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Ecological and environmental problems caused by the exploitation of groundwater resources

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ABSTRACT

With the rapid development of social economy, people's life on the increasing demand for water resources, surface water resources have been unable to meet the needs of human, and groundwater has stable water supply capacity and good water quality, so the development of groundwater resources has become a topic of concern from all walks of life. If we fail to pay attention to the rationality and appropriateness of resource development, it will inevitably cause certain environmental pollution. This paper first expounded the ecological and environmental problems caused by the overexploitation of groundwater resources, and then put forward reasonable solutions, hoping to help people to rationally use and protect groundwater resources.

Keywords: Groundwater resources, Ecological environment, Over exploitation, Solve the advice

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Water resources, energy, population, ecology and other issues are widely concerned by people, almost all of which are intrinsically related to water. The influence of water on all aspects of social economy is very important. The irrational use of water resources will lead to many problems, such as water supply shortage, regional groundwater level decline, lake shrinkage, river runoff reduction, seawater intrusion, land subsidence, ecological environment degradation and so on. Distribution of water resources on earth, and groundwater (including underground salt water and fresh water) accounted for 1169% of total water resources, which is about 23.4 million km³, groundwater is a kind of mineral resources, but it is not identical with general mineral resources, mainly in groundwater has many characteristics, such as liquidity and recoverability, through the movement of recharge, runoff and discharge form, circular migration, It shows regular changes ^[1]. Under normal circumstances, groundwater mainly receives direct and indirect recharge from precipitation or surface water (the recharge of groundwater in south China is mainly precipitation), and is discharged through the form of submersible evaporation, spring overflow or underground runoff. Under normal natural conditions, the amount of supply and consumption can basically reach a natural balance every year. Under the condition of artificial exploitation, the original replenishment and discharge relationship has changed, but as long as the amount of exploitation and other consumption are in balance with the amount of replenishment, normal groundwater circulation can be maintained and no abnormal situation will occur. However, excessive exploitation will destroy the original equilibrium relationship, resulting in the continuous decline of water level, water depletion and other phenomena.

1. Ecological and environmental problems

caused by overexploitation of groundwater resources

1.1 The groundwater level continues to decline

According to a large number of studies, if the groundwater is in the state of "exploitation > replenishment" for a long time, it will inevitably lead to the continuous decline of the groundwater level. In 2015, Jinan News and Television reported that, influenced by various factors, the groundwater level of the city continued to decline and fell below the red warning line of 27.60m within 5 days ^[2]. However, the Water Resources Bureau indicated that emergency measures should be taken to implement the well sealing and spring protection project, reduce the amount of groundwater exploitation, and start the water source replacement project of large industrial enterprises. In order to gradually ease the decline of the water level. In 2013, Xinjiang Water Resources Department showed that the groundwater level of Changji Hui Autonomous Prefecture showed a downward trend by the end of the year. There were 99 dynamic monitoring points in Changji Autonomous Prefecture, among which 69 monitoring points showed the phenomenon of water level decline, and the area involved accounted for up to 87%. Through investigation and analysis, the main factor leading to this phenomenon lies in the serious imbalance between exploitation and supply. Water consumption data show that groundwater extraction in Changji Hui Autonomous Prefecture increased year by year from 2011 to 2013, among which agricultural water accounted for more than 84% ^[3], and the water level of Fukang City and Qitai County decreased at an annual rate of 1.3m. In addition to the above areas, the water level all over the country has fallen, directly affecting the local economic development. Taking Jinan as an example, due to the decline of local water level,

the natural landscape of Baotu Spring and its nearby areas was affected to a certain extent, which made it difficult to effectively improve the economic benefits of the scenic area and limited the urban economic development.

1.2 Serious soil salinization

The problem of soil salinization is concentrated in the northwest area of China and the core factor which causes this problem is also the unreasonable development. In the case of soil salinization, white, green and red frost will appear directly in the soil, and the gradual deepening of the color directly reflects the severity of soil salinization. In 2017, Gansu Daily showed that by the end of the year, the land salinization problem in Gansu Province was gradually aggravated, resulting in grain loss of more than $1 \times 105t$ ^[4] and crop failure in many areas. The causes of this serious problem can be divided into several factors, among which improper irrigation is the most obvious one. Under the action of irrational irrigation all year round, a large amount of salt in the soil rises to the surface along with the evaporation of irrigation water, and finally stays in the surface of the soil. In addition, Xinjiang region is also a "typical region" with extremely serious soil salinization problem. According to statistics, the area of salinization land in this region is comparable to the area that can be paid attention to. If this problem is not solved and dealt with in time, it will inevitably affect the regional economic development.

1.3 Serious land subsidence phenomenon

Groundwater extraction will change the groundwater pressure, resulting in compression reaction and land subsidence. In 2016, relevant experts in Beijing showed that due to the long-term overexploitation of groundwater, the land subsidence phenomenon in some areas was extremely serious, and the subsidence trend in the eastern part of Beijing was the most obvious. Through

radar satellite detection, it was found that the annual average subsidence was as high as 10cm. By the end of 2012, about 4000km² of land in Beijing plain area had been settled by more than 10cm. In recent years, the land subsidence problem in Beijing has been alleviated to some extent under the joint effect of the effective implementation of various mining system constraints and governance measures. For example, after the implementation of the "South-to-North Water diversion project" in 2014, the land subsidence trend has been significantly reduced, and it is estimated that the water level will rise in 2025 ^[5]. In response to these problems, a president of Peking University has called for the reduction of groundwater extraction as much as possible, the simultaneous comprehensive protection of water resources, and the awareness of environmental protection among residents. Land subsidence will cause hidden problems such as distortion of urban planning and large area cracking of houses, which will cause certain harm to People's Daily life. Land subsidence is a continuous process of change, so at present, it is necessary to explore more appropriate, more efficient and more comprehensive rescue methods from multiple perspectives to gradually solve the problems of the city.

1.4 The problem of water pollution is aggravated

As is known to all, water self-purification function, but with the transition of human on groundwater resources development and utilization, water self-purification function and therefore cannot be effectively play, if combined with local agriculture waste water and industrial waste water into the river, the cause of shallow underground water suffered serious pollution, and smaller water flow completely don't have the ability to play from the net function, This will lead to further exacerbation of local water scarcity. Under the influence of

overdevelopment, the water resources dynamics gradually change accordingly, resulting in a large number of pollutants directly entering the ground water resources, resulting in a serious water pollution problem. According to related investigation reports, at present stage in our country still more than 90% of the water resource are polluted by different degrees, of which more than 60% is seriously polluted [6]. The main forming factors of this pollution problem are as follows: first, the excessive exploitation of groundwater in coastal areas leads to the decline of water level, which leads to the direct pollution of water resources by seawater intrusion; Second, industrial waste and other harmful substances with the hydrodynamic into the water and soil, causing direct pollution; Third, pesticides and fertilizers in the process of agricultural production penetrate into the ground along with the hydrodynamic force, and the harmful substances pollute the shallow groundwater. The serious consequences of groundwater pollution include endangering human health, affecting the quality of crops, destroying the whole ecological environment and causing huge economic losses. Pollution control is a long-term process, which must be prevented from the source.

1.5 Seawater intrusion occurs

Due to excessive exploitation, seawater directly enters into the groundwater system, which changes the water quality and poses a certain threat to people's health and safety. In 2012, the China Marine Environment Bulletin indicated that due to the excessive exploitation of groundwater, seawater invaded the soil using underground funnels as carriers, and the seawater intrusion problem was aggravated in some coastal areas. Through investigation and analysis, more than 400 Wells were drilled intensively in a rural area of the Bohai Sea in order to obtain water resources. If it was difficult to get fresh water

from shallow Wells, they were drilled deeper and deeper, with the deepest reaching 100m. In 2015, Xinhua reported serious seawater intrusion in China's Bohai coastal plain, causing direct economic losses.

2. Suggestions on protecting groundwater resources and solving ecological environmental problems

2.1 Recharge groundwater and make full use of available surface water resources

In order to effectively control the more serious groundwater environmental problems in some areas, groundwater replenishment should be adopted, which is mainly centered on field water storage and ditch network water storage, so as to effectively alleviate various environmental problems. For example, the 2019 relevant report showed that Hebei Province started the corresponding pilot work in September 2018, and by August 2019, it had completed the work of water replenishment of 1.39 billion m³, and gradually expanded the scope of influence of groundwater recharge. This pilot work on the one hand promotes the river to be clean and smooth, on the other hand also gradually restores the ecological function of the river and lake. Another example is the report of Xinhua News Agency in 2019, which showed that by the end of October, the groundwater in Beijing plain area had recovered 2.88m through the implementation of the "South Water into Beijing" project, and the amount of water replenishment of 1.48 billion m³ had been completed. This replenishment project greatly promoted the rehabilitation of underground water sources in Beijing.

2.2 Set up a monitoring network to keep abreast of groundwater dynamics and water quality changes, and take preventive measures in time

Groundwater monitoring is an important basis for rational exploitation and utilization of

groundwater, water resources management and ecological environment protection. The monitoring items of the National water Conservancy monitoring system include groundwater level, water quantity, water quality, water temperature and other elements. However, the overall groundwater monitoring work is relatively weak, which is difficult to meet the needs of water resources management and dispatching, and there are many problems, mainly including insufficient density of groundwater well network, obsolete monitoring equipment, backward means of observation and information transmission, and insufficient funds. There are only four national monitoring sites in Guangdong Province. In order to rationally develop and utilize groundwater resources in the future and improve the ability of forecasting and early warning, it is necessary to establish and optimize a groundwater monitoring system in this area. On the basis of the existing groundwater dynamic monitoring network, it is necessary to optimize, adjust and add monitoring sites and expand the monitoring scope. A reasonable and perfect monitoring network shall be formed to control central cities, important economic zones and key water sources, and the dynamic management of rational utilization and protection of groundwater resources shall be effectively implemented.

2.3 Optimize the management mode and prohibit unreasonable mining behavior

In order to realize the rational development and utilization of water resources, relevant departments must pay attention to the necessity and significance of optimizing the management mode. First of all, before the development of groundwater, regional conditions, environmental conditions, soil conditions and other contents of a comprehensive investigation, and formulate a more appropriate and scientific planning scheme; Secondly, regional hydrogeology should be fully

understood, combined with the actual local conditions to predict various possible environmental problems. Thirdly, we should strengthen the protection of existing water resources to avoid pollution caused by unreasonable exploitation, encourage the public to actively report, and more strictly restrict such unreasonable behavior.

2.4 Improve the ability of groundwater environmental impact assessment

Based on the in-depth analysis of groundwater environmental impact assessment in China, it can be seen that there are still some problems in the groundwater environmental impact assessment in some areas, and these problems have a very serious impact on the quality of groundwater environment. In view of this situation, relevant groundwater environmental impact assessment departments should take targeted measures to solve the problem. Such as: When found irregularities exist in the groundwater environment impact assessment work to accept or the problems such as illegal business, need law enforcement supervision and management departments to strengthen the management work of the corresponding qualification, with reference to the corresponding law system, carried out in accordance with the requirements of supervision and management principles, ensure that the groundwater environment impact assessment work has the scientific nature and rationality, So it lays a good foundation for groundwater environmental impact assessment. In addition, in the work of groundwater environmental impact assessment, evaluators play a very important role in the implementation, and their own level has a very close relationship with the final impact assessment results. Therefore, measures should be taken to continuously improve the professionalism and evaluation ability of the evaluators, carry out strict training in a certain period of time, and make the evaluators fully master the

corresponding professional knowledge and methods through learning, so as to continuously improve their comprehensive quality. Only in this way can we ensure that the assessors can fully carry out their responsibilities in their work and improve the quality and level of groundwater environmental impact assessment to a greater extent.

2.5 Solve pollution problems and create more fresh water resources

First of all, the relevant departments can take a targeted way to deal with different pollutants. For example, they can open Wells in polluted areas and add pollution-free chemicals to precipitate harmful substances, so as to remove inorganic impurities from water. In addition, organic impurities in water can be removed by rational use of biological decomposition to achieve environmental protection. Secondly, the relevant departments can take the air isolation pollution treatment method, mainly refers to the organic impurities contained in the groundwater resources to the outside environment, so as to achieve separation and purification. Again, Also can use the management means that ion exchanges, combine advanced high-tech technology to realize hard water to soften, brackish water to desalinate.

2.6 Strengthen publicity and education to enhance public awareness of environmental protection

We will earnestly implement a series of groundwater management policies and measures issued by provinces and cities, publicize and implement relevant laws and regulations, continue to work hard to build waterworks, strengthen water quality administration and law enforcement, and respond to various water-related illegal acts. Crack down hard. Strict inspection and approval system Inspection and approval are strictly prohibited if the spacing of horizontal Wells in each

mine area does not meet the requirements of the same intake group. Strictly control the borehole layout of each mining area and each aquifer group, and control the density of ultra-deep Wells. Scientific planning of vertical layout of deep Wells, strict stratified water intake and multi-level water suspension. Strictly control the intensity of mining in every well, every water intake area and every mining area. Water resources management departments must allocate water resources equally and scientifically according to the requirements of water users. The protection of groundwater resources should not be carried out only by the government departments. At the same time, the residents should make their own modest efforts to help the relevant departments to start from water saving and protect the precious groundwater resources.

3. Conclusion

To sum up, the unreasonable exploitation and use of groundwater resources by human beings will lead to many ecological and environmental problems, which will cause serious adverse effects on People's Daily life and economic development. Therefore, people should take a series of measures to improve the utilization efficiency of water resources, so as to reduce the exploitation and utilization of groundwater resources, and then realize the effective protection of local ecological environment.

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