

# **Leading the world wetland ecological restoration with Chinese wetland science**

**By: Dr. Wu Jisong**

## **Abstract:**

The article introduces the innovative Chinese wetland science and its comprehensive definition, based on which the largest wetland in the world and China was established. Wetland is the birthplace of human civilization and the region with the richest biodiversity. This paper introduces the successful examples of wetland restoration in China, and proposes using “international healthy wetland selection” to replace the unscientific “international wetland city certification”. This paper introduces the powerful measures to strengthen wetland research in China, and the National Key Laboratory of Wetland Ecological Restoration in China will become the primary platform for international cooperation.

**Keywords:** Chinese wetland science, wetland ecological restoration in China, scientific research on methane emission from wetland

## **I . The innovative wetland science theory in the world**

Over the past 34 years, the author has led the team to continue wetland research and established wetland ecological restoration.

### **1. Comprehensive and scientific definition of wetland**

At present, China's understanding of the definition of wetlands comes from the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar), which refers to a special wetland. The international academic community also believes that the term "wetland" is not easy to define, and the controversy is obvious.

Wetland is a special landform with both land and water, water and land blending, dry and wet, which is different from the ecosystem of lakes and rivers. The Chinese word "wetland" is divided into "soil", "also", "show" and "water", which is a better

definition of wetland.

After many years of research, the author gives a comprehensive and quantitative definition as follows: a naturally formed, perennial or seasonal ponding area, where the water depth at low tide on the beach does not exceed 6 meters; The land is permanently or intermittently submerged by shallow water, the groundwater depth is less than 3 meters, the water content of sediment is more than 30%, so the seasonal or annual water depth changes greatly, and the change range is more than 30%, such as marshland, wetland, peatland, beach, paddy field or other waterlogged areas.

Therefore the author believes that there are two criteria to determine a wetland. First, the wetland water is not deep; Second, the water level of the wetland should change. For example, the average water depth of Taihu Lake is only 3 meters, but the change of water depth is very small, so it is a lake, not a wetland. These characteristics determine the special ecological functions of wetlands.

## **2. The largest wetland in the world**

As one of the first scholars to go abroad for visits after the reform and opening up, the author began to investigate the global ecosystem in 1979, and has visited 106 countries, including all types of wetlands in the world.

The Amazon rainforest is the largest wetland in the world. The Amazon rainforest is divided into two parts, one of which is a plain flood wetland. In the rainy season, the left and right banks of the floodplain of the main stream can reach 40 km respectively, and the wetland area is more than 100,000 km<sup>2</sup>. Since 1970, 20% of them have disappeared.

## **3. Wetlands are precious in the original ecology**

In order to implement "the original ecology of wetland", it is necessary to study the innovative discipline of wetland ecological history.

Since the Industrial Revolution began in 1722, there were only 1.04 billion people on the earth in 1820, and now there are 7.9 billion people, which is 7.6 times that of that year. Today's GDP is about 1460 times that of that year. Human production and life use raw materials obtained from nature, which has caused the greatest damage to the "original ecology" in history.

The great significance of "precious in the original ecology" lies in the fact that ecological restoration should be based on tracing the original ecology, not on the mathematical model or experimental data of "experts", nor on "hurried and cursory investigations".

#### **4. Wetland is the birthplace of human civilization**

The world knows the four birthplaces of human civilization, and human beings all originated from the same kind of ecosystem-wetlands, where they live and farm.

Mesopotamia is the birthplace of West Asian civilization. The word "Iraq" means "blood vessels" in Arabic, and there is a network of wetlands as dense as blood vessels.

Ancient Egyptian civilization also originated in the wetlands of the Nile Delta. The author made three field trips and told local scientists and officials: "The construction of the Sphinx may be due to the large number of original lions." "I admire the Chinese for knowing so much about Egypt," they said.

The main source of Chinese civilization is also the wetland of the Weihe River, a tributary of the Yellow River, which created the Yangshao civilization.

Indian civilization also originated from the Indus Delta wetlands, and the word "India" comes from the Sanskrit word "Sindhu", which means "river".

This shows that human beings come from the same kind of ecosystem, are now a community, and have a common future.

#### **5. Wetland is the region with the richest biodiversity.**

The international understanding of wetlands is that they are temporary habitats for wintering birds. In fact, native wetlands are the places with the richest biodiversity on land. In 1990, the author visited the Botswana Delta Wetland in Africa, which was rarely visited, but it was not listed in the United Nations Natural and Cultural Heritage List until 2014.

In the Okavango Wetlands, not only wintering birds, but also African elephants, hippos, white rhinos, elk, beavers, crocodiles, giant eels, piranhas and vultures coexist with people in the wetlands.

## **II. World-leading practice of wetland ecological restoration**

The author has not only done many years of in-depth theoretical research, but also seven years of successful practice.

### **1. Four national ecological restoration plans are the most successful examples of wetland ecological restoration in the world.**

Since 1998, the author has served as the executive vice-director of the National Water Conservation Office in 20 provinces, municipalities and autonomous regions, including Beijing, Shanghai, Shenzhen and Hebei, Jiangsu, Heilongjiang, Guangdong and Guangxi, to guide the preparation, formulation and implementation of four national ecological restoration plans (including wetlands) approved by the Premier's Office of the State Council. On December 8, 2001, the then Chinese Premier Zhu Rongji wrote: "This is a green ode, and it is worth writing about."

The plan for the sustainable use of water resources in the capital has restored the wetland at the source of the Chaohe River, which is the source of water for Beijing, and has solved the problem of ensuring water resources for the Beijing Summer Olympic Games and Olympic Winter Games and the severe water shortage in the capital.

(1) The Heihe River Basin Management Plan has restored the dry East Juyanhai Wetland, guaranteed the drinking water of the manned space base and the successful launch of Shenzhou V; The region has changed from a source of sandstorms to a tourist hotspot with rippling blue waves and shaded *Populus euphratica*. In 2019, there were 5.21 million tourists in Ejina Banner.

(2) After the implementation of the Tarim River Basin Comprehensive Management Plan, the dry Taitema Lake wetland at the end of the Tarim River has always maintained its water surface, with a maximum of 200 km<sup>2</sup>. Uygur residents who moved away because of water shortage moved back to Yingsu village with abundant water and grass.

(3) With the innovative concept of "ecological water", a new "Yellow River Water Allocation Plan" has been formulated to make the Yellow River, which has

been cut off since 1972, no longer cut off, and to restore the world's youngest estuarine wetland, which is dry and cracked. Now the reeds are overgrown and the green grass is everywhere, which also makes Jinan Spring Gush reappear and become a tourist hotspot again.

The author hopes that these valuable experiences could be promoted at the International Wetland Conference and shared by mankind.

## **2. The unscientific "International Wetland City Certification" should be replaced by "International Healthy Wetland"**

At present, the "International Wetland City Certification" of the Secretariat of the International Convention on Wetlands is mainly considered from the perspective of typicality and biodiversity, without considering the main functions of wetlands such as water purification, carbon sequestration, flood control and landscape, and without considering the administrative system of cities governing counties in China (some cities have tens of thousands of kilometers<sup>2</sup>), which destroys the balance between supply and demand of local water and is not scientific enough. It should be replaced by the "international healthy wetland" proposed by the author.

**Table 1 Evaluation index of healthy wetland**

	Indicator name	Request
1	Wetland area (water area > 60%)	> 1km <sup>2</sup>
2	Population density (number of permanent residents + number of tourists per year)	< 200 persons/km <sup>2</sup>
3	Water resources per capita	> 3000m <sup>3</sup> /person
4	GDP per capita	> 3876 USD/person
5	Water consumption per capita in the basin	< 92.5m <sup>3</sup> /person · year
6	Water quality in the basin	Above Class III
7	Inbound water quality	Above Class II
8	Sewage discharge per capita	< 0.03 m <sup>3</sup> /day

The author hopes this initiative become a powerful measure for the restoration of

wetlands in the world and lead the restoration of international wetlands.

### **III. Strengthening wetland research and protection is a consensus at home and abroad.**

The author made a speech on wetland ecological restoration with Chinese characteristics at the "International Wetland High-level Forum" held in Beijing in 2018, which was unanimously recognized by experts at home and abroad. According to the proposal of the meeting, the author organized 15 members of the CPPCC to jointly propose "Establishing the State Key Laboratory of Wetland Ecological Restoration and Strengthening the Basic Research of Wetland Ecology", and the Ministry of Science and Technology, the undertaker of the CPPCC, gave a very positive and affirmative reply to the State Forestry and Grass Administration. The abstract is as follows: "China's wetland protection work started late, especially the weak support of wetland science and technology, which has always been a prominent problem of wetland protection and restoration in China.". Your proposal is timely and accurate, which is of great significance. "The Ministry of Science and Technology will seriously study and absorb your relevant opinions, actively support the construction of relevant state key laboratories, and strengthen the research on the ecological restoration of Baiyangdian wetland." Now the Preparatory Committee has been established and the laboratory will be established soon, which will become the first platform for international wetland scientific exchanges.

### **IV. Scientific research on the impact of methane emission from wetlands on climate change is a top priority**

Wetlands have a strong carbon sink function and a strong CO<sub>2</sub>absorption function, but they also emit a large amount of methane. Methane is the second largest greenhouse gas, and it is also true that wetlands, including artificial wetlands and rice fields, emit a lot of methane. At the Glasgow Global Climate Change Conference in 2021, China's special envoy reached an agreement with the United States that China would do its utmost to reduce methane emissions. Methane is the main component of natural gas (60-98%) and can be utilized. The author has successful practices in India

and China.

On April 7, 2022, the US News and Business Channel website published an article saying that "the contribution of methane to the greenhouse effect is 84 times that of carbon dioxide", and some international organizations even proposed 100 times. In the report of the United Nations Intergovernmental Panel on Climate Change on April 4 this year, the value was only 21 times. Which is scientific? What is the experimental basis? Does the data of a large country contain any designs against other countries? The author expects to obtain more scientific data from the Convention on Wetland to be held in Wuhan.

## **V. Conclusion**

The 14th Conference of the Parties to the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat which will be held simultaneously in Wuhan and Geneva on November 6 this year, should be a scientific conference. China should make a strong voice of the times with its own voice and guide the trend of international wetland scientific research. Together with all international colleagues and the Secretariat of the new International Convention on Wetlands, we are willing to make more and more contributions to the sustainable development of the "community of human destiny" and the "community of man and nature", relying mainly on the National Key Laboratory of Wetland Ecological Restoration in China.

## **References:**

1. Wu Jisong. River management experts talk about river length [M]. Beijing: Beihang University Press, 2017.
2. Wu Jisong. Theory and practice of wetland restoration planning [M]. Beijing: China Architecture & Building Press, 2018.
3. Wu Jisong. Principle and application of wetland ecological restoration engineering [M]. Beijing: China Architecture & Building Press, 2021.
4. Joosten, A. M. T. Flora of the blue-green algae of the Netherlands: The

Non-Filamentous Species of Inland Waters[M]. Utrecht : KNNV, 2006.

5. Ewers Lewis et al. Impacts of land reclamation on tidal marsh 'blue carbon' stocks. Science of The Total Environment, 2019.

**About the author:**

Wu Jisong, Director of the Preparatory Committee of the National Key Laboratory of Wetland Ecological Restoration, Director of the Academician Workstation of China Xiongan Group, Foreign Academician of the Royal Swedish Academy of Engineering Sciences, Doctor, Doctoral Tutor, National Excellent Scientific and Technological Worker, Member of the Expert Advisory Committee of Beijing Municipal Government, First-class Professor of Beijing University of Aeronautics and Astronautics, Hohai University and Beijing University of Information Science and Technology. He presided over China's accession to the International Convention on Wetlands and first translated "wetland" as wetland in 1988. Former Deputy Director of the National Water Conservation Office, Director of the Water Resources Department of the Ministry of Water Resources, former Consultant on High-tech and Resources and Environment of the Science and Technology Department of UNESCO, and former head of the Secretariat of the International Convention on Wetlands.

*The views and opinions expressed in the article only represent those of the author.*