Research on Water Resources Planning and Management in the Context of Intelligent Water Conservancy

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Abstract: With the increasing tension of global water resources and the increasing environmental problems, water resources planning and management has become the focus of attention in the world. Traditional water resources management methods have been difficult to meet the current social demand for efficient and sustainable use of water resources, so it is particularly important to explore new water resources planning and management paths. In recent years, with the rapid development of modern information technologies such as the Internet of Things, big data, cloud computing and artificial intelligence, the concept of smart water conservancy has emerged, providing new ideas and technical means for water resources planning and management. Intelligent water conservancy refers to the use of modern information technology to achieve comprehensive perception, intelligent analysis, accurate decision-making and efficient services of water resources, so as to promote the modernization and intelligence of water resources management. In the context of smart water conservancy, water resources planning and management no longer rely solely on traditional experience and manual operation, but rely more on data-driven and intelligent decision-making. Through real-time monitoring and comprehensive perception of hydrology, meteorology, water quality and other water conservancy information, smart water conservancy provides more accurate and timely data support for water resources planning and management. Using big data and cloud computing technology, intelligent analysis and mining of massive water conservancy information can find problems and trends in water resources management and provide basis for scientific decision-making; The combination of artificial intelligence technology can realize the precise decision-making of water resources planning and management, and improve the scientific and accuracy of decision-making. At the same time, information sharing and collaborative services of water resources planning and management can be realized by means of information technology, which can further improve management efficiency and service level. This paper aims to discuss the research on water resources planning and management under the background of smart water resources, analyze the application status of smart water resources technology in water resources planning and

management, and put forward targeted strategies and suggestions, in order to provide new ideas and inspiration for researchers and practitioners in the field of water resources planning and management, and jointly promote the efficient and sustainable utilization of water resources.

1. Introduction

Water resources are the basic resources that human society depends on for survival and development, and play a vital role in economic and social development and ecological environment protection. However, with the acceleration of population growth, economic development and urbanization, water resources shortage, serious water pollution and water ecological degradation have become increasingly prominent, and water resources management is facing great challenges. In order to cope with these challenges, intelligent water conservancy came into being, providing new ideas and methods for water resources planning and management. By integrating advanced technologies such as the Internet of Things, big data, cloud computing and artificial intelligence, intelligent water conservancy can realize intelligent perception, network transmission, precise decision-making and efficient service of water resources, and promote the transformation of water resources planning and management to digitalization and intelligence[1]. This paper will study the planning and management of water resources under the background of smart water conservancy, in order to provide reference for sustainable utilization of water resources and high-quality development of water conservancy.

2. Connotation and characteristics of intelligent water conservancy

2.1 Definition of smart water conservancy

Intelligent water conservancy refers to a new water conservancy development model that utilizes modern information technology to carry out comprehensive perception, intelligent analysis, accurate decision-making and efficient service of water conservancy information, realize the deep integration of water conservancy business and information technology, and promote the process of water conservancy modernization[2]. With water resources management as the core, smart water conservancy covers many fields such as flood control and disaster reduction, water resources allocation, water ecological protection, water conservancy project construction and management, aiming to improve water resources utilization efficiency and management level, and ensure national water security.

2.2 Characteristics of intelligent water conservancy

The characteristics of intelligent water conservancy are reflected in four aspects: comprehensive perception, intelligent analysis, accurate decision-making and efficient service. It realizes real-time monitoring and comprehensive perception of hydrology, meteorology, water quality and other water conservancy information through technical means such as the Internet of Things and sensors, and provides timely and accurate data support for water resources planning and management[3]. Using big data, cloud computing and other technical means, intelligent water conservancy conducts intelligent analysis and mining of collected water conservancy information to find problems and trends in water resources management, so as to provide support for decision-making. Based on the

results of intelligent analysis and combined with artificial intelligence technology, intelligent water conservancy can achieve accurate decision-making in water resources planning and management, and improve the scientific and accuracy of decision-making[4]. In addition, through information technology, smart water conservancy can also realize information sharing and collaborative services in water resource planning and management, further improving management efficiency and service level (Table 1).

Table 1 Overview of intelligent water conservancy characteristics

Characteristic dimension	Description	Technical means	Application field
Total perception	Realize real-time monitoring and comprehensive perception of hydrology, meteorology, water quality and other water conservancy information	Internet of Things, sensors	Water resources management
Intelligent analysis	The collected water information is analyzed and mined intelligently to find the problems and trends in water resources management	Big data, cloud computing	Water resources planning and management
Precise decision	Based on the results of intelligent analysis and combined with artificial intelligence technology, accurate decision-making of water resources planning and management can be realized	Artificial intelligence technology	Water resources planning and management
Efficient service	Information sharing and collaborative services of water resources planning and management are realized by means of information technology	Information means	Improve management efficiency and service level

3. Specific application of smart water conservancy in water resources planning and management

3.1 Intelligent monitoring and early warning

Through the Internet of Things, sensors and other technical means, can real-time monitoring of hydrology, meteorology, water quality and other water conservancy information, timely detection and early warning of flood and drought disasters, water pollution and other risks. At the same time, big data and artificial intelligence technology can also be used to conduct intelligent analysis and mining of monitoring data, find potential risks and problems, and provide support for decision-making[5]. For example, a hydrological monitoring and early warning system can be established to monitor river level, flow and other information in real time, and timely warn of floods and other disasters. It can also establish a water quality monitoring and early warning system to monitor water quality changes in real time and warn water pollution events in time.

3.2 Optimal allocation of water resources

Through big data, cloud computing and other technical means, water resources can be refined management and optimized allocation. To be specific, reasonable water resource allocation schemes can be formulated according to the water demand and characteristics of different regions and industries. At the same time, intelligent algorithms and models can also be used to simulate and optimize water resources to improve the utilization efficiency and management level of water resources[6]. For example, an optimal allocation system of water resources can be established to make reasonable water resources allocation schemes according to regional water demand and water supply capacity. Intelligent algorithms can also be used to simulate and optimize water resources to improve the utilization efficiency of water resources (Table 2).

Table 2 Application table of optimal allocation of smart water resources

Application field	Technical means	Specific content
Water resources allocation	Big data, cloud computing	According to the water demand and characteristics of different regions and industries, a reasonable water resources allocation plan should be formulated
Water resources simulation and optimization	Intelligent algorithms, models	Intelligent algorithms and models are used to simulate and optimize water resources to improve the utilization efficiency and management level of water resources

3.3 Construction of water-saving society

By means of information technology, the process of building a water-saving society can be promoted. Specifically, the Internet of Things, sensors and other technical means can be used to monitor and evaluate the water efficiency and water saving effect of different industries and regions in real time; At the same time, big data and artificial intelligence technology can also be used to conduct intelligent analysis and mining of water use data to find water saving potential and improvement measures. For example, a water-saving social construction management system can be established to monitor and evaluate water use efficiency and water-saving effect in different industries and regions in real time. Intelligent algorithms can also be used to analyze and mine water consumption data to find water saving potential and improvement measures, providing a scientific basis for the construction of a water-saving society[7].

4. Strategies and suggestions for planning and management of sewage resources in the context of smart water conservancy

4.1 Strengthen the top-level design and improve the technical standard system

In order to promote the application of smart water conservancy in water resources planning and management, it is necessary to strengthen the top-level design and improve the technical standard system. To be specific, unified technical standards and specifications should be formulated to clarify requirements such as data format, interface and transmission mode to ensure data sharing and collaborative management between different systems[8]. At the same time, it should also strengthen the publicity and promotion of technical standards, improve the awareness and participation of relevant departments and enterprises, and promote the wide application of smart water conservancy technology.

4.2 Promote data sharing and collaborative management

Data sharing and collaborative management is the key to the planning and management of sewage resources in the context of smart water conservancy. In order to promote data sharing and collaborative management, communication and collaboration between departments should be strengthened, departmental barriers and data silos should be broken, and cross-departmental and cross-regional data sharing should be realized[9-10]. At the same time, data sharing mechanism and data security guarantee mechanism should be established to ensure the security and reliability of data. On this basis, the establishment of a smart water cloud platform can be explored to provide a unified data sharing and collaborative management platform for various departments to improve management efficiency and service level.

4.3 Strengthen information security

Information security is an important guarantee for the planning and management of sewage resources in the context of smart water conservancy. In order to strengthen the information security guarantee, we should establish a sound information security management system and technical preventive measures to ensure the confidentiality, integrity and availability of data. At the same time, we should also strengthen the monitoring and early warning of information security risks, and timely discover and deal with potential information security risks. In addition, information security training and publicity should be strengthened to improve information security awareness and prevention capabilities of relevant departments and enterprises.

4.4 Strengthen personnel training and introduction

The development of intelligent water conservancy needs the support of high-quality technical personnel. In order to strengthen the cultivation and introduction of talents, we should increase the cultivation of talents in the field of intelligent water conservancy, and improve the comprehensive quality and innovation ability of talents. At the same time, we should also actively introduce excellent technical talents and teams at home and abroad to provide intellectual support for the development of smart water conservancy. In addition, it is necessary to strengthen the construction of talent incentive and guarantee mechanisms, provide a good working environment and development space for talents, and stimulate their innovation vitality and enthusiasm for work.

5. Conclusion

In order to promote the application and development of smart water resources in water resources planning and management, it is necessary to strengthen the top-level design, improve the technical standard system, promote data sharing and collaborative management, strengthen information security and strengthen personnel training and introduction. In the future, with the continuous development and innovation of information technology and the constant change and upgrading of water resources management needs, the application prospect of smart water conservancy in water resources planning and management will be broader and better.

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