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Water Pollution Control of Ecosystem Based on Naive Bayesian Algorithm

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Abstract: With the increasingly serious environmental problems, a new type of environmental protection technology is urgently needed to improve the efficiency of environmental governance. Therefore, it is very necessary to accelerate the certification and evaluation of environmental protection technology and establish a scientific environmental protection evaluation system. With the development of economy, people pay more and more attention to living conditions. As a major factor of ecological environment pollution, water resource pollution has also received widespread attention. To solve the problem of water resources, it is necessary to start from the root, and take physical, chemical, biological and other means to achieve sewage treatment. It is also necessary to strengthen the transformation of the water resources circulation system to save water resources, and repair the environment, so as to maintain the stability of the environment and create a warm and comfortable environment for people's production and life. Through the analysis of experimental data on the effect of sewage control, it was found that the efficiency of the naive Bayesian algorithm used in this paper was 18% higher than that of the artificial algorithm, which showed that the naive Bayesian algorithm was more effective in the prevention and control of Water Pollution (WP) in the ecosystem.

1. Introduction

Various evaluation indicators of the ecosystem are quantified according to relevant national laws, regulations, specifications and other standards. For those that fail to meet the requirements of the standards and have not been quantitatively analyzed, they are described quantitatively and qualitatively according to relevant specifications and procedures. The inspection of sewage treatment technology mainly includes two types: field confirmation test and indoor confirmation test. The field confirmation test is the field test and confirmation conducted in the WP control area.

This method is convenient to use, and the cost is low. The data are true and reliable, and applicable to the inspection of industrial wastewater and living sewage. From the ecological point of view, the treatment method suitable for environmental protection should be selected when the water body is treated. Based on environmental recovery, in the process of WP prevention and treatment, it is necessary to constantly innovate, explore and improve the utilization rate of resources to achieve the protection of ecology and environment. Only on the basis of the unity of ecological concepts, can green ecological restoration and WP control be better combined to achieve the goal of sustainable development.

Many experts have analyzed the ecosystem. Spears Bryan M made a comparison of three lakes where preventive measures were taken to reduce the effects of human stress. In order to maintain or improve long-term social welfare, an elastic ecosystem should be established, and its ecological integrity should be maintained with the prevention and control of lakes as the main content, which was to have a solid basis to support the initial initiatives that attempt to reverse the change in environmental conditions [1]. Carey Cayelan C established a framework of seamless connection of data, models and network architecture, which aimed to promote the realization of circular economy forecast of freshwater basin in the short term. He would focus on how to develop, implement and maintain a forward-looking management and prediction system, and broke through the obstacles of scientists to control lakes and reservoirs around the world [2]. Kosnik Marissa B analyzed the sustainable utilization of chemicals in sewage samples by analyzing the limit of ecological cycle, thus explaining some stress reactions, which had a great positive impact on the protection of ecosystems [3]. Basu Nandita B identified the main cognitive gaps related to nitrogen cultural heritage in the natural ecological environment and provided suggestions on how to control and improve the water environment [4]. Cao Jie analyzed heavy metal elements such as lead, zinc and cadmium in mining areas, tailings areas, sewage treatment plants, residential areas, reclamation areas and agricultural areas. The geological accumulation index method laid a foundation for the development and environmental protection of the mine [5].

Many experts set the ecological compensation system based on the price of ecological services with the goal of maintaining the ecological environment. Mehinto Alvine C proposed a risk management system for water ecosystem, which defined four major regulatory thresholds from less regulation to higher attention. Pollution prevention and control methods were introduced to reduce environmental emissions. It was necessary to carry out high-quality toxicity tests and strengthen the understanding of behavior mechanism in order to better link the negative effects related to ecology [6]. Hou C H Chen established comprehensive evaluation indicators for economy, ecological environment and medical treatment, and studied the coupling and synergy of China's economy, ecological environment and health system in 2009-2016 using the entropy weight method and the collaborative coupling model. It was a new idea to realize green, healthy and sustainable development to attach importance to the interconnection and coordination of green product systems [7]. Faroque Sarker discussed the lack of effective governance and implementation of water resources, and provided a number of feasible methods for providing clean water for all and sustainable development [8]. Dai Yingjie summarized the comprehensive impact of pollutants in the farmland ecological environment, and put forward the countermeasures and approaches for treatment against the distribution characteristics, degradation and migration, and environmental impact [9]. Haghnazar Hamed analyzed the harm of WP to human body during the closure period, and the salt content and alkalinity of seawater increased during the closure period. The sources of pollution included weathering, urban sewage, industrial and agricultural wastewater, solid waste and vehicles [10]. To solve the problem of pollution control of water resources, people should protect water resources where they could, so as to avoid further deterioration of the environment and achieve the goal of restoring the ecological environment.

The above research only focused on the prevention and control of WP in ecosystems, which did not combine naive Bayesian algorithm. Although these studies had some referential value, they were more or less insufficient to prove the conclusion and had some room for improvement. In order to solve the problem of WP prevention and control in the ecosystem, this paper put forward the research of WP prevention and control in the ecosystem based on naive Bayesian algorithm. By analyzing the process and principle of WP prevention and control, and through the analysis of experimental data, the effects of artificial algorithm and naive Bayesian algorithm were compared, which had reference significance for the future research of algorithms in other fields.

2. Evaluation of WP Prevention and Control in Ecosystem

2.1. Evaluation of Ecosystem Cycle Purification

Ecological restoration means that in the process of WP control, both the relationship between people and water, and the relationship between people and nature, as well as the relationship between water and nature should be considered. With the continuous development of economy and the rapid expansion of industrial scale, the problem of water resources has become increasingly prominent. The population of the city has increased rapidly, and the industry has become more and more prosperous. The residents have more and more water, and the demand for water is also increasing. With the emergence of drinking water safety, environmental pollution, excessive discharge and other problems, relevant experts and scholars need to carry out systematic and strategic research and formulate corresponding countermeasures to solve these problems.

The test index can be divided into general and special types according to the difference in nature. The general standard is universal and can be used for the inspection and evaluation of various biological treatment technologies. Its characteristic index is an index reflecting the specific process characteristics and WP characteristics of the evaluated technology. A large number of high-quality and repeatable tests were obtained through the inspection of factors such as WP site and temperature, which saved a lot of test time. However, due to the need for strict simulation, the cost is relatively high, which is mainly used in bioreactors, sewage treatment equipment, biological aids and other aspects. The principle of ecosystem cycle purification is shown in Figure 1.

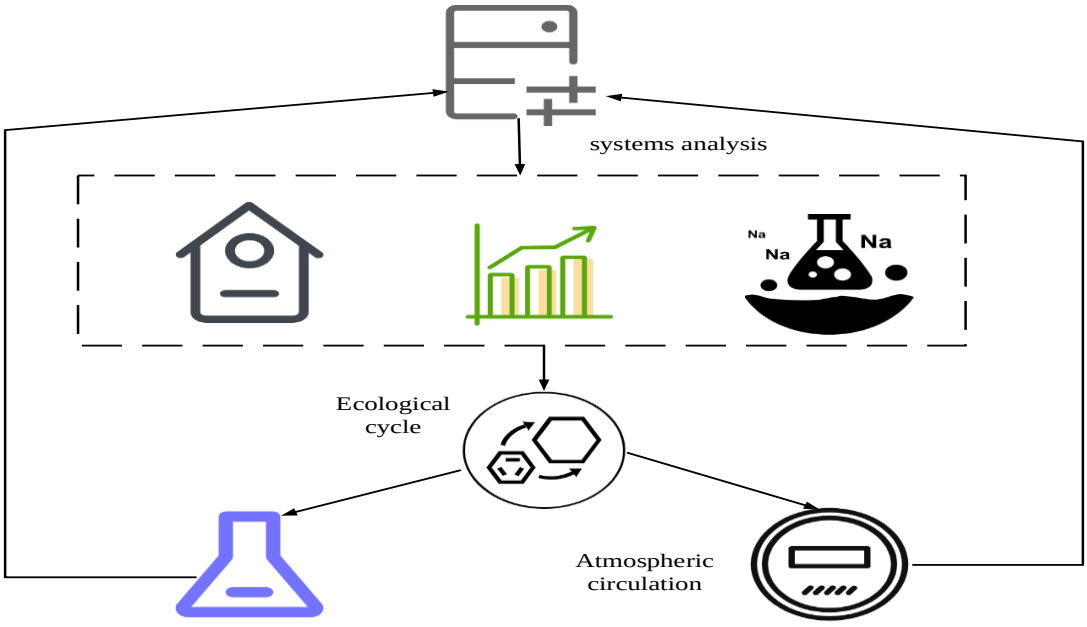


Figure 1. Principle of recycling and purification of ecosystem

2.2. Technical Principle Evaluation of WP Prevention

At present, the treatment methods for WP are relatively diverse. Due to the different water quality, treatment difficulty, treatment cost and management, different water bodies can adopt different treatment methods. One is to use the principle of falling precipitation of insoluble large particles and insoluble materials in water. In the polluted water source, insoluble large particles and insoluble materials settle due to the influence of gravity, which achieves the purpose of "solid-liquid separation". In the treatment of wastewater in the area polluted by water, the separation method of "solid-liquid separation" should be reasonably used for pretreatment according to the actual situation of water sources in various places.

Before discharging the sewage, the first sedimentation shall be carried out, and then the sewage shall be divided into secondary sedimentation. After sedimentation, the sediment content in the sewage can be reduced to achieve water quality improvement. Although the cost of using precipitant is low, it is limited to processing samples with poor solubility.

According to the particle size of the particles in the sewage, the small screen and separator whose diameter ratio is used to filter the suspended substances in the sewage are determined. The microporous channel can separate the suspension from the sewage. The filtration process can be divided into four stages: screen filtration: For the first time, the screen filter is used to treat industrial sewage and living sewage. Under the action of fluid pressure and mechanics, a membrane filter with specific structure is selected. The microorganisms and organic substances in the sewage are removed by membrane secondary filtration.

In the process of industrial production, due to the large oil content in the sewage, it is necessary to establish an isolation tank for treatment. The waste water is discharged into the oil drain tank at a low level. The oil would float on the water surface when the concentration is reduced, and a layer of oil would be coated on the water surface with an oil knife. During the cleaning process, more oil would be deposited in the oil removal tank, and the bottom can be discharged through the sewer. The pollutants are adsorbed on the water body by using the extremely dispersive micro foam plastic. Buoyancy is greater than air buoyancy and air buoyancy. Therefore, pollutants would float on the surface, thus resulting in bubbles. The suspended body in the polluted water is sucked into the surface of the bubble, and then it is lifted and placed on it. In the water, shovels are used to clean up the dirt. Accordingly, different drainage measures can be designed for different pollution periods. If it is in the early stage of flood, due to heavy rainfall, it can be properly drained. According to the characteristics of vertical layering of water body, the vertical layering flood discharge is adopted. The surface drainage releases algae, and the deep drainage is scoured by the flow at the bottom of the dam, which has achieved effective control effect.

As the main control object, phosphorus would be discharged under pH and redox conditions once it enters the water, thus causing secondary pollution. In order to reduce the discharge of phosphorus, aluminum or iron salt can be sprayed directly into the water, and aluminum and iron can react with phosphorus in the water, so that aluminum and iron ions can combine with phosphorus in the water. Aluminum or iron salt can enter the sediment layer, and the activity of phosphorus in the sediment becomes more stable. However, the amount of aluminum would cause secondary pollution, so it is necessary to ensure that the aluminum content does not exceed the standard. Excess iron salt would cause the decrease of pH value, which can be adjusted by adding calcium salt. It grows in water, which can also promote the retention of total phosphorus in the soil. When the water body, especially the submerged vegetation, reaches a certain amount, the dissolved oxygen in the bottom water body would increase, so that the phosphorus in the sediment can be stably buried in the silted water, thus achieving a better effect. The principle of WP prevention technology is shown in Figure 2.

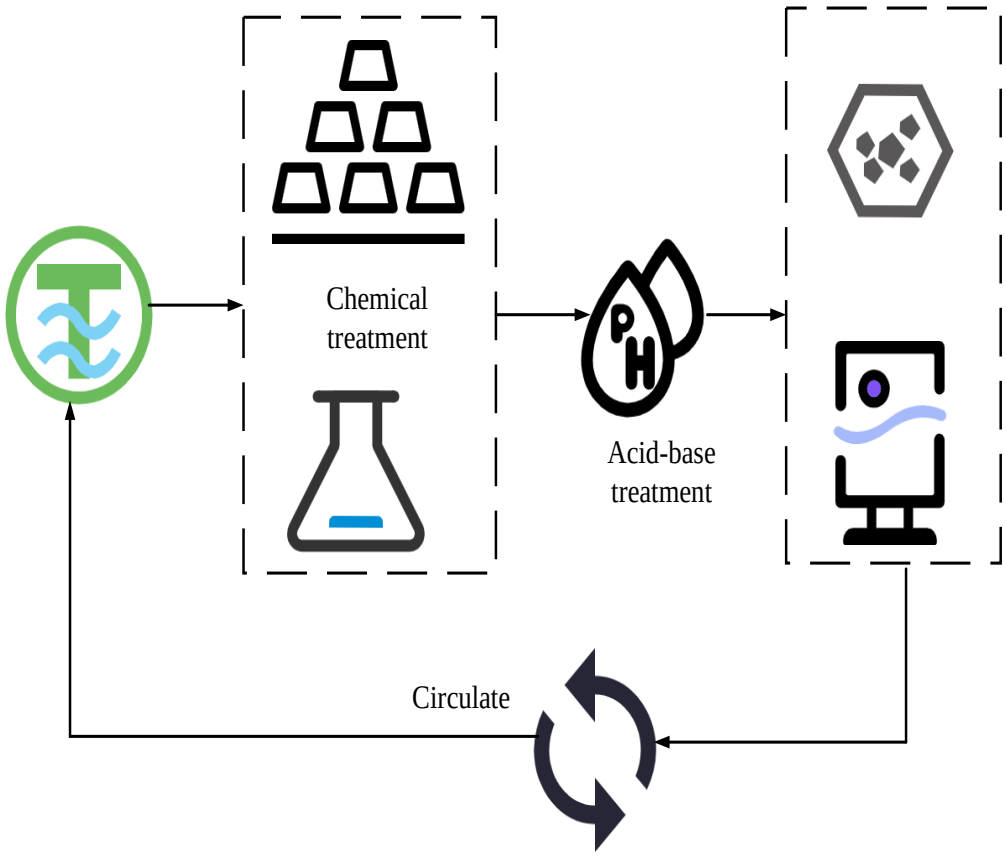


Figure 2. Technical principle of WP prevention and control

2.3. Application of WP Prevention and Control in Ecosystem

Microbial pollution control technology is an important means of water treatment and treatment. It uses organisms or aquatic plants that can absorb pollutants to carry out metabolism. Biofiltration technology is a new type of biological sewage treatment equipment. The air filter tank process has the advantages of high load, low energy consumption, low energy consumption and high practical value, which is widely used in small wastewater treatment plants. The use of many biotechnologies requires a comprehensive study of various microorganisms, the definition of the food chain of microorganisms, and a certain understanding of the viability of microorganisms. Therefore, biotechnology has high practical value in wastewater and ecological restoration.

In the aspect of prevention and control of WP in the ecosystem, the basin integration system, the establishment of administrative organs, the distribution of powers, the division of responsibilities, and the establishment of a sound operational coordination mechanism should be implemented to ensure the overall planning and management of the basin. Especially in the process of water environment treatment in the water source area of the middle line, effective control of the environment should be realized.

Relevant experts analyzed that the river and silt reflected the environmental characteristics of its location, and provided valuable ecological and environmental data for it. The presence of heavy metals poses a great threat to water bodies and human bodies. The content of these toxic heavy metals shows that the environmental situation is not optimistic and would cause great damage to the water environment of rivers [11]. Many scholars have discussed the effectiveness of different WP control technologies, capital expenditure, operation and maintenance costs, implementation costs of policies and measures, and feasibility in different situations. They hope to assist policymakers and

practitioners in using technologies and policy instruments applicable to the local environment to deal with WP in a sustainable and cost-effective way [12].

Professional personnel analyzed that the values of groundwater risk factors and risk indicators are greater than the overall risk threshold. The results show that the level of children is higher than that of adults, which indicates that their risk to health is significantly higher than that of adults. The most dangerous factor for the overall health of human body is the contact between drinking water and skin. This shows that arsenic in groundwater has potential harm to the health of residents [13]. Relevant personnel analyzed issues related to fisheries, climate change and species protection. In addition to more directly related research on management, they created opportunities for collaboration, and carried out long-term, eco-based monitoring on the ecosystem, so as to use scientific and technological progress to strengthen the understanding of global policies and ecology of the oceans [14].

Relevant personnel use the desk review design to determine the environmental pollution and health impact related to landfilling. Groundwater pollution and gas emissions may have an impact on health, thus causing carcinogenic and non-carcinogenic effects on the exposed population living nearby [15]. By considering the value, ecological protection cost, development opportunity cost and other factors, the prevention and control of ecosystem WP should be adjusted through the government and marketization. Policies for the coordinated development of environment and economy should be formulated to safeguard the interests of all parties concerned. The water resources utilization in different regions should be fully considered in the water source area of the middle line to ensure the safety of water resources. The application analysis of WP prevention and control in ecosystem is shown in Figure 3.

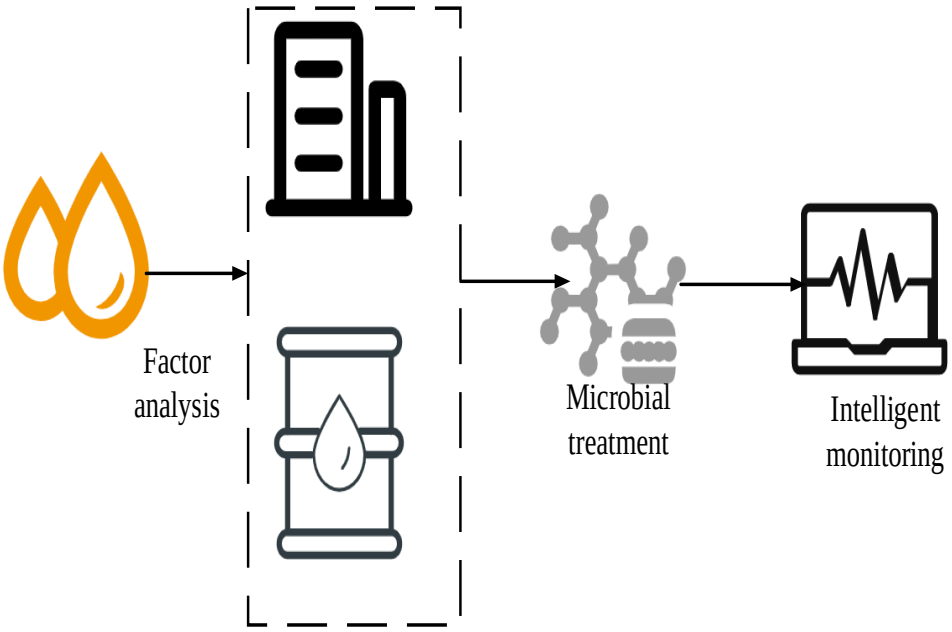


Figure 3. Application analysis of WP prevention and control in ecosystem

3. Naive Bayesian Algorithm

Bayesian model is derived from classical mathematical basis and has good classification effect. In a small range, it can complete various types of work and is very suitable for incremental learning. Especially when the data exceeds the storage capacity, it can be incremented one at a time.

This method is not sensitive to lost data, and its operation method is relatively simple. It is a common text classification method.

The joint distribution obtained by Bayesian formula is as follows:

$$P(X, Y = A_k) = P(Y = A_k)P(X_1 = x_1, ..., X_n = x_n | Y = A_k) \quad (1)$$

The classification formula of probability maximization obtained by Bayesian formula is as follows:

$$F(x) = A_k P\left(X = X_k | Y = A_k\right)P\left(Y = A_k\right) \quad (2)$$

Based on the independence assumption of Formula (2), the naive Bayesian formula is obtained as follows:

$$f(x) = A_k P\left(Y = A_k\right)\prod_{i=1}^{m} P\left(X = X_k | Y = A_k\right) \quad (3)$$

4. Experimental Evaluation of WP Control in Ecosystem

4.1. Experimental Method

By selecting a sewage sample from a certain area, the situation of the sewage treatment system in 2017-2021 was analyzed, and the various water quality indicators in this area were analyzed using naive Bayesian algorithm. The situation of the sewage treatment indicators in the past five years was compared.

4.2. Data Evaluation

4.2.1. Evaluation of Sewage Discharge Index

The sewage data from 2017 to 2021 were selected and analyzed using naive Bayesian algorithm to compare the indicators of sewage discharge. The unit was 10000 m3. The indicators of sewage discharge were shown in Table 1.

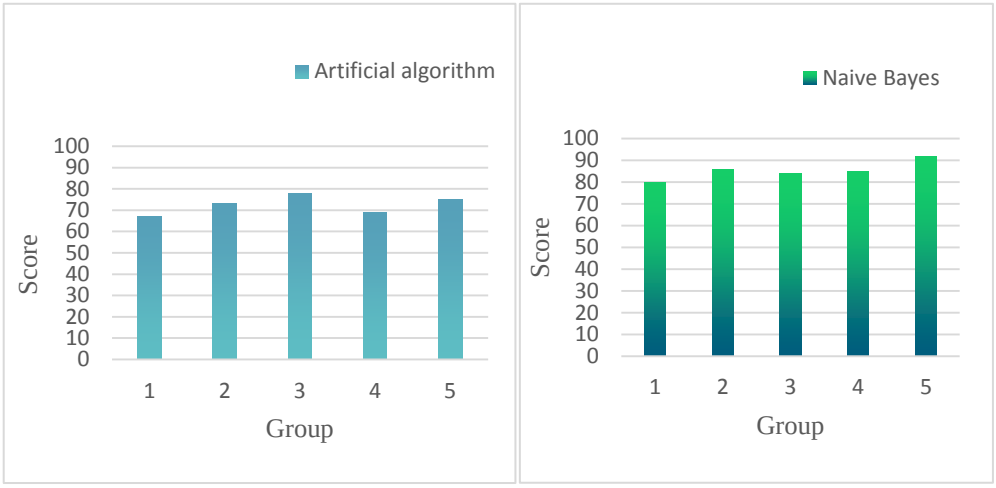
Table 1. Various indicators of sewage discharge

Target	Year				
	2017	2018	2019	2020	2021
Industrial wastewater discharge	298	345	456	564	543
Urban sewage discharge	457	674	498	678	578
Emissions from centralized facilities	124	138	168	214	246
Total sewage discharge	879	1157	1122	1456	1367

It can be seen from Table 1 that the range of industrial wastewater discharge was 2.98-5.64 million m3. The range of urban sewage discharge was 4.57-6.78 million m3, and centralized facility discharge was 1.24-2.46 million m3. From the overall data, the overall discharge base was large, so it was urgent to control the sewage discharge.

4.2.2. Evaluation of Sewage Control Effect

Five groups of data were selected to compare and analyze the effect of sewage control by using naive Bayesian algorithm and artificial algorithm. The hundred-point system was adopted. The higher the score, the better the effect of sewage prevention and treatment. The analysis and comparison of sewage control effect was shown in Figure 4.



(a)Artificial algorithm; (b)Naive Bayes

Figure 4. Analysis and comparison of sewage control effect

It could be seen from Figure 4 that Figure a showed the effect analysis of the artificial algorithm. Among them, the highest value was 78 and the lowest value was 67. The average value was 72.4. On the whole, the overall data was in a low state, and the data fluctuated greatly. Figure b showed the effect analysis of naive Bayesian algorithm. The maximum value was 92 and the minimum value was 80. The average value was 85.4. It could be concluded that naive Bayesian algorithm was better than artificial algorithm, and its efficiency was improved by 18%.

5. Conclusion

Through the analysis of the current situation and process of WP prevention and control in the ecosystem, this paper found that the current WP phenomenon was very common. In addition, due to the large amount of living sewage and industrial wastewater discharge, the rivers and river course were polluted, and the microorganisms and ecological environment in the water were also damaged. Through the analysis of sewage discharge and various indicators using naive Bayesian algorithm, it was found that the sewage discharge was increasing in recent years, and it was urgent to control sewage discharge and treatment. Naive Bayesian algorithm had reference significance for the prevention and control of WP in ecosystems.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] *Spears, Bryan M. "Lake management: is prevention better than cure?." Inland Waters 12.1 (2021): 173-186.*

[2] *Carey, Cayelan C. "Advancing lake and reservoir water quality management with near-term, iterative ecological forecasting." Inland Waters 12.1 (2021): 107-120.*

[3] *Kosnik, Marissa B, Michael Zwicky Hauschild, and Peter Fantke. "Toward assessing absolute environmental sustainability of chemical pollution." Environmental Science & Technology 56.8 (2021): 4776-4787.*

[4] *Basu, Nandita B. "Managing nitrogen legacies to accelerate water quality improvement." Nature Geoscience 15.2 (2021): 97-105.*

[5] *Cao, Jie, Chengyu Xie, and Zhiru Hou. "Ecological evaluation of heavy metal pollution in the soil of Pb-Zn mines." Ecotoxicology 31.2 (2021): 259-270.*

[6] *Mehinto, Alvine C. "Risk-based management framework for microplastics in aquatic ecosystems." Microplastics and Nanoplastics 2.1 (2021): 1-10.*

[7] *Hou, C., H. Chen, and R. Long. "Coupling and coordination of China's economy, ecological environment and health from a green production perspective." International Journal of Environmental Science and Technology 19.5 (2021): 4087-4106.*

[8] *Faroque, Sarker, and Nigel South. "Water pollution and environmental injustices in Bangladesh." International Journal for Crime, Justice and Social Democracy 11.1 (2021): 1-13.*

[9] *Dai, Yingjie. "Current research trends on microplastics pollution and impacts on agro-ecosystems: a short review." Separation Science and Technology 57.4 (2021): 656-669.*

[10] *Haghnazar, Hamed. "COVID-19 and urban rivers: effects of lockdown period on surface water pollution and quality-a case study of the Zarjoub River, north of Iran." Environmental Science and Pollution Research 29.18 (2021): 27382-27398.*

[11] *Ali, Mir Mohammad. "Distribution of heavy metals in water and sediment of an urban river in a developing country: a probabilistic risk assessment." International journal of sediment research 37.2 (2021): 173-187.*

[12] *Nikiema, Josiane, and Zipporah Asiedu. "A review of the cost and effectiveness of solutions to address plastic pollution." Environmental Science and Pollution Research 29.17 (2021): 24547-24573.*

[13] *Rakib, Md Refat Jahan. "Assessment of trace element toxicity in surface water of a fish breeding river in Bangladesh: a novel approach for ecological and health risk evaluation." Toxin reviews 41.2 (2021): 420-436.*

[14] *Matley, Jordan K. "Global trends in aquatic animal tracking with acoustic telemetry." Trends in Ecology & Evolution 37.1 (2021): 79-94.*

[15] *Siddiqua, Ayesha, John N. Hahladakis, and Wadha Ahmed KA Al-Attiya. "An overview of the environmental pollution and health effects associated with waste landfilling and open dumping." Environmental Science and Pollution Research 29.39 (2021): 58514-58536.*