

# High-quality development paths in the Yellow River Basin in the context of dual carbon

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**Abstract.** Since the introduction of the "double carbon" concept, cities and towns in the Yangtze River and Yellow River basins have been taking action to protect the ecological environment, this paper first gives a brief overview of the dual carbon policy, based on which the current situation of the development of the Yellow River Basin is introduced, and finally gives relevant suggestions on how to guarantee the high-quality development of the Yellow River Basin.

**Keywords:** High-quality; Yellow River; Dual carbon.

## 1. Overview of Dual Carbon Policy

### 1.1 The basic meaning of dual carbon policy

The "double carbon" refers to carbon peaking and carbon neutrality, carbon peaking is a commitment by the world's major countries to not increase their carbon dioxide emissions after they peak at a certain time in the future, while carbon neutrality is an environmental management method that uses tree planting and other methods to create more oxygen to achieve the goal of neutralizing excess carbon dioxide and protecting the ecological environment [1]. The starting point of the "Double Carbon" policy is the joint management of the world environment. As a large Eastern country, China has announced in the international community that it will achieve carbon peaking by 2030 and carbon neutrality by 2060, not only to maintain sustainable economic development but also to guarantee a natural and harmonious living environment for people.

### 1.2 Dual carbon policy basic requirements

The dual carbon policy requires regional governments, organizations and people to use scientific and reasonable means to jointly achieve ecological and environmental management and protection based on the new development stage and the goal of carbon peaking and carbon neutrality. The State Council issued the carbon peak and carbon neutral program proposed the overall deployment of classified policies, systematic promotion of key breakthroughs and other key tasks to carry out carbon reduction work in cities and towns together in order to gradually achieve the carbon peak and carbon neutral goals.

## 2. Yellow River Basin Development Status

### 2.1 Ecological status

#### 2.1.1 Ecological and environmental problems are still serious

Since the 21st century, the governments and people in the Yellow River Basin have made a series of efforts to protect the ecological environment of the Yellow River Basin, however, the ecological environment of the Yellow River Basin has been seriously damaged in the process of economic development, especially industrial development, and the treatment of the natural environment often requires a lot of time and cost. So far, the whole area of the Yellow River Basin ecological environment problems are still serious, including water pollution problems and stinky water problems are the most obvious, according to the Yellow River Basin Ecological Environment Supervision and Management Bureau investigation and research, in April this year, the left bank of the Yellow River Jinti River, natural Wenyan canal part of the river are direct discharge of sewage and river water

stinky phenomenon, due to sewage discharge caused by the emergence of river eutrophication phenomenon. In addition, referring to the national carbon emission quotas for each region, the carbon emission of each urban group in the Yellow River Basin in 2021 as shown in the Chinese Yearbook far exceeds the prescribed quotas, and the implementation of the dual carbon policy and the realization of its goals are difficult and long [2].

**Table 1.** Carbon emissions of urban groups in the Yellow River Basin by the end of 2020

City Cluster	Share of carbon emissions (%)	Carbon emissions per capita (t/person)	Carbon intensity (t/10,000 yuan)
Shandong Peninsula City Cluster	25.4	6.9	1.1
Central Plains City Cluster	19.9	7.4	1.5
Guanzhong Plain City Cluster	15.2	6.5	2.0
Jinzhong City Cluster	9.7	11.6	3.7
Hu Bao E Yulin City Cluster	16.0	24.8	2.8
Ningxia along the yellow city cluster	9.2	29.9	8.9
Lanzhou-Xining City Cluster	4.6	8.4	2.1

### 2.1.2 Overall water quality has improved

According to the national water quality statistics for 2021 released by the China Ecological Environment Status Bulletin, we can get that the water quality of the Yellow River has been significantly improved in 2021. Among the 265 national examination sections monitored, 81.9% of the sections with water quality of Class I~III, which is 2.0 percentage points higher than that in 2020; 3.8% of the sections with poor V, which is 1.1 percentage points lower than that in 2020. Overall, the water quality of the main stream of the Yellow River is excellent, and the water quality of the main tributaries is good.

**Table 2.** 2021 Yellow River Basin Water Quality Status

Water bodies	Number of cross-sections (pcs)	Proportion (%)					
		Class I	Class II	Class III	Class IV	Class V	Poor V class
Watershed	265	6.4	51.7	23.8	12.5	1.9	3.8
Main stream	43	14.0	81.4	4.7	0	0	0
Major Tributaries	222	5.0	45.9	27.5	14.9	2.3	4.5
Provincial boundary cross section	74	8.1	62.2	17.6	8.1	0	4.1

### 2.1.3 Damage to species diversity

Due to the slow ecological recovery, the species diversity of the Yellow River Basin continues to be affected, with the most affected freshwater fishes, with a total of 147 species of indigenous fish until the end of 2020, including 11 species of catfish, 8 species of Perciformes, and less than 4 species of each of the remaining orders. Analyzing the number of species, the Yellow River fishes only account for 8.9% of the total number of freshwater fishes in China. Compared with rivers such as the Yangtze and Pearl River, the Yellow River has few species and a low proportion of freshwater fishes, and the biodiversity of the basin is obviously limited.

## 2.2 Current Economic Development

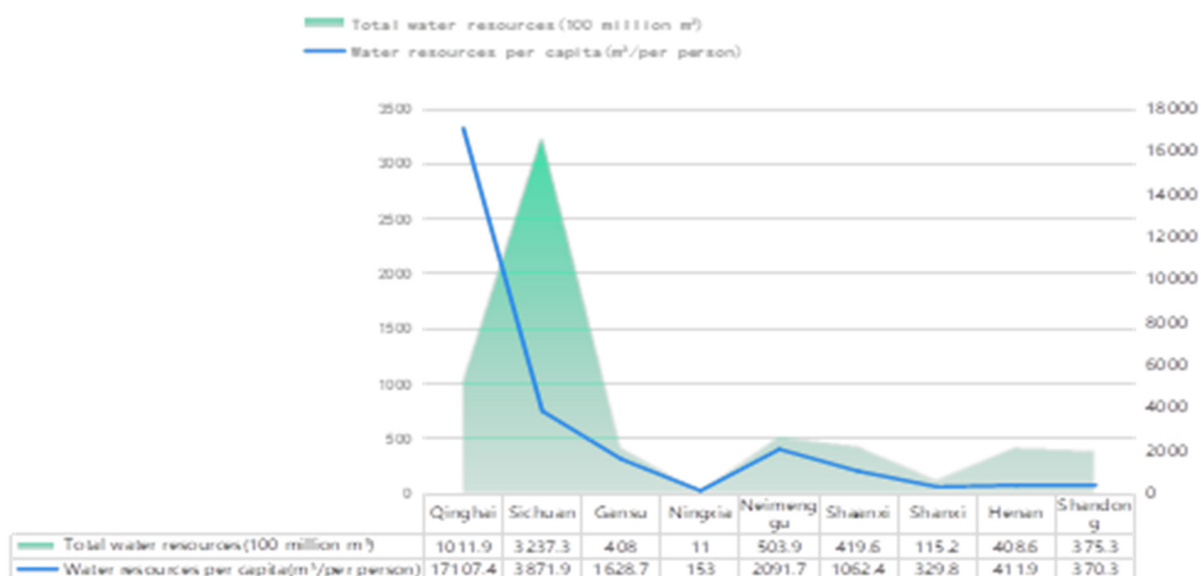
### 2.2.1 Fisheries development is limited

In recent years, the fish catch in the Yellow River basin has always hovered around 46,000 tons, due to the discharge of a large amount of industrial and agricultural wastewater, resulting in the death of a large number of phytoplankton in the river, excessive algae covering the river surface has destroyed the original survival environment of fish, the fish farming industry cannot give rise to vitality, a large number of fishermen unemployed in an invisible increase in regional employment difficulties, and the downstream related industries associated with fisheries are also affected to a certain extent. It is urgent to protect the living environment of fish and promote the development of fishery.

### 2.2.2 Tourism development is limited

The Yellow River basin is the birthplace of the Chinese nation, with ancient and simple characteristics, and the basin culture has always been one of the representative human content of the cities related to the Yellow River basin, and because of this characteristic, the Yellow River basin is full of tourists, but from the overall point of view, the Yellow River tourism development situation and the number of tourists is not very satisfactory, the Yellow River as the second largest river in China, the surrounding areas of tourism due to the ecological environment and economic development and other reasons tourism has not been fully developed.

### 2.2.3 Water resource utilization needs to be improved



**Fig. 1** Water use in the Yellow River Basin in 2020

According to China Statistical Yearbook 2021, the distribution of water resources in the Yellow River Basin varies among provinces and autonomous regions at the end of 2020, among which Sichuan has the highest total water resources of 323.73 billion m<sup>3</sup>, but less water resources per capita of 3,871.9 m<sup>3</sup>/person; Qinghai has the highest water resources per capita of 17,107.4 m<sup>3</sup>/person, but relatively less total water resources of 101.19 billion m<sup>3</sup>. The total water resources of Gansu, Ningxia, Shanxi, Henan and Shandong are less than 50 billion m<sup>3</sup>. the per capita water resources of Ningxia, Shanxi, Shandong and Henan fail to reach the international standard of extreme water shortage, and the utilization rate of water resources is low.

### **3. High quality development path of Yellow River Basin in the context of double carbon**

#### **3.1 Synergistic development of economic growth and ecological environment**

##### **3.1.1 Improve the modernized governance system of the ecological environment of the Yellow River basin**

Modern technical means will be more deeply and effectively applied to the modernization of the Yellow River Basin ecological environment management system, such as information technology means, Internet of Things means, etc., in the ecological environment monitoring and sewage discharge water quality monitoring and reporting on the use of information technology means to achieve real-time monitoring of watershed water quality, pollution status and enterprise sewage discharge status, in order to better grasp the current state of the Yellow River Basin ecological environment and restrain environmental damage. In addition, the Internet of Things (IoT) and other tools are used to promote the implementation of biodiversity conservation in the watershed, to promote the growth of freshwater fish in rivers, and to accelerate the pace of fisheries recovery and development.

##### **3.1.2 Building a Community for Ecological Protection and Economic Construction in the Yellow River Basin**

Link ecological environmental protection and economic construction, accelerate the pace of building the Yellow River basin ecological environment and economic construction community, in the past decades of development process, the Yellow River water flow is polluted largely due to regional development unilaterally focus on economic development and ignore the ecological environmental protection, and the Yellow River rushing vast, flowing through many provinces, cities and regions, therefore, different regions should strengthen cooperation and set up relevant ecological and environmental protection indicators in the process of economic construction, such as setting indicators for waste gas emissions and sewage discharge in the process of industrial development, in order to achieve sustainable development as the goal and promote the healthy operation of economic development in cities and towns[3].

#### **3.2 Policy control and social governance go hand in hand**

##### **3.2.1 Accelerate watershed ecological and environmental management legislation**

In the context of the dual carbon policy, the country strongly advocates energy saving and emission reduction, and echoes the water environment protection. In addition to the regular regulation of the emissions of enterprises, the government should also regulate the behavior of residents, such as the use of cars, waste disposal, etc., through the enactment of strict laws to restrain the behavior of environmental damage, and incorporate some of the "moral issues" into the legal provisions in a reasonable manner, so as to more strictly and effectively control urban carbon emissions and water pollution.

##### **3.2.2 Encourage the growth of environmental governance social organizations**

Under the consensus of protecting the ecological environment, some environmental protection organizations, such as regional environmental protection associations and volunteer organizations, have emerged spontaneously in the society. The government should pay full attention to the power of the people, give social organizations certain legal rights or reasonable requirements and regulations in pollution control and sewage supervision, continuously encourage the growth of environmental governance social organizations, and achieve the goal of ecological environment control in the Yellow River Basin through the power of the ubiquitous people.

### **3.3 Stimulate the endogenous momentum of regional synergistic development**

#### **3.3.1 Promote the advantages of Yellow River culture**

The Yellow River culture is one of the ancient and mysterious traditional cultures in China, but due to the scattering of towns and cities in the basin and environmental pollution, the Yellow River culture has not been well applied to the development of related industries in the basin, the double carbon policy proposes that all people should be part of environmental management, which echoes the spirit of watchfulness in the Yellow River Basin since ancient times. The Chinese nation has a great life of self-improvement and has nurtured a brilliant human civilization and gorgeous natural music for millions of years, with beautiful scenery everywhere, and myths, legends and ancient stories that attract people's attention. The relevant managers should give full play to the cultural advantages of the Yellow River on this basis, so as to effectively show the endogenous power of environmental management and high-quality development of the Yellow River basin [4].

#### **3.3.2 Improve cross-regional migration policy**

Talent is one of the important driving forces for the sustainable development of society. The provinces and cities in the Yellow River Basin have a scattered layout, which leads to limited exchange of talent, and regional government departments can cooperate with each other to develop new policies and norms for the introduction and exchange of talent and rationalize cross-regional migration policies, and only by promoting human exchange can the protection of the ecological environment and economic development be carried out in a more orderly manner.

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