

Study on the Impact of Water Conservancy Construction on Urban Development

-- A Case Study of Wenzhou

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Abstract. Hydraulic engineering is an important part of national economic infrastructure. Hydraulic engineering plays an important role in flood control, drainage, disaster prevention and reduction. In recent years, while promoting economic development, water conservancy construction has also played a role in driving the appreciation of surrounding plots, promoting the development of tourism, industrial upgrading and urban accumulation. This paper studies the achievements of water conservancy construction in Wenzhou in recent years, establishes the urban development index system of Wenzhou, calculates the index relationship between water conservancy investment and urban development by using partial least square method. The results show that there is a significant linear correlation between water conservancy investment and real estate investment, GDP and the development of secondary industry. It can be seen that water conservancy construction investment plays a positive role in promoting urban development.

Keywords: Hydraulic Engineering; Partial Least Square Method; Urban Development.

1. Introduction

Water conservancy projects are an important part of national economic infrastructure. For a long time, water conservancy projects have made great contributions to the development of national economy in flood control, waterlogging drainage, disaster prevention and disaster reduction. The construction of water conservancy projects has played a very important role in residents' life, agricultural irrigation, industrial production, ecological environment and other production and management. Water conservancy construction is an indispensable part in promoting the action of "big garden and big channel metropolitan area in Dawan District, Zhejiang Province". In recent years, from the "five water co governance" to the establishment of "beautiful rivers and lakes", Zhejiang takes water as the core, integrates resources, promotes industrial development, optimizes the layout and promotes rural revitalization with rivers as the link, and the function of water conservancy in serving social and economic development has been well reflected. The waterfront park with rivers and lakes as the core has become a beautiful scenic spot in the city. The improvement of river and lake environment has driven the development of tourism industry, the appreciation of surrounding plots, the upgrading of industry and the agglomeration of urban development. Water conservancy construction has played a positive role in urban development. A comprehensive study of the impact of water conservancy construction on urban development can play an important role in summarizing the role of water conservancy construction, ensuring the investment of water conservancy construction funds, ensuring the sustainable and effective benefits of water conservancy projects, and promoting the long-term sustainable development of water conservancy construction.

2. Current Situation of Similar Research Work at Home and Abroad

In 2021, Mao Chunmei [1] and others calculated the contribution of water conservancy investment to GDP growth in Hunan Province by using C-D production function and elastic analysis model on

the basis of analysing the correlation between water conservancy investment and national economy. The calculation results show that there is a strong correlation between water conservancy infrastructure investment and GDP. In 2018, Yang Xiao [2] put forward the contribution of water conservancy investment to economic growth by analysing the data of water conservancy investment and economic development in combination with the characteristics of water conservancy construction investment. In 2013, Ma Ting, [3] constructed the evaluation index system of the ability of water conservancy to support economic and social development according to the three levels of target level, criterion level and index level, and selected 15 index levels. According to the government statistical bulletin, relevant national planning objectives, international conditions and relevant analysis and research results, the present value and standard value of the index are determined. The index weight distribution is designed by using the analytic hierarchy process in system engineering theory, and the score of China's water conservancy's ability to support economic and social development is calculated. 2013 Zhang Jianzhang [4] proposed that investment in water conservancy infrastructure can effectively promote the development of agriculture, industry and tertiary industry, so as to promote the sustainable development of the national economy. In 2019 [5], Chen Yuanyuan studied the relationship between water conservancy investment and economic construction in the West. The results show that water conservancy investment can promote economic construction.

3. Overview of Wenzhou

Wenzhou governs 4 municipal districts, 5 counties and 3 county-level cities, with a land area of 12110 square kilometers and a sea area of 8649 square kilometers. In 2020, Wenzhou achieved a GDP of 687.09 billion yuan, a year-on-year increase of 3.4%. By the end of 2019, 8 million 324 thousand people registered residence in Wenzhou. By the end of 2019, the permanent resident population of the city was 9.3 million, of which the urban population was 3.052 million; The urbanization rate was 70.5%, 0.5 percentage points higher than that in 2018. At the end of 2019, the total registered residence of the city was 8 million 324 thousand. Among them, the male population is 4.309 million and the female population is 4.015 million, accounting for 51.8% and 48.2% of the total population respectively.

Table 1. Permanent resident population of Wenzhou

region	Permanent resident population at the end of 2019 (10000 persons)
Wenzhou City	930
Lucheng District	126.26
Longwan District	72.76
Ouhai District	95.37
Dongtou District	10.82
Ruian City	143.79
Yueqing	142.85
Longgang City	38.87
Yongjia County	83.32
Pingyang County	80.38
Cangnan County	85.42
Wencheng County	24.57
Taishun County	25.59

4. Completion of Water Conservancy Indicators during the 13th Five Year Plan Period

During the 13th Five Year Plan period, Wenzhou City completed 47.9 billion yuan of water conservancy investment at the same level, with the total investment ranking in the forefront of the province. Among the 16 main indicators, 13 indicators have been completed, and 2 binding indicators and 1 expected indicator have not been completed. Among them, due to the national regulation of permanent basic farmland and sea use control policies, the construction of some trunk dike reinforcement, reclamation projects and seawall upgrading projects lags behind, and the indicators are difficult to complete. The completion of each index is shown in the table below.

Table 2. Completion of binding indicators in the 13th five-year plan

category	Indicator name	Objectives of the 13th five-year plan	Completion
Flood control and drainage	Urban flood control compliance rate (%)	>90	92.3
	Up to standard rate of levees in the main stream of the three rivers (20-year return period and above) (%)	>90	83
	Compliance rate of first tier seawall (%)	>85	74
Water resources guarantee	Total annual water consumption control (100 million cubic meters)	<23.9	16.4
	Water consumption of 10000-yuan industrial added value (m3 / 10000 yuan)	<23.94	12.9
	Water consumption per 10000-yuan GDP (m3 / 10000 yuan)	<35.88	23.9
Farmland water conservancy	Effective utilization coefficient of farmland irrigation water	>0.59	0.595
Management reform	Standardized qualification rate of large and medium-sized water conservancy projects (%)	100	100

5. Study on the Impact of Water Conservancy Investment on Urban Development in Wenzhou

5.1 Water Conservancy Investment in Wenzhou in Recent Years

The investment sources of water conservancy construction mainly include government investment, central investment, local investment and the use of foreign capital. From 2015 to 2020, government investment was the main source of investment in water conservancy construction in Wenzhou. During the 13th Five Year Plan period, Wenzhou invested about 17 billion at the same level.

Table 3. Water conservancy investment in Wenzhou during the 13th Five Year Plan Period

years	Investment amount (10000 yuan)
2016	584000
2017	305337
2018	72887
2019	47944
2020	30852

5.2 Establishment of Urban Development Indicators

Urban development includes multiple dimensions, given the difficulty of data collection. The indicators of this urban development are established around the three dimensions of "population economy society". This paper attempts to construct the evaluation index system of Wenzhou urban development level from the three subsystems of population, economy and society.

Table 4. Urban development indicators

category	Company	Interpretation of elements
population growth	ten thousand people	It is divided into urban population and rural population
GDP	Ten thousand yuan	Gross National Product
primary industry	Ten thousand yuan	Including agriculture, forestry, animal husbandry and fishery
the secondary industry	Ten thousand yuan	Industrial construction, etc.
the service sector; the tertiary industry	Ten thousand yuan	Service industry, etc.
Total retail sales of social consumer goods	Ten thousand yuan	Social consumption
Real estate investment	Ten thousand yuan	Real estate investment over the years

5.3 Calculation Method

This time, by establishing the correlation between water conservancy investment and urban development, the correlation coefficient between water conservancy investment and each index is calculated, so as to calculate the contribution of water conservancy investment to each index. The partial least square method is used to solve the relationship coefficient between water conservancy investment and urban development indicators. Partial least squares are a principal component analysis method. Set the water conservancy investment as the dependent variable $Y = \{y_1, y_2, \dots, y_n\}$ (n is the total year), where y_i ($i = 1, 2, \dots, n$) is the water conservancy investment in a certain year. Set the economic and social development index as the independent variable X , then:

$$X = \begin{pmatrix} x_{11}, x_{12}, \dots, x_{1p} \\ x_{21}, x_{22}, \dots, x_{2p} \\ \vdots \\ x_{n1}, x_{n2}, \dots, x_{np} \end{pmatrix} \quad (1)$$

Where $x_{i,j}$ is the index factor of urban development, $i = 1, 2, \dots, n$, $j = 1, 2, \dots, p$, p is the number of influencing factors. Note that the urban development index factor matrix $X_{n \times p}$ is the independent variable matrix and the water conservancy investment Y_n is the dependent variable matrix, where n is the number of years and p is the number of independent variables.

5.4 Calculation Results

The relationship between water conservancy investment and various indicators of urban development calculated by partial least square method is as follows:

It can be seen from the above table that real estate investment, tertiary industry, GDP value and secondary industry are highly linearly correlated with water conservancy investment, while the correlation between total sales of consumer goods, primary industry and water conservancy investment is slightly weak.

Table 5. Correlation coefficient diagram between variables

r	x1	x2	x3	x4	x5	x6	x7	x8	y
x1	1	-1.00	0.86	0.97	0.87	0.81	0.95	0.77	-0.63
x2		1	-0.81	-0.97	-0.84	-0.75	-0.92	-0.70	0.56
x3			1	0.83	0.98	1.00	0.90	0.97	-0.91
x4				1	0.82	0.78	0.91	0.75	-0.63
x5					1	0.96	0.93	0.91	-0.86
x6						1	0.86	0.98	-0.93
x7							1	0.82	-0.76
x8								1	-0.96
y									1
0.5 ≤ r < 0.8: Significant linear correlation									
0.8 ≤ r ≤ 1.0: highly linear correlation									

6. Conclusion

The construction of water conservancy projects has played a very important role in residents' life, agricultural irrigation, industrial production, ecological environment and other production and management. A comprehensive study of the impact of water conservancy construction on urban development can play an important role in summarizing the role of water conservancy construction, ensuring the investment of water conservancy construction funds, ensuring the sustainable and effective benefits of water conservancy projects, and promoting the long-term sustainable development of water conservancy construction. By studying the relationship between water conservancy investment and urban development indicators in Wenzhou, this paper finds that there is a direct linear correlation between water conservancy investment and secondary industry, GDP and total real estate investment.

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