

Water Pollution Prevention Engineering Device Integrated with Intelligent Blockchain Technology

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Abstract: Water pollution prevention and control has always been a topic of public concern, but the problems in water pollution prevention and control have not been properly solved. The popularity of intelligent regional chain technology in water pollution prevention and control has brought more possibilities, and few people have applied this technology to water pollution prevention and control. In order to improve the effect of water pollution prevention and control, this paper uses intelligent blockchain technology to design water pollution prevention and control engineering device. This paper first introduces the factors and harmfulness of water pollution, then analyzes the detection of water pollution, and then introduces the regional chain technology. According to this technology, the water pollution prevention and control engineering device is designed. Finally, the effect of water pollution prevention and control is analyzed. It is concluded that the chromaticity measured at each water source has decreased after using the water pollution prevention and control engineering device integrated with intelligent blockchain technology. The color of water source 3 is 13 degrees. After using the water pollution prevention engineering device integrated with intelligent blockchain technology, the turbidity of each water source shows a downward trend, and the water pollution has been greatly improved. Intelligent blockchain technology has played a good role in water pollution prevention and control.

1. Introduction

People cannot live without water, and water pollution has become a public concern. The more serious the problem of water pollution, the more it will cause social panic. Only by preventing and controlling water pollution from the root can we effectively reduce the harm caused by water pollution, and thus ensure the health of the public. Intelligent blockchain technology has a good

application in water pollution prevention and control, but few people have analyzed it. Therefore, it is necessary to apply intelligent blockchain technology to water pollution prevention and control.

Water pollution has a relatively wide application space at present. He, Mingjing analyzed waste derived biochar for water pollution control and sustainable development [1]. Tony, Maha A made a brief and systematic review of low-cost adsorbents used for environmental pollution control from the perspective of principle, mechanism and application [2]. Ahmed, Shahid's impact on water pollution and its source, impact and management [3]. Li, Xiang analyzed the elimination of water pollutants and its industrial application prospect of metal-organic framework [4]. Delitic, Ana believe that water pollution control promotes sustainable development [5]. Rink and Karsten analyzed the virtual geographical environment of water pollution control [6]. Li, He analyzed that regional integration can control transboundary water pollution [7]. Water pollution prevention and control has not yet involved intelligent blockchain technology.

In order to improve the water pollution prevention and control effect, this paper proposes a water pollution prevention and control engineering device integrated with intelligent blockchain technology, and analyzes its prevention and control effect. Finally, it is concluded that after the use of the water pollution prevention and control engineering device integrated with intelligent blockchain technology, the color and turbidity of each water source are significantly reduced. Compared with other people's achievements, this paper applies intelligent blockchain technology to water pollution prevention engineering devices for the first time.

2. Water Pollution Factors and Harmfulness

Water pollution factors and hazards are shown in Figure 1:

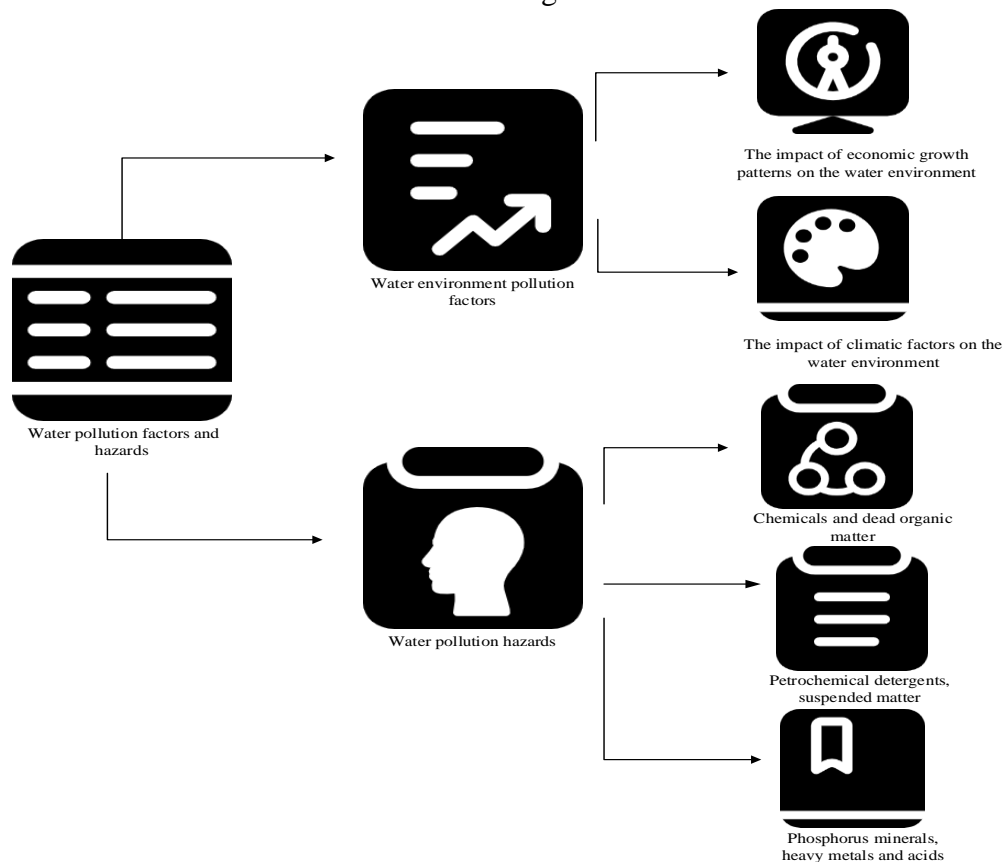


Figure 1. Water pollution factors and hazards

2.1. Water Environment Pollution Factors

2.1.1. Impact of Economic Growth Mode on Water Environment

The form of economic growth is slow, enterprises only pursue economic benefits, and technological transformation of enterprises often aims at expanding reproduction. With the continuous reform of the economic system, the continuous transformation of the growth mode and the rapid improvement of science and technology, the rational development and utilization of water resources will gradually take the path of scientific management. However, this transformation needs a long historical process. Another important reason for the serious problem of water resources is the different orientations of public policies [8-9]. For a long time, national economic and social development has focused on economic growth, primary product production and urban income growth, without considering the economic calculation of resource consumption and environmental costs. Under the planned economy system, some economic development measures are incompatible with environmental protection.

2.1.2. Impact of Climate Factors on Water Environment

The impact of natural factors has exacerbated the deterioration of the water environment to a certain extent, making the prevention and control of water pollution more difficult [10-11]. In recent years, climate change has led to changes in the distribution of global temperature, humidity and precipitation, causing some countries and regions to fall into serious disaster periods. With the increase of temperature, the decrease of surface runoff and the increase of evaporation, the possibility of early disasters is also increasing.

2.2. Water Pollution Hazard

Water pollution mainly comes from untreated and dumped industrial wastewater, domestic wastewater and agricultural wastewater, causing great harm to industrial and agricultural production and human health [12]. The impact of water pollution on industrial and agricultural production is to destroy facilities, reduce fertility, and affect human health; Contaminated water can cause stomach pain and cancer [13]. The source and risk analysis of polluted water are as follows:

2.2.1. Chemicals and Dead Organic Matter

The main sources of chemicals and dead organic matter are untreated urban wastewater, pharmaceutical wastewater, papermaking wastewater, agricultural wastewater, urban garbage, chemical cleaning agents, agricultural pesticides, herbicides, etc. [14]. Most organic chemicals are toxic. They flow into rivers and lakes, making water black and smelly, poisoning or killing aquatic organisms. If ingested, they will harm humans and animals.

2.2.2. Petrochemical Detergent and Suspended Solids

Most detergents are petrochemical products, and a large number of households and restaurants use detergents for washing. The leakage of water tankers and oil tankers is poured into the river, which is difficult to dissolve, causing serious water pollution. River garbage such as plastic packaging bags is very harmful to aquatic organisms, blocking the river, and endangering the ecological environment of aquatic organisms.

2.2.3. Phosphorus Minerals, Heavy Metals and Acidic Substances

Phosphorus is an important element for biological growth. Phosphorus-containing washing powder and low-phosphorus fertilizer affect a large amount of runoff after the lake, make the algae in the lake get rich nutrition and grow rapidly, reduce the viability of aquatic fish in the lake, and make the lake age and die. Water containing heavy metals will poison crops, and the acidic sources are mining waste, sewage discharged from factories into rivers, etc. They will poison aquatic plants and fish, and seriously damage the ecosystem of lakes and ponds. Mercury can cause speech confusion, hearing loss, nervous disorders, convulsions, general convulsions and childhood dementia; Lead can affect children's intelligence and lead to anemia and neurological disorders. Cadmium causes kidney and bone damage, which can lead to systemic pain, bone structure deformation, and even death; Arsenic damages metabolism and can cause skin damage, disability and skin cancer; Chromium causes skin damage, which can lead to skin ulcer and cancer; Phosphorus causes digestive system disorder, which can cause abdominal pain, vomiting, headache, dizziness, poisoning and death.

3. Water Environment Pollution Detection

3.1. Importance of Water Environment Prevention and Control

The current water situation and the serious pollution crisis facing mankind require us to properly protect and prevent water in our daily life and work. The prevention and control process may make people understand the movement and change of the natural environment over a period of time, reflect the quality of the aquatic environment and the discharge of pollutants, and provide main and accurate information to support water protection. As a quantitative study of water environment change, comprehensive and timely detection of water quality change characteristics can protect and manage water resources, prevent and control water and river pollution, and promote people to improve their environmental protection awareness in daily life, pay attention to protecting water resources in work and life, and make contributions to building an environment-friendly society.

3.2. Water Environment Prevention and Control Technology

At present, traditional prevention and control technologies can no longer meet the current needs, and new technologies with high cost effectiveness, high efficiency and accurate measurement are needed. The prevention and control methods of aquatic environment can be divided into three categories: automatic prevention and control, traditional prevention and control and emergency prevention and control, but these three technologies have their own advantages and disadvantages. For example, the advantages of traditional prevention and control technology are relatively mature, widely used, and the implementation process is clear. The advantage of automatic prevention and control technology is to promote the continuous prevention and control of pollution source water quality. However, due to the large number of water bodies, the complex local water environment, the automatic prevention and control equipment needs to adapt to different conditions, and the high requirements for equipment maintenance specialization, the high cost of consumables, the lack of trained technical personnel and many other reasons, the automatic prevention and control methods are rarely applied. The traditional control methods are summarized in Figure 2:

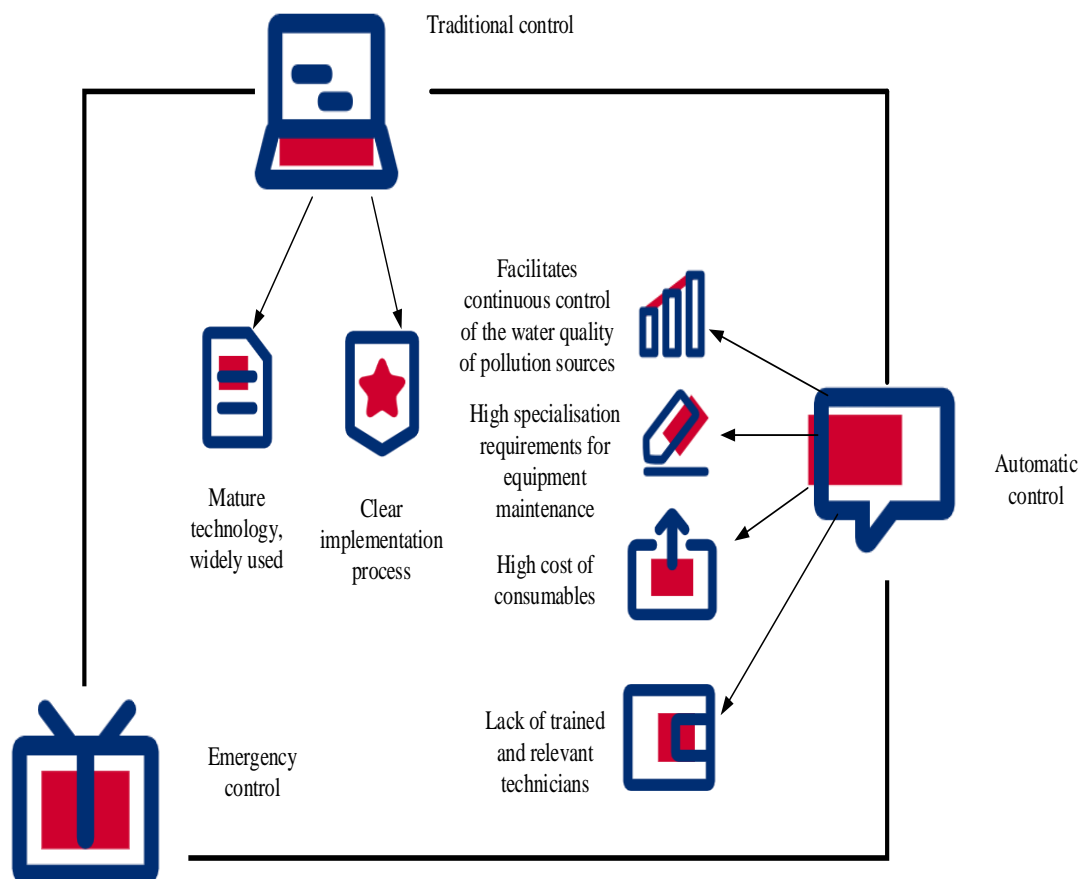


Figure 2. Techniques for the prevention and control of the water environment

3.3. Problems in Water Environment Prevention and Control

Environmental prevention and control technology plays a very important role in environmental protection. Due to the characteristics of water environment prevention and control (many sampling points, large sample size, time-sensitive, etc.), a reliable water environment prevention and control management mechanism has not yet been established. The defects of water environment prevention and control laws and regulations have seriously restricted the improvement and development of water environment prevention and control in China. The quality of aquatic environment prevention and control personnel is relatively low. Ordinary talents have less professional and professional qualities, pay less attention to water environment prevention and control, are unfamiliar with some advanced prevention and control methods, and can not make good use of the discoloration effect of heavy water on rivers. There are more and more reasons for water pollution, and the technical requirements for water environment prevention and control are also higher and higher.

3.4. Online Data Comparison of Detection

The establishment of detection and measurement network must comply with national standards and be carried out regularly. Pay attention to the maintenance and management of the detection network, which requires not only on-site information collection, but also the experience and ability to perform the prevention and control functions. The focus is to use different sampling methods for

sample comparison. Because the final results usually need to be delivered to the laboratory for further testing to obtain the factual information, the personnel engaged in the experiment should also have relevant business knowledge, have a full understanding of the relevant experimental ability, be able to perform the experiment, and improve the performance if possible to minimize the error.

4. Regional Chain Technology

Blockchain is a data structure composed of orderly arranged blocks, where a block is a file containing relevant information and recorded data. A block is composed of block header and block body. The former is a reference to other blocks, and the latter contains data information. The blockchain network is a point-to-point network, in which there is no central server or central management organization. Each node in the network has the same status, both as a customer and as a server [15].

A typical blockchain algorithm is a hash algorithm: suppose a hash value Hash (r) is found. If the original data is r , the result of the operation is R (Result).

$$R = Hash(r) \quad (1)$$

The characteristic of hash function Hash() is that for any input value r , a result R that cannot be traced from R to r will be obtained. Given an algorithm complexity d and a random variable n , the following formula can be obtained:

$$Rd = Hash(r + n) \quad (2)$$

Blockchain technology is a revolutionary change and challenge to the traditional social organization and use methods, and also an important attempt and achievement towards a new industrial form characterized by "equality and freedom, consensus and co-governance, openness and transparency".

First of all, blockchain represents a decentralized organization mode. In this organization mode, there is no centralized or hierarchical top-down management and control, but through bottom-up micro-environment interaction and competitive game between network nodes, forming a macro-system adaptive organization and the emergence of a higher level. Secondly, blockchain technology adopts a consensus-based data update mechanism. This makes it very difficult to manipulate or forge data, which is an important basis for decentralized trust of blockchain technology. Thirdly, the blockchain system adopts the data mode of open reading on the basis of privacy protection. However, data must be verified by all nodes before being written to the blockchain. After being written, all nodes can access it openly and freely, which is conducive to eliminating information advantages, reducing the trust cost of nodes in the system, and reflecting the technical characteristics of "openness and transparency".

5. Water Pollution Prevention Engineering Device

The water pollution prevention and control project applies different protection measures for different water types.

Rivers: attention should be paid to the comprehensive prevention and control of the whole basin, and strengthening the emergency prevention and control of water pollution emergencies is the main prevention and control measures. The main measures to protect the drainage layer of the water source area, ensure the water quality in the upstream of the protection area, and limit the use of indirect natural drainage ditches in the water source area are as follows: prevent toxic and harmful

substances from seeping into the protection area; Protect water resources at the basin level, prohibit or restrict shipping, recreational fish facilities, roads and railways and other mobile pollution sources.

Lakes and reservoirs: blue-green algae water bodies should be controlled, and total nitrogen and total phosphorus should be strictly controlled according to the type of algae. When algae water bodies occur, the rescue work of algae water bodies should be started immediately, and the causes should be analyzed according to the different characteristics of water bodies, and the control plan should be developed. In addition, measures to prevent river water pollution are also other important measures. Strictly control the water quality of the river entering the lake (reservoir) to purify the lake water; According to the characteristics of water quality, carry out scientific control of total nitrogen; Promote the development of soil testing and formula fertilization in farmland along the lake (reservoir); Formulate emergency plans in case of algae.

Groundwater: focus on pollution sources, pollution columns and pollution ways to prevent groundwater pollution. The main prevention and control measures include the development of junction and irrigation sewage, and the control of eutrophication and the use of drugs in agricultural land. Fish conservation areas and artificial lakes to prevent pollution of polluted surface water.

6. Water pollution control effect

In order to improve the water pollution control effect, this paper analyzes the water pollution control effect, analyzes the water pollution control effect before and after using the water pollution control engineering device integrated with intelligent blockchain technology, selects chromaticity and turbidity as the water quality analysis indicators, and records the selected five water sources in Table 1:

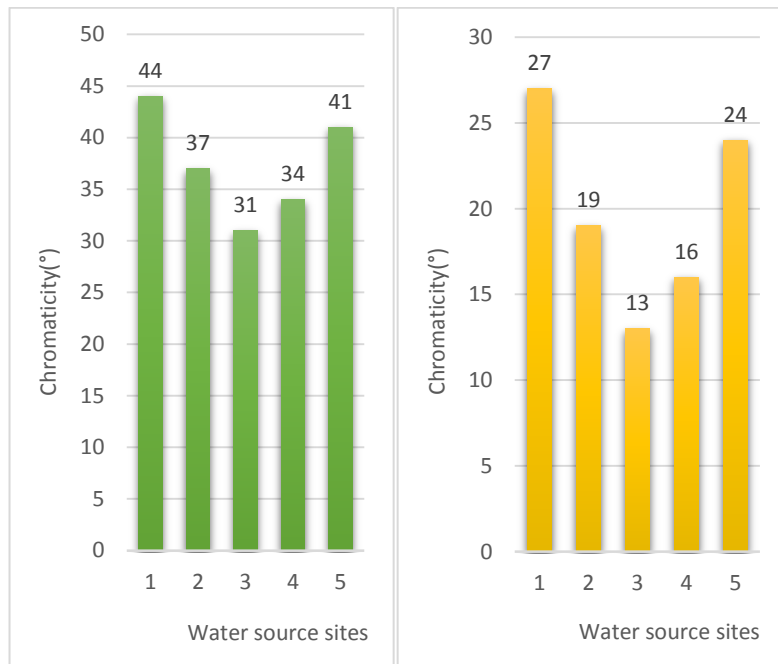
Table 1. Experimental subjects selected for this paper

Water source sites	Pollution level
Water source site 1	5
Water source site 2	3
Water source site 3	1
Water source site 4	2
Water source site 5	4

Among the five selected water sources, water source 1 has the highest degree of pollution, followed by water source 5, and water source 3

6.1. Chromaticity

When the color of drinking water exceeds 15 degrees, most people can recognize it. When the color of drinking water exceeds 30 degrees, most people feel disgusted. So the chromaticity of water is an important indicator for analyzing water pollution. Record the chromaticity results before and after the water pollution prevention and control engineering device integrated with intelligent blockchain technology to Figure 3:



A. Pre-installation chromaticity measurements for water pollution control projects using fused smart blockchain technology

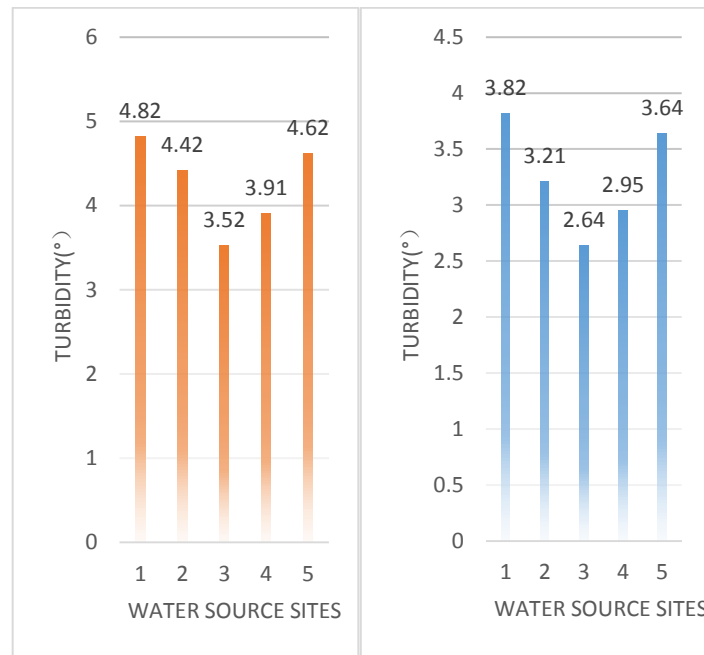
B. Post installation chroma measurements using the Water Pollution Control Project with Smart Blockchain technology

Figure 3. Chroma measurement results before and after the water pollution control project using fusion smart blockchain technology

In Figure 3, A represents the chromaticity measurement results before the water pollution prevention engineering device using the integrated intelligent blockchain technology, and B represents the chromaticity measurement results after the water pollution prevention engineering device using the integrated intelligent blockchain technology. The chromaticity of each water source before the water pollution prevention and control engineering device using the integrated intelligent blockchain technology is higher than 30 degrees, which makes most people feel disgusted. At this time, the water pollution is relatively serious. However, after the water pollution prevention and control engineering device using the integrated intelligent blockchain technology, the chromaticity of each water source has decreased, and the chromaticity of water source 3 is 13 degrees, which meets the standard of drinking water. It shows that the water pollution prevention and control engineering device integrated with intelligent blockchain technology can greatly improve the water pollution situation.

6.2. Turbidity

Turbidity represents the transparency and turbidity of water, and is one of the important indicators to measure good water quality. Record the turbidity survey results in Figure 4:



A. Turbidity measurements before the Water Pollution Control Works installation using fused smart blockchain technology

B. Turbidity measurements after the Water Pollution Control Project installation using Fusion Smart Blockchain technology

Figure 4. Turbidity measurements before and after the water pollution control project using integrated smart blockchain technology

In Figure 3, A represents the turbidity measurement results before the water pollution prevention and control engineering device using the integrated intelligent blockchain technology, and B represents the turbidity measurement results after the water pollution prevention and control engineering device using the integrated intelligent blockchain technology. Before adopting the water pollution prevention and control engineering device using the integrated intelligent blockchain technology, the turbidity of each water source is at a high level. However, after using the water pollution prevention and control engineering device using the integrated intelligent blockchain technology, the turbidity of each water source shows a downward trend, indicating that the water quality has been greatly improved.

7. Conclusion

In order to improve the effect of water pollution prevention and control, this paper uses the intelligent blockchain technology to design the water pollution prevention and control engineering device, and applies it to the process of water pollution prevention and control, and analyzes the water quality of different water sources before and after the use of the integrated intelligent blockchain technology water pollution prevention and control engineering device, and takes the chromaticity and turbidity as the reference indicators, and finally draws a feasible conclusion. After the use of the water pollution prevention and control engineering device integrated with intelligent blockchain technology, the chromaticity and turbidity of each water source have significantly decreased, indicating that the water pollution of each water source has been greatly improved.

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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.

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