Global Water Partnership (China) WACDEP
Work Package Three outcome report

To Increase the Benefits of Water Investment

For Regional and National Development

China Institute of Water Resources and Hydropower Research
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I. Introduction

In January 2014, Global Water Partnership approved to implement *Water, Climate and Development Program* in China, which was led by its China Region. It is a three-year (2014-2016) program. It covers the four provinces and Yellow River basin where there are Water Partnerships and the Pearl River delta region which is a pilot project.

The aim of this program, first of all, is to bring the content of water security and climate change into every country's plan of development; secondly, to encourage countries' funding in water security to strengthen their ability to respond to climate change; thirdly, to avoid conflicts, build up a peaceful environment and promote the economic development; fourthly, to devote to achieving the Millennium Development Goals and the goal of sustainable development after 2015; last but not the least, to help countries establish new management system and methods to respond to climate change.

According to the arrangements of GWP China, the *Program* is divided into seven work packages. The third one is "To Increase the Benefits of Water Investment in regional and national development". The aim is to promote the stockholders to research on how to decrease and avoid unfavorable investments and support organizations at different levels to develop investment strategies, policies and plans in ensuring water security and adapting to climate change.

According to the main aims of work package three, the main contents include four parts: collecting water investment information; analyzing the output of different ways of investment; evaluating the investment output efficiency; providing some suggestions for improvement in terms of investment. The work is implemented at national and provincial level respectively. This report will focus on the national level.

II. China's Water Investment Policy in Recent Years

At the beginning of 21st century, the proportion of China's water investment in total investment of fixed assets reached the highest in recent years. In 2002, it reached 1.88%. However, influenced by the overall national policy, in the national "eleven five-year(2006-2010)" planning, water sector is not among the national key investment sectors except the "south water to north water diversion" project and other key projects. Water investment ratio had been trending down and slipped into the lowest in 2008. At that time, it accounted for only 0.63% in fixed-asset investment.

1. Water Investment Policy in "12th Five-year Plan" Period (2011-2015)

In the last period of “11th five-year plan”, the country started to prepare for the “12th five-year plan”. It took the “strengthening of the development of water and disaster prevention system" as a major task. It made it clear about the request to strengthen the water infrastructure construction. The government should positively carry out harnessing of the important tributaries and lakes and the small river management on the basis of continuing advancing the river governance in order to strengthen the water supply and flood control capacity.

In the aspect of improving water supply capacity, the government should improve the allocation system of water resources, construct a number of inter basin water diversion projects and key water projects. At the same time, it should promote the overall development of small, medium-sized and large water projects to strengthen the water resources supply and reserve capacity. It could strive to solve the engineering type of water shortage problem in southwest area and shortage of water resources in northwest China. The annual water supply will increase by 40 billion cubic meters. The government should also promote the use of rain and flood and the use of cloud water resources, and promote the infrastructure construction to manage hydrology and water resources and the construction of scheduling system to manage major water projects.

In the aspect of enhancing the flood control capacity, the government should continue to strengthen the governance of Yangtze River, Huai River, the Yellow River, Dongting Lake, Poyang Lake and other big rivers and lakes, construct important storage and detention areas in these regions and build a batch of control projects to improve the capacity of flood control in key areas. The government should also strengthen the construction of small river levee and river rectification, especially of those that have the responsibility of flood protection in the basin of 200 square kilometers. Moreover, it should speed up the reinforcement of dangerous reservoirs and sluices to eliminate potential problems and enhance flood control capacity. The standard of seawall construction, the comprehensive regulation of important estuaries and the protection trans boundary rivers all need attentions, too.

At the same time, with the agricultural modernization, water should also be high-lighted. The government should comprehensively strengthen the construction of farmland irrigation and drainage facilities and improve the construction and management mechanism. It should also speed up the transformation of the supporting systems in large and medium-sized irrigation districts, irrigation and drainage pumping stations, and establish a number of new irrigation areas timely in rich water and soil resources areas. Moreover, the government should improve the rural small water facilities including improving the construction of water resources and promoting small farmland water facilities of key counties.

2. Water Investment Policies in Central Government’s Document “*The Decision on Speeding up the Reform and Development in Water Sector*”

In 2011, the Central Government emphasized that the country should establish a mechanism that can stabilize the growth of water investment, including:
(1) Increasing public financial input in water sector. Government should raise funds through multiple channels to make sure that in the next 10 years, the annual average investment on water nationwide will be more than double the figure in 2010. The government should play a leading role in water sector and regards the irrigation area as the focus of public financial investment. Financial departments at all levels should significantly increase the investment on water and also increase the growth rate of it. The proportion of water construction funds in the national fixed assets investment should be further improved. A substantial increase is needed in the central and local financial funds allocated to water sector. Government should allocate 10% of the income got from land transaction to the farmland water facilities and give full play to land use charges of the newly added construction land and other land renovation funds. It should also further improve the water construction fund policy, extend the year-span of taxation, broaden the source channels and increase the income scale. Moreover, government should improve the system of pay-and- use of water resources, adjust water resources fee collection standards reasonably, expand the scope of collection and strictly collect, use and manage it.

(2) Strengthening the financial support to water sector. It should combine the use of fiscal and monetary policies, and guide financial institutions to increase the credit funds for water. Places with favorable conditions should decide the financial discount scale, duration and interest rates according to the natures and features of water engineering projects. Agricultural development bank should be supported by the government to actively carry out a long-term policy of loan business in water sector. The National Development Bank, China Agricultural Bank, rural credit cooperatives, postal savings banks and other banking institutions should also be encouraged to increase the credit funds to further the construction of farmland water facilities. Moreover, the government should improve the scale and quality of the utilization of foreign capital for water projects by supporting the listing and issuance of bonds of qualified enterprises, exploring leasing business of large water facilities and equipment and actively carry out pledge of loans of water project usufruct and other forms of financing.

(3) Government should widely attract social capital investment for water sector. It should encourage the qualified financing platform corporations of local government to broaden the financing channels for water and attract social capital to participate in the construction of water projects. On the basis of unified planning, the government should improve the financing system of “one project one discussion” according to the principle of “more devotion more return” to fully mobilize the enthusiasm of the farmers’ construction of water projects. The government should also improve value-added tax policy of rural hydropower with the help of the reform of value-added tax and the legislative process. What’s more, it should improve farmland- occupation tax policy for water projects and actively and steadily push

forward the management of water project market financing.

At the same time, the Document also made clear the focus of water investment. The first to be highlighted was to improve the weak points of water projects in farmland: (1) Focusing on the construction of farmland water facilities and completing the construction of supporting systems in large and medium-sized irrigation areas and the transformation of water saving system. (2) speeding up the management of small rivers and reinforcement of small reservoirs. The government should give priority to the rivers that have flood frequently, those densely populated areas and those that have important targets to protect so as to make them reach the national standard of flood control. (3) The government needs to work quickly to solve engineering water shortage and basically solve the water supply shortage in densely populated cities, towns and rural areas. (4) Improving emergency response capacity of flood control and drought relief, and building up an emergency management mechanism of unity of command, responsible for the classification, department cooperation, rapid response, coordinated and orderly and efficient operation. (5) Continuing to promote the rural drinking water safety and basically guarantee safe drinking water in rural areas during the "12th five-year plan" period.

The second is to accelerate the construction of water infrastructure, the measures are like follows: (1) continuing to implement the governance of major rivers and working quickly to construct a number of flood control projects in river basins to constantly improve the flood storage capacity during the "twelfth five-year plan" period. (2) Strengthening the construction of water resources projects and optimizing the allocation pattern of water resources. Constructing a number of key water projects and the interconnected rivers system to improve the regulation of water resources and water supply capacity under the premise of ecological protection. (3) Devoting to soil and water conservation and ecological protection of water and implementing the national key projects of soil and water conservation. Taking the comprehensive management of small watershed, silt dam construction, slope farmland regulation, afforestation and ecological restoration measures to effectively prevent and control soil erosion. (4) Developing hydropower resources rationally. Quickening the development and utilization of water resources under the premise of ensuring ecological protection and the interests of farmers. (5) Strengthening the meteorological and hydrological and hydraulic support of science and technology.

This work focuses on implementing the national "twelfth five-year plan" and the principles in *The Decision on Speeding up the Reform and Development in Water Sector* and accomplishing the main task of work package three. It focuses on analyzing water investment in place since twenty-first century, also on the main investment direction, the main benefit and the support for sustainable economic and social development and sustainable utilization of water resources. It also studies the main existing problems and their reasons, and some corresponding suggestions for

improvement.

III. The Situation of China's Water Investment

1. China's Social Investment in Recent Years

(1)The trend of fixed assets investment

Since the reform and opening up, China's investment has experienced four main stages. The first stage was from the reform and opening up in 1978 to 1996. In this stage, China's economy was exploring to change from planned economy to market economy. High growth, high inflation characterized that stage. Economic growth and investment growth changed radically. In 1993, the investment growth rate was the highest, reaching 61.8%. The lowest growth rate occurred in 1989 and 1990, respectively, -7.2% and 2.4%. The average annual growth rate was 22.3% during the period. From 1997 to 2002, influenced by the "Asian financial crisis" and international environment, the national implemented "pro-active fiscal policy" and "prudent monetary policy" and systematically controlled the investment to solve the excessive production which was caused by excessive investment. In this stage, the investment was relatively stable, with an average annual growth rate of 11.3%. Since 2003, influenced by the shrinking of export economy and insufficient domestic demand, government implemented the investment to boost the economy. By 2009, the growth rate basically maintained at above 25%. From 2010, after the "4-trillion bailout plan", China investment growth started to slow down. From 2010 to 2012, the average annual growth rate of fixed assets investment was 18.6% and China entered a relatively stable stage again. As shown in Figure 3-1.

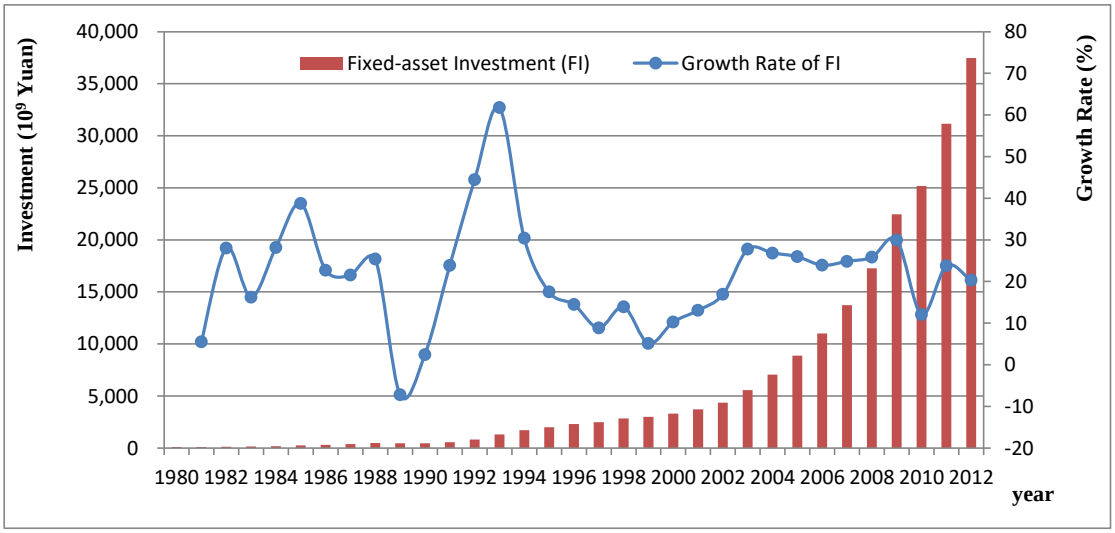
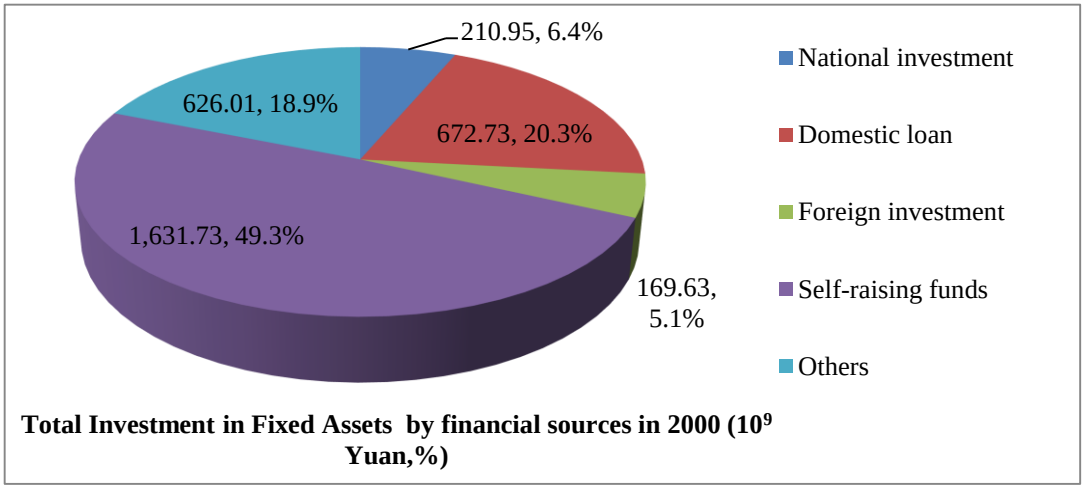


Fig.3-1 Fixed assets investment in China

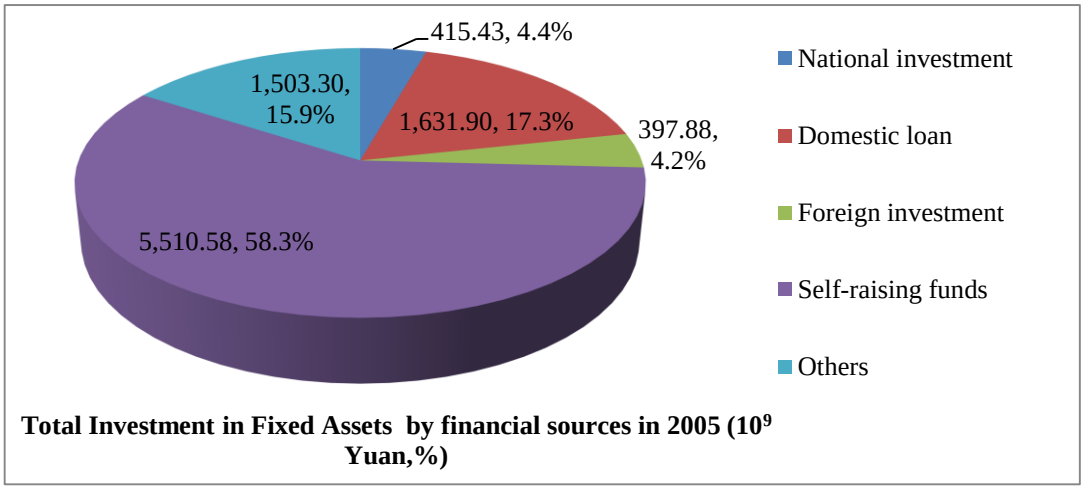
(2) The Structure of Fixed Assets Investment Source

Source of fixed assets investment is divided into state investment, domestic loans, its own funds, foreign investment and other funds. Other funds include social funds and personal funds, gratuitously donated funds and funds transferred from other units, etc. In recent years, its own funds were the main source of investment and the trend

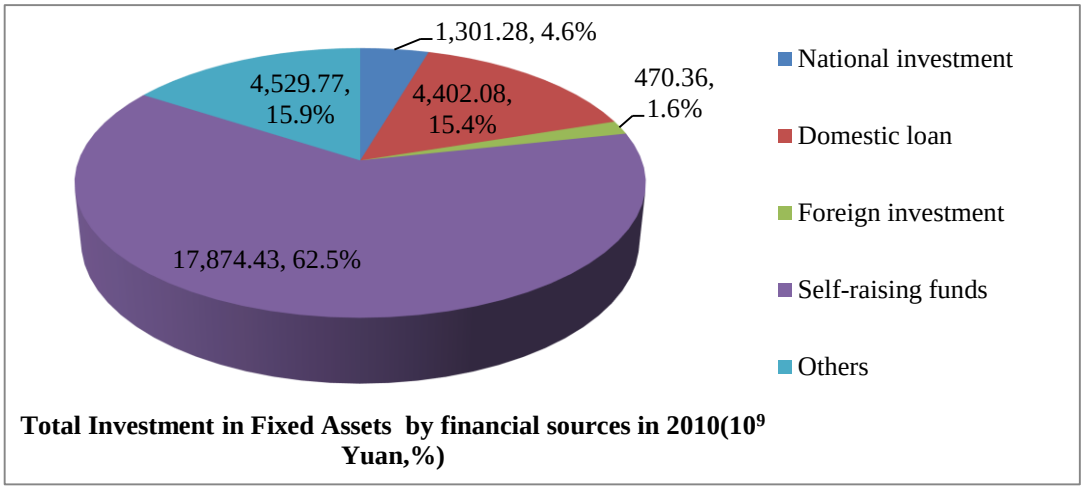
was increasing. The proportion in total investment increased from 49.3% in 2000 to 67.8% in 2012 and it became the absolute main body of fixed assets investment. Domestic loans were the second major sources, but in recent years the proportion showed a declining trend. It decreased from 20.3% in 2000 to 12.6% in 2012. Other funds were the third largest source of funds and it also showed a trend of decline. The proportion decreased from 18.9% in 2000 to 13.9% in 2012. In fixed assets Investment, the state investment proportion is relatively small, basic remained below 5%. In recent years, the fixed asset source as shown in Figure 3-2.



Total Investment in Fixed Assets by financial sources in 2000 (10^9 Yuan,%)



Total Investment in Fixed Assets by financial sources in 2005 (10^9 Yuan,%)



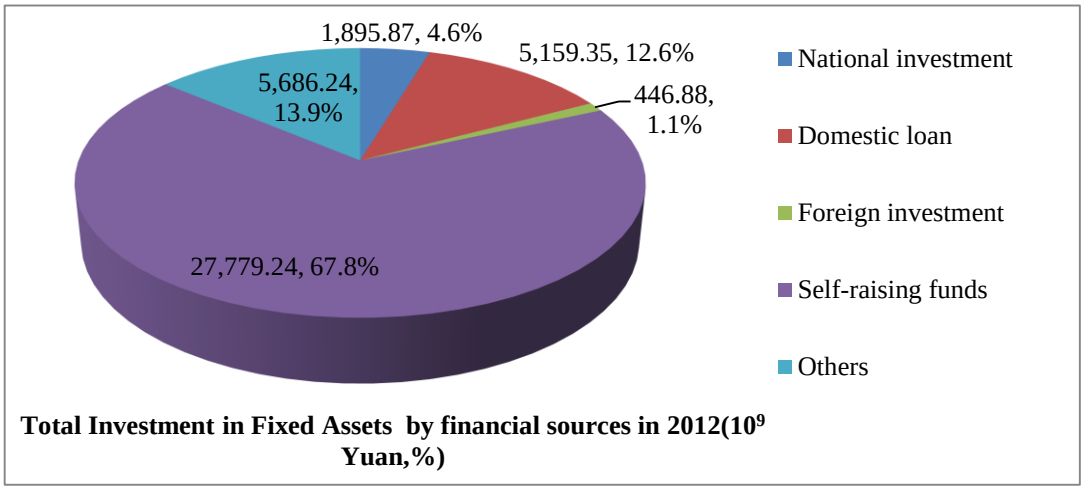


Fig.3-2 The structure of fixed assets investment source

(3) Purposes of Fixed Asset Investment

From the purposes of the fixed asset investment, we can see that in recent years, the construction of infrastructure such as manufacturing industry, real estate, transportation, storage and post and telecommunications industry, water conservancy, environment and public facilities management industry, electric power, gas and water production and supply industry had been the focus of investment. Meanwhile, the proportion of mining industry and agriculture, forestry, animal, husbandry and fishery investment were relatively high, too. In 2012, the industry investment in fixed assets that were mentioned above were more than 1 trillion yuan and totaled 32.5 trillion yuan. The proportion accounted for 87% of fixed assets investments. See table 3-1 for details.

Table 3-1 Purposes of fixed asset investment

Investment (10^9 Yuan)	2012	2010	2005	2003
Total Investment in Fixed Assets	37,469.5	25,168.4	8,877.4	5,556.7
Farming, Forestry, Animal Husbandry and Frishery	1,099.6	792.3	232.4	165.2
Mining	1,330.1	1,100.1	358.7	177.5

Manufacturing	12,455.0	8,861.9	2,657.6	1,469.0
Production and Distribution of Electricity, Gas and Water	1,667.3	1,568.0	755.4	396.2
Construction	373.9	280.2	111.9	92.4
Transport, Storage and Post	3,144.5	3,007.4	961.4	628.9
Information Transmission, Computer Services and Software	269.2	245.4	158.2	166.1
Wholesale and Retail Trade	981.1	603.2	171.6	92.3
Hotel and Restaurants	515.3	336.7	80.9	42.3
Financial Intermediation	92.4	48.9	10.9	9.0
Real Estate	9,915.9	6,487.7	1,950.5	1,314.3
Leasing and Business Services	470.0	269.3	55.0	37.6
Scientific Research, Technical Services and Geologic Prospecting	247.6	137.9	43.5	28.6
Management of Water Conservancy, Environment and Public Facilities	2,962.2	2,482.8	627.4	436.6
Services to Households and Other Services	190.5	111.4	36.3	24.2
Education	461.3	403.4	220.9	167.1
Health Social Securities and Social Welfare	261.7	211.9	66.2	40.6
Culture, Sports and Entertainment	427.1	295.9	85.7	53.2
Public Management and Social Organization	604.7	567.7	292.7	215.4
International Organization	0.0	0.0	0.0	0.3

2. The Overall National and Regional Situation of Water Investment in Recent Years in China

(1) The Trend of National Water Investment

Since 2000, China water investment was overall in growth. Before 2008, the growth rate was slow. The average annual growth rate was 7.4% and it took eight years to increase from 612.9 billion yuan to 1088.2 billion yuan. It was far slower than the growth rate of investment in fixed assets over the same period. The proportion of water investment of fixed assets investment declined from 1.86% in 2000 to 0.63% in 2008. Since 2009, the growth rate significantly increased because of the adjustment of national policy. The average annual growth rate from 2009-2012 reached 38.2% and it was far higher than the growth rate of investment in fixed assets over the same period. In 2012 the water investment reached 3964.2 billion yuan, accounting for 1.06% of proportion of fixed assets investment. See table 3-3 for details.

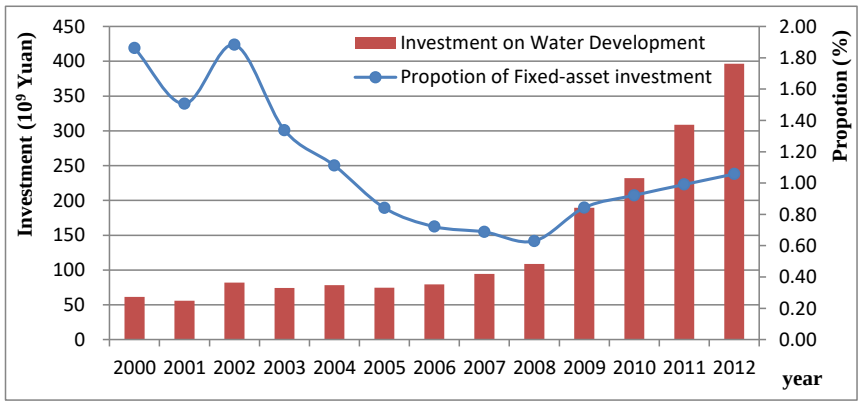


Fig.3-3 Status quo of water conservancy investment in China

(2) The Proportion of the Provincial Water Investment

Henan, Hubei, Zhejiang, Jiangsu, Chongqing, Shandong and Yunnan provinces accounted for higher proportion in provincial water investment, namely over or about 5%. Among them, the percentage in Hunan, Sichuan, Shaanxi, Xinjiang, Hebei, Heilongjiang and Anhui provinces were about 4%. We can see that provinces in the south and east invested more than those in the west. See table 3-4 for details.

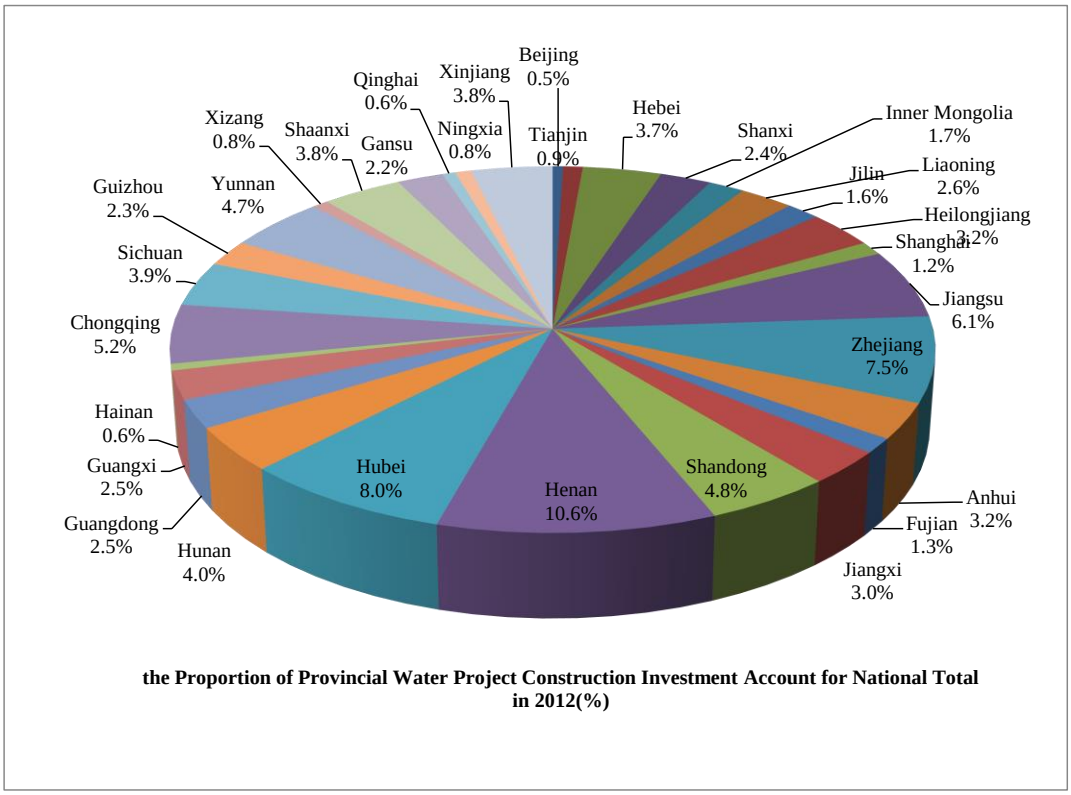
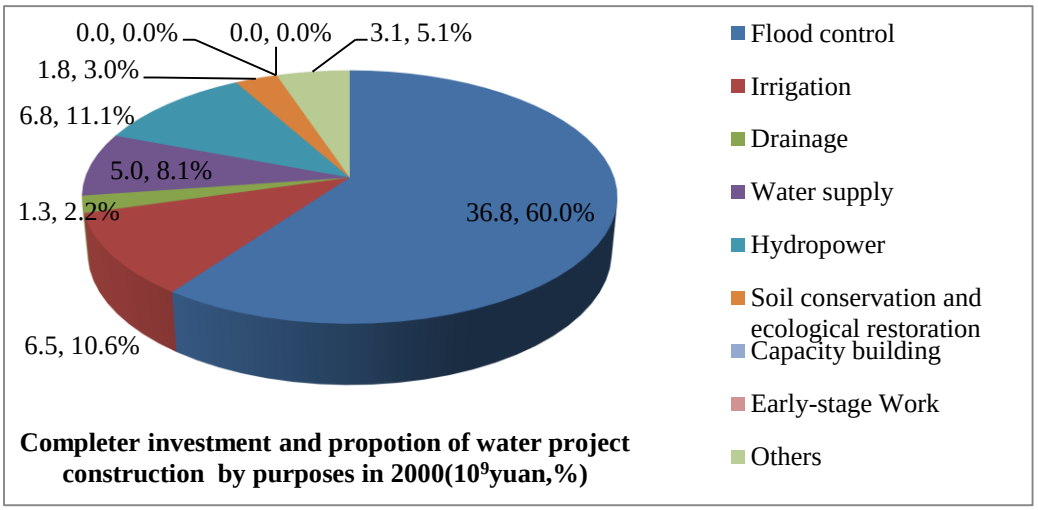


Fig.3-4 the proportion of provincial water project construction investment account for national total

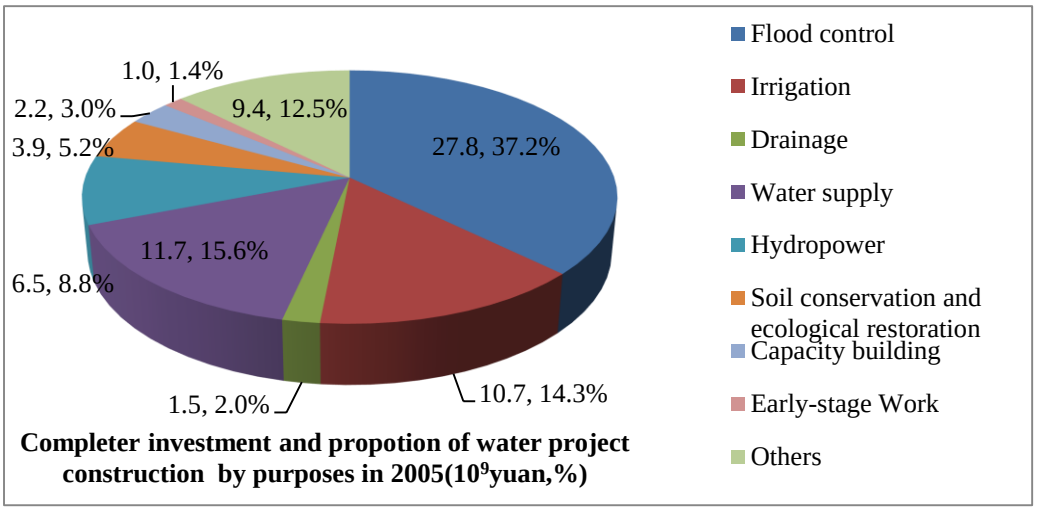
(3) The Key Areas in Water Investment

Seeing from China's water investments in recent years, we can know that flood control and irrigation have been the focus. The proportion of flood control accounted for 60% in water investment in 2000. Hydropower and irrigation occupied the second and third position. The proportions were 11.1% and 10.6%. Although the proportion of flood control in total water conservancy investment declined to 35.2%

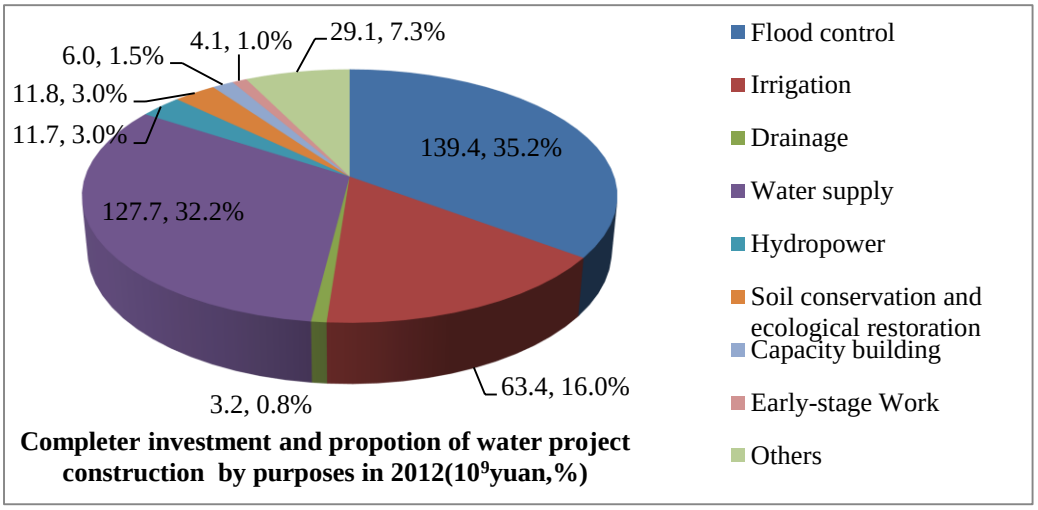
by 2012, it still held the first position. As the water demand of social and economic development increased, the water supply investment has shown a trend of rapid growth. By 2012, the proportion reached 32.2% and it reached the second position. The proportion of irrigation also increased and it reached 16.0% by 2012. The details of proportions of water in areas are shown in figure 3-5.



Completer investment and propotion of water project construction by purposes in 2000(10^9yuan,%)



Completer investment and propotion of water project construction by purposes in 2005(10^9yuan,%)



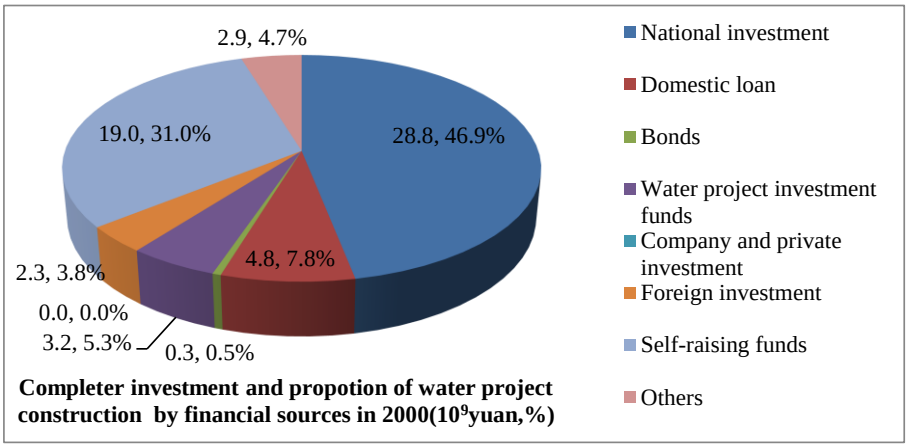
Completer investment and propotion of water project construction by purposes in 2012(10^9yuan,%)

Fig.3-5 Proportion of water projects by purposes

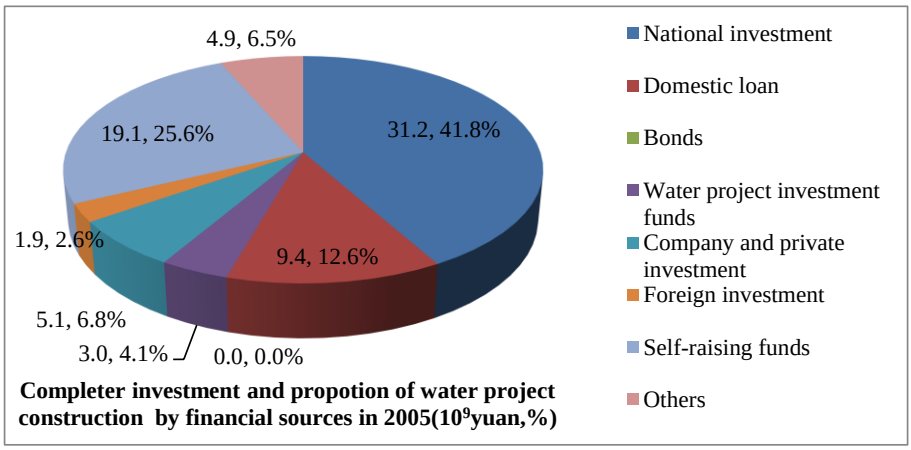
3. The National and Provincial Water Investment Sources in Recent Years in China

(1) Study of National Water Investment Sources

Unlike the source structure of fixed assets investment, government investment accounts for a high proportion in water investment. In 2000, the proportion was 46.9% and it declined a little bit then. In 2005, it declined to 41.8%. However, as the national policy gave preference to water sector, the proportion reached 69.5%. Another investment source that accounted for a high proportion was enterprises own funds. Although this proportion was declining, from 31.0% in 2000 to 8.8% in 212, it always occupied the second position. The third important source was domestic loans. The proportion in 2000 was 7.8% and it reached 12.6% in 2005. Then it declined to 6.7% in 2012. See table 3-6 for details.



Completer investment and propotion of water project construction by financial sources in 2000(10^9yuan,%)



Completer investment and propotion of water project construction by financial sources in 2005(10^9yuan,%)

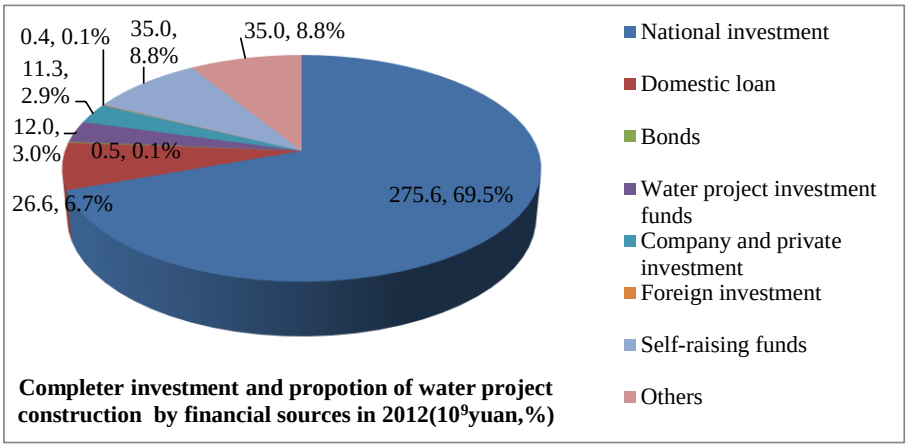


Fig.3-6 financial source of water projects

(2) Study of Provincial Water Investment Sources

The main source of provincial water conservancy investment is from the government, which is the same as that of the national level. Government investment accounts for the proportion of more than 85% in most provinces, autonomous regions, municipalities directly under the central government, except for Liaoning, Henan, Zhejiang, Chongqing and Shanxi provinces that have the proportion of around 70%. See table 3-2 for details.

Table 3-2 provincial water investment funds in 2012

Region	Total completed Investment	Government Investment			Domestic Loan	Company and Private Investment	Foreign Investment	Bonds	Others
			Centra	Local					
Total	396423.7	349770.9	20332	1464	26550.	11337.5	413.0	518.	7833
Beijing	1944.1	1815.4	1198.7	616.6	118.6	9.3	0.0	0.0	0.8
Tianjin	3658.1	3357.1	2329.6	1027.	13.2	231.7	0.0	0.0	56.1
Hebei	14700.0	13286.8	10639.	2647.	1225.3	0.0	0.0	0.0	187.
Shanxi	9559.3	8917.3	3541.2	5376.	381.0	241.8	0.0	0.2	19.1
Inner Mongolia	6732.2	6068.6	3541.0	2527.6	393.6	0.0	0.0	0.0	269.9
Liaoning	10161.3	7293.7	4612.6	2681.	2027.1	48.7	0.0	93.1	698.
Jilin	6361.9	6357.7	3082.1	3275.	3.0	0.5	0.0	0.0	0.7
Heilongjian	12864.2	12864.2	6998.7	5865.	0.0	0.0	0.0	0.0	0.0
Shanghai	4710.2	4566.8	114.2	4452.	0.0	143.4	0.0	0.0	0.0
Jiangsu	24027.5	20552.8	5150.6	1540	3186.3	30.2	168.9	0.0	89.3
Zhejiang	29884.7	23233.2	2856.1	2037	4045.4	1222.4	0.0	194.	1188
Anhui	12645.2	12370.0	7808.5	4561.	248.9	0.0	26.3	0.0	0.0
Fujian	5246.7	4840.3	3026.3	1814.	160.0	66.7	0.0	9.8	169.
Jiangxi	12003.7	10546.4	7862.6	2683.	1.9	1348.1	0.0	0.0	107.
Shandong	19012.7	17792.0	9942.7	7849.	1133.4	0.9	53.7	0.0	32.7
Henan	42026.6	33758.1	29190.	4567.	7960.0	0.0	22.4	0.0	286.
Hubei	31770.9	31172.5	26047.	5125.	288.0	40.9	0.0	200.	69.5
Hunan	15716.0	15476.2	9223.7	6252.	200.3	18.4	0.0	0.0	21.0
Guangdon	9922.8	8863.3	2255.7	6607.	930.0	101.2	0.0	0.0	28.4

Guangxi	10029.1	9982.0	6221.9	3760.	38.0	9.0	0.0	0.0	0.0
Hainan	2296.7	2243.2	1789.0	454.3	0.0	51.0	0.0	0.0	2.5
Chongqing	20583.8	15268.3	6524.5	8743.	1285.5	2218.1	100.8	20.0	1691
Sichuan	15552.6	13616.4	9456.7	4159.	414.8	1137.0	0.0	0.0	384.
Guizhou	9008.4	8890.7	6472.7	2418.	59.2	11.1	1.3	0.0	46.3
Yunnan	18693.9	17062.8	7781.1	9281.	581.0	633.8	0.0	0.9	415.
Xizang	3079.0	3079.0	3079.0	0.0	0.0	0.0	0.0	0.0	0.0
Shaanxi	14943.3	10287.9	5250.4	5037.	783.0	3285.4	0.0	0.0	587.
Gansu	8602.5	7403.1	5074.6	2328.	33.2	109.3	0.0	0.0	1056
Qinghai	2481.8	2110.0	1251.3	858.7	183.2	0.0	0.0	0.0	188.
Ningxia	3000.9	2982.5	2233.8	748.8	0.0	5.0	0.0	0.0	13.4
Xinjiang	15203.7	13712.6	8765.4	4947.	856.5	373.7	39.6	0.0	221.

(3) The Overall Evaluation of Water Investment Sources

Overall, China's water investment is greatly influenced by national policies. When the policy is favorable towards water construction, the investment keeps growing rapidly. Otherwise, the speed will slow down and the proportion of total investment in fixed assets will be reduced. Among the water invest sources, government investment accounts for a big proportion. From the national level, the proportion of government investment in water sector maintains at more than 40% and it reached nearly 70% in 2012. From the regional level, government investment accounted for an absolute proportion in water investment. Government investment accounts for more than 85% in the majority of provinces, autonomous regions, municipalities directly under the central government, except for a few that have the proportion of around 70%. Besides the government investment, the main sources of funds are domestic loans and enterprises own funds. In 2012, both of these accounted for less 10%.

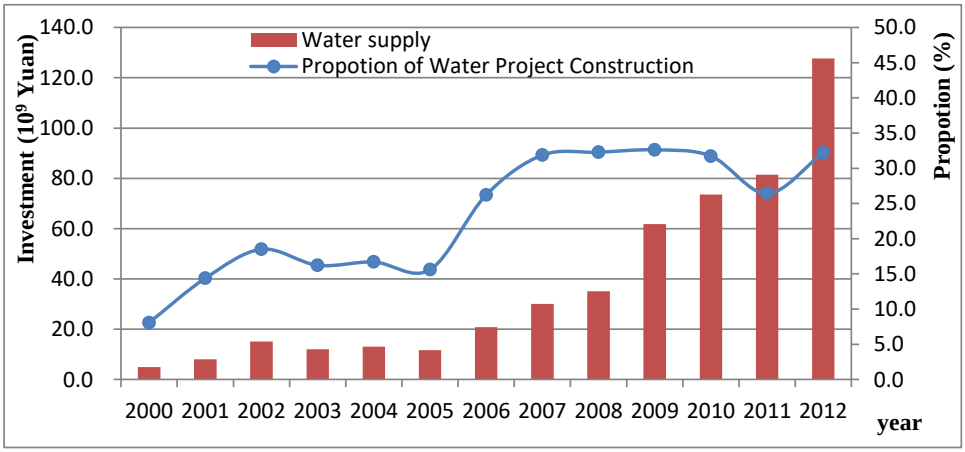
IV. The Assessment of China's Water Investment in Recent Years

4.1 The Allocation of Water Investment

Water investment in China mainly goes to water supply, irrigation, flood control, drainage, soil conservation and ecological restoration, hydropower, capacity building and early-stage work, etc.

(1) Investment in Water Supply

In order to meet the increasing demand of water in society, the investment in water supply has significantly increased in recent years: from 2002 to 2012, the annual growth rate of investment reached 40.8%, and the proportion of it rose from 8.1% in 2002 to 32.2% in 2012, making it an important field in water project construction. (See Fig.3-7)



Fig,3-7 the Run Chart of Investment in Water Supply in recent years

(2)Investment in Irrigation

The irrigation project has always been an essential part of water project construction. The investment in irrigation accounts for 10% of the total investment on water, and the annual growth rate of it is 20.9% from 2002 to 2012, and the highest figure appeared in 2012, namely 16% . (See Fig.3-8)

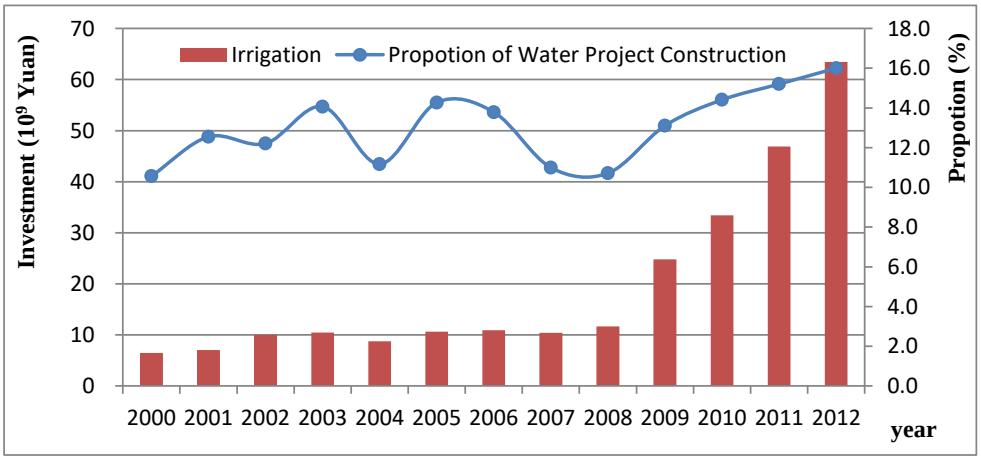


Fig.3-8 Investment in Irrigation in Recent Years

(3)Investment in Flood Control

The core of Water Project Construction is the investment in flood control, which accounted for 60% in 2000. In the past few years, the increase was relatively slow, and the investment growth rate was 11.7% from 2000 to 2012. The proportion in total water investment dropped to 35.2%, but remained as the largest among all the fields of water project construction. (See Fig.3-9)

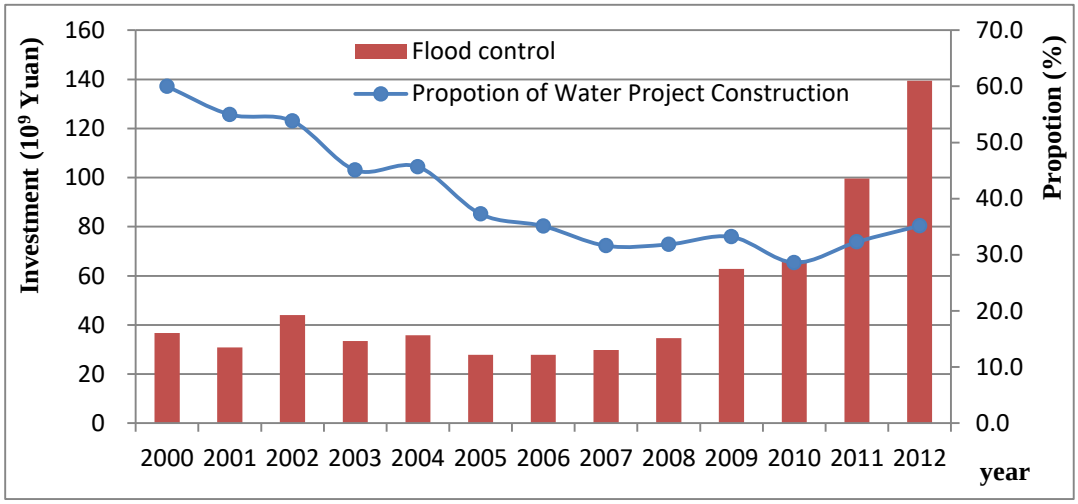


Fig.3-9 Investment in Flood Control in Recent Years

(4)Investment in Drainage

The investment in drainage occupies a small area of water project construction. From 2000 to 2012, the proportion of it was on the decrease, dropping to 0.8% in 2012. The investment rate was relatively low, which was only 7.5% from 2000 to 2012. (See Fig.3-10)

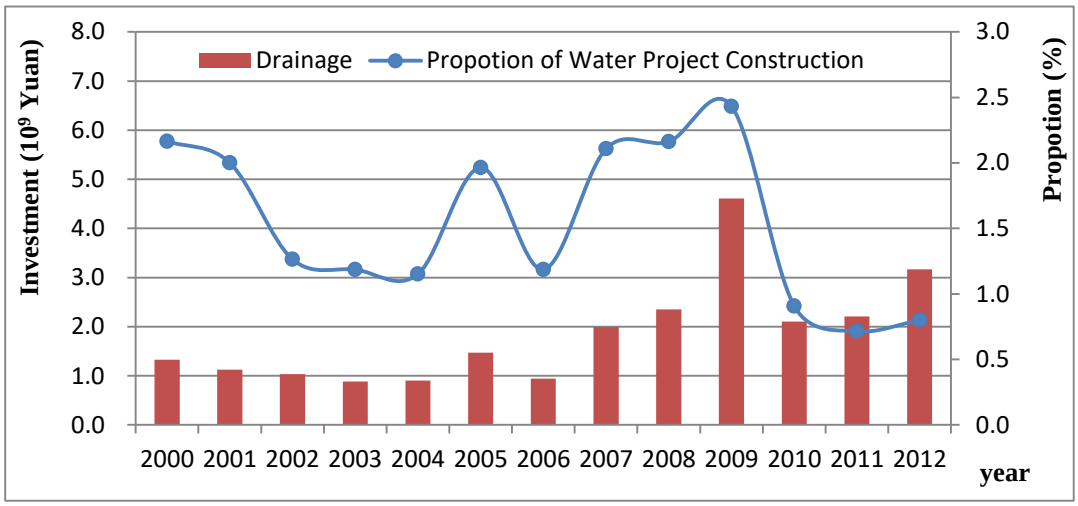


Fig.3-10 Investment in Drainage in Recent Years

(5)Investment in Soil Conservation and Ecological Restoration

The investment growth rate of soil conservation and ecological restoration was comparatively stable from 2000 to 2012, during which the annual growth rate was 16.8% and the proportion of total investment was between 3% and 8%. (See Fig.3-11)

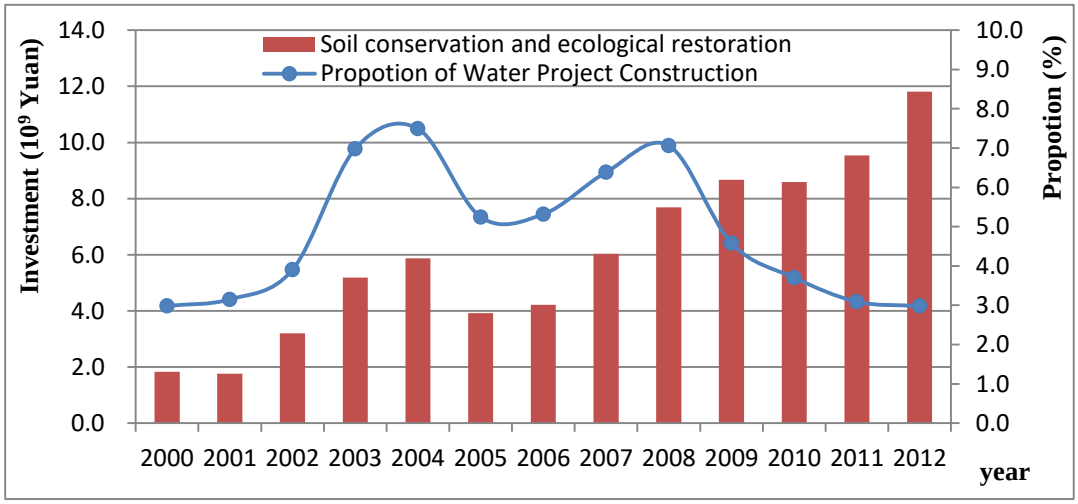


Fig.3-11 Investment in Soil Conservation and Ecological Restoration in Recent Years

(6) Investment in Hydropower

In recent years, the growth rate of investment in hydropower was fairly slow, and the annual growth rate was 4.6% from 2000 to 2012. Compared with other fields of investment, the growth rate of investment in hydropower was the lowest. Because of the comparatively low growth rate, the proportion taken by hydropower investment was decreasing, which dropped from 11.1% in 2000 to 3% in 2012. (See Fig.3-12)

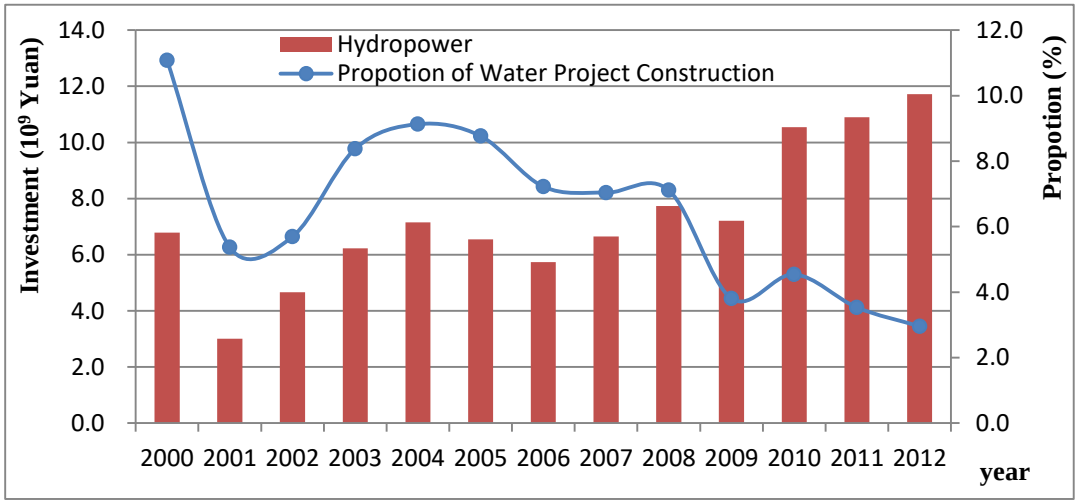


Fig.3-12Investment in Hydropower in Recent Years

(7) Investment in Capacity Building and Early-stage Work

Investment in capacity building and early-stage work does not account for a large proportion in water project construction. The proportion was kept between 1.4% and 5.0% from 2000 to 2012, while the annual growth rate of investment was 12.3%, fairly lower than other fields of investment. (See Fig.3-13)

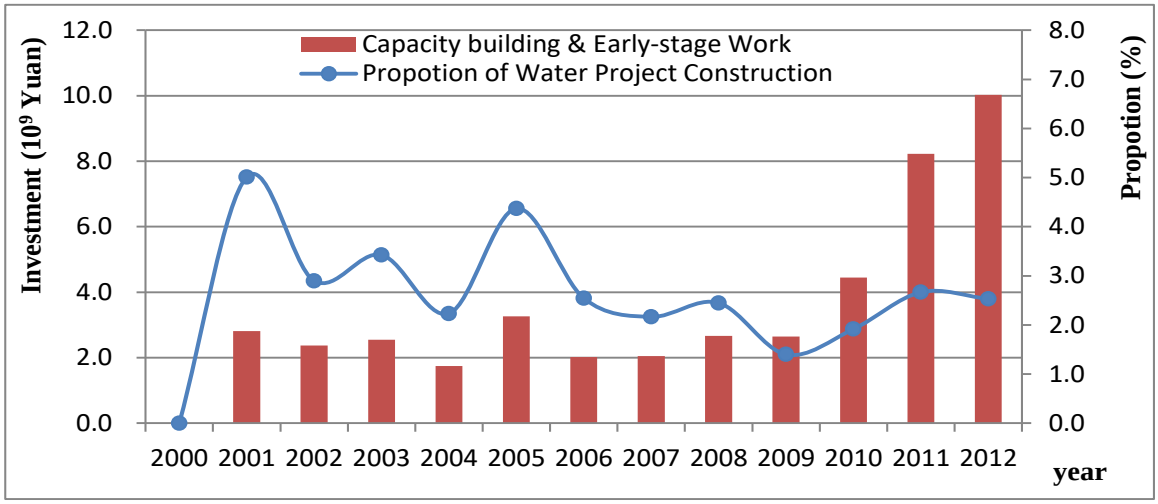


Fig.3-13Investment in Capacity Building and Early-stage Work in Recent Years

2 The Assessment of Water Investment

(1) The Assessment of Water Supply Investment

With the driving force of water supply investment, the storage capacity of water supply facilities has been significantly improved: the total storage capacity increased by 59.3%, from 518.3 billion m3 in 2000 to 825.5 billion m3 in 2012; the water supply capacity in urban area has also been remarkably improved: from 2000 to 2012, the water supply was improved by 98 million m3 per day, and 35.9 billion m3 per year, which, to a certain extent, satisfied the increasing water demand in society. In 2012, 363 million additional people gained access to safe drinking water compared with 2000, while the total figure reached 749 million. The investment in water supply has significantly improved the water consumption status in urban and rural areas.

(2) The Assessment of Irrigation Investment

Since 2000, the effective irrigation area have been expanded by 3245 thousand hm^2, reaching 62.491 million hm^2 in 2012. And 18.174 million hm^2 irrigation areas have been perfected. Besides, the irrigation rate (the proportion of effective irrigation area in total cultivated land) increased from 43% in 2000 to 51% in 2012; moreover, the total area of water-saving irrigation was added by 90.5%, from 16.389 million hm^2 to 31.217 million $hm^{2.}$ The rate of water-saving irrigation (the proportion of water-saving irrigation area in effective irrigation area) increased from 30% to 50%.

(3) The Assessment of Flood Control Investment

Flood prevention is a crucial part of water security, and an important field of China's water project construction. From 2000 to 2012, the length of newly-built or reinforced dikes reached 46.4 thousand km, while the total length ran up to 277.2 thousand km in 2012. The qualified length totaled 177.5 thousand, which has effectively ensured people's safety and property.

At the same time, drainage area increased by 2.003 million hm^2, reaching 21.857 million hm^2 in total in 2012, which was a 15.9% increase compared with 2000. It has greatly improved city's drainage capacity.

(4) The Performance Assessment of Investment in Soil Conservation and Ecological Restoration

From 2000 to 2012, the added area of soil conservation was 17.04 million hm^2, while the total area increased by 19.8%. In 2012, the total figure reached 103 million hm^2, accounting for 28.1% of the soil erosion area.

(5)The Assessment of Hydropower Investment

The hydropower capacity has also undergone significant improvement. From 2000 to 2012, the installed capacity of hydropower was enlarged by 18.1%, or 11.863 million kw, thus reaching 65.686 million kw in 2012. The hydropower improvement has played important function in alleviating electricity shortage.

For investment in different fields, please see Fig.3-14

(6) The Analysis on How Water Investment Influences the Sustainable Development of Economy and Sustainable Utilization of Water Resources

Water project construction plays an important role in the sustainable development of economy. Firstly, it meets the growing water demand in economy. With the proceeding of urbanization, water consumption is on the increase, and water utilization structure keeps changing: the proportion of rural water consumption decreases, while that of urban water consumption rises. The upgraded water storage and supply capacity in urban area successfully guarantees water delivery, and effectively relieves the supply-demand contradiction of water resources. Secondly, water project construction ensures food supply. To expand irrigation area is an important mean for increasing grain output. Supported by water conservancy investment, irrigation area, especially water-saving irrigation area, increased steadily; the grain output has increased while the consumption of irrigation water has decreased, remarkably propping up the growing food demand and the development of water-saving agriculture. Thirdly, water project construction safeguards people's lives and property. Flood prevention is a great pillar of water security. The perfecting flood control system and drainage system enhance our capability to control flood, mitigate the flood damages on towns and effectively reduce the economic loss in floods.

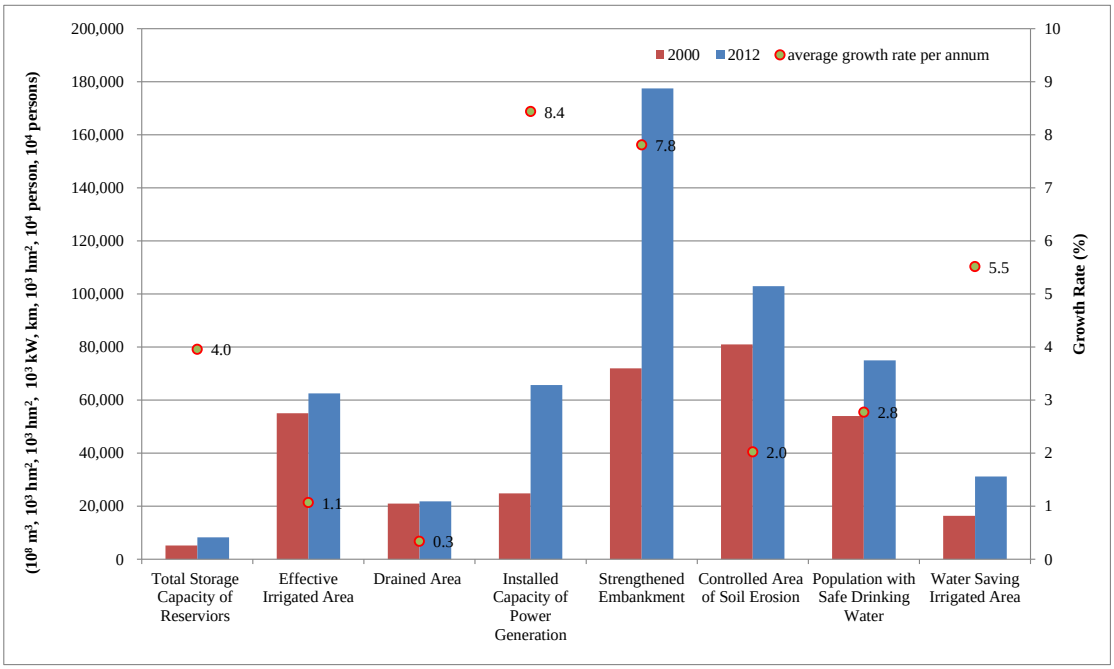


Fig.3-14 The Benefit of Water Investment Recently

V. The General Evaluation of Water Investment

1 The Achievement on Water Investment

(1) Water investment has accumulated abundant fixed assets of water project. Continuous investment enables an ongoing expansion of reservoirs, flood control projects, water supply projects, irrigation projects, etc. In 2012, the number of reservoirs across the country nearly reached 100 thousand, the length of dikes ran up to 277.2 million km, sluices totaled 97 thousand, electromechanical irrigation and drainage stations added up to 434 thousand, and the total of network stations, such as hydrometric stations, stage gauging stations, precipitation stations, groundwater monitoring stations, flood reporting stations, amounted to 84.8 thousand. In general, the accumulation of water projects has become an important component of national economic wealth.

(2) Water investment has improved the capacity for water security. With the deepening of water project construction, remarkable achievements have been made in flood prevention, drought control and disaster reduction; breakthroughs have been achieved in key water project construction. Water for people's livelihood has moved forward; water-saving society building has gone in depth; soil conservation and ecological construction have proceeded successfully; water development system has been upgraded continually. A complete and perfect water conservancy system, including flood control, irrigation, water supply, and soil conservation, has been preliminarily formed. The capabilities of water supply, flood control, and eco-security assurance have been gradually reinforced, and a water security system has been basically fostered.

(3) Water investment has created indirect benefits. Water resources are crucial to economic development. From 2000 to 2012, the total reservoir capacity reached 825.5 billion m^3, and the water supply capacity in urban area increased by 35.9 billion m^3. These have ensured the growing water demand in economic society, enabled the changes of industrial water utilization structure, stimulated the high-speed economic growth, and helped industrial structure upgrade. The water system has increased ability to prevent the flood and drought. In 2012, the length of dikes reached 277.3 thousand km, which was estimated to protect 566 million people and 42.6 thousand hm^2 of farmland, thus greatly reducing the economic loss caused by floods and droughts. Besides, the hydropower capacity is taking a growing proportion in total electricity output, approximately accounting for 16% in 2012. The proportion of clean energy keeps rising, so carbon emission is deceasing accordingly. Moreover, soil conservation and ecological restoration has improved water environment, preventing it from getting worse.

2. Existing problems on Water Investment

(1) Water investment remained small-scale, and occupied a fairly low proportion in fixed investment. The proportion of water investment in fixed investment was 1.85% in 2000 and 1.88% in 2002, which were fairly high figures in recent years. Later, the proportion kept decreasing to only 0.63% in 2008. Afterwards, with the national policy turning favorable towards water sector, the investment continued to increase, and the proportion reached 1.06% in 2012, but still lower than that in 2000.

(2) The fund resources were improperly structured. Government investment excessively overwhelmed social investment, and local funds were difficult to implement. In 2012, the proportion of government investment reached 58.5% while loan, enterprise and individual investment occupied less than 10% of total investment, which has generated too much load on government. Due to the limitation of local government funds, it was difficult to implement counterpart funds, and some of the money was raised by the form of welfare-to-work.

(3) Some of the water project constructions were faced with heavy debt left previously. Affected by policy orientation, water project constructions mainly focused on flood control, irrigation and water supply, and failed to pay enough attention towards drainage, soil conservation and ecological restoration. Hence, urban water logging and soil erosion became urgent problems. Furthermore, the maintenance ignorance led to the lack of inspection and repair work on water conservancy including dikes and irrigation area. So water infrastructure was seriously damaged and it failed to perform the expected functions.

(4) Funds were improperly allocated. Water investment mainly focused on project constructions but not much on management. The proportion of capacity building and early-stage work was kept around 2.5%, and the neglect of management investment

still remains.

(5) Funds were unequally distributed. Water investment was largely allocated to the east and southeast of China, and was less distributed to the west areas. The water conditions in western part were fairly poor, unable to withstand water disasters. Meanwhile, inadequate water supply and the unsound water resources allocation intensified the supply-demand contradiction of water resources in the local economic and social development.

(6) High investment was accompanied by little returns. Irrigation investment takes up a large proportion in water investment, but between 2000 and 2012, the annual growth rate of effective irrigation area was only 1.1%. One reason is that a large proportion of farmland was occupied in the process of urbanization, especially by transportation infrastructure, which decreased the irrigation area. The other reason is the damages on irrigation works caused by the little maintenance investment.

VI. Suggestions for Improving Benefits of Water Investment

1. Suggestions for Investment Policy

According to China's overall arrangements for investment, the annual investment in water sector should reach 400 billion yuan by 2020, which means the total investment from 2011 to 2020 should be 4 trillion yuan. In order to construct the system to insure water safety, China's water investment recently should focus on the construction of farmland irrigation and drainage systems, water safety in rural areas, urban water supply, the construction of waste-water treatment systems, the prevention and control of water pollution and the construction of hydrological information systems. Besides, many new skills to explore and use water resources should be promoted, such as water condition monitoring, water-saving irrigation, circulating utilization of water resources and seawater desalination. Considering the problems in previous investment, the investment recently mainly consists of several parts as followed:

(1) To shift the focus of water investment allocated by central government to the west. The government should increase the proportion of national funding distributed to the west, support the water projects for people and environment protection, and improve the subsidy standard for water projects construction. As for water projects construction for public welfare, the supporting funds allocated to the districts below county level and the concentrated areas which are in extreme difficulties should be canceled. The previous work of the China Western Development Project should be supported by central government budgets. Besides, the government should make better use of national fund for key projects to benefit the water projects constructions in the west.

(2)To strengthen the construction of water projects which are related to people's livelihood. The aim of the investment is to form an assurance system to provide safe drinking water, control flood and protect environment. More efforts should be made to provide safe drinking water in rural areas and the government should try to provide centralized water supply for districts with satisfied conditions. The farmland infrastructure construction for farmlands should be strengthened and the water conservation improvement works and water saving reforms in large irrigation districts should be completed by 2020. The government should facilitate the construction of irrigation system for newly-built reservoirs and develop high efficient water- saving irrigation. The government should also speed up the construction of water facilities in pastoral areas. The government should also speed up the construction of flood control systems in big cities, important villages and middle-sized and small rivers as well as eliminating potential dangers in large, medium-sized and small reservoirs.

(3) To optimize the direction of investment and repay some debts. Considering some debts in previous investment, the government should increase the investment in surface drainage as well as water and soil conservation in urban areas. The government should_continue not only to care about categories which are closely related to people's life and production, such as projects of flood control, water supply and irrigation, but more importantly, to optimize the allocations of water investment. This means the government should not only pay attention to some profitable projects, such as hydropower and reservoirs, but also emphasize the investment of flood control as well as soil and water conservation. The government should speed up the construction of drainage projects in urban areas in order to meet the cities' needs and eliminate the dangers which are caused by disproportionate distribution of water investment. It is also important to strengthen comprehensive control over key soil erosion areas as well as slope farmlands and small catchments. Besides, the government should also pay attention to the soil and water conservation work in Loess plateau, river water conservation districts and rocky desertification areas in southwest China. The government should also strengthen the comprehensive improvement of small watershed.

(4) To enhance capacity-building. The government should invest more on water management and using strictest regulations to build a water-saving society. The government should do the following things. Firstly, the government should fully control over the total quantity of water use, water use efficiency and water pollution in different functional areas; accelerate the development of volume-allocation plans of main rivers; establish water rights system gradually; implement rules of water-abstraction permissions, water resources assessment, management of different water resources functional areas and water engineering construction planning consent strictly. Secondly, it is necessary to strengthen the protection of water networks and water resources areas for urban and rural people. The government should also manage water resources uniformly, and distribute water for

life, production and environment reasonably. The third is to strengthen urban-rural integrated management of water affairs and actively promote the management of it.

2 Suggestions on Supporting Measures

(1) To establish a long-term effective mechanism that can guarantee the steady growth of public financial investment. The government should give full play to main channel of water investment, and ensure that the proportion of it cannot be lower than the existing rate and the investments should grow as the range of central government budget grows. Considering the present situations, central government should improve the amount of budgets and special investments, especially in finance within budget. Besides, the government should build new mechanisms of finance discount, grant and compensation with the regard of specific construction and management tasks. The government should invest more in water sector by using the central finance as a backbone and exploring other investment channels.

(2) To improve the local systems of investing in water sector. The investment does need not only central government input, but also the local input. With the steady expansion of the financial investment scale, local government at different levels should learn from the successful experiences worldwide and adapt them to the local circumstances innovatively. Considering the different characters of different financial phases and their natural backgrounds, they should establish preferential policy to draw private and social capital to construct water infrastructures. For the more developed areas in east China which have solid financial bases, they should depend more on themselves to make more progress in modernizing water construction. They should also emphasize the functions of leading policies and market mechanism with the help of high-efficiency use of different channels of funds. As for less developed areas in middle and west China, they should take the opportunity of the Western Development Project to attract all kinds of investment, including foreign ones, to achieve the cross-domain development. The local governments of these areas are supposed to support more, formulate preferential policies and bring in market mechanism so as to promote the fast development of water sector.

(3) To make full use of market financing and attract social capital. The government should renovate market financing system and policy of water infrastructures construction; absorb social capital by encouraging enterprises and other non-governmental organizations to play as main investment body. At the same time, the government should attract more investment by better managing water assets, selling and reconstructing capital, adding the value of capital and activating capital. The government can mainly use market financing from several ways as followed. Firstly, the government should continue to promote the policies of financial guarantee and financial discount to improve the capacity of self-financing for water conservancy projects, which can push more credit funds into water conservancy field. Secondly, the government should try to attract the preferential funds from World Bank, Asian Development Bank and governments of different countries for water

sector. Thirdly, as for the water projects for commonwealth, they have to depend more on market financing which is based on financial credit, because the funds from government can't meet their needs.

(4) To strengthen management of projects construction and improve investment efficiency. The government must pay more attention to the pre-planning and examining of water investment to solve the existing problem of low utility efficiency of investment. The government should also emphasize the connections between the water projects on the one hand and land use and urban construction on the other; eliminate the waste of investment caused by the change of land type; improve the efficiency of investment; strengthen the final-period management and bring the management and maintenance of commonweal projects into the range of government finance. At the same time, combined with the reform of water prices, the government should run non-commonweal projects with enterprise-style management to improve the income. The aim is to achieve the ideal condition of "using water to nurture water" to replace the status quo of "emphasizing construction instead of management" in water investment.