



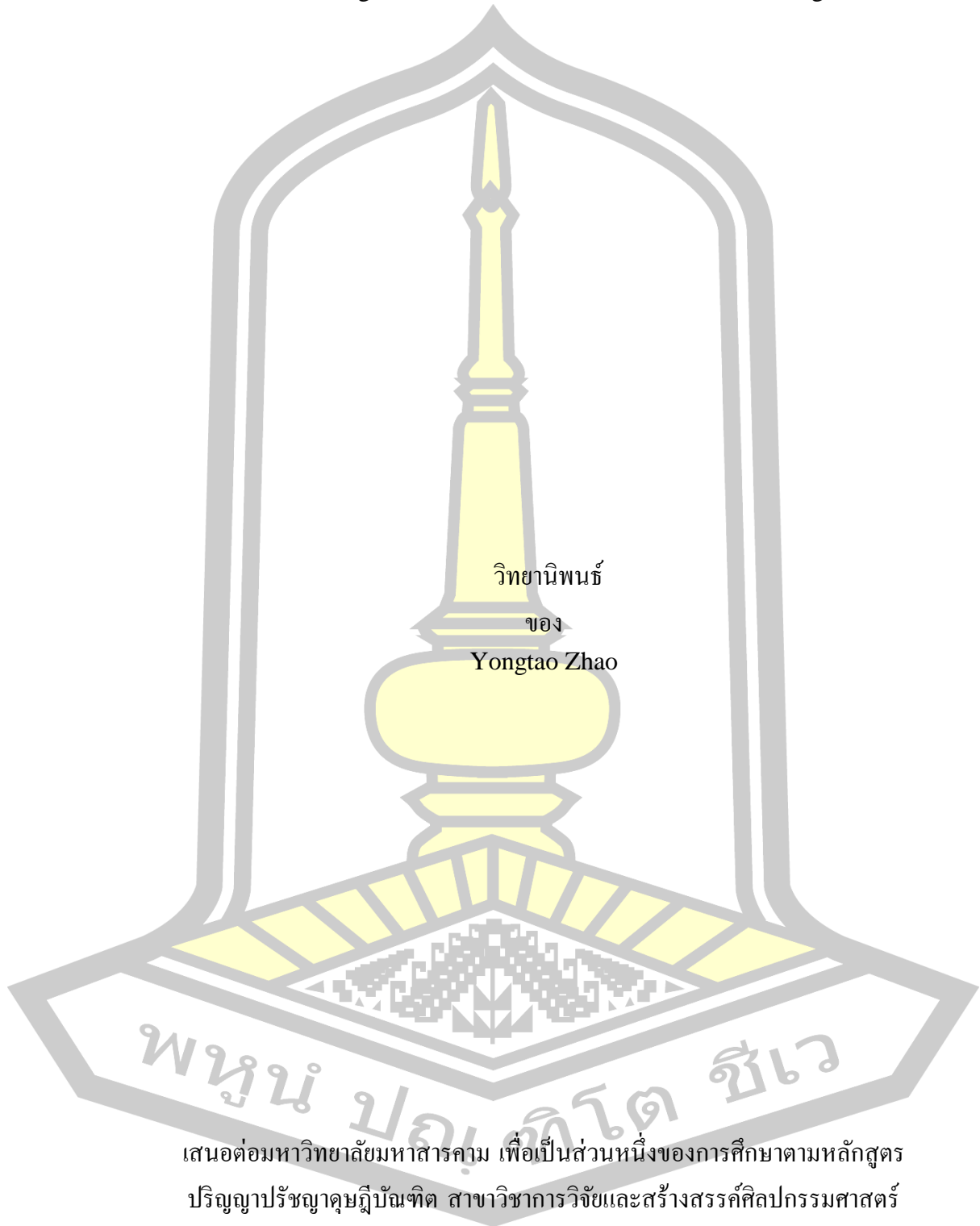
Yellow River Culture in Henan Province: The Composition and the Construction of  
Gene Pedigree in the context of World Cultural Heritage

Yongtao Zhao

A Thesis Submitted in Partial Fulfillment of Requirements for  
degree of Doctor of Philosophy in Fine and Applied Arts Research and Creation  
February 2024

Copyright of Mahasarakham University

Yellow River Culture in Henan Province: The Composition and the Construction of  
Gene Pedigree in the context of World Cultural Heritage



วิทยานิพนธ์  
ของ  
Yongtao Zhao

พหุบัน ปญฺ ติโต ชเว

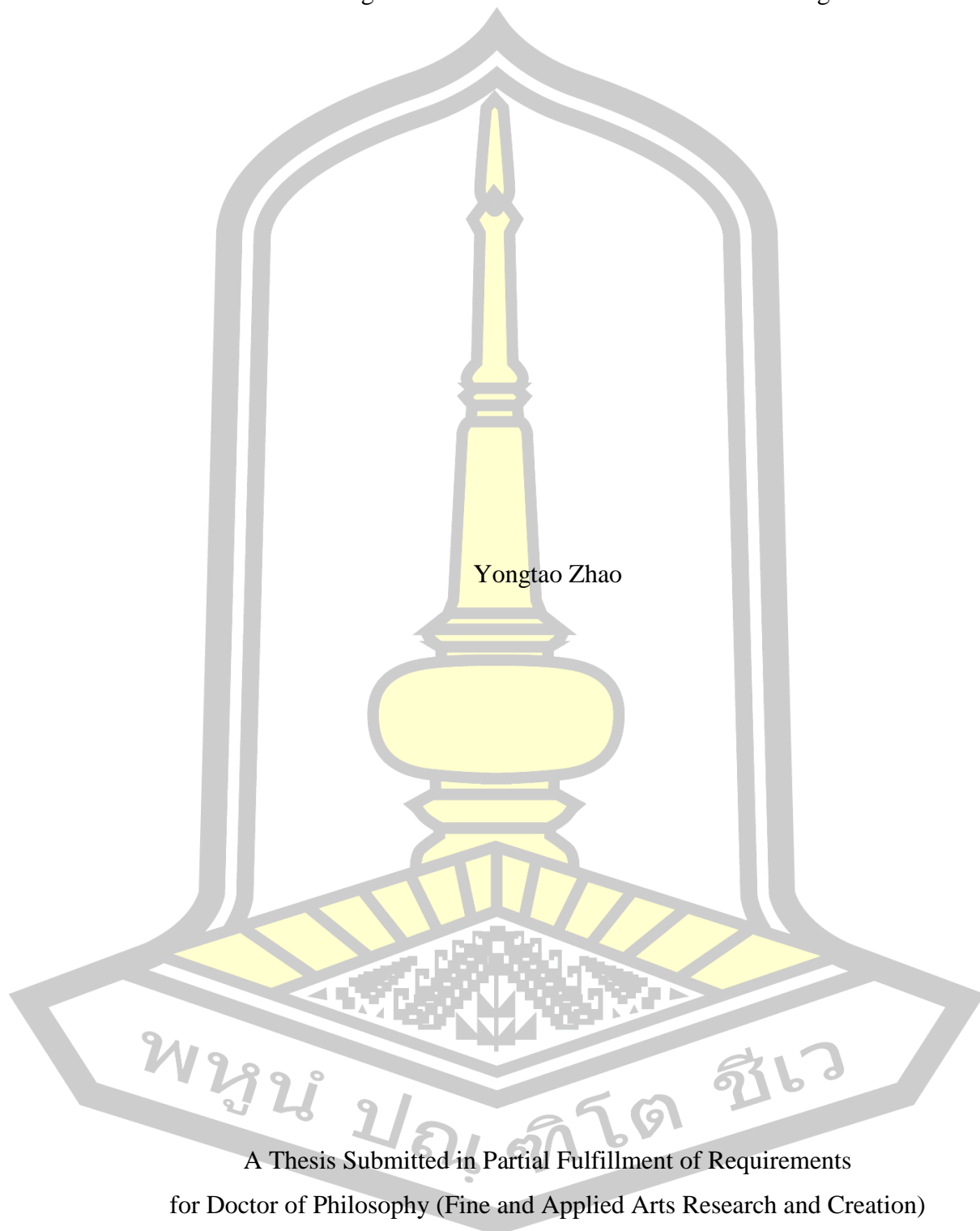
เสนอต่อมหาวิทยาลัยมหาสารคาม เพื่อเป็นส่วนหนึ่งของการศึกษาตามหลักสูตร  
ปริญญาปรัชญาดุษฎีบัณฑิต สาขาวิชาการวิจัยและสร้างสรรค์ศิลปกรรมศาสตร์

กุมภาพันธ์ 2567

ลิขสิทธิ์เป็นของมหาวิทยาลัยมหาสารคาม

Yellow River Culture in Henan Province: The Composition and the Construction of  
Gene Pedigree in the context of World Cultural Heritage

Yongtao Zhao



A Thesis Submitted in Partial Fulfillment of Requirements  
for Doctor of Philosophy (Fine and Applied Arts Research and Creation)

February 2024

Copyright of Mahasarakham University



The examining committee has unanimously approved this Thesis, submitted by Mr. Yongtao Zhao , as a partial fulfillment of the requirements for the Doctor of Philosophy Fine and Applied Arts Research and Creation at Mahasarakham University

Examining Committee

Chairman

( Li Yingfeng , Ph.D.)

Advisor

( Yihan Ke , Ph.D.)

Committee

(Assoc. Prof. Arkom Sa-  
Ngiamviboon , Ph.D.)

Committee

(Asst. Prof. Metta Sirisuk , Ph.D.)

Committee

(Asst. Prof. Peera Phanlukthao ,  
Ph.D.)

Mahasarakham University has granted approval to accept this Thesis as a partial fulfillment of the requirements for the Doctor of Philosophy Fine and Applied Arts Research and Creation

(Asst. Prof. Peera Phanlukthao , Ph.D.)

Dean of Faculty of Fine - Applied Arts  
and Cultural Science

(Assoc. Prof. Krit Chaimoon , Ph.D.)

Dean of Graduate School

<b>TITLE</b>	Yellow River Culture in Henan Province: The Composition and the Construction of Gene Pedigree in the context of World Cultural Heritage		
<b>AUTHOR</b>	Yongtao Zhao		
<b>ADVISORS</b>	Yihan Ke , Ph.D.		
<b>DEGREE</b>	Doctor of Philosophy	<b>MAJOR</b>	Fine and Applied Arts Research and Creation
<b>UNIVERSITY</b>	Mahasarakham University	<b>YEAR</b>	2024

### ABSTRACT

This paper selects Henan Yellow River cultural heritage as the research object, studies the historical changes of the Yellow River section of Henan under the background of world cultural heritage, systematically combs the composition system of Henan Yellow River cultural heritage, constructs the extraction method model of the Yellow River cultural genes, and constructs the genealogy of Henan Yellow River culture.

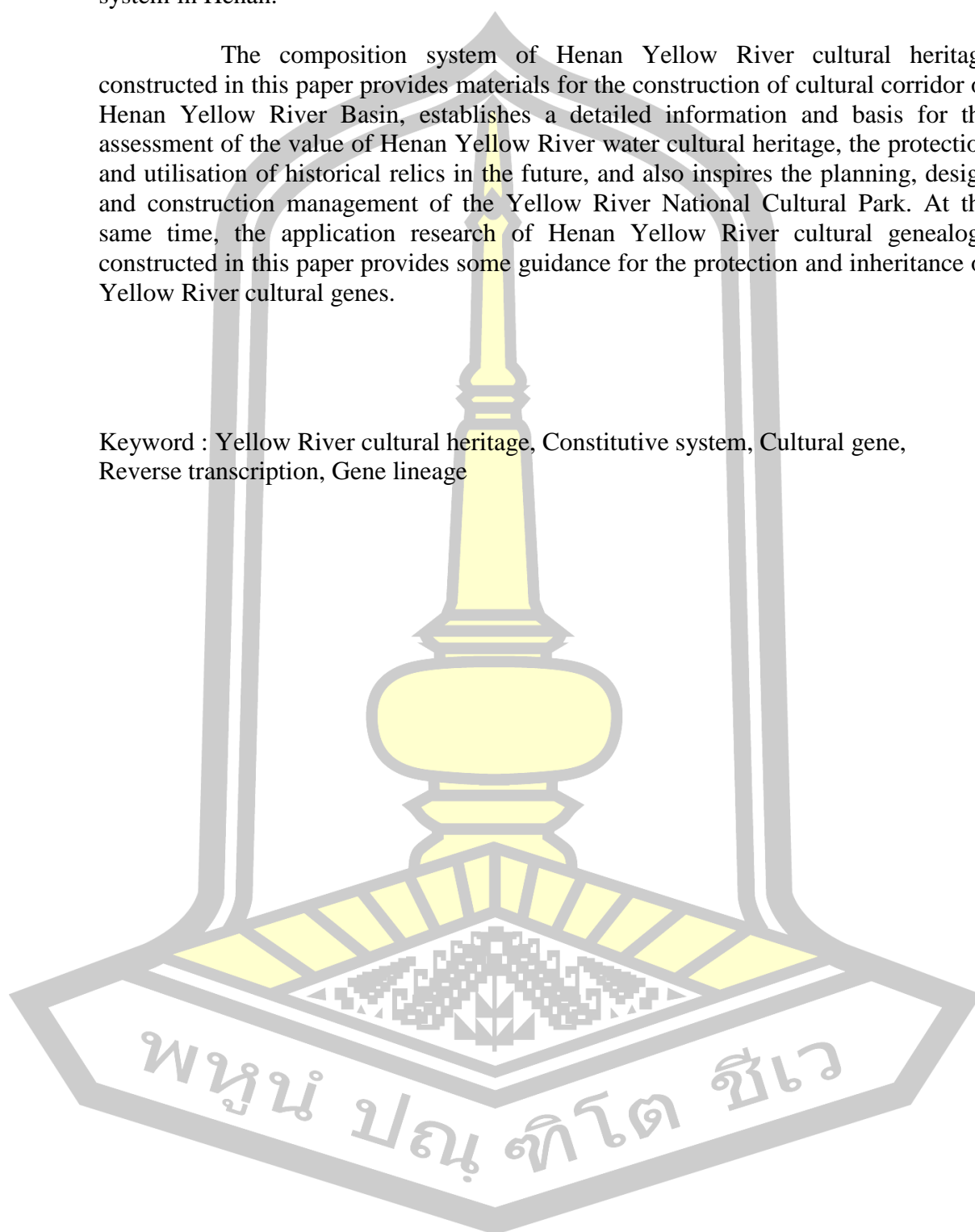
Firstly, literature analysis is applied to cognise the connotation of Yellow River cultural heritage by studying the evolution of the Yellow River Basin in Henan; secondly, on the basis of literature study and field research, the elements of the Yellow River cultural heritage components in Henan are summarised and the Yellow River cultural heritage component system in Henan is constructed; thirdly, by analogy with the product gene reverse transcription extraction method, and by comprehensively applying the literature analysis method, the field research method and the cross analysis method, a the general process of Yellow River cultural gene extraction; finally, it belongs to the empirical research content, using the constructed Yellow River cultural gene extraction method model, reverse transcription extraction, mining Henan Yellow River cultural genes and constructing gene genealogy.

This paper puts forward the conceptual connotation and composition requirements of Henan Yellow River cultural heritage, focuses on 12 kinds of heritage elements on the basis of three categories, according to which the "3-12" composition system of Henan Yellow River cultural heritage is constructed innovatively, and 239 elements of Henan Yellow River cultural heritage are found. This paper constructs a methodological model of Yellow River cultural gene extraction by analogy with the product gene reverse transcription extraction method. Taking the cultural heritage of the Yellow River section in Henan as an example, we extracted the externally explicit cultural genes, such as watercraft gene, water engineering gene, stone carving gene, and the internally recessive cultural genes, such as Yellow River governance gene, national spirit gene, traditional skills gene, folklore gene, folk belief gene, and literature and art gene, so as to validate and respond to the Yellow River cultural gene

extraction method, and to construct the genealogy of the Yellow River cultural gene system in Henan.

The composition system of Henan Yellow River cultural heritage constructed in this paper provides materials for the construction of cultural corridor of Henan Yellow River Basin, establishes a detailed information and basis for the assessment of the value of Henan Yellow River water cultural heritage, the protection and utilisation of historical relics in the future, and also inspires the planning, design and construction management of the Yellow River National Cultural Park. At the same time, the application research of Henan Yellow River cultural genealogy constructed in this paper provides some guidance for the protection and inheritance of Yellow River cultural genes.

Keyword : Yellow River cultural heritage, Constitutive system, Cultural gene, Reverse transcription, Gene lineage



## ACKNOWLEDGEMENTS

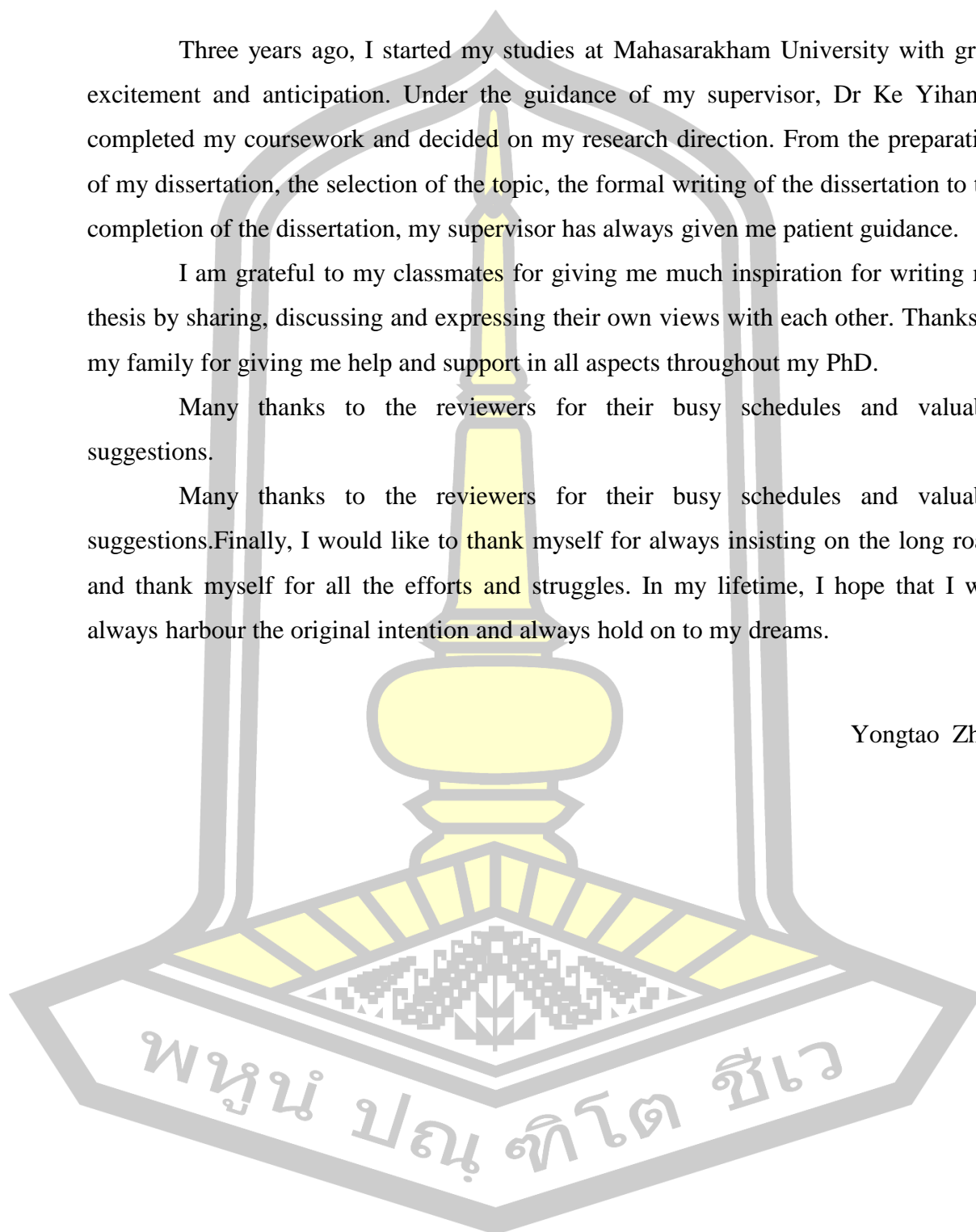
Three years ago, I started my studies at Mahasarakham University with great excitement and anticipation. Under the guidance of my supervisor, Dr Ke Yihan, I completed my coursework and decided on my research direction. From the preparation of my dissertation, the selection of the topic, the formal writing of the dissertation to the completion of the dissertation, my supervisor has always given me patient guidance.

I am grateful to my classmates for giving me much inspiration for writing my thesis by sharing, discussing and expressing their own views with each other. Thanks to my family for giving me help and support in all aspects throughout my PhD.

Many thanks to the reviewers for their busy schedules and valuable suggestions.

Many thanks to the reviewers for their busy schedules and valuable suggestions. Finally, I would like to thank myself for always insisting on the long road, and thank myself for all the efforts and struggles. In my lifetime, I hope that I will always harbour the original intention and always hold on to my dreams.

Yongtao Zhao



## TABLE OF CONTENTS

	Page
ABSTRACT.....	D
ACKNOWLEDGEMENTS.....	F
TABLE OF CONTENTS.....	G
LIST OF TABLES .....	L
LIST OF FIGURES .....	M
CHAPTER I.....	1
Introduction.....	1
1. Research background.....	1
2.Research Objectives.....	22
4. Definition of Terms .....	23
5.Scope of Research.....	24
6. Research Methodology.....	25
6.1 Population.....	26
6.4 Data analysis.....	28
7.Literature Reviews.....	28
7.1 Literature review on the study text.....	28
7.2 Literature review on research concepts .....	38
8. Conceptual Framework.....	45
8.1 Research concepts .....	45
8.2 Research conceptual framework .....	45
<b>9.Research plan</b> .....	46
10.Section structure .....	47
11. Benefits of research .....	47
11.2 Benefits of the research site to the society and community.....	47
CHAPTER II.....	49



Historical Changes in the Yellow River Basin of Henan .....	49
1. Overview of the Yellow River Section in Henan Province .....	49
1.1 Overview of the Yellow River Basin .....	49
1.2 Overview of the Yellow River Section in Henan Province.....	51
2. Governance, the evolution of the Yellow River strategy .....	53
2.1 The effectiveness of national governance as reflected in ancient river management.....	54
2.2 Efficacy of national river governance under a majoritarian centralised regime .....	54
2.3 The Weakening of State Power and the Frequency of Social Disasters in Modern River Governance .....	59
3. Artistic changes in the cultural heritage of the Yellow River in Henan .....	62
3.1 Changes in architectural art .....	62
3.2 Changes in the art of traditional skills .....	65
3.3 Changes in Literature and Art .....	67
3.4 Changes in folk art .....	68
4. The historical evolution of the Yellow River governance thought.....	69
4.1 Evolution of ancient river control ideas .....	69
4.2 The Development of Modern River Management Ideas and the Introduction of Western River Management Theories.....	71
5. Technological Innovations and Applications of Yellow River Management Throughout the Ages .....	73
5.1 The Continuous Improvement of Ancient Yellow River Management Technology.....	73
5.2 Introduction and application of modern Yellow River management technology Summary.....	80
6. The Impact of Yellow River Governance on Artistic Changes in the Yellow River Basin .....	81
Summary .....	82
CHAPTER III .....	84
Cultural Heritage Composition System of the Yellow River Section of Henan.....	84

1. Classification basis in the background of world Cultural Heritage .....	85
1.1 The World Heritage Convention .....	85
1.2 Notice of The State Council on Strengthening the Protection of Cultural Heritage .....	87
1.3. The UNESCO Convention on the Protection of the Intangible Cultural Heritage .....	88
1.4 Classification table of China's tourism resources survey .....	88
2. Definition, classification and composition of the Yellow River water cultural heritage .....	90
2.1 Definition of the Yellow River and the water cultural heritage .....	90
2.2. Classification method of cultural heritage resources .....	93
2.3. Classification of the Yellow River water cultural heritage resources in Henan province .....	97
3. Composition of the Yellow River water cultural heritage resources in Henan province .....	107
3.1 Level Composition of the Yellow River Water Cultural Heritage in Henan .....	107
3.2 Example source of the Yellow River Water Cultural Heritage in Henan Province .....	109
3.3 Construct the Yellow River water cultural heritage composition system in Henan province .....	110
3.4 Intangible water cultural heritage resources along the Yellow River in Henan province .....	120
4. The artistic value of Henan Yellow River water cultural heritage .....	126
4.1 Architectural art .....	126
4.2 Crafts and traditional arts .....	128
4.3 Folk art value .....	129
Summary .....	133
CHAPTER IV .....	134
<b>Constructing the model of gene extraction method of Yellow River culture .....</b>	<b>134</b>
1. Modern molecular biology theories for reference .....	134
1.1 Biological evolution theory .....	134

1.2 The hypothesis of cultural evolution .....	137
2. Analysis of cultural and gene theory .....	139
2.1 Origin and development of cultural genes .....	140
2.2 Comparison of the genetic characteristics of cultural genes and biological genes .....	142
2.3 Principles for the identification of cultural genes .....	143
2.4 Model structure for the transmission of cultural genes .....	144
3. Cultural gene extraction method of "reverse transcription" .....	145
3.1 Cultural gene identification pattern .....	145
3.2. Construction of cultural gene extraction method for "reverse recording" .....	146
3.3 Methodological Conceptualisation of the Countercultural Gene .....	148
4. Extraction of the cultural genes of the Yellow River cultural heritage .....	148
4.1 The Yellow River cultural heritage elements excavation .....	148
4.2 Categorisation of element examples .....	149
4.3 Population Construction of Yellow River Cultural Heritage Elements ....	151
4.4 Population analysis: extraction of cultural elements .....	152
4.5 Reverse transcription: Extraction of Yellow River cultural genes .....	154
Summary .....	158
CHAPTER V .....	159
<b>Genetic Genealogy of Yellow River Culture in Henan Based on Methodological Construction .....</b>	<b>159</b>
1. Cultural gene carrier performance of the Yellow River cultural heritage in Henan province .....	159
2. Reverse record extraction of the explicit cultural genes of the Yellow River Cultural Heritage in Henan Province .....	169
2.1 Hydro-work gene .....	169
2.2 Ancient architectural genes .....	172
2.3 Stone carving gene .....	174
3. Reverse record extraction of recessive cultural genes in the Yellow River Cultural heritage in Henan Province .....	177
3.1 Cultural gene of the Yellow River governance .....	177

3.2 National spirit gene .....	178
3.3 Traditional skill genes .....	178
3.4 Folk-custom genes.....	179
3.5 Folk belief gene .....	181
3.6 Literary and artistic genes .....	182
4. Construction of Cultural Genealogy of Henan Yellow River Cultural Heritage .....	184
Summary .....	189
CHAPTER VI.....	190
Research Result, Discussion and Suggestions .....	190
1.Conclusion .....	190
2. Discussion.....	194
2.1 Research on the Cultural Heritage of the Yellow River Historic Trail and Yellow River Region.....	194
2.2 Discussion on the method of extracting cultural genes from cultural heritage .....	196
2.3 Main innovation points of the paper.....	197
3.Suggestions .....	198
3.1 Genetic Types of Yellow River Culture in Henan .....	198
3.2 The Path of Educational Dissemination of the Yellow River Cultural Gene in Henan .....	200
REFERENCES .....	201
BIOGRAPHY .....	207

พหุ ม ประ โท ชี เว

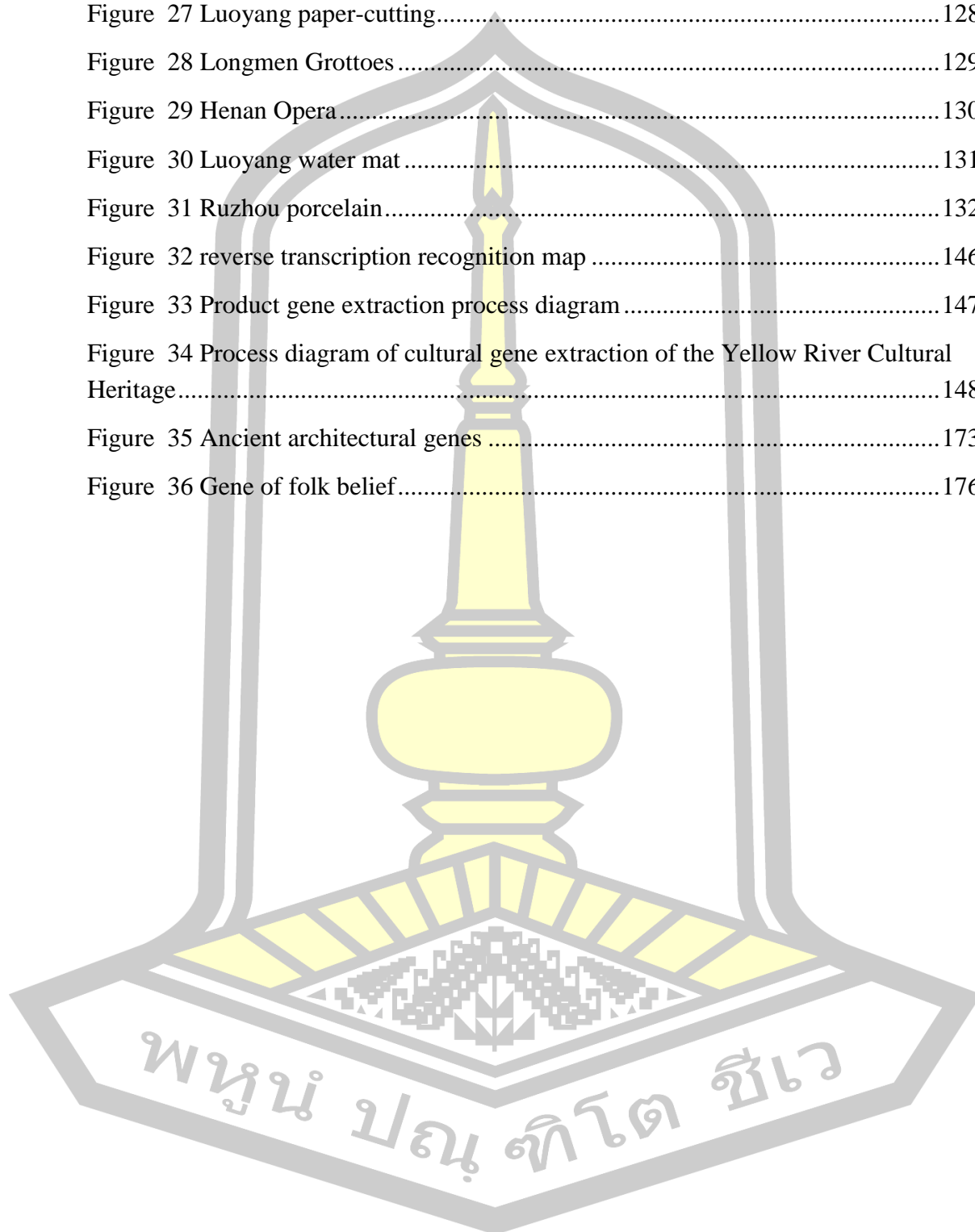
## LIST OF TABLES

	Page
Table 1 .....	46
Table 2 List of World Heritage categories Source: The author draws according to the World Heritage Convention Operational Guide 2013 edition .....	86
Table 3 General Survey and Classification Table of Chinese Tourism Resources Source: Excerpt from the "Tourism Resources Classification Table" (2017 national standard).....	89
Table 4 Classification system of Beijing-Hangzhou Grand Canal Source: the author collated, self-made .....	101
Table 5 Type composition of national cultural relics protection units in the cities along the Yellow River in Henan Province .....	107
Table 6 Type composition of provincial intangible cultural heritage in the cities along the Yellow River in Henan Province .....	108
Table 7 Type table of material cultural heritage along the Yellow River section in Henan province .....	117
Table 8 Classification table of material cultural Heritage Protection status along the Yellow River in Henan province Source: the author collated, self-made.....	117
Table 9 Classification of relationship between Water Cultural Heritage and Yellow River in Henan Source: the author collated, self-made .....	118
Table 10 Comparison table of biological genes and cultural genes.....	143
Table 11 Principles of Henan Yellow River cultural gene determination .....	144
Table 12 Principle of gene extraction of the Yellow River culture Source: the author homemade .....	155
Table 13 Table of the core cultural elements of the Yellow River Cultural Heritage in Henan province Source: the author homemade .....	169
Table 14 Outexplicit cultural genes of Yellow River cultural heritage in Henan ....	176
Table 15 Recessive cultural genes within the Yellow River Cultural heritage in Henan province Source: the author homemade .....	183
Table 16 Gene lineage of the Yellow River cultural heritage in Henan Province....	188
Table 17 Identification of genotypes of the Yellow River culture in Henan .....	198

## LIST OF FIGURES

	Page
Figure 1 Dujiangyan water Conservancy Project .....	6
Figure 2 Aerial view of the head of the World Irrigation Heritage .....	6
Figure 3 The World Heritage West Lake cultural landscape.....	7
Figure 4 China's Grand Canal heritage .....	9
Figure 5 Yellow River .....	11
Figure 6 Schematic diagram of China's five major national strategic space .....	14
Figure 7 The middle and lower reaches of the Yellow River boundary monument...	19
Figure 8 Research Conceptual Framework.....	46
Figure 9 Map of the Yellow River Basin.....	51
Figure 10 Map of the Yellow River.....	52
Figure 11 Schematic diagram of the Yellow River water cultural heritage circle layer .....	93
Figure 12 Live presentation of intangible water cultural heritage resources.....	103
Figure 13 Material carrier of intangible water cultural heritage resources.....	104
Figure 14 Structure diagram of the Yellow River Cultural Resources System .....	105
Figure 15 play an indispensable role .....	111
Figure 16 Taoist Temple of Good Response .....	112
Figure 17 Original Yang Linglong Tower.....	112
Figure 18 Zheng Gonghe Long on the tablet.....	113
Figure 19 Yellow River First Railway Bridge.....	114
Figure 20 Yellow River governance literature.....	115
Figure 21 Guarantee Yinghe plaque .....	116
Figure 22 Yellow River governance tools .....	116
Figure 23 The Yellow River is a traditional technique.....	123
Figure 24 Yellow River haozi.....	124
Figure 25 Yellow River mud xun .....	124

Figure 26 Yubeiting .....	127
Figure 27 Luoyang paper-cutting.....	128
Figure 28 Longmen Grottoes .....	129
Figure 29 Henan Opera.....	130
Figure 30 Luoyang water mat .....	131
Figure 31 Ruzhou porcelain.....	132
Figure 32 reverse transcription recognition map .....	146
Figure 33 Product gene extraction process diagram.....	147
Figure 34 Process diagram of cultural gene extraction of the Yellow River Cultural Heritage.....	148
Figure 35 Ancient architectural genes .....	173
Figure 36 Gene of folk belief.....	176





# CHAPTER I

## Introduction

### 1. Research background

The academic community has not yet formed an authoritative definition of the concept of Yellow River cultural heritage, and it is necessary to draw on the authoritative definition of the concept of world cultural heritage, and at the same time, combine the concepts of the Grand Canal cultural heritage, which has already been included in the world cultural heritage, and the concept of the water engineering heritage, which is closely related to water, in order to provide support for the definition of the concept of Yellow River cultural heritage.

Cultural heritage is a valuable material and spiritual wealth of human society, and with the improvement of the material living standard of human beings all over the world, the protection and use of cultural heritage have gradually been recognised by all walks of life in the society. In 1972, "cultural heritage" was formally identified as an object of direct protection by international conventions, and UNESCO formally adopted the term "cultural heritage" in the Convention Concerning the Protection of the World Cultural and Natural Heritage<sup>1</sup>. Article 1 of the Convention defines the term "cultural heritage": "For the purposes of this Convention, the following are 'cultural heritage': monuments, i.e. buildings of outstanding universal value from the point of view of history, art or science, sculptures and monumental works, and monuments and paintings monuments, i.e. buildings of outstanding universal value from the point of view of history, art or science, monumental sculptures and paintings, components or structures of archaeological objects, inscriptions, caves and ensembles; complexes, i.e. groups of single or linked buildings of outstanding universal value from the point of view of history, art or science in terms of their architectural form, their distribution or their integration in a landscape; sites, i.e. places of outstanding universal value from the point of view of history, aesthetics, ethnography or

---

<sup>1</sup>"UNESCO". (2007). Selection and compilation of international cultural heritage protection documents. Beijing: Cultural Relics Publishing House.

anthropology, in terms of their human engineering or combined natural or human engineering; as well as archaeological sites;". and places such as archaeological sites; these three categories are mainly immovable cultural heritage."

In 1992, UNESCO launched the Memory of the World (MoW) project, which is conceptually a continuation of the World Heritage programme and focuses on documentary heritage in the context of movable cultural heritage<sup>2</sup>, and in 2003 adopted the Convention for the Safeguarding of the Intangible Cultural Heritage (ICH), which defines "intangible cultural heritage" as traditional crafts", "knowledge and practices concerning nature and the universe", "social practices, rituals and festive events", "oral traditions and expressions (including as intangible cultural heritage)". Expressions (including language as a vehicle of the intangible cultural heritage)" and "Performing arts".



The criteria for assessing World Heritage properties are based mainly on the six categories of Outstanding Universal Value in the Convention Concerning the Protection of the World Cultural and Natural Heritage, and properties considered to be of Outstanding Universal Value must fulfil the conditions of integrity and/or authenticity as well as have adequate protection and management mechanisms in place to ensure their preservation. The conservation of World Heritage properties has gone through three phases, the conceptual origination phase, the conceptualisation phase and the conservation maturity phase.

The first is the phase of the origins of the concept of world cultural heritage, which first began in the 18th century during the Enlightenment, when the desire to preserve cultural heritage intensified with the rise of tourism. The twentieth century has seen great achievements in the preservation of cultural heritage. The protection of cultural heritage at the international level originated with the Athens Charter for the Restoration of Historic Monuments (1931), which for the first time at the international level set out the principles of modern conservation and restoration of cultural objects,

---

<sup>2</sup>The aim of the project is to make the memory of humanity more complete through international cooperation and the use of the best technical means to save the documentary records that are gradually aging, destroying and disappearing around the world.

involving an understanding of monuments and international collaboration in their protection. The United Nations Educational, Scientific and Cultural Organization (UNESCO), established in 1945, was the first international organisation engaged in the protection of cultural heritage, and adopted the Hague Convention in 1954 to strengthen the protection of cultural heritage in the event of armed conflict, and subsequently adopted a series of recommendations and treaties for the protection of cultural heritage, laying down the theoretical foundation for the protection of cultural heritage. UNESCO has since adopted a series of recommendations and treaties for the protection of cultural heritage, laying the theoretical foundation for cultural heritage protection.

The second stage is the formation of the concept of world cultural heritage. The Convention Concerning the Protection of the World Cultural and Natural Heritage, which was adopted by UNESCO in 1972 and implemented in 1975<sup>3</sup>, marked the formation of the definition of the world cultural heritage and the mechanism for its protection, which emphasised "outstanding universal value" and defined cultural heritage as monuments, architectural groups and sites of outstanding universal value in terms of history, art and science of mankind. In 1977, the World Heritage Committee was established and adopted the Operational Guidelines of the World Heritage Convention, which became the fundamental basis and effective tool for the implementation of the Convention.

The third is the stage of maturity of the protection of world cultural heritage. As the Operational Guidelines continue to improve and develop, the content of world cultural heritage has been deepened and refined, and relevant subheadings have been added, including architectural heritage, historic districts and buildings, monuments, cultural heritage sites, historic towns and urban areas, and underwater cultural heritage, and the mechanism for the protection of world cultural heritage has become more and more mature.

On 12 December 1985, China acceded to the Convention Concerning the

---

<sup>3</sup> Francesco FRANCIONI & Federico LENZERINI.(2008). The 1972 World Heritage Convention. a Commentary.

Protection of the World Cultural and Natural Heritage, starting the course of world heritage protection in China. 1982, the Fifth National People's Congress passed the Law of the People's Republic of China on the Protection of Cultural Relics,<sup>4</sup> which was later amended to strengthen the protection of China's world heritage, to inherit the excellent historical and cultural heritage of the Chinese nation, to promote scientific research, and to build a socialist spiritual and material civilisation. In 1986, China started to nominate world heritage projects to UNESCO, and became a member of the World Heritage Committee in 1999, and now the total number of world heritage sites in China has reached 56, making China the country with the largest number of world heritage sites in the world. Among them, 38 are world cultural heritage sites, 4 are dual world cultural and natural heritage sites, and 14 are world natural heritage sites, ranking first in the world, and China is already a major world heritage country.

With the continuous improvement of the world heritage system, different cultural heritages reflect unique humanistic achievements and natural landscapes, and are an important driving force for promoting world economic development, social development, and spiritual civilization development. Therefore, the protection and rational use of world heritage has become a constant discussion. topic. In 2017, General Secretary Xi Jinping delivered a keynote speech at the United Nations Headquarters in Geneva and pointed out that China has presented China's wonderful achievements based on 33 years of work in world heritage protection. China has the responsibility to better implement the World Heritage Convention and protect China's world heritage. , make good use and inherit it well, promote China from a heritage country to a heritage power, and let this treasure of world heritage bloom "China's wonderful" forever (Wang, 2020).

Water cultural heritage is a newly proposed type of cultural heritage in recent years, which belongs to a kind of industrial cultural heritage similar to architectural heritage, industrial heritage and agricultural heritage, and it has been incorporated into

---

<sup>4</sup> The Law of the People's Republic of China on the Protection of cultural Relics, which came into effect on December 29, 2007, aims to strengthen the protection of cultural relics.

the protection system of cultural heritage, which is an important part of cultural heritage. With the depth of the current research, water cultural heritage has been increasingly valued, and its status in the world cultural heritage has been continuously improved, as of 2020, about 25 projects involving water cultural heritage around the world have been inscribed on the World Heritage List; in 2014, the International Commission on Irrigation and Drainage (ICID) began to organise the selection of the world heritage of irrigation engineering for the purpose of protecting the irrigation engineering heritage in water cultural heritage<sup>5</sup>, and as of 2020, it will be the first time that the world heritage of irrigation engineering will be selected. In 2014, the International Commission on Irrigation and Drainage (ICID) started to organise the selection of the World Heritage of Irrigation Engineering in order to

protect the irrigation engineering heritage of the water cultural heritage. In general, compared to other types of heritage, the protection and research of water cultural heritage is still in its infancy, and research in related fields needs to be strengthened urgently.

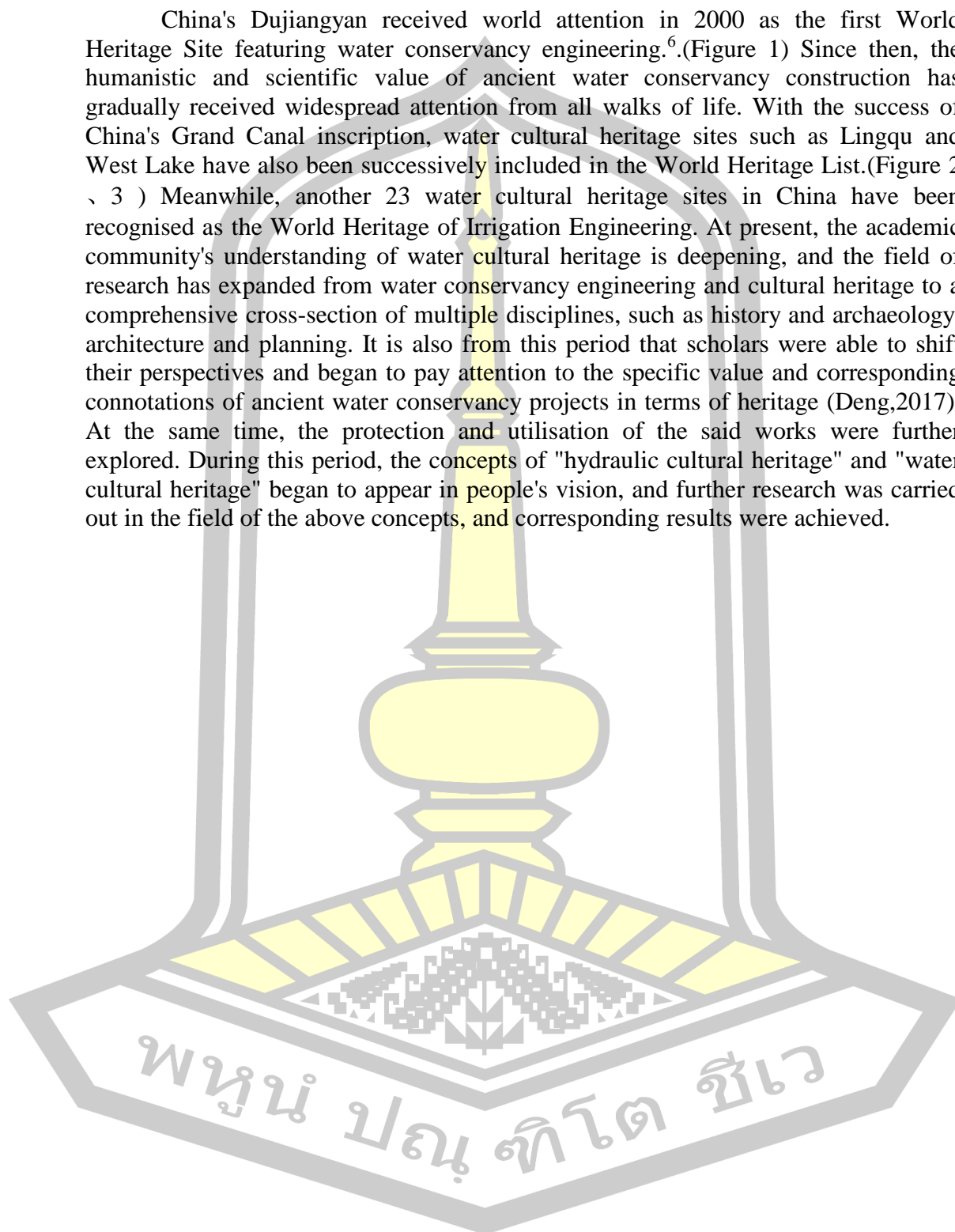
Water is the source of human civilisation. In a certain sense, the 5,000-year history of the Chinese nation's long civilisation is a history of water conservancy and the removal of water hazards. From the Neolithic era of dry bar construction, to the legendary Xia Yu decision nine rivers from the four seas; from the ancients to build dams, repair ditches, canals, to modern hydroelectric power, cross-basin diversion of water, the Chinese people in the long-term practice of water, creating a brilliant water culture, leaving a large number of invaluable water cultural heritage. These hydrological The heritage of water conservation, infused with the blood, sweat and ingenuity of the ancestors, condensing the immortal spirit of water conservancy people to explore nature, hard work, engraved with the children of China's unending water culture memory, is the condensation of the history of water management, is a reflection of the relationship between water and human beings, is the carrier of civilisation, and is the historical testimony to the great creativity of our nation. China's unique geographical location, natural environment and the historical

---

<sup>5</sup>The data are obtained by the authors according to the World Irrigation Engineering Heritage List published by ICID and the World Heritage List published by UNESCO.

development path of establishing the country by agriculture have determined that water conservancy is an inevitable choice for the survival and development of the Chinese nation. The first page of the history of water conservancy of the Chinese nation was opened by Dayu, and since then, all dynasties have taken the development of water conservancy and the elimination of water hazards as the top priority of ruling the country and securing the state, and water conservancy has been originated at the same time with Chinese civilisation and has been carried through the whole process of its development, coupled with the fact that China's vast territory, natural conditions, and the uneven distribution of water resources in both space and time have left behind a large number of water cultural heritages with a wide distribution and a rich variety of types in its 5000 years' history. These heritages are of various types, covering almost all types of water cultural heritage in the world. These heritages are of various types, covering almost all types of the world's water cultural heritage, and are of remarkable epochal and regional nature, systematically embodying the course of China's water conservancy construction and development and its achievements, reflecting the relationship between water conservancy and regional economic and social development, man and nature, water and regional culture, and bearing witness to the important role and great contribution of water conservancy in the unity of the country and social stability, as well as in the formation and development of the Chinese civilisation. It can be said that they are an indispensable and irreplaceable part of China's cultural heritage, and some of them have an important position in the world cultural heritage.

China's Dujiangyan received world attention in 2000 as the first World Heritage Site featuring water conservancy engineering.<sup>6</sup>(Figure 1) Since then, the humanistic and scientific value of ancient water conservancy construction has gradually received widespread attention from all walks of life. With the success of China's Grand Canal inscription, water cultural heritage sites such as Lingqu and West Lake have also been successively included in the World Heritage List.(Figure 2 、 3 ) Meanwhile, another 23 water cultural heritage sites in China have been recognised as the World Heritage of Irrigation Engineering. At present, the academic community's understanding of water cultural heritage is deepening, and the field of research has expanded from water conservancy engineering and cultural heritage to a comprehensive cross-section of multiple disciplines, such as history and archaeology, architecture and planning. It is also from this period that scholars were able to shift their perspectives and began to pay attention to the specific value and corresponding connotations of ancient water conservancy projects in terms of heritage (Deng,2017). At the same time, the protection and utilisation of the said works were further explored. During this period, the concepts of "hydraulic cultural heritage" and "water cultural heritage" began to appear in people's vision, and further research was carried out in the field of the above concepts, and corresponding results were achieved.





<sup>6</sup>Dujiangyan is the only grand water conservancy project in the world today, which has a long history and is characterized by no dam diversion.



Figure 1 Dujiangyan water Conservancy Project

Source: <https://new.qq.com/rain/a/20220519A062X700>, 2019



Figure 2 Aerial view of the head of the World Irrigation Heritage

source:

[https://mbd.baidu.com/newspage/data/dtlandingsuper?nid=dt\\_4666425257510923839](https://mbd.baidu.com/newspage/data/dtlandingsuper?nid=dt_4666425257510923839), 2022



Figure 3 The World Heritage West Lake cultural landscape  
source: [https://travel.sohu.com/a/577912588\\_121124430](https://travel.sohu.com/a/577912588_121124430), 2022

Based on this, in recent years, the protection of the cultural heritage of the three major rivers, namely the Beijing-Hangzhou Grand Canal, the Yellow River and the Yangtze River, has been successively incorporated into the national strategic plan, and the protection, inheritance and utilisation of the water heritage has gradually been highly valued by all walks of life. Since the State Council issued the Notice on Strengthening Protection of Cultural Heritage in 2005, China's water conservancy departments and relevant cultural relics protection departments have also carried out relevant work on the protection of water cultural heritage. At present, the 56 World Heritage Sites in China involve about 15% of the total number of water cultural heritage types; in addition, there are 23 World Heritage Sites of irrigation engineering in China, accounting for 22% of the total number of World Heritage Sites of irrigation engineering (Dong,2021). In conclusion, as the historical witness of human development and use of water, water cultural heritage demonstrates the concepts of scientific water management and water use as well as the construction technology and methods of ancient working people, reflecting the development process of China's water conservancy construction civilisation in different historical periods, and it has important historical, artistic and scientific and technological values. In-depth study of water cultural heritage not only for the development of current water conservancy construction, but also for the protection of cultural heritage are of great significance.

China's long history, vast territory, different geographical environment, water resources environment is very different, regional culture and customs are also different forms, very different, under the joint influence of these natural and social factors, China has produced a rich type of water cultural heritage, these water cultural heritage to promote the development of local economic and cultural development, the regional shipping business, agricultural development, etc., has had a significant impact, such as the Dujiangyan water conservancy project built in the Qin Dynasty, the Grand Canal built in the Sui Dynasty. For example, the Dujiangyan Water Conservancy Project built by the Qin Dynasty and the Grand Canal built by the Sui Dynasty. China is a large agricultural country, but also a large water conservancy country. Ancient water conservancy projects are still in use today, reflecting the

scientific concept of sustainable use, and play an important role in maintaining regional water efficiency, playing an important role in many aspects, and are also a major component of China's cultural heritage. In the past 30 years, under the impact of the market economy, the heritage of water conservancy projects with a long tradition is in a state of self-generation, in the water conservancy department is difficult to manage, the local government is unable to manage the situation. Due to the lack of systematic and effective protection, coupled with the general lack of knowledge of the community on the value of ancient water conservancy projects, many of the current water cultural heritage due to the loss of its use of its function in the process of economic development and large-scale construction in the face of the danger of being destroyed and forgotten. Therefore, the protection of water heritage is urgent.

As the research on cultural heritage in the academic world continues to deepen, from heritage monoliths to historic districts to regional linear cultural heritage, the knowledge continues to deepen, and the protection of cultural heritage presents a new trend of regionalisation and wholeness. At present, China's inter-regional large-scale cultural heritage mainly focuses on the protection of elements and single segments, however, inter-regional large-scale cultural heritage is a huge system of composite heritage, the complexity of its own heritage composition makes it difficult to identify the connotation of the heritage, screening and value assessment of the elements, and the lack of overall co-ordination among the administrative departments of the regions involved makes it difficult for the comprehensive value of the inter-regional large-scale cultural heritage to be effectively demonstrated. At the same time, China's cultural relics protection system mainly consists of four levels of cultural relics protection units at the national, provincial, municipal and district (county) levels, targeting only the protection of heritage elements, and the overall protection of regional heritage, which consists of the protection of historical and cultural cities, towns, villages, neighbourhoods and industrial heritage in some areas, and the lack of targeted protection of large-scale cross-regional heritage. In recent years, with the success of China's bidding for the Beijing-Hangzhou Grand Canal and the Silk Road (Chang'an-Tianshan Corridor), the country is increasingly focusing on the discovery of the overall value of large-scale cultural heritage. Therefore, a holistic study of cross-regional large-scale cultural heritage meets the needs of the current stage.

The concept of the Grand Canal cultural heritage is intuitively elaborated in China's Administrative Measures for the Protection of the Grand Canal Heritage, which defines it as "including the water conservancy engineering remains of the Sui and Tang Dynasty Canal, the Beijing-Hangzhou Grand Canal, and the Zhedong Canal, as well as all kinds of accompanying historical remains, historical neighbourhoods, villages and towns and the associated environmental landscapes."<sup>7</sup> At the international level, the concept of "canal" was discussed in detail at an expert meeting on canal heritage in 1994 and has since been incorporated into the Operational Guidelines for the Implementation of the Convention Concerning the Protection of the World Cultural and Natural Heritage, which defines canal heritage as: "A canal is a

---



<sup>7</sup>The Grand Canal is a great water conservancy structure created by the working people of ancient China. It is the longest canal in the world, and also the earliest and largest canal in the world.

waterway built by human beings. Canals may be of outstanding universal value, either historically or technically, either in essence or as a special case of this cultural heritage type. A historic canal can be seen as a heritage site, a defining feature of a linear cultural landscape, or an integral part of a complex cultural landscape." (Figure 4)



Figure 4 China's Grand Canal heritage  
source: <https://www.ihchina.cn/Article/Index/detail?id=22732>, 2021

For the heritage conservation of the Grand Canal has gone through three phases, the foundation phase, the initial phase, and the full implementation phase. The first stage was the foundation stage of the protection of the Grand Canal heritage before the inscription work in 2006, when a large-scale renovation of some sections of the canal was carried out, mainly involving the demolition of factories and sewage pipes on both sides of the canal, and the construction of new facilities such as greenways, roads, and cultural and tourism facilities, laying a certain foundation for



the protection and development of the Grand Canal heritage. The second stage is the initial phase of the protection of the heritage of the Grand Canal from 2006 to 2014. In 2006, the State Administration of Cultural Heritage included the Grand Canal in the Preparatory List of China's World Cultural Heritage, which initiated the bidding for the inscription of the Grand Canal. In the same year, the Beijing-Hangzhou Grand Canal was listed as one of the sixth batch of national key cultural relics protection units, and in 2013, when the seventh batch of national key cultural relics protection units was announced, the Zhedong Canal and the Sui and Tang Grand Canal were merged with the sixth batch of national key cultural relics protection units of the Beijing-Hangzhou Grand Canal and the name was changed to the "Grand Canal". 2012 saw the promulgation of the "Administrative Measures for Protection of Grand Canal Heritage" by the Ministry of Culture. In 2012, the Ministry of Culture promulgated the Measures for the Protection and Management of the Grand Canal Heritage, which elaborated on the concept, protection and management of the Grand Canal heritage. Since then, the relevant provinces and municipalities of the Grand Canal have issued protection and management measures for the corresponding sections of the Grand Canal, and formulated protection plans for the Grand Canal heritage of the corresponding sections of the Grand Canal. The third stage is that after the inscription, the protection of the heritage of the Grand Canal has entered a stage of full implementation. At the 38th session of the World Heritage Committee in 2014, the inscription of the Grand Canal on the World Heritage List was approved, and the series of heritage properties of the Grand Canal as applied for include 27 sections of river heritage, as well as the remains of canal waterworks, ancillary remains of the canal, and canal-related heritage, totalling 31 components and 58 parts. The Grand Canal Heritage Protection and Inheritance Special Plan for 2020 specifies the goal of comprehensive and systematic protection of the cultural heritage of the Grand Canal<sup>8</sup>.

The Yellow River has a total length of 5464 kilometres, flows through nine provinces and regions, and spans four major geomorphological units such as the Qinghai-Tibet Plateau, the Inner Mongolia Plateau, the Loess Plateau, the North China Plain and three major terraces of China's topography, with great changes in the geographic environment of the regions through which it flows, and a rich and colourful material and spiritual culture has been formed by the people along the route in the process of understanding and adapting to the natural environment. The special natural and humanistic environment of the Yellow River basin has given birth to the unique Yellow River culture. The Yellow River culture is not only a regional culture, but also a basin culture, a national culture, and even a national culture. (Figure 5)





Figure 5 Yellow River

Source: <http://www.shadafang.com/a/202210/4721420.html>, 2022

---

<sup>8</sup>General Secretary Xi Jinping has called for the protection, inheritance and good use of the Grand Canal, a precious heritage left to us by our ancestors, and for deeply excavating the historical and cultural resources with the Grand Canal as its core.

In a broad sense, Yellow River culture is the sum of material and spiritual wealth created by the ancestors in the Yellow River basin in the long-term social practice, including rules and regulations, rituals and beliefs, production level, way of life, language and writing, customs and habits, aesthetic tastes, spiritual outlook, value orientation, and so on; in a narrower sense, Yellow River culture refers to the spirit, value orientation, and behavioural synthesis of the spirit, concept, value orientation, and other cultural phenomena of the vast number of labourers in the Yellow River basin and Yellow River water conservancy workers. In a narrow sense, Yellow River culture refers to the spirit, value orientation, basic theories and behavioural synthesis of the vast working people in the Yellow River basin and the Yellow River water conservancy workers, mainly including the spirit, ideas, values, systems and other cultural phenomena. The Yellow River culture is the mother of Chinese civilisation, the core and backbone of Chinese culture, the root and soul of the Chinese nation, and the spiritual homeland of Chinese people all over the world.

As the "mother river" of the Chinese nation, the Yellow River basin is destined to be a place where the excellent culture of the Chinese nation is centrally displayed. The characteristics of the vast area, long history, and complex natural and humanistic environment of the basin determine that there are many world heritage sites distributed in the basin, including the regular types of cultural heritage, natural heritage, and dual natural and cultural heritage, and specific types of heritage consisting of cultural landscapes, cultural routes, historical towns and so on. As an

important component and core carrier of the Yellow River culture, heritage has become an indispensable resource in the process of high-quality development of the Yellow River Basin. Resources, in a broad sense, refers to the general term of all material, energy and information that can be developed and utilised by human beings, which widely exists in nature and human society, and is a kind of natural existences or wealth that can bring wealth to human beings. Heritage resources are an important carrier for the protection, inheritance and development of the Yellow River culture, as well as a fundamental resource for the construction of a strong socialist cultural country.

The Yellow River water cultural heritage goes deep into the dimension of the Yellow River water affairs, reflects the creative activities of human beings in governing the Yellow River, and embodies the ideological spirit of water activities. Water concept and water psychology are the basic contents of water culture, which govern people's choices, wishes and ways and means in water behaviour, and thus regulate people's water behaviour. In the Yellow River water activities of promoting benefits and removing harms, human beings have formed the way of thinking and behaving with the characteristics of Yellow River water conservancy, and created rich Yellow River water cultural heritage in terms of engineering, tools, architecture, art, science and technology, crafts and so on, including water conservancy projects, ancient ferries, ancient buildings and other tangible cultural heritage, as well as intangible water cultural heritage, such as the Yellow River Horns and other intangible water cultural heritage. The Yellow River water culture is mainly composed of three levels of elements: firstly, the material form of culture, such as water conservancy projects, hydraulic technology, water management tools, etc., which have been transformed and have humanistic imprints; secondly, the spiritual form of culture, such as the understanding of the Yellow River, the values about the Yellow River, cultural psychology, etc.; and thirdly, the institutional form of culture, such as the customs and habits, religious ceremonies, social relations and social organisations with the Yellow River as the carrier, laws and regulations, etc.

Since the beginning of Dayu's water control. More than 5000 years of water conservancy development in the Yellow River Basin have left a large number and variety of water conservancy projects along the route. To date, a large part of the water conservancy projects still continue to play the function of water conservancy and derive the cultural and landscape functions with regional characteristics, which have become an important cultural heritage that witnesses the development of water conservancy of the Chinese nation today (Wan, 2020). These water conservancy engineering heritage has significant times and regions, reflecting the relationship between water conservancy and regional economic and social development, man and nature, water and regional culture, and some of them are even unique creations in the world's water conservancy engineering, which not only unite the scientific and technological achievements of the Chinese people in the practice of flood control and river management, but also contain a splendid and deep history and culture, and show the Chinese people in the practice of flood control and river management. It is an important carrier for the protection, inheritance and promotion of the Yellow River culture, as well as the great spirit of hard struggle, dedication, sacrifice, commitment and innovation. It can be said that they are indispensable, irreplaceable and important parts of China's cultural heritage, and some of them have an important position in the

world cultural heritage. Only by properly protecting these water conservancy heritage can we keep the valuable heritage left to us by our ancestors; only by deeply excavating the contemporary value of the Yellow River Basin water conservancy heritage can we tell a good story about the contemporary "Yellow River Culture". Only by digging deeper into the contemporary value of the Yellow River Basin water conservancy heritage can we tell the contemporary "Yellow River story".

In April 2014, China identified its first major national strategy, the "Beijing-Tianjin-Hebei Cooperative Development"; in May of the same year, the "Yangtze River Economic Belt Development" was identified as a major national strategy; in March 2015, the "Guangdong-Hong Kong-Macao Greater Bay Area Construction" was identified as a major national strategy; in November 2018, the integrated development of the Yangtze River Delta was identified as a major national strategy. "In March 2015, the construction of the Guangdong-Hong Kong-Macao Greater Bay Area was identified as a major national strategy; in November 2018, the integrated development of the Yangtze River Delta was identified as a major national strategy; on 20 September 2019, General Secretary Xi Jinping convened a symposium on ecological protection and high-quality development of the Yellow River Basin in Zhengzhou, Henan Province, where he proposed the development of the Yellow River Basin. High-quality development symposium, he proposed that the ecological protection and high-quality development of the Yellow River Basin, like the Beijing-Tianjin-Hebei coordinated development, the Yangtze River Economic Belt development<sup>9</sup>, the Guangdong-Hong Kong-Macao Greater Bay Area construction, and the integrated development of the Yangtze River Delta, is a major national strategy, and the protection and development of the Yellow River Basin is given unprecedented attention, which is highly significant as it identifies the Yellow River governance and protection from the national level. Elevated to such a high level, this also means that the focus of attention of the whole China will be focused on the ecological protection and high quality development of the Yellow River. At present, our Chinese national strength is very strong, and a lot of foreign media also pay great attention to our major policies, and the Yellow River, as a how special river, will attract more attention from the whole world. This situation is unprecedented in the history of the Yellow River Basin.(Figure 6)

---

<sup>9</sup>National strategy is the overall strategy of comprehensive development, rational allocation and effective use of national power for safeguarding and enhancing national interests and realizing national goals.



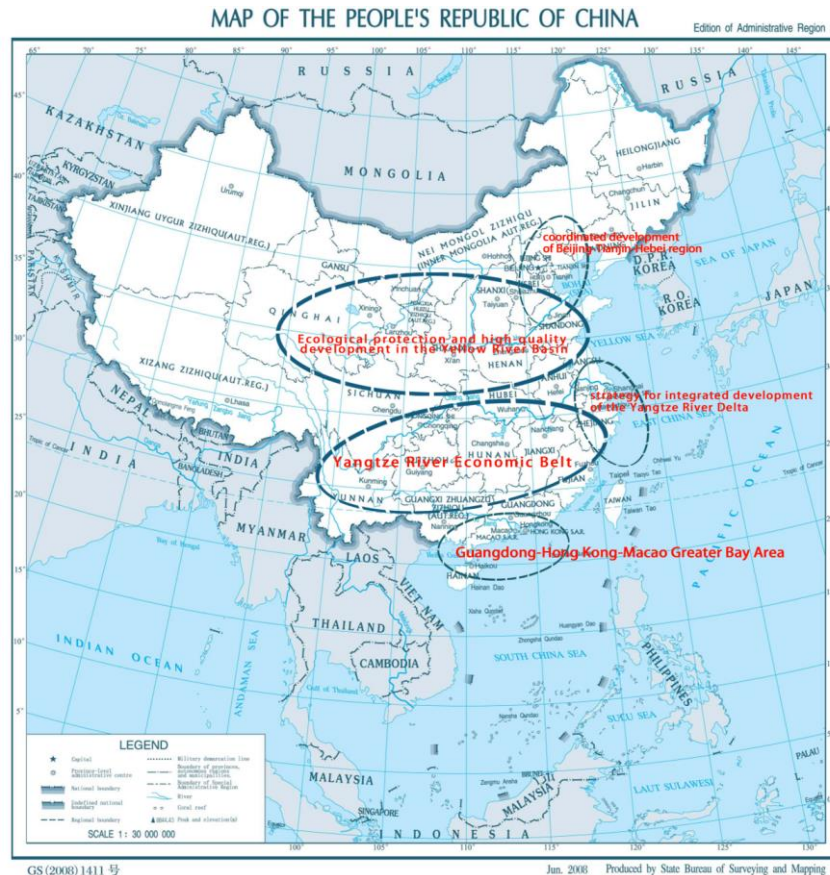


Figure 6 Schematic diagram of China's five major national strategic space  
Source: made by the author, 2024

General Secretary Xi Jinping stressed that "the Yellow River culture is an important part of Chinese civilisation and the root and soul of the Chinese nation."<sup>10</sup> It is necessary to promote the systematic protection of the cultural heritage of the Yellow River, deeply excavate the contemporary value of the Yellow River culture, tell the 'Yellow River story', continue the historical lineage, strengthen the cultural self-confidence, and build up the spiritual strength for the realisation of the Chinese dream of the great rejuvenation of the Chinese nation". General Secretary Xi Jinping

<sup>10</sup>Root, highlights the Chinese civilization originated from the Yellow River culture; soul, highlights the basic core of Chinese civilization, values and the Yellow River culture.

pointed out that "guaranteeing the long-term stability of the Yellow River, promoting the high-quality development of the whole basin, improving the people's life, protecting and inheriting and carrying forward the culture of the Yellow River, and letting the Yellow River become a happy river for the benefit of the people". On January 3, 2020, General Secretary Xi made another important instruction in the sixth meeting of the Central Financial and Economic Commission to implement the Yellow River cultural heritage system protection project, to build the Yellow River cultural tourism belt with international influence.

On October 8, 2021, the Central Committee of the Communist Party of China and the State Council issued the Outline of the Yellow River Basin Ecological Protection and High-Quality Development Plan, Chapter VIII (Yellow River Cultural Protection, Inheritance and Promotion), Article 93 of which states that the competent department of culture and tourism of the State Council, in conjunction with the relevant departments of the State Council, shall organise and guide the investigation and identification of the cultural resources of the Yellow River, and shall provide guidance for the investigation of the cultural relics and monuments, intangible cultural heritages, and the ancient literature. Article 94: The State shall strengthen the protection of historical and cultural cities, towns and villages, historical and cultural districts, cultural relics, historical buildings, traditional villages, villages with minority characteristics, and water cultural heritage such as ancient river courses, ancient dykes, ancient irrigation projects, as well as agricultural cultural heritage and toponymic cultural heritage in the Yellow River Basin. cultural heritage, toponymic cultural heritage, etc.

On 30 October 2022, the Law of the People's Republic of China on the Protection of the Yellow River was voted on and passed by the Thirty-seventh Meeting of the Standing Committee of the Thirteenth National People's Congress<sup>11</sup>.

---

<sup>11</sup>In order to strengthen the protection of the ecological environment in the Yellow River basin, ensure the stability of the Yellow River, promote the economical and intensive use of water resources, promote high-quality development, protect, inherit and carry forward the culture of the Yellow River, realize the harmonious coexistence between man and nature, and the sustainable development of the Chinese nation.

Chapter 12 (Protection, Inheritance and Promotion of Yellow River Culture) of the Law of the People's Republic of China on the Protection of the Yellow River focuses on the protection of cultural heritage resources along the Yellow River, the continuation of the historical lineage and national roots, the in-depth excavation of the contemporary value of the Yellow River culture, the enhancement of the supply of public cultural products and services, and the better fulfilment of the people's needs for spiritual and cultural life. The contents are as follows:

The first section is the systematic protection of the cultural heritage of the Yellow River. Carry out a comprehensive survey of the Yellow River cultural resources and Identifying and mapping out important cultural heritage such as cultural relics and monuments, intangible cultural heritage, ancient books and documents. Implementing the Yellow River cultural heritage system protection project and building the Yellow River cultural heritage corridor. The protection of endangered The implementation of salvage protection for the remains of dangerous heritage sites. High-level protection has been given to such important sites as the stone mount in Shaanxi, the Tao Temple in Shanxi, Erlitou in Henan, the double acacia trees in Henan, and the Dawenkou in Shandong; efforts have been stepped up to protect and restore large sites such as palaces and imperial tombs in a holistic manner; protection of farming cultural heritage such as ancient buildings, towns and villages, and of aquatic cultural heritage such as ancient irrigation districts and ancient ferries have been strengthened; and transport heritage remains such as ancient palisades have been preserved. Strict protection and restoration measures for the Ancient Great Wall will be taken, and the protection of key Great Wall nodes will be promoted. Supporting

cities such as Xi'an, Luoyang, Kaifeng and Dazhong to protect and improve the characteristics of historical features. Implementing the Huang A major research project on "Archaeological China"<sup>12</sup> in the river basin has been undertaken to strengthen the identification of cultural relics for protection, and to crack down on

---

<sup>12</sup>The "Archaeology of China" major project focuses on key areas such as the origin of human beings in China, the origin of civilization, the formation of Chinese civilization, the establishment and development of a unified multi-ethnic country, and the important position of Chinese civilization in world civilization.

crimes such as excavation, theft and illegal trade in cultural relics. Improve the protection level of revolutionary cultural relics and monuments in the Yellow River Basin, and strengthen the systematic protection of revolutionary cultural relics with the same theme across regions. Improve the protection list system of intangible cultural heritage in the Yellow River Basin, and vigorously protect the intangible cultural heritage of the Yellow River Basin, such as opera, martial arts, folklore and traditional skills. Comprehensively use modern information and media technology to strengthen the digital protection and inheritance of the Yellow River cultural heritage. The second section is the in-depth inheritance of the Yellow River cultural genes. The project of exploring the origin of Chinese civilisation will be implemented, and the development of Yellow River culture will be systematically studied and sorted out, so as to fully highlight the diversity of the Yellow River culture. We will carry out the Yellow River Culture Inheritance and Innovation Project, systematically expound the spiritual connotation of the Yellow River culture, and establish a Yellow River culture system that bridges history and reality, and draws tradition and modernity closer together. Create an important landmark of Chinese civilisation, and conduct in-depth research and planning for the construction of the Yellow River National Cultural Park. Support the declaration of the Yellow River cultural heritage as a world cultural heritage. Promote the revitalisation, utilisation, inheritance and innovation of the excellent farming cultural heritage of the Yellow River basin, and support its declaration as a globally important agricultural cultural heritage. Comprehensively display the cultural achievements of the Yellow River Basin in the fields of agriculture and hydrology, astronomy and calendar, river management technology, building construction, traditional Chinese medicine, Tibetan medicine and traditional crafts, etc., and promote their integration into real life. Vigorously promote the Yan'an Spirit, Jiao Yulu Spirit, Yimeng Spirit, etc., to nourish the heart and refine the soul. Integrate the research strength of Yellow River culture, consolidate the research foundation, build an interdisciplinary, cross-cutting and diversified innovative research platform, and form a batch of high-level research results. Appropriately expand and build a number of new Yellow River Culture Museums to systematically display the history and culture of the Yellow River Basin.

The Yellow River cultural heritage is summarised in the scope of the Yellow River basin, and all the heritage of material civilisation and spiritual civilisation created by human beings from ancient times to the present, which are closely related to the continuation of the development of the Yellow River and the continuation of the development of the human beings themselves, the former relies on the existence of a lot of material forms, such as the ruins, monumental carvings, buildings, collections of cultural relics, etc., which are clearly visible in the material forms of these



heritages, i.e. the so-called tangible cultural heritage. The latter relies on the existence of ideas, memories, technologies, performances and other forms, and its continuation depends on the inheritance of people, which is the so-called intangible cultural heritage. The systematic protection of Yellow River cultural heritage is to protect these two types of Yellow River cultural heritage in different ways according to their different characteristics, so as to provide cultural support for the ecological protection and overall high-quality development of the Yellow River basin. The Yellow River Basin, as the core of the development of China's northern region, the foundational role of culture is self-evident. Therefore, we should do a good job in the fundamental research on the cultural heritage of the Yellow River and contribute to the advancement of all the work in the whole basin.

Under the background of the implementation of the national strategy of ecological protection and high-quality development of the Yellow River Basin, the research of Yellow River cultural heritage has been paid attention by the academia, because most of the previous research on Yellow River cultural heritage was conducted from the local perspective or a single heritage, which lacked the holistic and global structure, and also ignored the hydro-industrial heritage which was closely related to the attributes of the Yellow River itself and was of great value. At the same time, there is a lack of hierarchical research on the value of the cultural heritage of the Yellow River, which is a river-type heritage. In the face of this task, the first thing that needs to be answered is, what is the composition of the Yellow River cultural heritage?

The importance of heritage components and their forms is clearly stated in international regulations. There are three reasons for this: firstly, the value of the heritage needs to be reflected in a well-developed heritage component; secondly, the definition of the heritage component makes conservation management more precise, as all conservation measures need to be specified in each component; thirdly, complex heritage requires a reasonably clear typology to facilitate the registration of new elements at a later stage.

Cultural genes are the "inner force" that determines the characteristics of a culture, and they are also the basic link of intergenerational transmission of culture. General Secretary Xi Jinping has repeatedly used the concepts of "genes", "cultural genes" and "spiritual genes" to discuss China's traditional culture (Xia& Jiang, 2021). On 8 October 2021, the Central Committee of the Communist Party of China and the State Council issued the Outline of the Plan for the Ecological Protection and High-Quality Development of the Yellow River Basin, which calls for the in-depth inheritance of the Yellow River cultural genes. How to inherit the Yellow River cultural genes has become a scientific issue of common concern in the academic world. What "Yellow River cultural genes" were given to human beings in the process of using and knowing the Yellow River in the historical period, and "how" to inherit the Yellow River cultural genes in the process of protection and utilisation need to be studied urgently.

Through the implementation of "cultural gene decoding", comprehensively excavating cultural connotations, decoding each cultural form, finding the inner genes of cultural existence, allowing people to retrieve cultural memories, enhancing the cultural identity of the people, firming up cultural self-confidence, and cohesion of developmental greatness, boosting economic and social development. The decoding



of cultural genes is an important carrier for demonstrating adherence to the socialist core value system, carrying forward the excellent traditional Chinese culture and revolutionary culture, advanced socialist culture, and is a key hand and key initiative for firming up cultural self-confidence, carrying forward the spirit of the nation, and enhancing the soft power of culture.

To transform the Yellow River culture into the "Yellow River story" that the people can understand and tell clearly, the key lies in how to abstract the huge and complicated collection of Yellow River culture into a unified, condensed, distinctive, real and complete basin cultural symbols, so as to make it cohesive with the spiritual kernel of Yellow River culture, and construct the grand Yellow River culture into a highly recognised The grand Yellow River culture will be constructed into a highly recognised cultural symbol of the Chinese nation. General Secretary Xi Jinping pointed out that "the Yellow River culture is an important part of Chinese civilisation, the root and soul of the Chinese nation." The words "root" and "soul" highly summarise the symbolic significance of the Yellow River culture in Chinese civilization. The natural and cultural heritage resources of different periods and forms in the basin are the "roots" of the Chinese nation. Over the past thousands of years, the Yellow River culture has been continuously living, integrating and advancing with the times, which has created the "green gene of respecting the law and harmony between human and water", the "red gene of self-improvement and hard struggle", and even presented The pioneering spirit of "increasingly enterprising, perseverance" and "the spirit of integration of the sea, openness and tolerance" have gradually formed the core value of the Yellow River culture in the new period, which is the "soul" of the Chinese nation. The core value of the Yellow River culture in the new period is gradually formed, which is the "soul" of the Chinese nation.

The Yellow River, the mother river of the Chinese nation, has flowed through the vast and fertile land of Henan for generations, and Henan is named after the fact that most of its territory is south of the Yellow River. From Xia to Song, many dynasties built or moved their capitals on both sides of the Yellow River in Henan, and Henan has long been the political, economic and cultural centre of the country. The Yellow River in Henan has special significance in the whole Yellow River basin. Henan is the important source of the Yellow River civilisation and the core area of Yellow River culture, the seat of "the earliest China", and "China by the Yellow River". As the geographical centre of the Yellow River culture, Henan is rich in the historical relics and cultural landscapes of the Yellow River civilization, and has nurtured the essence of the content and ideas of the Yellow River civilization (Zu, 2022).(Figure 7)



Figure 7 The middle and lower reaches of the Yellow River boundary monument

Source: <https://tuchong.com/2303443/94259751/>, 2021

You can know China by facing the Yellow River. The Yellow River has left its best content to the Central Plains, but at the same time, it has brought the people of Henan a deep disaster due to its spontaneous swing and huge amount of sediment. The Yellow River enters the North China Plain from the Mengjin Canyon, and gradually forms a "hanging river" due to silt accumulation. Here, the river is the widest, the largest overhang, the largest beach area, the most serious historical disasters, the flood control task is arduous, in the process of governance and development, produced a large number of carrying history, engraved memories of the Yellow River water culture treasures, in material form and non-material form, widely distributed, the continuation of the age of the long time, become an important part of the excellent traditional Chinese culture. There is a vast amount of Yellow River management literature, from the ancient masterpieces of "Yu River's old road" to the river engineering techniques in many private histories, etc., which have accumulated a wealth of literature on river management projects. The Yellow River ruins are rich and varied, and the Yellow River old course and thousands of miles of Yellow River embankment carry the history of the development and struggle of the Chinese nation, and become the best carrier to directly produce the historical touch. The sites of Yellow River governance on both sides of the Yellow River and the stone carvings and inscriptions in the basin have condensed the heavy national spirit and national culture, and have important cultural relics and documentary value (Li, 2022). The ruins of Yellow River culture in Henan include Honggou, Xingze, Pudianze, the old course of the Yu River, the old course of the Yellow River in the Ming and Qing Dynasties, the imperial dam monument, the Lin Gong dike, the Tongwangang crossing, the Huayuankou crossing, and the Liu Deng army crossing, etc. The ancient buildings include the Jidu Temple, the Dragon Horse Negative Temple, the Jiaying Temple, and the multitudinous mountain cliffs of the Great Buddha and its stone carvings.

For the protection and development of Henan Yellow River cultural heritage in the early stage is in the stage of being neglected, the inheritance of the long-lasting water conservancy engineering heritage is in the state of self-generation, which leads to a long period of time that people fail to consider it as cultural heritage and to be duly protected, coupled with a general lack of knowledge of the value of the ancient water conservancy engineering in all walks of life, the loss of many of the Yellow River cultural heritage due to the loss of its use in the economic development and large-scale construction process faces the danger of destruction and oblivion. Many cultural heritages of the Yellow River are in danger of being destroyed and forgotten in the process of economic development and large-scale construction due to the loss of their functions. The special investigation of the Yellow River water cultural heritage resources focusing on the heritage of water conservancy projects has never been carried out, and so far the family background is not clear, which leads to the extremely limited channels of data collection and reference support, and puts some valuable heritage in the blank zone of protection and development management, and makes it difficult to be protected and utilised in a scientific and effective way. And due to the long time, lack of protection awareness, protection measures are not in place, some of the Yellow River cultural heritage sites have been affected by floods, earthquakes, weathering, freezing and other factors and have been damaged to varying degrees. Together with the fact that some places are eager for quick success and quick profit, pursuing economic benefits one-sidedly and developing blindly, some Yellow River cultural heritage itself or the living environment has been seriously damaged. All this makes the original culture destroyed and loses the original regularity of the Yellow River culture. Therefore, the protection of Yellow River cultural heritage in Henan is urgent. Resource census should be carried out, in-depth research and systematic collation of Yellow River water cultural heritage resources should be carried out, the remains should be mapped out, Henan Yellow River water cultural heritage list should be established, Yellow River water cultural heritage system and Yellow River water cultural atlas should be formed, and Yellow River water cultural heritage should be protected and developed. To carry out targeted rescue and systematic protection of some seriously damaged or endangered relics, cultural relics and monuments, instruments of river management, as well as the Yellow River trumpet, Yellow River noob, Yellow River folklore, etc., to promote the creative transformation and innovative development of the Yellow River water culture.

Relevant departments have carried out the "Yellow River Cultural Heritage Protection and Utilisation Special Planning", "Yellow River National Cultural Park" and other special planning, as well as the Yellow River along the "cultural and tourism integration" related special studies. And has achieved stage-by-stage results. Most of these special plans and researches are carried out from the individual heritage. And for a long time, the protection of the Yellow River cultural heritage basically adopts a point-like and decentralised protection method, which is inefficient and ineffective, and is not conducive to the overall value of the Yellow River, and fails to meet the "systematic" requirements of the Yellow River cultural protection, and lacks a holistic and global structure, and fails to reflect the temporal and spatial characteristics of the overall heritage and the regional cultural evolution reflected behind it. It cannot reflect the temporal and spatial evolution of the whole heritage, as



well as the regional cultural and historical connotations reflected behind it. How to establish the heritage system of the Yellow River section in Henan and which representative elements to choose are of great significance for the formulation of the Yellow River protection strategy from the government level. Therefore, there is an urgent need for in-depth research and systematic organisation of the cultural heritage resources of the Yellow River.

Due to the long time, lack of protection awareness, lack of protection measures, etc., some Yellow River cultural heritage sites and relics have been damaged to different degrees for a long time by floods, earthquakes, weathering, freezing and other factors. Together with the fact that some places are eager for quick success and quick profit, pursuing economic benefits one-sidedly and developing blindly, some Yellow River cultural heritage itself or the living environment has been seriously damaged. All this makes the original culture destroyed and loses the original regularity of the Yellow River culture, leading to the fragmentation or even disappearance of the Yellow River cultural gene in Henan. What kind of role does cultural gene have? How is it inherited and expressed in Henan Yellow River cultural heritage? What kind of inspiration can the inheritance and expression of cultural genes bring us? These questions have important and direct significance for the further study of Henan Yellow River cultural genes.

The implementation of the major national strategy of ecological protection and high-quality development of the Yellow River Basin has opened the "Yellow River Era" for the rise of the Central Plains. How to make good use of the Yellow River cultural resources in Henan with a long history and deep heritage, excavate the value of the Yellow River culture in the times, make the Yellow River cultural heritage "live" and "stand" up, and tell the "story of Yellow River governance in Henan"? "This is an important mission and an important topic given to us in the new era. Henan Provincial Party Committee and Provincial Government put forward, committed to building a happy river of Henan model, and strive to be in the forefront of ecological protection and high-quality development of the Yellow River Basin. The "14th Five-Year Plan" and a period in the future will usher in a great renaissance of Chinese excellent traditional culture, and there is an urgent need for the renaissance of Chinese excellent traditional culture represented by the Yellow River culture to take the lead in the renaissance.

Protecting, inheriting and promoting the cultural heritage of the Yellow River and telling the "Yellow River story" can greatly improve the management and maintenance of the Yellow River ecosystem, and at the same time, it can effectively guide the cultural heritage of the Yellow River and turn the cultural heritage of the Yellow River into a kind of influence and appeal, which will gradually turn into the foundation support for the development of Henan. The Yellow River Basin has nurtured many traditional historical cultures and advanced cultures, and Henan is the most valuable and happy section of the Yellow River Basin and the core section of Chinese civilisation, which occupies the best cultural resources in the overall cultural field. In the political level Henan province even occupies all the Great Wall, Canal, Long March and Yellow River. The rational use of the Yellow River's cultural, political, hydrological, economic and social resources plays an important role in the overall social and economic development of Henan. On a macro level, it is conducive to highlighting the mapping and transmission of Chinese historical civilisation to the

global culture. Therefore, it is very important and absolutely necessary to protect and carry forward the cultural heritage of the Yellow River and tell the "Yellow River story" for the development of Henan Province.

Through searching in China Knowledge Network, the retrieval data of related papers with Yellow River culture as keywords are 2153, including 1810 academic journals and 161 dissertations (2 doctoral theses and 159 master's theses); 101 related papers with Yellow River water culture as keywords, including 83 academic journals and 3 dissertations (all of them are master's theses). The retrieval data of related papers with Yellow River cultural heritage as keywords are only 3 academic journal papers and 1 master's thesis. The search data of the Yellow River cultural heritage from the words shows that there are fewer related researches to study the Yellow River cultural heritage. There are 0 relevant papers retrieved with Yellow River cultural heritage and cultural genes as keywords.

Through searching Kongfuzi old book network, read the show network, access to the relevant Yellow River literature and information books more than 100 kinds of books, there is no research books for this aspect of the Yellow River cultural heritage. From the above data analysis, it can be concluded that the content of the Yellow River culture-related research is relatively high, and it is a research direction with relatively high attention at present, and there are more discussions on the analysis of the Yellow River culture and its protection and inheritance in the existing researches. However, there are fewer researches on the cultural heritage of the Yellow River, the theoretical research is still in the primary stage, and there is a lack of systematic and in-depth discussion on the protection, inheritance and revitalisation of the cultural heritage of the Yellow River. In the past, most of the research on Yellow River cultural heritage was carried out from the local perspective or a single heritage, which lacked a holistic and global structure, and also neglected the hydropower relics that are closely related to the Yellow River itself and have important value. At the same time, there is a lack of hierarchical research on the value of the Yellow River cultural heritage, which is a river-type heritage. The research on combining the Yellow River cultural heritage with cultural genes is extremely lacking, which is of great value and potential for further research.

## **2. Research Objectives**

There are four research objectives:

- 2.1 Study of historical changes in the Yellow River section of Henan Province
- 2.2 Systematic sorting out of the Yellow River cultural heritage composition system in Henan Province
- 2.3 Constructing the extraction method model of Yellow River cultural genes
- 2.4 Constructing the genealogy of Henan Yellow River culture

### 3. Research Questions

3.1 How did the cultural heritage of the Yellow River in Henan come about?  
How have successive dynasties managed the Yellow River floods?

3.2 What is the composition of the Yellow River cultural heritage in Henan?  
What are the representative elements?

3.3 What kind of role do cultural genes have? How to extract the Yellow River cultural genes?

3.4 What "Yellow River cultural genes" were given to human beings in the process of utilising and recognising the Yellow River section of Henan Province during the historical period?

### 4. Definition of Terms

#### 4.1 Historical changes

It mainly introduces the formation and development of the water cultural heritage of the Yellow River section in Henan, and elaborates on the typical features of the Yellow River in terms of geographic location, artistic changes, hydraulic construction and regional culture from five aspects: an overview of the Yellow River in Henan, the dominant role of the state in governance in successive generations and its historical evolution, an overview of the changes in the course of the river, the historical evolution of the Yellow River governance ideology, and the technological innovations and application of the governance of the Yellow River in successive generations.

#### 4.2 constitutive system

According to the classification system of the World Heritage Convention and Chinese laws and regulations, by analysing the conceptual understanding, composition system, value and classification of Henan Yellow River water cultural heritage, Henan Yellow River water cultural heritage is classified into three kinds of elements with immovable water cultural heritage, movable water cultural heritage and intangible cultural heritage as the main body, and tries to construct the composition system of Henan Yellow River cultural heritage, and elucidates the artistic value of Henan Yellow River cultural heritage.

#### 4.3 Cultural genes

Through research and comparison of the connection and difference between biological evolution and cultural evolution, we will explore the inheritance and evolutionary path of "cultural genes". Cultural genes need to be extracted by reverse transcription. In the process of reverse transcription, cultural genes have the internalisation structure of "firstly constructing cultural forms (cultural element populations), then establishing cultural elements (cultural element communities), then carrying out cultural decomposition (cultural elements), and finally expressing cultural genes in carriers (cultural genes)", which is from the expression of carriers, to the decomposition of cultural fragments, and then to the complete cultural genes themselves. Structure. Finally, the system construction of Yellow River cultural gene is realised.

#### 4.4 Cultural gene lineage

The construction of the genealogy of Henan Yellow River culture corresponds to the material culture genes and non-material culture genes to be sorted out, the material culture genes are expressed through the dominant carriers of culture genes; the non-material culture genes need to be expressed and inherited through the recessive carriers of culture genes and the carriers of cultural genes' behavioural activities. Explicit carriers of cultural genes refer to the material carriers that have actual forms and are created and established by human beings, such as water conservancy projects, ancient buildings, stone carvings, etc.; implicit carriers of cultural genes refer to the carriers that don't have actual forms but can record and display cultural information in other non-material ways, such as systems, arts, history, folk beliefs, etc.; carriers of behavioural activities of cultural genes refer to a series of carriers of cultural activities formed under the guidance of the consciousness and concepts, and the carriers of behavioural activities of cultural genes refer to a series of carriers of cultural activities formed under the guidance of the consciousness and concepts. The carriers of cultural gene behavioural activities refer to a series of carriers of cultural activities formed under the guidance of consciousness and concepts, such as rituals, festivals, crafts and technologies, and so on.

### 5.Scope of Research

#### 5.1 Research contents

5.1.1 The study of the historical changes in the Yellow River Basin in Henan has gone through a long and lengthy history, from the emergence of irrigation projects, the excavation of canals, and the construction of embankments in the Yellow River Basin in Henan during the Spring and Autumn Period and the Warring States Period, to the introduction of more advanced foreign methods of water management in modern times.

5.1.2 Construct the composition system of Henan Yellow River water cultural heritage based on the classification system of the World Heritage Convention and Chinese laws and regulations. Divide Henan Yellow River water cultural heritage into four categories: immovable water cultural heritage, movable water cultural heritage, intangible water cultural heritage and Yellow River governance culture. It contains 12 sub-categories: water conservancy projects, ancient sites, ancient buildings, stone carvings, important historical sites and representative buildings in modern times, water conservancy literature, water conservancy artefacts, water-related objects, folk water conservancy literature, performing arts, traditional water conservancy techniques, social folklore and festivals.

5.1.3 Study the steps and methods of extracting cultural genes of the Yellow River cultural heritage.

5.1.4 The research applies the Yellow River cultural heritage cultural gene extraction method model for reverse transcription to extract Henan Yellow River cultural genes, and constructs the gene genealogy construction of Henan Yellow River cultural heritage.



### 5.2 Space range

The spatial sorting scope of Henan Yellow River cultural heritage in this study is the Henan section of the Yellow River Basin, which is located in the middle and lower reaches of the Yellow River, and specifically refers to the cultural heritage resources of the Yellow River in the districts and counties along the Yellow River in Henan Province, and is the tangible cultural heritage and intangible cultural heritage surviving before the founding of New China in 1949. The generalisation and study of the tangible cultural heritage of the Yellow River section in Henan is based on the immovable cultural heritage along the Yellow River course within the regional scope, and the study of the movable cultural heritage is based on the displayed cultural relics in the public museums along the route. The intangible cultural heritage along the Yellow River in Henan is well preserved and rich in variety. Some of the important items will be selected and introduced in terms of their origins, inheritance, contents and forms, which are strongly related to the cultural characteristics of the Yellow River.

### 5.3 Time range

The historical changes of the Yellow River in Henan Province are sorted out from the pre-Qin period in 310 B.C., the two Han dynasties, the Wei, Jin and North and South Dynasties, the Northern Song dynasty, the Jin and Yuan dynasties, the Ming dynasty, the Qing dynasty to the time before the founding of the new China in 1949.

## 6. Research Methodology

Qualitative research methods were used. The specific methods used and the entry points for problem solving in the context of the actual operation of this research are as follows:

Firstly, the literature research method is mainly used in the applied research stage of the Yellow River cultural heritage. Through Using the literature resources related to the cultural heritage of the Yellow River, combing and analysing the current research results. Clarify the basic principles and relevant bases. At the same time, through the geographic characteristics of the Yellow River in Henan, the river water The corresponding literature, maps of the historical period of the Yellow River, and heritage data such as industrial characteristics and cultural and regional characteristics are collected, organised and analysed, so as to comprehensively understand the overview of the Yellow River cultural heritage of the current and former Yellow River routes in Henan.

Secondly, the field research method is mainly used in the applied research stage of the Yellow River cultural heritage. The field research method is mainly used to clarify the current status of important relics along the Yellow River section of Henan Province and to map out the relics by examining the heritage elements on the ground, conducting on-site surveys and collecting first-hand information. The field investigation includes the process of taking photos of the current situation, interviewing local authorities, and recording information on heritage resources. From the perspective of cultural genes, the field research explores the external manifestations, production and life styles and ideological values of the region, and makes a generalised summary.



Thirdly, morphological analysis method. With the help of the methods of "typology" and "morphology" in urban geography and architecture, the extraction of the morphology of Henan's Yellow River cultural heritage and the identification of prototypes will help to classify the Yellow River cultural system.

Fourthly, the method of literature analysis and comparison is used to screen, read and compare the abundant historical materials, historical records, articles and pictures of the Yellow River, which is also an important method of this research, combining the "literature analysis method" of history and the "graphic comparison method" of fine arts. This is also an important method of this research, combining the "documentary analysis method" of history and the "graphic comparison method" of art, to strengthen the discernment of the Yellow River's cultural heritage features and cultural gene.

Fifth, comparative study. By comparing the characteristics of biological genes and cultural genes, analysing the similarities and differences between them, simulating the biological genetic process, and referring to the genetic composition of products, the Yellow River cultural gene extraction method is established.

Sixth, the multidisciplinary cross-cutting method. The research of the thesis adopts the method of combining traditional history and water conservancy history, while taking historical materials as the research basis and wild history as the reference. Based on the collection of ancient historical materials and the study of modern water conservancy engineering archive examples, the vein of water cultural heritage is rationalised. At the same time, the issue of water conservancy engineering in the literature is deeply explored and examined in the light of the actual situation. Due to the complexity and diversity of the Yellow River cultural heritage, this paper also makes comprehensive use of the knowledge of heritage conservation, geography, landscape ecology, folklore, sociology and other disciplines to carry out research on the Yellow River cultural heritage in the study.

### 6.1 Population

Yellow River Basin managers are Yellow River workers in the Yellow River Conservancy Commission of the Ministry of Water Resources and its agencies, involving about 100,000 people.

There are about 10,000 culture and tourism workers, Yellow River museum workers and Yellow River culture research experts and scholars. About 1.52 million people live along the Yellow River.

Tourists visiting the Henan section of the Yellow River National Cultural Park.

Key informant: Zhang Song, Director of the Publicity Centre of the Yellow River Conservancy Commission. The Yellow River sites are rich and varied in remains, but there are not many records of historical materials, local literature and other information; the information about the remains of the Yellow River culture in part of Henan is scattered; the literature and excavation reports have been circulating for a long time, and the information is lost or mutilated. The existing cultural heritage is incompletely preserved, the historical appearance is not clear enough, and many cultural relics are in the process of disappearing or in the process of disappearing. This study requires visits to the Yellow River Water Conservancy Commission of the

Ministry of Water Resources and the Henan Yellow River Bureau to obtain first-hand information and data.

Practical Information Provider: Zhang Xinbin, whose research field and professional direction is Yellow River Changes and Yellow River Culture, is now a member of Chinese Water Culture Expert Committee of the Ministry of Water Resources, and vice president and secretary-general of Yellow River Culture Research Association. He has edited and published nearly 20 monographs and anthologies, such as "The Yellow River and Scientific and Technological Civilisation", "Research on Prehistoric Settlements and City Sites in the Yellow River Basin", "Henan Mission of Protecting, Inheriting and Promoting the Yellow River Culture", and has published more than 150 papers. The data on the Yellow River cultural remains in Henan that need to be collated for this study are complex, diverse and widely distributed, so it is necessary to visit experts and scholars in Yellow River culture research in a targeted way according to previous research.

General informants: people along the Yellow River

## 6.2 Instrumentation

Interviews, surveys.

## 6.3 Data collection

6.3.1 Literature. According to the data of Yellow River Cultural Heritage obtained by Yellow River Water Conservancy Commission of Ministry of Water Resources, there are 10 statistical bulletins; 19 research reports on Yellow River culture; monographs referenced are: *Sixty Years of People's Governance of the Yellow River*, *Yellow River - Journal of Water Conservancy and Hydroelectric Engineering*, *The Best of the Yellow River in Henan Province*, *The Yellow River: 400 Questions*, *A Thousand Mile Journey of Research and Study on the Culture of the Yellow River*, *Yellow River Ninth and the World at Peace*, *Xiong Jiuyi swims in the Yellow River*, *The Very Simple History of the Yellow River*. Extremely Simple History of the Yellow River", "Overview of the Yellow River", "Atlas of National Water Cultural Heritage Classification", "Hooked Sinking of the Great River - Shandong Yellow River Water Cultural Heritage Catalogue", "History of Water Culture in Henan", "Water Engineering Culture", "Chinese Cultural Gene Bank", etc.; through literature review, we have downloaded 120 theses from China Knowledge, and selected more than 20 theses to do the excerpts; through "People's Yellow River", we can understand the cultural heritage of the Yellow River through Chinese core journals. Chinese core journals to understand the related research dynamics of Yellow River cultural heritage; download a total of 50 articles from Yellow River Net, Yellow River Engineering Net, Yellow River Yellow Earth Yellow Race People, Yellow River Zhijian, Palm Yellow River, Henan Yellow River, Yellow River Vision, Yellow River Museum and other websites.

6.3.2 Field information was collected mainly through interviews, field visits, surveys and group discussions. During the period of more than one year from June 2022 to November 2023, field visits and surveys of heritage resources along the urban areas (counties) of the current and former Yellow River routes in Henan were conducted through five centralised surveys and three small-scale surveys. In the early stage of the research, we mainly collected the distribution of heritage in the surveyed

places, and selected representative heritage resources for the collection of relevant information, geographic demarcation and the formulation of the research plan. During the actual visit, including the process of taking photos of the current situation, interviews with local authorities, and recording information of heritage resources, nearly one hundred heritage resources along the Yellow River were investigated, and the geographic location of the heritage, photos of the preservation of the current situation, and interviews with some of the resources were recorded in detail. The heritage specific information obtained from the field research provides reliable basic data support for the study of the Yellow River cultural heritage composition system in Henan.

#### 6.3.3 Results

Gaining a comprehensive initial understanding of the selection and use of data analysis methods for qualitative research allows for better exploration of content in textual, observational, and pictorial forms, helping researchers to gain information and results.

### 6.4 Data analysis

6.4.1 Based on the definition of cultural heritage, fieldwork screening and collating the core elements of Henan Yellow River cultural heritage;

6.4.2 Grasp the historical lineage of the Yellow River in Henan through interviews, corresponding to the first research objective;

6.4.3 Understanding the core elements of Henan Yellow River cultural heritage through investigation and extracting Henan Yellow River cultural genes;

6.4.4 The group discusses and collates the constitutive types of Henan Yellow River cultural heritage and builds a constitutive system through research concepts; the concept of genealogy is used to determine the path of protection, inheritance and utilisation of Henan Yellow River cultural heritage.

## 7.Literature Reviews

### 7.1 Literature review on the study text

#### 7.1.1 Overview of foreign water cultural heritage research

In the 1960s, due to accelerated urbanisation, population growth and other factors, water pollution, water shortage and other problems emerged in Western developed countries, and this water shortage dilemma often triggered human water crisis, in this context, human beings began to re-understand the historically formed water concept, water culture, water engineering, water behaviour, in order to seek solutions to the dilemma, to better maintain the sustainable use of water resources and development (Zheng,2017). On the other hand, with the continuous expansion and extension of the scope of protection objects in the field of cultural heritage, some scholars have begun to pay attention to the heritage of ancient water conservancy engineering and have launched relevant research on it. And water cultural heritage, as a branch of cultural heritage, really got attention and carried out research after the 1980s of the twentieth century.

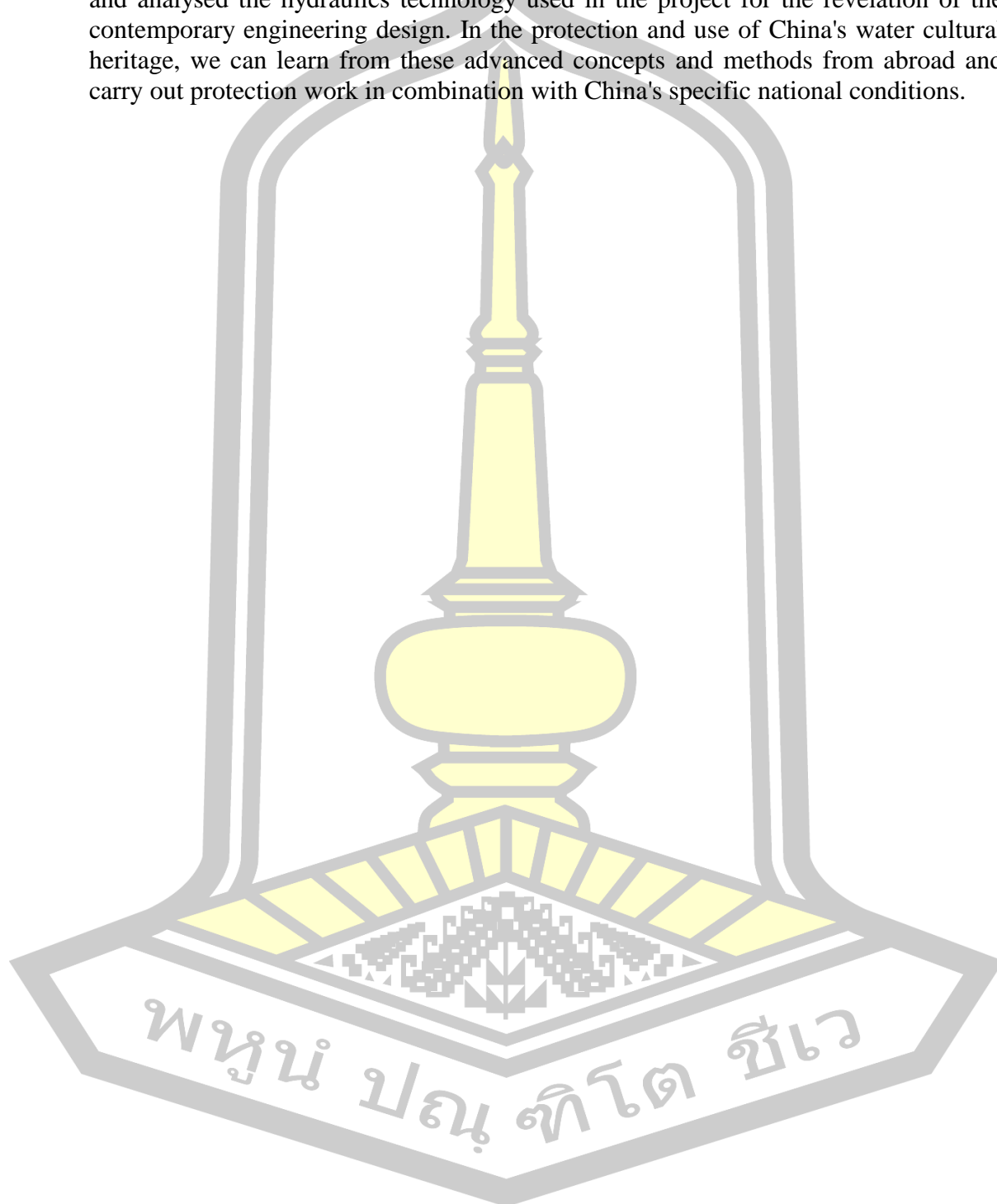
### Theoretical research

At present, foreign research on water cultural heritage mainly focuses on the following aspects: research on the value and connotation of water cultural heritage, research on the protection and utilisation of water cultural heritage, and research on water cultural landscape, etc. The relevant main studies are as follows:

Value and connotation research: American scholar Karl August Wittfogel (1989) firstly put forward the relevant concept of water civilisation in his book *Oriental Despotism*. Olmo, RM; Munoz, SF (2010) discussed the relationship between water and landscape in traditional irrigation systems in the Mediterranean region, as well as the value of landscape and heritage, and provided suggestions for the conservation and management of this heritage. Jorge Hermosilla Pla and Emilio Iranzo García (2014) dealt with the typology and characteristics of the cultural heritage of water in the Qanats and established a system of heritage assessment. Sujama Khadge, Sudarshan Raj Tiwari (2014) discussed the value characteristics of water heritage in Kathmandu valley and its connection with urban communities. Anna Catalani (2017) in her book *Water & heritage: material, conceptual and spiritual connections* explains the value and importance of water cultural heritage, water management for water resources and sustainable development. Shalamu Abudu; Zhuping Sheng et al. (2019) discuss the historical, socio-economic, and cultural values of qanats. Fošumpaur, P.; Kašpar, T. et al. (2019) discussed the scientific and technological value, cultural and historical value, as well as tourism development potential of locks on the Elbe and Vltava waterways in the Czech Republic. Maria Carmela Grano (2020) studied the value of ancient cisterns and wells in the town of Matera, Italy, analysing the natural and anthropogenic morphological features of the heritage. In the above study, it is evident that the value of water cultural heritage is well recognised.

Research on Conservation Utilisation and Management Methods: Gagik Badalians Gholikandi; Mandana Sadrzadeh et al. (2013) studied the scientific and technical methods of ancient Iranian hydraulic architecture and water facilities and the management system of water facilities and water resources. B.J.M. Goes; U.N. Parajuli et al. (2017) Describes the technical methods and management practices of kanji irrigation in Afghanistan and their current status, assesses the current status and management of kanji, and discusses the strategies for the conservation and restoration of kanji irrigation. Drahşan UĞAURYOL (2020) studied the existing status of the function, structure, materials, and shape of the Hamidiyeh water facilities in Istanbul and made recommendations for their conservation in relation to the existing problems. Luis Pérez-Urrestarazu, Gregorio Egea et al. (2018) described and evaluated the water management practices of historical gardens using the example of the Royal Alcázar Gardens in Seville. Boger, R; Perdikaris, S et al. (2014) explored the impacts of water resources, such as historical wells, on the island of Barbuda on local cultural practices and based on this, propose sustainable development directions for traditional water cultural heritage. Sinha, Amita (2019) outlines 800-year-old community water systems, water ritual architecture, etc. in India, and discusses methods for heritage conservation use and landscape protection under sustainable development. Adrian Smuleac et al. (2020) used modern mobile scanning technology to complete the documentation of Romania's Bega River water. Adrian Smuleac et al. (2020) used modern mobile scanning technology to complete the recording of three-dimensional

data of the water cultural heritage of the Bega River in Romania, and created a 3D database. Charles R. Ortloff (2020) used a modern hydrodynamic model to simulate and study the ancient urban water supply project of Tivnacu in Bolivia's highlands, and analysed the hydraulics technology used in the project for the revelation of the contemporary engineering design. In the protection and use of China's water cultural heritage, we can learn from these advanced concepts and methods from abroad and carry out protection work in combination with China's specific national conditions.





### Practical studies

Internationally, there have been many practical researches on the protection of water cultural heritage, such as France, Germany, Italy and other countries in Europe, and Japan, Korea and other countries in Asia, which have carried out useful explorations with specific examples and achieved relatively mature practical experience in protection.

Historically, France has a dense water network and many water cultural heritages exist, so its research on water cultural heritages is also more important. For example, the Canal du Midi in France is the most representative case of its many water cultural heritage protection designs. Built in the period of Louis XIV, it is one of the oldest canals still in use in Europe. In 1996, UNESCO inscribed it on the World Heritage List and emphasised the scientific, technical and artistic values of the canal in its evaluation. In the protection planning and design of the canal, France pays great attention to combining the landscape on both sides of the canal with its unique cultural tradition, and has successfully created a linear cultural tourism line. On the other hand, France pays great attention to the protection and management of the canal, and has also issued a corresponding protection and management regulation, which comprehensively and systematically provides and explains the protection and management measures for each part of the heritage of the canal (Maria, 2020). These conservation measures have ensured the sustainable development of the Midi Canal.

Italy and Germany have a long history of water culture, and there exist many excellent ancient hydraulic engineering heritage in the two countries, such as diversion bridges, aqueducts, fountains, baths, etc., a considerable part of which is listed in the World Heritage or national and local heritage lists, and which have been protected and utilised in different degrees and in different ways through relevant assessment work, such as the establishment of site museums, site parks, electronic information. These properties have been preserved and utilised to varying degrees and in different ways through the establishment of site museums, site parks and electronic information systems. Italy also has a rich network of canals, for example, Venice is a city built on canals and is one of the representatives of traditional Italian culture. Its mode of protection, development and management is different from that of France. Under the premise of maintaining the city's traditional regional characteristics, overall style and lifestyle, it combines the buildings on both sides of the river with the water surface, focusing on highlighting the charm of the buildings, and combines commerce and tourism, and rationally plans and develops the canal routes. In terms of protection and management mode, Italy adopts a combination of "top-down" and "bottom-up" approach to mobilise the whole society to participate in the protection work, and also adopts special legislation, namely the European Charter for the Protection of Canals, to better guarantee the moderate development of canals.

In Japan, many dams have been constructed to manage rivers, and today these dams are protected as part of the national and local cultural heritage. For example, the management of the Nagara River in Gifu Prefecture focuses not only on the preservation of the tangible heritage of the water culture remaining on both sides of the river, but also on the incorporation and inheritance of the intangible culture along the river. Such governance not only drives the economic and cultural development on both sides of the river, but also makes the water cultural heritage really come alive.

Korea's renovation planning for Cheonggyecheon is also an excellent case of protection. Similar to Japan's renovation concept, it also pays more attention to the inheritance of culture on both sides of the river, and in the renovation of the river, in addition to preserving historical relics such as ancient bridges and channels, it pays more attention to the shaping of cultural space on both sides of the river, such as displaying the lifestyle, aquatic products, and aquatic activities related to water culture on both sides of the river. It not only improves the regional water environment, but also protects the historical remains and intangible cultural information of the Qingxi River, and better realises the sustainable development of the Qingxi River (Wan & Wang, 2011).

Comprehensively, it can be seen that foreign research on water cultural heritage has not yet formed a complete system, and the research object is mainly the Grand Canal, large-scale water conservancy projects and other ancient important water conservancy projects, and the content of the research mainly focuses on the protection, utilisation and management, while other researches are more fragmented. Although there are more and more research, application and construction results of water cultural heritage in the international arena, there is still a big gap between the development of water cultural heritage and the current crisis facing the heritage.

#### 7.1.2 Overview of domestic research on water cultural heritage

The study of water cultural heritage in China began around 2000. With the success of Dujiangyan's inscription, all walks of life began to pay attention to the value of water cultural heritage. 2006, in order to cooperate with China's Grand Canal's inscription, the Ministry of Water Resources and cultural relics departments successively completed the compilation of the protection plan of ancient water conservancy projects and water heritage, as well as the research contents of the heritage census on the two sides of the Grand Canal and its identification and evaluation, so that the value of water cultural heritage and its protection have gradually been paid attention to, and the research results have increased year by year. The value of water cultural heritage and its protection have been paid attention to gradually, with research results increasing year by year. With the successful bidding for the inscription of the Grand Canal in China, water cultural heritage sites such as the Lingqu River and the West Lake have also been successively included in the World Heritage List. At the same time, another 23 water cultural heritage sites in China have been recognised as the World Heritage of Irrigation Engineering. At present, the academic community's understanding of water cultural heritage is deepening, and the field of research has expanded from the fields of water conservancy engineering and cultural heritage to the comprehensive and cross-disciplinary fields of history and archaeology, architecture and planning. In the research carried out by domestic scholars, the research contents of water cultural heritage mainly include: historical documentation research, value and connotation research, protection and utilisation research, policy and management research, and water cultural landscape research. Among them, the research on the value and protection and utilisation of water cultural heritage is the most numerous, which has a certain enlightening effect on the protection and research work of the Yellow River water cultural heritage.

### Historical documentary research

The content of historical literature research is mainly ancient books research, water conservancy archaeological research, water conservancy science and technology history research, etc., the representative results are: collation of water conservancy literature committee compilation and publication of the "renewed line of water jinjian" and water conservancy department compilation of the Qing Palace floods and droughts archives, systematic collation of the relevant water conservancy literature, river governance, meteorology and hydrology, and the social science research and other fields to provide a certain degree of reference; in the field of water conservancy archaeology, the Ministry of Water Resources, Yangtze River Water Conservancy Commission compiled the Yangtze River Three Gorges Project reservoir hydrological inscriptions Heritage Atlas, Zuo Huiyuan prepared the Yellow River Goldstone Records, and Wang Fuchun and others prepared the Yulin Red Stone Gorge: water history and inscriptions, etc.; in the water conservancy science and technology In terms of historical research, the main achievements include the History of the Beijing-Hangzhou Canal written by Yao Hanyuan, the Study of Beijing's Ancient Canal and Urban Water Supply by Cai Fan, and the Technical Basis for the Protection of the Cultural Heritage of the Grand Canal of China written by Tan Xu Ming and others.

### Value and content studies

In the research on the value of water cultural heritage, Wang Jian and Lu Yiqi (2012) explained the concept of water cultural heritage according to the definition of cultural heritage, combined with the characteristics of the content of water culture, and pointed out that water cultural heritage has historical and cultural value, scientific and technological value, artistic value, water conservancy function value, and economic value. Tan Xuming (2012) defined the definition and classification of water cultural heritage, elaborated on the four major value components of water cultural heritage, and thus proposed a value identification system. She also summarised the core values of the Grand Canal with reference to the criteria of outstanding universal values of the World Cultural Heritage in her book "Heritage Composition and Value Assessment of the Grand Canal of China". Zhang Nianqiang (2012) categorised the water heritage based on the functional attribute characteristics of the heritage and developed a value assessment system. In the same year, he also constructed a value assessment system for water cultural heritage in the Study on the Comprehensive Value Assessment of Ancient Water Conservancy Projects of the Beijing-Hangzhou Canal. Tu Shiping (2015) discussed the classification of water cultural heritage and the value selection of water culture creative design. Deng Jun (2017) argued that the value of water cultural heritage should contain historical and cultural value, scientific and technological value, ecological value, authenticity and integrity. Chen Haiying et al. (2019) interpreted the value of water cultural heritage and its connotation from the perspective of cultural tourism. Sui Lina (2018), on the other hand, first defined the connotation of Shaanxi water cultural heritage, and classified Shaanxi water cultural heritage based on the connotation cognition and value cognition. Liao Yanbin et al. (2020) studied the value connotation of agricultural water heritage in Jiangxi and put forward suggestions on heritage operation, construction and management.

### Conservation utilisation studies

In terms of the protection and utilisation of water cultural heritage, Zhang Zhirong and Li Liang (2012) discussed the protection and development strategies of water cultural heritage in the Hangzhou section of the Beijing-Hangzhou Grand Canal. Tan Xu Ming discussed the composition of the heritage of the Grand Canal, protection and management strategies, and the application of information technology in the protection of the heritage of the Beijing-Hangzhou Grand Canal in his book "The Technical Basis of the Protection of the Cultural Heritage of the Grand Canal in China". Li Yunpeng et al. (2016) discussed the principles of the protection and utilisation of the Grand Canal and the related protection management system with regard to the problems existing in the current investigation of the Grand Canal water cultural heritage. Huo Yanhong (2017) analysed the inheritance path and expression of the water cultural heritage of the Beijing-Hangzhou Grand Canal from the perspective of "cultural genes", and systematically put forward the corresponding protection principles and protection ideas. Wang Lei et al. (2019) discussed the current situation of water cultural heritage, and put forward some working ideas in combination with the existing problems. Wang Yefei (2020) combines the protection of water cultural heritage with the concept of sponge city, and proposes to realise the protection of water cultural heritage by constructing water ecological infrastructure and introducing advanced technology. Zhou Xuemeng et al. (2021) discussed the importance of the identification of water heritage, put forward the four core features of water heritage identification and the path of heritage identification work suggestions. Zhou Bo (2013) discussed five classification methods for the protection of water cultural heritage in water conservancy scenic areas. On this basis, Zhou et al. further analysed the current situation of the protection and utilization of water cultural heritage in water conservancy scenic areas and the existing problems, and put forward the protection strategy of water cultural heritage in water conservancy scenic areas. Shi Xiujing et al. (2020) applied the hierarchical analysis method to construct a spatial living evaluation system of water heritage landscape in Xiaoshaoxu District. Jia Bingqiang summarised the characteristics of water cultural heritage in Henan and proposed the inheritance and innovation strategies of water cultural heritage from different levels such as management and decision-making.

To sum up, the research on water cultural heritage in China mainly has the following characteristics: firstly, the research object mainly focuses on the Grand Canal, water conservancy scenic areas or important heritage sites, while the research on other aspects is less; secondly, in the research on the value of heritage, at present, most of the scholars mainly interpret the value of the Grand Canal or a certain place of heritage, and are less involved in the construction of the evaluation system; thirdly, the research on the definition and classification of water cultural heritage is the least, and there is no systematic definition of the constitutive framework of water cultural heritage. Thirdly, there are least studies on the definition and classification of water cultural heritage, and there is no systematic definition of the constitutive framework of water cultural heritage.



### 7.1.3 Overview of Domestic Research on Yellow River Cultural Heritage

Current research on the cultural heritage of the Yellow River focuses on the following three areas.

#### First, Research on the tangible cultural heritage of the Yellow River

The Yellow River is rich in types of tangible cultural heritage, and most of the scholars have studied a certain type of heritage in the Yellow River cultural heritage. Some scholars conduct research from the remains along the Yellow River, agriculture, industry, and Yellow Rule Chronicles, etc. Liu Qi (2008) "Research on Lanzhou Yellow River Iron Bridge Architecture as an Industrial Heritage" takes Lanzhou Yellow River Iron Bridge as an object, analyses the value of the Iron Bridge from the viewpoint of industrial heritage, and proposes a scientific protection strategy; Yang Min, et al. (Yang et al., 2015) conducts a research on the cultural heritage of petroglyphs in the Yellow River Basin, focusing on the process of building a database of petroglyphs and looking forward to the protection of petroglyphs; Min Qingwen et al. The process of rock painting database construction was highlighted, and the prospect of rock painting protection was made; Min Qingwen et al. (Yan, Liu, & Yang, 2018) studied the agricultural cultural heritage of the Yellow River Basin, and concluded that the Yellow River agricultural cultural heritage is of great significance to the ecological improvement and sustainable development of the Yellow River Basin; Wang Wei (2019) analysed the distribution of the ancient canal era in Ningxia from the concept of linear cultural heritage, and proposed a scientific conservation strategy for it; Wang et al. analysis of the distribution of ancient drains in Ningxia in the era of distribution, spatial distribution characteristics; Zhang Zhidong (2020) took Ningxia as an example, through the analysis of the historical value of farming culture in the Yellow River Basin, the traditional farming cultural heritage of Ningxia put forward the protection and development and utilization strategy; Chen Shiyue et al. (Cheng, Qiang, Zhang, & Xin, 2020) showed that the distribution of place placebo sites in terms of the temporal, spatial, and influencing factors [20]; Zhang Yi (2021) studied the spatial and temporal distribution characteristics and evolutionary mechanisms of cultural heritage along the Yellow River, and explored the reasons for the spatial heterogeneity of its distribution; Liu Lu et al. (Liu & Zuo, 2022) drew on the historical experience of the ancestors in the governance of the Yellow River by sorting out the representative events of the ancient water culture, and provided a reference to the modern governance of the Yellow River.

There is also a part of research on an important section of the Yellow River Basin. Zhao Peng's "Classification and Protection of Cultural Heritage in the Hukou Area of the Yellow River" (2007), by summarising the characteristics of the existing historical and cultural heritage of the Hukou, carried out a one-by-one screening research on the historical, artistic, scientific and economic values of the heritage of the Hukou and drew the corresponding conclusions.

#### Secondly, Research on the intangible cultural heritage of the Yellow River

For the study of the intangible cultural heritage of the Yellow River, most scholars currently focus on the study of the folk culture of the basin.

Ma Chengjun et al. (Ma, E, & Bi, 2007) studied the distribution and classification of the main intangible cultural heritage of the small ethnic groups in the upper reaches of the Yellow River from the perspective of multi-ethnic settlement in



the upper reaches of the Yellow River, and put forward the proposal that the protection of the intangible cultural heritage in the upper reaches of the Yellow River should be improved by sounding the relevant laws and regulations, dealing with the relationship between the development and utilisation of intangible cultural resources and their protection, and further explore intangible cultural resources and other strategies.

Tao Shuxia (2008) elaborated the representative intangible cultural heritage of Huangshui culture in the upper reaches of the Yellow River, Qin culture in the middle reaches, and Heluo culture in the lower reaches of the Yellow River from the perspective of the different cultural regions through which the Yellow River flows and put forward the concept of protection based on local characteristics.

Yao, Wang, & Qu, (2010) took the Yellow River sacrificial culture as the research object, analysed the historical value and significance of the Yellow River sacrificial culture, and put forward the strategies for the inheritance and promotion of the Yellow River sacrificial culture.

Zhao Zhijuan (2011) takes the Jiuqu Yellow River Lantern as an example, studies the origin and development of the Jiuqu Yellow River Lantern, historical changes, and introduces the path of inheritance of the Jiuqu Yellow River Lantern.

Ma Guangxue (2012) studied the Yellow River Horn, which was developed and produced by the labour of the Yellow River people, and briefly described the generation, characteristics, inheritance and protection of the Yellow River Horn, an intangible cultural heritage.

Hu Yijuan (2021) proposed that the Yellow River Horn should strengthen the static protection, innovate the dynamic protection, and expand the communication path of the Yellow River Horn with the thinking of new media and new technology.

Zhao Jun (2022) argues that the formation, development, and inheritance of the Yellow River Horn in Zongzhai Village, Changyuan, Henan Province, is the result of a combination of natural, historical, and national policies, and that it is a typical case in the process of recognising the onset and diffusion of traditional music.

Thirdly, Systematic research on the cultural heritage of the Yellow River

For the systematic study of Yellow River cultural heritage, some scholars focus on the research of the composition of Yellow River cultural heritage, Zhao Hu et al. (Zhao, Yang, & Zheng, 2021) proposed to construct the Yellow River cultural heritage system of the Yellow River hydrological characteristics, including hydropower heritage, accompanying remains, historical and cultural neighbourhoods, villages and towns, red revolutionary heritage, cultural landscapes and intangible cultural heritage; Zhao Hu et al. (Zhao, Yang, & Zheng, 2021) took Jinan as an example to analyse the composition system of the Yellow River cultural heritage in Jinan and put forward protection strategies; Liu Shanting (2021) considered that the connotation of the Yellow River culture in Shaanxi included five aspects: root culture, central culture, farming culture, Yellow River management culture and red culture, and sorted out the Yellow River cultural heritage resources in Shaanxi accordingly; Xing Nannan et al. (Xing & Li, 2021) put forward the ecological protection initiatives of the Yellow River cultural heritage in terms of sorting out cultural heritage resources, excavating cultural and spiritual connotations, optimising cultural ecosystems, and establishing national parks; and Wang Yinghua (2022) put forward the protection and utilisation of the Yellow River hydraulic heritage by systematically

summarising the formation of the Yellow River hydrological heritage and its value, analysing the composition of the Yellow River hydrological heritage and its main characteristics, and proposing the protection and utilisation of the Yellow River hydraulic heritage. and puts forward proposals for the protection and utilisation of the Yellow River's water conservancy heritage.

In the research of the Yellow River old road and Yellow River regional cultural heritage, Zhu Jian et al. (Zhu & Jiang, 2013) constructed a tourism value assessment system for the linear cultural heritage of the old road from the perspective of tourism development, and evaluated the tourism value of the linear cultural heritage of the old road, and put forward the suggestions of highlighting the central resources, constructing a heritage network, and strengthening regional cooperation; Xun Delin (2015), through the historical study of the Yellow River Road, Xun Delin (2015) clarified the geographic scope of the Yellow River Road and related historical and cultural heritage, and elaborated the significance of the protection of cultural heritage in the Yellow River Road region; He Xiaosheng et al. (He, Sheng, & Pan, 2020) proposed that the cultural heritage to be excavated in the Yellow River Road region of Xuzhou mainly includes the heritage of the Abandoned Yellow River itself, the related ancillary buildings along the Abandoned Yellow River, and the cultural heritage in the region of the Yellow River Road that has been washed away, silted up, abandoned, and destroyed by the Yellow River. Yellow River, the ancient ruins that have been washed away, silted and buried, and the intangible cultural heritage of the Abandoned Yellow River; Wu Bihu et al. (Wu, Ji, & Xue, 2021) took the Old Yellow River Route (Jiangsu section) as an example, sorted out the tangible and intangible cultural heritage of the Old Yellow River Route, and recapitulated the history of the formation and evolution of the Old Yellow River Route.

Wang(2021) proposed that the systematic protection of the Yellow River cultural heritage should be based on the main line of historical lineage to create a block of Yellow River cultural heritage protection area; take the national strategy as a leader to highlight the highlights of the Yellow River cultural heritage in Henan; take the regional characteristics as a hand to form the pattern of the Yellow River cultural heritage protection; and take the comprehensive development of the Yellow River Basin as the goal to develop a new plan for the protection of the Yellow River cultural heritage system and the display of the use of the new plan.

There is also a part of research on the environmental management of the Yellow River, the evolution of the river and the law of development, collated relevant works mainly include the Yellow River Journal (2017) edited by the Yellow River Commission, which mainly describes the major events that happened on the Yellow River, the large-scale water conservancy projects constructed in the past, as well as the ideology of river governance and management policies, reflecting the history and current situation of the Yellow River Basin's nature and society in many ways; Henan Yellow River River Affairs Bureau (2016), edited by Henan Yellow River Bureau, introduces the major events and important water conservancy projects built on the Henan section of the Yellow River in the modern period; Shandong Yellow River Bureau, edited by Shandong Yellow River Bureau, shows the overview of the cultural heritage of the Yellow River in Shandong in a more systematic and comprehensive way.

#### 7.1.4 Research Reviews

At present, domestic scholars' research on the cultural heritage of the Yellow River mostly focuses on specific types of tangible heritage and intangible heritage from the local perspective, and the research related to the cultural heritage of the Yellow River mainly concentrates on three aspects; the first one is the research on intangible heritage, the second one is the research on the pattern of historical and cultural urban and rural communities along the Yellow River, and the third one is the research on the historical and cultural clues related to the Yellow River waterway transport. However, there are fewer systematic researches on the Yellow River cultural heritage, only a few scholars in the overall level of the basin to sort out the resources of the Yellow River cultural heritage, study the composition system of the Yellow River cultural heritage, and carry out systematic researches, and the theoretical research is still in the primary stage. There is a lack of systematic and in-depth discussion on the protection, inheritance and activation of the Yellow River cultural heritage. Therefore, this paper selects Henan Yellow River cultural heritage as the research object to fill the research gap in this area.

### 7.2 Literature review on research concepts

#### 7.2.1 Research Progress of Cultural Gene Theory in Foreign Countries

The word "gene" comes from biology. It was formally coined by the geneticist Johnson in 1909 and is the smallest functional unit of hereditary material. It is the smallest functional unit of the genetic material, which is inherited through replication. 1976 Richard Dawkins, in his book "The Selfish Gene", while explaining social phenomena from the viewpoint of genetic inheritance in biology, suggested that although biological genes determine human behaviour, there exists another kind of replicating genes, which he called "meme" (translated as mother, enigma, modus operandi). "meme" (which translates as foraging mother, enigma meme, modelling). He believes that meme reproduces itself through imitation, passing from one brain to another, and that the spread of human culture is a reproduction of meme, and that meme has the characteristics of fidelity, prolificity and longevity.

Since the introduction of the term "meme", which has received attention in various fields, the 15th International Cybernetics Conference, held in Belgium in August 1998, organised a seminar on "memetics". The Conference concluded that, in the development of memetics, it was inappropriate to define memetics too narrowly; that memetics, as a discipline, should be founded on social science research methods as well as on modelling or simulation techniques, and proposed the establishment of a taxonomy of memetics.

In 1999, Blackmore, S. developed the 'meme' based on Richard Dawkins, who argued that the 'meme' is the cultural information that exists in the brain to perform a behaviour and is transmitted interpersonally through the process of mimicry. She believes that meme is cultural information that exists in the brain to perform behaviours and is transmitted interpersonally through the process of imitation. She proposed "meme-gene co-evolution", which means that genes and memes interact with each other in three ways: gene-gene interaction, gene-meme interaction, meme-meme interaction, and the interaction includes competition between genes and memes, as well as the interaction between genes and memes, and the interaction

between genes and memes. gene-gene interactions, gene-enigma interactions, and enigma-enigma interactions, which include competition and collaboration.

In 2003, He Natural and He Xuelin summarised the existence of two stages in the definition of modality in foreign countries: in the early stage, modality was regarded as a cultural genetic unit or imitation unit; in the later stage, modality was regarded as a unit of information in the brain, while words, music and images in the real world were the manifestations of modality. Four major schools of modality are also summarised:

#### Information Perspectives

The "information view" is represented by Daniel Dennet and Aaron Lynch, who argue that a modality is a pattern of information, that modal carriers are real in the brain as well as in objects, and that different modalities compete with each other, and similar modalities collaborate with each other, potentially forming modal complexes.

#### Ideological contagion of views

A representative of those who hold the idea contagion view is Gahterer, who argues that modalities are not only information in the brain, but also mimetic units of culture, i.e., modalities are directly observable cultural phenomena. This school of thought rejects the idea that modalities have a basis in biological reality and do not correspond to specific entities in the brain, arguing that modality theory is a theory of cultural transmission based on observation and quantification.

#### Cultural evolutionary perspective

The cultural evolutionary view is represented by Liane Gabora (1997), this school of thought believes that modality is a bridge between biological and cultural evolution, and that the formation of the brain is a result of a combination of biological and cultural evolution, and they believe that modalism explains how human practical experience is transformed into modalities in the human brain.

#### Modal symbol view

Deacon (1999), a professor of biological anthropology, combines modality and semiotics to solve the problem that modality does not have diagrams like DNA sequences, and that symbols can give modalities a material shape that can be reproduced, and that modalities can become "syntactic relations" between symbols. In addition, unlike modality, the concept of gene has been applied to other disciplines and has given rise to corresponding concepts, e.g. Taylor (2009) explored the use of genetic analysis to study the spatial and morphological characteristics of villages and extracted core genes. Conzen (1988) applied the concept of landscape genes to the study of historic landscapes in towns and cities and to the study of spatial layout.



### 7.2.2 Overview of domestic research on cultural genes

The development of "meme" (translated as "mother", "mystery", "mould") in China is relatively late compared with that in foreign countries, and the research results are mainly in the field of language, translation and various cultural inheritance, and the word with the same semantic meaning in China is "cultural gene", which is a concept with Chinese characteristics formed in the local development of "meme" in China. The same semantic term is "cultural gene", which is a concept with Chinese characteristics formed in the local development of "meme" in China. In China, the study of "cultural gene" involves a wide range of fields, including linguistics, translation, literature, culture, history, art, urban planning, architecture, landscape gardening and many other fields, and there are some representative ones:

In 1990, by analysing the most traditional Chinese culture and national characteristics of philosophy, management, medicine, aesthetics and agronomy, Liu Changlin found that almost all national cultural activities have a unified direction, characteristics and shape because they are controlled by a unified "gene". According to him, "cultural genes" are embodied in the traditional way of thinking and psychological infrastructure of the country. The traditional Chinese way of thinking includes a subjective consciousness, an emphasis on relationships, an emphasis on function, an emphasis on wholeness, an emphasis on image thinking, an emphasis on integration, a preference for synthesis, a preference for coordination and unity, an emphasis on time, and an expertise in intuition, which interact with each other to form a whole, that is, a systemic way of thinking.

In 2003, Wang Dong believed that the reason why Chinese culture endures is because it has excellent cultural genes, and the five core concepts of Chinese cultural genes are: the cosmic view of the unity of heaven and man, the mutual subjective view of the benevolent and loving people, the developmental view of the intersection of yin and yang, the cultural view of inclusiveness, and the unity of righteousness and profitability, and the value of harmony. And the "cultural gene" has evolved under the development of the times into the cultural gene of a new civilisation of socialism with Chinese characteristics facing the world.

In 2012, Guo Changfeng analysed the interaction between regional culture and regional economy from the perspectives of culture and economics, excavated the deep-seated cultural genes of the regional economy of Sanjin, summarised the characteristics and problems of the regional economic development of Sanjin, and put forward the ways of developing the characteristic economy of the Sanjin region. Compared with foreign "memetics" that focus on the biological interpretation of memes, the Chinese concept of "cultural genes" focuses more on its similarity to "genes", that is, "cultural genes" can be copied and spread. And it has its own characteristics of stability and longevity, without paying attention to whether there is the physical appearance of "cultural genes" in the human brain. Domestically, the concept of "gene" has been applied to the fields of urban space and landscape, and a wealth of research results have been produced. Correspondingly, the concepts of "spatial gene" and "landscape gene" have emerged. The following are domestic research results on "cultural genes", "spatial genes" and "landscape genes":



## Cultural genes

### In the field of urban conservation and development

In 2009, Wu Zairong revealed the intrinsic relationship between the variation of Wu cultural genes and the spatial evolution of Suzhou cities in the three historical periods of the Six Dynasties, the Two Songs, and the Ming and Qing Dynasties, i.e., Wu cultural genes play a controlling role in the urban space of Suzhou.

In 2011, Liang Hennian proposed that China's urban development should not copy Western planning principles, but should be based on China's local culture and explore China's own planning theories. The thesis demonstrates the influence of Western cultural genes - "the only true" and "people" - on Western urban planning theories, and argues that "cultural genes" have a profound influence on urban development. The thesis demonstrates the profound influence of "cultural genes" on urban development.

In 2015, Tian Tao established a theoretical system of spatio-temporal structure of ancient city rejuvenation and explored the planning strategy for the rejuvenation of Xi'an's ancient city by sorting out the cultural genes of Xi'an and the spatial planning mode of the ancient city.

In 2020, Niu Xiong, Tian Changfeng, Sun Zhitao and Huang Qin explored the cultural genes of Chinese urban form from the traditional Chinese philosophical thought and the history of Chinese urban construction. They concluded that traditional Chinese philosophical thought has three points: the unity of man and heaven, the order of yin and yang, and the Shangzhong, which is transformed into the cultural gene of Chinese urban space as follows: focusing on the overall creation of humanistic space, focusing on the change of yin and yang, and the construction thought of the Shangzhong, and statistically drew the "cultural genealogy of the construction of the Chinese capital city".

In 2018, Li Yunyan, Zhao Wanmin, and Yang Guang divided cultural genes into explicit genes and recessive genes, and proposed that the restoration strategies for the explicit material spatial genes of Cuntan Historical and Cultural Neighbourhood include: spatial texture restoration, spatial scale restoration, street space restoration, and architectural style restoration, and the restoration strategies for the recessive intangible cultural genes of Cuntan Historical and Cultural Neighbourhood include: historical and cultural restoration, special social function restoration, and characteristic economic industry restoration.

### In the field of urban space

In 2018, Liu Bo summarised the factors affecting the formation of "cultural genes", including internal and external factors (natural and social environment), and concluded that "cultural genes" are composed of ways of thinking and psychological structures. The author uses typology to classify urban spatial patterns into "base, shelf, core, axis, cluster and skin", and establishes the interrelationship between "cultural genes" and urban spatial patterns by analysing them in the same period.

In 2019, Liu Huilong believes that culture can be divided into conscious and non-conscious, and similarly, he believes that the cultural gene consists of two parts: concept and carrier, with concept as the essence and carrier as the concrete manifestation, thus establishing the cultural gene transmission model of "concept-carrier" and applying this model to the field of architecture to form the "architectural

cultural gene". This model is applied to the architectural field to form the "architectural cultural gene". The authors use this model to study the "architectural cultural genes" in the historical public space of Shou County, and put forward a proposal for the renewal of the "carriers" of the historical public space in Shou County.

In the field of construction

In 2019, Wang Hezhi argues that architectural cultural genes explore the inheritance of regional architecture from the perspective of architectural culture, which is unstable and subject to mutation and reorganisation in the process of transmission. On this basis, it focuses on analysing the phenomenon of architectural cultural gene reorganisation that occurred in Heilongjiang traditional architecture in different historical periods.

In 2019, Li Yannan divided cultural genes into three types of explicit, implicit and behavioural activities based on material, cognition, and consciousness, and analysed the components of the exhibition space one by one according to the above divisions, based on which he proposed a detailed design method for the detailed exhibition space.

In 2020, Su Xiurong extracted the architectural and cultural genes of Wujai Mountain Village, and combined them with the design needs of the Wuji Ancestral Temple Museum, applying the architectural and cultural genes to the design of the museum's plan, structure, modelling and decoration.

In the area of traditional villages

In 2018, Pei Peiran believes that the cultural gene system of ancient towns consists of spiritual culture (history, national beliefs), material culture (landscape environment, architectural construction mode), and behavioural mode (residents' production and life), which are composed of three categories and five branches together, and the three categories interact with each other. Through the historical research and current situation research to build the cultural gene system of Chongqing ancient town, and by summarising the dilemma of cultural gene inheritance in Chongqing ancient town: the destruction of landscape gene, the mutation of architectural gene, the disappearance of historical gene, the fault of national gene, according to the specific dilemma of the protection and development strategy.

In the field of regional culture

In 2017, Huo Yanhong argued that the water culture of the Beijing-Hangzhou Grand Canal is a huge system that consists of three levels, namely spiritual, material and intangible cultures, and that cultural genes are the basic units of this system, and therefore decomposed the cultural system of the Grand Canal into cultural systems - subcultural families (groups) - Therefore, the cultural system of the Grand Canal is decomposed into cultural system - subcultural system - subcultural population - subcultural species (group) - cultural gene family - cultural gene protein, and the phylogenetic tree is established to sort out the cultural genes of the Grand Canal. The phylogenetic tree is used to sort out the relationship between the cultural genes of the Grand Canal, and to summarise the main genes, attached genes, mixed genes, mutated genes, and the inheritance paths of each type of genes in the Grand Canal.

In the field of traditional Chinese gardens

In 1997, Wang Wei and Shi Zhen concluded that the aesthetic concepts of catering to nature and dialogue with heaven are the cultural genes of traditional Chinese gardens, specifically including: the integration of all things in heaven and earth with human beings, the beauty of nature in comparison with nature, the beauty of the concern of "purging away the mystical views", and the beauty of the entry of a variety of landscape elements into the gardens. This aesthetic concept is the inheritance gene of traditional garden culture.

In the field of landscape

In 2019, Wang Ke classified the cultural genes of the streets in the core area of the capital at the first level (including dominant genes and recessive genes) and the second level (including subject genes and attached genes) to sort out the relationship between various types of cultural genes and construct a gene map. And using the Delphi method, he evaluated the weight of cultural genes and the intensity of cultural genes by combining qualitative and quantitative methods, and finally put forward the guidelines for landscape design of the capital's core neighbourhoods in combination with cultural genes.

In 2020, Wu Yaoyu argued that cultural genes are immaterial and informative, and are a kind of thinking concepts, which are passed on and expressed by controlling the shape of carriers, and classified the carriers of cultural genes into: explicit carriers, implicit carriers and behavioural activity carriers, which interact with each other. Based on this theoretical framework, the transmission model of "cultural gene - landscape" is established.

Spatial genes

In 2019, Duan Jin, Shao Runqing and others, in the context of urban environmental pollution, lack of characteristics, and worrying cultural inheritance, academician Duan Jin believes that the traditional research on urban space is one-sided in terms of spatial determinism and spatial projection, which also results in the subjective arbitrariness of the designer and the misuse of formal symbols. Based on this, he proposed the concept of spatial genes: spatial genes refer to the unique and relatively stable spatial combination patterns formed in the interaction of urban space with natural environment and history and culture. Based on the theory of "spatial genes", the differences and similarities between Chinese and Western "axis genes" under different cultures, and the differences and similarities between "city-water relationship genes" under different regional environments, are compared to illustrate the following points The research value of "spatial gene".

In 2020, Shao Runqing, Duan Jin, Jiang Ying, Qian Yan and Wang Liyang established the spatial gene technology process of "spatial gene extraction, feature and gene feedforward coupling, and targeted guidance and control strategy based on spatial gene analysis and evaluation". The overall urban design process based on spatial gene technology is applied to Xiamen City's general urban design project, comparing the spatial genes of Xiamen and Yantai's gulf space, and clarifying the design key points of Xiamen's gulf space.

In 2020, Zhao Zhiqing carried out a systematic analysis of spatial genes in the form of "identification, evaluation and inheritance". Firstly, through the study of the spatial evolution and characteristics of Harbin historical city in different historical periods, he extracted the law of spatial form combination of historical urban areas, divided the space into four categories of "frame, axis, group and life", and analysed the spatial genes in accordance with the steps of "constituent elements - combination mode - expressive traits - evolutionary characteristics". The spatial genes are analysed according to the steps of "constituent elements - combination mode - performance traits - evolution characteristics". Secondly, it evaluates the material and spatial integrity of the current spatial genes and social cognition in the light of the development of the times. Finally, it puts forward the spatial gene inheritance strategy at three levels: bottom-line thinking, development perspective and institutional innovation.

#### Landscape genes

In 2011, Liu Peilin used typology to classify cultural genes into subject genes, attached genes, mixed genes and variant genes according to their own attributes, and dominant genes and recessive genes according to their material forms. Combining the principles of identification and classification, the landscape genes were classified into overall layout, resident characteristics, totem symbols, subjective public buildings, environmental factors, and basic forms for classification and identification. According to the results of gene identification, the planar mapping and elevation mapping of the colony landscape genes are summarised.

#### 7.2.3 Research review

It can be seen from the existing research on cultural genes that the research perspective of cultural genes has formed its own way of research based on the research in the field of architecture and urban landscape, which pays more attention to the inheritance of genes and puts forward different interpretations of cultural genes in different fields. Therefore, the article uses the theory of "cultural genes" to re-examine the Yellow River water cultural heritage, adopts a new concept to guide the protection of water cultural heritage, and provides a new entry point for the updated research in the field of heritage protection. Based on the modal theory, the article constructs a transmission model of "cultural gene - water culture" by taking advantage of the characteristics of self-replication and transmission of cultural genes, and studies the role and significance of cultural genes for the protection of aquatic cultural heritage, and at the same time realises the effective transmission of the Yellow River's cultural genes by using the process of heritage protection.



## 8. Conceptual Framework

### 8.1 Research concepts

8.1.1 Cultural heritage. Regarding the classification of cultural heritage, both international conventions and Chinese laws and regulations have a relatively complete classification system. Therefore, this paper intends to classify the cultural heritage of the Yellow River by drawing on the authoritative definition of the concept of world cultural heritage.

8.1.2 Memetics. The term "Meme" was coined by the famous British zoologist Richard Dawkins in his book *The Selfish Gene*, and was followed by the founding father of sociobiology, Edward Wilson, and the physicist Charles Lumsden, who jointly formulated the theory of "gene-culture co-evolution", defining it as "the basic unit of inheritance in the process of cultural evolution". This was followed by Edward Wilson, the founding father of sociobiology, and Charles Lumsden, a physicist, who jointly proposed the theory of "cultural co-evolution", which they defined as "the basic unit of heredity in the process of cultural evolution". This paper adopts the perspective of "cultural genes" to carry out research. Firstly, at the level of understanding of cultural genes, it is based on the recognition that cultural genes and biological genes are both a kind of "replication factor", and it is believed that cultural genes are the essential characteristics of all kinds of cultural phenomena, which have the same self-replicating ability as biological genes, and have the same ability of self-replication as biological genes. It is believed that cultural genes are the essential characteristics of various cultural phenomena and have the same self-replicating ability as biological genes, and that they are similar to biological genes in the process of cultural transmission.

### 8.2 Research conceptual framework

According to the definition of the concept of cultural heritage, the historical and cultural resources of the Yellow River section of Henan Province are systematically sorted out and analysed, and the carriers of cultural genes are analysed to extract the characteristic cultural genes of the Yellow River of Henan Province; the cultural genes are analysed from the levels of material cultural genes and intangible cultural genes, and the cultural genealogy of the Yellow River of Henan Province is constructed. In the specific expression of genes, the material cultural genes are expressed through the explicit carriers of cultural genes; the immaterial cultural genes need to be expressed and inherited through the implicit carriers of cultural genes and the carriers of cultural genes' behavioural activities. Figure 8.



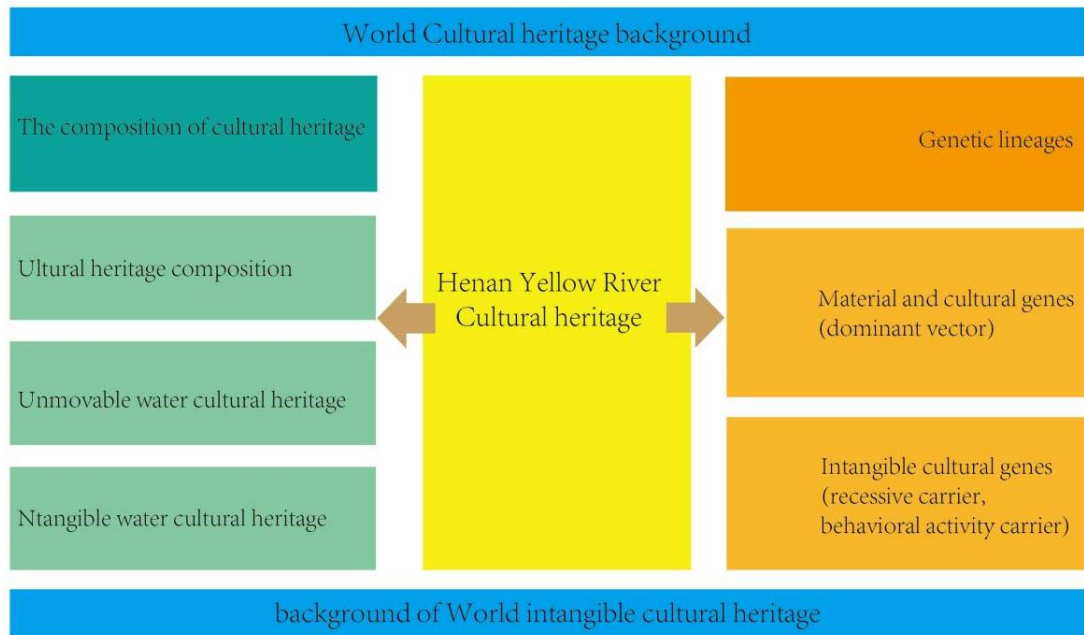


Figure 8 Research Conceptual Framework  
Source: made by the author, 2023

## 9. Research plan

Table 1

beginning and end	Main programme of work
2021.06-2022.06	Trace the theory of cultural heritage and genealogy, research progress and its development frontier dynamics, improve the research framework, collect and organise the literature related to the Yellow River water cultural heritage, and complete the literature review report.
2022.07-2022.12	Determine the scope of the research in the Yellow River Basin of Henan Province, formulate the outline of in-depth interviews, carry out field research, collate and analyse data, and form a research report.
2023.01-2023.05	In-depth excavation of Henan's Yellow River water cultural heritage resources, as well as collation, classification, research, and writing the theoretical content of Henan's Yellow River water cultural heritage composition and genetic genealogy construction.
2023.06-2023.08	Combine the results of the research, draft the paper and make further revisions to form a first draft of the research paper.
2023.09-2023.11	Conducting in-depth analyses, collating and researching information and data, and designing appropriate methodologies. Formation of 1 academic paper published in a Scopus-searchable international journal.
2023.12-2024.01	Supervisors are invited to review and supervise the research results, and to improve the thesis as a whole, resulting in a final draft.

## 10. Section structure

- Chapter 1 Introduction
- Chapter 2 Historical Changes in the Yellow River Basin of Henan
- Chapter 3 Cultural Heritage Composition System of the Yellow River Section of Henan
- Chapter 4 Constructing the model of gene extraction method of Yellow River culture
- Chapter 5 Genealogy of Yellow River Culture in Henan based on methodological construction
- Chapter 6 Conclusions, discussions, recommendations

## 11. Benefits of research

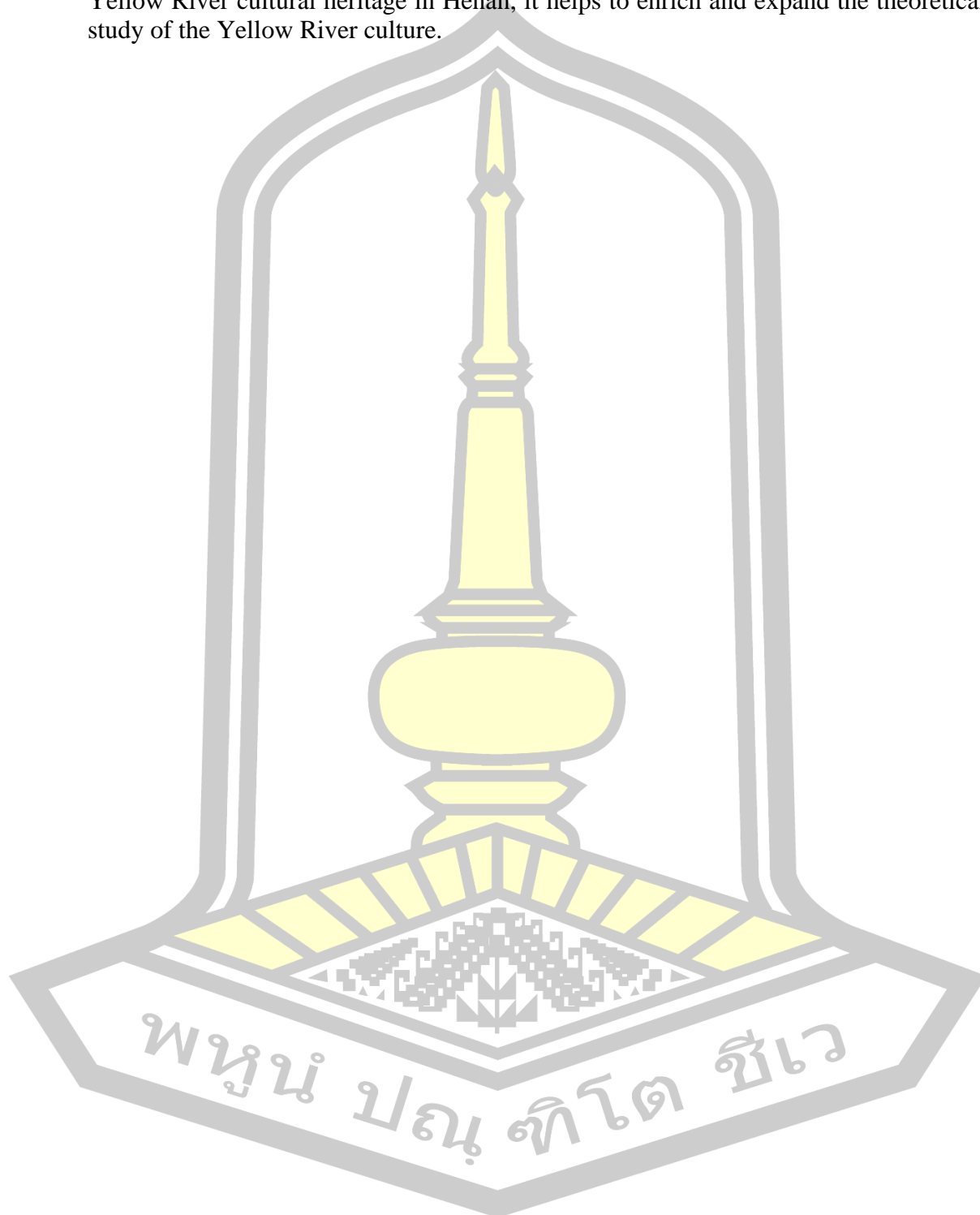
11.1 For the benefit of the academic community. To fill the theoretical gaps in the systematic study of the Yellow River water cultural heritage and the geographically targeted protection and transmission strategies of the Yellow River cultural heritage.

11.2 Benefits of the research site to the society and community. Contribute to the comprehensive display of the development pulse and great achievements of the Yellow River governance and development, promote the development and construction of the Yellow River governance and construction, and give full play to the educational, enlightening, inspiring and cohesive functions of the Yellow River cultural heritage, and at the same time utilise the process of heritage conservation to achieve the effective inheritance of the Yellow River cultural genes in Henan.

Through the implementation of the "decoding of cultural genes", the cultural connotation of culture is comprehensively explored, each cultural form is decoded, and the intrinsic genes of cultural existence are found, so that people can retrieve their cultural memories, enhance the cultural identity of the masses, strengthen cultural self-confidence, and promote economic and social development.

11.3 Benefits of formulating national or local government policies. It is hoped that the research results will provide materials for promoting the standardised identification of the Yellow River cultural heritage, providing materials for the construction of the cultural corridor of the Yellow River Basin in Henan, establishing a detailed information and basis for the future assessment of the value of the Yellow River water cultural heritage in Henan, the protection and utilisation of the historical sites, providing materials for the formulation of various related plans and policies, and providing references for the study of the Yellow River culture in the nine provinces along the Yellow River.

11.4 Theoretical. By collecting and organising the current situation of the Yellow River cultural heritage in Henan, it helps to enrich and expand the theoretical study of the Yellow River culture.



## CHAPTER II

### Historical Changes in the Yellow River Basin of Henan

This chapter corresponds to the research goal one: to study the historical changes of the Yellow River section in Henan Province, and select the Yellow River section in Henan Province as the research object for the formation and development of the Yellow River cultural heritage. It elaborates on the role of the Yellow River in six aspects: the overview of the Yellow River in Henan, the leading role of the state in governance in the past dynasties and its historical evolution, artistic changes, the historical evolution of Yellow River governance ideas, technological innovation and application of Yellow River governance in past dynasties, and the impact of Yellow River governance on artistic changes in the Yellow River Basin. Typical characteristics of geographical location, artistic changes of cultural heritage, hydraulic construction, regional culture, etc.

#### 1. Overview of the Yellow River Section in Henan Province

##### 1.1 Overview of the Yellow River Basin

The Yellow River is the second largest river in China, and also the world-famous giant river. Controlling the Yellow River is a major event in China and occupies an important position in history.

The Yellow River basin is the cradle of the Chinese nation. For a long historical period, the middle and lower reaches of the Yellow River have always been the political, economic and cultural center of China. The earliest feudal unified empire in China- -Qin and Han, were established in the Yellow River basin. For thousands of years, the industrious and brave people here have not only created a great material civilization, but also created a splendid spiritual civilization.

The Yellow River has made an indelible contribution to the development of our country, but also brought extremely profound disasters to the Chinese people. The Yellow River basin is the earliest birthplace of irrigation agriculture in China, and the Yellow River is the main shaper of the North China Great Plain, the largest plain in China. However, the lower reaches of the Yellow River are also the most frequent ones. Since ancient times, in order to prevent and control the water damage of the Yellow River and develop the Yellow River water conservancy, the Chinese people have carried out a long time and unremitting struggle, established brilliant achievements in water control, and accumulated extremely rich experience.

The Yellow River has a long history, and it is named because of its turbidity and yellow color. In Chinese ancient books, it has long been honored as the "Four blasphemy of the zong", the first of the hundred water, widely admired by people. In modern times, it was often regarded as a symbol of the Chinese nation. Although the word Yellow River was been seen in the Book of Han, many later history books still only referred to as "river" for short, and it is generally called the Yellow River in modern times.

The Yellow River originates in the Qongliling Basin at the northern foot of the Bayan Kala Mountains on the Qinghai-Tibet Plateau, flows through Qinghai, Sichuan, Gansu, Ningxia, Inner Mongolia, Shanxi, Shaanxi, Henan and Shandong, crosses the Loess Plateau and the Huang-Huai-Hai Great Plain, and finally pours into the Bohai Sea. The main stream of the Yellow River is 5,464 kilometers in length, with a basin area of 795,000 square kilometers. Above Hekou Town, Inner Mongolia is the upper reaches of the Yellow River, with the river length of 3472 kilometers and the basin area of 428,000 square kilometers; from Hekou Town to Henan, the river length is 1206 kilometers and the basin area is 344,000 square kilometers; the river length is 786 kilometers and the basin area is only 23,000 square kilometers (Figure 9).

According to the geological and geographical characteristics of the Yellow River basin, the Yellow River basin is divided into three sections, namely, the upstream Qinghai-Tibet Plateau, the Loess Plateau in the middle reaches, and the downstream North China Plain. This section of the upper reaches of the Yellow River is characterized by more water and less sand, clear water and uniform flow. Therefore, far away in the Western Han Dynasty, a large number of irrigation channels were built here, becoming one of the earliest important agricultural areas in the upper reaches of the Yellow River. This section of the middle reaches of the Yellow River is characterized by more water in summer and autumn, less water in winter and spring, rapid flood peak in flood season, and the water level rises and falls sharply, carrying a large amount of sediment. In addition, the upper and lower reaches of the river are canyon reaches, and the middle is relatively open, especially in the lower reaches of the Weihe River, the eastern Plain of Shaanxi Guanzhong is an important agricultural base and economic and cultural center in western China. The section of the lower reaches of the Yellow River is characterized by: gentle water potential, wide and shallow scattered, sediment deposition is serious, the riverbed gradually rising. Both sides of the Yellow River almost rely by the dike as a barrier, the river beach is generally 2-5 meters higher than the banks, and some even reach 10 meters, becoming "hanging river", this kind of high hanging is very unstable, very easy to breach. The Yellow River is the most tortuous section and the upper section, the middle reaches, while the lower section is straight.

Due to the different geology, geography, climate, vegetation and other conditions of the Yellow River basin, the characteristics of the Yellow River hydrology, sediment and River changes, so it is different from the general river in governance. The Yellow River is famous for its abundant sediment, good silt, good determination and good migration. Especially in its downstream, it has been many large changes, which is a typical overground river. As far as Tianjin in the north and the Jianghuai River in the south, many rivers and lakes are affected by the sediment deposition of the Yellow River, and the landform changes of the North China Plain and some coastal changes of the Bohai Sea and the Yellow Sea are also greatly affected by the Yellow River.



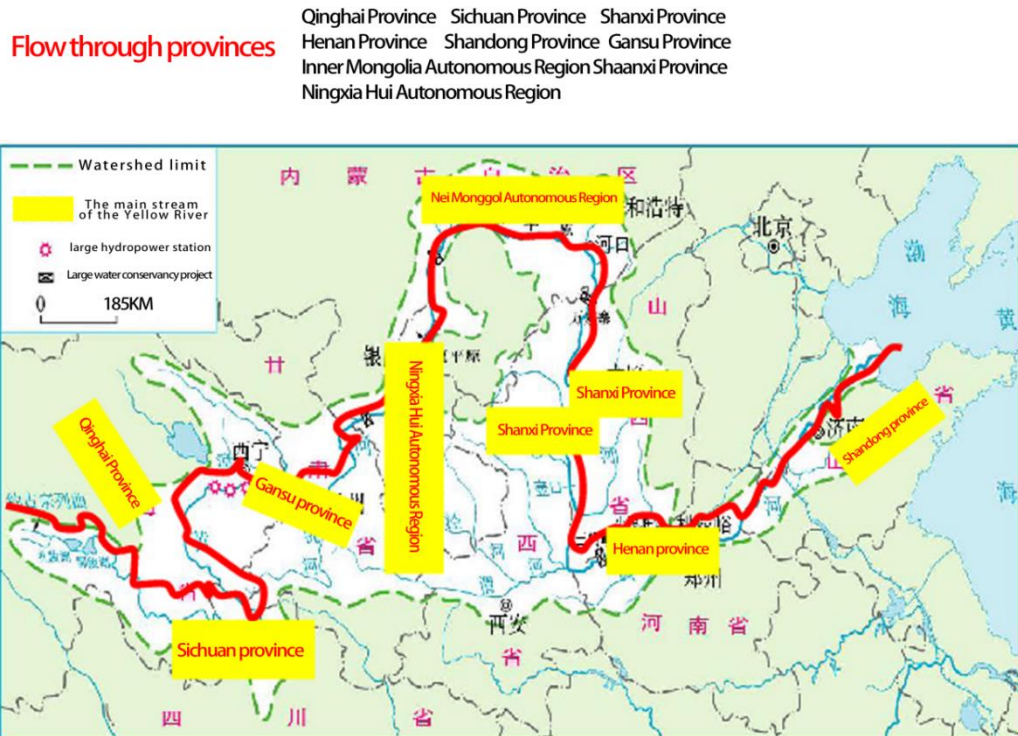


Figure 9 Map of the Yellow River Basin  
Source: made by the author, 2023

## 1.2 Overview of the Yellow River Section in Henan Province

The Yellow River enters Henan Province from Tongguan, Shaanxi Province, starting from Lingbao City in the west, east to Taiqian County, Luoyang, 28 counties (cities, districts), such as Sanmenxia, Luoyang, Jiyuan, Zhengzhou, Jiaozuo, Xinxiang and Kaifeng, the river length is 711 km, basin area of 3.6200 square kilometers, accounting for 5.1% of the total area of the Yellow River basin and 21.7% of Henan Province. The protection and benefit areas involve 105 counties (cities and districts) in 13 provincial cities in Henan Province, covering an area of 96,000 square kilometers, accounting for 57% of the whole province<sup>13</sup>. (Figure 10)

Because the Yellow River in Henan is located in the transition section from the mountainous area to the plain, the river has a special geographical location and the river form is complex, which has the prominent characteristics different from other rivers and other reaches of the Yellow River: one is the river The widest way. The distance between the banks of the Yellow River is generally 5 to 10 kilometers, the largest river is 24 kilometers wide, the river is wide, shallow, scattered, disorderly, the river is wandering and changeable, is a typical wandering river. Second, the suspension difference is the largest. The Yellow River sediment is mainly deposited in the Henan section, the riverbed is generally 3 meters to 5 meters above the surface of the banks, the maximum suspension difference is 23 meters, is the world-famous "hanging river on the ground". Third, the beach area has the largest area and the largest population. The Yellow River beach area in Henan province covers an area of 2,116 square kilometers with a population of 1,526,900. Fourth, the historical disasters are the heaviest. In 2540 from 602 BC to 1938, there were 1,593 breaches in

the lower reaches of the Yellow River, two-thirds of which occurred in Henan; 26 times and 20 times in Henan, known as "three years, one hundred years diversion". Therefore, the Yellow River in Henan has always been the top priority in the flood control of the lower Yellow River<sup>14</sup>.

<sup>13</sup>This data is from, Henan Yellow River Network <http://hnb.yrcc.gov.cn/html/web/whhh/index.html>

<sup>14</sup>The south section of the Yellow River has the widest channel, the largest suspension difference, the largest beach area and the most serious historical disaster.



Figure 10 Map of the Yellow River  
Source: made by the author, 2023

## 2. Governance, the evolution of the Yellow River strategy

The Yellow River flows through the loess Plateau with loose soil, and the sediment content is large. A large amount of sediment is carried to the downstream by the river, resulting in the frequent blockage, breach and diversion of the downstream river. Since ancient times and today, the control of the Yellow River has basically not been interrupted. Henan is the main battlefield of controlling the Yellow River for thousands of years. The Yellow River entered the valley from Mengjin into the North China Great Plain, due to silt deposition, gradually formed a "hanging river".<sup>15</sup> It has the widest river course, the largest suspension difference, the largest beach area, the most serious historical disaster, and the arduous flood control task. The control of the

---

<sup>15</sup>The riverbed is higher than the ground of the river, also known as "the ground river".

Yellow River in Henan is often closely related to the political stability and economic rise and decline of successive dynasties, which has been the top priority of flood control of the Yellow River since ancient times. In the arduous struggle, the sons and daughters of the Chinese nation not only created a great material civilization, but also created a splendid spiritual civilization. It is widely distributed in the material and non-material forms, continuing the long time, and becoming the importance of the fine traditional Chinese culture Component. The Yellow River management books are a vast sea of books, from the "Yugong",<sup>16</sup> " to the history of the official revision, and then to many private repair history of river engineering technology, accumulation Rich literature on river control engineering. The relics of the Yellow River are rich and diverse. The old path of the Yellow River and the dike of the Yellow River carry the development history and struggle history of the Chinese nation, and become the best carrier to directly touch the history. The yellow River control sites on both sides of the Yellow River and the stone carvings and tablet inscriptions in the river basin condense the profound national spirit and national culture, and have important cultural relics and document value. It is the continuous practice of river control in the past dynasties that enables the Chinese nation to accumulate rich experience in river management, seriously explore the rich connotation of the Yellow River management culture in the past dynasties, and provide a reference theory for us to protect, inherit and carry forward the cultural heritage of the Yellow River in Henan today.

The close connection between the establishment of a country and water control. Water control is the foundation of the formation of the early agricultural civilization. In order to ensure the safe life of the people in the Yellow River basin, it can be said that the control of the Yellow River has been continuous since ancient times. The important concern of the state, the state plays a leading role in the governance of the Yellow River, all dynasties have left the control of the Yellow River ink.

---

<sup>16</sup>Before the Han Dynasty, the lower Yellow River was called the Yu River.



## 2.1 The effectiveness of national governance as reflected in ancient river management

The Yellow River basin is one of the earliest areas of agriculture in the world, and water is the lifeblood of agriculture. For this reason, the Yellow River is very important to the agricultural production in the river basin. And the river flood, flooded farmland, destroyed houses, a serious threat to the production and life of the ancestors. It is accompanied by the ancestors launched a water control activities. Da Yu's father Gun was executed by Emperor Shun for failing to control the flood. Da Yu learned a lesson from the failure of his father Gun's water control, and adopted the method of dredging the blocked river channel, dredging the rivers or depressions and lakes that had been dredged, and making the flood flow to the sea, and finally controlling the flood. People can settle down, farm on the submerged land, agricultural production gradually recovers, the people live and work in peace and contentment, and live a happy life again. As Yu succeeded in controlling the flood, Shun passed the throne to Yu and established the state. It can be said that Dayu flood control not only revealed the great promotion of water control activities on the social productivity, but also strongly proved the great impact of water control activities on the production of the country and the progress of civilization.

## 2.2 Efficacy of national river governance under a majoritarian centralised regime

The Qin and Han dynasties opened their territory, connecting the middle and lower reaches of the Yellow River. The large-scale reclamation in the Loess Plateau area began to damage the original vegetation, aggravating soil erosion, resulting in frequent flooding in the lower reaches of the Yellow River. Through the marrow blockage in the Western Han Dynasty and the Royal River in the Eastern Han Dynasty, we can see how the two Han regime attaches great importance to and results in the control of the Yellow River. In the Western Han Dynasty, the Yellow River overflowed as many as 13 times. One of the most famous was in the third year of Yuanguang, Emperor Wudi of the Han Dynasty (132 BC), when the Yellow River broke at the Huzi dike in Puyang, Henan Province, China. It flowed to the southeast, poured into Juyeze, merged with the Sishui River and flowed into the Huai River. Yu County (southwest of today's Pingyuan County, Shandong Province) is close to the Yellow River and is often afraid of flooding. The breach just made the Yellow River flow south, and Tian's city Yu County was protected from the flood. He tried everything possible to persuade Emperor Wudi of the Han Dynasty not to block the breach and let the river flood, so that the river lasted for more than 20 years, the affected area of a thousand miles. The disaster was very serious, and in some places even people eat people. In the second year of the Yuan Dynasty (109 BC), Emperor Wudi of the Han Dynasty made up his mind to block the breach and ordered Ji An's younger brother Ji Ren to go to Dongjun, where the breach was located, to take charge of the breach. In the process of blocking the breach, Emperor Wudi of the Han Dynasty led the construction site to supervise the river, ordered all the followers from the general to carry firewood materials, participate in the blocking work, and finally

blocked the breach. In addition to ordering the building of the Xuanfang Palace to be commemoron the embankment, Emperor Wudi wrote the famous marrow Song, describing the scene of the blocked breach. By the time Wang Mang replaced the Western Han regime, the river in Xingyang County in Henan Province had changed greatly, leading to the serious collapse of the embankment between the Yellow River and the Jishui River, resulting in the turbulence of the Yellow River, Jishui River and Bianshui tributaries. In the ten years of the reign of Emperor Guangwu, the area south of the Yellow River has reached dozens of counties. Liu Xiu, Emperor Guangwu, rushed to build the river. Because of the weak new regime, he gave up the river halfway. After Emperor Mingdi of the Han Dynasty ascended the throne, the imperial court had different opinions on the control of the Yellow River, and Emperor Ming was at a loss. It was not until the twelfth year of Yongping that Emperor Ming accepted Wang Jing. Be began a large-scale governance activities. Wang Jing led his soldiers to dig the mountains that blocked the waterway, breaking the original water resistance projects in the river, blocking the transverse ditch, protecting the dangerous dikes, and dredging the silted river sections and channels. It not only managed the Yellow River, built a long dike from Xingyang to Haikou, but also managed the Bian Canal, namely "the canal", "water gate" and "ten miles up a water gate, to make more return". In short, wang Jing's large-scale control of the Yellow River and the Bian Canal took only a year to stop the Yellow River flood, which had lasted for more than 30 years. This is a very efficient national river control behavior, but also a comprehensive yellow control activities.

During the Southern and Northern Dynasties of Wei, the middle and lower reaches of the Yellow River were the center of war. The nomadic northern ethnic minorities dominated the Central Plains, resulting in a large number of agricultural Han people moving out. Therefore, many farmland in the middle and lower reaches of the Yellow River was turned into pastures, the vegetation on the Loess Plateau was restored, and the soil erosion was relatively reduced. The sediment in the river is reduced, and the downstream channel is relatively stable.

During the Sui, Tang and Five Dynasties, the Sui Dynasty lacked records of the control of water damage in the Yellow River. But the Grand Canal dug by Emperor Yang of the Sui Dynasty was the most effective control of the Yellow River. The Yongji Canal, which leads the Qinhe River, a tributary of the Yellow River, to Beijing, and the Tongji Canal, which leads the Yellow River to the southeast, are both actually divert the Yellow River water, naturally reducing the downstream floods. In the Tang Dynasty, the records of river disasters increased, but there were only a few river control activities in historical books. From these few river control activities, we can see that the supreme rulers attach great importance to the governance of the Yellow River. In the tenth year of Kaiyuan (722) in June, Bozhou (northeast of now Liaocheng, Shandong Province), Tang Xuanzong sent Bozhou governor Li She, Zhaozhou governor Liu Ru, Jizhou governor Pei Ziyu, "took the biography of the afternoon, and ordered Xiao Song to observe the situation". The imperial court sent ministers to lead the matter, and ordered the highest officials of the nearby three states to assist in handling it. It can be seen that the scale of the river control project should be relatively large, and the manpower used is also more. There are also Kaiyuan four years (726) Jeju now Shandong Ping southwest) river control. At that time, Pei Yaoqing was the governor of Jeju, and led the masses to repair the river embankment.



Soon the imperial court appointed him as the governor of Xuanzhou, but he still stayed to supervise the project and went to Xuanzhou (today's Xuancheng, Anhui Province). The people of Jeju set up a monument for him to celebrate his merits in governing the river. In the fourth year of Xiantong (863), the governor of Xuzhou, Xiao Fu, asked Tang Yizong for approval to control the flood of Xuzhou.

In addition to the Later Tang Dynasty, the Later Liang, Later Jin, Later Jin and Later Zhou Dynasty built Bianzhou (in today's Kaifeng, Henan Province), which was changed to Kaifeng Prefecture, known as Tokyo. The lower reaches of the Yellow River became the center of the rule. At this time, the river was frequent and the flood was very serious, which directly endangered the interests of the rulers. Therefore, the later Tang, the Later Jin and the Later Zhou all had records of river control activities. Especially after the later Zhou Dynasty Shizong Chai Rong ascended to the throne, faced the Yellow River for years of collapse, divided into two groups, merged for the Ze, filled the serious situation of hundreds of miles and repeated envoys can not plug, sent prime minister Li Gu to chan, Yun, Qi (now Shandong Jinan) and other states, according to the dike plug, served 60,000, with a month time, blocked many breach. In short, during the Sui, Tang and Five Dynasties, the Yellow River gradually ended the situation of the Eastern Han Dynasty, and entered a period of frequent river disasters, and the rulers continuously controlled the Yellow River.

In the Song and Jin dynasties, the lower reaches of the Yellow River had flowed for a long time, the sediment deposition was serious, the river changes were violent, and the disasters were more frequent. During the 167 years of the Northern Song Dynasty, the Yellow River overflowed more than eighty times, and 47 times in today's Henan province. Comparatively speaking, the Five Dynasties period had 22 recorded overflow, about once every three years on average, while the Northern Song Dynasty was more than once in two years on average. In the past one hundred years of the Jin Dynasty, the Yellow River was changed thirteen times, ten times in Henan. The Yellow River began to divert many strands, seizing the Huai River into the sea, destroying the downstream water system. In the Yuan Dynasty, the Yellow River in Henan flooded 44 times. In the face of the increasing flood of the Yellow River, the rulers of Song, Jin and Yuan regarded river control as one of the important tasks of governing the country and attached great importance to it, but the effectiveness of river control was very different.

In the Northern Song Dynasty, Kaifeng was the capital, near the Yellow River. The increasingly serious flood of the Yellow River not only poses a serious threat to the vast agricultural areas along the river, but also has a significant impact on the shipping of the Bianhe River and the safety of the capital. Therefore, the Northern Song Dynasty invested a lot of manpower and material resources to control the Yellow River, and many court officials and local officials participated in the discussion and practice of river control. Therefore, the court formed two groups of east and north to control the river for a long time, without dispute. As the result, the effect was very small. Among them, the three battles back to the river in the late Northern Song Dynasty was the largest river control project at that time, but the three battles were unsuccessful, wasting people and money. There are two main reasons for this. One is to see the disaster of the north stream, did not see the advantages of the relatively low terrain of the north stream, insisted on the water, so that the river back to the old road, failure is inevitable. Second, when returning to the river, there was no

comprehensive dredging of the old road, and the river channel dug was too shallow and narrow to accommodate the flood, resulting in continuous overflow, so the river was soon changed to the north.

After the Jin Dynasty occupied the middle and lower reaches of the Yellow River, it still defended the river. Jin followed the Song system, the imperial court set up the water supervision, the charge of river prevention. In order to strengthen river prevention, a system of reward and punishment was also implemented for river prevention officials and local officials. In addition, elm willows are planted on the banks of the Yellow River, which can strengthen the embankment and be cut down as cast.

The Song, Jin and Yuan dynasties had the greatest effect and a lasting effect. The flood of the Yellow River in the Yuan Dynasty was unprecedented serious. Among the many breaches, the fourth year (1344) and the ninth year (1349) were the worst in the west of Caoyuan County, Shandong Province). The river migration to the north threatened the Huitong River and the two Cao salt farms, and also threatened the economic lifeline of the dynasty. In April of the 11th year (1351), with the support of the prime minister, the imperial court adopted Jialu's advice and decided to control the river. Jialu mobilized 150,000 migrant workers from the north and south Bianliang of the Yellow River (in now Kaifeng, Henan Province), daimyo (now south of Hebei Province), and 20,000 troops in Luzhou (in now Hefei, Anhui Province), with a total of 170,000 people invested in the river control project. To September of that year, the Yellow River returned to the old road. In just five months, Jialu blocked the seven years of flooding, relieving the Yellow River flood at that time, and his contribution was huge.

In the Ming and Qing dynasties, Beijing was the capital, and the political center of the country was far away from the economic center of the south of the Yangtze River. Grain transport became the cornerstone of the national economy and people's livelihood. The Beijing-Hangzhou Grand Canal and the Yellow River through the north and south form a cross state. The Yellow River is easy to break, and the canal is easy to silt up. The two interweave together, so that the smooth flow of the canal is often disturbed and damaged by the Yellow River. Therefore, the purpose of the Huang in the Ming and Qing dynasties was to ensure the smooth water transport.

In the early 138 years of the Ming Dynasty (1368~1505), the Yellow River overflowed in Henan, Shandong and Southern Zhili provinces, and Henan was the most serious, which directly affected the Zhangqiu Canal in Yanzhou Prefecture, Shandong province. In order to release the north bank of the Yellow River to the Zhangqiu Canal in Shandong province, The main river control measures during this period was the eastward construction of the embankment in Meng County along the north bank of the Yellow River since the Yongle period, In particular, Xu Youzhen, a river management expert during the Jingtai period, built a Shawan (now Zhangqiu, Shandong province) dike, Hongzhi reign experts, Bai Ang and Liu Daxia, built hundreds of miles of long dikes on the north bank of the Yellow River, From zuo city, Henan, Through Hua County, Changyuan and Dongming, Caozhou and Cao County in Shandong province to reach Yucheng in Henan province, Three hundred and sixty miles in total, Called it the "Taihang dike", With the Yongle years in Henan Mengjin County, Wuzhi County, Yangwu County, the riverside dike connected to build a barrier against the northern flow of the Yellow River, The Yellow River returns to the

south, The Zhang Qiu Canal was not broken. Correspondingly, in the late Ming Dynasty (1506-1644), it was transferred to the east of Kaifeng Prefecture, Henan, Xuzhou in the southwest of Shandong, and Fengyang Prefecture in the north of Southern Zhili were the most serious in Xuzhou, which directly affected the smooth flow of the canal from Jining to Huai'an section. The center of gravity of the Yellow River was also transferred from the Zhangqiu Canal in the northwest of Yanzhou Prefecture to the Jining to Huai'an section. In order to relieve the threat of the Yellow River flood to this section of the canal, the main measures to control the river during this period were to "build dikes on both sides of the lower reaches of the Yellow River to attack the sand with water."<sup>17</sup> Build dike and bundle water, attack sand with water was put forward by the premier wangong, the premier of the Yellow River. Especially wanli 15 years (1587), Pan Ji tame given the previous embankments for "the age of traffic, rain of erosion", most have "high day low, thick", the south zhili, Shandong, Henan and other places dike dam for a comprehensive renovation reinforcement, in Xuzhou, lingbi, SuNing, if, Suqian, Taoyuan, county, qinghe, fengxian, county, DangShan, caoshan county, shan county, dike, and dike, taihang dike, soil dam, etc, a total of more than one hundred ten thousand zhangs. In Henan Xing ze, county, the original wu, ZhongMou, Zhengzhou, YangWu, sealing hill, auspicious, Chen Liu, Lanyang, instrument seal, SuZhou, city, Shangqiu, YuCheng, Hanoi, wu zhi, etc, help build and build yao, month and continuously, dike and new dam for more than one hundred thousand zhang, further consolidate the Yellow River embankment, to control river, water attack sand play a certain role, reversed the hong governance since river "north and south rolling, east and west" chaos, make the road clear.

---

<sup>17</sup>Pan Jixun, A List of River Defences, Vol. 2, Wenyuan-Ge Sikuquanshu, Vol. 576, History Department, Taiwan Commercial Press, 1986, p. 171.

During the Ming and Qing dynasties, the Yellow River embankment was in disrepair, especially in the 15th year of Chongzhen (1642), Li Zicheng's peasant army and the Ming army fought fiercely in Kaifeng, both sides dug the Yellow River dike flooded, the Yellow River burst until the first year of Shunzhi (1644), the Yellow River returned to the old road, and the Yellow River was repeatedly blocked. From the first year of Emperor Kangxi (1662) to the fifteenth year of Emperor Kangxi (1676), the lower reaches of the Yellow River, most of the sections in Cao County, Shandong Province, were concentrated in Jiangsu Province. They even burst three times a year, posing a serious threat to the grain transport. Among them, the biggest influence on the grain transport was in the summer of the fifteenth year of the reign of Emperor Kangxi (1676), when the Yellow River and the Huai River rose together, "the river flooded Hongze Lake, and the high weir could not be supported, and the breach reached 34. The dike collapsed, the clear pool of Gaoyou and the Daze Bay, a total of more than 300 zhang ", flooded the Huai, Yang seven prefectures and counties, resulting in the huai water is not clear," clean and yellow ". Without effect, the Yellow River channel is more silt pad, the canal is also silt. The failure of water transport has become a problem of the Qing Dynasty. At that time, although he was attacking the separatist forces of San Francisco led by Wu Sangui, Emperor Kangxi resolutely made the determination to control the Yellow River. In the 16th year (1677), he transferred Jin Fu, governor of Anhui, as the governor of the river, and

listed "San Francisco, river affairs and grain transport"<sup>18</sup> as three major events, which were written on the column of the palace to remind himself. It can be said that Emperor Kangxi was a generation of emperor who attached great importance to the governance of the Yellow River in history. From the 23rd year of Kangxi (1684) to the 46th year of Kangxi (1707), he toured the southern river workers for six times and conducted many investigations and studies. At any time to the river minister refers to the river management strategy. During the reign of Daoguang in Jiaqing Dynasty, the Qing government was corrupt and incompetent, and officials had no ability to control the

---

<sup>18</sup>The Record of the Holy Ancestors of Qing Dynasty, Vol. 154, the Thirty-first Year of Kangxi, Zhonghua Book Company, 1986, p. 701.

river. The flood of the lower Yellow River was very serious, and it was out of control.

In the fifth year of Xianfeng (1855), before the Yellow River was changed east in Lankao, Henan Province), the grain transportation of the Hangzhou Grand Canal withdrew from the stage of history. After the Opium War (1840), China was constrained by foreign forces and was at a passive disadvantage, and the governance of the Yellow River was also in a passive state.

### 2.3 The Weakening of State Power and the Frequency of Social Disasters in Modern River Governance

After the Opium War in 1840, the forces of western capitalist countries infiltrated China and controlled China from all aspects. The backward feudal economy was even more poor and weak. Not only were the funds used for river control reduced, but also the official corruption became popular. The only funds for river control were exploited by corrupt officials, and the real funds for river control were few. In the face of this extremely difficult complex social difficulties, represented by Lin zexu patriots, overcome difficulties, in the process of resisting foreign invasion, the burden of "national rise and fall, a man" mission, shoulder the river, not only put forward valuable river views, and physically involved in the activities of the river.

In February of the 11th year of Daoguang (1831), Lin Zexu became the governor of the Donghe River and handled the Yellow River affairs. He found that the use of the Yellow River was difficult, and proposed to build the river with stone, which was the first in Henan province. On June 16, the 21st year of Daoguang (1841), the Yellow River burst in Xiangfu, Henan province (now Kaifeng). The turbulent Yellow River filled the Xiangfu City, the depth of the city was nearly two meters, and the water broke to Anhui Province to pay attention to the Huai River. Henan and Anhui provinces have five prefectures and 22 prefectures and counties affected. Facing the governor of Henan niu Ji'an and the east river governor wen rushed on the river show helpless, claims that mouth block building difficult and request "migration province cure" negative response, daoguang sent bachelor Wang ding to auspicious field investigation, Wang Ding pointed out: " river change at any time, since ancient times, absolutely determined and not plug, plug and unexpectedly." It is not



feasible."<sup>19</sup> So Wen Chong was removed from his post, and Huaihai Road Zhu Xiang took over as the river governor. This plugging project, presided over by Wang Ding. At the time when Lin Zexu, who had been meritorious in combating opium, was sent to Yili, Xinjiang to guard the border. When Lin Zexu went to Yili, Xinjiang and passed through Henan, Wang Ding asked Lin Zexu to do the blocking project and went to the Emperor Daoguang for permission. Lin Zexu ordered to Xiangfu and Wang Ding to live in the Liubao construction site to guide the river. During the blockage of the Yellow River breach, Lin Zexu patrolled the more than 30 kilometers long area, not to avoid the scorching sun, and finally achieved the closure of the dragon. The plugging project lasted eight months, was a large plugging project in Henan at that time.

In the 38th year of the Republic of China (1911-1948), the Beiyang and the civil government successively dominated the warlords successively, and the political situation was constantly unstable, coupled with the plunder of imperialism, the people were in dire straits. Especially after the July 7 Incident in 1937, the Japanese invading army launched a all-out war of aggression against China, and the Chinese nation fell into a crisis of life and death. Under the background of internal and foreign troubles, the national government did not give up the governance of the Yellow River, but due to the restriction of political factors, it was difficult to make great achievements.

In the early period of the Republic of China, there were only river bureaus or river defense bureaus in Henan, Hebei and Shandong provinces in the lower reaches of the Yellow River. By the 1930s, the Yellow River Conservancy Commission was established. The fund for river control is very limited, "willing to fill everywhere, mian wei the status quo, cover yi abrupt difficult". It is extremely difficult to carry out minor repairs, but comprehensive repair projects are even more impossible. And at this time the lower Yellow River by the Henan, Hebei, Shandong provinces, can not

---

<sup>19</sup>Zhao Erxun, Draft of Qing History, vol. 126, He Qu I, Zhonghua Book Company, 1977, pp. 3739-3740.

be unified planning. Between the two provinces, the embankments are the weakest. Due to the continuous fighting between warlords, the government's financial difficulties, the only amount of river control funds can not be in place, the provincial river authorities often owe or advance. And the wind of corruption in the river bureaucracy is quite prosperous. The river does not want to control the river, but takes a large amount of the river for his own. At the cost of the project, the dike and war, and the dike and the dam are broken. According to records: " Since the founding of the Republic of China, warlords occupied, draining the water and fishing, all the embankments along the embankment, except the dike, all sold in the hands of compassion, the river workers all removed, the flood crisis."The embankments of the lower Yellow River are dilapidated and the flood resistance is very low. In the 38 years of the Republic of China, the Yellow River dike broke in 17 years, and each breach brought deep disaster to the people.

During the period of the Republic of China, there were also disasters caused by digging dikes and releasing water for military purposes. Among them, in June 1938, the south bank of Zheng County (now Zhengzhou, Henan Province) of the Yellow River had the most significant impact, which was a measure to use the flood of the Yellow River to prevent the Japanese attack. The flood after digging the dike



temporarily prevented the Japanese army from advancing westward, but caused serious disaster to the people of Henan, Anhui and Jiangsu provinces. Among them, Henan bore the brunt of the most serious disaster. According to statistics, "Henan houses washed away more than 1.40 million, land sink more than eight million mu".<sup>20</sup>

After the formation of the yellow area, in order to prevent the expansion of the garden gate, the national government built a new dike along the western boundary of the general area twice. In July 1938, the committee jointly with the government of Henan province and other departments set up new dike relief committee, to generation, since guangwu (now Henan RongYang northeast) Li Xihe Yellow River old dike, to zheng county Tang Zhuang (now Henan Zhengzhou Putian) longhai railway roadbed,

---

<sup>20</sup>Guo Tingyi, Outline of Modern Chinese History (Vol. 2), China Social Sciences Press, 1999, p. 406.

new long 34 kilometers embankment, called "pan west dike", but because of the project not then completed until July of the following year. Completed the embankment from Putian through Zhongmu, Kaifeng, Weishi, Fugou, Xihua, Huaiyang, Shangshui to the junction of Henan and Anhui Taihe County boundary first set (now Anhui boundary first), long 282 pan-new. The pan-west dike rises from the old dike of the Yellow River to the boundary of Taihe County, Anhui province, and is defended by the first, second and third defense sections of the pan-west dike. During the War of Resistance against Japan, "river defense is national defense". The maintenance of river defense is all based on military needs. On February 24, 1941, the national government military committee to the Yellow River water conservancy committee director Kong Xiangrong said in a telegram: "check yellow so block westward, shielding wan, los, and the river on the north of hundreds of thousands of nations rear supplies and accompany the periphery of security, professional on this, so according to the principle of the military first, victory first, not to the people's livelihood relationship yellow trough, reduce the enemy power." Is on May 17, Kong Xiangrong in" reported huai domain engineering about problem of thin "also made it clear:" about the problem of thin, should comply with the military commission, the executive yuan and the instructions, maintain the existing situation, points into vortex, small, and flood vortex, small, between shall not bundle water tank, to reduce the enemy force." The new river against the pan-west dike repair, always adhere to this principle. When repairing the dike, there are defense projects built along the dike, which are river defense, especially national defense, and the project have many military purposes. After the implementation of two large-scale comprehensive restoration projects in 1941 and 1943, it consolidated the Xinhe River defense and strengthened the role of the yellow flood area in blocking the enemy.

### 3. Artistic changes in the cultural heritage of the Yellow River in Henan

Henan Yellow River Culture refers to the cultural form centered on Henan Province and with the Yellow River Basin as the cultural background. This type of culture has a long history and a long history. It has profound historical accumulation and unique regional characteristics. It reflects the historical, cultural, social, economic and other characteristics of the Yellow River Basin. It is not only an important part of Chinese traditional culture, but also an important part of Chinese culture. One of the important sources of national spiritual civilization.

Henan is one of the birthplaces of Chinese civilization and the political, economic and cultural center of many ancient dynasties. There are many cultural relics and historical cities in Henan Province, such as the Yin Ruins in Anyang and the Longmen Grottoes in Luoyang. These are An important part of the Yellow River culture, and relying on the cultural background of the Yellow River Basin, Henan has extremely rich folk art, festival celebrations and folklore. At the same time, Confucian culture, Taoism, Buddhism and other religious cultures also blend and develop here. Henan Yu Opera, Calligraphy, painting and other arts form an important part of Yellow River culture, reflecting the region's unique artistic style and aesthetic taste. A series of important cultural heritage derived from the Yellow River culture in Henan, such as ancient buildings, archaeological sites, historical documents and folk customs, traditional arts, festivals and other intangible cultural heritage, collectively reflect the profound historical heritage and cultural characteristics of the Yellow River Basin. It is not only a precious treasure of Henan, but also a cultural heritage shared by all mankind.

#### 3.1 Changes in architectural art

The architectural art in the cultural heritage of the Yellow River in Henan has experienced rich changes and development from ancient times to the present. It not only shows the development of ancient Chinese architectural art, but also reflects the impact of social economy, cultural ideas and technological progress on architectural art.

##### 3.1.1 Pre-Qin period

The Pre-Qin period (approximately 21st century BC to 221 BC) was an important period in Chinese history. This period marked the initial formation of ancient Chinese civilization. During the pre-Qin period, the architectural art in Henan's Yellow River cultural heritage experienced significant changes and development. The following are several main features of the architectural art in the cultural heritage of the Yellow River in Henan during the pre-Qin period:

First, the architecture of the Shang Dynasty. The Yin Ruins in Anyang, Henan are the ruins of the capital city of the late Shang Dynasty. Although the architectural characteristics and achievements of this period are not as rich and detailed as those of later generations due to the long time and scarcity of documentary materials, through archaeological excavations, especially the study of the Yin Ruins in Anyang, we can see the characteristics of the architectural art of this period: Shang Dynasty The palace buildings of the dynasty were grand in scale and rigorous in layout, showing a

high level of construction technology. These buildings usually use wood as the main building material and adopt mortise and tenon structures, which embody the basic characteristics of ancient Chinese architecture. Specifically, the palace buildings of the Shang Dynasty were generally located in the center of the city, with large scale and rigorous layout. Wood was the main material of palace buildings in the Shang Dynasty, and the auxiliary use of earth and stone constituted the basic characteristics of Shang Dynasty architecture. From the archaeological data of the Yin Ruins in Anyang, we can find that the craftsmen of the Shang Dynasty had mastered quite advanced construction technology. For example, Yinxu architecture often uses a mortise and tenon structure that connects wood with concave and convex joints. This structure is both strong and flexible, and is an important feature of ancient Chinese architecture.

Second, tomb architecture. From the perspective of the Yellow River culture in Henan, the tomb architecture in the Pre-Qin period not only had significant development in technology and scale, but also had great significance in terms of culture and social structure. Specifically, the tomb buildings of the Shang Dynasty were usually large-scale and complex in structure. These tombs were often used to bury royal families and high-ranking nobles, demonstrating their social status and power. Therefore, these tomb buildings usually adopted the most advanced construction technology at the time, such as Shang Dynasty. Large-scale tombs in the ancient times often used wooden coffins, surrounded by mounds of earth, and had complex internal structures, sometimes equipped with stone or brick chambers. Tombs are often accompanied by a large number of funerary objects, including bronzes, pottery, jades, etc. These funerary objects not only pay tribute to the deceased, but also demonstrate the craftsmanship and artistic style of the time. The scale and decoration of the tomb buildings reflect the social structure and religious beliefs of the time. For example, human and animal sacrifices were sometimes found in tombs of the Shang Dynasty, which shows that a strict class system and specific funeral customs existed at that time.

Third, urban planning. As an important part of the Yellow River cultural heritage in Henan, urban planning in the Pre-Qin period reflects the early form of urban development in ancient China, especially the Yin Ruins in Anyang and Luoyang, the capital of the Zhou Dynasty, both of which provide rich information for the study of the Yellow River cultural heritage in Henan. From the perspective of urban layout, cities in the Pre-Qin period were usually built according to a certain planning layout. Anyang Yinxu, the capital of the Shang Dynasty, showed rigorous planning: the city center usually had palaces and sacrificial areas, surrounded by residential areas for nobles, while handicrafts and commercial areas were mostly located on the periphery of the city. This layout reflected the social hierarchy and status of the time. The concept of functional partitioning. From the perspective of the city defense system, cities in the Pre-Qin period used city walls as the most basic defense facilities, mostly built with thick rammed earth technology, which could protect the city from foreign enemies. From the perspective of street traffic, although there is not much street planning information reflected in the existing cultural heritage, through archaeological excavations, it can also be found that the street layout is usually coordinated with the overall layout of the city to facilitate internal transportation and urban operations.

### 3.1.2 Han and Tang Dynasties

The Han and Tang dynasties were two extremely important dynasties in Chinese history, representing the two peaks of ancient Chinese civilization. During the Han and Tang Dynasties, the architectural art in the cultural heritage of the Yellow River in Henan experienced significant changes and development, reflecting the cultural characteristics and aesthetic concepts of different historical stages. Among the cultural heritage of the Yellow River in Henan, the changes in architectural art during the Han Dynasty not only reflect the development of technology, but also reflect the changes in social culture at that time. Specifically, the Han Dynasty, as a unified empire after the Qin Dynasty, began to have more grandiose and large-scale construction projects, especially palaces, mausoleums and government buildings, and began to widely use masonry materials, and the mortise and tenon technology of wooden structures also has been further developed and improved. At the architectural decoration level, architectural decorative arts such as stone carvings and murals began to flourish. These decorations usually featured characters, mythological stories and natural landscapes, reflecting the rich cultural connotation and aesthetic taste of the Han Dynasty. In terms of urban construction, the urban planning of the Han Dynasty inherited the pattern of the Qin Dynasty, but paid more attention to practicality and aesthetics. Cities are usually laid out in a grid pattern with wide and neat streets. In addition, the Han Dynasty also attached great importance to the construction of water conservancy projects such as channels and dams, which not only improved the irrigation system but also promoted the development of cities and rural areas.

As a period of high cultural prosperity, the Tang Dynasty's architectural style became more grand and spectacular with the rise of religion, and advances in construction technology, such as large beams and columns and complex mortise and tenon structures, also made the buildings stronger and more exquisite. The Tang Dynasty was the peak period of the development of Buddhism in China, so Buddhist buildings such as temples and pagodas were extremely prosperous. These buildings not only increased in number, but also were innovative in scale, layout and artistic decoration. For example, the White Horse Temple and Longmen Grottoes in Luoyang are important representatives of Buddhist architecture and art during this period. Royal buildings such as the Daming Palace in Chang'an and the Dongdu in Luoyang reflect the high level of architectural art in the Tang Dynasty. These buildings are large in scale, rigorous in layout, and gorgeously decorated, showing the power and prosperity of the Tang Empire. In addition, the Tang Dynasty was also an important period for the development of Chinese garden architecture. The rise of royal gardens such as the Tang Dynasty Furong Garden and private gardens embodies the pursuit of natural beauty and superb garden architectural art.

### 3.1.3 Song, Yuan, Ming and Qing Dynasties

The Song, Yuan, Ming and Qing dynasties spanned a thousand years, and each dynasty had its own unique architectural features and craftsmanship.



The architectural style of the Song Dynasty emphasized simplicity, refinement and practicality. Compared with the glitz and splendor of the Tang Dynasty, it paid more attention to intrinsic quality and delicacy. Its construction technology continued to advance, the wood structure technology became more mature, the production and decoration techniques of wooden components became more sophisticated, and the garden architecture of the Song Dynasty reached its peak, emphasizing the harmonious unity of landscape and architecture, and many famous garden buildings appeared. At the same time, the development of Buddhism, Taoism and Confucianism in the Song Dynasty led to the rapid development of Taoist temples, temples, Confucian temples and other buildings.

The Yuan Dynasty was established by the Mongols, and the architectural style was influenced by Central Asia and other places, which gave the architectural art the characteristics of multiculturalism. The Yuan Dynasty attached great importance to large-scale construction projects, and in addition to local Buddhist and Taoist buildings, Islamic buildings also began to appear one after another.

The architecture of the Ming Dynasty attached great importance to large-scale building clusters and rigorous urban planning. Its urban construction and city wall construction also reached its peak. Private garden architecture paid more attention to the creation of natural beauty, and gradually formed a unique architectural cultural style.

Influenced by the Manchu culture in the Qing Dynasty, the architectural style incorporated Han and Manchu elements. During the Late Qing Dynasty, Western architectural styles began to gradually influence the architectural style of the Yellow River culture in Henan, and an architectural style combining Chinese and Western styles emerged.

In general, in this nearly one thousand years of history, the architectural art in Henan's Yellow River cultural heritage has experienced a process from prosperity to transformation, not only developing in technology and materials, but also in style and cultural connotation. changed.

### 3.2 Changes in the art of traditional skills

The traditional skills of Henan's Yellow River cultural heritage have experienced long-term development and changes, forming unique regional characteristics and cultural connotations. They not only reflect the geographical environment, historical background and social customs of Henan, but also reflect the development context of Chinese traditional skills.

#### 3.2.1 Ceramic craft

The ceramic craftsmanship in Henan's Yellow River cultural heritage has experienced an evolution from primitive pottery to high-end porcelain. The earliest pottery appeared in the Neolithic Age, mainly handmade coarse porcelain, used for storage and cooking in daily life. For example, the Yangshao culture was discovered in Sanmenxia City, Henan Province. Its painted pottery is famous for its red and black geometric patterns. Shows the artistry of early ceramic production. During the Shang and Zhou dynasties, with the development of bronze culture, pottery began to appear in more diverse forms and with richer functions. Technically, wheel-making



technology began to be used, and the shapes and decorations of pottery became more diverse and refined. During the Han and Tang Dynasties, ceramic production had formed a relatively mature craft system, and output increased significantly. For example, the green glazed pottery of the Han Dynasty and the three-colored pottery of the Tang Dynasty all showed the development of ceramic art and technology. The Song Dynasty was the peak period of Chinese ceramic art. Famous kilns such as Ru Kiln and Jun Kiln in Henan were famous for their unique glaze colors and firing techniques. Moreover, the establishment of official kilns in the Song Dynasty also marked the maturity of ceramic production skills and aesthetic taste. During the Ming and Qing Dynasties, Henan's ceramic techniques absorbed and integrated techniques and styles from other regions, forming an artistic style that focused more on refinement and beauty, and laid the foundation for the development of modern ceramic techniques.

### 3.2.2 Textiles and Embroidery

Textiles in the Pre-Qin period were usually made of plant fibers or animal hair, with relatively primitive technology, and mostly met basic living needs. Textile technology made significant progress during the Qin and Han Dynasties, and the types and quality of textiles were improved. With the opening of the Silk Road, the influence of Henan silk products expanded. From the Sui and Tang Dynasties to the Song and Yuan Dynasties, Henan's textile and embroidery technology reached its peak, and many high-end textiles and exquisite embroidery craftsmanship appeared. During the Sui and Tang Dynasties, the textiles in Henan were influenced by Central Asian culture, and their patterns and styles were compared to Other periods are richer and more varied. During the Ming and Qing Dynasties, Henan's textile and embroidery skills became more sophisticated. Especially in the Qing Dynasty, the palace's large demand for textiles and embroidery promoted the development of textile embroidery technology, and many high-end textiles and embroidery designed specifically for the royal family appeared.

### 3.2.3 Paper cutting and folk painting

The paper-cutting and folk painting arts in the cultural heritage of the Yellow River in Henan carry profound regional culture and folk traditions. After a long period of development and evolution, they have become an important part of the treasure house of Chinese folk art. The art of paper-cutting originated in ancient times and may have first appeared as part of sacrificial activities. Early paper-cut patterns were relatively simple, but in the Tang and Song Dynasties, the art of paper-cut began to mature, and the patterns and techniques became richer and more sophisticated, and began to be used in decorative fields such as window grilles and door gods. During the Ming and Qing Dynasties, as paper-cutting became a popular folk art form, the patterns of paper-cutting became more diverse and the skills became more sophisticated. It began to be widely used in festival celebrations, wedding ceremonies and decoration in daily life. In the early days, folk painting art was also related to religious beliefs and myths and legends, and was used to express people's wishes and beliefs. By the Song and Yuan Dynasties, folk painting techniques gradually matured, and the themes covered many aspects such as life scenes, historical stories, and natural scenery. During the Ming and Qing Dynasties, the folk painting art of the Yellow River Culture in Henan reached its peak, producing a variety of local schools and styles. These works have a high level of painting skills and artistic expression, are

deeply loved by the people, and have indirectly received modern academic world and art circles.

### 3.3 Changes in Literature and Art

The literature and art in Henan's Yellow River cultural heritage, as an important part of ancient Chinese culture, have profound historical heritage and rich artistic forms. From pre-Qin classics to modern literary works, Henan has left a mark in the history of Chinese literature.

#### 3.3.1 Pre-Qin period

Oracle bone inscriptions and bronze inscriptions from the Pre-Qin period are not only an important part of the cultural heritage of the Yellow River in Henan, but also one of the important sources of the development of Chinese characters. The Book of Songs is the earliest extant collection of poems in China. Many of the poems originate from the Henan area, such as "Guanyong", "Jianjia", etc., which reflect the social life and natural scenery at that time. These poems not only have a high degree of artistic value but also contain rich historical information and national cultural characteristics. In addition, such as the formation of Confucian cultural thought and the ideological confrontation of various schools of thought in the pre-Qin period, Henan Yellow River culture played an important role in it and had a profound impact on the cultural development of later generations.

#### 3.3.2 Han and Tang Dynasties

Yuefu poetry of the Han Dynasty is an important part of the literature of the Han Dynasty. As an important birthplace of Han culture, the Henan region has profoundly influenced the aesthetic taste and cultural connotation of Han Yuefu poetry. For example, the historical allusions and customs of the Yellow River culture in Henan often become the creative materials for Han Fu, and calligraphy such as Han steles Seal cutting further reflects the achievements of the calligraphy art of the Han Dynasty. Poetry in the Tang Dynasty reached its heyday, and poets in Henan, such as Du Fu and Han Yu, reflected the natural scenery and social features of Henan in their poems. In addition, such as the Longmen Grottoes in Luoyang and other mural art representatives of the Yellow River culture in Henan, it can be seen that the painting art of the Tang Dynasty has made great progress in Henan.

#### 3.3.3 Song, Yuan, Ming and Qing Dynasties

The Song Dynasty was a critical period for the development of poetry. Henan literati such as Su Shi and Huang Tingjian created a large number of literary and emotional poetry, which profoundly affected the development of literature and art in later generations. The art of calligraphy and painting also developed greatly in Henan, especially Landscape paintings and flower-and-bird paintings reflect the essence of Song Dynasty art. The Yuan Dynasty was a period of prosperity for Zaju and folk art. This kind of drama was very popular in Henan, promoting the development of local drama forms and contributing to the formation of the prototype of Henan Opera. Novels began to flourish in the Ming Dynasty, and many Henan folk tales and legends were incorporated into novels. Operas also developed further, with more opera types and repertoires with local characteristics appearing. The New Culture Movement in the late Qing Dynasty had an impact on literature and art in Henan, promoting the modernization of literature and art. Various literature and art such as poetry, novels, dramas, etc. have been further developed.

### 3.4 Changes in folk art

The folk art in Henan's Yellow River cultural heritage is deeply influenced by Henan's rich history and culture and diverse geographical environment. After thousands of years of development and changes, it has formed unique regional characteristics and cultural connotations.

#### 3.4.1 Folk music and dance

Traditional folk arts such as Henan Opera, Henan Opera, and Yu Diao have a long history in Henan. With the continuous changes in society, these traditional folk arts have also made certain innovations while maintaining their original characteristics, such as the introduction of new performances. Techniques and repertoire. In terms of dance, ancient dance forms such as Taiping Dance and Sword Dance have gained new vitality through the integration of martial arts elements. At the same time, various ritual dances are also displayed in traditional festivals such as the Lunar New Year and harvest celebrations. , showing a new artistic style.

#### 3.4.2 Food Culture

As one of the important birthplaces of agricultural civilization, Henan's early food culture was dominated by grains such as wheat and rice. The cooking methods were simple boiling, steaming, roasting, etc. The types and seasonings of food were relatively simple. During the Han and Tang Dynasties, with the prosperity and development of social culture, the food culture in Henan began to become rich and diverse, especially with the opening of the Silk Road, ingredients and cooking techniques from Central Asia and other regions began to spread widely. During the Song, Yuan, Ming and Qing dynasties, the cooking techniques of Henan's Yellow River culture were further developed, and more complex cooking methods and dishes appeared, which contributed to the formation of Henan cuisine as a local cuisine.

#### 3.4.3 Folk Beliefs and Legends

The folk beliefs and legends in Henan's Yellow River cultural heritage combine history, mythology, religion and local characteristics to form a unique cultural landscape. Early folk beliefs were mostly related to natural phenomena, such as the worship of mountains, rivers, and celestial phenomena, which reflected people's awe of the power of nature. Ancestor worship was an important form of belief in the early days, and ancestor sacrificial activities were an intuitive manifestation of ancestor worship. In addition, the folk beliefs of the Yellow River Culture in Henan emphasize the combination of history and mythology. After the introduction of Buddhism, Taoism and other religions, mythological stories based on historical allusions were formed, and the gods were also integrated with the local belief system. During the Ming and Qing Dynasties, folk beliefs in Henan became more diverse, and more local gods and patron saints appeared. Traditional stories and folklore are also widely circulated among the people and have become important ways of cultural inheritance.

#### 4. The historical evolution of the Yellow River governance thought

Since the earliest joint water control in the legend, in the long-term practice of river control, people have gradually understood the characteristics of the Yellow River and put forward new ideas of river control on the basis of constantly summarizing the experience and lessons of river control. Some of them have been used since ancient times and have played an important role in the long-term practice of governance and protection of the Yellow River

##### 4.1 Evolution of ancient river control ideas

From the earliest communist water control in the legend to the Opium War, people of all dynasties have carried out a series of river control activities. In the long-term practice of Yellow River control, people constantly put forward some ideas and propositions of river control, and these ideas and propositions have a process of continuous evolution.

##### 4.1.1 Thoughts of river control in the legendary age

As the father of Dayu, they organized the tribal people to shovel the high soil and block the flood to cut off the flood. The earth dike was used to block the water without dredging the river, and the water overflowed and did not follow its way, which still flooded. Therefore, both the communist work and the water control failed. Dayu is learned the communist and his father Gun water conservancy failure lessons, realize the operation of water, put forward "because of water", "high, Sichuan guide stagnation", "make nine chuan distance, dredging selectively Hui from Sichuan"<sup>21</sup> water conservancy method, namely the use of water from the high to low natural trend, along the terrain dredge congestion, the water dredge river, lakes and depressions, and then "universal", finally control the flood.

##### 4.1.2 The diversion method of the Western Han Dynasty

In the late Western Han Dynasty, the flood of the lower Yellow River became more and more serious, and more and more people explored the strategy of river control. When Emperor Cheng became, Feng Kun was the first to put forward the idea of diverting, advocating opening the Tun River and diverting the water from the Yellow River. During the reign of Emperor Ai of the Western Han Dynasty, Jia Rang put forward the famous "three policies of river control", which was to inherit the idea of "diversion", that is, more channels were opened in Jizhou, which could not only carry out transportation and irrigation, but also cut the water potential of the main river to reduce the chance of overflow. This river control strategy is mostly adopted by future generations. Especially in the first and middle Ming Dynasty, the thought of diversion occupied a dominant position in the river control, and almost most of the river rulers advocated diversion to kill water, such as Xu Youzhen, Bai Ang, Liu Daxia, Liu Tianhe and so on.

##### 4.1.3 The Broad River Flood Passage Method of Wang Jing in the Eastern Han Dynasty



During the reign of Emperor Mingdi of the Eastern Han Dynasty (58~75), the Yellow River continued to invade the south, causing the turbulence of the Yellow River, the Jishui River and the Bianhe River. As a result, the flood between the Yellow River and the Huai River was endless. Wang Jing was ordered to control the river, and his leading idea of controlling the river was to dig a new river and flood the wide river. First of all, he chose the natural depression with the lowest terrain at that time as the direction of the new channel, "<sup>22</sup>Build canals and embankments, from Xingyang east to Qianchengkou more than a thousand li", which was conducive to <sup>21</sup>(Han) Kong Anguo Biography, (Tang) Kong Yingda et al. "Shang Shu" 5 "Yi Ji", Shanghai Ancient Books Publishing House, 1997, p. 141.

flood discharge and sand discharge. Secondly, he used a wide river with vast beaches, which can adjust the flood peak, adjust the sediment deposition, and play the role of flood detention, silt and beach brush trough. Finally, he carried out the thorough renovation of the new river embankment construction, dike depth, water gate construction, cutting and so on. This renovation is also one of the important factors for the long-term safety flow of the Yellow River.

4.1.4 In the Ming Dynasty, Pan Jiyu used the method of embankment water and attacking sand with water

Based on his understanding of the characteristics of the Yellow River in the late Ming Dynasty, summarized the lessons of the practice of diverting river control since the late Yuan and middle Ming dynasties. On the basis of "building dike and flow" in the context, he advocated the idea of "tying water with dikes and attacking sand with water". At the same time, Pan Jiyu practiced this thought in the river control activities, and received the effect of "safe flow in the river, grain transportation unimpeded". Panji grasped the control of the river grasped the fundamental problem of sediment deposition in the Yellow River, summarized and applied the operation rules of water and sand, and realized the transformation of river control from diversion to confluence, from water control to sand control. His theory had a great influence on the later generations, which was not only inherited by Jin Fu and Chen Huang in the Qing Dynasty, but also continued to the modern times.

4.1.5 Zhou Yong in the Ming Dynasty and Chen Huang in the Qing Dynasty have paid attention to the thought of the whole river basin governance

In the long-term practice of the Yellow River management, the Ming Dynasty people had a deeper understanding of the characteristics and laws of the Yellow River, with the premier of the river as the representative, proposed that as long as people in

the Yellow River basin, they can use the water function of the canal to achieve the purpose of flood detention and flood reduction. At the same time, Zhou Yong also believed that to control the Yellow River well, it is not enough to rely on the strength <sup>22</sup>(Southern Song Dynasty) Fan Ye: The Biography of Wang Jing, Book of the Later Han, Vol. 76, Zhonghua Book Company, 1965, p. 2465.

of the government. It is necessary to mobilize the people of the world to cure the river, a "great disaster of the world". Zhou Yong's theory of governing the river was approved by the contemporaries Xu Zhenming, Xu Guangqi and other people of insight, who further elaborated and developed the idea that building the canal can change water damage into water conservancy. The thought of using the whole river

basin governance was inherited and developed by the Qing Dynasty people. Chen Huang, Shen Menglan, Xu Chengxuan and others of the Qing Dynasty advocated that the river was attach not only to the lower reaches, but also to the upper and middle reaches. Due to the limitation of historical conditions at that time, the idea of the whole river basin governance was not put into practice, but it still had some reference effect for the river governance of later generations.

In addition to the above main thoughts of river control, the prime minister of the Western Han Dynasty, the famous scholar of the Qianlong period, put forward the idea of rotating water between the two rivers to prevent the collapse, etc.

#### 4.2 The Development of Modern River Management Ideas and the Introduction of Western River Management Theories

After the Opium War, some Chinese people with lofty ideals, on the basis of traditional Chinese ideas, absorbed some advanced foreign ideas and theories of river control and put forward some new ideas and theories of governing the Yellow River.

##### 4.2.1 Thoughts on river governance after the Opium War

Lin Zexu was the most famous statesman and patriots in modern times, and also an expert in yellow governance. In February of the 11th year of Daoguang (1831), Lin Zexu served as the governor of the East River and handled the Yellow River affairs. He thought: " the river repair and defense priority, the relationship between the people's livelihood is the most important, the river to the overall situation, raise the machine appropriate, must understand the project, confident, beginning to eliminate the work, the risk into flat."<sup>23</sup>As the river is often cast by the sand, he is able to cast

<sup>23</sup>The Complete Works of Lin Zexu edited by the Editorial Committee, The Complete Works of Lin Zexu, Vol. 1, Straits Literature and Art Publishing House, 2002, p. 17.

the cast of the earth, and to cast the earth. In order to relieve the difficulties of the river and the Huai River at that time, Lin Zexu once proposed the idea of diverting the Yellow River to the north into the sea (i. e., the current river). Less than twenty years after he proposed this idea, the Yellow River underwent a major diversion in the fifth year of Xianfeng (1855), and its route was exactly the same as Lin Zexu's idea.

After analyzing the geographical situation of the lower Yellow River, Wei Yuan, a contemporary of the Yellow River, believed that the old river at that time was no longer sustainable and should be diverted manually changed in a planned way, otherwise the Yellow River would change its course by itself, bringing great disaster to the people. But his advice was not taken. As he expected, Xianfeng five years (1855) in Henan Lanjiang Henan LAN) copper tile box breach, diverted by the Daqing River people sea.

#### 4.2.2 Thought on river control during the Republic of China

With the descendants of western water conservancy science and technology, the thought of controlling the Yellow River in the Republic of China also underwent great changes, such as the root cause theory of the Yellow River, the theory of medium water level and river trough, and the comprehensive development and utilization.

The theory of curing the root cause of the Yellow River is advocated by Li Yizhi. In 1909 and 1913, Li went to Germany twice, especially the second time when she devoted herself to learning water conservancy science and technology. After returning to China, she engaged in water conservancy teaching and research. In 1922, he began to explore the causes of the flood of the Yellow River and the ways to cure it, and wrote the article "Discussion on the fundamental Treatment of the Yellow River". In the solstice of 1932 and 1935, he served as chairman and chief engineer of the Yellow River Conservancy Commission, wrote articles such as "Discussion on the Treatment of the Root cause of the Yellow River", "Inspection Report on the Upper reaches of the Yellow River", "Reservoir problem in the Yellow River Basin", "Outline of the Root cause Plan of the Yellow River", and further discussed the root strategy and governance measures of the Yellow River. On this basis, he put forward the proposition of paying equal attention to the upper, middle and lower reaches, and considering flood control, shipping, irrigation and hydropower, which pushed forward the thought of river control in China.

Medium water level river trough said is fixed river bed said, this proposition is proposed by two German water experts. German Fangxius's "internal and external dike method, high silt between two dikes" and Engels's "fixed medium water level double river channel, make the river deep and the beach rise", to the purpose of increasing the river's ability to carry sand and send sediment into the sea. In addition, Li Yizhi put forward the "well-off" policy to control the yellow River, and the previous "bundle water to the trough" roughly the same, mainly pay attention to the control of flood flow. At that time, the Yellow River Water Conservancy Commission also put forward the downstream management plan of "fixed medium water level river trough", but the width of the both sides of the riverbed was not easy to grasp, so it was difficult to implement.

The idea of comprehensive management and development was advocated by Li Yizhi and Zhang Hanying, the famous water conservancy experts in the Republic of China period. They believe that the simple management of the lower reaches of the Yellow River cannot solve the problem of flood control. They should start from the development of social production and the improvement of people's lives, make overall consideration for the upper, middle and lower reaches of the Yellow River, comprehensively control, promote and eliminate harm, and develop and utilize water and soil resources in various aspects.

In addition to the above important ideas of controlling the Yellow River in the Republic of China period was different from the previous generation, and the Yellow River governance not only had a special organization, but also made a comprehensive long-term plan. The Work Outline of the Yellow River Governance formulated by Li Yizhi and The Outline of the Yellow River Governance both advocated the use of modern science and technology, focusing on the comprehensive plan and outline of

the integration of the Yellow River basin governance and economic development, but both failed to be implemented.

## **5. Technological Innovations and Applications of Yellow River Management**

### **Throughout the Ages**

The severity of the Yellow River varies in different times. In the face of the Yellow River, later generations learn the experience and lessons of the success and failure of the river control, and constantly improve and enhance the river control technology.

#### **5.1 The Continuous Improvement of Ancient Yellow River Management**

##### **Technology**

##### **5.1.1 Evolution of embankment building technology**

Building large dikes has been the main measure to control the Yellow River since ancient times. Since the legendary leaders of the tribe of the ministry led the earth and stone to the low-lying land to build some original dikes to resist the invasion of the flood, this original method of obstructing the dikes was effective in the small range of the early human beings. When Gun, the father of Yu the Great, controlled the water, he borrowed the method of the communist tribes to control the water, but failed to control the flood. Gun failed to control the water, but the method of building dikes and MS to control the water had a profound impact on the flood control of later generations. Taking the experience of his predecessors of "obstructing" and "collecting water", Dayu adopted the method of "descending down and guiding the river" to finally control the flood.

During the Spring and Autumn Period and the Warring States Period, large-scale embankments in the lower reaches of the Yellow River were built. During the Spring and Autumn Period, the flood of the Yellow River had increased relatively. The vassal states in the lower reaches of the Yellow River competed to build levees. As a result, the overlord Duke Huan of Qi put forward the ban of "no song prevention" when the vassal Kuiqiu met. By the Warring States Period, the embankments of the lower Yellow River had reached a large scale. Jia Jean of the Western Han Dynasty once said, " <sup>24</sup> The construction of the Warring States, obstructing all rivers, each with his own benefit. Qi and Zhao and Wei took the river unexpectedly. Zhao and Wei fell down to the mountains and reached the river in the east. Zhao and Wei flowed in the west. Zhao and Wei also for the dike, to the river 25 li. Although not in its right, the water is still wandering." It can be seen that the state of

Qi took the lead in building embankments on the Yellow River, resulting in the flood being blocked by the Qi dike. As a result, the flood flooded in Zhao and Wei. Zhao and Wei also built embankments one after another, so that the river wandered in the riverbed about 25 kilometers wide. Obviously, the embankment increases the water capacity of the riverbed, and the flood control efficiency is self-evident. Therefore, the construction of embankments has gradually become the main means of people to resist the flood, which has continued in the continuous improvement to today, affecting the river control and flood control in China for thousands of years.



In the period of the Han Dynasty, stone dikes and eight shock dikes appeared, which made the dikes stronger. At that time, in Wei County and Dongjun, Pingyang, Pinggang, Zhaoyang, etc., the side of the embankment near the river with stone protection, known as the stone dike. Its role is to resist the erosion of water, the safety of the dike body, as the later embankment revetment or slope protection. By the middle of the Eastern Han Dynasty, the "eight exciting dike" appeared in Volume County, Henan province (today's Yuanyang Yangxi of Henan Province). "Eight exciting dike" was a great invention at that time, it can resist the erosion of the flood. It can also push the slip potential to move out, which is stronger than the protection ability of the stone dike, just like the short dam or stack on the later river workers.

In the Jin and Yuan period, people began to pay attention to the identification and selection of soil quality. The river soil could be divided into several types according to the soil color and soil nature, and realize that different kinds of river soil have different uses. Flower soil and foam soil are suitable for embankment repair, and silt soil is suitable to cover the embankment surface, so as to ensure the quality of the embankment.

In the practice of river control in the Ming Dynasty, there were strict requirements on the location of the soil for repairing the embankment, stipulating that "it must be dozens of steps away, and the ruler should be taken horizontally, and the pit should not be taken deeply, which would harm cultivation." Do not remain near the dike into a ditch, causing water immersion." This regulation takes into account the

quality of levees without affecting agricultural production. People also have high requirements on the quality of the soil used for embankment repair, not only to choose good soil, but also the degree of dry and wet soil should be appropriate, so as not to affect the quality of the project because the soil is too dry or too wet; To make sure the quality of the levee, it is necessary to "probe it with an iron cone or dig it at one time". Building levees to maintain a certain slope of the levees, "do not steep, such as six feet, the top must be two feet, so that horses up and down, so called the horse embankment",<sup>25</sup> to help reduce the impact of the flood on the levee.

In the practice of building dikes in the Qing Dynasty, the "five appropriate and two taboo" of building dikes were summarized. The "five conditions" are: the location and shape of the embankment line should be selected; the soil on the beach should be thin; the soil of the line is dry and wet, I weighs 70 jin, and "rise high, fall flat", the ring, I should be close; the acceptance should be strict. "Two taboo" are: avoid winter construction; avoid summer construction. The levee should be built in the spring and summer season. The use of these embankment experience, can make the embankment more firm.

#### 5.1.2. Management and maintenance of the Yellow River dike

The ancients not only improved the construction technology of levees, but also attached great importance to the management and maintenance technology of levees.

As early as in the Warring States Period, people had begun to defend the Yellow River dike. At that time, Bai Gui, an expert on repairing the dike, noticed the harm of the ant hole on the dike, and proposed to block it in time to prevent "the dike of thousands of feet and the hole of ants". In the Ming Dynasty, Liu Tianhe, who served as the premier of the river of the river, namely, lying willow, low willow,

<sup>25</sup>(Ming) Pan Jixun, "A List of River Defenses," Vol. 4, "Maintenance Matters," Wenyuan-Ge Sikuquanshu, Vol. 576, History Department, Taiwan Commercial Press, 1986, p. 199.

willow, deep willow, diffuse willow and high willow, to strengthen the dike with wind. According to different sections of planting willow, survive into live willow bank, can maintain the dike body. Cultivation into a forest, can be used as a river engineering material. At the same time, on the surface and foot of the embankment, all kinds of embankment weeds were planted in early spring, so that the whole embankment was covered by willow trees and weeds, which played a good role in protection. In the Ming Dynasty, a strict system was formed to guard the dike, and the berm organization was established. The provisions of "every ten people a defense", "three miles a shop, four shop an old man patrol". In particular, the annual requirements of "Fu autumn water hair, May 15 on the dike, September 15 under the dike", do the dike from people, people from the dike, ready. At the same time, in order to put the responsibility in place, a clear division of the defensive dike section, so that each shop with a gong, once there are police, each other gong, all efforts to rescue. Also formulated the "four prevention and two defense" regulations: "four prevention" is wind prevention, rain prevention, day prevention, night prevention, is required in the flood season, regardless of wind, rain and night, must be strictly defense; "two defense" is the combination of official defense and people guard.

In the first and middle period of the Qing Dynasty, along the Yellow River, the full-time officers and soldiers and castles along the river. Provisions each kilometer set a fort room, each fort set two, accommodation fort, regular day patrol. Fort fu are under the jurisdiction of the river flood personnel, usually protection dike, soil planting trees; police, gong gathered to protect. Use the signed dike to find the hidden danger of the dike, timely maintenance. Every year in the early spring "hundred insects stung", with a meter long pointed fine iron sign, according to the T-word wooden handle, the north and south of the dike sign test, there are north and south caves, the name of the "beam". After the dike opens, want to layer line I fill solid, restore original state.<sup>26</sup> They also domesticated hunting hounds and smoked hot

<sup>26</sup>(Qing) Xu Duan, "Sign the Dyke" in the Annals of An LAN, Ren Jiyu and Yu Yingao, General Collection of Chinese Science and Technology Classics, Henan Education Publishing House, 1994, p. 450.

peppers to catch badger rats. In the twenty-seventh year of Qianlong (1762) invented the method of warping the dike, which played a good role in the protection of the dike

At that time, the embankments in the area of the north bank of the Yellow River were mostly built of sand. Due to the high wind and rain erosion, the dikes were seriously damaged. River supervisor Zhang Shizei proposed to use the silt after the floodplain to cover the river slope of the embankment, similar to the clay inclined wall built to reinforce the embankment in modern times. Since then, in the sandy area,

most of the promotion of this practice, to play a very good role in protecting the Yellow River dike. In addition, the Qing Dynasty also used the water and sand resources of the Yellow River to release silt and strengthen the dike. This method of releasing silt, not only widened the dike body, but also can reduce the back hanging difference, reduce the pressure of the river on the dike.

#### 5.1.3 Evolution of plugging and emergency rescue technology

The technology of river plugging began in the Western Han Dynasty, especially the opening of the Han Dynasty was the most famous in history. In the Western Han Dynasty, there were two different ways to block the lower reaches of the Yellow River: one was to fill the mouth from the two sides to the middle. When a gap was left, two boats were used to block the mouth in a gap. These two methods of plugging are often used in the future river workers, and have been continuously improved and improved in practice.

In the Northern Song Dynasty, the method of combining blocking and leveling blocking was realized in the aspect of blocking the breach. Also built wooden dragon, stone bank and other revetment works on the dike, and promoted the casting. Stone banks are used to protect the embankments, possibly similar to stone banks. It is a famous hydraulic structure in the Song Dynasty, which can be used for rescue and plugging.

The Ming Dynasty has been improved and promoted in practice. The Ming dynasty people can use different blockage methods according to the specific situation of the breach. After the upper section breach, there is no large amount of water below the new gate and the river has not been cut off, which is called "overflow". The breach need not be built immediately until the water is called "through". This kind of breach is more serious, must be immediately built, pull the river to return to the old road. When the Yellow River first begins, the head is first cast to prevent the mouth from expanding. When the water potential is slightly slow, and then from both ends into the blocking. If the mouth is tight, and it is difficult to wrap it, the head of the wall, which is stopped when the water is washed here. If it still does not work, should be in the mouth door first "build a water dam, water potential shot across the other side, so that the back to wash the river, then the plug force can be used".<sup>27</sup> When the dragon is closed, the water is overflowing and the water is wide on the water and the mouth is used to block the dragon. The above plugging method is summarized and accumulated in long-term practice, and effective, and is still used in modern times.

In the middle of the Qing Dynasty, the cast. According to the situation of the mouth door, choose single dam or double dam. Small mouth with single dam, called "Dulong river"; big mouth water rapid, to cover the dam, in the dam and downstream of the additional side dam. Between the dam and the upper and lower dam, respectively with silt, the height and the dam level. This method of using the main dam and the lower dam with the mouth is called "double dam plugging". In addition, there is the use of the dam and the upper and lower sides of the dam, called "three dam into the plugging". No matter what form of plugging, the dam should be along the predetermined dam base forward, generally upward, to waterproof slip impact. This method, recently called the blocking technique, is still one of the effective methods to block the mouth. At the same time, when the plugging must be the first excavation of the river, to guide into the zheng River, so that the water has a way out, to facilitate the plugging. After the river is dug, the mouth and the end of the river

should be left with soil. When the water level of the two DAMS reaches to a certain height, and then take the opportunity of rising water, first dig the soil at the end of the river, open the river, so that the river falls down and returns to the old road, the gate can be blocked.

<sup>27</sup>(Ming) Pan Jixun, "A List of River Defense" Vol. 4, "Repair Matters", "Wenyuan-Ge Sikuquanshu" History Department, volume 576, Taiwan Commercial Press, 1986, p. 200.

Emergency rescue plugging is mainly in the Yellow River flood season flood. In

the Qing Dynasty, there were external plugging and internal plugging methods. Where there is a dike leakage, the first thing is to make clear "the dike is silt is sand, far from the river, whether there is along the river, measure the root depth of the dike". Then decide what kind of plugging method to take. If the water can be found, adopt the external plugging method; if the water cannot be found, adopt the internal plugging method. In addition, if the top of the dike is wide, you can also dig a ditch in the center of the leakage, the slope of the ditch should be larger, see the water with cotton-padded jacket and other things in the water plug, can also cut off the flow, this is another method of plugging. The key to plugging loopholes is fast, manpower, materials must join together, in order to succeed.

#### 5.1.4 The evolution of the technique

In the Warring States Period, the "prevention" technique has been used in the blocking project. The so-called "prevent the water" should be the first grass to block the breach. The two continued to use the grass, but improved.

The famous hydraulic works in the Song Dynasty is called "casting", which can be used to protect the wall. It can be used from local materials, such as brush, firewood, hammer stone, bamboo stone, bamboo rope, bamboo rope, etc. Choose a wide and flat embankment, spread a layer of branches and soft reed on the ground, and then press the soil in a layer, mixed with gravel, and then cross the bamboo rope across the area, called "heart rope". Finally, it was rolled and tied, and then tied to both ends with a larger reed rope. It takes hundreds of people to cast the cast on the bank. After the cast, cast the cast on the column of the embankment, and then cast on the ground.

In the Ming Dynasty, the workers is improved and developed in practice. During the reign of Yongle in the Ming Dynasty, Lin Fang, the chief officer of the Ministry of Industry, improved the "bamboo line" method of the previous generation and created the method of "big hoarding", using the water, but with the wall on the pile table, then the water can be killed, the dike can be fixed, and the river can be affected ". It is stronger and more durable than casting. People in the Ming Dynasty have been able to use straw, willow or grass to cast the cast in the autumn season of the Yellow River to reduce the threat of the Yellow River dike.

In the late Ming and early Qing dynasties, the Yellow River is still cast. In the cast of the cast, you will cast the cast. To the forty-third year of Qianlong (1778), Henan Majiadian blocked the mouth and changed the method of soft cable. That is, with a big ship across the dam at the head, called the bundle box boat. During the construction, hang the cable box on the boat for repair. This method is mainly made of straw and soil layer by layer. Because the material is lighter than the water, it is



easy to float in the water, but the soil is heavier than the water. It can increase the weight of the soil, and the connection of the pile rope to increase the weight. There are two kinds of building methods for casting them. The so-called straight box, that is, the straw material is parallel to the direction of the water flow; the so-called ding box, in addition to the bottom parallel to the water flow direction, the rest are vertical to the water flow. Because the straw is light and soft, it can be cast in a short time, so the cast and cast. In the late period of Emperor Qianlong, the stone was cast. During the Jiaqing period, it was widely used in the Nanhe River and promoted to the East River during the Daoguang period. Where the gravel is cast, the project will be cast. It is also a great improvement in the repair project.

#### 5.1.5 Evolution of measurement technology

In the process of controlling the water, Dayu began to use the method of measurement. He made the original survey according to the flow potential of the water to determine the direction of the river. Yu "left criterion, right rules, carrying four", "mountain trees, mountains and rivers".<sup>28</sup>The "criteria" and "rules" are

probably similar to today's measuring tools such as lines, corners and compasses, "mountain wood" or "mountain wood", presumed to be the original leveling. It shows that Da Yu was wading over mountains and rivers, leading people to survey the river, according to the water flow to determine the scene of the direction of the river.

<sup>28</sup>(Han) Sima Qian: Records of the Grand Historian, Vol. 2, Xia Benji, Zhonghua Book Company, 1959, p. 51.

Therefore, the history of water conservancy survey in China is also started from Dayu to control the flood.

The measurement technology of the Two Han Dynasty has made great progress. In terms of survey technology, there are the so-called "table", "quasi", "quotient" and so on. Table, probably like today's calibration direction and annotation height of the pile. Accurate, is the observation highland. In history, "the landscape is the topography of the quotient", and the quotient here should refer to the measured size.

In the process of river control in the Northern Song Dynasty, the leveling system was generally used to measure the terrain superiority. This "dingping" tool was the level that could measure the topography and water level, which could provide the basis for dredging the river and building the dyke, and played different roles in building and protecting the dyke.

In the first and middle period of the Qing Dynasty, the western surveying and mapping technology was applied on the Yellow River. In the 30th year of Qianlong's reign (1765), the Yellow River Shanzhou (now Sanmenxia, Henan Province) and Luohe Gong County (now Gongyi, Henan Province) "set up water records. From the peach flood day to the day of Frost every year, the water trend rises and falls, and reported according to the facts". The Qin River, a tributary of the Yellow River, also has water records, "daily inspection and report". However, it has no fixed datum, which cannot obtain the water level change data of the system. In the fourth year of Guangxu (1878), the first altitude measurement technology was used to observe the water level fluctuation. This shows that the western measurement technology has been applied on the Yellow River. In the fifteenth year of Guangxu (1889), under the

auspices of Wu Dacheng, the river governor, the Yellow River maps of Henan, Zhili (now Hebei, Beijing and Tianjin) and Shandong provinces were made. This was the first time to draw the topographic map of the lower reaches of the Yellow River by foreign surveying and mapping technology.

#### 5.1.6 Monitoring and forecast of water fluctuation of the Yellow River

The Yellow River is the mother river of the Chinese nation. People living on both sides of the river have long aware of the river and flood characteristics of the Yellow River. But can realize the law of the Yellow River water, should be to the Northern Song Dynasty. At that time, people through the long-term observation of the Yellow River water fluctuation analysis, can according to the phenology and seasonal to determine all kinds of water name, such as march "peach blossom water", April "wheat", "vines", July "bean water", August "miao water", "climbing water", "October" tank water ", November and December" frowning water ", the basis of phenology and seasonal determination of water, normal year basically can be fulfilled, called" water ". "Water letter has often, the rate shall prevail; overdue inflation, called the 'guest water' ". These understandings of the conditions of the river in different seasons show that people have mastered the preliminary law of the rise and fall of the river, and have a certain initiative in preventing floods.

The Ming people can monitor and forecast the water situation of the Yellow River. The Ming Dynasty used the "water flood" to replace the northern Song Dynasty letter water. In order to timely grasp the changes in the water situation, all the states and counties along the river in the early Ming Dynasty had rain records. The Ming people also realized some characteristics of the periodic changes of the Yellow River flood. For example, Premier Wan Gong said in his monograph "Water Control hoof": " The Yellow River is not a lasting water, but different from the river. Only five or six times a year, and only three or four times a day."And more concentrated in summer and autumn, tight in May, June, July, the rest of the small rise, not worry also". This provides a basis for the annual flood control work of the Yellow River. In flood season of the Yellow River water transmission, Wan Gong also created the horse sin system, from upstream to downstream quickly transfer water: regulation "from tongguan, down to Suqian, every three miles for a section, a day and five miles, the line in water fast, slow, levee, sound, the governor will prophet, and then blood penetration,<sup>29</sup> can thus also". This system for timely understanding of the Yellow River of the flood situation, deployment of flood control, for the initiative.

In the Qing Dynasty, in order to facilitate the transmission of flood information,

<sup>29</sup>(Ming) Wan Gong, Zhu Gengling, "Water Control Quan" vol. 1 "Yellow River", Water Conservancy Publishing House, 1985, p. 43.

in the 25th year of Guangxu (1899), the Shandong River Prevention Bureau began to set up telecommunications agencies and set up telephone lines. By the thirty-fourth year of Guangxu (1908), more than 700 kilometers of power lines had been built on both sides.

## 5.2 Introduction and application of modern Yellow River management technology Summary

In modern times, people have advocated the introduction of advanced western science and technology to change the poor and weak situation of China. During the period of the Republic of China, the number of Chinese students sent to China was increasing, and the number of foreign scholars and engineers came to China increasing. The more advanced water conservancy technology of western capitalist countries has also been introduced into China one after another, and has been applied in the governance of the Yellow River to a certain extent in the Yellow River.

The first is the introduction of western surveying and mapping technology applied to the Yellow River management. In the fourth year of Guangxu (1878), the first altitude measurement technology was used to observe the fluctuation of water level, which showed that the western measurement technology had been applied on the Yellow River. In the fifteenth year of Guangxu (1889), under the river governor Wu Dazhi, the first foreign surveying and mapping technology was measured on the Yellow River in Henan, Zhili and Shandong provinces. In the 25th year of Guangxu (1899), a telephone line was set up on both sides of the Yellow River to facilitate the information transmission of the Yellow River.

The second is the western investigation and research of the Yellow River. During

the period of the Republic of China, foreigners made more visits to the Yellow River. Most of their investigations of the Yellow River were hired and entrusted by the Chinese government. For example, Fang xius of Germany, Ferimen, Rebad, Gertong and Savanche of the United States have made investigations and studies on the Yellow River. The articles or works published after their investigation had a certain influence on the modern water conservancy technology and river control theory in China. In particular, American engineers, Professor Engels and Professor Fang xius, Germany, have published some useful opinions on the research and exploration of the governance of the Yellow River. Engels is a professor at the Technical University of Saxon, Germany, a famous expert in river model experiment. Although he had never come to China, he "studied the Yellow River, collected information about the Yellow River for more than 20 years and studied it tirelessly".<sup>30</sup> He also conducted model tests for the Yellow River for three times and put forward the famous strategy of "fixed medium water level river trough". Engels' student, Fang xius, is a professor at Hanov University in Germany. In 1928, he applied to China. While sponsoring the plan of guiding the Huai River, he also studied the strategy of guiding the Yellow River. His ideas were similar to those of Engels. Fixed medium water level river trough is conducive to stabilizing the riverbed. However, at that time, the test results of the Yellow River flow were not much, and the flow of the middle water was difficult to determine in the short term, so this idea of river control was difficult to implement at that time.

The third is the introduction and adoption of new water conservancy technology. From the late Qing Dynasty to the early years of the Republic of China, the Chinese government sent many overseas students. Some of them are engaged in the study and research of hydrology, meteorology, water conservancy engineering and

other disciplines. They have made many efforts in introducing foreign advanced water conservancy technology, which has obviously changed the river control technology of the Republic of China. In terms of hydrological tests and water situation transmission, hydrological stations, etc., were established in Shaanxi County, Henan Province and Luokou, Shandong Province in 1919, to test the flow, water level, sediment content and rainfall. Since then, rainfall stations have been set up in the Fenhe River and Qinhe River basins to expand the scope of rainfall observation.

Finally, the river control project began to conduct the hydraulic model test. From 1921 to 1927, the lower reaches of the Yellow River "mining the imitation of Europe

<sup>30</sup>Original works by Li Yizhi, Selected by Yellow River Conservancy Commission, Selected Works on Li Yizhi's Water Conservancy, Water Conservancy and Electric Power Press, 1988.

and America", foil engineering appeared. "Foil" is the cast discharge, which is used as

the foundation of the dam and has a good anti-erosion effect. In short, the introduction of western water conservancy science and technology, especially the introduction of foreign water conservancy science and computing technology in the mid-19th century, China has undergone new changes in water conservancy technology. After absorbing a lot of water conservancy technology theory, hydraulic construction theory, analysis method and calculation method, the river control technology has made obvious progress.

## **6.The Impact of Yellow River Governance on Artistic Changes in the Yellow River Basin**

The craftsmanship and calligraphy styles embodied in the cultural heritage "Craftsmanship" in the Henan section of the Yellow River Basin share weal and woe with the art and culture in traditional culture. The connotations of the 20 cultural heritages included in this theme are summarized as "art and culture". Art culture is a technical activity that is guided by human moral purposes and carried out practical production based on a correct, rational and true understanding of matter. It has technical, aesthetic and formal characteristics. The Henan section of the Yellow River Basin is a place where art and culture flourish. From the Qin and Han Dynasties to the Sui and Tang Dynasties, it was a prosperous period for the development of art in the Henan section of the Yellow River Basin.

The Xianbei people who lived in Henan during the Northern Wei Dynasty were famous for their music and dance; Hujia was very popular in the river basin area during the Tang Dynasty. This ancient percussion music is often reflected in the Six Dynasties murals in Maiji Mountain. In the history of the development of Chinese literature, poetry in the Tang Dynasty plays a very important role. In the "Complete Poems of the Tang Dynasty" and the "Supplement to the Complete Poems of the Tang Dynasty", there are about 100 poets from Henan, who wrote more than 3,000 poems. Speaking of ancient poems describing the Yellow River, the most representative one is Wang Zhihuan's "Climbing the Stork Tower": "The sun sets over the mountains, and the Yellow River flows into the sea. If you want to see a thousand miles away, go



to the next level." Readers of this poem The familiar poem can be regarded as an eternal masterpiece, and it will be inspired by future generations to read it.

During this period, the Central Plains region also made great achievements in literati painting, calligraphy, sculpture, etc. From the perspective of the development of Chinese character form, the Qin Dynasty was a period of transition from large seal script to small seal script and official script; the Han Dynasty used small seal script, but mainly official script. While official script was finalized, cursive script, running script, and regular script also emerged and became mature. Wang Duo, a famous calligrapher of the Tang Dynasty, was born in Mengjin, Henan. He was a calligrapher and painter in the late Ming and early Qing dynasties. His calligraphy is as famous as Dong Qichang, and he is known as the "King of South, Dong and North".

For thousands of years, people have worked hard and created hundreds of colorful artistic performance forms, among which drama is the most representative. Its dramas have strong local color, singing monologues, plot content, costumes and headwear, all of which are of high quality. artistic value.

In addition, the craftsmanship is exquisite and the craftsmanship is skillful, integrating people's yearning for a better life into it. Moreover, the bridge construction technology and ceramic production technology in the Henan section of the Yellow River Basin are also excellent. The Huiji Bridge in Zhengzhou during the Sui and Tang Dynasties and the Huiji Bridge in the Sui and Tang Dynasties are the only remaining wooden bridges in our province that combine cantilever beams and stacked beam arch structures on the Grand Canal of the Sui and Tang Dynasties. The Ruzhou porcelain kiln site in Ankou, which contains porcelain firing technology, is a testimony to this.

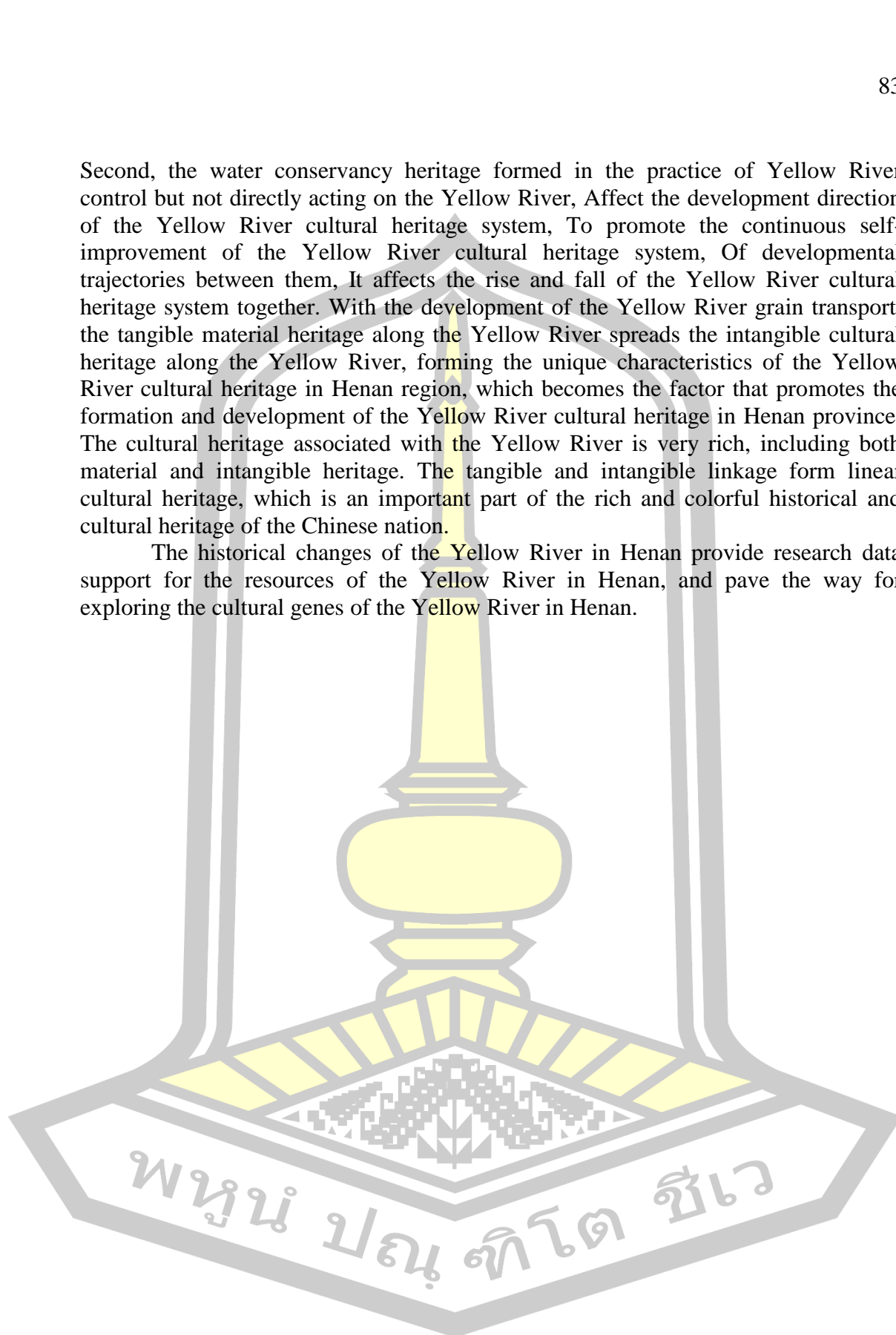
### Summary

Cultural heritage of the Yellow River is within the scope of time and space, with the flow of the Yellow River as the carrier of the rich variety of material cultural heritage and material cultural heritage, the Henan Yellow River associated historical and cultural heritage relics characteristic, with regional characteristics, is both the human development material culture and the history of spiritual civilization, is also constitute an important part of the rich and colorful historical and cultural heritage.

This chapter first through the literature research and field investigation of the geographical location of the Yellow River, regional characteristics information made a brief overview and comb, then mainly introduces the history of the Yellow River basin, from the spring and autumn period and the warring states period in Henan Yellow River basin irrigation engineering, digging canal, embankments, to the modern introduction of more advanced foreign water conservancy method, has experienced a long and long history. Through the evolution of the Yellow River Basin in Henan province, Water sources, water conservancy and shipping engineering facilities, river control technology relying on the Yellow River, Thus, a large number of cultural heritage closely related to the Yellow River, These cultural heritages accompany the historical changes of the Yellow River, It can still truly reflect the historical information that once happened and was related to the body of the Yellow River, Along with the Yellow River, Mutual dependence: First, the heritage formed by the body of the Yellow River and the human activities directly acting on it,

Second, the water conservancy heritage formed in the practice of Yellow River control but not directly acting on the Yellow River, Affect the development direction of the Yellow River cultural heritage system, To promote the continuous self-improvement of the Yellow River cultural heritage system, Of developmental trajectories between them, It affects the rise and fall of the Yellow River cultural heritage system together. With the development of the Yellow River grain transport, the tangible material heritage along the Yellow River spreads the intangible cultural heritage along the Yellow River, forming the unique characteristics of the Yellow River cultural heritage in Henan region, which becomes the factor that promotes the formation and development of the Yellow River cultural heritage in Henan province. The cultural heritage associated with the Yellow River is very rich, including both material and intangible heritage. The tangible and intangible linkage form linear cultural heritage, which is an important part of the rich and colorful historical and cultural heritage of the Chinese nation.

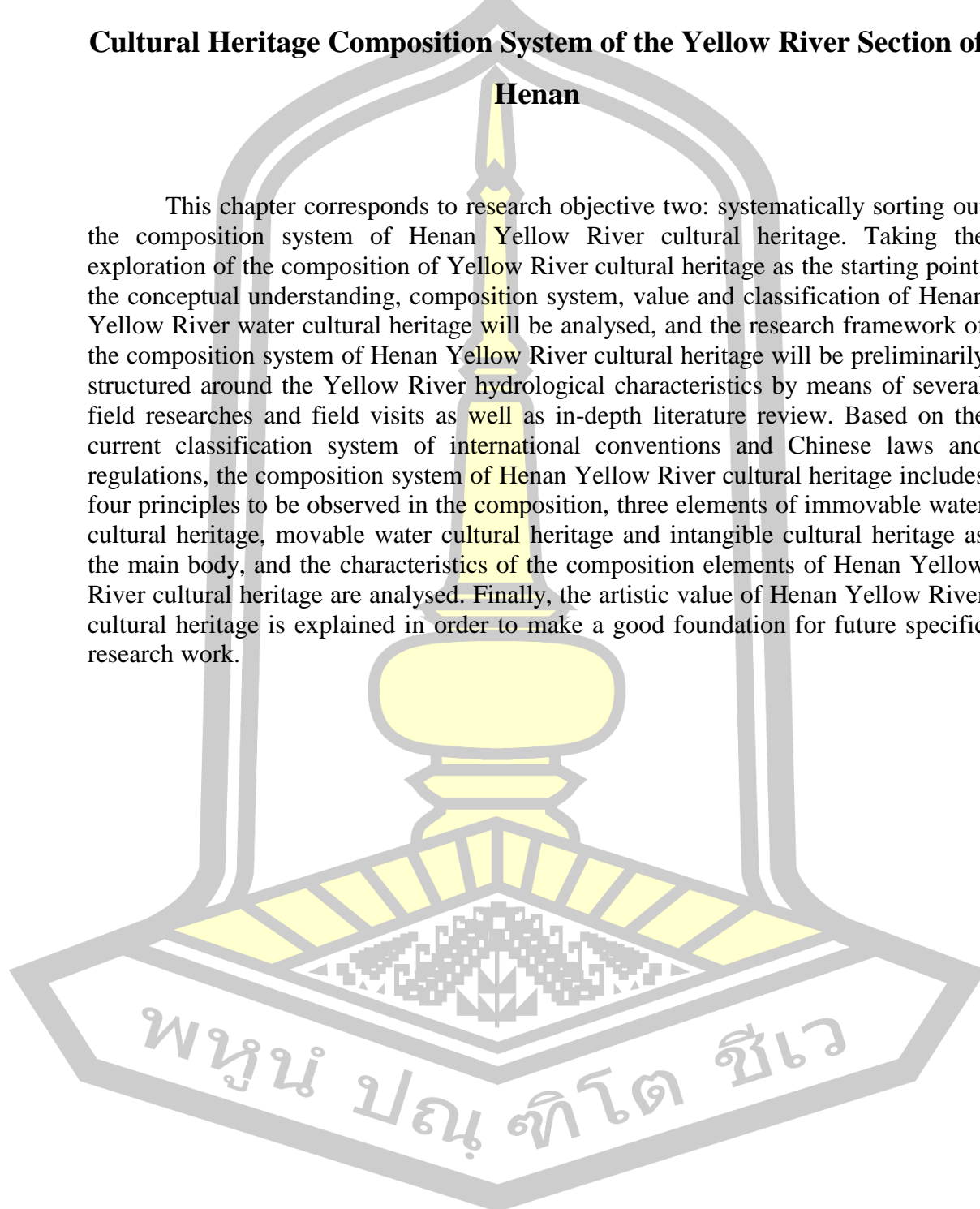
The historical changes of the Yellow River in Henan provide research data support for the resources of the Yellow River in Henan, and pave the way for exploring the cultural genes of the Yellow River in Henan.



### CHAPTER III

#### Cultural Heritage Composition System of the Yellow River Section of Henan

This chapter corresponds to research objective two: systematically sorting out the composition system of Henan Yellow River cultural heritage. Taking the exploration of the composition of Yellow River cultural heritage as the starting point, the conceptual understanding, composition system, value and classification of Henan Yellow River water cultural heritage will be analysed, and the research framework of the composition system of Henan Yellow River cultural heritage will be preliminarily structured around the Yellow River hydrological characteristics by means of several field researches and field visits as well as in-depth literature review. Based on the current classification system of international conventions and Chinese laws and regulations, the composition system of Henan Yellow River cultural heritage includes four principles to be observed in the composition, three elements of immovable water cultural heritage, movable water cultural heritage and intangible cultural heritage as the main body, and the characteristics of the composition elements of Henan Yellow River cultural heritage are analysed. Finally, the artistic value of Henan Yellow River cultural heritage is explained in order to make a good foundation for future specific research work.



## 1. Classification basis in the background of world Cultural Heritage

The Yellow River in Henan has special significance in the whole Yellow River basin. The Yellow River from the canyon of Mengjin into the North China Plain, due to the sedimentation, gradually formed "hanging river". Here the widest river, largest suspension, beach area, the most serious historical disaster, flood control and difficult task, in the process of management development, produced a large number of bearing history, engraved memory of the Yellow River culture treasures, with material form and non-material form widely distributed, long time, become an important part of Chinese excellent traditional culture. Therefore, for the classification of water cultural heritage resources, the existing international relevant resource classification standards and schemes have a very important reference significance for the classification of the Yellow River water cultural heritage resources.

### 1.1 The World Heritage Convention

In November 1972, UNESCO adopted the Convention for the Protection of World Cultural and Natural Heritage (hereinafter referred to as the Convention) at the seventeenth Conference in Paris, France, which divided world heritage into two categories, namely world cultural heritage and world natural heritage. However, in the process of specific world heritage protection and declaration in the future, the world heritage classification of world heritage has been revised and refined several times. According to the current UNESCO division method, there are five categories of world heritage: cultural heritage, natural heritage, cultural landscape, natural and cultural heritage and intangible cultural heritage of mankind. In practice, the world cultural heritage has been subdivided into material culture. The two categories of heritage and intangible cultural heritage can be summarized into the following heritage classification table according to the inclusiveness and subordination relationship of various types of heritage: (Table 2)





Table 2 List of World Heritage categories Source: The author draws according to the World Heritage Convention Operational Guide 2013 edition

world heritage	Material cultural heritage (i. e. original World Cultural Heritage)	
	Cultural heritage	the cultural landscape
	Intangible cultural heritage of human beings	
	natural heritage	
	Both a natural and cultural heritage	

In addition to the above classification, The Convention also makes it clear that cultural heritage items nominated for the World Heritage List must meet one or more of the following criteria: to represent a unique artistic achievement, A masterpiece of creative genius; For a certain period of time or in a certain cultural area of the world, It has a great impact on the development of architectural art, memorial art, town planning or landscape design; To provide a unique, at least a special witness to a faded civilization or cultural tradition; Can serve as an outstanding example of a building or complex or landscape, It can show one or more important stages in human history; Can be used as a traditional human residence or make

An outstanding example of land use representing one or several cultures, especially susceptible to destruction under the influence of irreversible changes; a direct or substantial connection with special events or existing traditions or thoughts or beliefs or literary works (only in special cases or when used in conjunction with other standards).

Article 1 of the Convention defines the term "cultural heritage": " In this Convention, The following items are 'cultural heritage': memorial sites, That is, from the historical, artistic or scientific perspective of buildings, compositions or structures of archaeological objects, inscriptions, caves and associations; architectural complex, That is, from a historical, artistic, or scientific perspective, In terms of the architectural style, distribution, or in combination with the environmental scenery, Single or connected buildings with outstanding universal value; ruins, That is, human engineering, which has outstanding universal value from the historical, aesthetic, ethnographic or anthropological perspectives, and archaeological sites; These three categories are mainly immobile cultural heritages."

In 1992, UNESCO launched the Memory of the World Project, which is conceptually the continuation of a world Heritage project, mainly a document heritage in a movable cultural heritage. It is worth mentioning that in 1999 international sites council the international cultural tourism charter (important cultural sites tourism management principles and guide), we found such a paragraph: " cultural heritage is developed in a community of a way of life, handed down from generation to generation, it includes customs, practices, places, items, artistic performance and value. Cultural heritage often presents itself as an intangible or tangible cultural heritage."This is a rare direct definition of the concept of" cultural heritage " in relevant international legal documents. Although the charter does not have any

constraint force, it is of certain guiding significance for all countries in formulating cultural heritage tourism policies and laws. It points out that the essential attribute of cultural heritage is the unique expression of life style passed down from generation to generation by people in a specific region. No matter tangible (material) or intangible (non-material) cultural heritage, its core is the subject's view of its way of life style, And is expressed in a unique form.

## 1.2 Notice of The State Council on Strengthening the Protection of Cultural Heritage

After the founding of new China, the relative concept used in Chinese law has always been "cultural relics". Until the beginning of the 21st century, with the improvement of the use frequency of the concept of "cultural heritage", China has more and more used the concept of "cultural heritage" to refer to the original concept of "cultural relics", "folk heritage" and so on. Especially since the establishment of the first "Cultural Heritage Day" in China in 2006, the concept of "cultural heritage" has gradually gained popularity among the people. Although there is still a lack of a clear definition of the concept of "cultural heritage" in the current legal origin, but in December 2005, the State Council issued a notice on strengthening cultural heritage protection, pointing out that: " Cultural heritage includes material cultural heritage and intangible cultural heritage. Material cultural heritage is one with historical, artistic and scientific value, including ancient sites, ancient tombs, ancient buildings, cave temples, stone carvings, murals, important modern historical sites and representative buildings, important physical objects, artworks, documents, manuscripts, books and materials in various times; and famous historical and cultural cities (blocks, villages) with outstanding universal value in architectural style, uniform distribution or combination with environmental scenery. Non-material cultural heritage refers to a variety of non-material form is closely related to the life, generations of traditional culture, including oral tradition, traditional performing arts, folk activities and etiquette and festivals, the nature and the universe of folk traditional knowledge and practice, traditional handicraft skills and related to the traditional culture form of cultural space." (Cultural Heritage paper) This is by far the most authoritative and clear explanation of the concept of " cultural heritage " in Chinese legal documents.

Of course, literally, this official explanation does not clearly define the connotation of the concept of "cultural heritage", but only points out its extension: material cultural heritage and intangible cultural heritage. However, because of its limitation, we can still interpret the spirit through words:

First, cultural heritage is the general term of material cultural heritage and intangible cultural heritage. It is the objects with historical, artistic and scientific value created by human beings, as well as the traditional cultural forms such as knowledge and practice passed down from generation to generation by a certain ethnic group and reflecting their special way of life.

Secondly, the material cultural heritage, namely the cultural relics in the current laws of China, has historical, artistic and scientific value, and its extension includes three categories: the first is the immovable cultural relics, ancient tombs, ancient buildings, cave temples, stone carvings, murals, modern important historical

sites and representative buildings; the movable cultural relics such as important objects, artworks, documents, manuscripts, books and materials; the third is the famous historical and cultural cities, blocks and villages and towns with outstanding universal value in architectural style, distribution or combination with environmental scenery.

Third, the intangible cultural heritage is a group from generation to generation, reflect the special way of life, its extension including oral tradition, traditional performing arts, folk customs, etiquette and festivals, traditional knowledge and practice, traditional handicraft skills in a variety of non-material form of traditional culture.

### 1.3.The UNESCO Convention on the Protection of the Intangible Cultural Heritage

Among the international documents of UNESCO on intangible cultural heritage, the most representative, authoritative and legal significance document is undoubtedly the Convention on the Protection of Intangible Cultural Heritage officially adopted by UNESCO at its 32nd session in 2003. Article 2, paragraph 1, of the Convention stipulates: " In this Convention, 'intangible cultural heritage' refers to the practices, performances, forms of expression, knowledge and skills and various groups, groups, sometimes individuals, objects, crafts and cultural sites. With the change of their environment, the mutual relationship with nature and the change of historical conditions, various groups and groups constantly innovate the intangible cultural heritage passed down from generation to generation, and at the same time, they have a sense of identity and history, thus promoting cultural diversity and human creativity. Paragraph 2 enumerates the manifestations of the intangible cultural heritage. According to the convention, the scope of intangible cultural heritage includes: oral traditions, including the language as a cultural carrier; traditional performing arts; folk activities, etiquette, festivals; folk traditional knowledge and practice of nature and of the universe; traditional handicraft skills; and cultural space related to the above forms of expression.

### 1.4 Classification table of China's tourism resources survey

In 2022, the Ministry of Culture and Tourism carried out a national survey of tourism resources. According to the national standard of Classification, Investigation and Evaluation of Tourism Resources (GB / T 18972- -2017), tourism resources are divided into 8 main categories, 23 sub-categories and 110 basic types. The Table 3 are shown for the basic types of tourism resources.

Table 3 General Survey and Classification Table of Chinese Tourism Resources Source:  
Excerpt from the "Tourism Resources Classification Table" (2017 national standard)

	FA	matter	The	FAA	Historical architectural remains with local style and historical color
	Cultural		architectural		
	relics		remains		
F history			FAB		In history, important objects, works of art, documents, manuscripts, books and materials, and representative objects in various times are divided into precious cultural relics and general cultural relics
historical			removable		
remains			artifacts		
	FB		FBA	folk	Literary and artistic works created by the image of social life
	intangible		literature	and	
	cultural		art		
	heritage				
			FBB	Local	The customs, etiquette, habits and taboos, and so on
			customs		
			FBC	traditional	Clothes with local and ethnic characteristics
			dress		
			decoration		
			FBD		Various traditional folk performance methods
				Traditio	
				nal acting	
			FBE		Local traditional retained medical products and treatment methods
			Traditional		
			Medicine		
			FBF	traditional	Regular local sports events
			sporting events		





## 2. Definition, classification and composition of the Yellow River water cultural heritage

### 2.1 Definition of the Yellow River and the water cultural heritage

#### 2.1.1 Concept definition of water cultural heritage

The Operational Guidelines for the Implementation of the World Heritage Convention defines "cultural heritage" from three aspects:

Cultural relics: from the historical, artistic or scientific perspective, with outstanding universal value of buildings, steles and stele paintings, archaeological elements or structures, inscriptions, caves and associations;

Building complex: a single or building complex with outstanding universal value from historical, artistic or scientific perspectives in terms of architectural style, uniform distribution or combination with environmental scenery;

Site: human engineering or natural and human engineering with outstanding universal value from historical, aesthetic, ethnographic or anthropological perspectives.

Water cultural heritage, as the name suggests, is a kind of cultural heritage related to water, which should have the general attributes of cultural heritage, and should also have its own characteristics. The Yellow River is the birthplace of Chinese civilization. It has a long history, rich and profound cultural resources. It is a major artery bearing the genes of Chinese civilization and spreading the national strength. The Yellow River is the mother river of the Chinese nation, can say the culture of the Yellow River is the civilization of the Chinese nation, is more than 5000 years of man and nature and the harmonious coexistence of culture, which makes the Yellow River along the Yellow River and contains its rich historical and cultural heritage, along the Yellow River in the era of heritage number, high grade, varieties, become today witness the development of the Chinese nation important cultural heritage. It can be said that they are an indispensable and irreplaceable part of Chinese cultural heritage, someIt occupies an extremely important position in the world cultural heritage, and is known as the "ancient culture corridor", "ancient science and technology library", "museum of scenic spots", "folk custom showroom", which contains the value of all aspects of history, science and art. At the same time, as the Yellow River water cultural heritage, it also has its own characteristics: first, The Yellow River itself is the carrier of the water cultural heritage, Since ancient times, people have gathered in the Yellow River basin, And with the help of the Yellow River waterway this carrier for the migration and flow of personnel and materials; 10 Second course, In the course of the governance practice, Different regions and different groups of people are constantly carrying out multi-dimensional material and cultural communication activities, This kind of exchange activity makes the Yellow River water cultural heritage continuously integrate and innovate; "Third, there is no," The cultural heritage of the Yellow River is nourished by the cultures of different regions and different times along the route, Time is continuous, Space is the Yellow River flowing along the area; Its four, The Yellow River water cultural heritage as a whole makes a huge heritage system, In the process of thousands of years of communication is the collection of material culture and intangible cultural heritage.

### 2.1.2 The Yellow River Water Cultural Heritage

Yellow River cultural heritage is formed by culture and natural "cultural landscape", is a static and dynamic "living, flowing" cultural heritage, is composed of point, line, surface "linear cultural heritage", is composed of ancient sites, relics, heritage "heritage corridor", is the superstructure, folk architecture and local architecture in the integration of the "national heritage corridor", is composed of the combination of material and non-material elements of "cultural space". Based on the understanding and grasp of the formation time, space and coverage scope of the Yellow River cultural heritage in Henan province, We can summarize the cultural heritage of the Yellow River as within the Yellow River basin, From the ancients building DAMS, building canals, opening canals, To the sum of all the material civilization and spiritual civilization heritages created by the development of the Yellow River and the continuation of the development of human beings, The former depends on many physical forms, The vectors involved, There are documents, inscriptions, temples, dyMS, city sites, villages, ferries, jin, etc., The material form of these heritage sites is clearly visible, What we call the material and cultural heritage; The latter relies on the forms of thought, memory, technology, performance, etc., It mainly involves the inventions and creations, hydraulic technology, rules and regulations, legends and rituals related to the Yellow River water, Its form of continuation depends on the inheritance of people, The so-called intangible cultural heritage. In order to ensure the authenticity, integrity and continuity of the Yellow River cultural heritage of the water, it is necessary to determine the standard of the water cultural heritage and the demarcation of the spatial boundary of the water cultural heritage, so it is necessary to classify the huge and complex water cultural heritage of the Yellow River.

This study first identified with the concept of cultural heritage contains material cultural heritage and intangible cultural heritage two categories, followed by the water along the Yellow River of cultural heritage and the Yellow River waterway, according to the circle theory will be divided into core relationship layer, subsidiary relationship layer and derivative relationship layer (figure 11) (table 3), the corresponding heritage species is the core water cultural heritage, affiliated water cultural heritage and derivative water cultural heritage. Such a huge heritage system, but, according to the principle of heritage protection integrity, Henan Yellow River culture, heritage investigation target by the Yellow River heritage ontology and the Yellow River heritage environment, including Henan region within the scope of the Yellow River water transport system and along the distribution, reflect the Yellow River water conservancy project at the national level of the historical role and historical status, and have the relevant archaeological evidence, physical, scientific data and exact reference prove, directly related to the development of the Yellow River, has the universal value of relics and relics, the connotation of the following three aspects. First, the Yellow River water conservancy project and related material cultural heritage include the Yellow River river body, water source, water conservancy and shipping facilities, and the management organization; and second, other material cultural heritage related to the history of the Yellow River, including some immovable and movable cultural relics related to the Yellow River. These immovable cultural relics are either born of the Yellow River, or are closely related to the Yellow River, such as the spread of culture along the Yellow River, and the

important traffic status of the Yellow River; the movable cultural relics are mainly the literature heritage in the movable cultural heritage. The third is the intangible cultural heritage related to the Yellow River. Water conservancy culture is the core of the water cultural heritage, Heritage formed because of the Yellow River itself and the human activities directly acting on it, It mainly includes the ancient river course formed by the Yellow River and all kinds of heritage directly acting on the Yellow River, The latter is also the most representative of the water conservancy project heritage directly built on the Yellow River, It includes the Yellow River itself and its river course, shipping, water conservancy and other directly related historical and cultural heritage, Such as channels, Bridges, ship locks, dikes, weir, revetment, towpath, wharf, etc., The spatial scope of such heritage should be close to the Yellow River, And around the canal shoreline, "Zero distance" from the canal; Affiliated heritage refers to the water conservancy heritage formed in the practice of Yellow River control but not directly acting on the Yellow River, That is, other water conservancy heritages other than water conservancy projects, Such as historical relics, documents, tablet inscriptions, temples, buildings, guild halls, etc.; Derived heritage refers to the cultural heritage indirectly formed by the Yellow River itself, That is, other Yellow River cultural heritage other than water conservancy heritage, It mainly involves the inventions and creations, hydraulic technology, rules and regulations, legends and rituals related to the Yellow River water, The spatial scope of this kind of heritage includes the urban areas along the Yellow River included by modern administrative divisions.

This paper combined with the Ministry of Water Resources of the Yellow River water resources commission of Henan the Yellow River cultural resources census results and compiled by Henan province provincial water resources bureau, Henan people's publishing house of Henan province first provincial water conservancy annals in the heritage, through field investigation and exploration, historical data access, professional topographic map extraction related geographic elements, visit the relevant people, the Yellow River in Henan existing system heritage selection and complement. In terms of material cultural heritage, the specific information data of immovable cultural relics comes from the survey results of the Yellow River Cultural Resources collected by the Yellow River Water Resources Commission of the Ministry of Water Resources and the written records of Henan Province, the first provincial water conservancy annals compiled by Henan Provincial Water Resources Department and published by Henan People's Publishing House. Since there is almost no new discovery of relevant material cultural heritage in the field survey, the research of material cultural heritage in the research area in this paper is carried out based on the existing heritage information, and the specific heritage components are selected for analysis. The research on movable cultural relics is mainly the cultural relics in public museums and libraries of cities along the route. In terms of intangible cultural heritage, the data of the representative list of intangible cultural heritage items of the intangible cultural heritage of Henan Province comes from the relevant notices published on the official website of Henan Provincial People's Government and the official website of Henan Provincial Department of Culture and Tourism and other public platforms. By October 2021, Henan province had published a list of representative items of provincial intangible cultural heritage (and its expanded list), and 478 cities along the Yellow River. Due to the vague

location of intangible cultural heritage and the limitation of display time and space, this paper only discusses the intangible cultural heritage located in the study area and has certain influence. The heritage types involve traditional art, performing arts, river governance legends, skills and folk customs. Some important projects will be selected to introduce the projects with the cultural characteristics of the Yellow River from the aspects of origin, inheritance, content and form.

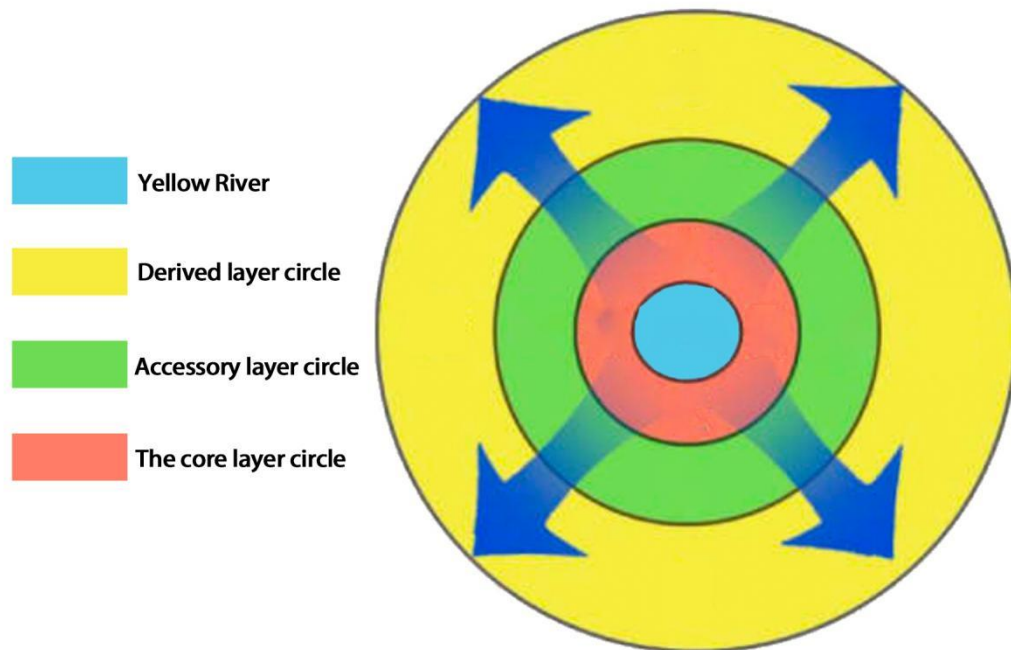


Figure 11 Schematic diagram of the Yellow River water cultural heritage circle layer  
Source: Drawn by Huo Yanhong, 2024

## 2.2. Classification method of cultural heritage resources

Cihai explains the resources as: "The source of resources generally refers to the natural source of resources." The United Nations Environment Programme defines resources as: "resources, especially natural resources, are the natural factors and conditions that can generate economic value in a certain period of time and location to improve the current and future welfare of human beings." Both definitions are limited to the interpretation of natural resources. Marx said in *Das Kapital*: "Labor and land are the two primitive forming elements of wealth." Engels defined it as "in fact, when labor and nature are together, and it is the source of all wealth. Nature provides materials for labor, and labor transforms materials into wealth." From the above definitions, we can conclude: the so-called resources refer to the general term of all material, energy and information that can be exploited and utilized by human beings. It widely exists in nature and human society, and is a natural existence or wealth that can bring wealth to human beings.



Thus, water cultural heritage belongs to a kind of resources, we can regard it as a special cultural resources, can also regard it as a special heritage resources, in short it can be human development and utilization, widely objective exists in nature and human society, can improve the current and future welfare of a kind of wealth resources. As for the classification of cultural heritage resources, there are different opinions and methods in the academic circle, which can be roughly divided into dichotomization and tripartite methods.

2.2.1 Dichotomy method can be divided from resource attribute, material attribute, statistical evaluation, sustainable development and physical form:

From the perspective of resource attributes, it can be divided into natural and cultural heritage resources and social and cultural heritage resources. Cultural heritage resources include all natural heritage resources and social heritage resources with cultural value. According to the definition of "natural heritage" in the Convention for the Protection of World Cultural and Natural Heritage, it can be seen that natural cultural heritage resources include the natural features composed of material and biological structures or such structures with outstanding universal value from the aesthetic or scientific perspective; geological and natural geographical structures with outstanding universal value and clearly classified as threatened animal and plant habitats; and natural attractions or clearly divided natural areas from the perspective of scientific, conservation or natural beauty. Social and cultural heritage resources mainly refer to the various abilities and habits acquired by human beings through all kinds of labor in the society. They include various aspects that can be used in cultural production and cultural life, mainly in education, science, literature and art, morality, law, customs, beliefs and other aspects. Therefore, some people say that culture is unique to human beings and is the product of human social practice. The natural and social aspects of the above-mentioned cultural heritage resources are interdependent.

According to the material attributes, it can be divided into material cultural heritage resources and intangible cultural heritage resources. Material cultural heritage resources mainly refer to the cultural relics with historical, artistic and scientific value, which includes movable cultural relics and immovable cultural relics. Among them, immovable cultural relics refer to ancient cultural sites, ancient tombs, ancient buildings, cave temples, murals, and representative buildings of important modern relics; movable cultural relics refer to important physical objects, artworks, documents, manuscripts, books, representative objects, etc., which are divided into precious cultural relics and general cultural relics. Precious cultural relics are divided into first cultural relics, second cultural relics and third cultural relics. Intangible cultural heritage resources refer to various forms of traditional cultural expression (such as folk activities, performing arts, traditional knowledge and skills, and related appliances, objects, handmade products) and cultural space that are related from generation to generation and are closely related to the lives of the masses. The scope of intangible cultural heritage resources include: in the folk long-term word of poetry, myth, epic, stories, legends, songs, proverbs, etc., traditional music, dance, drama, quyi, acrobatics, puppets, shadow puppets and other folk performing arts, the general public generation inheritance of life etiquette, activities, festivals, folk sports and competitive, and other customs about production, life, the nature and the universe of

folk traditional knowledge and practice, traditional handicraft skills, and the cultural expression related to the culture.

From the perspective of statistical evaluation, cultural heritage resources can be divided into two categories: measurable cultural heritage resources and immeasurable cultural heritage resources. Measurable cultural heritage resources refer to the types of resources that can establish the corresponding evaluation system to estimate and measure their instantaneous value, such as historical relics, buildings, handicrafts, etc.; Unmeasurable cultural heritage resources refer to the resource types that cannot be reflected by real value, such as folk customs, opera, etc. This measurement value includes the historical value and the social value of the cultural heritage, and it does not simply use the economic value as a measuring ruler. The measurable cultural heritage resources are of great practical significance in the development of cultural industry. First of all, cultural heritage resources are the basis of the development of cultural industry, but not all cultural heritage resources can be industrialized. To develop the cultural industry, the cultural resources should be evaluated from two aspects of resource endowment and market potential. Secondly, the measurable cultural heritage resources reflect the human recognition of the attributes of these resource products, and is the premise of the development of cultural industry. Third, the measurable cultural heritage resources to some extent solve the "identity" problem of cultural resources entering the market, and further clarify the instantaneous value of resources and the permanent value of sustainable development.

From the perspective of sustainable development, cultural heritage resources can be divided into renewable cultural resources and non-renewable cultural resources. Renewable cultural resources are the mainstream of cultural heritage resources, which refer to the cultural resources that can be added to value and innovated in every development. They include two forms of expression: material level and spiritual level. Renewable material and cultural resources mainly refer to those new buildings and landscape gardens with high historical value and cultural connotation along with the development and progress of the society. Renewable spiritual and cultural resources mainly exist in scholars' works, as well as in the aesthetic experience, spiritual enjoyment and mental activities of individuals or groups. Some works of high artistic value in history and today belong to this category, such as the four great literary classics of China and the works handed down by some artists. Non-renewable cultural resources refer to the cultural resources that cannot be present after being destroyed or destroyed, and they also include two forms: material and spiritual levels. Material level, non-renewable cultural resources mainly refer to human cultural relics, such as unearthed cultural relics, grottoes, stone carvings, etc.; spiritual non-renewable cultural resources mainly refer to the performances of artists or spiritual and cultural resources without written records, such as some folklore, handicrafts, music, etc.

From the perspective of historical evolution, cultural heritage resources mainly refer to the condensation of things created by predecessors. If divided by physical form, they can be divided into tangible cultural heritage and intangible cultural heritage. Tangible cultural heritage refers to a variety of movable cultural relics of the unearthed monks buried underground, including historical books, works of art and other artifacts, and can also be immovable historical relics including buildings, murals, settlements, stone carvings, etc. Intangible cultural heritage refers to the

cultural forms that rely on human carrier, human voice, body action, performance and other behaviors, such as legends, boatman songs, and time on. Intangible cultural heritage cannot exist in isolation from the producer or user, because it is not tangible things, but "intangible" skills and skills, which rely on the people engaged in them. Therefore, in the process of inheritance, more emphasis is placed on the protection of such intangible cultural heritage holders.

2.2.2 Three points can be divided from the perspectives of cultural connotation and object attributes:

From the perspective of cultural connotation, the cultural heritage resources are divided into three levels: cultural concept type, cultural activity type and cultural product type. One is the level of social psychology and spiritual temperament, namely the level of concept, which is mainly reflected in the level of philosophy, religion and morality; the second is the level of cultural production, including all kinds of cultural activities, roughly including the production of culture and art and natural science and technology; the third is the level of cultural products, including various utensils and finished products, and cultural products can be directly consumed by all subjects. The first level is more abstract, usually the unique cognitive tradition (including knowledge, morality and religion), way of thinking, customs and spiritual outlook formed in the long-term social development and cultural development. It is invisible, but it plays a great role. The second level is the level of cultural production, which mainly emphasizes the cultural production energy of the subject. Culture is not a simple established existence, but on a realistic level. It is also a kind of production activity, corresponding to material production. It is in this sense that culture is a part of the productive forces. As far as social reality is concerned, all kinds of cultural activities carried out to achieve certain goals according to certain requirements belong to the category of the protection, replication and creation of culture, so they can be generally classified as cultural activities. The third level is the level of cultural products. Cultural products include both cultural artifacts left over from history (such as cultural relics and historic sites) and finished products recording the historical past (such as Books, calligraphy and painting, etc.), this level has the most certain and quantifiable characteristics.

According to the object attributes, cultural heritage resources can also be divided into material cultural resources, institutional cultural resources and spiritual cultural resources. Material and cultural resources are the material civilization created by human beings for survival, adaptation and transformation of nature. The material culture created by human beings has historical, scientific and artistic value when it becomes a "non-renewable" cultural heritage resource. Cultural resources are formed in history, and they are the material carriers of political, economic and cultural activities in different periods, different regions and different ethnic groups. Institutional cultural resources are a set of social norms that regulate the relationship and rights and obligations between individuals and individuals, individuals and groups, and restrain people's behavior. People are social people, to survive, they must be in contact with others. In order to maintain normal social relations and social life, it must restrain people's behavior. Law, rules and regulations, and ethics are the main connotations of institutional culture. Spiritual and cultural resources are the invisible spiritual force to maintain social stability and unity, coordinate interpersonal relations, regulate people's behavior, adjust people's emotions, and place people's hopes. The

connotation of spiritual culture is very rich, including science and technology, literature and art, religious belief, people's customs, ideas, way of thinking, psychological characteristics and so on, which are all important contents of spiritual culture.

### 2.3. Classification of the Yellow River water cultural heritage resources in Henan province

The formation of the Yellow River cultural heritage is produced in the historical process of production and development in a specific space, which is a comprehensive, mutual connection, influence and change. Its formation has two of the most important factors: one is the unique and distinctive cultural heritage carrier, that is, the cohesive, open, inclusive and relatively stable Yellow River itself, which is the spatial axis factor; the historical evolution of the Yellow River governance in more than 5000 years, which is the gradual accumulation of history and culture in the Yellow River geographical area, which is the time axis factor. The Yellow River itself is the Yellow River cultural heritage resources matrix and foundation, is the existence of the Yellow River hydrological heritage and inheritance carrier, mainly refers to the historical period in the use of the Yellow River, the process of cognitive formation has certain historical value and art, scientific value of cultural expression, including both material form and non-material form of heritage.

According to the understanding of the connotation of cultural resources, it can be concluded that the concept of Yellow River water cultural heritage resources should be: all materials, activities, information and elements with the cultural attributes and water cultural attributes of the Yellow River, and with historical value, scientific value and artistic value. However, in the process of actual research and data sorting, which cultural heritage resources are the water cultural heritage resources, and how to judge and identify the water cultural heritage of the Yellow River? Through induction, arrangement and analysis, we obtain the following identification conditions, and the cultural heritage can be included in one of the following conditions: the water conservancy facilities related to the smooth protection of the Yellow River; the water conservancy facilities or buildings related to the function of the Yellow River; all the material and intangible cultural heritage produced and developed due to the Yellow River; the cultural heritage distributed along the Yellow River; depends on the production, entertainment, customs and customs of the people along the Yellow River in history. The cultural heritage resources of the Yellow River have the following characteristics: Cultural elements and natural elements coexist harmoniously; static and dynamic complement each other; is composed of point, line and surface; site, historical site and heritage; live inheritance and continuously developing historical cultural heritage and intangible cultural heritage resources; reflects the linear cultural space composed of material and intangible elements of the production and life of ordinary people.



### 2.3.1 Classification purpose and principles

Dayu water conservancy opened the first page of the history of the Chinese nation, since all dynasties will be water conservancy, water as the top priority, water conservancy and the Chinese civilization origin at the same time, and throughout its development, and China's vast territory, natural conditions, uneven distribution of water resources, makes China in five thousand history, widely distributed and rich type Water cultural heritage, these heritage types are diverse, covering almost all types of world water cultural heritage. And has a remarkable era and regional, systematically reflects the course and achievements of China's water conservancy construction and development, reflects the relationship between water conservancy and regional economic and social development, man and nature, water and regional culture, witnessed the unity of water conservancy in the country and social stability. Bearing the cultural genes of various ethnic groups and regions in the north and south of China, And the important role and great contribution in the formation and development of Chinese civilization. China's Dujiangyan attracted worldwide attention in 2000 as the first world cultural heritage site themed on water conservancy projects. So far, the humanistic and scientific value of ancient water conservancy construction has gradually attracted widespread attention from all walks of life. In the last 30 years, more than 100 water conservancy projects in China have been protected to varying degrees, and they have gradually become international, provincial and municipal cultural relics protection units. At the same time, the West Lake, the Hani terraces and the Grand Canal and other water conservancy projects have been listed in the World Cultural Heritage List. Water conservancy heritage gradually enters the vision of the government and scholars, and the importance of water conservancy heritage will be more and more valued. From this period on, scholars were able to change their Angle and begin to pay attention to the specific value and corresponding connotation of ancient water conservancy projects in terms of heritage. At the same time, the protection and utilization of the above projects are further explored. During this period, "water conservancy cultural heritage" and "water cultural heritage" and other related concepts began to appear in people's vision, and further research was conducted on the related fields of the above concepts, and corresponding results were achieved.

Based on this, in recent years, the cultural heritage protection of the Beijing- Hangzhou Grand Canal, the Yellow River and the Yangtze River has been included in the national strategic deployment, and the protection, inheritance and utilization of water conservancy heritage has gradually been highly valued by all sectors of society. Since The State Council issued the Notice on Strengthening the Protection of Cultural Heritage in 2005, China's water conservancy departments and relevant cultural relics protection departments have also carried out related work on the protection of water cultural heritage. At present, about 15% of the total, there are 23, accounting for 22% of the total world irrigation heritage. To sum up, as a historical witness of human development and use of water, water cultural heritage shows the concept and construction technology and methods of scientific water control and water use of the ancient working people, and reflects the development process of China's water conservancy construction civilization in different historical periods, and has important historical value. In-depth study of water cultural heritage is not only of great guiding

significance for the development of current water conservancy construction, but also for the protection of cultural heritage. It is a very important basic research work to scientifically classify the Yellow River water cultural heritage resources.

The importance of the composition and form of heritage is clearly stated in international regulations. There are three reasons: The value of heritage needs to be reflected by the composition of heritage; makes the determination of protection and management more accurate, because all protection measures need to be implemented in each component; complex heritage needs a reasonable and clear type composition to facilitate the login of new elements in the later stage.

The first of all, the purpose of classification is to organize and systematize many resources, and to provide convenient conditions for further protection, development and utilization, and scientific research. Secondly, the classification process of the Yellow River cultural heritage resources is actually the process of deepening people's cognition of the Yellow River cultural heritage and the Yellow River culture. Classification always divides different levels of subordination by studying the commonness or characteristics of a large number of resource attributes. Through the classification of water cultural heritage resources in different regions and with different requirements, the understanding of the attributes of the Yellow River water cultural heritage can be deepened from different aspects, and even some new laws and cognition can be found and summarized, so as to promote the theory of water about cultural heritage resource management Flat improvement.

For the purpose of research, protection and utilization, the Huanghe water cultural heritage resources should follow two basic classification principles: one is the comparison principle, that is, the divided types are relatively independent of each other, there will be no mutual tolerance or overlap; the other is the concise principle, that is, the classification system should be as simple and clear as possible, not easy to be complicated and redundant. The classification system is divided into three levels: main class, subclass and basic class. The principles of its subdivision are: conjugate and exclusivity principles. The canal cultural heritage resources of the same level must have common attributes and different types; the unity principle of standard. The principle must be justified by the same standard; strict system principle. Canal water cultural heritage resources is a complex system, which can be divided into different levels and different levels of subsystems. Classification should be classified step by step to avoid the logical error of leapfrog classification; the principle of water cultural heritage protection evaluation. In the classification of the Yellow River water cultural heritage resources, we should not only consider the protection evaluation of the single structure of water cultural heritage resources, but also consider the protection evaluation of the collection area of water cultural heritage resources.

### 2.3.2 Henan Yellow River Water Cultural Heritage resources Classification system

The classification system of Henan Yellow River water culture resources is divided into three levels: main category, subcategory and basic category.

**Main category** — According to the material attributes, Henan Yellow River water cultural heritage resources are divided into material cultural heritage resources and intangible cultural heritage resources. Material cultural heritage resources mainly refer to the cultural relics with historical, artistic and scientific value, which includes movable cultural relics and immovable cultural relics. Intangible cultural heritage resources refer to various forms of traditional cultural expression (such as folk activities, performing arts, traditional knowledge and skills, and related appliances, objects, handmade products) and cultural space that are related from generation to generation and are closely related to the lives of the masses.

**Subcategory** According to the scale, attribute and existence form of heritage resources, the material water cultural heritage resources of the Yellow River in Henan are divided into 8 subcategories, including water conservancy projects, ancient sites, ancient buildings, stone carvings, important modern historical sites and representative buildings, water conservancy literature, water conservancy art, and water objects, and the intangible water cultural heritage resources of the Yellow River in Henan are divided into folk water literature, performing arts, traditional water conservancy art, social folk customs and festivals, and river control legends.

**Basic type** Material water cultural heritage resources in subcategory can be finely classified according to relative scale, existence form, cause, function, etc.; non-material water cultural heritage resources in subcategory can be finely classified according to existence form, inheritance trend and regional scope.(Table 4)

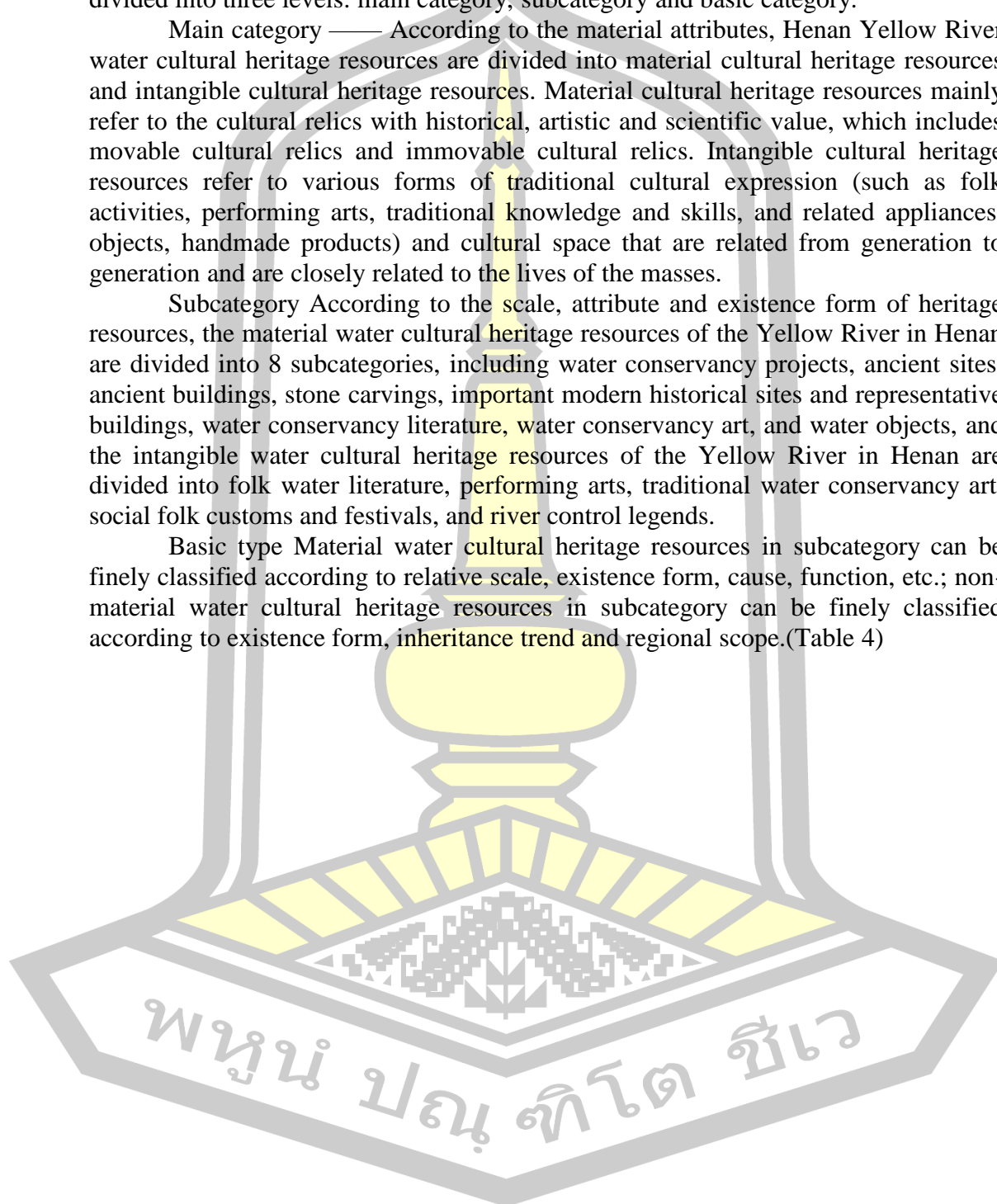


Table 4 Classification system of Beijing-Hangzhou Grand Canal Source: the author collated, self-made

main class	subvariety	fundamental type
Unmovable water cultural heritage	irrigation works	River course heritage, irrigation project heritage, canal project heritage, flood control project heritage
	ancient sites	Water city site, water edge settlement site, water conservancy projects and facilities site, water culture temple site
	historic building	Water altar ancestral temple, water culture pavilion platform que
	lithoglyph	Water culture cliff stone carvings, water conservancy tablet inscriptions
	Modern and modern times, important historical sites and representative buildings	Old sites of important water conservancy institutions, water conservancy facilities and appendages
Mobile water cultural heritage	Water conservancy literature	Water conservancy map, special water conservancy works, historical records of the Yellow River, the Yellow River special article
	Water conservancy art	Water conservancy calligraphy works, water conservancy paintings
	Waterwading objects	Ancient water conservancy machinery and tools,
Intangible water cultural heritage	Folk water conservancy literature	Water conservancy myth, water culture legend, water conservancy story, water conservancy ballad
	performing art	Water conservancy folk songs, water culture games
	Traditional water conservancy skills	Water engineering construction technology, water conservancy equipment production, water culture utensils production
	Social folk customs and festivals	Folk worship faith



The most remarkable characteristic of the Yellow River water cultural heritage resource system is its compatibility, openness, dynamic development and living inheritance, which brings great difficulties to the comprehensive statistics of the Yellow River water cultural heritage resources in Henan province. It is of great significance to deeply understand the relationship between the cultural heritage resources at all levels and the same level of cultural heritage resources in the system of the Yellow River and the protection of the Yellow River cultural heritage.

Material water cultural heritage resources and intangible water cultural heritage resources

The classification of the Yellow River water cultural heritage resources system is further classified on the basis of the material water cultural heritage resources and intangible water cultural heritage resources according to the existence form of water cultural heritage resources. Material water cultural heritage resources also become tangible water cultural heritage resources, such as a historical building, with specific shape and size, and intangible water cultural heritage resources, such as Yellow River haozi, legends, without explicit form. But both can be used by certain means or carrier intuitive display in front of the world, Intangible water cultural heritage resources can be reflected in the form of materialized, And the material water cultural heritage resources can also reflect the living intangible intangible water cultural heritage resources, For example, the traditional technique of the Yellow River is reflected in the cultural heritage along the Yellow River; The embodiment of the traditional performing art scenes and characters in the works of art; Myths, legends and stories are reflected through stone carvings, sculptures or paintings (Figure 12), Through these means, the transformation from immaterial water cultural resources to material water cultural resources, This transformation process is beneficial to people's intuitive cognition and in-depth understanding of the Yellow River water cultural heritage, More conducive to the record, inheritance and protection of the intangible intangible water cultural heritage, At the same time, it can be developed and utilized under the premise of protection, Let the intangible water cultural heritage better live inheritance. In the same way, some material water cultural heritage resources can also reflect the intangible water cultural heritage resources, such as the traditional Yellow River mud ink stone, which are the material carriers of traditional handicrafts in the intangible water cultural heritage resources.(Figure 13)





1. Yellow River haozi



2. Yellow River water wheel

Figure 12 Live presentation of intangible water cultural heritage resources  
Source: made by the author, 2023



1. Dayu water control statue



2. The Yellow Emperor's hometown ancestral worship ceremony

Figure 13 Material carrier of intangible water cultural heritage resources  
Source: made by the author, 2023

The transformation of historical resources and realistic resources in the water cultural heritage

The Yellow River itself is a large and living linear cultural heritage, and its active nature determines that the related water cultural heritage resource system is a dynamic system. In different historical periods, the category of water cultural heritage resource system will change. In the development and management of the Yellow River for nearly 5,000 years, there are thousands of historical water and cultural heritage resources left along the Yellow River, which are all historical evidences that constitute the development of social productive forces and cultural life in the historical stage of human beings. With the continuous development of science and technology and the continuous evolution of culture, new cultural phenomena begin to emerge, and the new water cultural resources of the Yellow River will continue to be derived on the original basis, or become the new water cultural resources of the Yellow River. In this process, the scope of the water cultural resources of the Yellow River will be continuously extended and expanded, and the species will be more



colorful. And with the passage of time, these new reality of water culture resources or will become the history of water cultural heritage, so, as long as the Yellow River live, water culture will constantly on the basis of existing derivative or created, human knowledge and wisdom will also greatly enrich and expand the category of the Yellow River water culture, and with the deposition of history, water cultural heritage is bound to be more and more rich and colorful.(Figure 14)

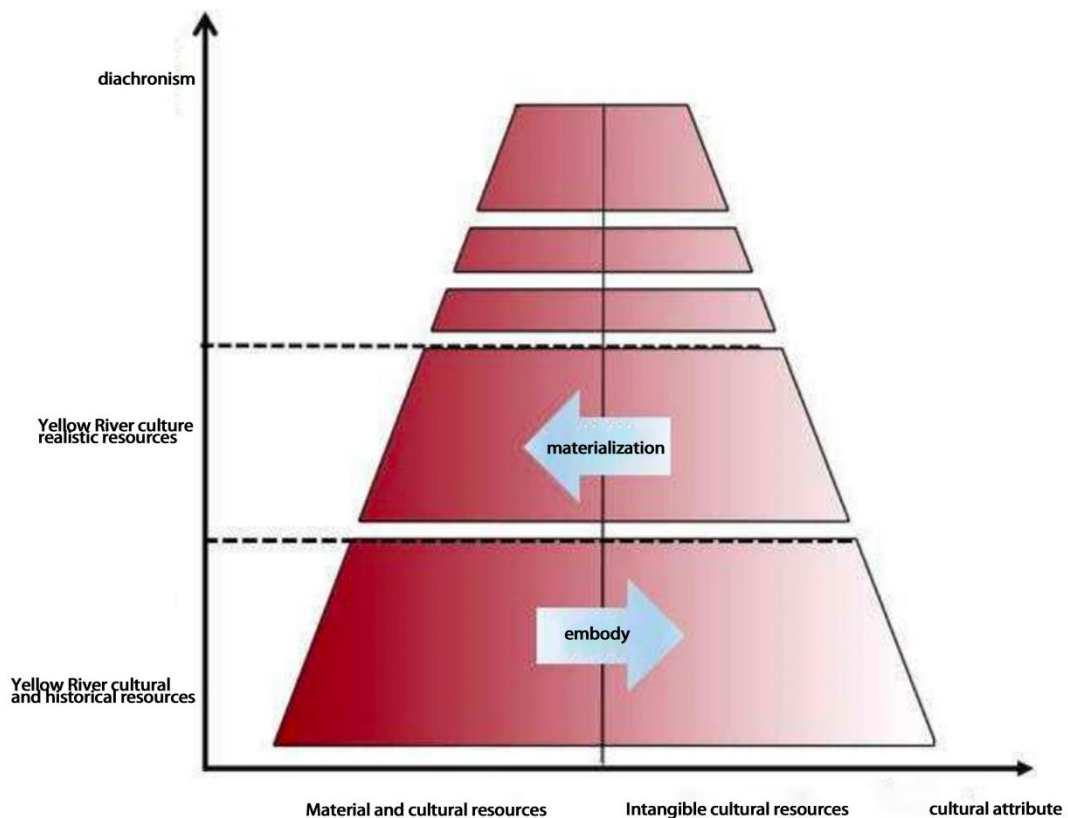


Figure 14 Structure diagram of the Yellow River Cultural Resources System

Source: Drawn by Zhao Yifan, 2017

The Yellow River water cultural heritage and historical resources. The historical resources of the Yellow River cultural heritage mainly refer to the cultural expression forms with certain historical value and artistic and scientific value formed in the utilization and cognition of the Yellow River in the historical period, including the heritage of material and intangible forms. The Yellow River in Henan is rich in cultural heritage resources. In general, the Yellow River cultural heritage in Henan can be divided into ancient civilization sites, capital city sites, ancient buildings, river engineering landscape, intangible cultural heritage, etc. The ancient civilization sites include "Nanzhao Man" Site, "Xuchang Man" Site, Jiahu Site, Peigang Culture Site, Taihao Mausoleum, Yangshao Culture Site, Huangdi Hometown, Erlitou Culture Site, etc., Zhengzhou Mall Site, Shangqiu City, Anyang Yin City, Sui Luoyang City Site, Kaifeng Song City Site, Longmen Temple, Songyang Academy, Yingtian Academy, Lv Zu Temple, Jiaying Temple, Jimin Temple, Great Buddha and Stone Stone; the water landscapes include Sanmenxia Dam Scenic Area and Mengjin Yellow River Wetland. Levee and river engineering landscape has the Yellow River Garden mouth



tourist area, Puyang Yellow River water conservancy scenic area, etc. Intangible cultural heritage including the yellow emperor, dayu legends, yellow mud inkstone, the Yellow River, the Yellow River sacrifice, river legend, drums, Luoyang, fuxi TaiHaoLing festival, Lao zi birthday festival, xinzheng hometown of yellow emperor worship ceremony, zhouyi culture, gossip symbol culture, etc., in addition to the traditional villages of the Yellow River basin, traditional farming technology and water conservancy engineering, folk festivals, folk art, folk arts and crafts, etc. The typical historical resources of the Yellow River water cultural heritage mainly include the following aspects:

**Site and historic sites.** Refers to the place where ancient people left cultural relics in the yellow River control activities. Such sites often have strong cultural color, providing modern people to think about the development process of ancient society and the historical rise and fall of various places. Including historical events, military sites, commercial sites, hydraulic sites, etc., such as ancient ruins, abandoned temples, ancient channel, ancient fiber path, Bridges, lock, dam, weir, revetment, water tank, wharf, beacon tower, inscriptions, ships and grain transport (salt, cure) management agencies, residence, the emperor palace, royal wharf, etc.

**Relics of the ancient buildings.** Refers to the ancient buildings related to the Yellow River or its control practice. In this kind of heritage, some are formed by water conservancy management, and some are the products of water worship, and water worship is the extension of water conservancy management to the society. The contents include: religious and ritual places, former residences of celebrities, art buildings and ancillary landscape buildings, home burial places, traditional local architecture, etc. For example, Wuzhi County, Jiaying County, Jiaozuo City, Henan Province, Shushui Pavilion, Mengzhou City, Yuzhou City, etc., all belong to such heritage.

**Stone carvings** refer to stone tablets, statues or cliff carvings engraved with words and patterns related to the Yellow River or its practice. Such as Henan Dengfeng Han Dynasty Qi Dayu water control carved stone, royal dam tablet, Zheng Gong dragon monument, town river god beast iron rhinoceros and so on.

**A movable relics and monuments.** This kind refers to the cultural relics that can be moved at will. According to their historical, artistic and scientific value, they can be divided into two grades of precious cultural relics and general cultural relics. These include cultural relics and antiques, celebrity calligraphy and painting, celebrity works, carving works, archival relics and relics, etc.

**Folk customs and cultural activities.** The intangible water cultural heritage including oral inheritance: local dialect, celebrity deeds, grain transport legends, labor songs, stories, rap, place names, etc. Water cultural heritage reflected through performing, singing, folk arts, water customs, religious etiquette, festivals, such as Yellow River song and Yellow River sacrifice, which are typical popular cultural activities along the Yellow River.

**Traditional craft and art.** It embodies the systematic skills and art handed down from the experience of people in the past dynasties. It includes the traditional architectural construction techniques and the intangible water culture of art combined with personal innovation factors, such as calligraphy, painting, clay sculpture, carving, xun Musical Instruments and many other traditional folk crafts.

### 3.Composition of the Yellow River water cultural heritage resources in Henan province

#### 3.1 Level Composition of the Yellow River Water Cultural Heritage in Henan

Type and structure of cultural relics protection units. From 1996 to 2019, The State Council announced 5,053 items of eight batches of national key cultural relics protection units (including five batches of merged projects), including 442 in Henan province and 231 in eight cities along the Yellow River<sup>32</sup>.

Table 5 Type composition of national cultural relics protection units in the cities along the Yellow River in Henan Province

region	ancient sites	ancient tombs	historic buildings	Cave and carvings and others	temples and stone and	Modern and the historical and representative buildings	and times, important sites	amount to
Zhengzhou	39	7	27	6		4		83
Luoyang	19	9	13	6		3		50
break or open a seal	4	0	10	0		7		21
Sanmenxia	6	1	4	1		0		12
City								
Jiyuan	1	0	8	0		0		9
Jiaozuo	7	4	14	3		0		28
Xinxiang	4	1	9	5		1		20
Puyang	4	0	0	2		2		8
Along the yellow city	84	22	85	23		17		231
whole	172	35	157	35		43		442
province								
nationwide	1188	420	2162	340		943		5053

Source: the author collated, self-made

In terms of type composition, there are 169 ancient sites and ancient buildings in 8 cities along Huang, accounting for 73.16%; 23 cave temples, stone carvings and other units, accounting for 9.96%; 22 ancient tombs, accounting for 9.52%; 17 projects of important historical sites and representative architectural units in modern times, accounting for 7.36%<sup>33</sup>。

Type and structure of intangible cultural heritage. By October 2021, Henan province had published 681 items of representative items of provincial intangible cultural heritage in five batches. Among them, 478 cities were reported in Zhengzhou, Luoyang, Kaifeng, Sanmenxia, Jiyuan, Jiaozuo, Xinxiang and Puyang, accounting for 70.19%. In terms of the number of cities declared, Jiaozuo, Luoyang and Zhengzhou Xiaozhou lead the total number of intangible cultural heritage, with 86,81 and 80 respectively, Puyang, Kaifeng, Xinxiang and Sanmenxia are the second echelon, 64,57,56 and 411 respectively, Jiyuan is the least and only 13, forming a "3-4-1" echelon structure<sup>34</sup>。

Referring to the classification of national intangible cultural heritage and the research of Tian Xiaobo and Hu Jing, it will The intangible cultural heritage projects of Henan Province are integrated into folk literature, performing art, arts and crafts, knowledge practice and folk festivals. From the perspective of category structure, the type structure of the 8 cities along the Yellow River is basically the same as the whole province, forming a type composition of "knowledge practice and performance art as the main, folk festivals and arts and crafts as the second, and folk literature as scarce".

Table 6 Type composition of provincial intangible cultural heritage in the cities along the Yellow River in Henan Province

region	Folk literature	Performing art	Arts and crafts	Knowledge practice	Folk festival
Zheng zhou	10	13	15	28	14
Luoyang	13	19	11	26	12
break or	2	14	9	23	9
open a seal					
Sanmenxia	4	13	10	10	4
City					
Jiyuan	3	3	1	5	1
Jiaozuo	11	32	4	23	16
Xinxiang	4	22	6	17	7
Puyang	4	26	10	12	12
Eight cities	51	142	66	144	75
along the					
Yellow River					
whole	92	207	72	191	119
province					

Source: the author collated, self-made

The list of representative items of intangible cultural heritage reflects the excellent traditional culture of the Chinese nation, has historical, literary, artistic and scientific value, and also reflects the existence status of cultural heritage to a certain extent. The composition of intangible cultural heritage in Henan Province and the 8 cities along the Yellow River highly reflects the type structure of the province's cultural heritage. At the same time, the number of intangible cultural heritage projects in the 8 cities along the Yellow River has an absolute advantage in the whole province, and the proportion of each type of intangible cultural heritage projects accounts for more than 50% in the whole province, indicating that the cities along the Yellow River are the "rich mining area" of the intangible cultural heritage projects in Henan Province.

Thus, along the Yellow River, the cultural heritage level high, complete type, including all kinds of material, non-material, oral intangible cultural heritage, national key cultural relics protection units, ancient capital, national famous historical and cultural city, historical and cultural town, etc., in the proportion of the large, especially in Henan province, will attract all kinds of heritage protection of the Yellow River.

<sup>32 33 34</sup>Yuan,M &Yang,X,Z.(2022). Characteristics and development suggestions of cultural resources in cities along the Yellow River in Henan Province. Henan science access, professional topographic map extraction related geographic elements, visit the relevant people, the Yellow River in Henan existing system heritage selection and complement.

### 3.2 Example source of the Yellow River Water Cultural Heritage in Henan Province

Based on the understanding and grasp of the formation time, space and coverage scope of the Yellow River cultural heritage in Henan province, We can summarize the cultural heritage of the Yellow River as within the Yellow River basin, From the ancients building DAMS, building canals, opening canals, To the sum of all the material civilization and spiritual civilization heritages created by the development of the Yellow River and the continuation of the development of human beings, The former depends on many physical forms, The vectors involved, There are documents, inscriptions, temples, dyMS, city sites, villages, ferries, jin, etc., The material form of these heritage sites is clearly visible, What we call the material and cultural heritage; The latter relies on the forms of thought, memory, technology, performance, etc., It mainly involves the inventions and creations, hydraulic technology, rules and regulations, legends and rituals related to the Yellow River water, Its form of continuation depends on the inheritance of people, The so-called intangible cultural heritage.

This paper combined with the Ministry of Water Resources of the Yellow River water resources commission of Henan the Yellow River cultural resources census results and compiled by Henan province provincial water resources bureau, Henan people's publishing house of Henan province first provincial water conservancy annals in the heritage, through field investigation and exploration, historical data In terms of material cultural heritage, the specific information data of immovable cultural relics comes from the survey results of the Yellow River Cultural Resources



collected by the Yellow River Water Resources Commission of the Ministry of Water Resources and the written records of Henan Province, the first provincial water conservancy annals compiled by Henan Provincial Water Resources Department and published by Henan People's Publishing House. Since there is almost no new discovery of relevant material cultural heritage in the field survey, the research of material cultural heritage in the research area in this paper is carried out based on the existing heritage information, and the specific heritage components are selected for analysis. The research on movable cultural relics is mainly the cultural relics in public museums and libraries of cities along the route.

In terms of intangible cultural heritage, the data of the representative list of intangible cultural heritage items of the intangible cultural heritage of Henan Province comes from the relevant notices published on the official website of Henan Provincial People's Government and the official website of Henan Provincial Department of Culture and Tourism and other public platforms. By October 2021, Henan province had published a list of representative items of provincial intangible cultural heritage (and its expanded list), and 478 cities along the Yellow River. Due to the vague location of intangible cultural heritage and the limitation of display time and space, this paper only discusses the intangible cultural heritage located in the study area and has certain influence. The heritage types involve traditional art, performing arts, river governance legends, skills and folk customs. Some important projects will be selected to introduce the projects with the cultural characteristics of the Yellow River from the aspects of origin, inheritance, content and form.

### 3.3 Construct the Yellow River water cultural heritage composition system in Henan province

In order to analyze the resources of Henan Yellow River water cultural heritage in detail and intuitively, this study tries to construct the composition system of Henan Yellow River water cultural heritage resources. This paper uses geographic information system (GIS) technology to obtain the geographical elements along the Yellow River in Henan province, and analyze and process the obtained data. Specific methods for the basic geographic map data selected river expansion within 500 meters, surrounding the existing heritage related environmental elements (including lakes water system, water conservancy engineering facilities, shipping engineering facilities, roads, towns, villages, mountains, etc.), and belongs to the founding of new China in 1949 before the existence of the material cultural heritage and intangible cultural heritage. This is predicted as the geographical elements in the existing system heritage composition of the Yellow River section in Henan province. According to the preliminary investigation and literature review, the composition system includes a total number of 210 water cultural heritage resources, among which the author has made a field investigation of some water cultural heritage along the Yellow River section in Henan province, and the areas not investigated are compiled and compiled through reading a large number of documents and materials. The composition system is classified according to the river reach, type, age, protection level, preservation status and specific existence location of the water cultural heritage. The division of type and the determination of age are of scientific significance to the study of Henan Yellow River water cultural heritage, and the division of protection level and the

clarity of preservation status are of practical significance to the protection of Henan Yellow River water cultural heritage in Henan.

### 3.3.1 Type division

There are many types of water cultural heritage along the Yellow River in Henan Province. This study attempts to divide water cultural heritage into 7 categories (Table 6):

Water conservancy project facilities site: The heritage of the Yellow River water conservancy project refers to all kinds of projects and related facilities built in the Yellow River basin to eliminate water damage and promote water conservancy. Including docks, gates and DAMS, Bridges, plank roads and other water cultural heritage directly related to the Yellow River;(Figure 15)



Figure 15 play an indispensable role

Source: <http://jun0186.blog.sohu.com/95906515.html>, 2008

Historic site buildings: refers to the ancient buildings related to the Yellow River or the Yellow River control practice. In this kind of heritage, some are formed by water conservancy management, and some are the products of water worship, and water worship is the extension of water conservancy management to the society. Including temples, churches, guild halls, gardens, and dwellings, all along the canal Former residence, academy, ancient pagoda, city tower and other architectural heritage;(Figure 16)



Figure 16 Taoist Temple of Good Response

Source: [http://www.360doc.com/content/21/1025/16/52455769\\_1001242091.shtml](http://www.360doc.com/content/21/1025/16/52455769_1001242091.shtml), 2021

Historical sites and sites: refers to the place where ancient people left cultural relics in the activities of Yellow control. Including all kinds of ancient sites along the Yellow River, including city site, fort site, wharf, temple site, shipwreck site, caocang site, etc.:(Figure 17)



Figure 17 Original Yang Linglong Tower

Source: <http://www.wikicleta.com/index.php/wiki/10250.html>, 2022



Stone carvings: refers to the stone tablets, statues or cliff carvings engraved with the words and patterns related to the Yellow River or the Yellow River control practice. It mainly includes all kinds of stele inscriptions left along the Yellow River related to the shipping and historical development of the Yellow River, including tombstones, cliff carvings, monuments, stone archways, stone carvings, brick carvings, etc.:(Figure 18)



Figure 18 Zheng Gonghe Long on the tablet

Source: [http://www.360doc.com/content/19/1111/16/14561708\\_872461516.shtml](http://www.360doc.com/content/19/1111/16/14561708_872461516.shtml), 2019



Important historical sites in modern times: mainly refers to the important historical sites and representative buildings related to the historical events or figures and with commemorative significance, educational significance or historical value. Including various old sites, modern industrial heritage, etc.(Figure 19)



Figure 19 Yellow River First Railway Bridge

Source: [https://www.sohu.com/a/556945192\\_121107011](https://www.sohu.com/a/556945192_121107011), 2022



Water conservancy documents refer to all kinds of data recording the history of the changes and governance of the Yellow River.(Figure 20)

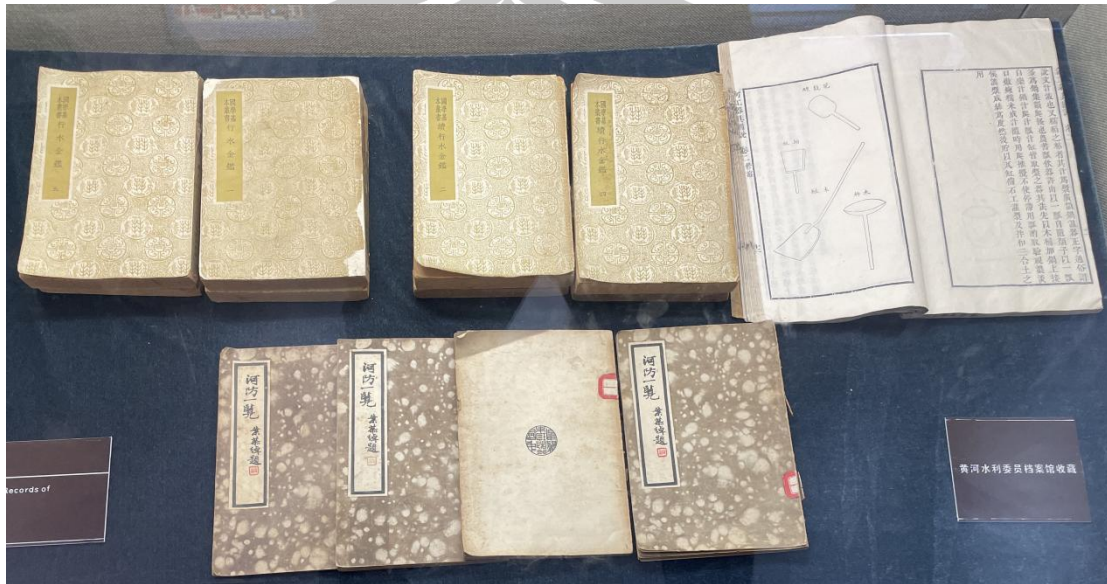


Figure 20 Yellow River governance literature  
Source: Photo was taken at the Yellow River Museum, 2023

Water conservancy art refers to the art and arts and crafts created with the theme of the Yellow River or the Yellow River in each historical period. Most of the works of art are aesthetic, unique or repeatable, such as painting, calligraphy and carving.(Figure 21)

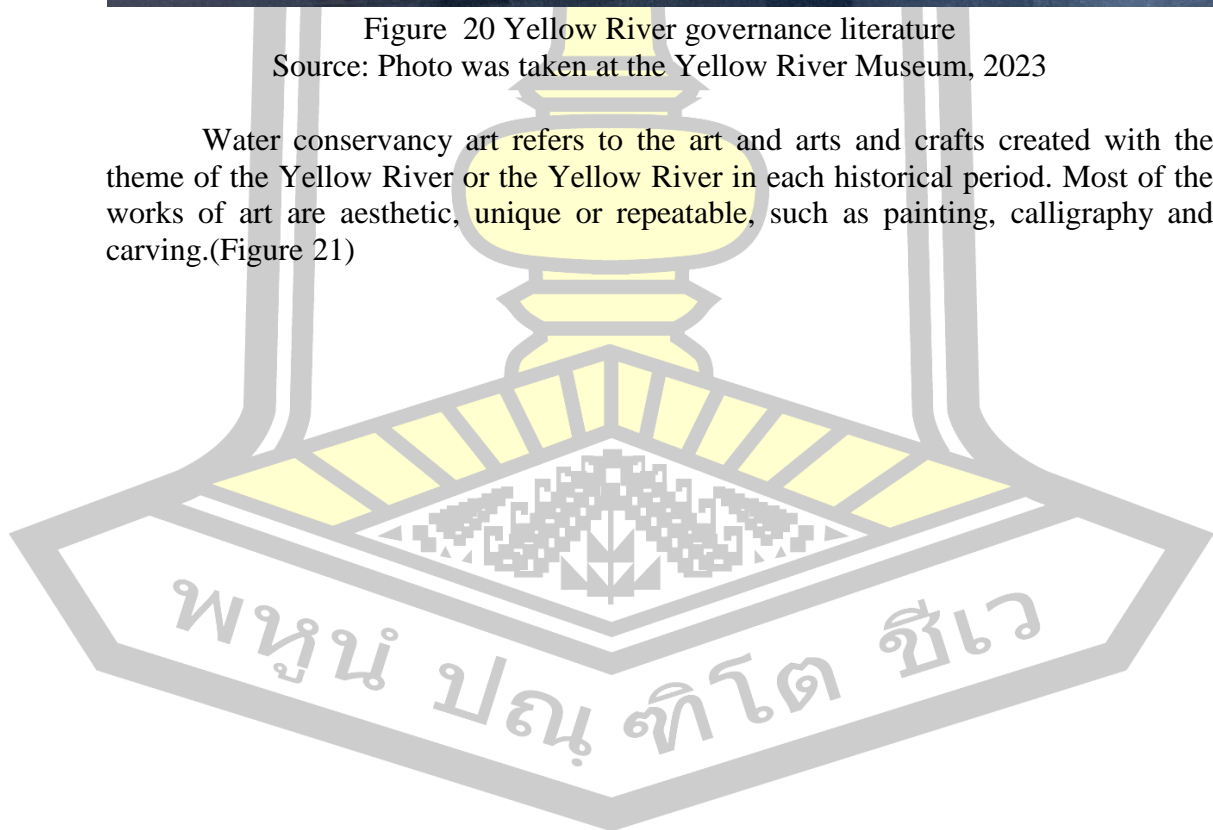




Figure 21 Guarantee Yinghe plaque

Source: Photo was taken at the Yellow River Museum, 2023

Water-related objects refer to the representative objects that reflect the social systems and production and life styles in the practice of governing the Yellow River.(Figure 22)



Figure 22 Yellow River governance tools

Source: Photo was taken at the Yellow River Museum, 2023



Table 7 Type table of material cultural heritage along the Yellow River section in Henan province

type	Water conserva ncy project facilities	Hist oric build ings	lith oglyph	Hist oric sites	Water conser vancy literat ure	Water conser vancy art	Water wading objects	Modern heavy To history	am ount to
Quantity (item)	12	23	46	21	64	24	13	7	210

### 3.3.2 Storage status quo

The preservation of water cultural heritage along the Yellow River in Henan varies greatly, and the protection status varies between cities and cities. Some water cultural heritage is well preserved, with its authenticity and integrity and high value; and some water cultural heritage with high scientific research value; some water cultural heritage is seriously damaged, and only sites (or relics) can be tested; some are no longer exist or completely rebuilt. Through field investigation and literature analysis, the protection status of the material cultural heritage of the Yellow River in Henan province is roughly divided into the following 8 types (Table 8)

Table 8 Classification table of material cultural Heritage Protection status along the Yellow River in Henan province Source: the author collated, self-made

Current status of heritage protection	Original property protection Preservation is good	Original property protection Preserve better	The original thing s easy To save	rebuilt recovered	whole rebuilt	Original thing broke n Bad serious	The original site can be tested	Protect now Unknown	over all count
Quantity (item)	38	50	7	30	35	22	13	15	210



### 3.3.3. Relationship between material and cultural heritage and Henan Yellow River

Reference to professor Yu Kong Jian team studied the method of the relationship with the canal, (need footnote) to water cultural heritage and the relationship between the Yellow River as a starting point, the water along the Yellow River in Henan cultural heritage is roughly divided into: related to the Yellow River function heritage, related to the Yellow River history, and the Yellow River space related heritage three categories.

Functionally related, referring to a large number of heritage directly related to the operation of the Yellow River distributed along the Yellow River in Henan province, including sluices, DAMS, Bridges, docks, ferries, banknotes, etc. on the canal;

Historical related, refers to some, although not directly related to the governance of the Yellow River, it is derived from the development of the Yellow River grain transport, trade and other functions, including local trade halls, post stations, temples, mosques, tombs, steles, inscriptions and other heritage with historical relations with the Yellow River;

Spatial correlation means that the single heritage site has no obvious function and historical connection with the Yellow River, but its spatial location is close to the Yellow River water cultural heritage, which is an integral part of the Yellow River heritage in a broad sense.

According to the relationship between material cultural heritage and the Yellow River section in Henan province, the number of functional, historical and spatial related heritage.(Table 9)

Table 9 Classification of relationship between Water Cultural Heritage and Yellow River in Henan Source: the author collated, self-made

relation type	functional correlation	History related	space correlation	amount to
Quantity (item)	72	88	50	210

The material cultural heritage along the Yellow River in Henan province is rich in content and variety. Through the combination of field research and literature sorting, 210 kinds of water cultural heritage have been preliminarily sorted out. Because the Yellow River spans a wide area and lasts for a long time, each region is based on the history of the Yellow River in Henan province, and the number and types of material cultural heritage contained in it are also very different. This study was roughly classified by geographic reach.(Table 10)

Table 10 List of classified material cultural heritage along the Yellow River in Henan province

Heritage type	Heritage category	Legacy name
Unmovable water heritage	irrigation works	Yellow River dike, gap, Beijin dike, Western Han Yellow River dike, Tongji canal, Wulongkou water conservancy facilities
	ancient sites	Zhongliu, Minquan Kuiqiu Alliance, Kaifeng "City", Lin Lingdi, Sanyangzhuang site, Yuanyang Linglong Pagoda, Miaole Temple Pagoda, Shang Village site, Huilocang site, Bali Hutong plank road remains, Sanmenxia plank road relics
	historic building	Jiaying View, Suoshui Pavilion, Yuwang Temple, Yuwangtai, Chongning Temple, Yuwang Suojiaowell, Hemudu Temple, Wen County River Temple
	lithoglyph	Yu wang tablet, dengfeng han dynasty mother que dayu water conservancy carved stone, big i mountain cliff Buddha and stone carving, town river god beast, Hou tablet, royal dam tablet, Zheng Gong dragon tablet, clear water tablet, town river god beast iron rhino, Ming ChengHua guanghui canal tablet, imperial repair river work, building Yang Qiao river shrine tablet, Chen four county river tablet, Huang Ling Gang plug river work, mian pool east willow village flood carved stone, rebuild city tablet in Henan province
A movable water heritage site	Modern and modern times, important historical sites and representative buildings	Zhengzhou Yellow River Bridge of Pinghan Railway The origin of the Kuomintang Yellow River negotiation site Yellow River Garden mouth memorial pavilion
	Water conservancy literature	Central plains yellow figure, yugong, river book, Shandong zhili Henan three provinces of the Yellow River, river list, water Jin Jian, ZhongMou big work, Shandong zhili Henan three provinces, all the government, the Yellow River situation, ji one hundred and thirty volumes, han book one hundred volumes, song history four hundred and ninety-six volumes, yuan history two hundred and ten volumes, Ming history three hundred and 32 volumes, river strategy, water control, hoof, caohe TuZhi 2, tonghui river, ask water set, yuji the Yellow River project, river illustration, river theory, yu river, nine province canal spring water conservancy situation, river prevention 1. Yellow River issue discussion collection, Professor Engels's test report,

Water conservancy art	drawing of river tools, Yellow River Flood control Conference and the first meeting of the Yellow River Water Conservancy Committee "ChiJianjia should view" plaque, "contact DE apply ren" plaque, "rui should be glory" plaque, yu trace map rubbings, qing emperor qianlong imperial pen inscription tablet rubbings, Xing eight fort solid beach dike tablet rubbings, the qing dynasty water monument rubbings, ChiJianYang Qiao river temple monument rubbings, town river iron rhinoceros inscription rubbings, the Yellow River map tablet rubbings, security Xing river plaque, "premier river" plaque
Waterwading objects	The Northern Song Dynasty, the Kaifeng Dynasty, the stone, the Yellow River, the iron dragon claw mud cart, the iron ba, the river dragon

---

Source: the author collated, self-made

### 3.4 Intangible water cultural heritage resources along the Yellow River in Henan province

The Yellow River intangible water cultural heritage of Henan province is a very important part of the water cultural heritage. It refers to the cultural heritage that exists in the intangible form, born with the Yellow River or spread through the Yellow River basin; it is closely related to the life of the people along the Yellow River, the cultural expression is the long-term inheritance; it especially emphasizes the human skills, experience, spirit and other intangible elements in the water cultural heritage; it is a living inheritance, continuous evolution of water cultural heritage.

The International Convention on the Protection of Intangible Cultural Heritage gives a clear definition of "intangible cultural Heritage" (Intangible Cultural Heritage): refers to the various practices, performances, forms of expression, knowledge and skills and their related tools, cultural heritage, physical objects, handicrafts and cultural sites. With the change of their environment, the mutual relationship with nature and the change of historical conditions, various groups and groups continuously innovate the intangible cultural heritage passed down from generation to generation, and at the same time, they have a kind of themselves A sense of identity and history, thus promoting cultural diversity and human creativity. It includes: oral legends and expressions, including language as a medium of intangible cultural heritage; performing arts; social customs, etiquette, festivals; knowledge and practice about nature and the universe; traditional handicraft skills; and cultural space related to the above traditional cultural manifestations.

### 3.4.1 Intangible cultural heritage and Chinese cultural system

China has a land area of 9.6 million square kilometers, spanning three climate zones of tropical, temperate and cold zones. It has various climate characteristics such as Marine climate, inland climate, plateau climate and desert climate. In the long course of historical development, China has formed distinctive cultural differences and cultural diversity. China is a populous country in the world, is a multi-ethnic country, is also one of the four ancient civilizations in the world, with a history of five thousand years of civilization, is one of the countries with the most rich cultural heritage. In May 2001, UNESCO announced in France the list of the representative Works of Oral and Intangible Cultural Heritage of Humanity in Paris, France, and the first batch of Chinese Kunqu arts were selected. By December 2022, a total of 43 projects in China have been listed in UNESCO's "Representative Oral and Intangible Cultural Heritage of Humanity", and seven projects, including the traditional construction skills of Chinese wooden arch Bridges, have been included in the "Intangible Cultural Heritage List in urgent Need of Protection", making it the country with the most selected projects in the world.

Chinese traditional culture and profound, brilliant, both the Beijing-Hangzhou grand canal, the Great Wall, qin shihuang mausoleum, the Ming and qing dynasties palace mausoleum, buddhist grottoes, Suzhou gardens, Huangshan, mount tai, west lake and the Summer Palace, the world natural and cultural heritage, such as kunqu opera, guqin, opera, Chinese quintessence art, and silk weaving, porcelain firing, dragon boat customs, mazu beliefs and other non-material cultural heritage essence. China's intangible cultural heritage and material cultural heritage, just like a meridian and weft line, jointly compiled a rich and colorful, colorful and beautiful scene of Chinese culture, vividly shaping the giant image of China, an ancient Oriental civilization.

### 3.4.2 Intangible water cultural heritage of the Yellow River section in Henan province

Henan is an important source of the Yellow River civilization and the core area of the Yellow River culture. It is the location of "the earliest China" and "China by the Yellow River". As the geographical center of the Yellow River culture, Henan is rich in the historical relics and cultural landscape of the Yellow River civilization, and breeds the content essence and ideological essence of the Yellow River civilization. From the summer solstice to the Song Dynasty, many dynasties established their capitals or moved to both sides of the Yellow River in Henan, and Henan has long been the national political, economic and cultural center. As a living, linear corridor and still developing cultural heritage corridor, the Yellow River has not only left an unusually rich material water cultural heritage, but also left an intangible water cultural heritage with profound connotation and extensive extension.

For the intangible water cultural heritage, in order to realize effective and high-level protection, it is necessary to conduct scientific and systematic screening and clearly define the specific content of the heritage. Due to the vague location of intangible cultural heritage and the limitation of display time and space, this paper only discusses the intangible cultural heritage located in the study area and has certain influence. The heritage types involve traditional art, performing arts, river governance legends, skills and folk customs. Some important projects will be selected to introduce



the projects with the cultural characteristics of the Yellow River from the aspects of origin, inheritance, content and form.

First, it is the definition of cultural and spatial nature formed by human oral and intangible cultural heritage. The time and space of human existence is not the space and time in the natural state, but the time and space passed through human "culture", that is, human beings attach many humanistic meanings to the space and time of nature. In human culture, there are some specific cultural space as a form of cultural expression, the folk sacrificial space is a typical representative, for example, all over the Yellow River to the Yellow River; there are also a leading form of cultural realization, for example, Henan Province, "Yu sacrifice" on the 28th of the third lunar month. The timing and space of culture are important representations of intangible water cultural heritage.

Secondly, it is the investigation of the development and evolution of human oral and intangible cultural heritage and the Yellow River in Henan province. The so-called formation, inheritance and development of the Yellow River in Henan has a direct or indirect relationship with the Yellow River in Henan, and has an inevitable connection between endogenous, development, evolution and inheritance. It is mainly reflected in the following 4 aspects:

first, Direct associated with the Henan Yellow River intangible water cultural heritage, namely the Yellow River ontology formed in the process of the intangible heritage project, such as working people and the Yellow River flood struggle created a unique traditional skills, the Yellow River build brake dam, reinforcement embankments, plugging building of traditional skills, water, water diversion, water, drainage and other traditional facilities building skills, etc.(Figure 23)



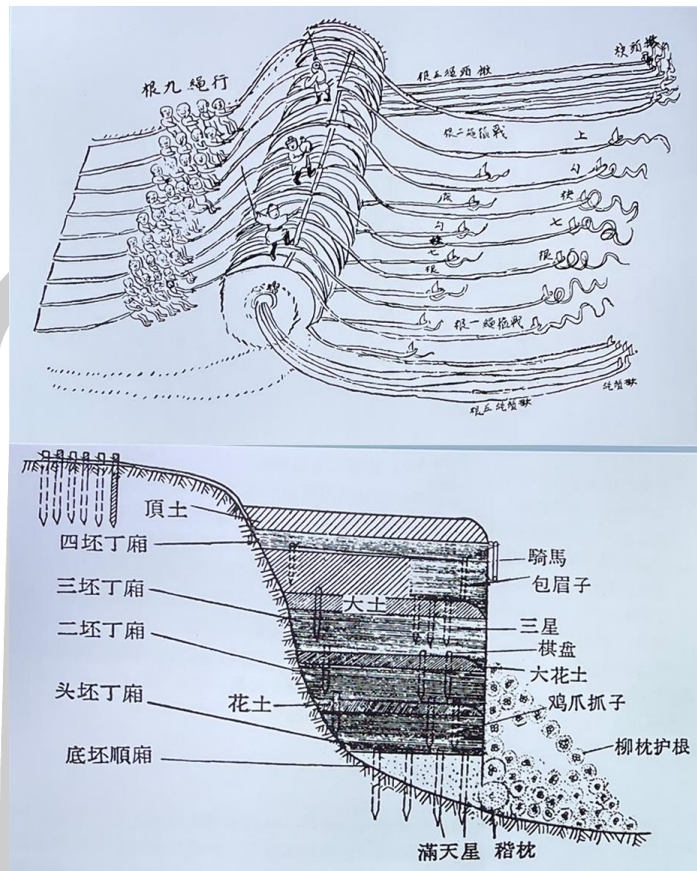


Figure 23 The Yellow River is a traditional technique

source: <https://www.yantuchina.com/people/detail/713/27378.html#info>, 2016

second, Life derived from the Yellow River in Henan human oral heritage, such as about the governance of the Yellow River stories, legends, about the Yellow River of the river, boat songs, folk songs, nursery rhymes, produced by the Yellow River social customs, etiquette, festivals, and some important because of the formation of the Yellow River dialect, etc. (Figure 24)

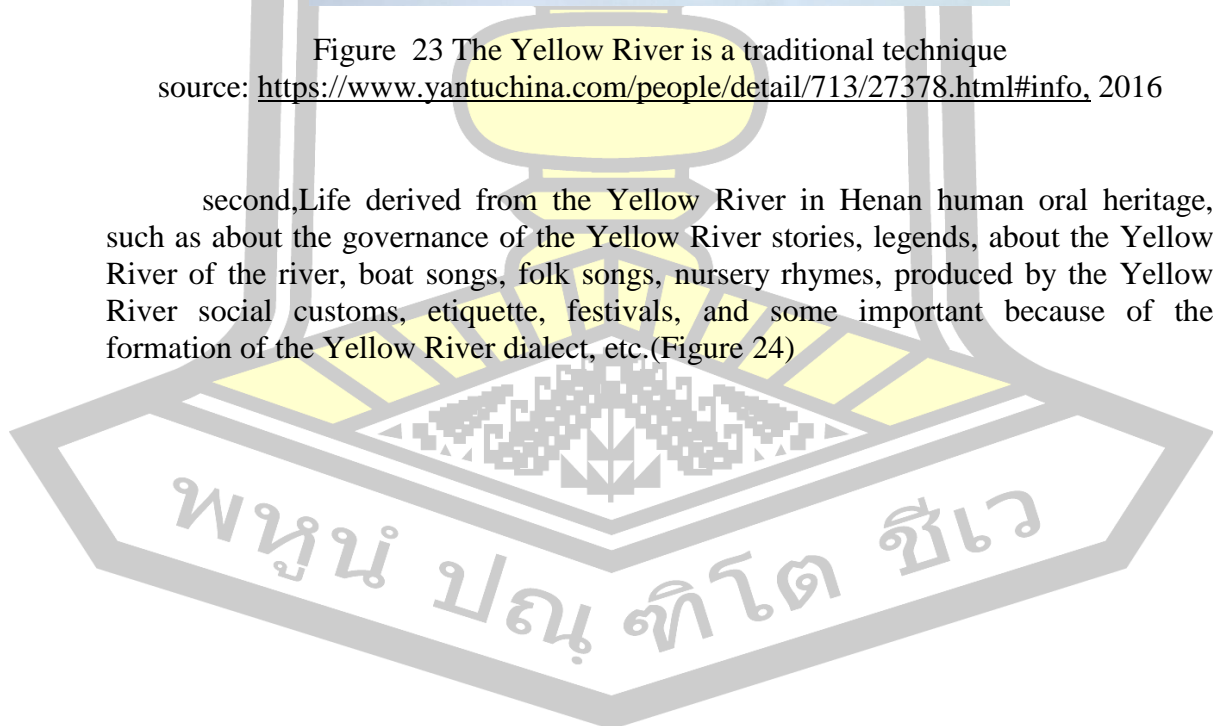




Figure 24 Yellow River haozi

Source: <http://news.cctv.com/china/20090527/109461.shtml>, 2009

Third, due to the spread of the Yellow River culture, the traditional handicraft skills produced or inherited, such as the Yellow River mud inkstone making skills on the bank of the Yellow River, and the Yellow River mud xun making skills in Wuling County, Jiaozuo City, Henan Province.(Figure 25)



Figure 25 Yellow River mud xun

Source: <https://baijiahao.baidu.com/s?id=1646890074939583138&wfr=spider&for=pc>, 2019

The Yellow River in Henan has been integrated with the social, economic and cultural life of the people along the river, so its culture will inevitably expand from the material level to the social level and spiritual level, forming the unique form of social organization and folk etiquette along the Yellow River in Henan. Through field investigation and in-depth literature research, 15 projects of intangible water cultural heritage along the Yellow River in Henan province were preliminarily sorted out, mainly including folk water conservancy literature, performing arts, traditional water conservancy skills, social folk customs and festivals, etc. The distribution of intangible water cultural heritage along the Yellow River in Henan province is shown in Table 11.

Table 11 List of Intangible cultural heritage by type along the Yellow River in Henan province

Source: the author collated, self-made

Folk water conservancy literature		The legend of Dayu controlling the water, the legend of Sanmenxia, the legend of King Yu Suojiaojing, the legend of etu, the folk song hu Zi Song, the folk song of Shaanxi County
performing art		River worker haozi, soil I haozi, boatman haozi
Traditional water conservancy skills		The Yellow River clear mud ink stone, the Yellow River mud xun, the Yellow River cast by the traditional skills
Social customs and festivals	folk and	Yellow River sacrifice, Yu Wang sacrifice, yellow Emperor hometown worship ceremony

### 3.4.3 The Importance and far-reaching significance of the intangible water cultural heritage protection of the Yellow River in Henan province

The intangible water cultural heritage of the Yellow River in Henan province contains the unique spiritual value, way of thinking, value orientation and artistic quality of the Chinese nation, embodies the vitality and creativity of the Chinese nation, and is the crystallization of the wisdom, labor and creation of the Chinese nation. The intangible water cultural heritage along the Yellow River in Henan province is an important part of Chinese culture. In the long history, the blood of the Yellow River has not only nourished the body and strength of the Chinese nation, but also cultivated the wisdom, spirit and national characteristics of the Chinese nation. At present, among China's material and intangible heritages that have been selected in the World Heritage List, many representative heritage projects are directly or indirectly related to the Yellow River and have typical water cultural heritage characteristics. They are important parts of the world heritage and treasures of human civilization.

To protect, develop and inherit the intangible water cultural heritage of the Yellow River in Henan is an inevitable requirement for protecting the Chinese traditional culture, enhancing soft power and realizing the great rejuvenation of the Chinese nation. It is also the bounden duty and responsibility of Chinese descendants. While taking the responsibility of inheritance and protection, it can get spiritual,



material and cultural harvest, etc. At the same time, it can protect the cultural heritage of the Yellow River in Henan for its integrity, authenticity, integrity and systematization, promote the creative transformation and innovative development of the Yellow River water culture, so that it can be passed on in basic research.

#### **4.The artistic value of Henan Yellow River water cultural heritage**

The Yellow River cultural heritage in Henan is not only a treasure of Henan culture, but also an important part of the cultural treasure house of the Chinese nation. Whether it is architecture, sculpture, painting, calligraphy, seal cutting or other folk arts, they all have high aesthetic value, demonstrate the profound heritage and unique style of traditional Chinese art, and are important resources for studying traditional Chinese culture and history.

##### **4.1 Architectural art**

The architectural art in Henan's Yellow River cultural heritage embodies the essence of ancient Chinese architecture and has extremely high historical, artistic and cultural value. These buildings not only demonstrate the development of ancient architectural techniques and artistic styles, but also reflect the profound cultural heritage and unique regional characteristics of Henan.

##### **4.1.1 Historical Value**

As one of the important birthplaces of ancient Chinese civilization, Henan has many historic buildings, such as the Shang Dynasty ruins in the Yin Ruins in Anyang, which are important physical evidence for studying Shang Dynasty culture and the early development of Chinese civilization. And its ancient buildings cover multiple dynasties. The architectural style and technology of each period reflect the architectural characteristics and social and cultural status of that era. These actual materials can record historical development and reflect the cultural characteristics and technological levels of different historical periods. . In addition, Henan's ancient buildings not only include palace relics from various dynasties, but also religious buildings such as Buddhist temples and Taoist temples, as well as residential buildings, ancestral halls and other buildings. Supplemented by their building materials, building structures, decorative techniques, etc., they can reveal ancient architecture. The classification and development history of technology provide valuable examples for studying ancient construction technology.

#### 4.1.2 Art value

The Yellow River cultural heritage buildings in Henan have a long history and rich types. Through these ancient architectural sites, people can not only understand the architectural styles of various dynasties, but also feel the unique heritage of the Yellow River culture, which embodies the unique regional cultural characteristics of Henan. From a philosophical perspective, many ancient buildings in Henan are closely related to religious beliefs, such as Buddhist temples, Taoist temples, etc. These buildings are not only places for religious activities, but also important media for the dissemination of philosophical ideas. From the perspective of life, traditional Henan buildings such as government buildings, residential buildings, and gardens reflect the lifestyles and social structures of different social classes. Many buildings also incorporate folk art and traditional lifestyles, such as courtyard design of residential buildings, decorative arts, etc. , reflecting the people's living habits and aesthetic taste. These buildings can serve as living historical teaching materials and inspire academic research in the fields of architecture, art history, cultural studies and other fields.(Figure 26)



Figure 26 Yubeiting

Source: [http://k.sina.com.cn/article\\_2810373291\\_a782e4ab02001tvtd.html](http://k.sina.com.cn/article_2810373291_a782e4ab02001tvtd.html), 2020

## 4.2 Crafts and traditional arts

### 4.2.1 Craft value

The handicraft cultural heritage of the Yellow River culture in Henan, such as Ru kiln, Jun kiln, paper-cutting, embroidery, etc., are outstanding representatives of the superb craftsmanship of ancient China. To this day, the inheritance of many skills still retains the traditional production technology, reflecting the Henan people wisdom and creativity. The cultural elements contained in these handicrafts, such as local legends, historical stories, folk beliefs, etc., are important carriers of Henan Yellow River culture and can display the unique artistic style and aesthetics of Henan Yellow River culture. In addition, the development and changes of handicrafts reflect the social and historical changes in Henan at various stages. These handicrafts can not only peek into the daily life and social customs of the ancient Yellow River culture people in Henan, but can also be used as tourist souvenirs to promote cultural tourism in Henan and promote local Economic development has important practical significance.(Figure 27)



Figure 27 Luoyang paper-cutting  
Source: Wang Fei's works, 2020



#### 4.2.2 Traditional artistic value

From the perspective of music and dance, Henan folk music such as Yu tunes and ditties reflect the musical and artistic style of Henan's Yellow River culture, while folk dances such as Taiping dance and sword dance are not only forms of folk entertainment, but also reflect The history and folk beliefs of Henan. From the perspective of arts and crafts, Henan's murals, stone carvings and other art works focus on the superb skills of ancient artists, as well as the cultural heritage of being the ancient political and cultural center and the birthplace of the Chinese nation. Handicrafts such as ceramics, paper-cutting and embroidery The handicrafts are not only very practical, but also have unique artistic value, reflecting the consistent aesthetic taste of the Henan people. In general, traditional art, as an important part of the cultural heritage of the Yellow River in Henan, is an important resource for cultural inheritance in Henan and even China as a whole. It has become an important bridge connecting tradition and modernity, past and future.(Figure 28)

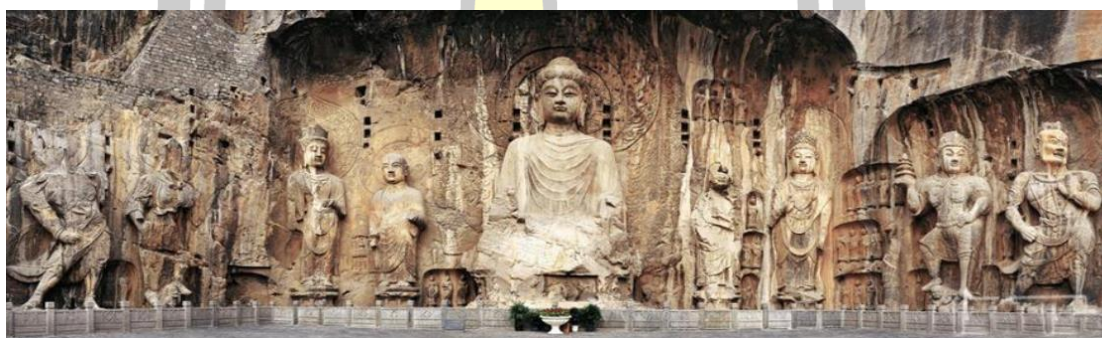


Figure 28 Longmen Grottoes

Source: <https://www.163.com/dy/article/DI32THDA0524UROR.html>, 2018

#### 4.3 Folk art value

##### 4.3.1 The value of traditional drama and folk art

As one of the largest local operas in China, Yu Opera's performance art integrates singing, chanting, acting, fighting and other elements. The repertoire is extremely rich, covering historical stories, folklore and other themes, with rich character creation and profound emotional expression. , occupies an extremely important position in the forest of Chinese dramas. At the same time, Henan's Yellow River culture has rich traditional folk art forms, including cross talk, storytelling, etc. These folk art forms skillfully combine speaking, singing, acting and other skills in the performance. The language used in many pieces is vivid, humorous and full of local characteristics. , reflects the wisdom and sense of humor of the Henan people, and has high artistic appreciation value. Traditional drama and folk art, as important ways of cultural inheritance, can spread historical and cultural knowledge and carry out moral education through vivid stories and performances. Many drama and folk art works themselves reflect folk life and social conditions, and are important for studying social history. important window. Overall, the artistic value of traditional dramas and folk arts in the cultural heritage of the Yellow River in Henan lies in its



maintenance and inheritance of traditional Chinese arts, as well as its contribution to promoting cultural diversity and social harmony.(Figure 29)



Figure 29 Henan Opera

Source: <http://www.studyofnet.com/326506818.html>, 2022

#### 4.3.2 Music and dance value

Traditional music such as Yu Diao and Yu Opera has an artistic style that combines classical and folk elements. These music forms inherit the elements of ancient music, such as using traditional instruments and following the melody patterns of ancient music, etc., reflecting the historical depth of Chinese traditional music. , and traditional dance art not only retains the traditional elements of ancient dance, but also incorporates the innovation and development of modern dance, vividly reflecting the spiritual core of Henan's Yellow River culture and displaying local folk culture and historical allusions. These traditional music and dance arts not only reflect the social life and emotional thoughts of the people in the Yellow River cultural area, but also reflect the cultural diversity of Henan. In local festivals, folk gatherings and other occasions, traditional music and dance forms have been widely disseminated, and have also strengthened community cohesion and cultural identity. In addition, the music and dance arts in the cultural heritage of the Yellow River in Henan help stimulate the enthusiasm of the younger generation to understand and learn traditional arts, and also provide inspiration and reference for modern art creation.

#### 4.3.3 Food culture value

From the perspective of historical inheritance, Henan's food culture carries thousands of years of history, reflecting the evolution of eating habits, cooking techniques and ingredient selection from ancient times to the present. Through the traditional cuisine of Henan's Yellow River culture, we can get a glimpse of the different cultures in history. The social scene, economic conditions and cultural exchanges of the period. And the reason why Henan cuisine is famous is because of its unique cooking methods, seasoning techniques and dish tastes. The so-called "one

dish, one style, one hundred dishes, one hundred flavors" is nothing more than this. Even in modern times, Henan chefs are constantly innovating traditional cooking methods, so that Henan cuisine always maintains its vitality. Eating habits and food preferences are often closely related to local economic conditions and material resources. Therefore, food culture is also a manifestation of economic and cultural development to a certain extent. The development of food culture can not only promote cultural exchanges at home and abroad, but also present the "color, fragrance" aesthetics and life art of the Chinese cooking system, which is of great significance for carrying forward the excellent traditional Chinese culture.(Figure 30)



Figure 30 Luoyang water mat  
Source: <http://mt.sohu.com/20151001/n422492453.shtml>, 2015

#### 4.3.4 Intangible Cultural Heritage

In the historical and cultural dimension, intangible cultural heritage such as traditional drama, music, dance, and handicrafts carry the historical memory and cultural traditions of Henan and even the entire Chinese nation. These intangible cultural heritage are important for the cultural identity and self-expression of the Henan people. approach is crucial to maintaining social continuity and cultural diversity. In the social and economic dimensions, intangible cultural heritage such as festivals and folk beliefs can directly reflect the social customs, lifestyles and values of the Yellow River Cultural Region in Henan. Through the production and sale of traditional handicrafts, cultural tourism and other activities, intangible cultural heritage plays a positive role in the development of local economy. In the dimension of art and creativity, intangible cultural heritage demonstrates human

creativity and aesthetic ability in artistic creation and expression, such as Henan opera and Henan cuisine, which are outstanding representatives of artistic creation. The continuous integration of new elements and creativity in the process of inheritance and development can show the vitality and adaptability of culture. In terms of group memory shaping, Henan Yellow River cultural heritage is the epitome of thousands of years of history and culture in Henan, and is also one of the blood sources of Chinese civilization. The protection of Henan Yellow River cultural heritage can enhance the cohesion of the people of the Chinese nation and awaken thousands of years of history. The collective memory buried deep in blood is the key to establishing cultural root identity.(Figure 31)



Figure 31 Ruzhou porcelain

Source: <http://www.yidianchina.com/netauction/auction/298160.html>, 2015



By analyzing the artistic value of Henan's Yellow River cultural heritage in architectural art, traditional drama and folk arts, music and dance, handicrafts and intangible cultural heritage. The research results show that the artistic value of Henan's Yellow River cultural heritage has multiple dimensions, not only reflected in its rich forms and unique styles, but also in its importance in inheriting Chinese culture, promoting cultural exchanges, and enriching the diversity of human culture. effect. Henan's traditional art not only provides us with a profound understanding of ancient lifestyles, ideas and artistic creation, but also provides rich inspiration and resources for contemporary art creation and cultural development. Therefore, the artistic value of Henan's Yellow River cultural heritage lies not only in its historical depth and cultural breadth, but also in its continued impact on contemporary and future society. As a precious cultural heritage of the Chinese nation, its artistic value should receive more attention, research and inheritance to ensure that this cultural wealth can be passed down from generation to generation and shine in the future.

### Summary

This chapter proposes a classification method for Henan Yellow River water cultural heritage resources based on various classification methods of world cultural heritage resources. According to the close relationship between water cultural resources and Henan Yellow River, it is divided into core areas, focus areas and There are three levels of influence in the radiation area, and various types of heritage are divided into core heritage, associated heritage and associated heritage according to their location, thereby conducting hierarchical identification of Henan Yellow River water cultural heritage resources. Based on the material cultural heritage and intangible cultural heritage formed by the historical changes of the Yellow River in Henan Province in Chapter 2, there are three types of immovable water cultural heritage, movable water cultural heritage and intangible cultural heritage based on the cultural heritage of the Yellow River in Henan Province. Elements screened and sorted out the heritage resources within the research scope of the districts and counties along the Yellow River in Henan, and tried to build a system of water cultural heritage of the Yellow River in Henan.

This study has sorted out a total of 239 items of water cultural heritage of the Yellow River in Henan, including 12 water conservancy projects, 21 ancient ruins, 23 ancient buildings, 46 stone carvings, 7 important modern historical sites and representative buildings, 64 water conservancy documents, There are 24 works of art, 13 water-related objects, 13 items of folk water conservancy literature, 5 items of performing arts, 5 items of traditional water conservancy skills, and 6 items of social folk customs and festivals. The type, age, protection level, preservation status, and specific location of each water cultural heritage were numbered and classified one by one, in order to lay the foundation for future research. When interpreting the value of Henan's water cultural heritage, it only analyzes its artistic value, and makes a preliminary explanation of some of its characteristics and important cases. It is hoped that this can arouse more experts and scholars in the field to pay attention to the value of Henan's Yellow River water cultural heritage. Pay attention and research to make it have a more complete and scientific value system.



## CHAPTER IV

### Constructing the model of gene extraction method of Yellow River culture

This chapter corresponds to research goal three: constructing a model for extraction methods of Yellow River cultural genes. Starting from the basic related concepts of molecular biology, gene expression and gene inheritance and evolution theory, we will study and compare the connections and differences between biological evolution theory and cultural evolution theory to explore the inheritance method and evolutionary path of "cultural genes". Collect and identify the cultural elements of the Yellow River cultural heritage, extract cultural genes from them, and conduct reasonable classification. The extraction of biological genes is completed according to reverse transcription of biological genes, while the extraction of cultural genes is a process of abstract analysis and reverse translation of various related cultural heritages to obtain core cultural elements. In this way, we try to extract the cultural genes of the Yellow River and realize the construction of a cultural gene system to intuitively describe the evolutionary relationship between various types of water cultural heritage, in order to discover the historical laws of the formation or evolution of the Yellow River water cultural heritage. Provide scientific reference for the protection, reproduction and sustainable development of the Yellow River cultural heritage. Discuss the development and protection of Yellow River culture from the source and process of Yellow River cultural history, providing a new perspective for the protection and inheritance of linear cultural heritage.

#### 1. Modern molecular biology theories for reference

The goal of modern biological research is to master the function of cells at the molecular level and reveal the essence of life. Since the 1940s, countless life scientists have won with their wisdom and sweat the victory of the greatest revolution of contemporary natural science —— to uncover the mystery of biological genetics. This study based on the concept of water culture and water cultural heritage, think any kind of culture has its origin, evolution, development, inheritance process and law, and the biologist Darwin advocated "species evolution" has the same effect, this section in the introduction of biological evolution at the same time, trying to summarize the theory and method, in order to reference and application in the cultural system.

##### 1.1 Biological evolution theory

In the world of biology, the following three questions about life and all biological phenomena:

How did life originate?

Why is it that "a father has a son"?

Why do different organisms in different places have identical or similar characteristics?

### 1.1.1 Development history

Until the early 19th century, most of these questions were answered only from a religious or superstitious perspective. Westerners have always believed in the propaganda of Christianity, believe that God first created flowers and trees, all things in the world, and then created the man Adam, and then took out a rib from Adam, created a woman Eve, Adam and Eve married and produced human beings. In 1859, the great British biologist Darwin (Charles Darwin) published the famous book "The Origin of Species", which established the concept of evolution. It was Darwin's theory of biological evolution that broke the traditional concept of God making man, changed the society's view of the position of human beings in the whole world, and greatly promoted the thought and development of human beings.

We need to correctly understand the theory of evolution, which does not attribute all evolution to evolution. The so-called evolution, the most scientific method is to learn from history and find out the law and direction of life in the historical facts. In ancient Greece, there were some sporadic evolutionary ideas, including the evolution without direction is reasonable, which are not systematic scientific theories. In ancient China, there was also a theoretical prototype of evolution in the Warring States Period (about 450 BC—about 375 BC) mentioned in his book "Shuo Fu" that "everything is born with me. Class no noble or cheap, the size of intelligence and phase system, overlapping food, not for. People take food and eat, is heaven for life? And gat skin, tiger Wolf meat, not the gnats born, tiger Wolf raw flesh zai ". This sentence shows that the column believes that the relationship between species is not the result of the purposeful arrangement of heaven, that creatures in nature (including man) are the products of natural development, and that man is not more noble than other animals.

Among many theoretical views, the British biologist Darwin's theory of evolution, also known as Darwinian theory, is the most classic and representative, with the most far-reaching influence on the scientific development of later generations. Darwin took part in a five-year trip around the world as a natural scientist, collecting a large number of animal and plant specimens and fossils and carefully compared, identified and studied, and asked and answered a series of academic questions, such as: Why do similar animals live in different areas thousands of miles away? Why do so many different animals gather on the same island? What is the connection between lower animals and higher animals? How do people arise about?..... By publishing a series of papers, Darwin gradually expounded the view of biological evolution, and published the epoch-making scientific masterpiece "The Origin of Species", with a large number of facts to prove the evolutionary thought of "natural selection, survival of the fittest". In this scientific masterpiece, Darwin argued two questions:

First, all species in the world are variable, organisms are evolutionary, and predict that transitional species must exist in the process from low to high. This theory fundamentally replaced the creation theory and became the cornerstone of biological research.

Second, natural selection is the driving force of biological evolution. Darwin pointed out that the variation of species is caused by the natural environment of nature and the competition for the survival of groups of organisms. There is mutation in

individuals in the same population, and those with favorable mutation that can adapt to the environment will survive and reproduce, and individuals without favorable mutation will be eliminated. If the change of natural conditions is directional, then in the course of history, after a long period of natural selection, the small variation is accumulated and become significant variation. This may lead to the formation of both subspecies and new species.

Darwin's theory of biological evolution and its materialist theory of the origin of species completely rejected the old idea of God creating all things and overthrew the myth of species unchanged. It is one of the greatest innovations in the history of biological science and has an indelible contribution.

#### 1.1.2 Theoretical content

One is that populations are the basic unit of biological evolution. The basic unit of biological evolution is the population, not the individual. Populations refer to the sum of individuals living within the same region. A species usually includes many populations distributed in different locations. Individuals in each population have basically the same genetic basis, but there are also some individual differences, so the population is generally hybrid, and the existence of heterosis means the existence of alleles. All the genes contained in the individual organisms that can reproduce again become the gene pool of the population. The ratio of a gene to the total number of alleles in a population gene pool is called the gene frequency. If the gene frequency of the population remains relatively stable, the genotype of the population also remains stable. But in nature, population gene frequency changes are inevitable, so genotypes gradually change.

Second, the biological world is discontinuous. The predominant species present are highly variable when recording studies span a longer historical period. Most of these changes are caused by environmental factors, such as earth change, temperature in specific regions, changes in rainfall and changes in climate conditions, etc. These external conditions will be reflected in the form of "natural selection pressure" in the generational inheritance of organisms. It is under this "natural selection pressure" that new species are being born, and old species that are no longer environmentally compatible are dying. Darwin wrote in the *Origin of Species*: for every animal and plant population, because there are always many more individuals who are likely to survive, the struggle for survival is long and permanent. If some individuals accidentally acquire a mutation favorable for themselves, they will gain the upper hand in the struggle between life and death, and thus survive. According to genetic principles, any surviving individual tends to amplify its new, modified traits to maintain a survival advantage.

Third, geographical isolation is a necessity for speciation. Geographic isolation is due to some geographical barriers, the river, mountains, desert, strait and long distance can separate population, make they can't contact with each other, stopped the gene communication between different species, a mutation in a population will not spread to another population, make different populations evolve in different directions. Long geographical isolation exposes two populations to different environments, each accumulating variation.

## 1.2 The hypothesis of cultural evolution

Through the above words, we basically understand the definition, development history, theoretical content and theoretical defects of evolution. In today's era of scientific explosion, evolution has been valued and developed as an important branch of biology, and its ideas and principles have been widely used in other academic fields, and formed many emerging interdisciplinary disciplines, such as evolutionary finance, evolutionary securities, evolutionary economics and so on. Based on the perspective of cultural heritage protection, this study boldly puts forward the hypothesis of "cultural evolution", and the first innovative study crosses the theory and research methods of evolution into the field of heritage protection, hoping to provide a new idea and method for the protection of cultural heritage.

Before exploring the hypothesis of cultural evolution, we should also raise three questions related to culture and all cultural products:

What is the origin of the cultural and cultural phenomena that we are now exposed to or see?

Why are there the same or similar cultural elements or cultural phenomena in different regional cultural backgrounds?

What is the connection and difference between the evolution of culture and the evolution of organisms?

### 1.2.1 Cultural evolution in different contexts

Cultural evolution under the background of philosophy originated in ancient Greece. thinkers speculated on the origin and development of the universe, and also made philosophical thoughts about the nature and purpose of the universe. After the origin of species published in 1859, on the basis of Darwin's biological evolution gradually formed the theory about human cultural evolution, it is the core content of the basic psychological consensus, gradual evolution, natural selection, the survival of the fittest, with its strong self-consciousness as the leadership of the second half of the 19th century until the early 20th century era thought pioneer. As an important theory of philosophical anthropology, cultural evolution was the guiding ideology and theoretical framework of anthropology at that time. The theoretical process of cultural evolution from germination to formation reflected the historical process of human beings thinking about their own cultural destiny.

The content of cultural evolution in the background of human culture is the same as the view of "evolution" as the theory of biological evolution. Just the difference between the two is: biological evolution of evolution is a natural process, that is to say in the evolution process is not "people" and "people" consciousness, and the cultural evolution reflects "evolution" process, not only have "people", and "people" consciousness, more emphasis is the evolution of "people", to people, to the natural person, to the society, to civilized people. From this point of view, "cultural evolution" facilitates the obvious distinction of "biological evolution".



### 1.2.2 Content of cultural evolution hypothesis

The theory of cultural evolution in this study is put forward under the background of cultural heritage conservation. In order to distinguish between philosophical and anthropological theories, it is assumed after cultural evolution and also used for criticism and correction by peers and experts. Cultural evolution hypothesis also follows the Darwin's evolution advocated "evolution" view, think every country, every nation, every region has its own unique cultural, the culture on the appearance although the phenomenon and expression, but they should have homology, and should also have time dimension and space dimension, concrete can be divided into the following three aspects:

First, the "cultural gene" is the basic unit of cultural evolution. A region often have a dominant culture system, sometimes with a particular factor, this particular factor can be a common national composition, similar natural conditions, similar political policy, and even a series of drainage or traffic channel, can also lead to a set of large cultural system between several regions. If the cultural system is too complex and redundant, it can also be divided into cultural sub-systems according to the connotation characteristics and expression forms of the culture. Each culture (sub-system) system is composed of several cultural populations, each of which has the same or similar genetic basis and population structure

Whether stability is subject to whether the "cultural genes" have external interference in the process of evolution, inheritance and development. In fact, after the change of time and spatial dimensions, the vast majority of "cultural genes" will have mutations to different degrees, so there will be certain differences among cultural populations.

Second, large cultural systems are relatively stable structures, while cultural populations have discontinuity. Populations change substantially when our tracing studies of a certain culture span a longer temporal dimension or a larger spatial dimension. Causes this change of many factors, such as each historical period of dominant ideology and ideology, aesthetic appeal, science and technology development level, social, political and economic, and different regional space national composition, natural geographical environment, climate conditions, economic development level, customs, etc., these objective factors can lead to "cultural gene" in the process of spread "open" or "closed". On the contrary, when the unsuitable environment appears in the external conditions, the "cultural gene" is "shut off", then the cultural population where the "cultural gene" will be forced to stop evolution, and the interruption and Northern Dynasties will occur. Only when the external conditions are appropriate, the "cultural gene" will "open" again to participate in the evolution of the population. This is also in line with the "natural selection pressure", which can be called "cultural selection". Only under this selective pressure can new cultures emerge constantly, and the old cultures that are not suitable for social development will be transformed or directly eliminated. Only by adhering to the law of "survival of the fittest and survival of the fittest", can we promote the continuous progress of human culture, and the society will be more civilized. The same is true of foreign culture, when the semi-feudal, semi-colonial period, foreign culture invasion, and Chinese culture collision, two coexistence situation: one is the foreign culture strongly felt the impact of Chinese culture and gradually absorb the

advanced part of Chinese culture, thus integrated into the foreign culture; on the other hand, Chinese culture will gradually familiar with foreign culture, and choose the Chinese culture, to form a new model, such as in the survey technology, according to records, the Guangxu four years (AD 1878), the Yellow River has adopted the metric altitude to observe the rise of water level. This shows that western measurement techniques, had been applied on the Yellow River in the 1870s. Later, the application of this new measurement technology became more and more extensive. In the fifteenth year of Guangxu (1889), under the supervision of Wu Dacheng, the governor of the river, surveying the Yellow River map of Henan, Zhi and Shandong provinces, and began to draw the topographic map of the lower Yellow River with foreign mapping technology, which perfectly reflected the scene of cultural integration of Chinese and Western elements.

Third, the natural geographical conditions cause the separation of different regions, which also creates the formation of different cultural systems. Especially in ancient times, when transportation was underdeveloped, natural rivers, mountains, deserts and straits were the main factors blocking the spread of cultural genes. Various regions could not contact each other, so cultural populations would not spread to each other's regions. The long-term barrier will make different cultural populations evolve in different directions under the suitable regional environment. With the accumulation of different variation factors, the same cultural populations will be separated more and more distant. This can also be a very good explanation for the Chinese people of the Chinese nation

The living habits between the south and the north; the application of the same Chinese vocabulary will produce positive and negative concepts due to regional differences, and may form certain cultural conflicts.

## **2. Analysis of cultural and gene theory**

In the process of transmission and development of human culture, the same situation as the biological genes will also occur. Some human cultures have strong ability to adapt to the social environment and natural environment, so they can continuously inherit and develop, and maintain the uniqueness of their own culture; at the same time, in the spread and development of some human cultures, the social environment or natural environment has changed. In order to adapt to the new environment, these cultures will also change like biological genes, so that the culture can be better inherited.

In the 1950s, foreign scholars have begun to attach importance to the spread of culture and its development of this phenomenon, so the concept of "cultural gene" gradually studied and put forward, in 1952 by the famous American human culture scientist Crober and Clark hong in its published "cultural concept" of cultural gene concept of new understanding and definition.[51] They explicitly put forward in this book, culture is not only a kind of human internal, invisible behavior organization and constitute, human culture should also have dominant characteristics (the characteristics of external characteristics), it is equivalent to organisms or external traits, and the external characteristics of human culture through a particular symbol. The statement between Crober and Clarkhong began to attract the attention of scholars, and the question of culture in the transmission process began to be discussed

by scholars, the inheritance and variation of different biological traits depend on biological genes, and the biological genes form unique traits through transcription and replication, and complete the inheritance and development of organisms from generation to generation, and the same. In the following twenty years, the famous British scholar Dawkins published the book "Selfish Gene", which clearly proposed the concept of "Meme (mystery mi)" for the first time, and took it as the minimum unit of culture; "Meme" itself comes from the Greek semantic memory, and "Meme" means cloning in other languages, which very complies with the definition of the minimum unit of cultural transmission and development. Susan Black Moore, a student of Richard Dawkins, explains the representation and phenomenon of "Meme" in different cultures in more detail, and also specifies in the book that "Meme" is identical to biological genes and plays a similar role with biological genes in the development of culture. Later, a large number of foreign scholars have supplemented this concept and added their own understanding.

## 2.1 Origin and development of cultural genes

The term "gene" was originally derived from biology and is the basic genetic unit guiding biological traits. The essence of "biological genes" refers to the DNA chain carrying biological genetic information that directs protein synthesis. DNA, also known as deoxyribonucleic acid, is responsible for the expression of a biological trait, usually located on chromosomes in the nucleus; chromosomes are often homologous chromosomes, the two genes are a pair of alleles. In the process of guiding the expression of a trait, if one of the genes plays an inhibitory role on the expression of the other gene, the suppressed gene is called the recessive gene and the other is the dominant gene.

As far as the "gene" itself is concerned, it has the dual attributes of material (mode of existence) and information (fundamental attribute). Materiality means that a gene is a real substance, which is a double helical polymer; its most fundamental function is to carry biological genetic information. In addition, genes also have other properties during inheritance and expression, such as heritability, stability, variability, unidirectional transmission, and so on. Genetics: the basic characteristics of genes. In the process of biological reproduction, genes are transmitted to the parental fertilized eggs along with the chromosome in the sexual cells to realize the transmission of genetic information. Stability: a gene has a set of precise genetic codes to help make it more accurate and stable in the pairing process of base pairs. Variability: In the entire human system, gene replication and transcription processes are very frequent, hundreds of millions of dollars, at the same time under the influence of the internal and in vivo environment, more or less errors will lead to gene sequence changes, and then affect the expression of subsequent traits. Unidirectional transmission: the transmission process of biological genes to the offspring usually realizes along with the parental reproduction, and this process is unidirectional and irreversible.

Most biological genes only need to be inherited through self-replication, and the mutation process also mostly appears in the process of self-replication and self-inheritance. The "inheritance" of cultural genes (i. e. cultural inheritance) process and "mutation" (i. e., cultural variation) are restricted by many factors. Firstly, culture is created by people and required by people; the transmission and development of culture gradually adapt to different social and natural environment; the interference of

inheritance and development of the culture; its expression is formed by the local unique regional environment; cultural genes will not perish, some will enter "dormant" state, waiting for the surrounding environment to change and show their vitality again. Therefore, cultural genes have the basic characteristics of demand, adaptability, instability, scalability and periodicity.

Demand means that culture is produced to meet the needs of "people", as the basic unit of culture, is also to meet the needs of "people"; adaptability is

In the long course of time, the environment is also changing. Like biological genes, the cultural products we can see now must have highly adaptable cultural genes; uncertainty is that biological genes are only unidirectional in the process of inheritance and transmission, and cultural genes have uncertain feedback in the process of inheritance and transmission. Extensibility is manifested as the same cultural gene, and interacts with different regional environmental conditions to produce different forms of material expression. This phenomenon is expansibility. Cyclity refers to the phenomenon that the genes of the old and new cultures will alternate in the process of spreading the culture and its products. The old cultural genes will not completely disappear just like biological genes, but enter a state of "dormancy" and wait for the change of the environment.

There are many controversies on the definition of cultural gene by Chinese scholars. "There are both philosophical scholars, such as Liu Changlin, discussing the theory of social and cultural evolution; cultural historians, such as Liu Zhihui, who discuss the significance of cultural genes from the perspective of cultural inheritance; and ethnic scholars and cultural anthropologists, such as Xu Jieshun, who study the natural factors in human cultural structure through cultural genes". BiWenbo under the definition of "cultural gene", represents the domestic most scholars: "lies in all kinds of cultural phenomenon, and has the time and space to inheritance and ability of basic idea or basic spirit, and has the ability of cultural expression or form of basic style, called 'cultural gene'". In recent years, more and more scholars from literature, philosophy, history, law, political science, ethics, communication, architecture, medicine, economics, geography and many other disciplines have adopted the concept of "cultural gene" to explain and explain the phenomena and problems existing in their research field. It greatly opens up the research space of "cultural gene" and provides a new perspective for the protection and inheritance of cultural heritage in China.

As a basic unit in the process of cultural dissemination and inheritance, the cultural gene plays an important role in the cultural system. As mentioned in the "meme theory", the cultural gene itself is a container of concept and concept storage, and the behaviors and activities needed for the expression of ideas. Therefore, according to the specific existence form of cultural genes, they can be divided into two categories: "consciousness concept" and "gene carrier". Among them, "consciousness concept" is the essence of cultural gene, and "gene carrier" is the concrete expression of cultural gene. "Consciousness concept" exists in the human brain, which is abstract and invisible. It contains people's view and judgment of the world, condenses the cultural connotation of the world; "gene carrier" is the intermediary of "cultural gene" to express and show itself to the outside world.



According to the above content, it can be learned that "cultural genes" are similar to "biological genes", but also have two basic attributes: "immaterial" and "information". Among them, "immaterial" is determined by the essence of "cultural gene". As a concept of consciousness, it is abstract in the human brain; "information" means that "cultural gene" contains many cultural information, which is also the basic nature that makes culture can be spread and inherited. In addition, "cultural genes" also have other characteristics in the process of expression and transmission, such as heritability, variability, selectivity and multi-directional transmission. Genetics: In the advancement of history, cultural genes carry the cultural characteristics of a region and a nation, and are continuously transmitted between times and between people, providing necessary conditions for the preservation and spread of these cultural characteristics. Variability: similar to the "biological gene" in the process of genetic influenced by the internal and external environment of the variation of "cultural gene" in the process of transmission will be affected by the outside world, make information deviation, for example when a person tells a story, another person because of memory, information processing, language transformation and make the story changes. Selective: The transmission of "cultural genes" can be accepted by the children, and they will choose according to the merits of the cultural genes. Multi-directional transmission: "cultural genes" have multiple transmission routes in the transmission process, which can be transmitted from one object to multiple objects, or from multiple objects to one object, etc.

## 2.2 Comparison of the genetic characteristics of cultural genes and biological genes

Through the analysis of "biological genes" and "cultural genes", it can be learned that they have many similar or different characteristics in the transmission process. In order to more intuitively understand the characteristics in the transmission process of "cultural genes", they can be horizontally compared with "biological genes" (Table 12).



Table 10 Comparison table of biological genes and cultural genes

characteristic	Biological genes	Cultural gene
each other be similar particular nature	Genetics: Both carry cultural information, transmitted from parental to offspring, which is also the most important trait Variability: both in the transmission route, due to the environmental influence, and then cause the cultural gene changes Information: the most fundamental characteristics of the two, only by carrying information, transmission can have practical significance	
no same particular nature	Matstance: essentially is deoxyribonucleotide polymer Stability: controlled by the genetic code, the transmission process is relatively accurate Unidirectional: can only be transmitted from parent to offspring, irreversible	Imateriality: abstract, intangible Selective: Children can choose on genetic information Whether to accept Multicotropy: one to many, many to one or many to many

### 2.3 Principles for the identification of cultural genes

The study of cultural genes plays an important role in excavating the core elements of the Yellow River cultural heritage. However, to truly understand the cultural gene of the Yellow River cultural heritage, it is much more complicated than understanding the basic characteristics of the Yellow River cultural heritage. In addition to its external expression, the understanding of the cultural genes of the Yellow River cultural heritage should also have a deep understanding of the internal causes of its formation, such as religion, culture, nature, history and so on.

Combined with the connotation of "genes" in biology and according to the principle of differences in geography, generally speaking, the cultural genes of the Yellow River cultural heritage can be considered from four aspects: internal uniqueness, external uniqueness, local uniqueness and overall advantage (Table 13). Among them, the internal uniqueness principle refers to the unique internal characteristics of the Yellow River; the external uniqueness is the unique external characteristic of the Yellow River; the local uniqueness refers to the important elements that the Yellow River but does not exist in other areas; the overall superiority principle refers to the elements that are not unique to the Yellow River, but more dominant than other areas.

*Table 11 Principles of Henan Yellow River cultural gene determination*

*Source: the author homemade*

The principle of gene determination of the Yellow River	The principle of inner uniqueness	The unique inherent characteristics of the Yellow River
	The principle of external and uniqueness	Unique external characteristics of the Yellow River
	The principle of local uniqueness	An important element unique to the Yellow River but does not exist in other areas
	The principle of overall advantage	It is not unique to the Yellow River, but more dominant than other regions.

## 2.4 Model structure for the transmission of cultural genes

### 2.4.1 Classification of cultural gene carriers

As mentioned above, cultural genes are divided into two parts: "consciousness concept" and "gene carrier". As the essence of "cultural gene", "cultural gene", the inheritance and expression of "cultural gene" must be completed by relying on the "gene carrier". In the field of cultural genes, the three-level theory of cultural structure can be divided into spiritual culture as internal recessive genes, and social culture and material culture as dominant genes. The explicit cultural genes are interpreted as the cultural elements that exist in the cultural heritage and can be directly felt by the external society; the implicit cultural genes are interpreted as the cultural logic contained in the cultural heritage. There are many forms of "gene carrier", which can be divided according to the different forms and states of the carrier, namely dominant, internal recessive and social culture. Among them, the explicit carrier of cultural gene refers to the material carrier with actual form and created and established by people, such as water conservancy projects, ancient buildings, stone carvings, etc.; the recessive carrier of the cultural gene does not have actual form, but can record and display cultural information through other non-material ways, such as governance culture, national culture; the social carrier of cultural gene refers to a series of cultural activities formed under the guidance of consciousness, such as sacrificial activities, folk beliefs, festival celebrations, and technology.

### 2.4.2 Architecture of cultural gene transmission mode

Usually, things need three parts in the process of transmission: "input", "output" "and the" medium " between the two. The whole transmission process is a cyclic process. In the transmission process of the "cultural gene", the "conceptual consciousness" as its essence needs to help the "gene carrier" to realize the transfer from the abstract state to the concrete state. Among them, "concept consciousness" is the "input end" of the whole transmission process; "human brain" provides a place for the existence of "concept consciousness" and also provides guidance for the specific "gene expression", so "human brain" is the "medium" of the whole transmission

process; under the guidance of "human brain", people create the "cultural gene carrier" through the real behavior consciousness "and it is the" output end " of the whole transmission process. Of course, there are often many changes throughout the transmission process. Due to the external environment and social technology Such influence, "culture" in the process of transformation into "gene carrier" will be updated, the new "gene carrier" after "brain" analysis and identification will form a new "concept consciousness (culture)", from "concept" to "carrier" to "concept" is the process of cultural gene transmission process, the cycle of "cultural gene" vitality greatly enhanced.

### **3. Cultural gene extraction method of "reverse transcription"**

#### **3.1 Cultural gene identification pattern**

In the aforementioned domestic research progress of cultural genes, this paper summarizes two major recognition modes based on the current classification results of cultural genes, namely: analytical classification method and operational classification method.

In mathematics, the analytical method is a mathematical method that expresses the parameters of natural attributes with variables and expresses the action relationship between the parameters of each attribute with formulas. Mathematically, the field of cultural heritage protection also has its own analytical method. Wang Linlin explored the analysis method of urban landscape pattern. The cultural gene analysis method referred to in this paper refers to the method of exploring the attribute parameters of cultural genes from an abstract concept or concrete characteristics from the inside out, etc. The final result is to obtain the connotation index of cultural genes.

At present, most studies on cultural genes in China are divided to material and culture according to their presence status, dominant and recessive, according to their hierarchical structure, chain and shape, main genes, attached genes and importance to mixed genes. The analytical classification method is oriented to the research basis of cultural gene objects with natural limitations. In the process of its division, the following problems also appear: lack of hierarchy, cultural genes have macro, medium and micro scale levels in terms of material form, and the current analytical division mode is the embodiment of this characteristic

There are still deficiencies, which makes the division often mature for micro landscape and architectural level, and the lack of symbolic understanding, such research often falls on the representation of material and non-material, and the internal rules of its composition are easy to be ignored.

In contrast, the operational classification method is more comprehensive, among which the more typical is the feature deconstruction method proposed by Hu et al. In 2015, hu most use the characteristic deconstruction method classified landscape genes as environmental genes, architectural characteristics, cultural characteristic genes and layout, the author applied to the cultural gene division found that it still has certain limitations, the Yellow River as the dynamic evolution of the organism, should be based on the perspective of historical development analysis of historical culture, historical events give the relevant historical connotation of the Yellow River. In general, the Yellow River has the constituent characteristics of the integration of



multiple attributes of "ecology- -form- -culture- -history", but the division of only cultural characteristics is obviously difficult to highlight the constituent attributes of the Yellow River, so the grasp of the cultural gene of the Yellow River cultural heritage should clarify the constituent characteristics of history.

### 3.2. Construction of cultural gene extraction method for "reverse recording"

The determination of the type classification and identification method of cultural genes is the focus of the current cultural genes from abstract concepts to the research stage of concrete gene extraction and relationship construction. In view of the lack of hierarchy and symbolic understanding of the existing analytical classification methods, and the lack of classification characteristics of the operational classification methods, this paper tries to improve the identification of cultural genes, and intends to construct a more universal and applicable extraction method. Based on this, this paper proposes that the "reverse recording" analytical method can be used to identify cultural genes (Figure 32).

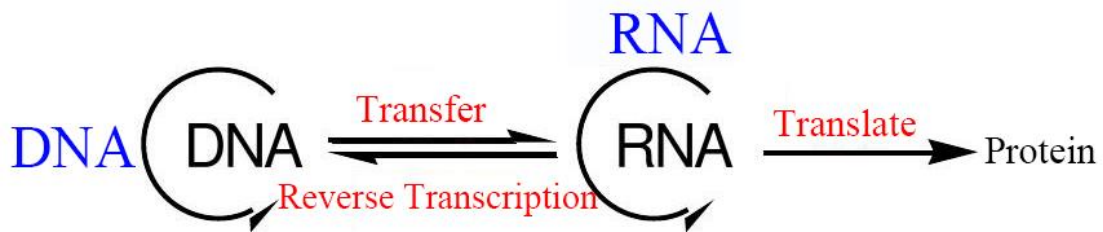


Figure 32 reverse transcription recognition map

Source: made by the author, 2023

"Reverse transcription method", that is, the cultural form is pushed back to the cultural gene, and the direction of the genetic information flow in the process of "reverse transcription" refers to the process of "internalization" of the cultural gene carrier into the gene meaning. Therefore, this paper using the "reverse recording method", based on practical research on the Henan Yellow River cultural resources characterization and related laws, thus pushing, dig out the cultural gene, establish a more detailed gene carrier culture gene index system, then according to the principle of "merge close category" will classify each gene, after image extraction into cultural gene family and type of cultural gene group, population category, and complement the transcription process, finally classified as a complete cultural gene system.

Compared with the existing methods, the method of "reverse transcription" extraction method has certain advantages, and the process of "reverse transcription" from specific vector to gene subject category has good identification and practice. And the process of reverse transcription is more inclusive and scalable, so the extraction of cultural genes will be more perfect.

In the process of biological gene extraction, reverse transcription takes RNA as the template, and the catalytic DNA synthesis by reverse transcriptase to obtain biological genes. Feng Pei'en et al. first proposed the product gene extraction method based on the reverse engineering,[20] This kind of "reverse search" idea has been applied in the product gene extraction. Tailigang and Zhong Tingxiu further pointed out the extraction method of product gene reverse recording in the thinking of "reverse search". In biological genetic engineering, the coding and arrangement of base pairs A, G, C, and T determine the composition of biological genes. In the case of known proteins, access of biological genes can be obtained by reverse transcription. Similarly, the product genes are composed of three basic elements: function, principle and structure. With known product examples, the acquisition of product genes can be achieved by reverse transcription. The process of reverse transcription is shown in Figure Figure 33.

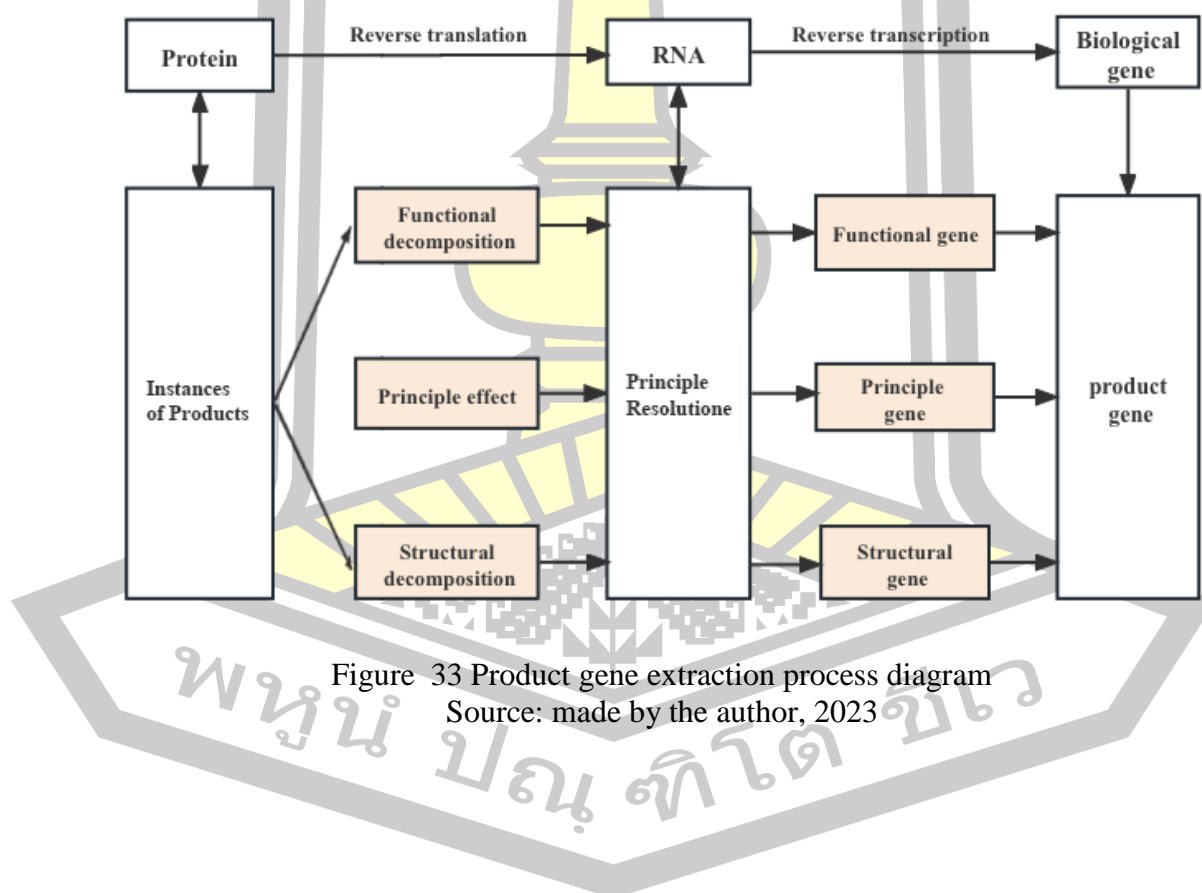


Figure 33 Product gene extraction process diagram

Source: made by the author, 2023

### 3.3 Methodological Conceptualisation of the Countercultural Gene

The extraction of cultural genes is similar to the method of biological gene extraction method. The reverse transcription process of product gene extraction is essentially to analyze the product examples and extract the product genes from them. Cultural elements are similar to the "original understanding" in the process of product gene extraction, and the reverse recording process based on "original understanding" is equivalent to the process of concentration and refining of cultural elements. Cultural genes are contained in cultural elements, which are the concentration and essence of cultural elements. Compared with the reverse transcription of the product genes, the reverse transcription of the Yellow River cultural heritage cultural genes can be obtained through the analysis of the elements of the Yellow River cultural heritage. Yellow River cultural heritage elements is equivalent to product example in the process of gene extraction, abstract analysis of a cultural heritage makes its cultural elements with different functions of the Yellow River cultural heritage "original understanding" (equivalent to biological genetic engineering RNA), through the enrichment and refining of cultural elements (equivalent to biological genetic engineering reverse record) get the corresponding cultural gene, process as shown in figure 34.

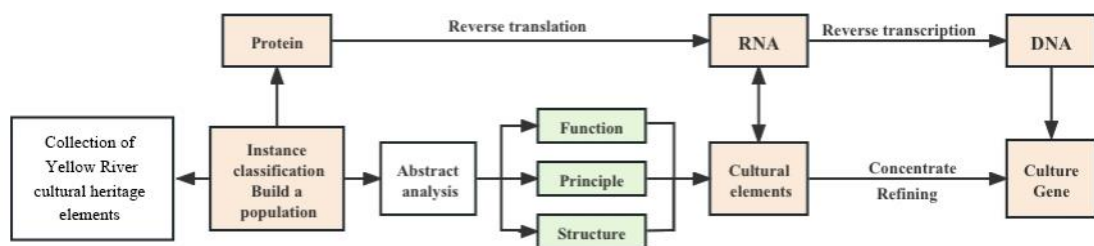


Figure 34 Process diagram of cultural gene extraction of the Yellow River Cultural Heritage

Source: made by the author, 2023

## 4. Extraction of the cultural genes of the Yellow River cultural heritage

### 4.1 The Yellow River cultural heritage elements excavation

In the collection of example elements of the Yellow River cultural heritage, "Yellow River" should be taken as the key word, and the correlation and correlation degree of a certain cultural heritage and "Yellow River" should be taken as the key index. Including Henan region within the scope of the Yellow River water transport system and along the distribution, reflect the Yellow River water conservancy project at the national level and historical status, and has the relevant archaeological evidence, physical, scientific data and the exact references, directly related to the development of the Yellow River, has the universal value of relics and relics, its connotation is composed of the following three aspects. Firstly, the Yellow River

water conservancy project and related material cultural heritage include the Yellow River river body, water source, water conservancy and shipping facilities, and the other material cultural heritage related to the history of the Yellow River, including some immovable and movable cultural relics related to the Yellow River. These immovable cultural relics are either born of the Yellow River, or are closely related to the Yellow River, such as the spread of culture along the Yellow River, and the important traffic status of the Yellow River; the movable cultural relics are mainly the literature heritage in the movable cultural heritage. The third is the intangible cultural heritage related to the Yellow River.

Through literature review, field research, and personnel visits, The representative cultural heritage physical elements of the Yellow River were collected as detailed as possible, Mainly involves, river heritage, irrigation engineering heritage, canal engineering heritage, flood control engineering, shuicheng site, water settlement sites, water conservancy engineering and facilities, water culture temple sites, water altar temple, water culture, water culture cliff stone carvings, water conservancy inscriptions, important water conservancy site, water conservancy facilities and appendages, water conservancy map, special water conservancy works, local Chronicles, the Yellow River, the Yellow River, water conservancy calligraphy, water conservancy paintings, ancient water conservancy machinery, water conservancy myth, water culture, water conservancy story, water conservancy songs , Water conservancy folk songs, water culture games, hydraulic construction technology, water conservancy equipment production, water culture utensils production, folk worship and belief, etc.

#### 4.2 Categorisation of element examples

More than 200 collected examples of the Yellow River cultural heritage elements were classified, and the cultural system of the Yellow River was decomposed into cultural system—subcultural system (system)—cultural population—subcultural species (group)—cultural gene family—cultural gene protein. According to the relationship between form and superior and subordinate, it is divided into three levels: main class, subclass and subclass, and conducts cultural gene coding. In terms of function and form, the element examples of the Yellow River cultural heritage can be divided into two categories: examples of material elements and spiritual elements. The examples of spiritual layer elements have obvious internal recessive characteristics, while the examples of material layer elements have more obvious explicit characteristics.

Considering comprehensively, the cultural elements are closely related to the Yellow River in terms of history, geography and function, and the explicit cultural elements are divided into explicit cultural elements and social cultural elements. On the other hand, the implicit cultural elements are usually hidden in people's behavior and thinking mode of people, which are the values sublimated by the people of all ethnic groups in the historical process and brilliant achievements of governing the Yellow River, transforming nature and realizing self-development. Thus, three main categories of Yellow River cultural heritage elements are formed, namely, examples of explicit cultural elements, examples of internal recessive cultural elements and examples of behavioral social cultural elements. The instance content types of explicit



cultural elements are diverse, through observation found that they mainly include hydraulic culture, site culture, architectural culture, stone carving culture, ancient literature culture, traditional culture and art. And 6 subclass cultural elements. Internal implicit cultural elements mainly include two subclass cultural elements of governance culture and national spirit, and social and cultural elements mainly include art culture, folk culture, folk belief culture, literature and art culture, four subclass cultural elements. The cultural elements of each subclass exist in the next level of category, forming sub-subclasses. Specific examples of cultural elements can be divided according to the subordinate relationship between superiors and subordinates. For example, the subcategory of hydraulic culture elements mainly include subclass elements of irrigation engineering heritage, canal engineering heritage and flood control engineering heritage, while the subcategory of folk water conservancy literature and cultural elements mainly include subclass elements of water conservancy myths, water culture legends, water conservancy stories and water conservancy ballads.

According to the material and spiritual function standards, the examples of cultural elements in the Yellow River section in Henan province can be divided into two main categories: examples of internal implicit cultural elements and examples of explicit cultural elements. On this basis, according to its correlation with the Yellow River, it is divided into two parts, according to the circle theory. The explicit cultural element instance consists of two parts. First, the ancient river course formed by the Yellow River itself and various heritage elements directly acting on the Yellow River are the Yellow River water conservancy project and related material cultural heritage, including the Yellow River river body, water source, water conservancy and shipping engineering facilities; second, the water cultural heritage formed in the practice but not directly acting on the Yellow River, including some immovable cultural relics, movable cultural relics and intangible cultural heritage related to the Yellow River. As mentioned above, cultural genes can be divided into three carriers: dominant, internal recessive and social culture.

The explicit carrier refers to the material carrier directly acting on the cultural heritage of the Yellow River, including cultural relics, sites, etc.; the implicit carrier refers to the social culture, including all kinds of people, events and ideas that have an influence and effect on the cultural heritage of the Yellow River. The social culture contains two different groups: one is the Yellow River conservancy participants, including the units and individuals directly related to the Yellow River, the Yellow River governance participants and their descendants; the second is the Yellow River conservancy beneficiaries, including all kinds of people formed in the practice of yellow control, or the intangible cultural heritage formed in the activities of yellow control.

Comparing the cultural genes of the dominant and internal recessive carriers, the author found that the two elements have obvious differences in the carrier form, external expression and acting object. First of all, the explicit carrier refers to the material carrier directly acting on the cultural heritage of the Yellow River, while the internal implicit carrier refers to the social culture related to the Yellow River but not directly acting on the cultural heritage of the Yellow River. Secondly, the dominant carrier shows a material form, while the internal recessive carrier shows a mental form. Therefore, there are significant differences between the dominant and internal

implicit carriers in terms of material properties, external manifestations and acting objects.

#### 4.3 Population Construction of Yellow River Cultural Heritage Elements

An instance population is a set composed of elements of the same type. According to the above classification, the calendar Yellow River cultural heritage and the element instance population are extracted. The Yellow River example population of cultural heritage elements consists of internal recessive population, dominant population and social and cultural population. Among the external dominant population, there are six ethnic groups: hydraulic engineering culture, site culture, architectural culture, stone carving culture, ancient literature culture and traditional culture and art.

Hydraulic culture refers to the inheritance and development of water conservancy projects and related technologies related to the Yellow River. As the mother river in China, the management and utilization of the Yellow River plays an important role in the development of Henan province. Site culture refers to the rich historical sites of the Yellow River section in Henan province, and these sites have witnessed the evolution and development of human society. Architectural culture refers to the unique architectural style and architectural skills of the Yellow River section in Henan province, reflecting the wisdom and creativity of the local people. Stone carving culture refers to the words and patterns carved on the rocks that record historical events and cultural traditions. Ancient literature culture refers to the ancient documents preserved in the Yellow River section of Henan province, which is of great value for the study of history and culture. Traditional culture and art include painting, music, dance and other art forms, representing the aesthetic concept of the local people and creative ability of the local people.

The social and cultural population includes four ethnic groups: traditional art culture, folk culture, folk belief culture and literature and art culture.

First of all, the traditional art culture in the social and cultural population refers to those cultural forms that are passed down from generation to generation and have unique skills. For example, in the Yellow River cultural heritage in Henan province, traditional handicrafts such as ceramic making, silk textile and wood carving all play an important role. These techniques reflect not only the wisdom and creativity of the local people, but also their close connection with the natural environment.

Secondly, folk culture refers to a series of customs, festivals and traditional activities formed by people in their daily life. In the cultural heritage of the Yellow River in Henan province, folk activities such as farming culture, dragon and lion dances and temple fairs are all important cultural elements. These activities not only enrich people's lives, but also pass on the historical and cultural memories.

Third, folk belief culture covers people's belief in and worship of gods, religions and supernatural forces. In the Yellow River cultural heritage of Henan province, Taoism, Buddhism and folk beliefs all occupy an important position. These belief systems not only affect how people think and act, but also constitute the unique local spiritual culture.

Finally, literature, art and culture refers to the artistic creation expressed in the form of words, music, dance and drama. In the Yellow River cultural heritage of Henan province, ancient poetry, quyi performance and traditional drama are all important

cultural elements. These art forms not only show people's aesthetic pursuits, but also record historical and social changes.

In addition to the social and cultural populations, the governance culture and the national spirit in the internal recessive population are also the cultural genetic elements worth paying attention to. Governance culture involves the norms and values of the government, laws and social organizations, while the national spirit emphasizes people's great feelings for the nation. Governance culture refers to the norms and values of a specific society or group for the government and the law. It reflects the way a society governs, the distribution of power, and the handling of public affairs. In the inner recessive population, the formation of governance culture is influenced by various factors such as history, geography and economy. Different inner recessive populations may have different governance cultures that are critical for the organization and operation of inner recessive populations. For example, some implicit populations may focus more on collectivism and community cooperation, while others may emphasize individual freedom and rights protection. The existence and inheritance of governance culture provides a code of conduct and social order for the internal recessive population, and promotes the unity and development of the internal recessive population. National spirit refers to the identity and belonging of a person or a group to their national identity. It is people's unique culture, history and tradition of their own nation. In the implicit population, the national spirit is crucial for the identity and cohesion of individuals and groups. It strengthens the connections and interactions among members of the internal recessive population by emphasizing common values, beliefs and customs. National spirit is also an important driving force for the inheritance and protection of its own culture. By maintaining and inheriting the national spirit, the internal hidden population can better maintain its own uniqueness and diversity, but also promote the diversified development of the society.

#### 4.4 Population analysis: extraction of cultural elements

The specific process of population analysis is to extract cultural elements through abstract analysis of population elements, and complete the inverse translation process from instance to element, which mainly involves three levels of function, principle and structure.

Hydraulic culture is directly built on the Yellow River, and directly acting on the Yellow River water cultural heritage. Functionally, it reflects the water conservancy heritage formed in the practice of controlling the Yellow River, and it is the most important cultural element directly related to the development process of the Yellow River.

Ancient site culture refers to the place where ancient people have cultural relics in the activities of Yellow control. Compared with other cultural factors in the instance layer of explicit cultural elements, its function, principle and structural characteristics have a low correlation effect with the cultural heritage of the Yellow River in Henan province, and it is difficult to exist as "original understanding".

Some ancient architectural culture is formed by water conservancy management, and some are the products of water worship, and water worship is the extension of water conservancy management to the society. In terms of function, an important part of playing the role of a legacy, a landmark historical building that

witnessed the great influence of the Yellow River in Henan province, and witnessed important activities along the Yellow River in geographical relations.

The stone carving culture is The landmark historical relics that witness the great influence of the Yellow River cultural heritage, in the function An important part of playing the role of a legacy, And witness important activities along the Yellow River.

As an auxiliary peripheral culture, the modern and modern important historical sites and representative buildings have a relatively weak functional effect on the cultural heritage of the Yellow River. The identity positioning of "original understanding" is slightly far-fetched and can be ignored to some extent.

Ancient literature culture refers to all kinds of materials recording the changes and governance history of the Yellow River, reflecting the important influence of the cultural heritage of the Yellow River on the governance of the Yellow River. As an important cultural resource, it is an important "original understanding".

Literature, art and culture is a kind of language art form expressed through words. The literature and art of the cultural heritage of the Yellow River in Henan province record the history and humanity of the Yellow River section in Henan province, which is a very important carrier for others to facilitate their cultural interpretation. The spiritual layer belonging to the cultural structure is the core component of the Yellow River cultural heritage system in Henan province.

Folk culture is usually based on customs and habits, and the characteristics of different regions lead to different production and living modes. Therefore, people's activities are dominated by the local culture, but also provide a carrier for the transmission of local culture. Folk culture is an important product reflecting the generation and development of the Yellow River cultural heritage in Henan province.

Traditional art culture is the spiritual layer of the structure and content of culture, which is very important to the emergence, survival and development of the Yellow River cultural heritage in Henan province, and is an important "original understanding".

Folk beliefs include some traditional Chinese beliefs in ghosts and gods, beliefs in ancestral ancestors and beliefs in heroes. These beliefs have accompanied the Chinese people for a longer time, and are truly born from the local folk culture. This rich folk belief culture can show the cultural psychology of the Yellow River, but also imperceptibly into people's daily life. A landmark historical activity to witness the significant impact of the heritage, Its function, principle and structure characteristics have a great correlation effect with the cultural heritage of Henan Yellow River, which can exist as the "original understanding".

The main body of the governance culture is the governance activities of the Yellow River in the past dynasties, and the control of the Yellow River is often closely related to the political stability and economic rise and decline of the dynasties, which has been the top priority of flood control of the Yellow River since ancient times. Its function and principle is to reflect the origin and cultural inheritance process of the Yellow River governance culture in the past dynasties through historical induction and deduction, and it is the source and main line to reveal the law of the formation and development of the Yellow River cultural heritage.



National spirit is gradually formed in the Yellow River governance activities of the powerful spiritual power, its function and principle in the Chinese nation nature, respect for nature, the spirit of perseverance, this culture is created in the implementation of the Yellow River governance process and concise into the thought, fighting spirit, innovation consciousness, unity and cooperation and ecological concept, etc., is an important "original understanding".

Accordingly, the main cultural elements of the Yellow River cultural heritage (biological gene engineering "original understanding") include: irrigation engineering, canal engineering, flood control works, water altar ancestral temple, water culture tower que, water culture cliff stone, water inscriptions, water conservancy, water conservancy works, water painting, water construction technology, water culture, folk songs, folk sacrifice beliefs, water culture legends, water conservancy songs, history and culture, management spirit, national character, national values.

#### 4.5 Reverse transcription: Extraction of Yellow River cultural genes

The enrichment and refining of cultural elements is an important stage to extract the cultural heritage and cultural gene of genes. Cultural genes are contained in cultural elements, which is the concentration and refinement of cultural elements. Therefore, it can be seen that the cultural genes of the Yellow River in Henan province are hidden in the cultural elements, and it is the most concentrated and essential part of cultural elements. When extracting the cultural genes of the Yellow River cultural heritage, the following principles should be followed: the principle of the internal uniqueness principle, the external uniqueness principle, the local uniqueness principle and the overall superiority principle. Among them, the internal uniqueness principle refers to the unique internal characteristics of the Yellow River; the external uniqueness is the unique external characteristic of the Yellow River; the local uniqueness refers to the important elements that the Yellow River but does not exist in other areas; the overall superiority principle refers to the elements that are not unique to the Yellow River, but more dominant than other areas. Different extraction principles are adopted according to the characteristics of different categories of cultural genes, and the cultural genes are obtained by analyzing and extracting and transforming the carriers of cultural elements.

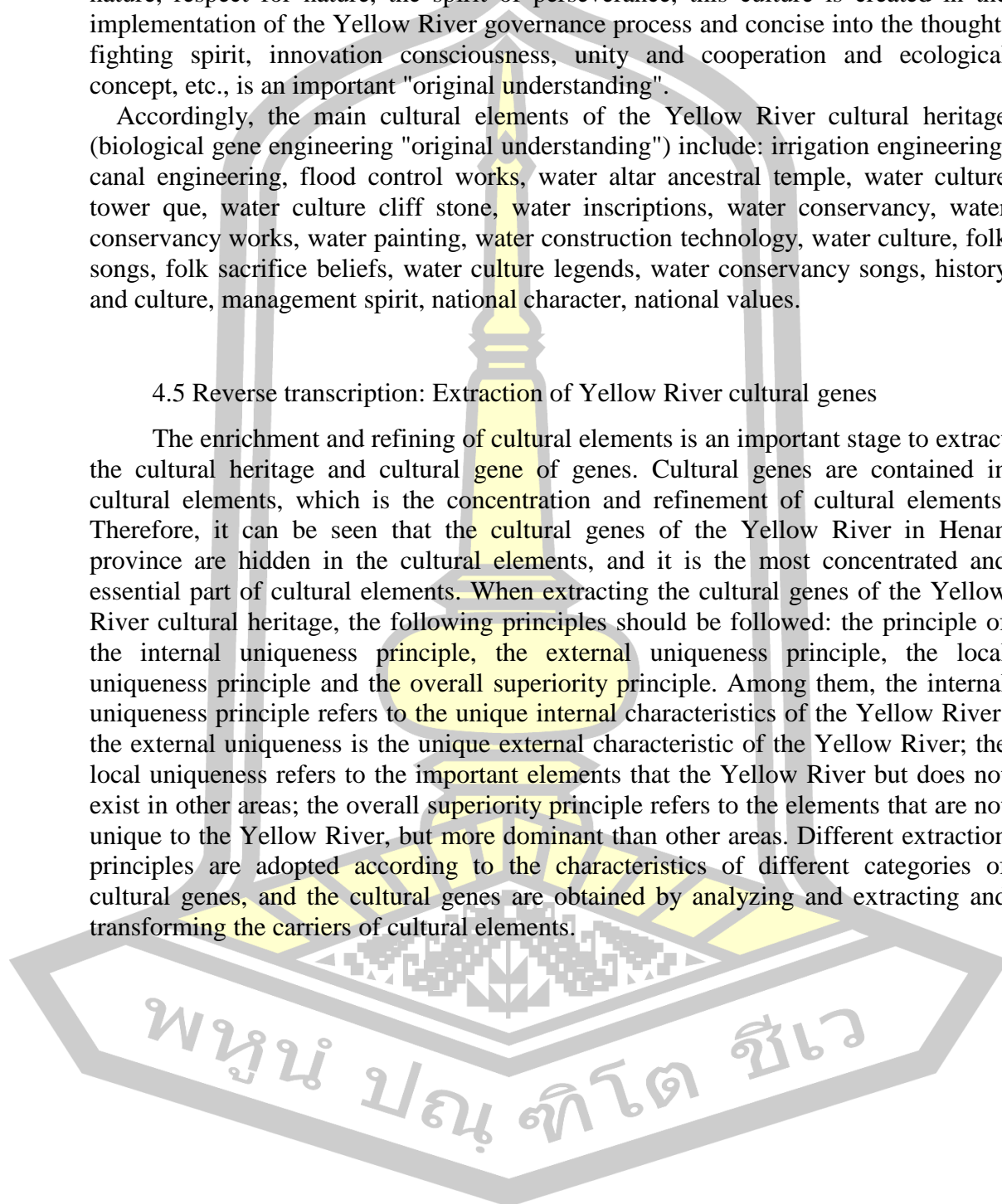


Table 12 Principle of gene extraction of the Yellow River culture Source: the author homemade

Cultural gene categories	Principles of cultural gene extraction	Extraction principle
Hydraulic gene	The principle of external and uniqueness	The uniqueness of the external representation
historic buildinggen	The principle of local uniqueness	Local key elements are unique
lithoglyphgen	The principle of local uniqueness	Local key elements are unique
Ancient literature genes	The principle of inner uniqueness	The uniqueness of the internal causes
Traditional culture and art gene	The principle of inner uniqueness	The uniqueness of the internal causes
Folk genes	The principle of overall advantage	Other river basins have similar cultural elements, but this element is particularly prominent in this watershed
Traditional skills genes	The principle of local uniqueness	Local key elements are unique
Folk faithgen	The principle of external and uniqueness	The uniqueness of the external representation
literature and fine artgen	The principle of inner uniqueness	The uniqueness of the internal causes
administergen	The principle of overall advantage	Other river basins have similar cultural elements, but this element is particularly prominent in this watershed
ethosgen	The principle of overall advantage	Other river basins have similar cultural elements, but this element is particularly prominent in this watershed

Irrigation projects refer to irrigation and drainage projects and related facilities built in the Yellow River basin to ensure farmland drought and flood protection and stable and high yield. The type of irrigation project in the Yellow River basin is not available. External and uniqueness, the form is much the same.

The canal project is an artificial river channel excavated in the Yellow River basin for the development of water transportation, and it is the main national water transportation network with the Yellow River as the center. Canal works are water conservancy projects and related facilities built to maintain the normal operation of the canal, so they do not have them. Exterior and uniqueness.

Flood control engineering culture refers to the projects and related facilities built in the Yellow River basin for the prevention and control of floods or for the use of flood resources, which is the most prominent content in the governance of the Yellow River. The Yellow River from the canyon of Mengjin into the North China Plain, due to the sedimentation, gradually formed "hanging river". It has the widest river course,

the largest suspension difference, the largest beach area, the most serious historical disaster, and the arduous flood control task. Therefore, the Yellow River flood control project has a exterior and uniqueness. In Henan, the Yellow River dike in the Western and Eastern Han Dynasties and the Yellow River dike in the Ming and Qing Dynasties were well preserved, in line with the "principle of external uniqueness".

The water altar ancestral temple is the architectural heritage of water worship, that is, the ancient buildings or structures built for the temple and the river. The main gene is water worship architecture, such as Henan Wuzhi Jiaying View, in line with the "principle of external uniqueness".

Water culture pavilion is a water conservancy memorial architectural heritage, that is, used to commemorate, pay tribute to the famous people. The main gene is the water culture memorial building, such as Linfen Water Temple, Yuzhou Yuwang Temple, etc., in line with the "principle of external uniqueness".

Water culture cliff stone is the past dynasties engraved with water control, praise and other content of the stone. The main gene is the text of water control, such as the Han Dynasty in Dengfeng, Henan province., which has local key elements and is unique, in line with the "principle of external uniqueness".

The water conservancy inscription is a stone tablet engraved with water control, water management, praise or classic water control articles. The main genes are water control inscriptions, town water god beast, etc., such as the former collected in the Yellow River Museum, Henan Wuzhi County Royal dam monument, the latter, such as Kaifeng, river god beast iron rhinoceros, all have local key elements with unique, in line with the "principle of local uniqueness".

Water conservancy maps and special water conservancy works refer to all kinds of data that record the history of the changes and governance of the Yellow River, all of which do not have the uniqueness of internal causes and do not conform to the "principle of internal uniqueness".

Water conservancy calligraphy works and water conservancy painting works refer to the art works of art and arts and crafts created with the Yellow River or the Yellow River as the theme in each historical period. The main gene is calligraphy painting, which does not have the uniqueness of internal causes and does not conform to the "principle of internal uniqueness".

Hydraulic construction technology refers to the river construction technology and technology produced and spread in the Yellow River basin and reflects and highly reflects the level of yellow River control. The main gene is a traditional technology, which all have local key elements and are unique and in line with the "principle of local uniqueness".

Water culture artifacts production is the activities of water relationship (water, water, water, water, water, etc.) created in the cultural achievements, the main gene is the traditional arts and crafts, such as yellow mud inkstone, Yellow River mud Xun, external appearance, local key elements are unique, in line with the principle of "local uniqueness".

Water conservancy folk song refers to the art form related to the Yellow River or the Yellow River control completed through the performance. The main gene is the performing art, which is more typical than other river basins. Such as the Yellow River song, ramming my song, in line with the principle of overall advantage.

Folk worship belief refers to the folk life, activities, festival celebrations, traditional ceremonies and other customs formed and passed down from generation to generation in the practice and daily life of governing the Yellow River. The main gene is folk belief, such as Yellow River sacrifice, Yu King sacrifice and so on. The uniqueness of external appearance conforms to the principle of external uniqueness". Water culture legend refers to the literary works related to the Yellow River or its control, which are produced and spread in the folk society and can best reflect their emotion and aesthetic taste. The main genes are stories and legends, such as the legend of Yu the Great, the legend of Sanmenxia, and so on. The uniqueness of the intrinsic causes, in line with the "internal uniqueness principle".

Water conservancy ballads refer to the folk songs related to the Yellow River or the Yellow River, which are produced and spread in the folk society and can best reflect their emotions and aesthetic taste. The main gene is folk ballads, such as Shaanxi folk songs, etc. The uniqueness of the intrinsic causes, in line with the "internal uniqueness principle".

History and culture is the evolution and development of the Yellow River governance activities in the past dynasties. For the history and culture of the Yellow River section in Henan province, it is often formed because of its unique development course, cultural tradition and historical context. After witnessing the change of dynasties, the flow of population and the development of economy for thousands of years, all the past are deeply hidden in the history and culture of the Yellow River section in Henan, which is an important influencing factor of the unique characteristics of the Yellow River section in Henan. The main gene is the historical evolution, such as historical causes, historical process, historical events, etc., which has the uniqueness of internal causes and conforms to the "principle of internal uniqueness".

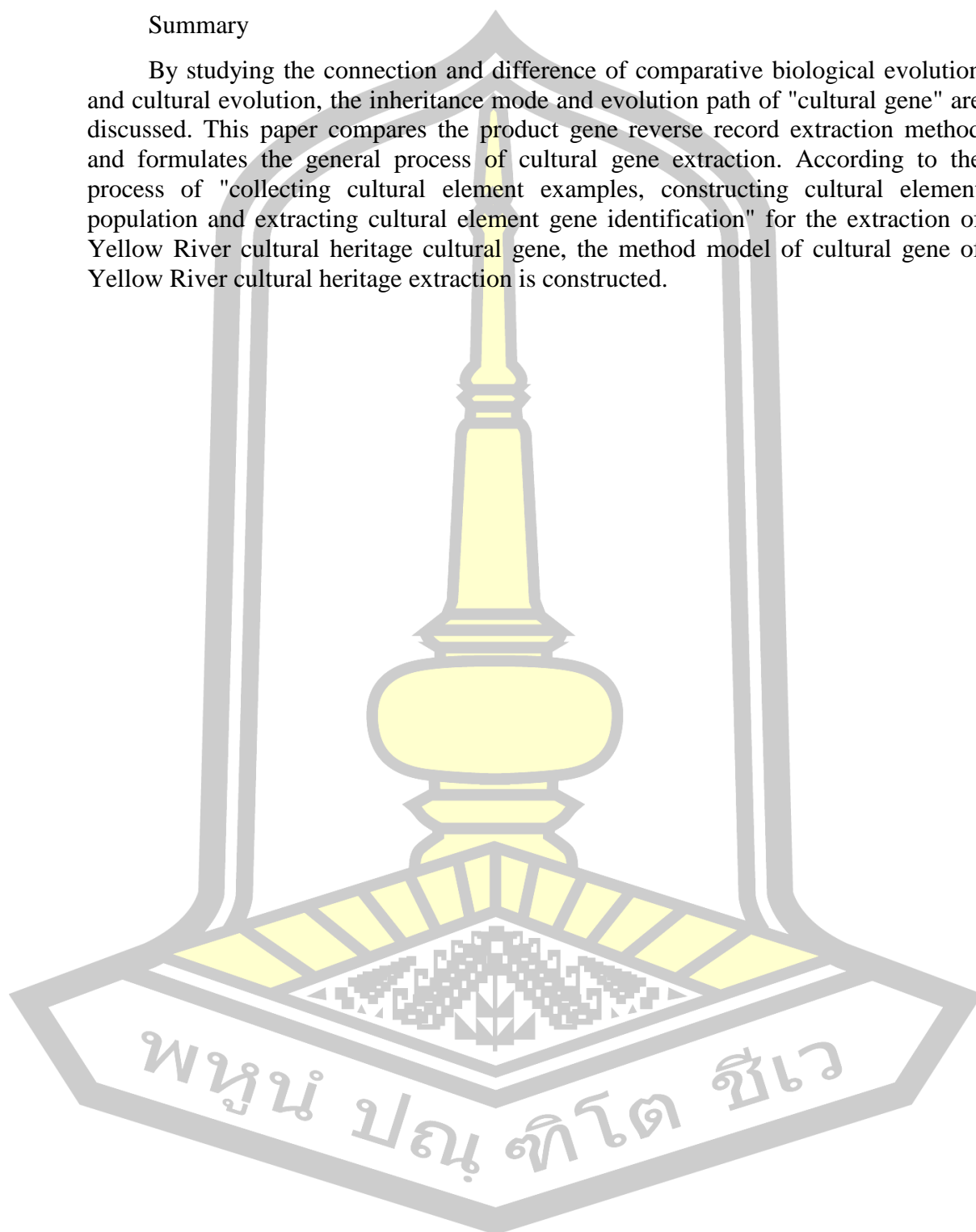
The spirit of governance is the Yellow River culture gradually formed in the process of implementing the Yellow River governance. The main gene is the national spirit, such as the thought for the people, the fighting spirit, the innovation consciousness, unity and cooperation and the ecological concept, all of which have the uniqueness of internal causes and conform to the "principle of internal uniqueness".

National character refers to the national characteristics reflected in the long-term historical process and accumulation, including the spiritual culture of "transforming nature", respect for nature " and perseverance. The other basins have similar cultural elements, but this element is especially prominent in the basin. National values are the way of thinking created and condensed by people in the process of implementing the Yellow River governance, such as unity and cooperation and ecological concepts. Other river basins have similar cultural elements, but this element is particularly prominent in this watershed.



### Summary

By studying the connection and difference of comparative biological evolution and cultural evolution, the inheritance mode and evolution path of "cultural gene" are discussed. This paper compares the product gene reverse record extraction method and formulates the general process of cultural gene extraction. According to the process of "collecting cultural element examples, constructing cultural element population and extracting cultural element gene identification" for the extraction of Yellow River cultural heritage cultural gene, the method model of cultural gene of Yellow River cultural heritage extraction is constructed.



## CHAPTER V

### Genetic Genealogy of Yellow River Culture in Henan Based on Methodological Construction

The exploration of the Yellow River cultural genes should not only stay at the level of static freezing of the extraction, but also construct an optimisation path for the extraction results and apply it, so as to achieve the dynamic continuation of the Yellow River cultural genes. Therefore, this chapter takes the cultural heritage of the Yellow River section in Henan as an example, conducts reverse transcription extraction according to the model of the Yellow River cultural gene extraction method constructed above, excavates the cultural genes of the Yellow River culture in Henan, and finally constructs them completely in the cultural genealogy.

#### 1. Cultural gene carrier performance of the Yellow River cultural heritage in Henan province

The cultural gene of Henan Yellow River is a complex organism, which covers four logical axes: spiritual culture, ecological environment, spatial elements and time stage. These axes contain a variety of influencing factors and interactions of substances and information, forming a complex and organic whole. In this whole, these influencing factors and factors can be divided into three levels of structure, namely, gene ontology, gene segments, and carrier elements. In the hierarchical identification of Henan Yellow River cultural gene, the cultural gene level of material and information is the easiest to grasp. The carrier elements are the most specific and practical form. In the process of extracting the cultural genes of Henan Yellow River, an important aspect is to determine the carrier elements. Carrier elements refer to the actual forms existing in the Yellow River cultural gene of Henan Province, which are the basis of the cultural gene research in the Yellow River basin of Henan Province.

Irrigation projects refer to irrigation and drainage projects and related facilities built in the Yellow River basin to ensure farmland drought and flood protection and stable and high yield. The type of irrigation project in the Yellow River section of Henan province is not available. External and uniqueness, the form is much the same. In the process of the cultural gene extraction of the Yellow River cultural heritage, the extraction of irrigation projects has also appeared. In general, for the extraction of irrigation engineering from its historical evolution, function, but the research process, in order to more comprehensive and systematically cultural gene extraction, we first on the basis of its history, analysis of its functional characteristics, then through the analysis of its functional characteristics, it is concluded that its cultural genes. Through the two analysis steps:

"Water as the key point": the management ideas and measures for irrigation projects in different historical periods and dynasties.

"People": from the historical change of the construction and use of irrigation projects, it can be divided into two types of people, one is the main use of agricultural production, which is the majority, they create a good irrigation environment for irrigation projects; the other is the main use of agricultural production, which is the minority, they only need to follow certain policies and management methods to ensure agricultural production. Therefore, in different periods in the history, the needs of irrigation projects for different groups of people will also change.

"Take the land": Due to the low level of social productivity at that time, people mainly considered the fertility of the land when choosing irrigation projects.

The canal project is an artificial river channel excavated in the Yellow River basin for the development of water transportation, and it is the main national water transportation network with the Yellow River as the center. Canal works are water conservancy projects and related facilities built to maintain the normal operation of the canal, so they do not have them Exterior and uniqueness. Therefore, the sorting of canal projects in the Yellow River basin can be divided into two categories: one is the canal projects with the Yellow River as the center; the other is the derivative heritage of the Yellow River centered canal project, including Tongji Canal, Han ditch, Yongji Canal, Jeju River, Weihe River, Huitong River, Datong River, etc. As an important part of the grand Canal heritage, the canal project in the Yellow River basin has played different functions in different historical periods. The Yellow River Basin canal project is a water conservancy project built in order to meet the demand of water transport for a long time, which plays an important role in the utilization of water resources. Among them, the two most important buildings in history were the Beijing-Hangzhou Grand Canal and the Grand Canal of the Sui and Tang Dynasties. The Beijing-Hangzhou Grand Canal was mainly used for water transport and shipping, while the Grand Canal of the Sui and Tang Dynasties was mainly used for military and politics.

Flood control engineering culture refers to the projects and related facilities built in the Yellow River basin for the prevention and control of floods or for the use of flood resources, which is the most prominent content in the governance of the Yellow River. The Yellow River from the canyon of Mengjin into the North China Great Plain, due to the sedimentation, gradually formed "hanging river". It has the widest river course, the largest suspension difference, the largest beach area, the most serious historical disaster, and the arduous flood control task. In Henan, the Yellow River dike in the Western and Eastern Han Dynasties and the Yellow River dikes in the Ming and Qing Dynasties were well preserved. Flood dike is an important barrier for flood prevention, mainly composed of embankment, revetment and embankment forest. Many embankments built along the Yellow River in history have not only resisted floods, but also played a role in protecting social and economic development, cultural heritage and ecological environment. Especially in the lower reaches of the Yellow River, the flood dikes have become an important cultural heritage. As a heritage of flood control engineering, dike is not only an important historical and cultural heritage, but also one of the most representative cultural heritage types in the Yellow River cultural heritage.

The Yellow River basin has the typical landform characteristics of the Loess Plateau, mainly in the yellow alluvial plain, and is one of the earliest active areas in human history. The Yellow River flows through the Loess Plateau, forming a unique loess accumulation landform, that is, "loess accumulation landform". Loess accumulation landform is mostly distributed in the valley terrace or sloping plain, which is a special surface form and natural geographical landscape. The middle reaches of the Yellow River is a typical area of the Loess Plateau, including the main reaches of the Yellow River and its tributaries in Shanxi, Shaanxi, Gansu and Qinghai provinces, as well as the reaches flowing eastward near Zhengzhou, Henan.

The middle and lower reaches of the Yellow River can be divided into two regions: the Weihe River bounded to the south and the north. The middle and lower reaches of the Yellow River have diverse landform types, mainly typical loess hills and loess tableland. Due to the large differences in climate and hydrological conditions historically, different landform types were formed in different regions. In general, the middle and lower reaches of the Yellow River belong to the typical landform area of the Loess Plateau. Second, the south is Fenhe Valley; the north is South Shanxi Basin. The natural geographical environment of the two regions varies significantly, and there are also great differences in the geomorphic types. In addition to the above two regions, there are also some small areas along the Yellow River (such as the middle reaches of the Yellow River), as well as the Jinnan Basin and the Guanzhong Plain, there are also some small areas (such as the Shanxi-Shaanxi Basin).

The water altar ancestral temple is the architectural heritage of water worship, that is, the ancient buildings or structures built for the temple and the river. The main gene is the water worship building, such as Henan Wuzhi Jiaying View, etc. Water sacrifice culture is an important branch of the Yellow River cultural heritage. Its main cultural gene is "water". "Water" is the most basic cultural gene in the Yellow River cultural heritage, which represents the core value and spiritual core of the Yellow River cultural heritage. In the sacrificial etiquette, there are sacrificial activities such as the heaven, the earth, the river, the sea and the sacrificial day. Among them, the river sacrifice activity is the most grand, which is one of the important contents of the major ceremony of the country. In the Yellow River basin, the Yellow River is mainly taken as the center, including the lower Yellow River region in Shandong, Henan, Shanxi three provinces and the Central Plains.

Water culture pavilion is a water conservancy memorial architectural heritage, that is, used to commemorate, pay tribute to the famous people. The main gene is the water culture memorial building. For example, the Suo Water Pavilion in Mengzhou, Henan Province was built to commemorate the water control of Dayu. After the building was built, it was named because it "locked" the water of the Yellow River. The lock water pavilion is equipped with a "lock" to lock the water of the Yellow River, and tourists can lock the water of the Yellow River through the hole in the stone. In addition to the lock water pavilion, there are Yuwang Temple, river temple and so on. These buildings are built to commemorate the historical figures of water control. They embody the essence of the Chinese culture of water control and are the representative of the cultural gene of the Yellow River in Henan region.

Water culture cliff stone is the past dynasties engraved with water control, praise and other content of the stone. The main gene is the text of water control, such as Dengfeng, Henan Province, which has local key elements and uniqueness. Water



control was a crucial link in the development of ancient Chinese society. Due to China's vast area, numerous rivers and frequent flood disasters, flood control has become an indispensable task. With its strong historical background and rich cultural connotation, the cliff carvings have become an important carrier to record and inherit the wisdom of water control. The local key elements of water culture cliff carvings are also the embodiment of its uniqueness. These elements include water control technology, water resources management, irrigation systems, etc. Through these stone carvings, we can understand the ancient Chinese people's understanding of water conservancy projects and their wisdom in dealing with flood disasters.

Water conservancy tablet is a stone tablet engraved with water control, water management, classical water control or classic articles related content. The main characteristics of these inscriptions are the theme of water control as the core, but also include some water gods and other patterns. Among them, some important water control inscriptions are collected in the Yellow River Museum in the dragon stele and Wuzhi County, Henan Province. In addition, some unique water conservancy inscriptions also show the local key elements such as iron rhinoceros. As a cultural heritage, the water conservancy tablet inscription carries rich historical information and technical wisdom. These inscriptions record the methods, achievements and experiences of water control in ancient times, and they are still of important reference value for today's water conservancy projects. Through the study of these inscriptions, we can understand the importance and efforts of ancient people to water conservancy projects, as well as their coping strategies in the face of flood disasters. Water control inscriptions usually describe the contributions and achievements of successive rulers in the control of floods. These inscriptions contain the details of various water control measures and projects, such as the construction of dikes, excavation of channels, dredging of rivers, etc. The existence of these inscriptions is not only a memorial to the ancient water control project, but also a guide for the inheritance and learning of future generations. In addition, some water conservancy inscriptions also feature mythical animal patterns. These beasts are often seen as guards guarding the waters, symbolizing people's awe and protection of water.

Water conservancy maps and special water conservancy works refer to all kinds of materials on the history of the changes and governance of the Yellow River. These materials include maps, books and documents on the water conservancy system of the Yellow River basin. As the longest river in China, the Yellow River has played an important economic and cultural role since ancient times. Therefore, it is of great significance to record and study the governance and change history of the Yellow River.

A water conservancy map is a map used to show the distribution of water conservancy projects and water resources. In the Yellow River basin, the water conservancy map can show the distribution of the main branches of the Yellow River, lakes, reservoirs, sluices, DAMS and other water conservancy facilities. Through the water conservancy map, we can intuitively understand the water conservancy system in the Yellow River basin, so as to better plan, build and manage the water conservancy projects.

Specialized water conservancy works are books or documents for in-depth study and record of the governance history of the Yellow River. These works usually cover the hydrology, water conservancy projects, water resources management, flood

control and other aspects of the Yellow River basin. By analyzing the successful experience and failure lessons of the Yellow River management, these works can provide an important reference for the future water conservancy planning and management. The expansion of water conservancy maps and special water conservancy works are of irreplaceable value for the study of the historical changes and governance of the Yellow River. They can help to understand the hydrological environment, water resources distribution and the development of water conservancy facilities in the Yellow River basin. At the same time, by studying the experience and lessons of the Yellow River management, we can better cope with the current and future challenges of water resources management and flood control.

Water conservancy calligraphy works and water conservancy paintings refer to the works of art and arts and crafts created with the theme of the Yellow River or the Yellow River in each historical period. The main genes of these works are calligraphy and painting, which show the importance of water conservancy and people's attention to water resources through the form of art. Water conservancy calligraphy works and water conservancy painting works with their unique artistic expression, the water conservancy project and art are perfectly combined. The calligraphy works use traditional Chinese brush and ink techniques to depict the magnificent scenery of the Yellow River and the great achievements of the control of the Yellow River project. Through the use of color and the design of composition of the works, the paintings show the unique scenery of the Yellow River basin and people's respect for water conservancy projects. These works are not only the creation of art, but also the praise and commemoration of water conservancy projects and the cause of yellow control. They document the efforts made by the ancient Chinese rulers to solve the floods, and they also express people's value of water resources and their reverence for the natural environment.

Hydraulic construction technology is a traditional technique derived from the Yellow River basin, which reflects and highly reflects the process and technology of the yellow River control level in this area. The main gene of this technology can be traced back to ancient times. After thousands of years of development and inheritance, it has become an indispensable tool for local people in the process of controlling the Yellow River and its tributaries. The core goal of hydraulic construction technology is to effectively control and direct the flood of the Yellow River by building various Dikes, rivers and water conservancy facilities to protect the surrounding farmland and residents from flood disasters. The unique feature of this technology is that it combines rich experience and wisdom with scientific water conservancy engineering principles, so that the yellow River control work can be carried out more accurately and effectively. Hydraulic construction technology adopts a variety of methods and processes in practice. For example, dikes are usually built using natural materials such as loess, stones, and wood, which are both easily accessible and compatible with the natural environment. At the same time, the craftsmen used clever construction methods, such as staggered masonry and inverted ladder, to increase the stability of the dam and the ability to fight flood. The inheritance and development of hydraulic construction technology cannot be separated from people's in-depth observation and understanding of the natural environment. In the Yellow River basin, such a difficult area, people through long-term practical experience, gradually explore a set of

effective yellow treatment methods, formed a unique hydraulic construction technology system.

The production of water cultural artifacts is a cultural achievement created in various activities of the relationship between man and water (water control, water control, water management, water viewing, water love, water protection, etc.). The main gene is the traditional arts and crafts, such as the Yellow River clear mud inkstone, the Yellow River mud xun, etc. The production of water cultural artifacts is the product of various activities between people and water, including the use of water, water treatment, water management, water appreciation, love of water and protection of water. The main purpose of these activities is to pay homage to water by creating artworks and show the interdependence with water. Traditional arts and crafts are the core gene of the production of water culture artifacts. The Yellow River clear mud inkstone and the Yellow River mud Xun and other artifacts are representative works of traditional arts and crafts. It is famous for its unique material and exquisite production technology. It can not only be used as the four treasures of the study, but also as a work of art. The Yellow River mud Xun is a kind of pottery made of the Yellow River soil, and its unique decoration and color make it a popular decoration. The production of water culture artifacts is not only a handmade art, but also a way of cultural inheritance and expression. By making artifacts, people integrate their feelings and feelings about water into them and pass them on to future generations. These objects not only show people's awe and dependence on water, but also reflect the local regional culture and way of life.

Water conservancy folk song refers to the art form related to the Yellow River or the Yellow River control completed through the performance. The main gene is the performing art, which is more typical than other river basins. Such as the Yellow River haozi, ramming my haozi, etc. Water conservancy folk song is a unique art form related to the Yellow River or the yellow River control, and its main form of expression is completed through performance. Compared with the folk songs in other river basins, the water conservancy folk songs are more typical in terms of expression. Yellow River haozi and rammer haozi are two typical water conservancy folk songs. With its unique melody and lyrics, the Yellow River Haozi vividly depicts the magnificent scenery of the Yellow River and people's deep affection for the Yellow River. It not only shows the rich cultural deposits of the Yellow River basin, but also conveys people's awe and dependence on the Yellow River. Hang ramzi is more attention to the expression of yellow hardships and efforts. Rammer I is a tool used for building flood control dyke, ramming my trumpet by praising the diligence and wisdom of rammer my workers, and their great contribution to the governance of the Yellow River. These songs, with full rhythm and passionate melody, express people's enthusiasm and firm belief in the governance of the Yellow River incisively and vividly. As a form of performing art, water conservancy folk songs not only show the rich cultural heritage of the Yellow River basin, but also inherit people's love and awe for the Yellow River. Through the performance of water conservancy folk songs, people can have a deeper understanding of the importance of the Yellow River and the difficult process of controlling the Yellow River. At the same time, these songs also inspire people's determination and confidence to protect water resources and control floods. In a word, the water conservancy folk song, as an art form related to the Yellow River or the Yellow River control, has become an important part of the

culture of the Yellow River basin in Henan province with its unique performance mode and typical theme content.

Folk sacrifices in the Yellow River basin in Henan province are based on folk life, annual activities, festival celebrations, traditional ceremonies and other customs from generation to generation. The main gene of this belief originates from the deep folk belief system, including the famous Yellow River sacrifice and Yu King sacrifice. As one of the longest and most mysterious rivers in China, the Yellow River sacrifice is regarded as a sacred water area. Every year in the fourth or May month of the lunar calendar, when the Yellow River enters the rising period, people hold grand sacrificial ceremonies to pray for the blessing of the river god and a smooth irrigation season. This sacrificial activity is not only the reverence of the power of nature, but also the inheritance and promotion of the Yellow River culture. The ceremony is an important ceremony in memory of the great monarch Emperor Yu in ancient Chinese legend. Emperor Yu was honored as a hero to control floods and open up land, and his deeds were widely celebrated among the people. Every year on the lunar summer solstice, people gather in front of his altar and hold a grand sacrificial ceremony to express their reverence and gratitude to Emperor Yu. Folk sacrificial belief is not only a religious activity, but also an important part of Chinese traditional culture. Through these rituals and customs, people express respect and pray to the gods, and at the same time deepen the connection between man and nature, man and history. These traditional ceremonies will not only help to carry forward the excellent traditional culture of the Chinese nation, but also provide people with a common spiritual sustenance and cohesion.

Water culture legend refers to the literary works related to the Yellow River or its control, which are produced and spread in the folk society and can best reflect their emotions and aesthetic taste. The main genes are stories and legends, such as the legend of Yu the Great, the legend of Sanmenxia, etc. One of the most famous water culture legends is the legend of Da Yu controlling the flood. Legend has it that in the distant ancient times, the Yellow River was frequently flooded, which brought great trouble to people's lives. Later, Da Yu, with his intelligence and tenacity, successfully managed the flood of the Yellow River and enabled people to live and work in peace and contentment. This legend not only reflects the ancient people's ability and wisdom to respond to disasters, but also shows their awe and gratitude for the Yellow River. Another legend related to the Yellow River is the legend of Sanmenxia. It is said that in ancient times, the Yellow River once formed a huge waterfall in Sanmenxia, with the water surging and shaking the valley. People call the waterfall "the first waterfall of the Yellow River", and give it a mysterious and lofty symbolic meaning. This legend not only reflects people's pursuit of the beauty of the Yellow River landscape, but also highlights their awe and worship of the Yellow River. Water culture legend has become an important part of the traditional culture of the Chinese nation. These stories not only bring people fun and inspiration, but also let us deeply feel the close connection between man and nature.

Water conservancy ballads refer to the folk songs related to the Yellow River or its control, which are produced and spread in the folk society and can best reflect its emotions and aesthetic taste. The main gene is folk ballads. As a traditional folk ballad form, water conservancy ballad has touched countless listeners with its simple language and profound emotions. They depict people's hardships and efforts to



control the Yellow River, and express their awe and gratitude for it. For example, the famous folk song marrow Zi Ge, with its beautiful melody and sincere lyrics, expresses people's deep feeling for the Yellow River most vividly. The ballad goes, "The Yellow River rolls eastward, and the people are amazed and worried. Thousands of years of flood to, the yellow is like a climbing building." These simple and simple words, directly hit the people, let people have a deeper understanding and experience of the hardships of governing the Yellow River. Water conservancy ballad is not only an emotional catharsis for the Yellow River, but also a praise and encouragement for the work of controlling the Yellow River. These songs, in their unique way, incorporate people's expectations and blessings for the yellow River control project. Through singing, people expressed their reverence and gratitude for the heroes of the Yellow River, and also conveyed their support and call for the cause of the war. These ballads inspire people to continue to move forward, firmly devote themselves to the cause of governing the Yellow River, and strive to protect the Yellow River for the benefit of future generations.

History and culture is the evolution and development of the Yellow River governance activities in the past dynasties. For the history and culture of the Yellow River section in Henan province, it is often formed because of its unique development course, cultural tradition and historical context. After witnessing the change of dynasties, the flow of population and the development of economy for thousands of years, all the past are deeply hidden in the history and culture of the Yellow River section in Henan, which is an important influencing factor of the unique characteristics of the Yellow River section in Henan. The main gene is the historical evolution, such as historical causes, historical processes, historical events, etc. The history and culture of the Yellow River section in Henan was formed through the evolution and development of the Yellow River governance activities in the long years. This region has unique historical and cultural characteristics because of its unique development course, cultural tradition and historical context. Over thousands of years, the Yellow River basin has witnessed the historical changes of dynasties, population flow and economic development, all of which have been deeply integrated into the history and culture of the Yellow River section in Henan province. Historical causes refer to the reasons and conditions for the formation of the history and culture of the Yellow River section in Henan province. For example, the frequent flooding of the Yellow River, the rise of agricultural civilization and the convenience of transportation have all had a profound impact on the history and culture of the region. Historical process refers to the evolution process of the historical and cultural formation of the Yellow River section in Henan province. Since ancient times, the Yellow River governance activities have never stopped in this area. Through the construction of the Yellow River, people constantly transform the hydrological environment of the Yellow River to protect the safety of farmland and residents. The historical process of these governance activities not only records the struggle between human beings and the natural environment, but also shapes the unique history and culture of the Yellow River section in Henan province. Historical events refer to the important events affecting the historical and cultural development of the Yellow River section in Henan province. For example, the disasters caused by the flood of the Yellow River and the land changes caused by the diversion of the Yellow River have all had a profound impact on the history and culture of the region.

The spirit of governance is a kind of culture gradually formed in the implementation of the Yellow River governance, that is, the culture of the Yellow River. The main gene of this culture can be attributed to the national spirit, including the thought for the people, the fighting spirit, the innovation consciousness, the unity and cooperation, and the ecological concept. The thought of serving the people is an important part of governing the Yellow River culture. In the process of controlling the Yellow River, people always put the interests of the people first and aim to meet the needs of the people. They focus on the people's lives and safety, and strive to provide better living conditions and the environment. The fighting spirit is also one of the core values of governing the Yellow River culture. Faced with the challenges and difficulties brought about by the Yellow River, the people showed their indomitable fighting spirit. They braved the difficulties, went forward bravely and made unremitting efforts to solve the problem of the Yellow River and protect the safety of people's lives and property. In addition, innovation consciousness also plays an important role in the governance of the Yellow River culture. Through the introduction of new technologies, new ideas and new methods, people constantly explore and try to find innovative ways to solve the problem of the Yellow River. They actively promote scientific and technological progress and improve the efficiency and effectiveness of governance. Unity and cooperation is also an important value in the governance of the Yellow River culture. People realize that only through joint efforts and cooperation can the problem of the Yellow River be effectively solved. Therefore, they actively promote the cooperation in various sectors and establish a good cooperative relationship between multiple departments and multiple stakeholders.

National character is the embodiment of the unique characteristics formed by a nation in the long-term historical process and accumulation. It includes a range of features related to the spiritual culture of transformation, respect for nature, and perseverance. Although similar cultural elements may exist in other areas, these elements are particularly prominent in particular catchments. First of all, reforming nature is an important aspect of the national character. In the interaction with the environment, different nationalities develop and utilize resources to meet their living needs. Some ethnic groups have unique wisdom and skills in transforming nature. They can adapt to different geographical environments and transform them into resources for sustainable development. This ability to transform nature reflects the creativity and adaptability in the national character. Secondly, respect for nature is also an important aspect of national character. Many nations have the awe and worship of nature. They recognize the interdependence between human beings and nature, and respect the laws and ecological balance of nature. This attitude of respecting nature reflects the national character of humility and the awareness of environmental protection. Finally, the spiritual culture of perseverance is also an important feature of the national character. In the long course of history, some ethnic groups have experienced various difficulties and challenges, but they have always maintained a spirit of perseverance. No matter what kind of difficulties they face, they can stick to it and overcome it through their own efforts and wisdom. This indomitable spirit reflects the perseverance and courage in the national character. To sum up, the national character is a comprehensive embodiment of the national characteristics formed by a nation in the long-term historical process and

accumulation. It includes many aspects of cultural genes, such as nature transformation, respect and indomitable spiritual culture.

National values have played an important role in the implementation of the Yellow River management process. These values are the way of thinking created and condensed by people in getting along with the Yellow River for a long time, including unity and cooperation and ecological concepts. First of all, unity and cooperation is one of the core of national values in the Yellow River basin. Due to the particularity of the Yellow River, its governance needs the joint efforts of all parties. In the process, people realized that only through solidarity and cooperation can they deal with floods and prevent soil erosion. Therefore, the people of the Yellow River basin have formed a spirit of unity and mutual assistance, actively participate in the governance work, and are willing to contribute to the interests of the whole basin. Secondly, the ecological concept is also an important part of the national values in the Yellow River basin. As one of the longest rivers in China, the improvement of the ecological environment of the Yellow River is crucial to the sustainable development of the whole country. Therefore, the people in the Yellow River basin pay attention to the protection of natural resources, advocate green development, and devote themselves to building an eco-friendly society. They know that only by protecting the ecological environment of the Yellow River can we ensure people's quality of life and the sustainability of economic development. Although similar cultural elements exist in other river basins, these values are particularly prominent in the Yellow River basin. This is because of the particularity of the Yellow River and its important influence on the whole river basin. The governance of the Yellow River needs the joint participation and efforts of the whole society, and the concept of unity and cooperation and ecology is the key to the success of the governance of the Yellow River.

In addition to the above described core cultural elements of the Yellow River cultural heritage in Henan province, it also includes the cultural elements of water culture pavilions, water culture pavilions, water culture games and other related cultural elements.(Table 15)

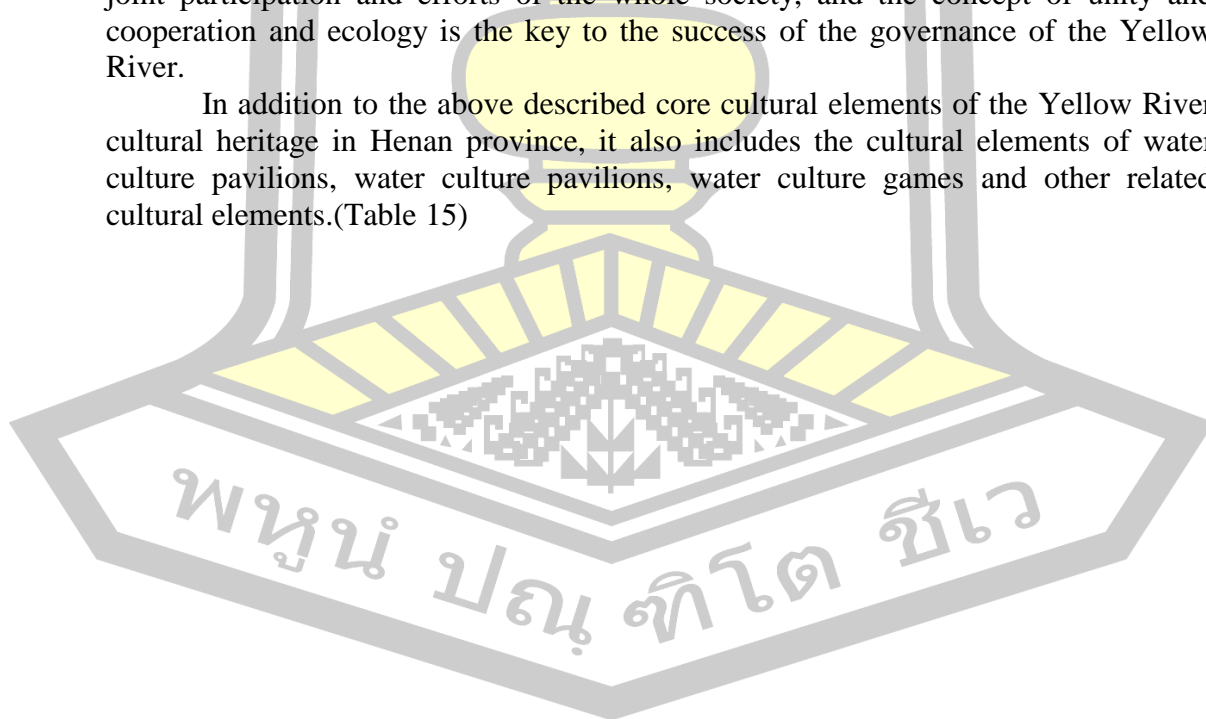


Table 13 Table of the core cultural elements of the Yellow River Cultural Heritage in Henan province Source: the author homemade

Hydraulic culture	Irrigation project heritage, canal project heritage, flood control project heritage
Site culture	Water city site, water edge settlement site, water culture temple site
Ancient architecture culture	Water altar ancestral temple, water culture pavilion platform que
Stone carving culture	Water culture cliff stone carvings, water conservancy tablet inscriptions
Ancient literature culture	Water conservancy map, special water conservancy works
Traditional culture and art	Water conservancy calligraphy works, water conservancy paintings
Traditional art culture	Water engineering construction technology, water conservancy equipment production, water culture utensils production
folk culture	Water conservancy folk songs, water culture games
Folk faith culture	Folk worship faith
Literature, art and culture	Water conservancy myth, water culture legend, water conservancy story, water conservancy ballad
Governance culture ethos	historic culture, National character and national values

## 2. Reverse record extraction of the explicit cultural genes of the Yellow River Cultural Heritage in Henan Province

### 2.1 Hydro-work gene

The Yellow River basin in Henan province is one of the most important flood control areas in China, with a history dating back to thousands of years. Due to the frequent flooding and bursting of the Yellow River, the people in Henan have had to face the severe flood threat for a long time. In ancient times, the flood control work in the Yellow River basin in Henan province mainly relied on building DAMS and digging channels to control the flood. As early as the Spring and Autumn Period and the Warring States Period, the local government began to carry out large-scale control projects, building many dikes and channels to protect the surrounding farmland and residents. The success of these projects made Henan one of the cradles of ancient Chinese agricultural civilization. However, with the passage of time, the flood problem of the Yellow River became more and more serious. Especially in modern times, due to the acceleration of population growth and industrialization, the flood



control pressure in the Yellow River basin in Henan is even greater. To meet this challenge, the Henan government has taken a series of measures. First of all, the monitoring and early warning system of the Yellow River was strengthened to grasp the dynamics of the flood in time, so as to make timely response measures. Second, they have stepped up the maintenance and repair of embankments and channels to ensure their normal operation. At the same time, the government also encourages scientific and technological innovation, introducing modern flood control equipment and technology to improve flood control capacity. At present, the flood control work in the Yellow River basin in Henan province has achieved remarkable results. Through years of efforts, the frequency and impact degree of flood disasters have been effectively controlled, and the living safety of farmland and residents has been better guaranteed.

Henan is located at the intersection of the middle and lower reaches of the Yellow River, the west is mountainous and loess hills, and the east is vast alluvial plain. On the one hand, it has the natural advantages of utilizing the soil and water resources of the Yellow River to develop farming, irrigation and shipping, but on the other hand, it is also vulnerable to flood disasters.

Henan Yellow River flood control project is an important project in Chinese history, which not only has great economic significance, but also carries rich cultural connotation. The Yellow River is China's mother river and one of the most sediment-rich rivers in the world. However, due to its large amount of sediment, turbulent water potential, frequent floods throughout the years. In order to protect coastal residents and farmland from floods, the construction of the Yellow River flood control project in Henan province has become a priority for the local government.

From the flood control of Yu the Great to the early period of the Northern Song Dynasty, people basically followed the method of flood control of Yu the Great, that is, channeling and diverting the Yellow River. This method was basically adapted to the natural conditions and economic and social development of the lower reaches of the Yellow River at that time, and it was a period when the governance of the Yellow River was more coordinated with social development. At that time, the Yellow River was different from later generations, mainly having the following characteristics: First, the water and soil loss in the middle reaches was relatively light, and the Yellow River had less sand content. According to geographical research results, about 975 million tons of sediment entered the downstream every year before the Western Zhou Dynasty, and only 1.16 billion tons from the Western Zhou Dynasty to the end of the Northern Song Dynasty, although there was siltation in the downstream, the speed was slow. Second, there are many lakes in the North China Plain. In ancient times, North China was once home to thousands of lakes, the larger of which were Xingze, Putian Ze and Meng Zhuze in Henan, Continental Ze, Jize and Huangze in Hebei, Daye Ze and Heze in Shandong, Fengxize in Jiangsu, and so on. Shandong Dayeze later evolved into the Liangshan River, until the Northern Song Dynasty was still a vast expanse of 800 miles. The Yellow River winds through these lakes, providing a huge reservoir of conditioning and a vast space for silt. Third, because the sedimentation is light, the river is also more stable. Before the Warring States period, there were no systematic levees. After the Warring States period, levees arose, but most of them were discontinuous. Weak levee will not form a suspended river, flood disaster is lighter. According to the historical records, there are 15 years in the 400

years of the Han Dynasty, with an average of nearly 30 years. In Wei, Jin, Sui and Tang dynasties, 48 years of 748 years of runoff occurred, the average occurrence of 15 years, much lower than the frequency of later generations of runoff. Fourth, the population is sparse. In the heyday of the Han and Tang Dynasties, the population of the country was only over 50 million. According to the population statistics of the first two years of the Yuan Dynasty of Emperor Ping of Han, the population of Henan Province today is more than 12.89 million people, although it accounts for nearly a quarter of the national population at that time, but the population density is about one-tenth of today's. Therefore, even if the Yellow River is wandering and changing, there is also a vast room for migration. Fifth, rivers and lakes are connected to form a convenient transportation network. At that time, the Yellow River, the Jishui River, the Kaibian River and many lakes could be connected in all directions. Because of the above situation, the Yellow River land and water resources can be exploited and utilized, and the flood disaster is less, so that Henan's economy and society have been rapid development, becoming one of the most economically developed areas in the country at that time.

In addition, the Qing Dynasty hole river brick, stone I, iron dragon claw Yang mud car, mixed river dragon and so on all recorded the hydraulic culture of Henan river basin. The Qing Dynasty was an important period in Chinese history, and the Henan River basin was an important area of hydraulic culture in the Qing Dynasty. During this period, many remarkable hydraulic tools appeared in this land. Perforated river working bricks are special bricks that are usually used to build embankment and bank revetment for river courses. These bricks have special perforated structures that can enhance their stability and impact resistance. By using perforated river bricks, people are able to better control the flow of the river, prevent flooding, and protect the surrounding farmland and villages. Stone I is a kind of stone used at the bottom of the river. They are carefully selected and processed to ensure their quality and stability. The use of stone I can effectively prevent riverbed erosion and siltation, maintain the smooth and stability. Iron dragon claw mud truck is a tool used to clear the river silt. They are made of iron and have sharp dragon-claw-like devices that can easily raise the silt and move it elsewhere. The use of these mud trucks greatly improves the efficiency of clearing the river channel and helps to keep the river open. Mixed Jiang Long is a special hydraulic building, which is used to build bridges and dikes for river channels. These dragon-shaped buildings are made up of stone or bricks. Zaijianglong is not only practical, but also has ornamental value, and has become one of the representatives of hydraulic culture in Henan river basin.

These record the hydraulic culture of Henan river basin, cut through the river brick, stone, iron dragon claw Yang mud car and mixed river dragon, show the people's attention and wisdom to water conservancy projects. They have not only improved the water environment, but also made great contributions to the local economic and social development. The existence of these hydraulic cultural heritages enables us to better understand and inherit the ancient Chinese water conservancy technology and wisdom.

Waterproof and water control project by building dikes, widening the river, strengthening embankments and other measures, effectively reduce the occurrence of flood disasters, protect the safety of people's life and property, but also provide a stable guarantee for the local economic development. In the long-term engineering construction process, countless workers have devoted their painstaking efforts and wisdom, and their hard work and dedication have formed a special engineering culture. This culture emphasizes the spirit of unity, cooperation and courage, and has become the common value and code of conduct of the local people. At the same time, the Yellow River flood control project has also given birth to many excellent engineering and technical personnel, and their professional knowledge and innovation ability have made important contributions to the development of China's water conservancy projects. Henan Yellow River flood control project is not only an important economic project, but also has rich cultural connotation. It not only protects the safety of people's lives and property, but also cultivates an excellent engineering and technical team, and forms a unique engineering culture.

## 2.2 Ancient architectural genes

In order to avoid floods and pray for good weather, the ancients built many temples and temples along the Yellow River. This kind of heritage often exists in the form of water gods, sacrificial buildings, and religious beliefs of water, etc. It usually belongs to the symbol of specific culture and has certain regional characteristics, and is of certain value to the study of water culture and customs. Most of the buildings in the Yellow River basin in Henan province are ancient and sacred buildings, commonly found in many religions and cultures. They are often used for ceremonies, prayers and celebrations to express reverence and gratitude to the gods. Water altar shrine designs are often related to natural elements, especially sites associated to water sources. These buildings are often located near lakes, rivers or springs so that people can be better connected with nature. Such a position also symbolizes the source of life and the power of cleanliness. Or with water as inspiration, water culture into every detail, creating water culture pavilion que from the appearance, it uses a streamlined design, as if the form of water waves dancing in the air. On the facade of the building, the glass curtain wall and the water curtain wall are arranged staggered, making the sunlight refracted through the water droplets, creating a dreamy effect. The Henan river basin is mainly plain, supplemented by shallow mountains and hills, which is a developed area of agricultural civilization.

The Yellow River, as the "four blasphemy". Since the Tang Dynasty, he was conferred the title of Lingyuan (Tang) and his God (Song), King Hongji (Yuan), the god of the Great River (Ming) and the god of the Great River (Qing). The locations of the state memorial ceremonies of the Yellow River include Shanxi and Shaanxi Chaoyi), Hejian Prefecture (Puzhou, Shanxi), and Wujia Ying View. Jiaingguan, located in the north bank of the Yellow River in Zuowu County, Henan Province, is also known as "Temple Palace". In the 60 years of the Qing Dynasty from the first year of Kangxi to the first year of Yongzheng (1721-1723), the Yellow River burst in Wu. Emperor Yongzheng ordered Ji Zengjun to build the dike. It is called the "royal dam". Later, Emperor Yongzheng offered to offer sacrifices to the Yellow River, rewarded the heroes and ordered them. The view covers an area of 140 mu, the main



building is located on the north-south axis, from south to north of the gate, the pavilion, front hall (Yan Hall), the hall (king hall), hall (pavilion), Yuwang Pavilion, both sides with the door, bell and drum tower, dressing room, hall, wing room, etc. Its layout is rigorous, the primary and secondary orderly, carved beams and painted buildings, yellow tiles on the top, is a typical Qing Dynasty official buildings. In particular, the bronze tablet given by Emperor Yongzheng was erected in the imperial tablet pavilion. The inscription describes the river disaster control of the Yellow River, expresses the wish to pray for divine blessing, and expresses the intention of building "the Dragon King Temple of the Huai and Yellow Rivers". Jiainguan is a rare official place for sacrifice to the river god. In addition, since the Song Dynasty, there have been special places to worship the Yellow River in Hua, Wenxian, Puyang, Yanshi, Lankao, County, Suining, Yanjin and other places. These places, including u Temple, River Temple, King Temple, Yuwang Temple, Dragon King Temple, etc., all have high historical value

In different geomorphic areas and related microclimate, it presents different water culture architectural characteristics.(Figure 35)



Memorial Temple to King Yu the Great



River temple

Figure 35 Ancient architectural genes

Source: made by the author, 2023

Henan region due to the soil, climate, water conservancy and other natural conditions for the developed agricultural culture provides the superior material basis, mainly self-sufficient family agricultural economy, strengthen the family patriarchal concept, great worship of the ancestors, directly affect the formation of interpersonal relationship of Confucianism and the concept of the five elements of Yin and Yang.

In terms of architectural form, similar to the traditional Chinese architecture in terms of plane and facade shape, the regional architecture in Henan province is influenced



by the "ritual" of the Central Plains culture and remains unchanged. One of the main contents of "rites" is to maintain the order of high and low grades, for example, "Le Ji" said: " Rites, the order of heaven and earth also,..., order, so the group is different."Mr.Li Yunshu pointed out:" the design of all ritual buildings is full of symbolism, which is a metaphysical expression based on the unity of content and form in ancient times."For example, the urban layout model proposed in" KaoJi " comes from the ritual system, which is the representative of the ritual architecture. This also shows the inevitability of emphasizing social ethics and humanistic spirit in the central Plains culture. It can also be seen from the development of the ancient architecture in Henan province, which not only contains the inheritance and development of the modeling will of the Bronze Age, but also is influenced by the philosophy of Lao Zhuang, that is, the anti-artificial isolation and the separation from nature. The regional architecture in Henan has been developed on the basis of the mysterious struggle and combination of Confucianism and Taoism.

In terms of space combination, the traditional regional architecture in Henan province has the characteristics of space-time integration and the pursuit of group harmony. Although the basic unit is a simple form, complex relationships and changes form in the process of its combination. This approach is somewhat coercive, but helps to identify between buildings. The axis and axis are the inner order of the courtyard, which is directly related to the ancient feudal consciousness centered on the imperial power, divine power, clan power and family power. In the way of realizing order, the courtyard combination adopts the current order —— roof, brackets, color and its special equivalence system, resulting in the organization and order within the group. All basic units are controlled by "module" to achieve the purpose of unity.

### 2.3 Stone carving gene

The stone carvings record the efforts and achievements made by the people of Henan in controlling floods, building DAMS and digging channels. One of the most representative works in the stone carving culture is the stone scriptures of the Luoyang White Horse Temple. The stone inscription covers Buddhist teachings and also records the water control project at that time. The stone scriptures is engraved with a large number of words and patterns, vividly showing the wisdom and courage of Henan people in water control. In addition, there are many beautifully carved stone tablets and stone plaques in Henan, which are not only cultural heritages, but also witness to the history of water control. These stone carvings record the thinking and practice of water control in various historical periods, and show their importance and love for water conservancy projects. The stone carving culture in Henan is not only the form of artistic expression, but also the crystallization of the wisdom of water control.

The inscription of the Chijianyangqiao River Shrine, written by Emperor Qianlong, is stored in the Yellow River Museum in Zhengzhou as a key protection inscription. The inscription is very concise, but it clearly records an appalling flood disaster in the 26th year of Emperor Qianlong of the Qing Dynasty (1571). In July of that year, the rainstorm hit the lower reaches of the Yellow River from Sanmenxia to Zhengzhou Huayuankou area, so that " the yellow water rises everywhere, and it is difficult to prepare for it. The remote dike can not tolerate, the son weir is

abandoned."At that time, the Yellow River and the Qinhe River were flooded at the same time, and the embankment at the intersection of the two rivers broke. The water situation was once difficult to control, causing chaos inside and outside the imperial court. After several months of control, the disaster was finally brought under control and closed together in Yangqiao, but the damage caused by the disaster still shocked the world. Twelve prefectures and counties in Henan province were affected by the flood, while two prefectures in Shandong province and four counties in Anhui province were completely submerged. In order to commemorate the flood, Emperor Qianlong wrote three poems in the face of the tablet to express relief for the death of the people in the disaster. Between the lines of these three poems, it is not difficult to see that the ancients were full of fear of the river damage. Although experiencing a hundred years of wind and rain, the whole inscription has some old and the inscription is not very clear, but it is still the most real bearing this period of history, become a strong witness of the heavy flood.

The frequent river basins are mainly concentrated in the middle and lower reaches of the Yellow River, such as Henan, Shandong and other provinces and regions. The most typical one is Henan, 84 stone carvings are distributed here, making it the province with the most stone carvings with a high rate of 39.6% of the total. However, among these stone carvings, as many as 14 stone carvings are related to flood and drought disasters, accounting for 66% of the total number of flood and drought stone carvings. It can be seen that in the middle and lower reaches of the flood, the Yellow River stone carvings are also densely distributed.

Through the study and inheritance of these stone carvings, we can better understand the efforts and achievements of the people of Henan province in water control, and at the same time can learn from their experience and lessons, so as to provide reference and inspiration for the future water control work. Stone carving is a unique and exquisite art form, which integrates the elements of nature and humanity, and shows the deep emotion and communication between human beings and water. These stone carvings can be found between mountains and rivers, by rivers or by lakes, and they are famous for their excellent craftsmanship and exquisite details. As the source of life, water plays a vital role in the development of human civilization. The cliff carvings of the water culture successfully convey the power and mystery of the water to the viewer. Frequent patterns in these stone carvings include running water, fish, boats and aquatic creatures, as well as myths and folk tales related to water. Every detail is carefully carved to present the flow of water, ripples and magnificent scenes. These cliff carvings of water culture are not only works of art, but also an expression of worship and awe for water. Water plays an important role in human life, it is the source of life, but also the moderator of nature. Through these stone carvings, the viewer can deeply feel the power and spirituality of water. Patterns of running water often appear in these stone carvings, which show the beauty of water flow. From the trickle of the stream to the surging torrent of the river, the forms of the running water are different, but they all show the vitality and endless changes of the water.(Figure 36)

Table 14 Outexplicit cultural genes of Yellow River cultural heritage in Henan  
Source: the author homemade

Dominant culture genes	irrigation worksgen	Flood control engineering gene
	historic buildinggen	Water altar ancestral temple gene, water culture pavilion taique gene
	lithoglyphgen	Water culture cliff stone carving gene, water culture tablet inscription gene



Figure 36 Gene of folk belief  
Source: made by the author, 2023



Based on the characteristics of Henan Yellow River culture dominant culture, can through the Yellow River culture dominant culture reverse will be summarized for flood control engineering gene summary for engineering culture, the water altar ancestral temple gene, water culture pavilion tower que gene summary for ancient building culture, the water culture cliff stone gene, water culture inscription gene summary for stone carving culture. It is not difficult to find that the reverse transcript extraction results of cultural genes respond to the preliminary identification of cultural gene transcription in the material and information layer, and the environment, layout and architectural genes show the comprehensive influence characteristics of water culture in the Yellow River Basin in Henan Province.

### **3. Reverse record extraction of recessive cultural genes in the Yellow River Cultural heritage in Henan Province**

#### **3.1 Cultural gene of the Yellow River governance**

The governance of the Yellow River is a long and complex process, which requires the governance spirit with unique cultural characteristics. The Yellow River culture is a historical category, and its formation and development should have a historical process. Due to the importance of the Yellow River in Chinese history, all dynasties have attached great importance to the control of the Yellow River. For example, in the Qin Dynasty, the drainage channel connects the Yangtze River and the Pearl River; in the Western Han Dynasty, Emperor Wudi treated the Yellow River on a large scale; dredging the Yellow River in the Tang Dynasty opened the "Jing River"; in the Ming Dynasty, he explored and accumulated much experience in controlling the Yellow River; Yongzheng and Qianlong treated the Yellow River on a large scale. In these governance activities, the culture with the characteristics of The Times and with the specific mark of The Times has been gradually formed. In these cultures, there are both the values that continue the history of governing the yellow country, maintain the national unity and the national unity, and the values that reflect the national cultural characteristics and the characteristics of The Times and the concept of ecological civilization. It is under the influence of these values that the Chinese nation has formed its own unique values and methodology system. It can be said that the Chinese national culture of governing the Yellow River is the product of the continuous formation and development of the Chinese nation's values and



methodology system in the governance practice. However, this kind of governance of the Yellow River culture is not independent and self-contained, but gradually integrated with other cultures in its formation process. Different from the traditional Chinese culture with Confucianism as the core and the traditional Chinese culture represented by Mohism thought, it is also different from the traditional Chinese culture with legalist thought as the core. Therefore, we say that the governance of the Yellow River culture is a unique and advanced gene culture gradually formed and developed by the Chinese nation in the long-term practice of controlling the Yellow River.

### 3.2 National spirit gene

The national spirit has played an important role in the implementation of the Yellow River management process. These spirits are the way of thinking created and condensed in the relationship with the Yellow River. We cannot deny that, due to the characteristics of the Yellow River itself, it has inevitably brought disaster to people in the process of human development. For example, due to the huge water and sediment content of the Yellow River, and the serious soil and water erosion in the basin, the economic development along the Yellow River has been seriously restricted. However, in the course of thousands of years of history, the Chinese nation has never stopped the governance of the Yellow River. In the process of getting along with the Yellow River for a long time, the Chinese nation has formed a series of spiritual and thinking modes of great significance to the governance of the Yellow River. For example, through continuous summary and innovation, the Chinese nation has gradually formed such philosophical concepts as "the people are the foundation of the country, the foundation is solid and the state is better", "people-oriented" and "the unity of nature and man". These philosophies run through the Yellow River governance and are an important part of the Chinese nation's thought and culture of governing the Yellow River.

### 3.3 Traditional skill genes

The Henan region of the Yellow River has preserved a large number of unique folk literary and artistic works, forming the traditional skills of the Yellow River region from the interaction of people with the Yellow River. The terrain of the Yellow River basin is high in the west and low in the east, and the terrain is complex and diverse. Influenced by the huge sediment content and the significant seasonal climate, the Yellow River has always been unstable in history, and the downstream plain areas frequently cope with the challenges of flood and drought. Our ancestors chose places to live and gathered in the Guanzhong Basin, Fenhe River Basin and northern Henan Plain with humid and rainy climate and good drainage, gradually forming various types of rural settlements. In production and life, people record the related scenes and states, creating unique intangible cultural heritage such as songs and dances,

sacrifices, rituals and rituals. At the same time, the high mountains, valleys and hilly basins in the Yellow River basin form a relatively closed and isolated geographical space, providing conditions for the development of self-sufficient small-scale peasant economy. In the process of the evolution of human and land relations, the residents in the river basin have always continued the traditional way of production and life, and the intangible cultural heritage has been inherited, evolved and developed, and has been completely preserved in the long history.

Many display techniques in the Yellow River basin were created in the course of fighting with the floods of the Yellow River. For example, the "Yellow River rammer" in Qihe County is a cry to coordinate action, unify rhythm and build emotions, it is simple, heavy, bold, bold, accompanied by the Yellow River. Yangko comes from the struggle against the flood, after overcoming the disaster, people will gather together to sing and dance, to express their joy. In this dance, you can also see some abstract flood control actions.

Some of them are derived from the local people's belief in nature, and they use dance to express people's yearning for good wishes. For example, it is a dance used by people to pray for rain when dry weather has not rained for a long time. "Duangu" refers to a kind of folk music sung by people around Dongping Lake when offering sacrifices to the god of water. The Yellow River provides rich materials for it, and also creates conditions for it. For example, brick plastic, it is only found along the Yellow River, it is the Yellow River "" as raw material, with the fine sand on the river, and carved on the best red clay, and with flour, cotton mix, made into a variety of various shapes of clay, lifelike, lifelike. The clay in Zhang Village in Henan province has been old for more than 200 years, and young and young people in the village can make clay.

The focus of gene identification is the art categories that can reflect the interaction between people and the Yellow River, the specific places and carriers for the generation and dissemination of art, as well as the wishes and commemoration expressed by art.

### 3.4 Folk-custom genes

The folk culture of the Yellow River is people's worship of nature, the memory of ancestors, the pursuit of morality and the yearning for life. Its connotation and form are constantly changing with time. In the 20th century, the Yellow River sacrifice has been derived from the traditional sacrificial activities, continuously innovated and enriched in the tide of modern culture and economic development, and become an indispensable part of the folk belief in the Yellow River basin. In Henan, the Yellow River sacrifice is mainly concentrated at the junction of Henan, Shandong and Shaanxi provinces. Zhengzhou city and Gongyi City in Henan Province are the areas with the most concentrated cultural heritage of the Yellow River, and are known as "the hometown of the Yellow River culture in China". Zheng Xiaohua, a Chinese Yellow River culture scholar and a professor at Henan University, said that the Yellow River basin represented by Henan province is one of the cradles of Chinese civilization, which gave birth to a long-standing, extensive and profound Chinese civilization. Henan Yellow River basin is a typical farming culture area, alluvial plains suitable for agricultural farming, self-sufficient farming culture strengthened

with blood of family, clan relations, festival ceremony, performing arts and other intangible activities and traditional village residents daily production and life still maintain close ties, in the construction of family concept and identity continue to play a role.

Henan is located in the Central Plains, which is the largest wheat yield province in China. The Peigang culture, Yangshao culture and jiahu culture proved the developed agriculture and animal husbandry in Henan province as early as the Neolithic period. Therefore, the folk customs of Henan have distinct characteristics of agricultural civilization. Simply put, the people living here have a strong sense of local land, etc. Most of the folk customs are related to agricultural production and food. People in Henan will never forget their own cattle, horses and other big cattle, such as Laba. People in Henan, whether it is Laba porridge or small rice, will not forget to eat some cattle who have worked hard in the fields for a year. Lunar July 15, Henan some places on this day for their home big cattle feast, not only let them off a day, but also steamed on the shape of some lamb white steamed buns, steamed after worship on the table, set off firecrackers, after the steamed to feed to big cattle, also feed cattle at night, also dedicated to these big cattle boil a pot of millet porridge.

The Yellow Emperor Festival in Xinzheng, the Fuxi Festival in Huaiyang, the Guan Gong Trust custom in Luoyang, and the Peony Flower Fair in Luoyang are all related to historical figures and historical culture. The Yellow Emperor is considered to be the ancestor of the Chinese nation, and his worship in the Spring and Autumn Period, after the Tang Dynasty, became the national ceremony, at the tradition of worship to the Yellow Emperor, from 2006, and upgraded to the "Yellow Emperor hometown worship ceremony". The worship of ancestors and the sacrifice of ancestors are a very important part of Henan folk customs. Not only is the grand ceremony, but deep into the details of Henan people's life. Henan people celebrate the Spring Festival, before the New Year's Eve to go to the ancestral grave to invite ancestors, thirty evening, before the New Year's Eve dinner to worship ancestors. In some areas of Henan, there is the custom of burning cypress branches in the courtyard on New Year's Eve, which is actually the residue of the Spring Festival ceremony of the Han Dynasty. People in Henan believe that cypress branches must be cut down to their ancestral graves, because it will be blessed by their ancestors. Tomb-sweeping Day for the death of relatives, the grave is also very special, to use the married daughter sent pork live chicken steamed buns to sacrifice. July 15, to burn paper in front of the ancestors grave, set off firecrackers, to burn incense at home, prepared POTS, spoons, rice and water. The hostess carried the rice basin, scooped water with a spoon, while sprinkling, the mouth kept saying to bless the ancestors, after the whole family knelt down to the ancestral tablet.

At the same time, villagers are the leading force in the cultural change and inheritance of traditional villages, and the key to maintain the vitality of folk customs. The traditional culture of the Yellow River basin in Henan was deeply rooted, and people received the dual role of Confucianism and small-scale peasant economy, and formed the local concept of settling land and relocation. The agricultural production mode in the river basin and the blood clan system based on this survived, and the folk culture was passed down as an important part of the social life of the traditional village residents.

### 3.5 Folk belief gene

In the folk beliefs of the Yellow River basin, in addition to the original belief of offering sacrifices to ancestors and gods, there are also the original belief represented by offering sacrifices to natural gods such as mountains, rivers and land. Among them, sacrifice to natural gods (heaven, earth and water) is the earliest original belief in the Central Plains and continues to this day. Since the Shang and Zhou dynasties, the original beliefs, represented by offering sacrifices to mountains, rivers and land gods, have spread in the Central Plains. During the Spring and Autumn Period and the Warring States Period, with the continuous expansion of the vassal states and the economic and cultural prosperity of the Central Plains, the sacrificial activities became more and more frequent. Since the Eastern Han Dynasty, the Yellow River sacrifice has gradually formed a complete ritual system. During the Ming and Qing Dynasties, the scale of the Yellow River sacrifice reached its peak and became the most influential folk belief activity in the whole Yellow River basin. According to Yu Gong, after the success of Dayu controlling the flood, a grand "grand sacrifice" was held in today's Henan, Shanxi and Shaanxi, in which the sacrificial ceremony included two parts: "Nine Yellow River Festival" and "Great Day of the People". There are also records about the sacrifice of King Yu in the Book of Rites, Rites of Zhou and Rites of Rites. Yao Nai, a scholar in the Qing Dynasty, said in Yu Gong cone inger: " Yu's sacrifice, Xia Zhi also. The son of Heaven spent six days, five days for the princes, three days for the doctor, and one day for the scholar. All officials use the day, the moon, the stars, and the hour."This is the earliest record of the Yu memorial ceremony, which includes the sun, the moon and the star. Among them, the day, the moon and the star are important parts of King Wang's ceremony.

As an ancient form of sacrifice, Yu sacrifice has rich cultural connotation. It is said that after King Yu succeeded the water, he led the water of the Yellow River into the sea in order to thank the support and love of the people. In order to bring this water more benefits to mankind, he gave his kindness to the earth and shaped two dragons with the soil, placing them on the high ground on both sides of the Yellow River. From then on, the Yellow River has continuously flowed east day and night. Later, people built many temples and ancestral halls to commemorate Yu on the banks of the Yellow River.

The sacrificial forms of King sacrifice can be roughly divided into three kinds: one is "heaven and earth" sacrifice; the second is "he Bo" sacrifice; the third is "Shui Bo" sacrifice. According to the Encyclopedia of China, " The gods of heaven and earth are the gods of China. When the Yellow Emperor was made the son of Heaven, heaven was the father and the earth was the mother. The day with the rain god called the rain master; the earth with the thunder god, the water with the sea god called the sea, the fire with the fire god called the Yan Emperor; the wood with the god of trees called the wood; the gold with the gold god called the gold emperor ".

With the Yellow River, Jishui, canal related to the primitive mountain worship. The management and development of the Yellow River, the water river and the canal are the manifestation of the progress of human civilization. In order to benefit the people, to develop the social economy, and to improve the ecological environment, these are the responsibility of our Chinese people, but also the origin of our Chinese civilization."Heaven" means nature, and "man" means human beings. "induction of heaven and man" is a manifestation of the interdependence and influence between



nature and human beings, which is one of the important thoughts in ancient China and also one of the core contents of ancient Chinese traditional culture.

### 3.6 Literary and artistic genes

Folk literature is the expression of people's life records and feelings. It records people's production, life experience and social development history, and it is handed down in oral transmission. Its core content involves love, filial piety, etiquette, personality and many other aspects, in which the basic philosophy, ethics and positive meaning are worth exploring and inheriting.

In the National Intangible Cultural Heritage List, folk customs are divided into three categories: one is historical stories, the second is character stories, and the third is local legends. Among them, Dayu three doors, the battle of Zhuolu, is around a specific historical role; the so-called events are created according to the specific history or reality, such as Feng Yi's when he Bo, bald tail Lao Li legend; representative folklore with regional characteristics, such as: kuafu peak, peach forest, etc. The inheritance and development of oral literature must depend on the medium of "dialect" that it carries. "Words" not only makes the folk customs have strong regional characteristics and life color, but also reflects the characteristics of various regional cultures. In general, the pronunciation and intonation of the dialects in the Yellow River region of Henan province have the common characteristics of the northern region, but in the evolution of individual meanings and etymology, they show the unique characteristics of different regions. The township dialects in the Yellow River area of Henan province have the common characteristics of the northern region in both pronunciation and intonation, but they show the unique characteristics of different regions in the evolution of individual meanings and the formation of verbal evidence. The township dialects in the Yellow River area of Henan province show similarities with the northern region in pronunciation and intonation. This may be due to the close geographical proximity of the Yellow River region in Henan province. Township dialects are usually passed down orally, and with the passage of time, these dialects have gradually formed their own characteristics. Therefore, the dialects of the Yellow River region of Henan are similar to those in the northern region in pronunciation and intonation, reflecting the common historical and cultural background. However, in terms of the evolution of individual meanings and etymology, the township dialects in the Yellow River region of Henan province show the unique characteristics of different regions. Due to the differences in geographical environment, historical development and social communication, there are some differences in the vocabulary and usage of each township dialect. For example, some township dialects may borrow local vocabulary or expressions to meet local life and cultural needs. Furthermore, the evolution of individual meanings may also lead to differences between dialects. When people in different regions use dialects, some words or expressions are subtly adjusted according to their own language habits and environmental needs. To sum up, the township dialects in the Yellow River region of Henan province have the common characteristics in terms of pronunciation and intonation, but show the unique characteristics of different regions in the evolution of individual meanings and etymology. The diversity of this dialect reflects the uniqueness of the local history, culture and society, and also enriches the diversity and charm of Chinese dialects. Some special words, can reflect a special way of thinking

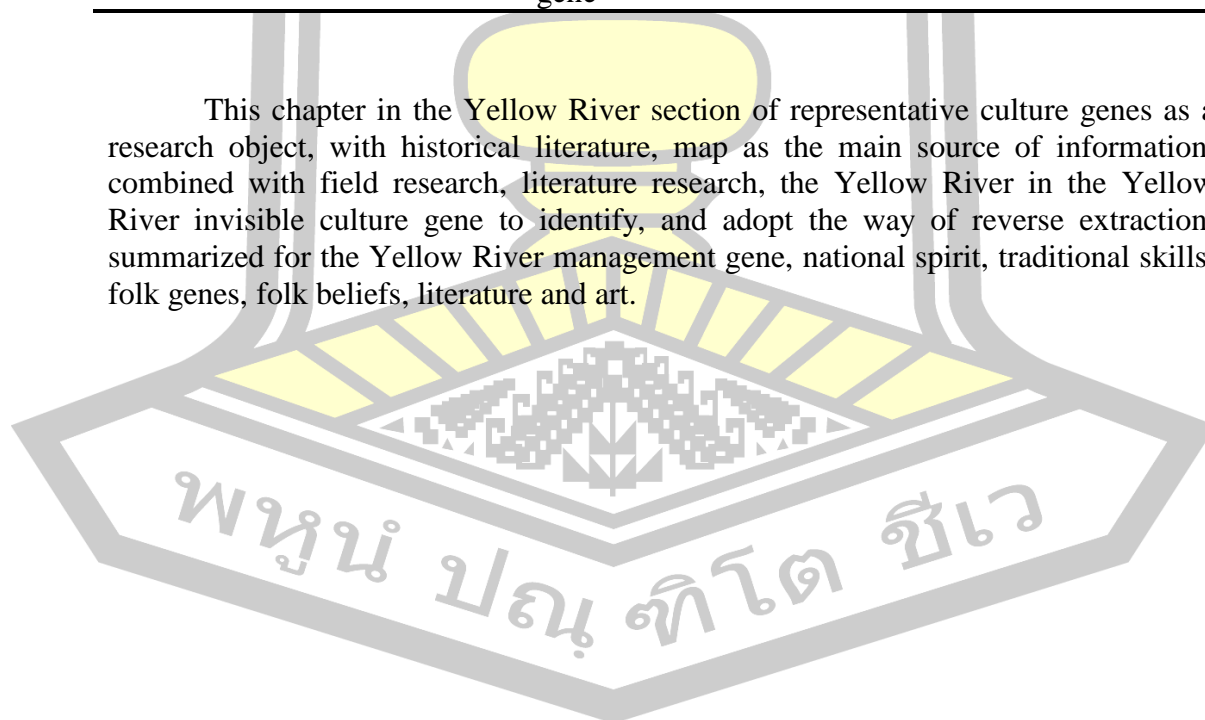
and cultural mentality. The folklore and stories told in the local dialect preserve the regional characteristics and historical traces of the township area.

Folk genes can be divided into three main identification indicators: "literary category", "description object" and "inheritance carrier", while "inheritance carrier" can be subdivided into two aspects: "language tone" and "phrase construction". Its main content is the folk literature stories and legends recording the daily life, production and living experience of the villagers and the development history of the villages and towns, as well as the characteristics of the dialect of each region.

Table 15 Recessive cultural genes within the Yellow River Cultural heritage in Henan province Source: the author homemade

	Yellow River governance gene	Historical and cultural gene, governance spirit gene
The internal recessive culture gene	National spirit gene	National character gene, national value concept gene
	traditional skillgen	Making gene of water conservancy appliances, water culture utensils
	folk customgen	Water conservancy folk song gene, water culture game gene
	Folk belief gene	Folk sacrifice belief gene
	Literary and artistic genes	Water conservancy myth gene, water culture legend gene, water culture story gene, water culture ballad gene

This chapter in the Yellow River section of representative culture genes as a research object, with historical literature, map as the main source of information, combined with field research, literature research, the Yellow River in the Yellow River invisible culture gene to identify, and adopt the way of reverse extraction, summarized for the Yellow River management gene, national spirit, traditional skills, folk genes, folk beliefs, literature and art.



#### 4. Construction of Cultural Genealogy of Henan Yellow River Cultural Heritage

Cultural genetic lineage map is a unique concept used to describe the transmission and inheritance of genetic information in regional cultural systems. Similar to genetic genes in biology, cultural genes also have the characteristics of exchange, recombination and mutation, thus forming a complex chain of information. In the cultural gene lineage map, each region has its own unique combination of cultural genes. These cultural genes are transmitted through the communication and interaction between people. When people from different regions meet, they will exchange their own cultural genes, thus enriching and changing their own cultural characteristics. This exchange can be about language, customs, art, religion, and so on. At the same time, the cultural genes will also undergo the process of recombination and mutation. Recombination refers to the combination and fusion of genes of different cultures to form new cultural elements. For example, when two people from different cultural backgrounds are combined together, their cultural genes will merge with each other, creating a unique cultural landscape. Mutation refers to the mutation or innovation of cultural genes, which makes the culture constantly evolve and update in the process of evolution. The significance of cultural gene lineage map lies in revealing the dynamics and diversity of cultural inheritance. It helps us to understand the communication and influence between different regional cultures, as well as the changes and development of cultures in the historical evolution. By studying the cultural genetic lineage map, we can better protect and inherit our own cultural heritage, but also can appreciate and respect the uniqueness of other regional cultures. In conclusion, cultural gene lineage mapping is a tool useful in understanding regional cultural systems, demonstrating the processes of transmission, exchange, recombination, and mutation of cultural genes. Through the in-depth study of the cultural gene lineage map, we can better understand and cherish the cultural diversity of each region, and promote the inheritance and development of culture.

The cultural gene of the Yellow River in Henan is an extremely rich cultural system formed by constantly integrating, learning from and absorbing other cultures in the long historical process of the Chinese nation. It has the basic characteristics such as openness, diversity and diversity. The Yellow River cultural gene of Henan province is determined by the Yellow River water system. From the perspective of the historical development of the Yellow River, water has given birth to an all-encompassing cultural system. The core and essence of the Yellow River culture is "water culture", which can be identified as the cultural origin of the cultural heritage of the Yellow River in Henan. Therefore, taking the water culture as the transmission code of the Yellow River is the basic feature of inheritance and evolution. In the long process of historical development, the integration of various ethnic groups in the Yellow River basin has promoted the integration and innovation of cultural genes, and formed a rich and colorful national culture. The essential feature of the Yellow River culture is the "harmony between man and water". This concept reflects the unique values and way of life of the Chinese national spirit in the Yellow River basin, and it

is also a great cultural achievement jointly created, shared and inherited by the Chinese people.

As one of the mother rivers of China, the Yellow River is closely linked to the history and destiny of the Chinese nation. For thousands of years, the Yellow River has given birth to countless national heroes and great cultural heritages. In getting along with the Yellow River, people deeply realize the great power of nature and the insignificance of human beings. This kind of awe and gratitude for nature has formed the unique relationship between man and water of the Chinese nation, that is, "harmony between man and water". The Yellow River culture emphasizes the harmonious coexistence between man and water. People respect water resources and are good at using and protecting the water environment. They rely on the water source of the Yellow River for agricultural production, and also actively carry out control projects to prevent floods. This way of life integrated with water not only meets the material needs of people, but also reflects the Chinese nation's reverence and humility for nature. The Yellow River culture is a great cultural achievement jointly created, enjoyed and inherited by the Chinese people. For thousands of years, countless literati have left a rich and colorful cultural heritage in the Yellow River basin, including poetry, calligraphy, painting and other art forms. These works not only show the wisdom and creativity of the Chinese nation, but also inherit the spiritual blood of the Chinese nation, and become an important part of the Chinese civilization. The essential feature of the Yellow River culture is the "harmony between man and water". It embodies the Chinese nation's reverence and gratitude for the nature, and emphasizes the harmonious coexistence between man and water. It is also a great cultural achievement created, shared and inherited by the Chinese people. This unique cultural values and way of life have not only enriched the spiritual world of the Chinese nation, but also made important contributions to the development of human civilization.

**Construction of Henan Yellow River cultural gene lineage** The extraction process of standard cultural genes has visualized the structure of cultural genes according to the architectural system of "cultural form (cultural elements population) cultural elements (cultural elements ethnic group) cultural decomposition (cultural elements) cultural gene carrier (cultural gene)". Mining or decoding the Yellow River cultural gene from the cultural gene code lineage of the Yellow River cultural heritage can straighten out the cognition of the Yellow River cultural heritage. Through the implementation of "cultural gene decoding", we can comprehensively excavate the cultural connotation, decoding each cultural form, and find the internal genes of cultural existence.

The cultural gene of the Yellow River in Henan has distinct regional characteristics of the Central Plains and distinctive characteristics of the Central Plains, and has the unique historical, geographical, economic, cultural characteristics and tradition of the Central Plains. The cultural gene of the Yellow River in Henan was produced and developed in the natural geographical environment and human geographical environment of Henan, and has distinct regional and national characteristics. Henan Yellow River culture gene refers to the in Henan specific geographical conditions formed and exist for a long time, with the Chinese nation as the main body, based on farming, with moral as the core, patriarchal family, with



regional characteristics, features national tradition and revolutionary tradition, in the Yellow River basin nationalities create cultural culture.

The pedigree table represents the relationship between different regions or different cultures in different time scales by tree structure. It can intuitively present the relationship between different regions or cultures in space, making people clear at a glance. Lineage map can be divided into two types: regional culture lineage map and cultural gene lineage map. Regional culture pedigree map mainly studies the structure and law of the relationship between elements in regional culture, as well as the evolution process of these elements in time scale. Cultural gene lineage map is to comb, summarize, summarize and present the internal connections between various elements in regional culture, It is mainly used for the study of the relationship between elements in regional culture and the relationship between elements and a specific historical period and a specific region. The table of regional culture genealogy is to summarize, summarize, summarize and present the relationship between elements in regional culture and between elements in a specific historical period and specific regions.

Cultural gene lineage table is an orderly arrangement, combination and deconstruction of traditional cultural elements, such as primitive cultural memory, folk art, religious belief and settlement form, according to their own attributes and internal logical relations, and finally form an orderly map that can completely record all the historical information of regional culture.

Cultural gene is a "potential genetic code", which is like an invisible "fingerprint", which is inherited through the inheritance and continuously evolves in the cultural inheritance. Through cultural genes to investigate whether culture has vitality, from another perspective, we can see how cultural genes "reproduce" different kinds of cultures and cultures of different periods."Reproduction" is one of the ways that life can exist and continue. Living things reproduce the continuation of individual life, animals reproduce the population by reproduction, and human beings reproduce the continuation of civilized society. Cultural inheritance is also the basic way and way of cultural existence and continuation. Through cultural inheritance, human beings can make all people in a nation, a country, a region and a country understand each other, and can achieve common development at a higher level through mutual understanding.

Genes are the extrinsic manifestation of biological genetic information on the chromosome. Genes are made up of DNA (deoxyribonucleic acid). DNA carries genetic information, which is arranged in chains on the chromosome. It is the most basic and important unit of genetic material. Cultural inheritance and continuation also need a kind of gene carrier to carry, namely the so-called "gene lineage". "Gene lineage" refers to the map formed by taking genes as the research object. It plays an important role in cultural inheritance and continuation, and is an important basis for understanding and analyzing the laws and characteristics followed in the process of cultural inheritance and continuation.

To understand how a culture "breeds", you first need to understand what genetic information the cultural genes contain and how it is paired up. Through the collection and sorting of the characteristic cultural genes of the Yellow River in Henan, a map that can completely record the cultural heritage information of the Yellow River in Henan. Therefore, the basic logic of the construction of the Henan Yellow River

cultural gene lineage table, which can clearly display the cultural genes, can be understood as a complex genetic system. In this system, the genetic lineage of the Yellow River culture is regarded as a genetic chain, carrying the genetic information of the Yellow River cultural system. On this genetic chain, information is protected and passed on by inheritance, variation, exchange, or mutual grafting. GeneInheritance refers to the transmission process of gene information in offspring, which ensures the continuity of the Yellow River cultural genes. Variation refers to the mutation and diversity of gene information, which enables the Yellow River cultural genes to adapt to the change and evolution of the environment. Exchange refers to the exchange and integration of information between different regions or different cultures, which promotes the diversity and richness of cultural genes in the Yellow River. Mutual grafting refers to the mutual influence and reference between different cultures, which promotes the innovation and development of the Yellow River cultural gene. Through these genetic mechanisms, the Yellow River culture gene lineage can maintain its uniqueness and continuity. Each generation carries the genetic information of its predecessors and passes it on to the next generation. At the same time, with the passage of time and the change of the environment, the genetic lineage of the Yellow River culture will also change and evolve accordingly to adapt to the new challenges and needs. The communication and grafting between different regions or different cultures provide the soil for the diversity and innovation of cultural genes in the Yellow River. From the perspective of phylogeny, the basic logic of the genetic lineage construction of Henan Yellow River culture is to protect and inherit the Yellow River cultural genes through inheritance, variation, exchange or mutual grafting. The existence of this genetic chain enables the Yellow River culture to continue in time and space, and constantly adapt to and develop. Content, features, and interrelationships.

Through the extraction and classification of the explicit and recessive cultural genes of Henan Yellow River cultural heritage, the gene lineage of Henan Yellow River cultural heritage can be derived and constructed. As an important part of the ancient Chinese civilization, the Yellow River culture in Henan province has a rich and unique heritage. By extracting and classifying the dominant cultural gene and the recessive cultural gene, we can derive and construct the gene lineage of Henan Yellow River cultural heritage.

First of all, explicit cultural genes refer to those elements that are directly expressed in the material culture, such as architecture, art, artifacts, etc. In the Yellow River culture in Henan, these dominant genes include many famous ancient buildings, which, with their unique style and exquisite craftsmanship, show the prosperity and glory of the Yellow River culture in Henan.

Secondly, recessive cultural genes refer to those factors that are not easily detected but profoundly affect cultural inheritance, such as values, belief systems, traditional customs and so on. In the Yellow River culture in Henan province, these recessive genes are reflected in people's reverence and dependence on the natural environment, as well as the importance of family, community and social unity. These traditional values and customs provide a solid foundation for the continuation and inheritance of the Yellow River culture in Henan province.

By extracting and classifying these dominant and recessive cultural genes, we can describe a complete genetic lineage of Henan Yellow River cultural heritage. This genetic lineage will demonstrate the diversity and richness of the Yellow River culture in Henan, and will also reflect its connection and communication with other regional cultures. This genetic lineage not only helps us to better understand and study the evolution and development of the Yellow River culture in Henan province, but also can provide important reference and guidance for cultural protection and inheritance.

In short, through the extraction and classification of the explicit cultural genes and recessive cultural genes of Henan Yellow River cultural heritage, we can construct a comprehensive and in-depth genetic lineage of Henan Yellow River cultural heritage, so as to better understand and inherit this important cultural heritage.

*Table 16 Gene lineage of the Yellow River cultural heritage in Henan Province*

cultural attribute	Performance carrier	Cultural population	cultural element	type
thing nature Article spend base follow	apparent nature	Hydraulic culture	Flood control project heritage	Henan western River and Eastern Han Yellow River dike, Ming and Qing Yellow River dike
	year body	Ancient architecture culture	Water altar ancestral temple, water culture pavilion platform que	Wuzhi Jiaying guan, Mengzhou Suoshui Pavilion, Yuzhou Yuwang Temple, Yuwang Suojiao well, Hemudu Temple
		Stone carving culture	Water culture cliff stone carvings, water conservancy tablet inscriptions	Mianchi East Liuwo village flood stone, Dengfeng Han Dynasty imu Que Dayu water control stone, Zheng Gong dragon stone, Henan Wuzhi County Royal dam stone, the Yellow River Garden mouth dragon monument, Kaifeng town river god beast iron rhinoceros
		Traditional art culture	Production of water conservancy appliances, water culture utensils production	The Yellow River clear mud ink stone, the Yellow River mud xun, the Yellow River cast by the traditional skills
mistake thing nature Article spend base follow	hide nature year body	folk culture	Water conservancy	River worker haozi, soil I haozi, boatman haozi

		folk songs, water culture games	
Folk culture	faith	Folk worship faith	The Yellow River sacrifice, Yu Wang sacrifice
Literature, art and culture		Water conservancy myth, water culture legend, water conservancy story, water conservancy ballad	The legend of Dayu controlling the Water, the legend of Sanmenxia, the legend of King Yu Suojiaojing, the legend of etu, the folk song hu Zi Song, the folk song of Shaanxi County
Governance culture		History and culture, and the spirit of governance	Historical causes, historical process, historical events, thought for the people, fighting spirit, innovation consciousness, unity and cooperation, ecological concept
ethos		National character and national values	Reform nature, respect nature, perseverance, unity and cooperation, ecological concept

### Summary

The cultural heritage of the Yellow River section in Henan is selected as an example, and the cultural gene of the Yellow River is dug out according to the extraction process of the Yellow River cultural heritage gene formulated above. Extract the dominant culture gene has hydraulic gene, hydraulic gene, stone carving gene, within the recessive culture gene has the Yellow River governance gene, national spirit, traditional skills, gene, folk gene, folk belief, literature and art, verification and response to the Yellow River cultural heritage culture gene extraction method, finally its complete construction in cultural gene lineage.



## CHAPTER VI

### Research Result, Discussion and Suggestions

#### 1. Conclusion

Yellow River water cultural heritage is a special cultural heritage with a long history, many types and rich value connotations, however, at present, the research on the composition system of the Yellow River water cultural heritage in China is a blank, and there are not many in-depth systematic analyses and researches from the level of cultural genes. Under the background of the implementation of the major national strategy of ecological protection and high-quality development of the Yellow River Basin, the systematic protection of the Yellow River cultural heritage has become one of the key tasks of the provinces and cities along the Yellow River, and the study of its composition is the basis for the development of this work. The thesis selects the water cultural heritage of the Yellow River section in Henan as the research object, initially constructs the composition system of the water cultural heritage of the Yellow River section in Henan, systematically analyses the cultural genes of the Yellow River cultural heritage, and constructs the genealogy of the Yellow River culture in Henan.

Cognition of the Yellow River cultural heritage connotation. This paper firstly starts from the basic theoretical research and summarises the relevant research on the Yellow River cultural heritage of various experts and scholars, and comprehensively cognizes the connotation of Yellow River culture and defines the Yellow River cultural heritage from the two main axes of time and space, namely, the natural environment of the Yellow River culture, its development history, its spatial distribution, the essence of the culture, its constituent elements and its attribute characteristics from various perspectives, so as to provide a basis for the research on the composition of the Yellow River cultural heritage in Henan Province. The Yellow River cultural heritage in this study penetrates into the dimension of Yellow River water affairs, reflects the creative activities of human beings in managing the Yellow River, and embodies the ideological spirit of water affairs activities. In the Yellow River water affairs activities of promoting benefits and removing harms, human beings have formed a way of thinking and a way of behaving with the characteristics of the Yellow River water conservancy, and have created a rich Yellow River water cultural heritage in the aspects of engineering, tools, architecture, art, science and technology, crafts and so on, including the tangible cultural heritage of water conservancy engineering, ancient ferries, ancient architecture and so on, as well as intangible water cultural heritage of the Yellow River Horns and other intangible water cultural heritage.

Summarise the elements of Henan Yellow River cultural heritage. Taking the connotation of Yellow River culture as the cognitive framework and theoretical basis, with the help of relevant historical data and local records, the historical lineage of Henan Yellow River cultural heritage is sorted out, and under the support of the connotation framework of Yellow River cultural heritage, the constituent elements of the connotation of Henan Yellow River cultural heritage are summarised and

condensed from a multidisciplinary perspective and are divided into the three elements of immovable water cultural heritage, movable water cultural heritage and intangible cultural heritage as the main body.

The composition system of Henan Yellow River cultural heritage is constructed. Through in-depth research on the connotation composition of Henan Yellow River cultural heritage, this paper establishes 12 sub-categories based on three categories of Yellow River cultural heritage under the framework of connotation composition of Henan Yellow River cultural heritage -cultural elements-, according to which the "3-12" composition system of Henan Yellow River cultural heritage is constructed innovatively. Accordingly, the first list of Henan Yellow River cultural heritage was compiled based on the "3-12" composition system, with the classification of connotation composition as the main body, the logic of heritage combing reflecting the continuity, origin and subjectivity of Yellow River culture, and the time, space and scope of heritage combing as the benchmarks. In total, 239 items of Henan Yellow River water cultural heritage were sorted out, including 12 water conservancy projects, 21 ancient sites, 23 ancient buildings, 46 stone carvings, 7 important historical sites and representative buildings in modern times, 64 water conservancy documents, 24 water conservancy artefacts, 13 water-related objects, 13 items of folk water conservancy literature, 5 items of performing arts, 5 items of traditional water conservancy techniques, and 6 items of social folklore and festivals. The whole system in the list breaks the boundaries and shackles between the original cultural protection units, historical and cultural cities, towns, villages, scenic spots and other heritage hierarchies, and from the cognition of the connotation of the cultural heritage of the Yellow River, it builds a more complete and real heritage system reflecting the connotation of the Yellow River culture of Henan, and tells a relatively real and complete story of the Yellow River culture of Henan.

From the concept of cultural gene, we can see that cultural gene is the "soul" of a cultural system, and this soul must be attached to a certain carrier in order to be inherited and protected, so in this sense, to protect and repair the material culture in the cultural system is to protect and inherit the cultural gene of the cultural system. According to the explanation of the consensus of cultural gene, here we can define the concept of Yellow River cultural gene:

The Yellow River cultural gene is the basic element that the Yellow River culture, as a complete self-organized cultural system, remains unchanged in the generation and evolution of its culture. This basic element permeates the material culture, and with the help of the material culture of the Yellow River, it can express the national integrity, national spirit and values.

Different material carriers can inherit the same cultural gene, for example, bridges, piers, wharves, granaries and other architectural sites built along the Yellow River can carry the national spirit of our ancient people in the era of waterway transport, and various Yellow River cultural halls built in imitation of the ancient Yellow River architectures can also reproduce the cultural gene of our ancient Yellow River culture. Therefore, from this level, to protect the Yellow River culture is to protect the material culture which can permeate the gene of Yellow River culture. The process of change, development and innovation of the material culture of the Yellow River is the process of generation and development of the Yellow River cultural system, i.e. the process of "reproduction" of the Yellow River culture.

From the cultural gene and the definition of the Yellow River cultural gene, it can be concluded that the cultural gene of the Yellow River is essentially the national spirit embodied in the Yellow River culture. The famous philosopher Mr Zhang Dainian once said: "Every great nation has its national culture, and every national culture has its basic spirit, which can also be called national spirit. This national culture and national spirit form part of the life of the nation." Then, we can extract and deconstruct the cultural gene of the Yellow River from the development and change of more than 5000 years' history of water conservancy development in the Yellow River Basin - the people's thought, the spirit of struggle, the sense of innovation, the unity and cooperation and the ecological concept, etc., which have been created and condensed by the people in the process of implementing the Yellow River's governance, and this is our national spirit. The cultural gene of the Yellow River can be briefly summarised as the national spirit of transforming nature, respecting nature and perseverance.

Through the implementation of "cultural gene decoding", each cultural form is decoded, the inner gene of the Yellow River cultural heritage is found, and the cognition of the cultural heritage of the Yellow River in Henan is straightened out. Based on the cultural genes of Henan Yellow River, we can construct the cultural genealogy of Henan Yellow River, the so-called cultural genealogy of Henan Yellow River is actually the development genealogy of material culture in the process of development and change of the Yellow River, and the history of the development of material culture of the Yellow River is actually the history of the inheritance of Yellow River cultural genes.

This article constructs the genetic genealogy of the Yellow River culture in Henan from the perspective of cultural genes. The genetic genealogy generated by culture can not only distinguish the Yellow River culture and non-Yellow River culture, but also accurately formulate protection measures for the Yellow River cultural heritage based on the genetic genealogy. It can also cultivate new generation points of the Yellow River culture based on the genetic genealogy.

A genetic genealogy of the Yellow River culture in Henan was constructed. Based on the spatial distribution of the canal cultural heritage and its kinship with the Yellow River, a cultural genetic pedigree for the development of the Yellow River culture can be constructed: a three-stage development pedigree of the core carrier cultural heritage of the gene - the derived carrier cultural heritage of the gene - the comprehensive carrier of the gene cultural inheritance.

The core carrier heritage of the Yellow River cultural genes in Henan. Including the Yellow River itself and its course, ancient sites, ancient buildings, important historical sites and representative buildings in modern times, stone carvings, water conservancy projects, etc., immovable cultural heritage with specific forms are part of the core carrier heritage. For example, the Yellow River itself and its course, Xiaolangdi Water Conservancy Hub, Sanmenxia Large Water Conservancy Hub, Jiaying Guan, Jidu Temple, Yuwang Temple, Longma Nitu Temple, and Locked Water Pavilion.

The Yellow River cultural genes of Henan are derived from the carrier heritage. Such cultural examples as Jiayingguan and Zhenhe iron rhinoceros which can reflect the characteristics of tangible cultural heritage, and cultural examples such as the singing style of the Yellow River Horn in intangible cultural heritage,

engineering and management techniques in the practice of Yellow River management, and stories and spirits in the process of management of the Yellow River, are all derivative carrier heritage.

The comprehensive carrier heritage of the Yellow River cultural genes in Henan. Such as flood control project, irrigation project, urban and rural water supply and drainage project, soil and water conservation project, landscape water conservancy project.

From the point of view of phylogeny, the basic logic about the construction of genealogy of Henan Yellow River culture is that the genealogy of Henan Yellow River culture is a gene chain containing the genetic information of Henan Yellow River culture system, and the information on the chain completes the protection and inheritance of the genes of Henan Yellow River culture through heredity, mutation, exchange, or grafting with each other. The development process of genealogy of Henan Yellow River culture is the process of generation, development and enrichment of Henan Yellow River culture, and then the process of forming Henan Yellow River culture system. And with the development of the times, the cultural system of Henan Yellow River culture will also develop continuously with the addition of new elements of the times.

According to the genealogy of the Yellow River culture in Henan, it is possible to clarify the connotation and extension of the Yellow River culture: the Yellow River cultural heritage in Henan does not refer to all the cultures and cultural sites along the Yellow River and in the Yellow River basin in general, but rather refers to those that are permeated with the genes of the Yellow River culture. For example, the Mingtang site of Sui and Tang Dynasty Luoyang City, which survived thousands of years ago, can hardly be said to be necessarily connected with the Yellow River even though the site is located in Luoyang City, a city along the river. If the site is protected according to the protection measures of the Yellow River cultural heritage site just because it is located in Luoyang, then the protection scope and number of the Yellow River cultural heritage site will be infinitely enlarged without being able to really implement the protection, and it is also a mistake of pan-cultural protectionism. Therefore, from this point of view, the construction of the genealogy of Henan Yellow River culture defines the connotation of Yellow River culture and also draws a clear boundary for the extension of Yellow River culture. At the same time, based on the genealogy of Yellow River culture in Henan, i.e. the logic of Yellow River culture generation and development, we can promote the protection of Yellow River culture by cultivating its new growth point continuously.

The Yellow River itself is a flowing and living culture, with the change of time and the development of society, the Yellow River culture also changes and develops, and the connotation of the developing Yellow River culture can be realised through the development of the genetic genealogy of the Yellow River culture. Cultural heritage is an important embodiment of the depth of a nation's history, and the appropriateness or otherwise of cultural heritage protection measures is directly related to whether a nation's civilisation record is broken or forgotten, so the protection of cultural heritage should follow a scientific and reasonable method, and should not be tossed around and subjectively made up as one wishes, especially for the cultural heritage which is still "alive" and has recorded the history of the Yellow River culture, which is still "alive" and has recorded the history of the Yellow River



culture. This is especially true for the Yellow River cultural heritage which is still "alive" and has political, economic and cultural imprints across nine provinces and districts. This paper gives the methodological measures for the conservation of the Yellow River cultural genes from the perspective of the logic of cultural genealogy, with a view to providing some guidance for the study and formulation of the Yellow River cultural conservation measures in the provinces and regions along the Yellow River.

Through the extraction of cultural genes and the construction of genealogy in Henan Yellow River cultural heritage, it helps to clarify the structural relationship between complex cultural elements, obtain the scientific method of copying and applying cultural genes, and is conducive to the creative transformation of the Yellow River culture into cultural industry. In addition, the gene genealogy helps Henan Yellow River culture to trace its roots by adopting the genealogy table to collect, analyse and integrate the associated information, so as to screen out the culture with value, which can provide theoretical methodological guidance and development path guidance for the excavation of cultural genes of China's linear cultural heritage, the restoration of historical memories, and the cultural inheritance.

## 2. Discussion

At present, domestic scholars have less systematic research on the cultural heritage of the Yellow River, and only a small number of scholars have conducted systematic research by sorting out the cultural heritage resources of the Yellow River at the level of the basin as a whole and studying the composition system of the cultural heritage of the Yellow River. Most of the research based on cultural genes is still limited to the discussion of its concept, connotation, field and its characteristics, and there are few in-depth research on a specialised field.

### 2.1 Research on the Cultural Heritage of the Yellow River Historic Trail and Yellow River Region

For the systematic study of Yellow River cultural heritage, some scholars focus on the composition of Yellow River cultural heritage. Zhao Hu and other scholars propose that Yellow River cultural heritage should not be generalised, and that it should be based on the historical process of symbiosis and coexistence between people and the Yellow River over the past thousands of years, and on the heritage of hydraulic engineering in the Yellow River system, so as to build a system of Yellow River cultural heritage of Yellow River hydrological characteristics, which includes hydro-industrial heritage, accompanying remnants, historical and cultural districts and towns, red revolutionary heritage, cultural landscapes, and intangible cultural heritage.

Dong Jingjing, in "Research on the Value Evaluation and Application of Water Cultural Heritage of Zhengzhou Section of Yellow River", divides the Yellow River water cultural heritage into two major types: Yellow River engineering water cultural heritage and Yellow River non-engineering water cultural heritage, for the Yellow River engineering heritage types mainly include: navigation project, irrigation project, flood control project, soil and water conservation project, urban water supply and

drainage project, monolithic buildings, etc.; the Yellow River non-engineering heritage mainly includes the related The non-engineering heritage of the Yellow River mainly includes the related water conservancy facilities (e.g. water lifting tools, water conservancy machinery facilities, etc.), engineering management facilities, water gods and their worship buildings, and water culture sites.

Zhao Peng, in "A preliminary study on the classification and protection of cultural heritage in the Yellow River Hukou area", divides the cultural heritage of the Yellow River Hukou into movable heritage, immovable heritage and intangible cultural heritage. Movable heritage includes: carvings, calligraphy, poems, relics and relics, ruins of ancient castles, buildings and architectural complexes; immovable heritage includes: sites of ancient human activities, grottoes; and intangible cultural heritage includes: spiritual symbolism of Hukou Falls, temple activities, ritual activities, early land boat trips, folklore.

He Xiaosheng et al. suggested that the cultural heritage to be excavated in Xuzhou Yellow River watercourse area mainly includes the heritage of the abandoned Yellow River itself, the relevant ancillary buildings along the abandoned Yellow River, the ancient sites in the area of the Yellow River watercourse that have been washed away, silted up and buried by the Yellow River as well as the intangible cultural heritage of the abandoned Yellow River.

Wu Bihu et al. "Regional Geographic Effects of the Yellow River Diversion and the Revitalisation of the Heritage of the Forbidden Road - Taking the Yellow River Forbidden Road (Jiangsu Section) as an Example" study takes the Yellow River Forbidden Road (Jiangsu Section) as an example, the tangible cultural heritage system of the Yellow River Forbidden Road (Jiangsu Section) consists of three parts: towns along the route, architectural remains, and water conservancy engineering facilities, and the intangible cultural heritage system of the Yellow River Forbidden Road (Jiangsu Section) consists of the culture of water management, spiritual culture, and folklore culture.

However, there are still some limitations in the research on the constituent system of the Yellow River cultural heritage, and the depth and breadth of the existing research on the constituent system of the Yellow River cultural heritage are different. Most of the studies are carried out from the local perspective or a single item of heritage, which lacks a holistic and global structure, and also neglects the intangible cultural heritage that is closely related to the Yellow River's own attributes and has important value. Some studies are somewhat limited in dividing the Yellow River water cultural heritage into two major heritage types: engineering and non-engineering. This leads to the fact that our overall grasp of the constitutive system of Yellow River cultural heritage is not comprehensive enough, and some important constitutive elements still need to be further excavated and sorted out in depth.

## 2.2 Discussion on the method of extracting cultural genes from cultural heritage

At present, there is no research on the cultural genes of the Yellow River, so this paper discusses the extraction and identification methods of the "cultural genes" of the Grand Canal by analogy.

Huo Yanhong's "Theoretical Analysis on the Extraction and Inheritance Path of "Cultural Genes" of the Beijing-Hangzhou Grand Canal", Gong Yu's "Composition of Cultural Heritage and Construction of Gene Genealogy of the Wuxi Section of the Grand Canal", and Song Changshan's "Composition of Cultural Heritage and Genealogy of the Jiangsu Section of the Grand Canal" are all about the introduction of the gene extraction method of biological genetics to the extraction of cultural genes of the Grand Canal, and then sorting out the ideas of extracting cultural genes of the Grand Canal. and then sort out the extraction ideas of the cultural heritage of the Grand Canal.

Huo Yanhong's "Research on the Protection of the Water Cultural Heritage of the Beijing-Hangzhou Grand Canal Based on the Perspective of "Cultural Genes"" draws on the phylogenetic analysis method and the phylogenetic tree construction method in modern molecular biology, and tries to construct a phylogenetic tree model of the water culture of the Beijing-Hangzhou Grand Canal on the basis of this method. The Study on Cultural Gene Analysis and Protection and Inheritance of Yangzhou Section of the Grand Canal draws on the method of extracting and identifying the "spatial genes" of Duanjin to excavate the cultural genes of Yangzhou Section of the Grand Canal.

Zhang Yi, "Construction of Canal Visual Culture Gene Model in the Field of Non-Genetic Inheritance", extracts canal visual culture genes based on the double-diamond model and constructs the extraction model.

Existing studies still have some gaps and limitations in research methods and contents. Numerous scholars study the inheritance of the Grand Canal cultural heritage from the perspective of cultural genes, which can clarify the inheritance and development mode of the Grand Canal cultural heritage, but there is no mention of how to extract cultural genes. In view of the lack of hierarchical and symbolic understanding of the existing analytical classification methods, and the lack of classification features of the operational classification methods, this paper improves the research on the identification of cultural genes, and constructs a more universal and more applicable extraction method. In this paper, we propose to adopt the method of "reverse transcription" to extract cultural genes. Compared with the existing methods, the extraction method of "reverse transcription" has certain advantages, and the process of "reverse transcription" from the specific carrier to the main category of genes has better identifiability and practicability. Therefore, the "reverse transcription" extraction method is more inclusive and expandable, and the extraction of cultural genes will be more perfect in comparison.

At present, most of the cultural gene extraction methods refer to the process of biological gene extraction, and there is still a gap in the substantive and in-depth study of the extraction step methods. This paper proposes a general process of cultural gene extraction for the Yellow River cultural heritage by analogy with the product gene reverse transcription extraction method. According to the process of firstly collecting examples of cultural elements, secondly constructing populations of cultural elements,

secondly establishing ethnic groups of cultural elements, again extracting cultural elements, and finally identifying cultural genes for the extraction of cultural genes of the Yellow River, the cultural elements are extracted from the cultural forms, and then the cultural elements are decomposed, and the cultural genealogy of the Yellow River culture of Henan Province is constructed through the structure of cultural gene carriers' expression.

### 2.3 Main innovation points of the paper

Under the background of the implementation of the national strategy of ecological protection and high-quality development of the Yellow River Basin, the Yellow River has been endowed with more cultural significance, however, there are fewer systematic researches on the cultural heritage of the Yellow River in the field, and even fewer articles talking about the cultural heritage of the Yellow River from the perspective of cultural genes at a deeper level. Based on the new perspective of cultural genes of cultural heritage, this paper constructs a cultural genealogy of the Yellow River in Henan. It is mainly innovative in the following aspects:

2.3.1 On the basis of systematically combing relevant literature and existing representative cultural heritage resources, this paper puts forward the conceptual connotation and compositional requirements of the Yellow River cultural heritage, pays attention to 12 kinds of heritage elements, and accordingly innovatively constructs the "3-12" compositional system of the Yellow River cultural heritage in Henan, which scientifically explains the concept and content of the Yellow River cultural heritage. content.

2.3.2 In terms of methods and ideas of protection, the concept of cultural genes has been comprehensively introduced into the protection of the cultural heritage of the Yellow River for the first time.

2.3.3 Based on "cultural gene", this paper puts forward "cultural gene of Yellow River cultural heritage", and excavates the cultural gene of Yellow River in Henan.

2.3.4 The methodological model of cultural gene extraction of Yellow River cultural heritage is constructed. The existing cultural gene extraction of cultural heritage draws on the biological gene reverse transcription method which lacks the execution process, this paper analogises the principle of biological genetic engineering, adopts the typological and phenomenological research method to propose the general process of cultural gene extraction of the Yellow River cultural heritage, which makes up for the shortcomings of the existing method, and expands the relevant theories of the study of cultural genes.

2.3.5 Through the implementation of "cultural gene decoding", the unique cultural gene content of Henan Yellow River cultural heritage has been screened and extracted, and the knowledge of Henan Yellow River cultural heritage has been rationalised.

2.3.6 A cultural gene identification index system of Yellow River cultural heritage is constructed. This paper clarifies the connotation and concept of cultural genes of cultural heritage, takes Henan Yellow River cultural heritage as the research object, identifies and extracts the explicit features of Henan Yellow River cultural heritage such as hydraulic culture, stone carving culture, ancient building culture, etc., and the implicit cultural genes features such as traditional skills culture, folklore culture, folk beliefs culture, literature and art culture, governance culture, national



spirit, etc., and constructs the Henan Yellow River cultural gene identification The index system of Henan Yellow River cultural gene identification was constructed.

### 3.Suggestions

#### 3.1 Genetic Types of Yellow River Culture in Henan

Cultural genealogy chart is a chain of genetic information containing regional cultural systems, and the genetic information on the chain completes the dissemination and inheritance of cultural genes through exchange, reorganisation and mutation. From the point of view of the historical development of the Yellow River, water has given birth to an all-encompassing cultural system, and the core and essence of the Yellow River culture is "water culture", which can be identified as the cultural origin of the cultural heritage of the Yellow River in Henan Province, therefore, the inheritance and evolution of the Yellow River culture in Henan Province with the water culture as the code of transmission is the basic feature of the Yellow River cultural genes in Henan Province. The cultural genealogy construction method adopted in this study is to establish the internal logical relationship between genetic information and cultural origin, i.e. the affinity of "water" culture in Henan Yellow River cultural heritage, and the extracted cultural genes are classified into three components, namely, main genes, attached genes and mixed genes (Table 19).

Table 17 Identification of genotypes of the Yellow River culture in Henan

gene type	define	genetic property	Genetic Types of Yellow River Culture in Henan
main gene	Cultural genes that are central and prominent in a culture, have a dominant role over other cultures and are uniquely identifiable with the culture	Cultural dominance, cultural identity uniqueness, benign variability	The Yellow River itself and its channels, Xiaolangdi Water Conservancy Hub, Sanmenxia Large Water Conservancy Hub, Jiaying Guan, Jidu Temple, Yuwang Temple, Longma Nitu Temple, Locked Water Pavilion, etc.
attachment gene	Genes that are dependent on certain carriers and are highly recognisable within the culture, reflecting the cultural identity better	Cultural identity, benign variability	The site of the Yellow River Huayankou dyke, "Yellow River Juzu", Yellow River Horn, Yellow River Waterwheel, the legend of Dayu's water treatment, Yellow River Rituals, etc.
hybrid gene	Genes that are not specific to the culture and are generally recognisable, but still record important historical information about the culture and reflect certain cultural characteristics	not have	Flood control project, irrigation project, urban and rural water supply and drainage project, soil and water conservation project, landscape water conservancy project, etc.

3.1.1 The main gene has the most profound influence on the Yellow River culture in Henan, has the uniqueness of cultural identification, and occupies a dominant position in the Yellow River culture system in Henan. It is the mother body for the formation and derivation of other cultural genes in the gene-culture genealogical chart, and once the main gene is missing, it is difficult to form and spread the Yellow River culture. In the cultural heritage of the Yellow River in Henan, the cultural genes that directly embody the characteristics of water culture and are most closely connected with water culture belong to the main genes. The Yellow River itself and its course, ancient ruins, ancient buildings, important historical sites and representative buildings in modern times, stone carvings, water conservancy projects, etc., the immovable water cultural heritage with specific forms are part of the main gene in the genealogy of culture. For example, the Yellow River itself and its course, Xiaolangdi Water Conservancy Hub, Sanmenxia Large Water Conservancy Hub, Jiaying Guan, Jidu Temple, Yuwang Temple, Longma Nitu Temple, and Locked Water Pavilion.

3.1.2 Attachment gene refers to the part of gene that depends on the main gene, as the extension of the main gene, attachment gene is a type of cultural gene that exists in a specific carrier, which has the function of strengthening the characteristics of Henan Yellow River culture, making the characteristics of Henan Yellow River culture more recognisable, and at the same time, it is closely related to water culture. For example, the cultural elements such as Jiayingguan and Zhenhe iron rhinoceros that can reflect the characteristics of material cultural genes; the singing style of the Yellow River Horn, the engineering and management techniques in the practice of Yellow River management, the stories and spirits in the process of Yellow River management in the intangible cultural genes belong to the attached genes.

3.1.3 Mixed genes are new genes formed after the fusion of multiple cultures in multiple carriers, which are not unique to the Henan Yellow River, but are gene types preserving special cultural and historical information in different periods, and are indispensable components in the cultural inheritance of the Henan Yellow River. Such as flood control project, irrigation project, urban and rural water supply and drainage project, soil and water conservation project, landscape water conservancy project and so on.



### 3.2 The Path of Educational Dissemination of the Yellow River Cultural Gene in Henan

Based on the above categorisation of cultural genes, different educational communication paths can be taken for different types of genes:

#### 3.2.1 Refining cultural symbols and branding cultural and educational communication

At the level of the juche, firstly, a policy of protection should prevail; once the juche disappears, the culture loses its essence. Secondly, its main position in cultural application should be strengthened so that the main gene plays a full leading role. When applying it, it can consider refining the cultural symbols so that it can be easily applied to the cultural industry and realise its cultural brand value.

#### 3.2.2 Implantation of cultural symbols to enhance the uniqueness of cultural and educational communication

Attached genes are genes carried by the main genes, with distinctive identification, firstly, protection measures need to be strengthened, and secondly, the implantation of cultural symbols should be adopted more often, and gene symbols should be extracted and fully implanted into cultural products and cultural spaces, so as to turn cultural resources into cultural capital, which is the most effective way to realise the renaissance of the development of cultural genes.

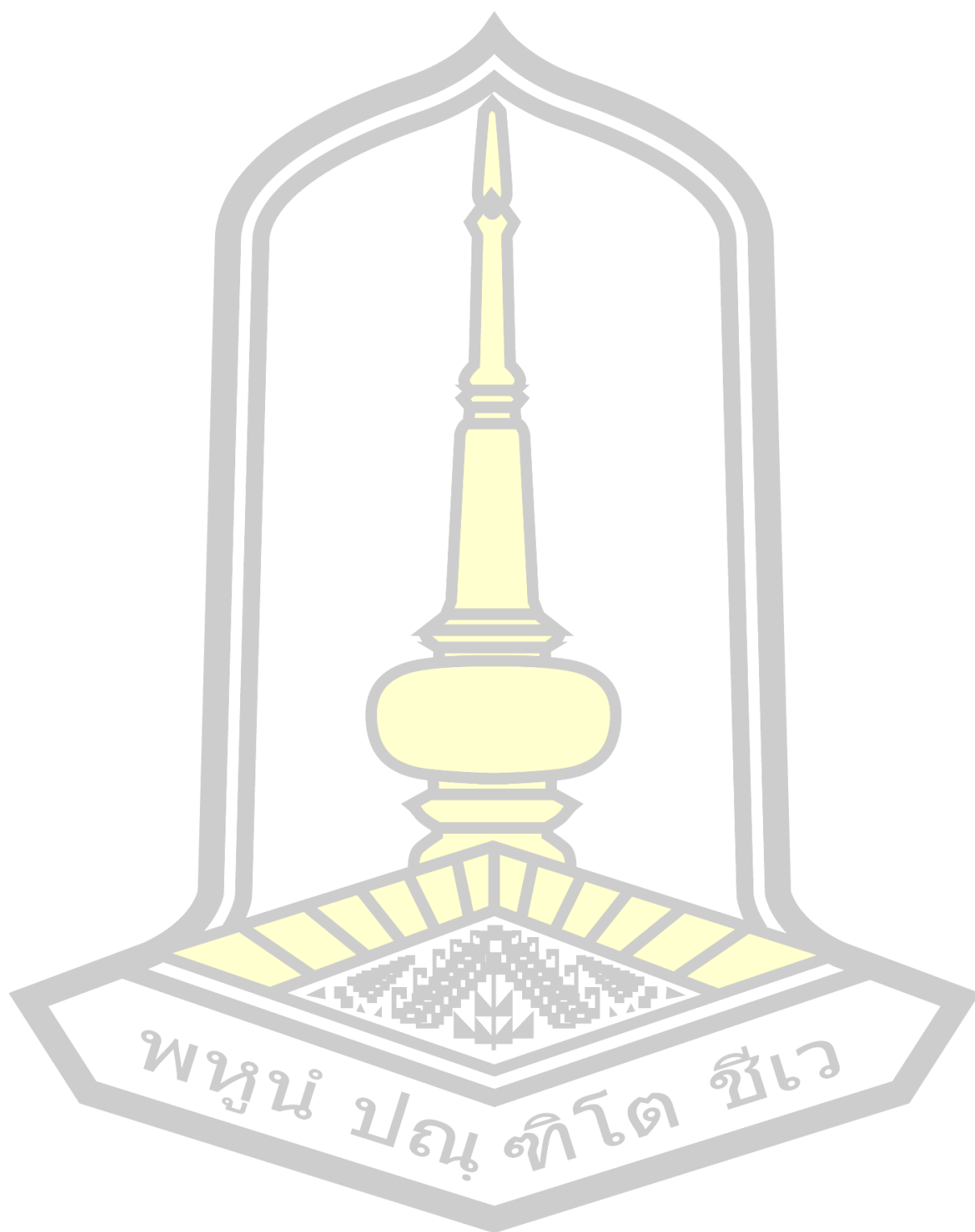
#### 3.2.3 Symbiosis of cultural symbols for effective cultural and educational communication

In the case of hybrid genes, the main focus should be on protection policies, with attention paid to better integration with the main genes, strengthening their inherent transmission power and promoting the effective dissemination of culture and education.

To sum up, the application of cultural genes, firstly, clarify the classification of main genes, attached genes and mixed genes, determine the most important and core cultural genes, and clarify the mutual structural relationship between various types of genes, secondly, according to the different types of different cultural genes corresponding to the application strategy, the cultural genes will be fully utilised in cultural inheritance and protection, and meanwhile, be applied to the cultural industries, such as cultural tourism, creative products, etc., so as to make them shine in the construction of spiritual civilization in modern society. The genes will shine in the construction of spiritual civilisation in modern society.

พหุพันธุ์ ปณั ทิ โต ชี เว

## REFERENCES





- Blackmore, S..(2001).The Enigma Rice Machine.
- Chen H.,Li X.,&Li P.(2019).*Research on the connotation, attribute and value of water conservancy heritage under the perspective of cultural tourism. Ecological economy.*
- Chen, Y. (2019). *Flood dynamics of the lower Yellow River over the last 3000 years:Characteristics and implications for geoarchaeology.* Quaternary International, 521.
- Chen,Z.(1990).*The rise and decline of the Yellow River shipping in history. The People's Yellow River*,(5): 67-72.
- Chief Office of Yellow River Conservancy Commission.(2017).*The Yellow River Annals. Zhengzhou: Henan People's Publishing House.*
- Conzen M R G.(1988). Morphogenesis,Morphogenetic Regions,and Secular Human Agency in the Historic Townscape, as Exemplified by Ludbw.
- Deacon,T.(1999).*Memes as signs.The Semiotic Review of Books*, Volume10(3).
- Deng J.(2017).*Research on water conservancy heritage.* China Research Institute of Water Resources and Hydropower Research,Beijing.
- Dennett,D.(1995).*Darwin's Dangerous Idea:Evolution and the Meanings of*
- Dong J.(2021).*Value Evaluation and application research of water Cultural Heritage in Zhengzhou section of the Yellow River.* (Master's thesis, Zhengzhou University).
- Duan Jin,Shao Ruiqing,Lian Wenlong,Jiang,Y.(2019).Spatial genes. town planning(02).
- Fošumpaur, P., Kašpar, T., & Zuka, M. (2019). Technical Cultural Heritage on the Elbe-Vltava Waterway. Technical Cultural Heritage on the Elbe-Vltava Waterway, 290(1), 012152. <https://doi.org/10.1088/1755-1315/290/1/012152>
- Gabora,L.(1997).Tiaking memes seriously.*The Semiotic Review of Books*,
- Gatherer, D. (2008). WHY THE "THOUGHT CONTAGION" METAPHOR IS RETARDING PROGRESS OF MEMETICS. A memetics compendium, 673.
- Henan Yellow River River Bureau. (2016). *The big river is calm down.* Yellow River Water Conservancy Publishing House.
- Hu, Y. (2021). Study on the Transmission Path of the Yellow River Horn. Journalism Lover.
- Karl,A.(1989).Xu Shigu et al(1989).*Oriental despotism—A comparative study of totalitarian power.*China Social Sciences Press, Beijing.
- Li Y.(2019).*Research on the application of cultural genes in exhibition space design*, (Master's thesis,Xi'an Academy of Fine Arts).
- Li,Y, Lv, J., Wan, J., & Deng, jun. (2016). *Survey on the Current Situation of China's Grand Canal Hydraulic Heritage and Discussion on Protection Strategies.* Journal of Hydraulic Engineering.
- Li, Y., Zhao, W., & Yang, G. (2018). Exploring the Protection Methods of Historical and Cultural Neighbourhoods Based on the Concept of Cultural Gene--The Case of Cuntan Historical and Cultural Neighbourhood in Chongqing. Urban Development Studies.
- Liang H.(2011).*The "cultural gene".* town planning(10).
- Life.London:Allen Lane Press.

Liu B.(2018).*Study on the evolution of Qingcheng urban spatial form from the perspective of cultural gene*. (Master's thesis, Chang'an University).

Liu P.(2011).*Construction and application of Chinese traditional settlement landscape gene map*, (Master's thesis, Peking University).

Liu Q.(2008).*As an industrial heritage of Lanzhou Yellow River Iron bridge construction research*. (Master's thesis, Xi 'an University of Architecture and Technology).

Liu S.(2021).*Research on the composition system of Shaanxi Yellow River cultural heritage based on connotation cognition*.(Master's thesis,Xi'an University of Architecture and Technology).

Liu X.(2019).*Research on the updated design of historical public space in Shouxi County in the context of architectural culture gene*. (Master's thesis,Beijing University of Architecture and Architecture).

Liu, L., & Zuo, Q. (2022). *A Compendium of Representative Events of Ancient Water Culture and Its Reference to Modern Yellow River Governance*. Yellow River.

Ma , C., E, C., & Bi , Y. (2007). Keeping Watch over the Spiritual Home of the Distant Past - A Research Report on the Intangible Cultural Heritage of Small Ethnic Groups in the Upper Reaches of the Yellow River. *Journal of Northwestern Ethnic Studies*.

Ma G.(2012).*A Brief description of Chinese music and cultural heritage - Take the Yellow River haozi as an example*. art and literature for the masses.

Maria C.(2020).*Underground cisterns and wells for water supply in the Matera town (South Italy)*[J]. *Il Capitale Culturale: Studies on the Value of Cultural Heritage*.

Maria, G. (2020).*Underground cisterns and wells for water supply in the Matera town (South Italy)*. *Il Capitale Culturale: Studies on the Value of Cultural Heritage*.

Min, Q., Liu , M., & Yang , L. (2018). Types, Values and Conservation of Agricultural Cultural Heritage in the Yellow River Basin. *Democracy & Science*.

Niu , X., Tian, C., Sun, Z., & Huang, Q. (2020). Exploring the Cultural Genetics of Chinese Urban Space. *City Planning Review*.

Olmo, RM; Munoz, SF. Cultural water landscapes and heritage.(2010). *Safeguarding the heritage value of traditional irrigation systems*.*Scripta nova-revista electronica de geografia y ciencias sociales*.

Pei P.(2018).*Research on the protection and planning strategy of Chongqing Ancient Town based on cultural gene*.(Master's thesis,Chongqing University).

Pla J H, García E I.(2014). *The crisis facing Tunisian drainage tunnels: identification, analysis and evaluation of water heritage in the Mediterranean region*. *Water Scienceand Technology; Water Supply*.

Richard,D.(2016).*The Selfish Gene:40th Anniversary edition*.Oxford OUP Oxford.

Shalamu A., Zhuping S. (2019).*A Karez System's Dilemma: A Cultural Heritage on a Shelf or Still a Viable Technique for Water Resiliency in Arid Regions*.*Socio-Environmental Dynamics along the Historical Silk Road*.

Shandong Yellow River River Bureau.(2021).*Great River hook sink- - Shandong Yellow River water cultural heritage compilation*. Zhengzhou: Yellow River Water Conservancy Publishing House,2021.

Shao R.,Duan .,Jiang Y.,Qian Y.,&Wang L.(2020).*Space genes: a new way to promote overall urban design in situ.* planner.

Sui L.,Cheng Y.,&Guo Y.(2018).*Protection and utilization of water cultural heritage in Shaanxi Province.* water conservancy economy.

Sun X.(2020).*The design and application of the architectural culture gene in the exhibition space.*Shandong Institute of Arts and Crafts. Jinan.

Tan X.(2012).*Definition, characteristics, type and value interpretation of water cultural heritage.* China Water Conservancy.

Tan X.(2013).*China Grand Canal Cultural Heritage Protection Technology Basic Science Press.* Beijing.

Tan X.,Wang Y.,&Li Y.(2012). *Composition and value evaluation of China's Grand Canal heritage.*China Water Resources and Hydropower Press.

Tao S.(2008).*The intangible cultural heritage of the Yellow River basin inherits a mother river multi-cultural belt.* China's Three Gorges construction.

Taylor,Griffith.(2009).*Environment, Village and City:A Genetic Approach to Urban Geography;with Some Reference to Possibilism.*Annals of the Association of American Geographers, 32(1):1-67.

Tian T.(2015).*Ancient City Renaissance: Study of Xi 'an Cultural Gene and its spatial planning mode in Xi' an.*(Master's thesis,Xi'an University of Architecture and Technology).

Tu S.(2015).*On Water Cultural Heritage and Creative design of Water culture.* Journal of Zhejiang Institute of Water Resources and Hydropower Power. Volume8(2).

Wan J.(2020).*Protect the Yellow River water conservancy heritage and tell the "Yellow River story" well.*China water conservancy.

Wan Q.(2020).*Research on the landscape renewal of traditional villages based on the perspective of cultural and gene inheritance.*(Master's thesis,Nanjing Forestry University).

Wan T.,&Wang Y.(2011).*France Midi Canal heritage protection and management analysis—Some suggestions on the World Heritage application and protection management of the Grand Canal.*China's famous city.

Wang H,(2019).*Research on Heilongjiang Heritage of Traditional architecture from the perspective of cultural gene,* Harbin Institute of Technology.

Wang J.(2021).*A Brief Discussion on the Protection of the Yellow River Cultural Heritage System.* culture industry.

Wang J.,&Lu Y.(2012).*The value and protection and development of water cultural heritage in China.* Research on water conservancy development.

Wang K.(2019).*Research on the compilation method of street landscape design guidelines in the capital core area based on cultural gene inheritance.*(Master's thesis,Beijing University of Civil Engineering and Architecture).

Wang W.(2019).*Research on the status of ancient canals in Ningxia based on the concept of linear cultural heritage.* landmark.

Wang W.(2020).*Research on the construction of Jianglang Mountain in Quzhou under the influence of world Natural Heritage.*(Master's thesis,Zhejiang University of Technology).

Wang W.,Shi J.(1997).—— *A brief analysis of the traditional cultural genes of Chinese gardens.* new building(02).

- Wang Y.(2005).*Water right interpretation*.Shanghai People's Publishing House.
- Wang Y.(2022).*Composition, protection and utilization of the Yellow River water conservancy heritage*. (Master's thesis,Journal of Yantai University).
- Willems, W. J. H., & Van Schaik, H. P. J. (2015). *Water & Heritage: Material, Conceptual and Spiritual Connections*.
- Wu B.,Ji F.,&Xue T.(1997).—— *Take the old road of the Yellow River (Jiangsu section) as an example*. Folk-custom studies(3).pp.5-14.
- Wu Z.(2009).*Research on Suzhou ancient urban Space based on the perspective of "cultural gene"*.(Master's thesis,Nanjing University).
- Wu, X., Sheng, C., & Pan, L. (2019). *Research on the Development Strategies of Cultural Tourism Resources in the Ancient Yellow River Basin in Xuzhou*. Contemporary Tourism.
- Xia Y,&Jiang J.(2022).*Public facilities and urban cultural gene inheritance*. Jiangxi Social Science.
- Xie J.(2020).*Spatial gene analysis and protection and inheritance strategy of Harbin Historical city*.Harbin Institute of Technology.
- Xing N.&Li W.(2021).*Protection and development path of the Yellow River cultural heritage in Qilu region*. Journal of Shandong Institute of Arts and Crafts.
- Xun D.(2015).*The formation of the Yellow River and its cultural heritage*. Jiangsu Local Chronicles
- Yang M,Shu X,&Wang X.(2015).*Construction and protection of rock painting cultural heritage database in the Yellow River Basin*. Library theory and practice.
- Yanhong, H. (2017). *Research on the water cultural heritage protection of the Beijing-Hangzhou Grand Canal based on the perspective of "cultural gene"*. (Master's thesis, Tianjin University).
- YaoM.,Wang R.&Qu Z.(2010).*The Yellow Riversacrificial culture inheritance and promotion of the micro*. (Master's thesis,Journal of Hohai University ).
- Ze, H., Xiaolin, H. (2003). Meme theory and social language use. *Modern foreign language*, (02), 200-209.
- Zeng X,(2017).*The development and innovation of foreign water culture in recent years*. China Water Conservancy.
- Zhang N,(2012).*Identification of water conservancy heritage based on value appraisal*. China water Conservancy.
- Zhang N,Tan X.&Wang Y.(2012).*Evaluation of the Comprehensive Value of the Ancient Water Conservancy Project of the Beijing-Hangzhou Canal and Journal of China Water Resources and Hydropower Research Institute*.
- Zhang Y.(2021).*Spatial distribution characteristics of the Yellow River regional cultural heritage in Henan province- -Take immovable cultural relics as an example*.Regional research and development.
- Zhang Z.(2020).*Protection, development and utilization of traditional agricultural cultural heritage in Ningxia section of the Yellow River Basin*. The Journal of the Ningxia Party School.
- Zhang Z.,&Li L.,(2012).*The protection and development of the water cultural heritage of the Beijing-Hangzhou Grand Canal (Hangzhou section)*. Journal of Hohai University (Philosophy and Social Sciences edition).
- Zhao H.,Yang S.,&Zheng M.(2021).*Research on the composition system and protection strategy of Jinan Yellow River cultural heritage*. Chinese cultural heritage.



Zhao J.(2022).*Inheriting the Yellow River civilization- -Take the Yellow River Haozi in Changyuan. Henan province as an example.* Shandong Art.

Zhao P.(2007).*Preliminary study on the Classification and protection of cultural Heritage in Hukou area of the Yellow River.* (Master's thesis,Xi 'an University of Architecture and Technology).

Zhao Z.(2011).*Intangible cultural heritage nine qu Yellow River lamp.* The Beijing Archives.

Zhou B.(2013).*On the classified protection and utilization method of water cultural heritage in water conservancy Scenic area.* China Water Conservancy.

Zhu J.&Jiang W.(2013).*Research on tourism value evaluation and development of linear cultural heritage of the Yellow River.* Resource development and marketing.

Zu S.(2022).*See the Yellow River read China —— "Yellow River culture thousands of miles of research journey" overview.* The Yellow River is loess and yellow seed people.



## BIOGRAPHY

NAME	Zhao Yongtao
DATE OF BIRTH	December 3, 1978
PLACE OF BIRTH	Henan
ADDRESS	Room 202, Unit 1, Building 22, Zhongtai Century Flower City, Lichun West Road, Luoyang City
PLACE OF WORK	2001, Bachelor's Degree at Hunan University of Technology, majoring in Art Design, China; 2014, Master's Degree at Henan Normal University, majoring in Fine Arts, China

