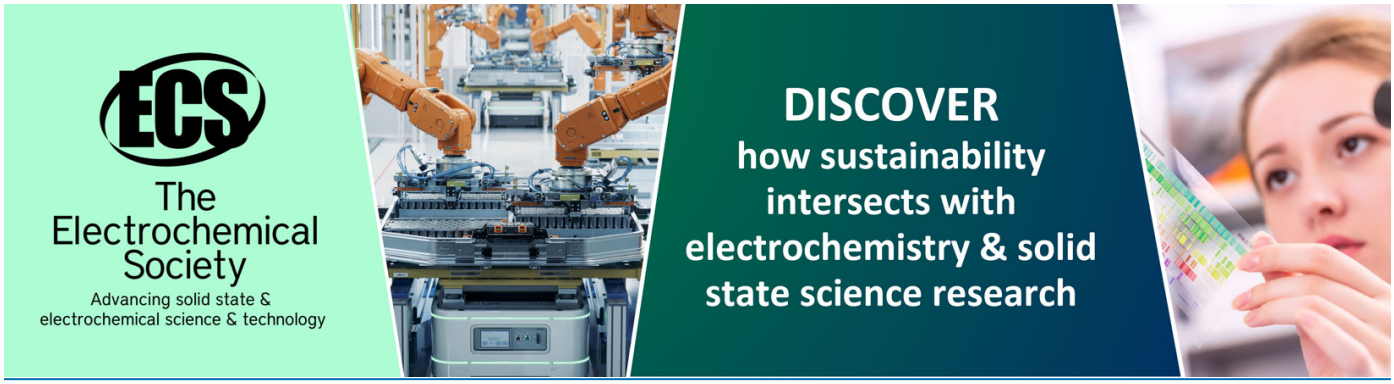
Impact and Evaluation of Construction Stage of Water Resources and Hydropower Projects on Ecological Environment



Impact and Evaluation of Construction Stage of Water Resources and Hydropower Projects on Ecological Environment

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Abstract. With the continuous development and progress of modern society, engineering construction in various fields is also constantly improved. Among them, water conservancy and hydropower engineering are the main guarantee project for the development of modern society. However, large area of earthwork needs to be constructed in the construction process of water conservancy and hydropower engineering. In order to effectively solve the impact of water conservancy and hydropower engineering on the ecological environment in the construction process, in order to promote the construction of water conservancy and hydropower projects and provide a good impetus for the work of ecological environment protection, it is necessary to analyze and study the actual impact and formulate scientific and reasonable solutions. Based on this, this paper will analyze the impact of water conservancy and hydropower projects on the ecological environment, and then work out the construction of water conservancy and hydropower projects and ecological environment protection measures, and finally provide a good guarantee for the smooth construction of water conservancy and hydropower projects and the protection of the ecological environment.

1. Introduction

Ecological environment is the basic condition for human survival and development, and the basis for economic and social development. To protect and build a good ecological environment and realize sustainable development is a basic policy that must be adhered to all the time in China's modernization drive [1]. The ecological environment not only provides food, medicine and other means of production and life for human beings, but also provides the natural environment conditions for human survival. It plays an important role in maintaining the hydrological cycle, purifying the air and resisting natural disasters. The survival and development of human society cannot do without the support of natural ecosystem.

The construction of water conservancy project means the overall change of resources, ecology, environment and economic structure in the whole river basin, which will inevitably bring the impact of natural environment, ecological environment and social environment. There are many aspects of the negative impact of water conservancy projects, involving many factors [2]. For this, scholars at home and abroad have demonstrated the impact of water conservancy projects on the ecological environment from different perspectives, involving various components of the ecosystem. People pay attention to the relationship between water conservancy project construction and environmental impact from the development of current evaluation to the combination of current evaluation and long-term prediction, from the development of quality evaluation to economic evaluation, from the development of simple

evaluation to the evaluation of the whole process of countermeasures, implementation, feedback and countermeasures [3]. The natural and ecological environment problems caused by water conservancy projects are the important factors restricting the construction of water conservancy projects. The long-term goal of water conservancy project construction is to combine the ecological and economic benefits, which is the focus of the research on the relationship between water conservancy project construction and ecological construction [4].

2. Influence of water conservancy and hydropower project construction on ecological environment

The construction of water conservancy and hydropower projects has an impact on many aspects of the ecological environment. According to the classification, it is mainly reflected in the impact on the river ecological environment, local climate environment, soil conditions, living environment of aquatic organisms, etc. Figure 1 shows the influence of water conservancy and hydropower project construction on ecological environment.

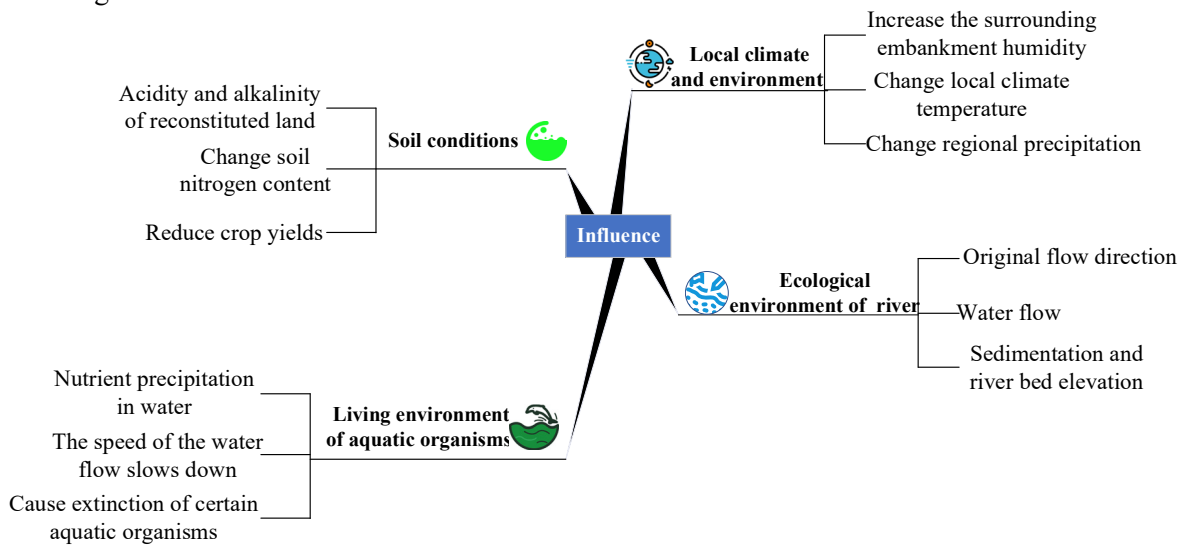

Figure 1 The influence of water conservancy and hydropower project construction on ecological environment

2.1. Impact on the ecological environment of the river

The construction of water conservancy and hydropower projects will affect the original flow direction and water flow. Water conservancy and hydropower projects are generally reinforced concrete buildings, which will certainly affect the ecological balance of the original natural river, and even affect the normal growth and survival of organisms in the river [5]. If the river originally carries a large amount of sediment, if the local water conservancy and hydropower projects are built, there will be a lot of sediment deposition in the river course, thus raising the river bed. When the sludge accumulates to a certain height, it will bury potential safety hazards for the residents on both sides of the river course.

2.2. Impact on local climate and environment

The construction of water conservancy project will directly affect the climate conditions near the construction. The implementation of large-scale irrigation and water conservancy projects will greatly increase the surrounding embankment humidity after the project construction, affect the climate conditions within the scope, not only change the local climate temperature, but also change the regional precipitation [6]. In addition, if the construction of water conservancy project is unreasonable, the problem of water accumulation will occur, which will increase the degree of local water evaporation and precipitation. For example, in the process of construction of reservoir project, low temperature effect may occur, which will affect the precipitation. After completion, the spatial capacity will be changed,

and the temperature of local environment will be increased.

2.3. Impact on soil conditions

The northern region of China is usually loess, mainly because the soil moisture is not enough, so the soil alkaline content is high, the precipitation in the south is relatively abundant, the soil is usually red soil [7]. Because of the long-term erosion of rainwater, the acid content of the soil in the south will be higher. After the construction of a water conservancy project, the local groundwater level will be changed, the acidity and alkalinity of the land will be reorganized, the original data value of the nitrogen content in the soil will be changed, and the local crop yield will be reduced. In addition, after the completion of the water conservancy project, the internal environment of the soil will be changed, which will affect the growth of soil organisms and even cause death of the organisms in the soil.

2.4. Impact on the living environment of aquatic organisms

In the construction of water conservancy and hydropower projects, aquatic organisms will be greatly affected. With the continuous increase of water level, the speed of water flow will slow down, and the nutrients in the water will precipitate. Some aquatic organisms could get food in the shallow water area, but now they need to get food in the deep-water area, which has a great impact on the survival of aquatic organisms, and even cause some aquatic organisms to die out absolutely. With the increase of water storage, the range of land biological activities becomes very small, and the survival of those animals who take aquatic organisms as food is more difficult [8]. In addition, the local climate has changed, the living environment of the animals is more and more severe, and the environmental pollution is increasingly serious.

3. Evaluation of the ecological environment impact of water conservancy and hydropower project construction

3.1. Environmental impact assessment system of water conservancy and hydropower projects

Environmental impact assessment is an internal environmental management process and tool, which aims to provide reliable and verifiable environmental information to managers continuously, to determine whether the environmental performance of an organization meets the standards set by the managers of the organization [9]. Combined with the characteristics of the environmental impact factors of water conservancy and hydropower projects, the environmental performance evaluation index system during the construction of water conservancy and hydropower projects is established.

3.2. Dynamic evaluation model of data analysis

In order to reflect the level of continuous improvement of environmental management during the construction of water conservancy and hydropower projects, the model is used to dynamically evaluate environmental performance. The basic idea is: within the range of n indicators, the base score of environmental monitoring data from the previous period of the project is used as the reference index x_j, the current environmental performance base of engineering index j, as the current index y_j is the output; using the model in the dynamic analysis method of data analysis, dynamic evaluation is performed by analyzing the change trend and degree of input and output values.

$$\begin{cases} \max Z \\ s.t.\sum_{j=1}^{n}\theta_j x_j \le x_{jo}, \sum_{j=1}^{n}\theta_j y_j \ge Z y_{jo}, \\ \sum_{j=1}^{n}\theta_j = 1, \theta_j \ge 0, j = 1,2,...,n. \end{cases} \quad (1)$$

The key to the evaluation model is to find the optimal value Z^*. If the optimal value $Z^* = 1$, it means that in the evaluation system composed of these n indicators, the current index y_{jo} of the j_o enterprise has reached the optimal, The improvement level has reached the optimal level; if $Z^* > 1$, let $y_{jo}{}^* = Z^* y_{jo}$, $y_{jo}{}^*$ is the optimal level of the j_o company, and the current index y_{jo} of the company has not reached the optimal level. The larger the Z^* value, the greater the potential for improving environmental performance, and the current environmental performance of the project is insufficient compared to the previous year. Z^* reflects two factors, one is the size of the current index y_{jo}, and the other is the trend and degree of continuous improvement. Therefore, the evaluation value f is as shown in formula (2).

$$f = \frac{1}{Z^*} \times 100\% \quad (2)$$

3.3. Analysis of empirical research

Taking a large-scale water conservancy and hydropower project as an example, an environmental performance assessment method based on the maturity of project management is used to evaluate the environmental management of the project. After the construction of the project for a period, the environmental management maturity level of the project during this period is evaluated using the engineering environmental performance evaluation index system. Data are obtained through three ways: the first is to organize expert scores, conduct a questionnaire survey on the level of maturity of each indicator, and count the proportion of experts at each maturity level; the second is the proportion of completed targets in statistical indicators. The third is to calculate the maturity level based on the monitoring data and the interval of the standard value, combined with the number of monitoring data, to obtain the base score at this stage, and to propose improvement measures [10]. In the latter period, the same data acquisition method was used to score the environmental management of the project construction process again, and the environmental performance base scores for these two periods were obtained. Then use the dynamic assessment method given above to measure the environmental performance in these two periods. The results are shown in Table 1.

Table 1 Evaluation of the ecological environment impact of water conservancy and hydropower project construction

Index	First period reference index	Second period reference index	Z^*	Score of dynamic evaluation
Environmental management system	1.8	4.5	1.011	98.97
Environmental information management	2.2	4.3	1.023	98.34
Implementation of pollution prevention measures	2.6	2.7	1.424	77.63
Concentration of wastewater discharge	2.8	2.7	1.140	87.92

Concentration of exhaust emissions	2.0	2.6	1.142	99.87
Disposal rate of solid waste	3.2	3.5	1.000	100.00
Environmental quality of surface water	3.4	2.8	1.068	100.00
Environmental quality of groundwater	3.6	3.9	1.035	100.00
Air quality	2.8	2.9	1.288	78.34
Soil environmental quality	2.6	3.7	1.000	100.00

It can be seen from table 1 that the environmental performance during the construction of the water conservancy and hydropower project is good, but it needs to be further improved. In the first period, the total score of engineering environmental performance is 2.971, which is at the measurement level. In the second period, it reaches 3.6, which is at the control level. This indicates that the environmental management of engineering construction has been improved to some extent. which is reflected in the contribution of 7 indicators. the preparation of management plan, environmental management system, environmental information system, contractor's environmental management, environmental management personnel, exhaust gas emission concentration and soil environmental quality, to the improvement of environmental performance large, the two indicators of solid waste disposal rate and groundwater environmental quality have excellent performance, and the environmental performance is on the rise. The dynamic score through is 100, and the dynamic comprehensive ranking is tied for the first.

4. Conclusion

To sum up, because large-scale earthwork construction is required in the construction process of water conservancy and hydropower projects, this factor will affect the ecological environment, and the sewage produced in the construction process will also affect the ecological water resources. In order to effectively reduce the negative impact of the project on the environment, it is necessary to formulate corresponding solutions in combination with the impact. In the construction of water conservancy and hydropower projects, we should take different protection measures, and follow the concept of common growth of human and natural environment, to properly solve the problems of water conservancy and hydropower projects on the ecological environment, and then achieve the goal of joint development of water conservancy and hydropower projects and ecological environment.

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