Watershed: the Transformation and Interrelationship of Urban Tianjin and its Water Environment in China's Planned Economy Era

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Abstract: Much has been written about cities in China's planned economy era from 1949 to 1978. Most of them focus on political and economic background, urban-rural relationship, land policy, and residential registration system to gain a general understanding of the time, while some, by choosing typical components or important projects, reveal characteristics of urban development. With a few notable exceptions, little is known about the relationships between built and natural environments of a city at that time. Mao, who had terminated the long time unrest status of the nation, gained unprecedented power to mobilize the masses. This power, facilitated with the traditional eager of water ruling and modern water conservancy technology, made a radical shift on the water environment. What was easily overlooked is that this change not only influenced irrigation, navigation, flood control, and hydropower generation, but also affected the development of cities along the rivers.
This article focuses on the city of Tianjin, which is located at the mouth of the Haihe River, to exam the interrelationship between the city and its water environment at that time. By investigating water conservancy works in and beyond the city, comparing several versions of urban master plans, and depicting the evolving urban forms and structures, the paper argues that the transformation of the water environment along the river deeply impacted the urban development, set the foundation of transforming the river-based trade city into a plain-based industrial city, and tore the city into an urban-harbor dual structure.

1. Introduction

The idea is generally recognized that the development of a city is inseparable from the environment in which it is located. If we define a city in "adequate environmental terms" and place it within "the larger framework of the physical world", we may get a better understanding of its evolvement (Melosi, 1993). This method is especially necessary for the study of Chinese cities, especially with regard to urban and water environments. Water plays an important role in culture, society, and governance of China. "Many of them are likely to remain strange, opaque or alien unless their connection with water is understood" (Ball, 2016). There is a big amount of excellent research on the issues of cities and waters in China. And some of them discuss the role of water in the evolution of urban forms, mainly in ancient time. But for the planned econ-

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omy period, research on such issues is rare. In fact, with the development of modern technology, human beings have become more capable of transforming nature. The changes in the water environment and the city have become more intense, and their connections and interaction have become stronger. In this regard, Tianjin, located at the mainstream of the Haihe River, as a case demonstrates the enormous impact of changes in the water environment on urban form in China's planned economy era. This paper tries to bridge the research of urban planning, water conservancy, and related socio-political background through a historical perspective to build a holistic and multidisciplinary approach to understand the city's development and transformation at that time.

2. Waters and urban form of Tianjin

The city of Tianjin emerged in ancient time for the sake of its location, which is the intersection of the Grand Canal and the Haihe River, and played a role of trade terminal that serving the imperial capital Beijing and the river basin. The topographic and climatic factors cause frequent flooding in this area. The low-lying terrain in the downstream plain and coastal area is full of wetlands and ponds. Cities and villages can only construct in limited highland, which formed a unique physical form and living conditions.

This stable situation changed when the colonizers come at the end of the 19th century. The environment condition cannot meet their need to build a modern port city (figure 1). A large number of management projects had been made to transform the rivers and surrounding environment, which became a foundation for the city's prosperity. Before the Communist China established in 1949, the city of Tianjin transformed from a trade settlement with 200 thousand

Figure 1. *An aerial view taken by the French military shows topography along the Haihe River around 1900.*

people to a modern port city with a population of 1.8 million, the second largest city in China at that time. The Haihe River and its tributaries presented crucial roles of navigation, industrial, domestic and irrigation water supply, waste water and flood discharging. The river became a veritable mother river in the city.

During the planned economy period, Tianjin and its water environment experienced tremendous changes. The built-up area (BUA) rapid grew by 1960, from 61skm in 1949 to 146skm in 1960, and then entered a long-term stagnation period (only increased 15 skm for 16 years). The urban population grew from 1.79 million in 1949 to 3.02 million in 1964, and then fell back to 2.72 million in 1976. The linear form along the rivers that shaped before 1949 gradually evolved into a sprawling pattern surrounding the old city (figure 2).

The following paragraphs will review and compare the initial versions of the urban planning scheme, investigate the water conservancy projects carried out in the same period of the Haihe River Basin and the resulting changes in the water environment and the impact on Tianjin. The paper argues that the water environment and its changes have played a much more important role than usual understanding in the formulation of the plan, the development of the city and the evolution of the urban form.

3. Urban planning: visions of the city and its waters

On March 13, 1949, the Second Plenum of the 7th CCP Central Committee was held in Xibaipo Village, on the northern bank of the Hutuo River, an important tributary of the Haihe River. This meeting was widely regarded as an important meeting for drawing the blueprint for future national construction. The meeting put forward the main tasks to transform China from an agricultural country to an industrial country. It also pointed out that only by restoring and developing the production in the city, and transforming the consumer-oriented city into a production-oriented city, can the people consolidate their regime. The editorial of the People's Daily subsequently pointed out that the old cities with modern industry like Tianjin still has the nature

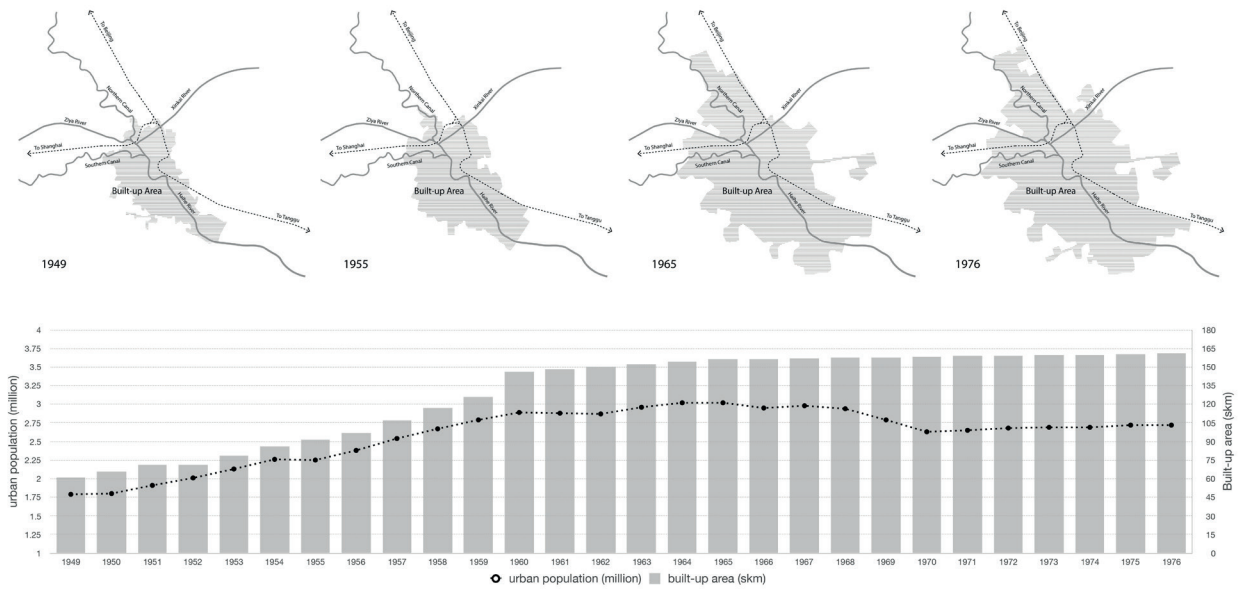


Figure 2. *Urban form of Tianjin in some key years and urban population and built-up area from 1949 to 1976.*

of a consumer city. Its prosperity is based on the exploitation of workers and the exploitation of villages. "We want to eliminate this phenomenon,... It is necessary to quickly restore and develop production". "Building a production-oriented city" had laid the basic policy for China's urban construction in the following 30 years. Under the influence of frequently changing international and domestic situations, political lines, economic and urban policies, urban planning during this period also frequently changed. The development of the "old city" such as Tianjin was mainly centered on "reconstruction" and always reflected the consideration of its water environment.

4. The will of developing along the river

In the first three years after 1949, known as the period of national economic recovery, industrial and agricultural development had grown rapidly. A large number of rural people had entered the city. The population of urban area of Tianjin had increased from 1.79 million in 1949 to 2.01 million in 1952, while the area of built-up area (BUA) had only increased from 61skm to 71skm. The tight condition of construction land shortage had not improved. Since 1951, the Tianjin Construction Committee (TCC) had considered the expansion of the urban area and strives for more land for construction. In 1952, TCC proposed the Plan for Expanding the Built-Up Area (1952 Plan).

The plan believes that Tianjin's urban construction is strongly restricted by the surrounding low-lying terrain, resulting in densely populated areas in the BUA. In order to provide land for new industrial projects and supporting facilities, it is necessary to choose an appropriate direction to expand the building area. The plan was deeply influenced by *the Greater Tianjin Metropolitan Plan* during the Japanese occupation period. It broke through the restrictions of administrative divisions at that time, especially strengthening the role of the Haihe River as the axis of urban development, and focusing on the development of the lower reaches of the river. The linear form establishes the connection between Tianjin urban area and Tanggu and the seaport. It intended to give full play to the support of Haihe to industrial development. Two districts were planned along the river, and the industrial zone was arranged on the bank to take advantage of the river's transportation, water supply and sewage disposal. The residential land was placed inland (figure 3).

The low-lying topography around the BUA was both the premise for this plan and the primary problem that must be faced in the subsequent construction. A big portion of the planning text was used to demonstrate the land reclamation plan in detail. According to the plan, over 30skm land will be filled for an average of 1.5 meters high in three years. The soil was from the mud dredged from the Haihe River and the rural area outside the embankment in the southwest. The total cost of land reclamation was nearly 95 million yuan, which was close to the total amount of all infrastructure investment of Tianjin in 1952. Such a huge investment is a burden on an new regime at that time. Later, two more versions of filling scheme were discussed to scale down or extend the schedule to reduce the cost. At last, the height of filling was reduced and the whole project was divided into ten phases.

5. Reconsidering the direction

In September 1952, the Central Financial and Economic Committee (CFEC), the most important administration of the planned economy, held the first national urban construction conference, requiring cities to formulate urban planning, especially the master plan to guide the construction of the city. For the first time, the Chinese cities were classified into four categories ac-

Figure 3. *The layout of several versions of urban plan in same scale. The current outer ring road is drawn to help compare.*

cording to the proportion of heavy industry that planned to be developed. Tianjin ranked in the third category, that is, the proportion of industry will not be increased in the future, and no priority will be placed on development. At the same time, a large number of Soviet experts participated in the construction of the country and gave professional guidance.

In this context, Tianjin's first urban construction preliminary plan was born in January 1953 (1953 Plan) (Figure 3). The plan replaced the linear structure of the 1952 Plan by establishing a mono-centered structure. A hierarchy system with "one city center and ten district centers" and a "three-ring and eighteen-radiant" road system were set up as the skeleton of the city. Research

on historical sources suggests that the reasons for this major shift may include: 1. The strong desire of the authorities and planning practitioners to change the old city's unconformity structure caused by the large number of concessions and the separation of Chinese and Foreign districts. 2. And the deep influence of Soviet expert Muchin who visited Tianjin in October 1952 and suggested that urban planning must reflect the superiority of the socialist system, reflect the infinite care for the working people and create comfort environment for them. A socialist city should make good use of rivers, so that the people can enjoy the natural scenery along the banks. The city must have a city center, and there must be a cultural and educational area, etc. It is clear that the 1952 Plan, which placing industrial areas on the riverside with the purpose of facilitating production, and the absence of urban centers for its linear structure will inevitably be opposed by Muchin. In the 1953 Plan, the urban centers was highlighted, and the four industrial areas selected were no longer occupied the riversides, but left the space to the workers' houses.

The First Five-Year Plan began in 1953, marking the full debut of China's planned economy. Mao Zedong proposed that the general line of building socialism is to gradually realize the socialist industrialization of the country. The focus of the First Five-Year Plan was to carry out industrial construction focusing on 156 projects aided by the Soviet Union and establish a preliminary foundation for industrialization. Soviet experts put forward that "urban planning is the continuation and implement of the national economy", and urban planning should be coordinated with industrial projects. Urban planning following the pace of economy plan and the factory site selection became a rule in the following years. This rule, on one hand, embodied the central position of industrial land in the city, and it also indicated that the long-term plan follows the short-term economic goals may cause great uncertainty.

In June 1954, another conference of urban construction was held by the Ministry of Construction and Engineering (MCE). Under the guideline of giving the priority to develop the key cities and attention to the expansion of existing industrial cities, the conference put forward a new category of the cities, in which Tianjin accelerate its class than before and got the allowance to "use the old urban area as much as possible, construct a new urban area in a planned way, and combine it with local reconstruction in the expansion to serve the new industrial area".

In this context, the TCC formulated the 1954 Plan based on the modification of the 1953 Plan, clarifying that the city is an industrial city. The planned urban population increased from 2.5 million to 3 million. And the mono-centered structure, hierarchy system, and the ring road network were retained while the planned district centers increased to 15. The planned urban area expands evenly comparing the former one and the area increased to 230s km. The road system has been more classically beautified, highlighting the composition of the city center and the axis (Figure 3). In this plan, the role of the Haihe River as the axis of urban development has been neglected, but countermeasures have been proposed for the low-lying situation to meet the needs of urban expansion and maintain the mono-centered urban structure. It is recommended to fill or concentrate the puddles, excavate artificial lakes, and use the soil scooped out in urban construction.

Due to the consideration of an upcoming war, CCP proposed a strategic contraction of the coastal areas in 1955. Only rational and effective use of coastal cities will be carried out to support the construction of the interior. The no. 115 factory of the 156 aid projects originally planned to be built in Tianjin moved out of the city. The shrinking industrial scale also means a reduction in urban area. Hence, the new plan (1955 Plan) reduced the planned urban population to 2 million.

Only one year later, Mao Zedong published his famous *Ten Major Relationships* and made a dialectical interpretation of the relationship between the coast and the interior, that is, it is

necessary to carry out reasonable development of coastal cities in order to better support the construction of the interior cities. At the same time, the central government headed by Zhou Enlai advocated a frugal movement on the increase of production and the practice of frugality. In the field of urban construction, it was reflected in the compression of non-productive construction. Under the contradictory policies from the top level, the revised urban plan (1957 Plan) restored the population size to 3 million, while urban area was compressed to 158.82 skm (30% less than the 1954 Plan). Compared with the mono-centered expansion of the 1954 Plan, the consideration of land conditions in this version was much more practical. The Soviet experts had especially played a crucial role in this revision.

In August 1956, after their field trip in Tianjin, the chief adviser of the MCE, Sarisev, and other Soviet experts deeply felt the restrictions on the development of low-lying terrain. He suggested to make a new comparison plan with a linear layout that fully consider and take advantage of the relative high typography along the Haihe River, especially in the northern part of the city. He also pointed out that the Haihe River as the main axis of the city should be emphasized. Subsequently, economic comparisons were made between the two layouts from six aspects, such as filling and municipal construction. It was calculated that the layout of an oval form could save an investment of 30.37 million yuan compared with the mono-centered round form. Meanwhile, in order to save arable land along the lower reaches of the Haihe River, the city was planned to expand to the northwestern along the river.

6. Placing the city on a water network

In 1958, China entered the Second Five-Year Plan and officially took the step of the Great Leap Forward. In the same year, Tianjin became the capital of Hebei Province, and its area was expanded to more than 30,000 skm. The 1957 Plan cannot provide sufficient land for huge industrial investment and needs to revise. The urban population of the new plan reached 3 to 3.5 million, and the land area expanded to 370 skm, more than two times of the 1957 version. According to the layout principle of "scattered in large and concentration in small", combined with policy of building urban people's communes, the urban area was divided into twelve production and living groups. Each group has its own industrial area, living area and service facilities to achieve self-sufficiency within the group and reduce transportation between different groups. The urban form comprehensively considers the opinions of the previous versions of the plan, avoids the low-lying areas in the northeast and southwest, and develops to the highland in northwest, forming an oval shape along the direction of the Haihe River. At the same time, in order to implement the requirements of "controlling big cities and developing small cities", and considering the low-lying conditions around Tianjin, the plan proposed to develop several industrial satellite towns around the urban area and at Tanggu.

The layout of such a large urban structure and a big number of industrial zones was placed on an efficient traffic system. In addition to newly built or adjusted railway lines, it was mainly based on an urban river network. The network, taking the Haihe River as trunk and making full use of the channels and ponds in the city, planned to construct a river transportation system around the urban area, and connect the warehouses and factories in and beyond the city. (Fig. 3) Meanwhile, through the construction of the Beijing-Tianjin Canal and the Tianjin-Tangshan Canal, and the restoration and expansion of the old channels, the waterway communication with the whole river basin will be realized to meet the urban positioning of "North China Water and Land Transportation Hub". This plan was carried out under the guidance of the Min-

istry of Communications' proposal for the construction of a river network, and the "Planning for Urban River Networking" of Tianjin. And both of river network ideas were based on the Haihe River Basin Plan compiled by the MWR in 1957 and the improvement of various adverse conditions in the Haihe River after river basin management.

7. Waters in tremendous changing

7.1. *Haihe River Basin Plan: waters for an ideal world*

At the end of 1957, the Ministry of Water Resources (MWR) completed the preparation of *the Haihe River Basin Plan (Draft)*, and believed that the main means of comprehensive management of the basin is to fully control and regulate water resource. The plan takes flood control as the primary task. A large number of large and medium-sized reservoirs are planned at the exits of Taihang and Yanshan Mountains to regulate floods and control runoff. There are also several distributary channels in the coastal area that planned to reduce flood when needed.

The plan considers that the total amount of water, 9.678 billion cubic meters, cannot meet the full development of irrigation, navigation, hydropower, and industrial and domestic water demands. It is necessary to divert water from outside the basin. It is planned to divert 23.45 billion cubic meters from the Yellow River through the Sanmenxia Reservoir and 1.15 billion cubic meters from the Luanhe River. In the future, it can also transfer 25 billion cubic meters of Hanjiang water through the Danjiangkou Reservoir. Based on these idealized figures, MWR finished the plan of the Haihe River Basin and distribute these water resources in a top-down way. In addition to renovating and providing water for 165 million mu of land suitable for irrigation in the whole basin, the plan also planned a network of waterways in the basin to promote the transportation, industrial and agricultural development. It included the Beijing-Tianjin Canal, Tianjin-Tangshan Canal and 9 more major waterways in near-term plan and canals that link the basin to the Yellow River, Huaihe River and the Yangtze River in long-term plan. In addition, a hydropower development program has also been formulated for upstream rivers.

7.2. *The Haihe River Transformation Project: A Sign of Warning*

Just as people yearn for the ideal world, the facts send an early warning. In the early years after 1949, the central government took "building water conservancy projects to develop agriculture" as an important national policy to implement. On the one hand, it encourages farmers to build "small water conservancy" spontaneously, and on the other hand gradually increases investment in water conservancy projects. The eager of farmers to improve farming conditions through the construction of water conservancy projects out of control to some extent. According to the People's Daily, the total amount of water conservancy projects during the First Five-Year Plan was huge, equivalent to the construction of more than 40 Great Walls. This kind of booming scene was essentially the competition for water resources in various regions. In the absence of systematic planning and coordination, these projects have had a tremendous impact on Tianjin that located in the lower reaches of the Haihe River.

The North China was arid from the winter of 1957 to the spring of 1958. There was very little water coming from the upper reaches of the Haihe River. By April 20, the flow of the

Mainstream was only 4.2 cubic meters per second, almost equal to the amount of wastewater discharged into the river. The Tianjin Municipal Government held a meeting to discuss the issue of urban water use. It is believed that with the development of the economy, the fresh water required by the city will increase exponentially, but the amount of water in the Haihe River is not abundant, while the amount of water used for irrigation in the upstream is also growing. The amount of water coming upstream will keep decreasing. Therefore, in order to solve the problem of water use in Tianjin, the government decided to reconstruct the mainstream of the river so that the water source can reach the standards for industrial and domestic using.

The project includes the construction of a hub project in the river mouth to separate freshwater and seawater and the reorganization of the urban sewer system to avoid discharging sewage into the Haihe River. The investment amounted to 80 million yuan, almost 1.3 times to the total investment in municipal construction during the First Five-Year Plan. Two newly built gates at the river mouth cooperated with the ship-lock built in 1946 proof the seawater and make the Haihe River a freshwater storage channel with a total storage capacity of 80 million cubic meters. In order to quickly resolve the situation of water shortage, the municipal government mobilized the public to participate in voluntary labor and became the main force of Haihe transformation. The construction of the gates was completed in half a year at the end of 1958, and the sewage renovation project was completed at the end of 1959. The project has alleviated the urgent need for Tianjin's industry, agriculture and people's living water in a certain period of time.

Although this project is an early warning to Tianjin's water supply, it is not enough to shake people's beliefs. It is still believed that when achieving the complete control of water and transferred enough water, the situation will be improved. Therefore, under the guidance of the Haihe River Basin Plan, the project focusing on water storage continued.

Since 1949, the Soviet experts who helped manage the Huaihe River introduced Stalin's view of nature and proposed "water is the wealth of the people. It must be controlled follow people's domination". "Only when it finishes all its work, water can be sent to the sea". Gradually, the MWR shifted the water management method from giving the priority to drainage in the past to giving the priority to water storage. This method then was recognized by the central government and became the guiding principle for national water conservancy construction. During the Second Five-Year Plan period, the investment in water conservancy changed the former balanced distribution. The proportion of investment in reservoir construction exceeded half of the total.

According to the arrangement of the HRBP, from 1958, the climax of mass construction of reservoirs began. By 1963, 21 large reservoirs, 45 medium-sized reservoirs, and thousands of small reservoirs were built with a total storage capacity of 13.72 billion cubic meters, equivalent to 1.5 times the total available surface water resources of the Haihe River. The site choice for these reservoirs is mostly reasonable. However, under the influence of the Great Leap Forward, in order to shorten the construction period, survey, design and construction carried out at the same time, resulting in some problems in design and construction quality, which brought some dangers to future flood control. In addition, a large number of water storage projects and irrigation districts were built in the plain area. The projects only paid much attention to water storage but not to the construction of drainage system, which caused large-scale farmland salinization in a very short period. And this finally became an important cause of the following famine.

7.2. *The 1963 Big Flood and the Haihe River Controlling Campaign*

Just as people have not fully recovered from the disaster caused by the Great Leap Forward, the big flood occurred in 1963 seemed to be a test of the water conservancy projects that built in the Haihe River Basin since 1949.

In August of that year, the largest floods since records occurred in the southern rivers of the Haihe River Basin. Although more than a dozen large reservoirs in the upper reaches controlled nearly 46.2% of the total amount of water coming from the mountains, the floods still flowed from the west to the east across the Beijing-Guangzhou railway, causing successive floods in the rivers, flooding 101 counties and cities and more than 53 million *mu* of land. Tianjin spared from this flood for the sacrifice of the places along the flood. Although there have been people who have blamed that this unprecedented scale of flood was not mainly due to the climate, the official insisted that the natural factors are far greater than human factors in causing the disaster. And the appropriate treatment is to carry out larger scale flood control projects, the so-called "great disaster only could be ruled by great control".

On November 17, 1963, after visiting the exhibition on flood control and disaster relief, Mao Zedong issued a call to "bright the Haihe River under permanent control". It marked the beginning of a mass campaign that lasted for more than ten years (Figure 4). MWR formulated *the Haihe River Basin Flood Control Plan (Draft)* that was based on the experience of flood fighting in 1963 and the problems of flood control. The plan gave priority to building distributary channels in the coastal area.

The massive Haihe River Permanent Controlling Campaign was mainly concentrated in Hebei Province. Millions of people had participated in voluntary labor. In order to ensure the progress, even during the Cultural Revolution, no political movement was required on the project site. More than 50 distributary channel and drainage rivers have been built to ensure all the major tributaries of the upper reaches can obtained independent access to the sea. The discharge volume of water reaches 24,680 m^3/s, which is 10 times to the capacity of the Haihe River. Since then, the Haihe River Basin has return to the original state before the Wei Dynasty with all the channels controlled by human being. Hence, the foundation of Tianjin as a trade city completely changed. Alomost at the same time, the Sanmenxia Dam, which is an important water diversion project to deliver water to the Haihe River Basin, had experienced serious siltation problems since its completion. A number of renovations had been carried out to save

Figure 4. *Taming the rivers.*

the dam and upper reaches in the 1960s, making the ideal of diverting water from the Yellow River a bubble.

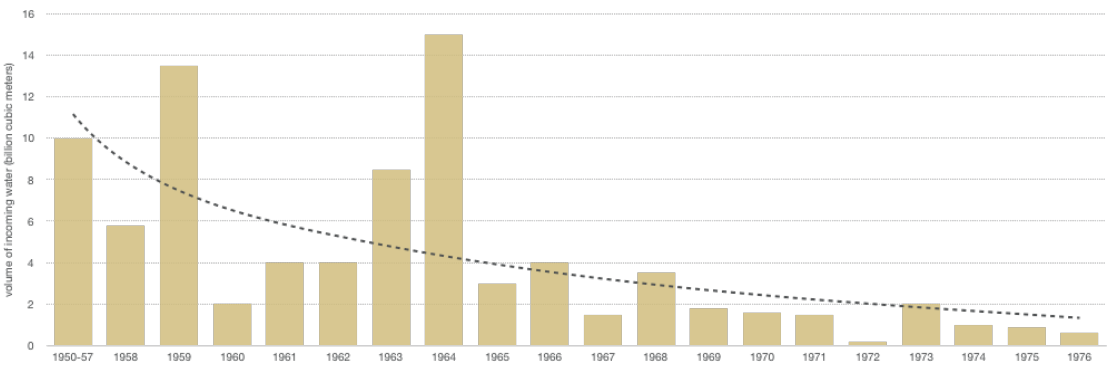
7.3. *The thirsty city and tore form*

Due to the closure of water resources in upstream, the construction of distributary channels, and the failure of water transfer plan, the water volume flowed into Tianjin has decreased from an average of 10 billion m^3 per year (1950-1957) to only 1.8 billion m^3 per year (1965-1972). The lowest was only 300 million in 1972 (Graphic 1). Due to the leakage of Haihe Gate, the agriculture and industrial sewage discharge in upstream and the opening and closing of ship locks, it still caused seawater intrusion, threatening industrial, agricultural and domestic water supply of the city. Due to the decrease in incoming water, the river channel lacks erosion and the siltation is aggravated, causing the riverbed to be 1-2 meters high, reducing the river's ability to discharge floodwater. In addition, the decline of navigation and the move of port have had a fatal impact on Tianjin.

Inland navigation consisting of the Grand Canal and the upper reaches of the Haihe River has always been one of the main ways of collecting and transporting in Tianjin Port. Even after the rise of the railway, water transports are still prevalent. After 1949, 54 rivers were excavated which made the mileage of inland navigation reached 721 kilometers. At the same time, due to the abundant water resources of the river, the port in urban Tianjin was flourishing. At that time, the 3,000-ton sea-going vessel could directly reach the city. In 1949, the seaborne throughput of the urban port was 220,000 tons, accounting for 70% of the total in that year. In 1959, it reached 828,000 tons, the highest level since 1949. After that, due to the reduction of the water amount, the construction of locks, dams, and bridges on the main stream that had cut off the waterway, the urban port that has flourished for a century and the inland navigation that has continued for hundreds of years declined.

Along with the decline of the urban wharf was the rise of the New Harbor in Tanggu. The construction of the New Harbor began in the Japanese occupation period. At that time, the Japanese were dissatisfied with the control of the urban wharf by the Westerners and planned to build a new harbor at the river mouth. But the project did not finish for the reason of war. Since 1949, the Ministry of Communications of PRC officially took over the businesses of Tianjin Port and started to build the harbor. It also started to establish the combination of govern-

Graphic 1. *Volume of incoming water from 1949 to 1976.*



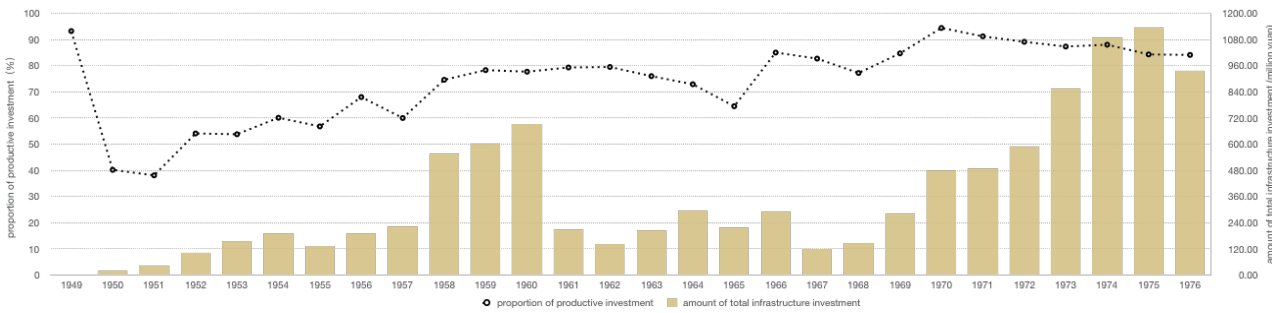
ment function and enterprise management centered on planned transportation. The city lost its right to manage the port. The central government control the international and domestic trade and determined which kind of good to import or export, and the city was only responsible for transportation and distribution. The supporting role of trade in urban industries has disappeared.

Furthermore, the spatial stripping was much more obvious. The distance between Tianjin urban wharf and the New Harbor is more than 40 kilometers. It means that all the port facilities, warehouses, railways, highways, waterways need to be rebuilt or upgraded in Tanggu. It was a huge burden for a new country to do that in a short time. On the one hand, the loss of navigation of the Haihe River increased the dependence on land transportation. As the railway transportation capacity was almost saturated, and the highway construction was slow improved, the traffic connection between Tianjin and the New Harbor was difficult for a long time. On the other hand, the various facilities in the urban wharf have been abandoned, and the storage, industry, and ancillary facilities built near the wharf have been dying. Since then, one cannot find the prosperity of a port city in Tianjin again.

The stripping of the port and the decline of navigation have completely changed the structural logic of urban space that developing along the river. After the Great Leap Forward, urban planning was considered to be the chief culprit in the blind expansion of cities. The central government proposed that "do not make urban planning for three years" during the period of national economic recovery. Later, because of the preparation for war, decentralized urban layouts became the main guidance for a long time. And during the Cultural Revolution, the planning department had been closed and the professionals had been laid off. In the second half of the planned economy, systematic planning adjustments could not be implemented. The changes in the internal logic of urban space caused by the dramatic changes in the water environment at that time can only be passively coped.

The 1959 Plan with its urban layout and structure formed on the river network became the last version of master plan of Tianjin during the planned economy period. Although the compulsory had been weakened because of the social chaos, it still played the only guiding role at that time. From the beginning of 1958, the understanding of building a production-oriented city had become extreme, unilaterally emphasized on production and compressed everyday life. The proportion of productive investment exceeds 70% of total infrastructure investment until the end of the planned economy (Graphic 2). The more than ten planned industrial zones were quickly built in a short period of time, which made the BUA grown from 107 skm in 1957 to 146skm in 1960. Due to the failure of urban river network construction, these industrial areas

Graphic 2. *Amount of total infrastructure investment and the percentage of productive section.*



had lost effective traffic support, which made the urban layout showing a loose structure with scattered and unreasonable components. Meanwhile, due to the continuous implementation of the policy of "controlling the size of large cities", the area of the BUA increased from 145.95skm to 160.89skm in the following 16 years (1960 – 1976), only increased 14.94 skm (10.2%). The urban population dropped from 2.89 million in 1960 to 2.72 million in 1976. The city entered a stage of restrained urbanization that focusing on filling in the gaps (Hou, 2010). The internal adjustment of the urban structure during this period was more obvious than the change of urban form, including the continuous construction of new industrial zones, the transfer of industrial zones in the old city, especially along the river, to these new zones or satellite towns, as well as the spontaneous construction of citizens to make up for the lack of investment in non-productive construction. In the decade of the Cultural Revolution, the illegal building area was about 4.11 million square meters, close to half of the completed building area at the same time and 2/3 of the total legally completed building area in the 1960s.

8. Conclusion

The review of the planning process reveals how people consider the river and the water environment when they were drawing the blueprint of the city and how did they put intentions on the environment. Serious price had to pay when the ideals became unrealistic. The transformation in the Haihe River has weakened the river's support to the city, and changed the urban structure that centered on it. The river instead hindered the communication between the two sides. The shift of ports, factories, warehouses and the construction of supporting facilities were all huge burdens on cities in the years of scarcity. A once prosperous trading city, due to the drastic changes in the water environment and the guidance of national policies, had to make a tough turn in the era of planned economy and become an industrial city that lost its port. To some extent, the story of Tianjin and its water that happened in the planned economy era is a sorrow. This kind of thing happened not only in Tianjin, but also in some of the villages and cities in the Haihe River basins, even in other parts of China and the world. Human's desire to tame nature and create an ideal world has become fanatical with the blessing of modern technology. It is one of the reasons for the tragedy. A holistic way of reading cities may help us be more aware of this kind of history and allow us to make more sensible decisions on similar issues in the future.

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