review of the results of water samples studied in the summer and autumn periods was taken into account regulatory requirements according to [2-4].

The analysis of one hundred samples was carried out and compared with the results of the study of reference [6] in which The water quality of the Temirnik river was assessed by the bioanalytical method according to a set of practices, taking into account the toxicity levels of each of the applied bioassays. The studies were conducted in 2017-2019. The cultures was Chlorella vulgaris, Raphanus sativus (bioassay) and Daphnia magna were used

Result and Discussion

The results of 6 ions of the composition of salts, nitrogen and phosphorus compounds, dissolved oxygen, pH, total iron, fluorides, petroleum products, detergents (surfactants), BOD5, COD, aluminum, strontium, 7 heavy metals, toxins of organic origin, physical properties of water were determined. Their data were compared with the maximum permissible concentration of drinking water, which revealed "foci of pollution" in water bodies that have a negative impact on the quality of water in the river.

The results of the analysis in [5] allow us to consider the main factor of pollution to be salt impurities in the form of CaSO4, MgSO4, NaCl, etc., which make up 70-80% of the dry residue in the range of 2.0-3.3 g/l. The hardness of the water is generally increased (16-23 mEq/l). Sulphate ions range from 0.8 to 1.4 g/l. The color of the water is several times higher than usual. During the autumn period these shows

Increase by 15-20%. Chemical oxygen consumption (COD) values are above normal: 32-38 mg/l in the area of the Rostovsky sanatorium and the Kashtan tourist center in June-August 2000. In the same year, the use of petroleum products was detected in this area (0.2 - 1.2 mg/l) and Sg^2 (9.7 - 9.9 mg/l).

In general, 7 heavy metals Al, F, pH and nitrogen group compounds (NO*, NO2, NO3) did not exceed the standard values.

The obtained data allow us to conclude that the greatest influence of technological pollution (industrial waste) and anthropogenic pollution is observed in the Temirnik river in the Oktyabrsky and Zheleznodorozhny districts of Rostov-on-Don. The nature of the impurities indicates that according to the established Maximum permissible concentration (MPC) criterion the water in the Temirnik river water should be classified as fresh water according to the classification of O. Alekin with a wide range of mineral and organic components - pollution entering the river with wastewater from industrial enterprises and city institutions of various profiles and household and economic

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emissions. This is also evidenced by the stable nature of the detected impurities in their composition and concentration, inherent in local parts of the river or reservoir, which do not experience significant fluctuations at different times of the year and over several years of monitoring. Such disturbances in the ecological balance of natural water systems lead to an increase in the color of the water, which we noted above. This may be caused by the natural processes of chemical weathering of rocks, soil filtration, the formation of colored substances in the reservoir, and the entry of sewage from some enterprises. High color has a detrimental effect on the taste of water and the development of plant and animal life in the water body,which increases the disruption of the natural ecosystem of the studied rivers. This work is related to what was previously carried out [1].

The Temirnik River water showed a wide range of toxicity from “low toxicity” (class “A”) to “high toxicity” (class 5). The dynamics of water quality was characterized by an increase in toxicity from 2017 to 2019. The highest degree of water toxicity was recorded at the mouth of the Temirnik River, and in the Don River below the mouth of the Temirnik River, near the Botanical Garden of the Southern Federal University at the storage site of the extracted bottom sediments. Bioassay data were confirmed by analytical data on water pollution [6].

Conclusion

1. In the Temirnik River, saline pollution accumulates in the form of calcium and magnesium sulfates and chlorides, which causes an increase in the over all hardness of the water .

2. Because of The strong effect of anthropogenic pollution observed of the river, where untreated industrial wastewater and municipal waste are discharged in this area. The river cannot cope with such a load through natural self-purification processes.

3. Analysis of the results obtained convinces us of the need to trace the pollution in the past to compare it with the present and the results of carrying out a set of cleaning and cleaning operations of the Temirnik river bed.

4. In this review and comparison of pollution in different years of pollution and toxic effect in the Temirnik river, we note that the river is constantly suffering from anthropogenic influence and that the impact of this pollution is reflected in the community as a result of toxic pollution.

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