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Comprehensive Risk Assessment of Algae and Shellfish in the Middle Route of South-to-North Water Diversion Project

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Abstract: Since the main canal of the Middle Route of South-to-North Water Diversion Project was put into operation, the species, quantity and biomass of algae and shellfish have responded quickly to the environment, and a single dominant species has appeared in the community, demonstrating the remarkably abnormal proliferation property of algae and shellfish. In order to evaluate the safety risk of abnormal proliferation of algae and shellfish in the Middle Route and realize dynamic analysis of all kinds of influencing factors, a comprehensive risk evaluation system of algae and shellfish in the Middle Route of South-to-North Water Diversion Project based on comprehensive weighting and Four-Element Connection Number (MCEN) was constructed by integrating the Analytic Hierarchy Process (AHP) and the weight assignment theory of CRITIC. The system consists of 21 evaluation indexes selected from risk factors and carriers. Taking Henan section in the Middle Route as an example, comprehensive risk evaluation system of algae and shellfish in the Middle Route of South-to-North Water Diversion Project was applied to calculate the partial connection number of each order and obtain the risk development trend of each indicator. The results showed that algae and shellfish in the Middle Route were in a very safe state at the safety risk level of level I. Finally, reasonable measures to reduce the risks facing algae and shellfish in the Middle Route of South-to-North Water Diversion Project are given, which effectively make up the deficiency of existing evaluation methods.

Key words: Middle Route of South-to-North Water Diversion Project; set pair analysis; algae and shellfish; risk evaluation；Comprehensive weight；Partial connection number；

1 Introduction

In recent years, along with rapid population growth and economic development, uneven distribution of water resources and imbalance in regional water demand have intensified, which give birth to inter-basin water diversion projects（Chen et al. 2021; Ren et al.2021; Cai et al.2021）. The water diversion projects have not only changed the water resources situation in the receiving area, but also interrupted its ecological balance(Peng et al.2021) by causing fast invasion of algae and shellfish, biofouling, water quality deterioration and other phenomena. Since the middle route of South-to-North Water Diversion Project was put into operation, on the one hand, there has been rapid algae proliferation in a specific period due to changes in nutrient salt and hydrodynamic conditions as well as water pollution accidents; and on the other hand, freshwater mussels have appeared in the main canal of the middle route and showed an increasing momentum along the route, which has broken the ecosystem structure of the middle-route canals and affected waterworks along the route.

In the past decade, the outbreak frequency of algal blooms in Arabian Gulf has elevated remarkably, which has affected drinking water sources and tightened residents' shortage of domestic water (Maryam et al.2014). The outbreak of green algae has become an ecological problem in the southern Yellow Sea(Li et al.2021).Accurate prevention and control of abnormal algae and shellfish proliferation is an urgent task at present, and the premise of accurate prevention and control lies in determining the risk level of abnormal proliferation in a quickly and accurate manner. At present, many scholars both at home and abroad have carried out studies on the middle route's risk assessment. In the sudden water pollution accident in the middle route of South-to-North Water Transfer Project, the index system and comprehensive risk assessment method are adopted, with emphasis on the factors of town scale（Yang et al.2020）. When the emergency management strategies and measures of long-distance water conveyance project are put forward, Mike 11 can be used to establish Bayesian model to simulate the flow field and pollutant transfer process（Tang et al.2016)Algae density increased along the channel and was significantly correlated with COD and Mn, suggesting that algae catabolism was the main mechanism driving the change of COD and Mn(Wang et al. 2022).The midline risk database based on entity relationship diagram is helpful to improve the efficiency of relevant departments in dealing with emergencies (zhou Ning.2021).Establishing an ecological compensation system coordinated to control transboundary water pollution can use the differential game modeling method and improve the effectiveness of water pollution（heng et al.2020). The systematic risk interpretation model of "risk factors → hazard links → hazard modes" is used to evaluate the risk of the main canal(Wang et al.2021).Variance analysis, correlation analysis and principal component analysis are used to analyze the influencing factors of water quality in the middle route of South-to-North Water Transfer Project. The results show that Hg is an important factor affecting water quality and health(Nong et al.2019).The most important parameter of water quality change in one season may not be important to another season. This conclusion is obtained by analyzing the water quality parameters in the middle route of South-to-North Water Transfer Project with principal component analysis（Ouyang et al. 2006). These studies provide favorable information for risk management, but most of them are plagued by single perspectives or lack of comprehensive analysis. The potential risks of algae proliferation should be paid attention to in future research(Nong et al.2020).

Given the above-mentioned research needs, this paper, taking the Middle Route of South-to-North Water

Diversion Project as the object, established a comprehensive risk evaluation system of algae and shellfish based on comprehensive weighting and Four-Element Connection Number (MCEN) by integrating the Analytic Hierarchy Process (AHP) and the weight assignment theory of CRITIC, in a bid to provide information support for the emergency management system of long-distance water diversion projects.

2 Profile of the Target Research Areas

The water source area of the Middle Route of South-to-North Water Diversion Project is Danjiangkou Reservoir in Hubei province, and its main canals span three provinces of Hubei, Henan and Hebei before flowing to Beijing and Tianjin（Lei et al.2017）. The main canal in the middle route is 1277 km long, involving more than 1750 engineering buildings throughout the line（Long et al.2016）. By July 19, 2021, the Middle Route of South-to-North Water Diversion Project had supplied water to Henan, Hebei, Beijing and Tianjin respectively at 13.5 billion m^3,11.6 billion m^3, 6.8 billion m^3 and 6.5 billion m^3, which totaled 40 billion m^3 in water diversion, 5.9 billion m^3 in ecological water supplement, and 79 million of a cumulative beneficiary population（Hu et al.2021；Chengjing .2021）, as shown in Figure 1(Nong et al.2020).

Figure 1 Sketch Map of the Middle Route of South-to-North Water Diversion Project

3 Comprehensive Risk Evaluation Methodology on Algae and Shellfish in the Middle Route of South-to-North Water Diversion Project

The comprehensive risk evaluation process of algae and shellfish in the Middle Route of South-to-North Water Diversion Project includes the following main steps: building a safety risk assessment index system, determining the safety risk grading standards of evaluated objects, calculating the weights of different assessment indexes, constructing a set pair evaluation model, calculating the set pair potential and partial connection number of indexes, and determining the risk grade, as shown in Figure 2.

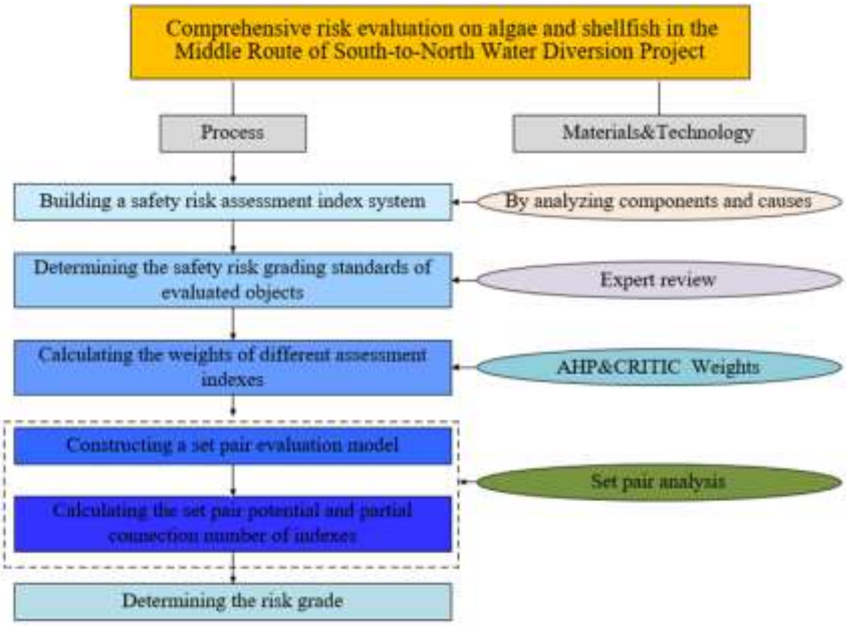


Figure 2 Diagram of Comprehensive Risk Evaluation on Algae and Shellfish in the Middle Route of South-to-North Water Diversion Project

3.1 Building a Safety Risk Assessment Index System

By analyzing components and causes of the risk system, an evaluation system of algae and shellfish in the Middle Route of South-to-North Water Diversion Project is constructed. This evaluation system encompasses two categories of factors: hazard factors and carriers. The primary indexes: hazard factors include physical, chemical and biological indicators; carriers include the degree of damage, exposure and vulnerability of projects. The secondary indexes include 21 factors, as shown in Figure 3.

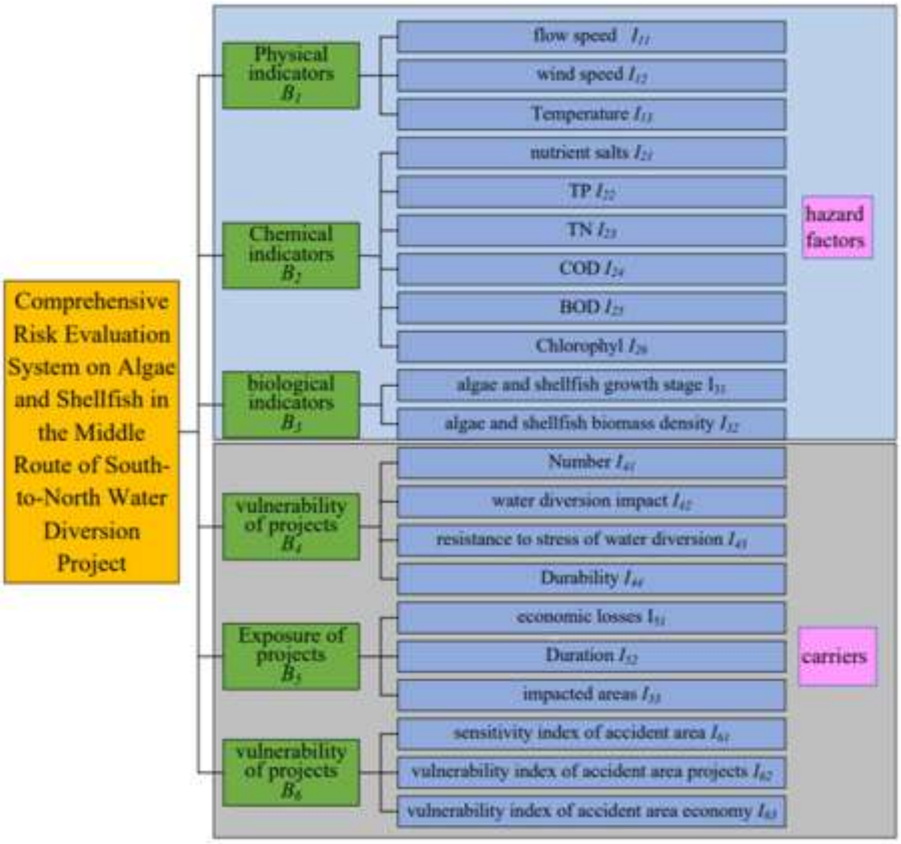


Figure 3 Comprehensive Risk Evaluation System on Algae and Shellfish in the Middle Route of South-to-North Water Diversion Project

3.2 Safety Grade Standards

According to the *National Emergency Plan for Environmental Emergencies* revised in 2015, the comprehensive safety risks of algae and shellfish in the Middle Route of South-to-North Water Diversion Project is divided into four grades. See Table 1 for detailed classification and connotation.

Table 1 Safety Risk Assessment Grading

safety grade	I	II	III	IV
safety situation	highly safe	relatively safe	safe	unsafe
symbols	1	*i*	*j*	*k*

3.3 Determining Weights of Indexes

Subjective weights are determined by experts with their own experience, which are subject to subjective judgment; objective weights are determined by original data, but they cannot reflect the importance attached by the judges to different factors (Guo2018). Therefore, the comprehensive weight calculation method is adopted. The subjective weights $w_i^{'}$ are obtained by AHP(Doğan et al.2021) . AHP includes four steps: first, establishing a hierarchical structure model; second, constructing a judgment matrix; third, examining single sequencing and consistency; fourth, obtaining the weight. See reference(Doğan et al.2021) for the detailed calculation process.

The objective weights $w_i^{''}$ are obtained by the weight method of CRITIC (Criteria Importance Though Intercriteria)(Ji et al.2021). CRITIC includes four steps: first, standardizing evaluation indexes; second, calculating correlated coefficients of the indexes; third, calculating the variability and conflict of the indexes; fourth, calculating the weight. See reference (Ji et al.2021) for the detailed calculation process. The weights obtained by AHP and CRITIC are combined into the comprehensive weight w.

$$w_i = \lambda w_i^{'} + (1-\lambda) w_i^{''} \qquad (1)$$

Where: λ is the preference coefficient, and usually λ = 0.5; w_i is the comprehensive weight of the *i*-th index.

3.4 Constructing the Set Pair Evaluation Model

There are four grades for the comprehensive risk evaluation of algae and shellfish in the Middle Route of South-to-North Water Diversion Project. Therefore, the quaternion connection function is adopted for set pair analysis.

The first step is to construct an index evaluation matrix. *N* experts are asked to determine the risk grade of each index, among whom *n* experts think that the risk grade of the index falls in Grade *i*, then the level I evaluation result of the index for Grade *I* is $u_{ij} = \frac{n}{N}$, which constitutes the index evaluation matrix C, whose expression is as follows:

$$C = \begin{bmatrix} u_{11} & u_{12} & u_{13} & u_{14} \\ u_{21} & u_{22} & u_{23} & u_{24} \\ \vdots & \vdots & \vdots & \vdots \\ u_{n1} & u_{n2} & u_{n3} & u_{n4} \end{bmatrix}$$

The second step is to establish the quaternion connection function. The safety grading standard matrix A=[1，*i*，*j*，*k*] is obtained in 3.2. The comprehensive weight matrix B=[$w_1, w_2, \cdots, w_n$] of each index is obtained in 3.3. And he index evaluation matrix C is obtained in 3.4. The quaternion connection function is expressed as follows:

$$\mu=\left[w_1, w_2, \cdots, w_n\right]\begin{bmatrix} u_{11} & u_{12} & u_{13} & u_{14} \\ u_{21} & u_{22} & u_{23} & u_{24} \\ \vdots & \vdots & \vdots & \vdots \\ u_{n1} & u_{n2} & u_{n3} & u_{n4} \end{bmatrix}\begin{bmatrix} 1 \\ i \\ j \\ k \end{bmatrix}=\sum_{r=1}^{n} w_r u_{r1}+\sum_{r=1}^{n} w_r u_{r2} i+\sum_{r=1}^{n} w_r u_{r3} j+\sum_{r=1}^{n} w_r u_{r4} k \quad (2)$$

For convenience of follow-up reference, the above expression is usually represented with:

$$\mu=a+bi+cj+dk \quad (3)$$

3.5 Calculating Set Pair Potential and Partial Connection Number

The changing trends of set pairs is expressed by *a*/*d* in formula (3); if *a*/*d* > 1, it is the same potential, which indicates the unified momentum between risk and ideal state, a low-risk state; if *a*/*d* =1, it is the average potential, which means that the risk has an equal status with the ideal state, a medium-risk state; and if *a*/*d*<1, it is the opposite potential, which demonstrates that the risk is in the opposite momentum to the ideal state, a high-risk state.

Partial number is a quantitative analysis of deviation trend, which can effectively reflect the dynamic changes of indexes. The calculation formulas of partial connection number of each order are as follows(Hong et al.2014；Zheng et al. 2018) :

First-order partial connection number: $\partial\mu=\partial a+i\partial b+j\partial c$ (4)

Where $\partial a=\dfrac{a}{a+b}, \partial b=\dfrac{b}{b+c}, \partial c=\dfrac{c}{c+d}$。

Second-order partial connection number: $\partial^2\mu=\partial(\partial\mu)=\partial^2 a+i\partial^2 b$ (5)

Where $\partial^2 a=\dfrac{\partial a}{\partial a+\partial b}, \partial^2 b=\dfrac{\partial b}{\partial b+\partial c}$。

Third-order partial connection number: $\partial^3\mu=\partial^2(\partial\mu)=\partial^3 a$ (6)

Where $\partial^3 a=\dfrac{\partial^2 a}{\partial^2 a+\partial^2 b}$。

3.6 Determining the Safety Risk Grade

The weighted average connection degrees of each safety grade are obtained through formula (3) and compared, before determining the final safety grade(Qiu et al.2020) .

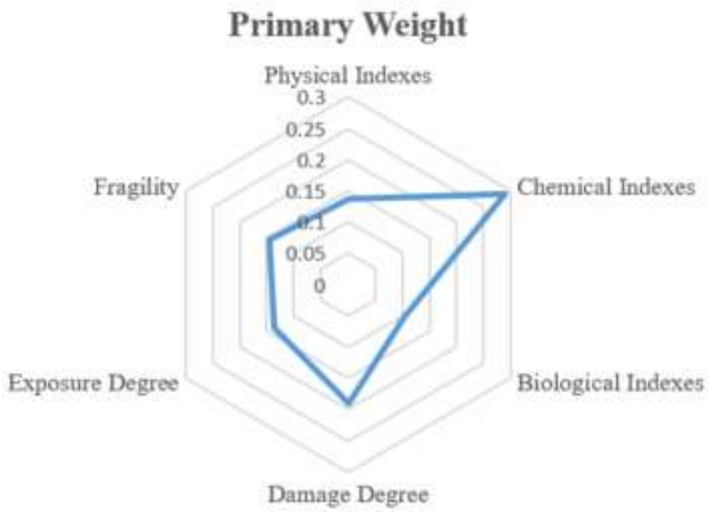
e.g. Grade S $\quad S=\max(a,b,c,d)=c$ (7)

Where c represents Grade III, denoting a safe state.

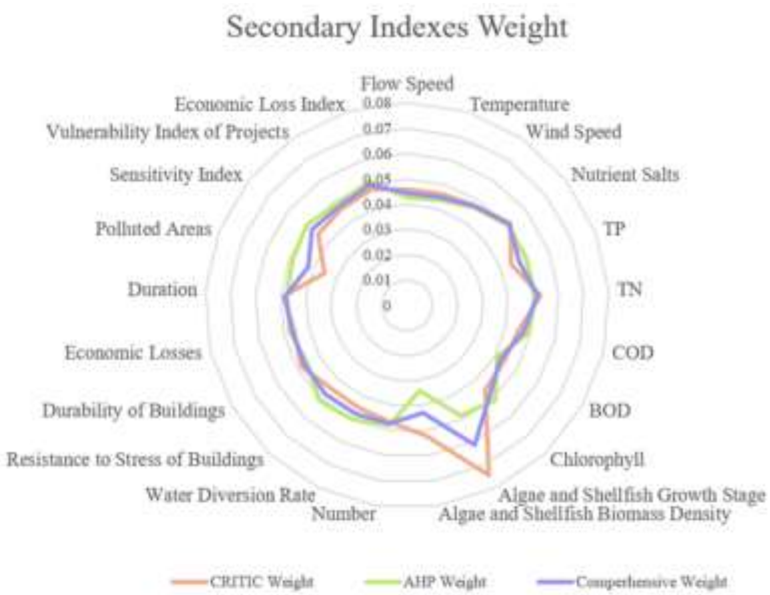
4 Case Study

4.1 Determining Index Weight

The target research area of this paper is the Henan section of the Middle Route of South-to-North Water Diversion Project, and the data are retrieved from April 2016 to April 2019. According to the calculation method of comprehensive weighting, the weights obtained by AHP and CRITIC are combined into comprehensive weights, as shown in Figure 4.



（a）



(b)

Figure 4 Weights of Algae and Shellfish in the Middle Route of South-to-North Water Diversion Project

4.2 Constructing Set-Pair Connection Function

A questionnaire survey was conducted among 30 experts, who, on the basis of their experience, knowledge reserve and personal values, evaluated the safety grade of each index in combination with the features of the Middle Route of South-to-North Water Diversion Project, thus forming the index evaluation matrix for algae and shellfish in the Middle Route, as shown in Table 2 for details. And the quaternion connection function is established according to formula (2), as shown in Table 3.

Table 2 Index Evaluation Matrix for Algae and Shellfish in the Middle Route of South-to-North Water Diversion Project

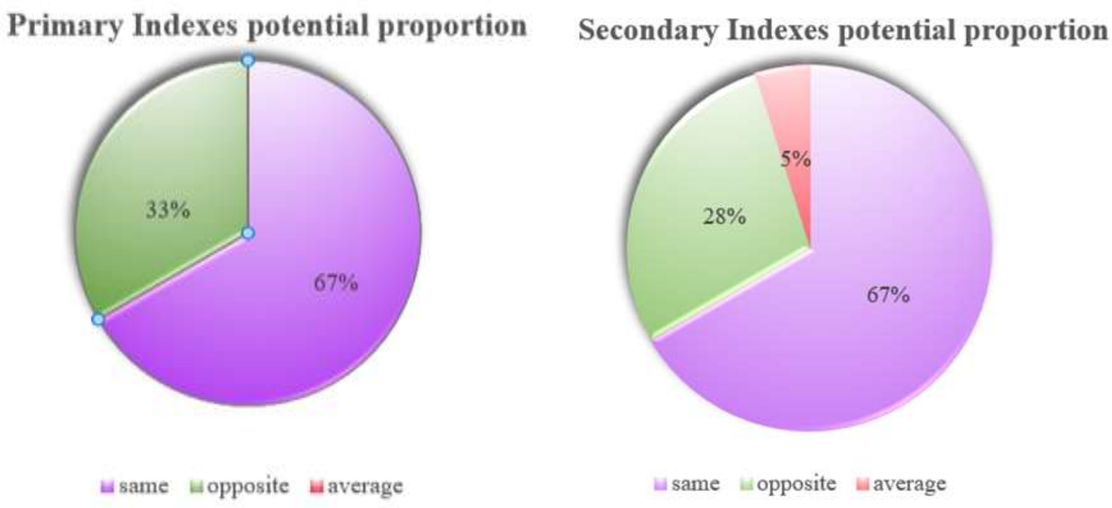
Evaluation Indexes	Highly Safe	Relatively Safe	Safe	Unsafe
Flow Speed	0.3	0.1	0.3	0.3
Temperature	0.15	0.15	0.35	0.35
Wind Speed	0.3	0.35	0.2	0.15
Nutrient Salts	0.25	0.25	0.2	0.3
TP	0.3	0.2	0.3	0.2
TN	0.25	0.2	0.4	0.15
COD	0.3	0.3	0.2	0.2
BOD	0.4	0.2	0.3	0.1
Chlorophyll	0.2	0.2	0.3	0.3
Algae and Shellfish Biomass Density	0.1	0.3	0.2	0.4
Algae and Shellfish Growth Stage	0.4	0.2	0.3	0.1
Number	0.3	0.4	0.25	0.05
Water Diversion Rate	0.35	0.35	0.15	0.15
Resistance to Stress of Buildings	0.3	0.4	0.2	0.1
Durability of Buildings	0.2	0.5	0.2	0.1
Economic Losses	0.25	0.3	0.25	0.2
Duration	0.4	0.2	0.3	0.1
Polluted Areas	0.15	0.15	0.3	0.4
Sensitivity Index	0.5	0.2	0.1	0.2
Vulnerability Index of Projects	0.4	0.1	0.3	0.2
Economic Loss Index	0.2	0.2	0.4	0.2

Table 3 Quaternion Connection Functions for Indexes at All Grades in the Middle Route of South-to-North Water Diversion Project

Primary Indexes	Secondary Indexes	Quaternion Connection Function	Potential
Physical Indexes	Flow Speed	$0.3+0.1i+0.3j+0.3k$	same
	Temperature	$0.15+0.15i+0.35j+0.35k$	opposite
	Wind Speed	$0.3+0.35i+0.2j+0.15k$	same
Physical Indexes Totality		$0.25+0.20i+0.28j+0.27k$	opposite
Chemical	Nutrient Salts	$0.25+0.25i+0.2j+0.3k$	opposite

Indexes	TP	$0.3+0.2i+0.3j+0.2k$	same
	TN	$0.25+0.2i+0.4j+0.15k$	same
	COD	$0.3+0.3i+0.2j+0.2k$	same
	BOD	$0.4+0.2i+0.3j+0.1k$	same
	Chlorophyll	$0.2+0.2i+0.3j+0.3k$	opposite
Chemical Indexes Totality		$0.56+14i+0.12j+0.16k$	same
Biological Indexes	Algae and Shellfish Stage	$0.1+0.3i+0.2j+0.4k$	opposite
	Algae and Shellfish Density	$0.4+0.2i+0.3j+0.1k$	same
Biological Indexes Totality		$0.22+0.26i+0.24j+0.28k$	opposite
Damage Degree	Number	$0.3+0.4i+0.25j+0.5k$	opposite
	Water Diversion Rate	$0.35+0.35i+0.15j+0.15k$	same
	Resistance to Pressure of Buildings	$0.3+0.4i+0.2j+0.1k$	same
	Durability of Buildings	$0.2+0.5i+0.2j+0.1k$	same
Damage Degree Totality		$0.29+0.41i+0.19j+0.11k$	same
Exposure Degree	Economic Losses	$0.25+0.3i+0.25j+0.2k$	same
	Duration	$0.4+0.2i+0.3j+0.1k$	same
	Polluted Areas	$0.15+0.15i+0.3j+0.4k$	opposite
Exposure Degree Totality		$0.27+0.22i+0.28j+0.23k$	same
Fragility	Sensitivity Index	$0.5+0.2i+0.1j+0.2k$	same
	Vulnerability Index of Projects	$0.4+0.1i+0.3j+0.2k$	same
	Economic Loss Index	$0.2+0.2i+0.4j+0.2k$	average
Fragility Totality		$0.23+0.16i+0.27j+0.2k$	same
Totality		$0.28+0.25i+0.26j+0.21k$	same

As shown in Table 3, the quaternion connection function of algae and shellfish in the Middle Route of South-to-North Water Diversion Project is $0.28+0.25i+0.26j+0.21k$, and its set pair potential is 1.75, which shows the same potential between the ideal state and actual risk, registering relatively small risks. Among primary indexes, physical and biological ones feature opposite potential; chemical ones feature average potential; damage degree, exposure degree and vulnerability feature same potential. Among secondary indexes, temperature, nutrient salts, chlorophyll, growth stage of algae and shellfish, number of projects, and polluted areas feature opposite potential; economic loss index features average potential; and the rest indexes all feature same potential.



（a） （b）

Figure 5 Risk situation proportion chart of the middle route of South-to-North Water Transfer Project

As shown in Figure 5, the ratio of different sets of first-order partial connection number and second-order partial connection number to the situation is calculated. In the partial connection number of the first-level indicators, the opposite potential accounts for 33%; The same trend accounted for 67%; average account for 0%. In the partial connection number of secondary indicators, the opposite potential accounts for 28%; The same trend accounted for 67%; The proportion of average is 5%. The proportion of partial connections of primary indicators is different from that of secondary indicators, because primary indicators are the result of comprehensive consideration of secondary indicators, and primary indicators are closer to the overall trend of partial connections.

4.3 Calculating the Partial Connection Number and Set Pair Potential of Each Order

Risk potential are obtained by analyzing the ratio of a/d according to formulas (4)-(6). See Table 4 for details of partial connection number and set pair potential of each order.

Table 4 Partial Connection Number and Set Pair Potential of Each-Order Indexes for the Middle Route of South-to-North Water Diversion Project

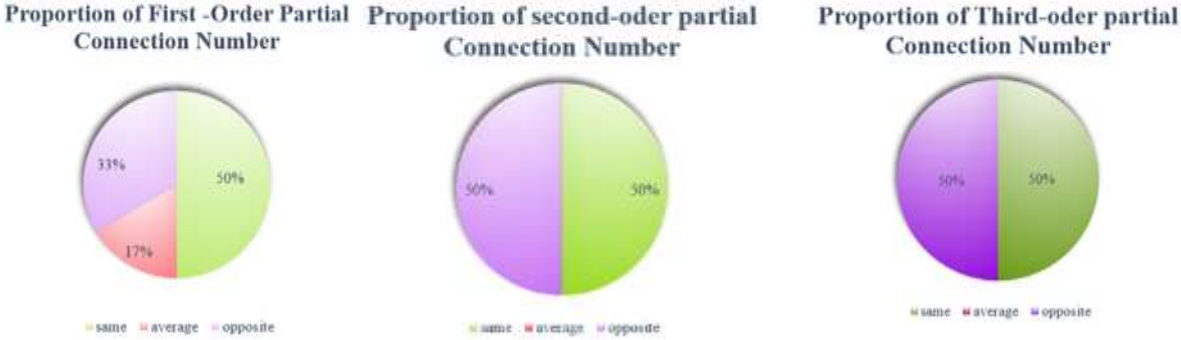
	First-Order Partial Connection Number	**Set Pair Potential**	**Second-Order Connection Number**	**Set Pair Potential**	**Third-Order Partial Connection Number**	**Set Pair Potential**
Physical Indexes	0.56+0.42*i* +0.51*j*	same	0.57+0.45*i*	same	0.56	same

Chemical Indexes	0.80+054i+0.43j	same	0.60+0.57i	same	0.52	same
Biological Indexes	0.46+0.52i+0.46j	average	0.47+0.53i	opposite	0.47	opposite
Damage Degree	0.41+0.68i+0.63j	opposite	0.38+0.52i	opposite	0.42	opposite
Exposure Degree	0.55+0.44i+0.55j	opposite	0.56+0.44i	same	0.56	same
Fragility	0.59+0.37i+0.66j	same	0.61+0.36i	opposite	0.63	opposite
Totality	0.53+0.49i+0.55j	opposite	0.52+0.47i	same	0.52	same

(1) As shown in Table 4, the first-order partial connection number for comprehensive risk assessment of algae and shellfish in the Middle Route of South-to-North Water Diversion Project is 0.53+0.49i+0.55j, and the set pair potential is 0.96. The ideal state and actual risks feature opposite potential; namely, algae and shellfish in the middle route show a first-order risk rising momentum. Among primary indexes, the safety potential of damage degree features opposite potential; biological indexes and exposure degree feature average potential; and other indexes feature same potential.

(2) As shown in Table 4, the second-order partial connection number for comprehensive risk assessment of algae and shellfish in the Middle Route of South-to-North Water Diversion Project is 0.52+0.47i, and the set pair potential is 1.11. The ideal state and actual risks feature same potential; namely, algae and shellfish in the middle route show a second-order risk falling momentum. Among primary indexes, the safety potential of biological indexes, damage degree and fragility feature opposite potential; and other indexes feature same potential.

(3) As shown in Table 4, the third-order partial connection number for comprehensive risk assessment of algae and shellfish in the Middle Route of South-to-North Water Diversion Project is 0.52. The ideal state and actual risks feature same potential; namely, algae and shellfish in the middle route show a third-order risk falling momentum. Among primary indexes, the safety potential of biological indexes, damage degree and fragility feature opposite potential; and other indexes feature same potential.



(a) (b) (c)

Figure 6 Proportion of each order situation in the middle route of South-to-North Water Transfer Project

As shown in Figure 6, in the situation of the first-order partial connection number in the middle route of South-to-North Water Transfer Project, the reverse potential accounts for 50%; The same trend accounted for 33%; The balance of power is 17%. In the situation of the second-order partial connection number of the South-to-North Water Transfer Project, the reverse potential accounts for 50%, and the same potential also accounts for 50%. The third-order proportion is the same as the second-order proportion. Compared with the second-order partial connection number, the equilibrium of the first-order partial connection number disappears in the second-order partial connection situation, which is due to the chemical index showing counter potential in the second-order partial connection situation and showing equilibrium in the first-order partial connection situation. The proportion of the second-order partial connection number situation and the third-order partial connection number situation has no obvious change, because there is no change in the second-order partial connection number situation and the third-order partial connection number situation. The deviation trend of each stage is progressive and calculated in turn.

4.4 Determining Safety Grade of Algae and Shellfish in Middle Route of South-to-North Water Diversion Project

The overall risk correlation coefficient obtained from Table 4 is [0.28,0.25i,0.26j,0.2k]. The above results show that for the Henan section of the Middle Route of South-to-North Water Diversion Project: the risk correlation coefficient of Grade I (highly safe) is 0.28, Grade II (relatively safe) is 0.25, Grade III (safe) is 0.26, and Grade IV (unsafe) is 0.2. According to formula (7), by comparing the risk connection coefficients of different grades, the risk connection coefficient of Grade I is the largest, so the overall safety grade of Henan section of the Middle Route of South-to-North Water Diversion Project is Grade I, a highly safe state.

5 Conclusions and Implications

5.1 Conclusions

(1) By combining the growth properties of algae and shellfish in the Middle Route of South-to-North Water Diversion Project with set pair analysis, it is concluded that the safety risk grade of the middle-route algae and

shellfish is Grade I, a highly safe state.

(2) The comprehensive risk assessment system of algae and shellfish in the Middle Route of South-to-North Water Diversion Project was established, and the comprehensive weights are obtained by combining AHP and CRITIC weights. The comprehensive risk evaluation model of algae and shellfish in the Middle Route of South-to-North Water Diversion Project was established to grasp the dynamic risk changes of each index by calculating the partial connection numbers of each order: the overall first-order partial connection numbers feature opposite potential, with risks on the rise; the second-order and third-order partial connection numbers feature same potential, with risks in decline.

(3) There are both same and opposite potentials in the quaternion connection numbers and partial connection numbers of each order, which comprehensively shows the dynamism of algae and shellfish risk in the Henan section of the Middle Route of South-to-North Water Diversion Project.

5.2 Implications

(1) Among the evaluation indexes of the comprehensive risk assessment model of algae and shellfish, the growth stage, nutrient salts and TN occupy the largest weights, which prove to be important indexes affecting the overall risk. Therefore, it is necessary to focus on the growth stage and chemical indexes of algae and shellfish.

(2) At present, the comprehensive risk of algae and shellfish in the Henan section of the Middle Route of South-to-North Water Diversion Project is in a highly safe state, and is expected to present a safe momentum in the future. However, in the first-order overall potentials, both physical and biological indexes show opposite potential; namely, the physical factors in the Henan section are suitable for the growth of algae and shellfish. Therefore, it is necessary to strengthen the monitoring of physical indexes and pay close attention to the growth of algae and shellfish.

Ethical Approval

This article abides by academic norms, and there is absolutely no academic fraud.

Consent to Participate

All authors are actively involved in the paper and agree to the specifications of your journal.

Consent to Publish

All authors agree to submit to your journal, one publication, never multiple submissions for one manuscript.

Conflicts of interest

None

Authors Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Youming Li , Jia Qu and Wei Gao. The first draft of the manuscript was written by Yan Long and Mengjuan Feng,and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript."

Availability of data and materials

Appendix A.

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