

Study on Early Warning of Water Level of Urban Groundwater Quality

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Abstract: Groundwater, as an important component of water resources, is mainly used in industry, agriculture and life. At present, with the rapid development of China's economy, China's urbanization construction has been effectively promoted, the scale of the city continues to expand, and the number of urban populations continues to increase sharply, thus increasing the demand for groundwater resources. In this case, the decline of urban groundwater level and the deterioration of water quality lead to new requirements for the early warning of urban groundwater quality level, which shows that the early warning of urban groundwater quality level has a very practical significance for improving the current groundwater situation. Under this background, this paper firstly expounds the basic connotation of urban groundwater early warning, summarizes the meaning of urban groundwater quality and water level, and then analyses the characteristics of urban groundwater quality and water level early warning, on this basis, constructs a framework of urban groundwater quality and water level early warning, in order to optimize the research process.

1. Introduction

As the most essential resource for human survival, water resources provide basic material guarantee for social and economic development. However, with the unreasonable utilization and exploitation of water resources, water resources, especially groundwater, have been in crisis, which seriously restricts the development of social economy. At present, with the intensification of urbanization, the increase of urban population and the intensification of industrialization, urban groundwater resources in China are facing severe challenges. Under this background, this paper carries out the early warning research of urban groundwater quality and water level in order to provide basic support for the improvement of urban groundwater condition in China.

2. The Connotation of Urban Groundwater Early Warning

2.1 Significance of Urban Groundwater Quality Early Warning

The essential meaning of groundwater quality early warning is to analyze and evaluate the rationality of groundwater quality in a certain period, monitor and analyze the changes of water environment, and realize capacity evaluation, future development prediction and various early warning information prediction on this basis. Through this early warning process, we can provide the basis for constructive opinions or countermeasures in the current unreasonable situation, thus promoting the intervention of unreasonable situation and realizing the containment of the deteriorating trend of the problem [1]. For the early warning of groundwater quality, the key is to correctly judge the consequences of the deterioration of groundwater quality, which helps to put forward scientific measures to resolve the warning situation.

2.2 Significance of Early Warning of Urban Groundwater Level

The early warning of urban groundwater level refers to the corresponding early warning when the urban groundwater level approaches or falls below the warning level. For this aspect, it includes evaluation, prediction and alarm related content [2]. It is mainly reflected in the early warning of regional water level in space, and in time, it is mainly reflected in the evaluation, prediction and early warning of urban water level. On the one hand, it is a multi-level, long-term and sustained work, and a systematic project, which is critical to the development of the city.

3. Characteristics of early warning of urban groundwater quality and water level

3.1 Emergency and Accumulation of Police Situation

In the process of water resources development and utilization, the corresponding balance is destroyed. If this link is not handled properly, it will lead to the reverse succession of the system [3]. This consequence is embodied in the sudden change of quantity to quality in time and the accumulation change of related elements in water resources system in space [4]. The accumulative nature of the police situation requires that the time and space should be fully included in the process of the early warning analysis, while the sudden nature of the police situation is determined by the internal factors of the water resources system, which focuses on the forecasting of the police situation and the formulation of measures to resolve the situation.

3.2 Complexity of Police Sources

For the complexity of the police source, it is mainly embodied in three aspects [5]: (1) the complex relationship of substitution and symbiosis within water resources leads to the complexity of the police source, especially in order to effectively resolve the alarm situation, the complex relationship needs to be analyzed, and its analysis process is complex; (2) for the water quality early warning analysis link, besides through the current economic accounting fingers. In addition to the standard, some new indicators need to be provided. The complexity of analysis indicators leads to the complexity of this work; (3) Early warning process, due to the change of managers'subjective status, leads to the change of judgment standards, which is easy to mix with complex social problems, thus leading to its complexity.

3.3 Concentration of Early Warning

The focus and foothold of early warning is not only on the general status quo and analysis, but also on its awakening and alertness. Therefore, the process of early warning focuses on the deterioration link and the analysis of serious deterioration and deterioration, highlighting the warning of its possible hazards.

3.4 Dynamics of Early Warning

For the early warning process, it involves evaluation and prediction. For the former, it is usually static and one-off, but it is a dynamic process for prediction [6]. For the latter, its early warning process is multi-dimensional, involving the change of time and space, which makes a judgment for each period of time in the process of change, so as to achieve the accuracy of prediction.

4. Construction of Early Warning Framework for Urban Groundwater Quality and Water Level

Based on the current research, the early warning framework of urban groundwater quality and water level can be summarized, which mainly includes the following links: defining warning meaning, finding warning sources, distinguishing warning signs, forecasting warning degree, eliminating warning and so on [7]. In these five links, defining the warning meaning is the precondition and the basic condition of early warning research; finding the warning source is the analysis of the causes of early warning and has the basic supporting role for the resolution of warning and patient; analyzing warning signs is the analysis of related factors, which directly serves as the basic condition for early warning; forecasting warning degree is the key link of early warning implementation, and it serves as the basis for the resolution of warning and patient. The ultimate purpose of early warning is to exclude the warning. Based on the above analysis, the corresponding basic block diagram can be obtained, as shown in Figure 1. This section focuses on the analysis of these five links.

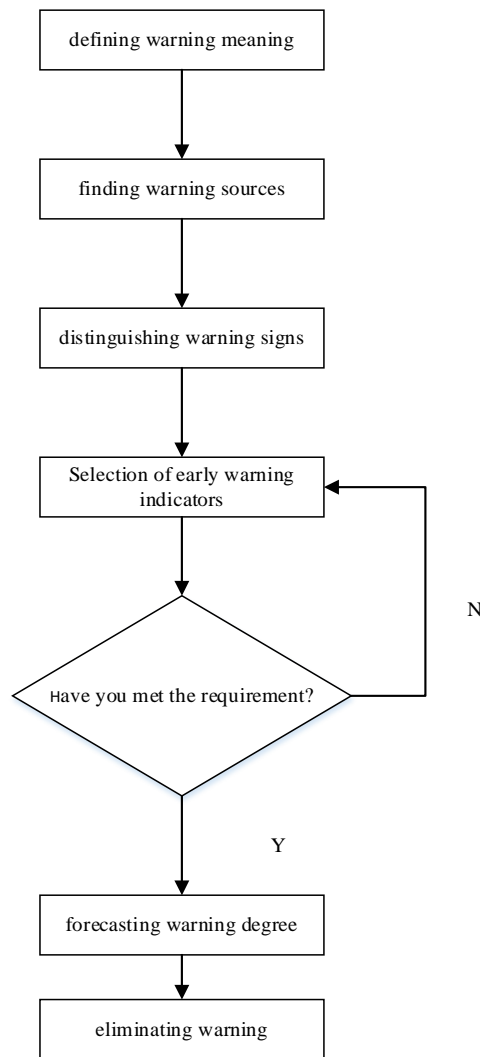


Fig. 1 Basic Framework of Groundwater Quality and Water Level Early Warning

4.1 Defining the warning meaning

As the first step of the basic framework of urban groundwater quality and water level early warning, the main purpose of defining the warning meaning is to determine the object of study and to realize the division of warning elements. In fact, the police element is an important indicator to constitute the warning situation. Its brief summary is to determine what happens to the water level of urban groundwater quality. For the early warning of urban groundwater quality and water level, it is to forecast the dangerous location or region that may appear in the process of the change of groundwater quality and water level leading to the change of each factor, so as to send out the corresponding warning process, so as to provide the basic basis for groundwater management, control and related decision-making in this area. For this dangerous location or region, it represents the abnormal situation in the dynamic change of groundwater, which is summarized as a warning factor. For the police element, it is mainly divided into two categories: natural and social. For the former, all the natural factors that can affect the groundwater condition, including regional hydrological characteristics, geography, climate factors, etc., are included; for the latter, the behavior of groundwater changes caused by the main human social activities and other factors.

4.2 Finding Police Sources

The source of police is the source of police information. The abnormal changes mainly reflect the alarm caused by the destruction of the normal internal and external conditions of the water system. According to this statement, police sources can be divided into internal and external sources. Endogenous is the warning source caused by natural conditions, which is mainly the objective

information of groundwater warning caused by natural disasters caused by abnormal changes of natural conditions; while exogenous is the warning source of external input, which is mainly the warning information caused by socio-economic, cultural and other factors.

4.3 Distinguishing warning signs

Distinguishing warning signs is the key link in this early warning process, which is characterized by the warning signs before the emergence of the situation. The warning sign is a kind of pre-warning phenomenon, and its sympathy with the police is a symbiotic relationship. The relationship between the two is directly or indirectly related [8]. The warning signs have a broader scope than the warning sources, and at the same time they are more specific. For warning signs, it mainly includes boom warning signs and trend warning signs. For the former, it mainly measures the prosperity degree of a certain aspect of groundwater system based on physical movement; for the latter, the relevant indicators that do not directly indicate the prosperity degree of groundwater system are all within their scope. The warning sign is the intermediate state of the transition from the source of police to the situation of police. Both of them have the function of guidance and acceptance. Therefore, it is very important to do a good job in related fields.

4.4 Forecasting Alert

For this link, its forecasting methods mainly have two aspects [9]: (1) building a basic model of warning factors, and then forecasting, according to the warning limit into warning; (2) building a warning model of warning factors, which directly predicts the warning level of warning signals. There are many kinds of divisions of police, which are generally divided into five categories by statistical methods, namely, no police, light police, medium police, heavy police and giant police. These five levels are shown by blue light, green light, yellow light, red light and double red light. This link is an important basis for eliminating the warning, so accurate forecasting of the warning degree is of great significance to the relevant decision-making.

4.5 Excluding police

Elimination of warning is the final link of urban groundwater quality and water level early warning system, which is also the ultimate goal. For this link, it relies on the alarm degree of groundwater situation forecast in a certain region to formulate corresponding measures. Through the application of macro-control tools, it helps the alarmed groundwater level, and can take timely measures suitable for local disaster reduction, prevention and control, so as to make groundwater enter the development track of a virtuous cycle.

5. Conclusion

The early warning research of urban groundwater quality and water level is an urgent research process under the background of deterioration of urban groundwater quality and depletion of water level in China. Its purpose is to provide information early warning, development trend prediction and decision-making basis for the control and solution of related problems. On this premise, this paper focuses on the analysis of the basic connotation and characteristics of urban groundwater early warning, and on this basis discusses the basic framework of urban groundwater quality and water level early warning, which also provides an effective basis and ideas for the construction of urban groundwater quality and water level early warning system.

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