

Analysis on the construction of water ecological civilization and its evaluation index in China

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Abstract. Ecological Civilization reflects the harmony state between human progress and nature in human civilization, and the ecological civilization of city water is the "concentrated shining point" of ecological civilization, but also the focus and difficulty of ecological civilization construction. This paper analyzes the construction essentials, constructional connotation, evaluation index, calculation and assignment method of water ecological civilization in China, to explain the importance and urgency of the construction of water ecological civilization in China.

Introduction

It is of great practical significance and profound historic significance that the construction of ecological civilization is placed in a prominent position and integrated into the overall layout of the socialist cause with Chinese characteristics in **19th CPC National Congress**, which is a major theoretical innovation and practice of sustainable development and social construction in China.

a basic knowledge of water ecological civilization

The term "ecology (eco-)" originates from the ancient Greek word, which refers to the family or our environment, and the modern meaning refers to the living state of the organism and the relationship between them and the environment and human beings.

"Civilization" originates from the Latin "Civis", refers to the sum of material wealth and spiritual wealth created by mankind, it also refers to the state of social development to a higher stage, which covers the relationship between man and man, man and society, man and nature.

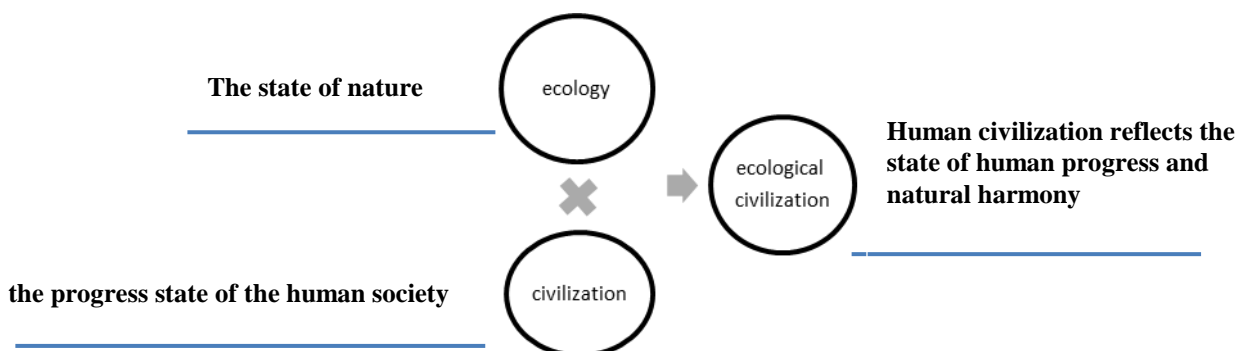


Fig. 1 The relationship between ecology and civilization

Water is the basic composing factor of the surface environment system, and the temperature, illumination and water are classified as three major non biological environmental factors.

Water is the control factor that affects the balance and evolution of ecosystems, and the water status determines the basic types of the landing ecosystem. The types of terrestrial ecosystem are desert (hot, cold), tundra, polar, plateau, grassland (wet and dry), sparse trunk grassland, temperate coniferous forest, broadleaf forest, tropical monsoon forest, rainforest; aquatic ecosystems are freshwater ecosystems (rivers, streams, canals, lakes, marshes, ponds and reservoirs), marine ecosystems, including coastal zones, Shallow sea belt, upwelling belt, ocean Belt and coral reefs and

other parts.

The evolution of water is an important driving force of ecological evolution and social development, and the construction of water ecological civilization is an important part of ecological civilization construction.

a knowledge of water ecological civilization construction

In 2013, the "No.1 document" of the Ministry of Water Resources, "the Ministry of Water on speeding up the construction of water ecological civilization " clearly stipulates the requirements of the construction of water ecological civilization: implement the most stringent water resource management system, optimize the allocation of water resources, strengthen water conservation management, protect water resources strictly, promote water ecosystem protection and restoration, strengthen the ecological protection in water conservancy construction, enhance the guarantee and support ability, carry out the propaganda and education extensively.

The paper puts forward the following requirements for the construction of water ecological civilization: Optimizing the development pattern of national land, comprehensively promoting resource saving, increasing ecosystem and environmental protection, and strengthening the construction of ecological civilization system.

Key points of water ecological civilization construction

Key point (1):

It should be based on the water cycle perspective of "Nature-society", reflecting the connotation of source of life, production points and ecological basis.

Key point (2):

The transformation of values, systems, production and consumption patterns and the improvement of water eco-environmental protection level and quality should be reflected.

Key point (3):

Protect firstly, emphasizing the natural water ecosystem self-healing.

Key point (4):

People as the elements of the ecosystem, should be integrated with water conservancy.

The understanding of water ecological civilization

Ecological civilization or water ecological civilization construction is not only for the natural ecology, disregard human civilization, but on the basis of the existing to achieve human and natural "rebalancing" so as to achieve harmony between man and nature, and new balance between economic and ecological harmonious development. Including:

- (1) The balance between the demand of human production and the supply of ecosystem services;
- (2) The rebalancing of social and economic development and natural resources endowment;
- (3) The rebalancing of the development of resources and environmental protection;
- (4) The rebalancing of the spatial pattern of land and resources and industrial distribution;
- (5) The rebalancing of the natural restoration of damaged and degraded ecosystems and major ecological projects.

Connotation of water ecological civilization construction

The connotation of water ecological civilization construction includes seven levels:

(1) Flood control and drainage

Affected by global climate change, urban flood risk is increasing, while urban drainage facilities lag behind the development of cities, river and lake space and waterfront line crowding out seriously, the discharge capacity of flood decreased. There are some obvious characteristic, such as small rainfall and large flow, small flow and high water level and so on. The phenomenon of contention between human and water is very common in urban areas, and the problem of crowding out water space is very prominent. While crowding out the water space, human beings also put themselves in the high risk of flooding. The "721" flood in Beijing is a typical case.

To protect the river space, we should reserve and discharge the channel for flood. Strictly control

riparian lakeside development activities to ensure the safety of the river natural process, the flood line after 50 years or even a century is not allowed to build a permanent project in order to restore the function of river natural storage for delay rain.

(2) The water supply guarantee

In the construction of water ecological civilization, water-saving and water supply, conventional and unconventional water, surface waters and groundwater should be integrated to strengthen regional water supply safety.

The safety of drinking water in urban and rural area as a target, it demands to protect the river water quality, pollution sources along the river, such as sewage outlets, garbage dumps, farmers markets and so on. Protected areas in water source area should be clear, to make strict management system for protected areas, to eradicate the environmental pollution sources, to ensure that drinking water safety, so that urban and rural residents can drink safety water.

(3) Water environmental standards

Lake eutrophication, water pollution and other problems remain the stubborn disease of the city lake, which is the common problem in Chinese cities. Water quality problems endanger the health of residents; seriously affect the city landscape and image.

Strengthen urban sewage treatment, improve the recycling rate of wastewater treatment, reduce the amount of sewage into the lake such as river, reduce the pressure of urban pollution on rivers, and improve river water quality, the lower goal is to eliminate the phenomenon of black odor, the middle goal is to meet the water quality of contact landscape, the higher goal is to meet the water quality needs of fish.

(4) Water Ecological Health

Urban water system is a typical aquatic ecosystem, although it is strongly disturbed by human beings, the primary aquatic organisms may be lost, but in the new environment, the urban water system can build a new aquatic ecosystem. The system needs a certain amount of nutrients input, through primary productivity, herbivores, predators, birds and human fishing, etc., to form a virtuous water cycle.

Water system management should consider the need of building a benign ecosystem, through the circulation of ecosystem, promoting the water purification and improving the biodiversity and so on. The exchange and circulation between land and sea should also be taken into account.

(5) A fine water scenery

With the improvement of living standard of urban residents, the demand for beautiful landscape becomes more and more urgent. Urban water system management should conform to the wishes of the residents, so in the process of treatment, the riparian greening, pedestrian road, garden design, hydrophilic revetment, swimming and water safety, bio-diversity restoration, aquatic landscape construction should be taken into account. Through these works, the city's image can be improved and the city's taste can be promoted.

(6) Rich water culture

Water system carries the long history and culture of mankind, especially Chinese civilization, with a long history, many City Rivers and lakes record the long-term historical process of the coexistence between human beings and water. With the disturbance of construction activities, the historical and cultural characteristics of river and lake are seriously damaged, and the protection of water cultural heritage is in crisis.

Strengthen the river culture, we should pay attention to the protection of historical relics in water culture, set up the corridor of cultural heritage along the river, create the waterfront area with characteristic, individuality and connotation, and inherit the pulse of the development of urban humane society.

(7) The development of water economic

The construction of water ecological civilization should not only provide the security of flood control and water supply, but also play an important role in improving the development environment, promoting the increment of land, stimulating employment and the development of industrial belt.

While the urban water system is governed, the industrial belt, functional area and infrastructure along the rivers should be planned systematically. And define the function zoning of the river. Along the river to set up financial areas, living and commercial zone, high-tech zones, leisure areas and so on. River and wetland, as the green link between urban development and industrial development highland, through the river governance, comprehensively promote urban development.

Evaluation standard of water ecological civilization

Basic Principles

(1) The quantitative evaluation

Index data can be obtained, quantified, avoiding subjective factors interference in evaluation.

(2) The moderate division

The majority of indicators should be consistent, which can be horizontal comparisons, giving consideration to both local characteristics and regional priorities.

(3)The scientific judgment

The criteria for each indicator should truly meet the requirements of "civilization", at present the overall level of national water ecological civilization is relatively low, so it is not suitable to set a higher total score requirements.

the overall framework

(1) There are 25 evaluation indicators in total, of which 23 national common indicators and 2 local characteristics indicators existed, each index set up evaluation criteria of "excellent-good-medium-poor- inferior", 4-0 points respectively, the full score is 100.

(2) The evaluation index is divided into two categories: Binding index and Anticipatory index, and the binding index takes the form of one-vote veto, that is, any one binding index can not be evaluated as "inferior", or the evaluation will disqualified.

(3) In the absence of a binding index of "inferior ", the total score of 60 points area can be evaluated as the demonstration city of national Water Ecological Civilization Construction (district, county).

System Division

The evaluation index is divided into: water safety evaluation, water ecological evaluation, water environment evaluation, water conservation evaluation and water culture evaluation;

The region is divided into: North East, Huang-Huai-Hai area, Yangtze River Middle and lower reaches, South China coastal area, southwest and northwest.

Evaluation Index

Water Safety Evaluation Index

The indexes of water Safety evaluation include 4 indexes: standard rate of flood protected Area, standard rate of flood protected Area, safety guarantee standard rate of centralized drinking water source, safety guarantee rate of centralized drinking water source, the following examples illustrate calculation and assignment method of standard compliance rate in flood protected area:

Calculation methods: The weighted average value of the standard of flood control in the urban and rural areas, and the flood control standard of different scale cities and village protection zones is based on the flood control standard.

Table 1 Water Safety Evaluation Index—standard compliance rate of flood protected areas

index	dimension	Index classification threshold and score					Index attribute
standard compliance rate of flood protected areas	%	excellent (4 scores)	good (3scores)	Medium (2 scores)	Poor (1scores)	inferior (0scores)	binding
		100-90	90-80	80-70	70-60	\	

Water ecological evaluation Index

Water ecological evaluation Index include 6 indexes: The satisfaction degree of river Eco-base flow, the proportion of groundwater exceeding mining area, the index of longitudinal connectivity of river and lake, the ratio of ecological revetment, the loss index of rare aquatic animals and the treatment rate of soil erosion, the following examples illustrate the calculation and assignment of the satisfaction degree of river ecological basis flow:

The Calculation method: The average monthly ecological basis flow satisfies the typical section of the main river in the evaluation area. According to their own conditions, the evaluation area should select not less than 3 regional representative rivers as the object of assessment, and generally should be the 3 rivers with the largest area within the jurisdiction area under evaluation.

Table 2 Water Ecological Evaluation Index—satisfaction degree of river ecological basis flow

index	dimension	Index classification threshold and score					Index attribute
satisfaction degree of river ecological basis flow	%	excellent (4 scores)	good (3 scores)	Medium (2scores)	poor(1 scores)	inferior (0scores)	binding
		100	100-95	95-90	90-80	\	

Water environmental evaluation index

Water environment index includes: water quality standard, length ratio above III type river, 3 indicators of urban sewage treatment rate, the following examples are the calculation and assignment method of the water quality in the function area:

Calculation methods: It refers to the number of standards in the water functional area designated by the superior Government. This index needs to reach the "three Red Line" control index issued by the superior Government, otherwise the evaluation is "inferior"; for the evaluation areas with the target rate of less than 40% but reach the Red Line index, the evaluation qualification is retained, but this index does not score.

Table 3 Water environment evaluation Index-water quality standard rate

index	dimension	Index classification threshold and score					Index attribute
Water quality of water function zone	%	excellent (4 scores)	good (3 scores)	Medium (2 scores)	Poor (1 scores)	Inferior (0scores)	binding
		100-90	90-75	75-60	60-40	40-0	

Water Saving Evaluation Index

The indexes of water saving evaluation include 4 indexes: the relative value of increasing water consumption of the ten-thousand-yuan industry, the effective utilization coefficient of farmland irrigation, the popularization of water-saving equipment, the leakage rate of public water supply network, the following examples illustrate the calculation and assignment method of the relative value index of the added value of the ten-thousand-yuan industries.

Calculation methods: The ratio of water consumption of value added in the evaluation area to the national average of the year. The value of increasing water consumption in the evaluation area should reach the "three red Lines" control index issued by the superior Government, otherwise the evaluation would be "inferior", and for the evaluation area above 150% but the Red Line index was achieved, the evaluation qualification was retained, but the index did not score.

Table 4 Water saving evaluation index- the relative value of ten-thousand-yuan industrial value added

index	dimension	Index classification threshold and score					Index attribute
the relative value of ten-thousand-yuan industrial value added	%	excellent (4 scores)	good (3 scores)	Medium (2 scores)	Poor (1 scores)	inferior (0 scores)	binding
		0-25	25-50	50-100	100-150	\	
		0-12	12-15	15-20	20-25	\	

Water Management Evaluation index

Water management evaluation Indicators include 3 index: standards of total amount of water, standards of water quantity, the ratio of water ecological civilization construction to the performance assessment, the following examples illustrate the method of calculation and assignment of standards of total amount of water.

Calculation method: Whether the total amount of water used in the evaluation area is realized annual water quantity control target of the superior government, which is based on the evaluation result of the most strict water resources management system by the superior government.

Table 5 Water management evaluation index- standards of total amount of water

index	dimension	Index classification threshold and score					Index attribute
standards of total amount of water	-	excellent (4 scores)	good (3 scores)	Medium (2 scores)	Poor (1 scores)	Inferior (0 scores)	binding
		up to the standard	-	-	-	not up to the standard	

Water culture evaluation index

Water culture evaluation includes 3 index: quantity of water culture propaganda and education, coverage of water ecological civilization propaganda and education, the public's satisfaction with the water ecological environment, the following examples illustrate the method of calculation and assignment of the cultural propaganda and education carrier quantitative index.

Statistic caliber: water conservancy scenic spot above the provincial level, important wetland and wetland Park above the provincial level, the education base of water saving and the soil and water conservation, the cultural festival, the museum, the material cultural heritage, the nature reserve above provincial level taking the water, water conservancy or the aquatic resources conservation protection as the main educational content.

Table 6 Water Culture Evaluation Index-the number of water culture propaganda and education carriers

index	dimension	Index classification threshold and score					Index attribute
The number of water culture propaganda and education carriers		excellent (4 scores)	good (3 scores)	Medium (2 scores)	Poor (1scores)	inferior (0scores)	predictability
		≥ 8	7-6	5-3	2-1	0	

regional index

Examples are given to illustrate the calculation and distribution of indicators in the northeast and northwest regions.

Northeast

Key points of Evaluation: the control of farmland non-point pollution and the protection of natural wetlands in northeast China.

Table 7 Northeast Evaluation Index

index	dimension	Index classification threshold and score					Index attribute
		excellent (4 scores)	good (3 scores)	Medium (2 scores)	Poor (1 scores)	Inferior (0scores)	
application of fertilizer/pestic ide	Kg/ hectare	0-200、0-2	200-2252- 2.5	225-250 2.5-3	250-275 3-3.5	above275 above3.5	predictability
retention rate of natural wetlands	%	100-90	90-70	70-50	50-30	30-0	

Conclusion

Ecological civilization is a new stage of the development of human civilization, which is the sum of the material and spiritual achievements of human beings, nature (water, soil, gas, ecology, etc.) and the harmonious development of society. Water ecological civilization focuses on the interrelationship and coevolution of "man-water-ecology". Ecological civilization is not to return to the original state, but to shape a healthy, harmonious and efficient "new ecological balance" in the new stage of development. The ecological civilization of urban water is the "concentrated sparkle" of ecological civilization, and also the focus and difficulty of ecological civilization construction. Our water ecological civilization construction must achieve the the criterion of each index of requirements of "civilization" to create a good living environment for mankind.

References

- [1] Hou Quanliang. Ecological Civilization and River Ethics [M]. Zhengzhou: Yellow River Water Conservancy Press, 2009.
- [2] Chen jing, Huang wui. Discussion on the implementation of three red line management of water resources management [J]. China Water Conservancy, 2011 (6).
- [3] Jin Xiaojuan, Chen jin. The transformation of different indexes in the river health assessment [J]. China Water Conservancy, 2010 (5).