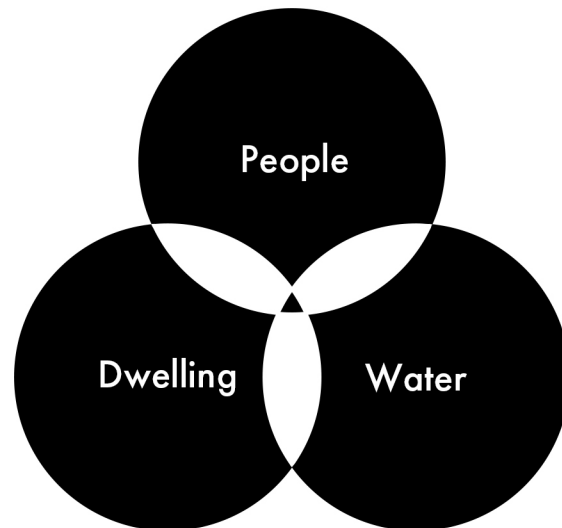


DIFFERENT GENES OF THE SAME TYPE OF ARCHITECTURE

WATERFRONT DWELLINGS IN AMSTERDAM AND SUZHOU



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Abstract

In the 17th century, both Amsterdam and Suzhou were in a period of rapid social and economic development. When faced with similar water environment and social problems such as conflicts between population and limited land resource, the residents of the two places chose completely different ways to build their dwellings. In response to such differences, this study explores the reasons for the differences between the traditional waterfront dwellings in Amsterdam and Suzhou in the 17th century. First of all, the study describes the social conditions at that time and the development processes of waterfront dwellings in the two places to construct a basic historical framework. Then it interprets the specific differences in the respective relationships between the two waterfront dwellings and the water environment, indicating the objective architectural differences. Next, it analyzes the reasons for forming the specific differences from three aspects which are social culture, lifestyle, natural environment and climate, and reveals the influence of these factors on the results of architectural form differentiation. Finally, starting from the reasons for the differences, further thinking about the current architectural practice is carried out, so as to bring some enlightenment to the readers.

Keywords

17th century, Waterfront dwelling, Architectural form differentiation, Social culture, Lifestyle, Natural environment and climate

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Introduction

The establishment of an architectural vocabulary system is based on multi-level aspects and different influencing factors often lead to different results. Both Amsterdam and Suzhou in the 17th century experienced a stage of rapid social and economic development, and population growth also caused an increasing strain on available land resources. As cities built on water and abundant in rain, waterfront dwelling was an inevitable choice that people would face. When the building types are both waterfront dwellings, different areas tend to bring different architectural forms. This study aims to reveal the reasons why the people of Amsterdam and Suzhou in the 17th century adopt different architectural approaches in their respective traditional waterfront dwellings when both engaging with the water environment by comparison. It further explores whether the residents of the two places were affected by social culture, lifestyle and natural environment when building different types of waterfront dwellings, if so, in which way were the residents being affected. In this context, waterfront dwelling is defined as the residential building attached to canal directly or indirectly.

The formulation of the research question is motivated by two aspects. First, in terms of academic research, the respective research materials of these two types of buildings are already sufficient, but their comparative analysis is still in the blank stage. Through this comparative study, a certain understanding of how different contexts and backgrounds affected the generation of waterfront dwellings can be drawn. It also provides reference information for people who are interested in this area. Second, in terms of personal interests, because of previous short stay in these two cities and the deep impression of the relationship between the characteristic waterfront dwellings and the canals, further exploration will be made in this field to solve personal doubts about the dwellings' differentiated constructions.

In order to test the influence of social culture, lifestyle and natural environment on the differences in the constructions of two waterfront dwellings. This study first presents the historical context of the two cities and their respective waterfront dwellings, providing a basic historical framework for subsequent analysis. In the next chapter, it compares the overall differences between these two types of waterfront dwellings on the basis of existing research literature (*The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan* by Weihao Yang, *Well-Being in Amsterdam's Golden Age* by Derek Phillips, etc.) to show the objective status. Then, according to other research articles and paintings (*Prosperous Suzhou* by Yang Xu, *Along the River During the Qingming Festival* by Ying Qu, *View of the Golden Bend in the Herengracht* by Gerrit Berckheyde, etc.), the differences in the aforementioned three aspects of these two places and their specific influences on the building constructions are analyzed to demonstrate the causal relationship between the factors and the architectural outcomes. In terms of analytical method, the processes of the influences are clarified with mainly qualitative analysis to derive the conclusion which answers the research question of this study and provokes reflections on contemporary architectural practice.

Chapter 1 Historical context

Introduction

At the beginning of the whole study, the research object and history are explained first. Looking at the historical backgrounds of the two cities in the 17th century and the origins of the construction of their respective waterfront dwellings, the differences and commonalities outline the causes for the different results of the two waterfront dwellings from different perspectives. Under their respective established historical backgrounds, objects in different environments may have different changes, and comprehending these historical backgrounds can help to understand the basic social environments of the specific constructions of the objects. Based on this condition, further exploration for the reasons for the specific constructions are carried out.

1.1 Amsterdam and Suzhou in the 17th century

The 17th century was a time of opportunity for the Netherlands and China. Both countries have been marked by drastic changes in their economic growth and national strength during this period of time.

For the Netherlands, the 17th century was known as the Golden Age for its trade, science and art. Famous painters such as Johannes Vermeer and Rembrandt Harmenszoon van Rijn both belong to this period. The rise of this period stemmed from the defeat of the South Netherlands, which caused many Calvinist merchants to flee north, and many to Amsterdam, which was a small port at that time. By the 17th century, the fast-growing Amsterdam had become one of the most important ports in the world, and this move was called "building the new Antwerp". Several other factors also contributed to the prosperity of trade, industry, science, and art during this period. One factor was the availability of cheap energy sources such as wind and peat, most of them could be transported to different cities via canals. Furthermore, the advent of sawmills allowed large-scale fleets to be built and it made the trade around the world possible for the Dutch people, as well as military means to defend the economic interests of the republic.

All these developments were hand in hand with the increasing socio-economic gap between the citizens of the city. The wealth gap between the rich and the rest reached unprecedented level. In 1674, the richest 1% of households in Amsterdam owned around 45% of the city's total wealth, while the richest 10% of households even controlled 93% of the total [1]. These estimations are based on the taxes for all household members but the figures maybe underestimate the level of the wealth imbalance since most households could not even be taxed because of their extremely low level of wealth.

In addition to the disequilibrium of social wealth, sanitation was also a challenge for 17th Amsterdam. In the book *Observations upon the United Provinces of the Netherlands* written by Sir William Temple who spent 1668 to 1670 as British ambassador in The Hague, the author wrote about the hygiene problems in Amsterdam, "The extreme moisture of the air, I take to be the occasion of the great neatness of their houses, and cleanliness in their Towns. For without the help of those customs, their country would not be habitable by such crowds of people, but the air would corrupt upon every hot season, and expose the inhabitants to general and infectious Diseases. The same moisture of Air makes all Metals apt to rust, and Wood to mold." [2] Due to the sanitation issues, the water quality of the canal was quite poor and it

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- [1] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [2] William Temple. (1932). *Observations upon the United Provinces of the Netherlands* (1st ed.). Cambridge University Press.

would emit an unpleasant smell under the summer sun. The residents rarely used the canal in other ways other than transportation. Therefore, the interaction between residents of Amsterdam and the surrounding water environment has been reduced, which further promoted their negative attitude towards the water.

During the golden age, Dutch achievements in architecture reached new heights. Due to the booming economy, the city expanded considerably. New town halls, weighing houses and warehouses were built one after another. Merchants who made great fortunes bought the houses built along new canals which are for the purpose of defense and transportation, with exterior decorations that matched their new status. In the grand mansions the rich called home, the carpets under their feet, the drawings on the walls, the customized beds they slept in, the stylish clothes they wore, and other expensive furniture and decorations which were placed throughout their houses often indicated a number of million guilders.



Figure 1.1 The map of the fourth expansion of the city of Amsterdam in 17th century

The fourth expansion was huge and it covered the whole urban district of Amsterdam to the city wall which was at the Singel canal. In this map, it shows the urban layout of Amsterdam divided by canals, as well as the layout of residential areas built along the canals. Different residential areas had different types of residence arrangement due to the different social status and wealth accumulation of the dwellers.

For China, its political situation has undergone great changes. The Manchu Qing Dynasty took over the Central Plains and replaced the Ming Dynasty as the new ruler of the Central Plains. As far as Suzhou was concerned, its superior natural environment and dense and developed river network traffic provided a solid foundation for Suzhou's economic development, which was very beneficial to the development of agriculture, fishery and animal husbandry. The economy of Suzhou area was based on the traditional farming to develop sericulture, textile and other industries like book engraving and woodworking. After the Ming Dynasty, the sericulture economy and cotton farming economy have been vigorously developed, and Suzhou's economic structure has changed from a self-sufficient rural economy to a market economy dominated by commodity production and commodity exchange. It also provided an economic foundation for the construction of traditional waterfront dwellings in Suzhou [3].

During this period, due to the rapid development of the commodity economy, the social life in Suzhou area began to change, and the idea of emphasizing business and culture emerged. Literati and scholars also gathered here, frequently carried out literary activities. Furthermore, the reading atmosphere prevailed, which made the literati have higher personality qualities. In the early Qing Dynasty, Suzhou was one of the most economically and culturally developed cities in the whole country, it had the heaviest fiscal and taxation, the most important water conservancy, and the most prominent literati in the Southeast of China. The rare and special products produced by the nature, the currency circulated in foreign countries, different kinds of merchants, gorgeous chariots and horses, all of them came from all directions and gathered in this city. The prosperous scene of Suzhou in the 17th century was recorded in detail in Yang Xu's Prosperous Suzhou.



Figure 1.2 Prosperous Suzhou (excerpt) by Yang Xu

[3] Xueying Zhou. (2006). Research Library of Chinese Architectural Culture: The Chinese Architectural Culture of Jiangnan Watertown (1st ed.). Hubei Education Press.

Suzhou, like Amsterdam, also had a large social class and wealth difference within its residents, but this was also related to the feudal system in China since ancient times. Class differences were also reflected in residential buildings. Different classes of people corresponded to dwellings of different shapes and sizes. For example, the prince's main hall could have seven to eleven Jian (the unit used to measure the building bay, the distance between two columns is one Jian), while officials below the sixth rank and civilians could only use three Jian. Even if the dwellings were all built along the river, there were huge differences in the construction of these buildings.

1.2 Waterfront dwelling

The definition of waterfront dwelling is that the house is directly or indirectly connected to the river, and the generation and use of the dwelling are affected by the river to a certain extent. Waterfront dwellings exist in most cities with rivers running through them, but the origins of these dwellings are not the same.

The rise of waterfront dwelling in Amsterdam in the 17th century was inextricably linked to the formation of the Canal District. The canal used to be the economic lifeline of the entire city of Amsterdam. In the early days of the city's establishment, the function of the canal was defined as transportation and trade. The transportation was mainly reflected in the waterway connection between the city of Amsterdam and the outside world, and convenient transportation brought more trade opportunities. At the beginning, the



Figure 1.3 View of the Golden Bend in the Herengracht by Gerrit Berckheyde

land on both sides of the canal was mainly used for markets and residences, and also some industrial facilities such as shipyards and ports were built in this area. In the golden age, in order to solve the problems of population living and urban land shortage, the city expanded in concentric circles and built three ring canals. During the first large-scale expansion of Amsterdam in the 17th century, the rich in the city were the first to build spacious and luxurious dwellings along the canal in the city center, and the middle class people lived in clusters across the canal, building houses with relatively narrow widths. With the opening of the gentleman's canal, citizens with less money built smaller houses on the other side of the canal and lived opposite the middle class. As the result, poorer people had to build their houses on the other side of the third canal, the Kaiser Canal. Therefore, with the three main canals of Amsterdam as the boundaries, the width of the house shows a corresponding change due to different layers of wealth [4].

Waterfront dwellings in the Suzhou area have a more distant origin. The history of traditional waterfront dwellings in the south of the Yangtze River can be traced back to the ancient Hemudu culture (5000 BC to 3300 BC). In the Neolithic Age, the ancestors of the Suzhou area began to thrive in this place. In order to survive, the architectural traditions of living near the water and building one's own housing have been formed and these living cultures and habits have been passed down. Over time, factors such as political management, wars, economic development, immigration, etc., have made the waterfront dwellings in the Suzhou area continue to change.

Until the Qin and Han Dynasties, the governor began to set up prefectures in the Suzhou area and sent full-time officials to govern this particular place which brought the most advanced construction technology at that time to improve the quality of waterfront dwellings. By the Tang Dynasty, several wars happened in the Suzhou area which led to frequent construction activities, as the result, the building technology was significantly developed during this period to increase the sustainability of the houses. In the Southern Song Dynasty, the relocation of the capital led to unprecedented economic and cultural development in the Jiangnan region (including Suzhou area), the rise of water transport business has made people pay attention to the relationship between buildings and canals. By the Ming and Qing Dynasties, the Jiangnan region had become the most economically developed and culturally prosperous region in the country. High officials, nobles, literati and sages all built their dwellings here. Due to the large number of residents and the shortage of land, the traditional waterfront dwellings in the south of the Yangtze River continued to evolve to save land resource, in order to resolve the conflict between people and land. Throughout the history, the development of waterfront dwellings in Suzhou is inseparable from natural conditions and socio-cultural changes [5].

Conclusion

In the 17th century, Amsterdam and Suzhou had many similarities at the urban level, such as the contradiction between residents and land use. The factors affecting the construction of dwellings come from many aspects, and a set of completed architectural vocabulary system is the result of a joint action of different factors. At the same time, in response to similar social environmental problems, different architectural treatment methods also highlight the results of cultural background differences. In the next chapter, the specific differences in the relationship between the two waterfront dwellings and the surrounding water environment will be analyzed and explained in detail.

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- [4] Jingjing Chen & Xiaoming Liu. (2015). On the Canals of Amsterdam and Development of the City Space. *Modern City Studies*, 5, 93-98.
- [5] Weihao Yang. (2016). The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan (Master Thesis, Jiangnan University)

Chapter 2 Comparison of waterfront dwellings in Amsterdam and Suzhou

Introduction

In order to further interpret the reasons for the huge differences between the two waterfront dwellings, this chapter first lists and analyzes the specific differences between the two residences. The analysis is mainly divided into the relationship between the building and the canal and the relationship between the building and the rainy weather. It is hoped that through the analysis of the regional location, the building plan form and the building functional layout, the specific differences between the two types of residences will be clarified. The differences between the buildings exist in all aspects, ranging from geographic location to details of doors and windows, but this chapter only focuses on the topic of water environment and discusses aspects related to it.

2.1 Relationship with the canal

2.1.1 Connection with the canal

For the waterfront dwellings of Amsterdam, they all maintained a less intimate relationship with the canals. The entrances of these waterfront dwellings were separated from the canal by public streets, which were highly public as the main traffic space on both sides of the canal, and the connection between the waterfront dwellings and the canal was also affected by this street. From a positional point of view, the dwellings all had a visual relationship with the canal. These houses had a large number of windows on the façade facing the canal to introduce natural light into the interior, which made the view



Figure 2.1 The bend of the Herengracht at the Nieuwe Spiegelstraat in Amsterdam by Gerrit Berckheyde

of the canal visible to the residents in the houses. The canal has thus further become an inseparable part of the daily life of these inhabitants. However, in the construction of waterfront dwellings, whether it was a luxury residence for a wealthy family or a multi-family shared residence for poor families, their connection to the canal was not emphasized in the design level of the dwellings [6]. On the contrary, for the waterfront dwellings in Suzhou, their connection to the canal was an important consideration when these houses were built. Whether it was princes or senior officials or ordinary people, they all renovated the riverfront space according to their own needs. For example, some nobles chose to build private pavilions and platforms on the riverside for scenic walks, while the owners of some commercial-residential dwellings transformed the riverfront space into small docks for loading and unloading, and some residents who had no functional requirement for the canal even occupied the riverfront space completely by incorporating it as the interior part of the dwelling, but the relationship between this kind of houses and the canal was also increased through large-area openings. The diverse relationships between these dwellings and the canal are the concrete manifestation of the fact that residents in Suzhou attached great importance to the canal when building their houses, which is also very different from the relatively single form of the Amsterdam waterfront dwellings when facing the canal.



Figure 2.2 Prosperous Suzhou (excerption) by Yang Xu

2.1.2 Plan forms with different degrees of customization

Since the Dutch government stipulated that the amount of house tax depended directly on the width of the house, so the waterfront dwellings in Amsterdam were generally elongated. This kind of rectangle shape also made the arrangement of dwellings in Amsterdam very compact. Furthermore, the degree of land resource utilization was high and the adjacent dwellings were close together, so the windows were only installed on the façade perpendicular to the direction of the canal. For people who wanted to enter the dwellings, these houses had their main entrance facing the canal and there were usually four to eight steps on both sides of the entrance to appropriately increase the height of the ground floor. Even though the waterfront dwellings were all rectangular in shape, the proportions of rectangles were quite different between houses owned by families with different incomes.

For houses owned by wealthier families, the ground floor was usually divided into three sections, with a garden in the middle and two houses on both sides, and each of the houses had doors to the public street and garden respectively. For families with average or slightly poor income, there was generally only one

[6] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.

house with a single door facing the public street. But no matter what kind of waterfront dwellings, the dimensions of the facade which could be connected with the canal were basically the same, and from the perspective of the plan form, the residents did not make any special or differentiated architectural treatment for the canal in front of the dwellings, so the interface of the whole street was continuous and flat.

For waterfront dwellings in Suzhou, the plan forms were not very regular. Although different classes had their corresponding basic forms, in terms of the space manipulating on the side of the canal, different residents had different plan forms according to their own needs. For example, the residents who needed to use canal water from the riverside staggered the building boundary on the side of the canal, forming platforms and stairs that could be used for fetching water and washing vegetables. Such dislocations of the plan boundaries were also compatible with the local curved river channels.

For medium and large-scale waterfront dwellings, in order to flexibly handle the relationship between buildings and canals, the characteristic courtyard-style layout of Suzhou area reflected its advantages. The courtyard-style layout is formed by standard house units that can be assembled vertically and horizontally. Because of the house bases of different shapes, it was convenient to apply the courtyard-style layout to build and expand the dwelling in stages, and during the whole process, the dwelling has always maintained a response to the shape of the canal [7]. The diverse plan forms of the Suzhou waterfront dwelling reflect the diverse interaction patterns between residents and the canal, which is also vastly different from the more uniform plan form of the Amsterdam waterfront dwelling.

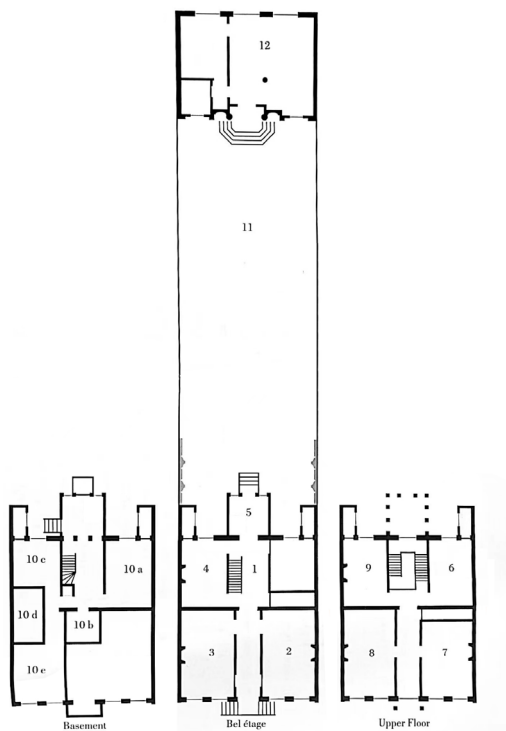


Figure 2.3 Typical plan of Amsterdam waterfront dwelling

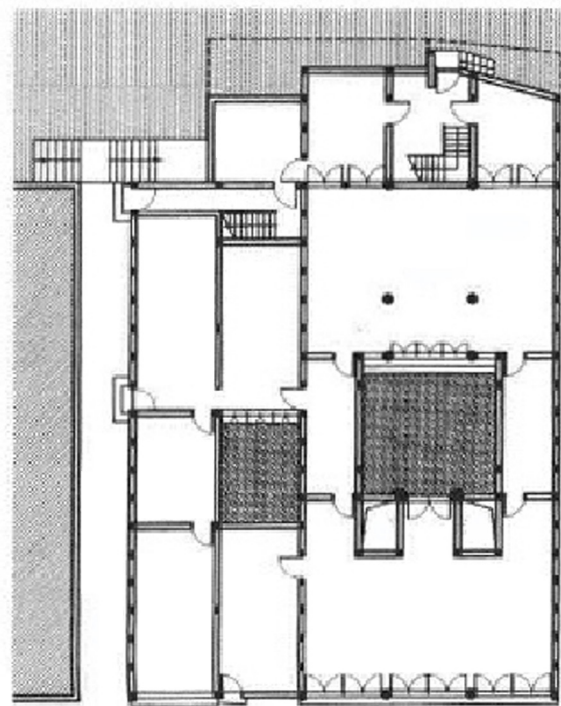


Figure 2.4 Typical plan of Suzhou waterfront dwelling

[7] Weihao Yang. (2016). The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan (Master Thesis, Jiangnan University)

2.1.3 Functional layout of the dwellings

As mentioned above, the residents of Amsterdam did not make any special architectural treatment for the canal on the plan of the waterfront dwelling, and accordingly, the functional layout of the house did not take the canal as the main consideration. For dwellings purely used for living, their functional layout fully served the daily life of the owners. Most of these dwellings were equipped with a kitchen in the basement, a restaurant and a living room on the ground floor, bedrooms on the first floor. For the higher floors, they were usually equipped with storage space and hanging laundry [8]. For residential-commercial dwellings, the owners often set up shops on the side close to the street. In addition to providing convenience for customers to shop, it was also easier and faster to carry goods from the canal cargo ships as much as possible. Some goods that were inconvenient to be transported and stored in time were temporarily piled up by the canal.

In contrast, the waterfront dwellings in Suzhou made various functional arrangements for the canal that met the needs of the occupants. In addition to the adjustment of the waterfront space caused by the daily water demand mentioned above, there were three other general demands that also affected the layout of the waterfront dwellings. The first was to travel by boat. Most households set up a river pier at the revetment in the back of the dwelling, so that they could travel by boat at their own river pier, which was convenient for going out to work or buy daily necessities. The second was the demand for landscape. Waterfront dwellings often set up terraces, balconies, open-air restaurants, etc. at the riverside. In these spaces, the residents could get a wide view of the landscape and obtain good ventilation. Furthermore,

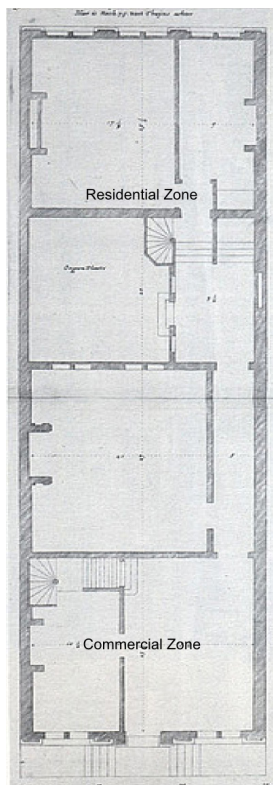


Figure 2.5 Typical plan of Amsterdam waterfront dwelling

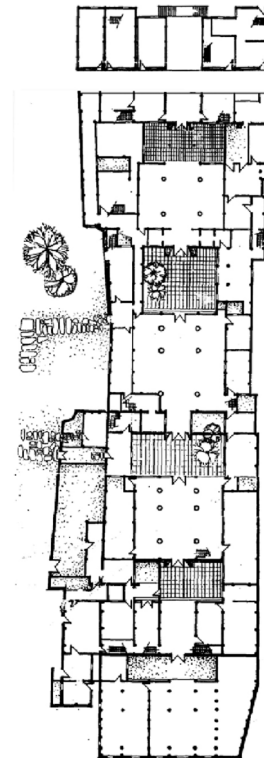


Figure 2.6 Typical plan of Suzhou waterfront dwelling

[8] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.

sitting by the water could also make the residents feel comfortable. The third was water trade. Due to the development of shipping, many hawkers would drive boats to sell. The opening of the building facing the canal could trigger product trading activities on the canal. In addition, some hawkers would set up stalls at the waterfront area to sell goods to customers on the boat, and the riverfront space of the dwellings created conditions for this conduct of trading activities.

Compared with the waterfront dwellings in Amsterdam, the waterfront dwellings in Suzhou fully considered the possibility of the canal providing convenience for life and production in the functional layout. Residents actively incorporated the canal into the functional layout of the dwellings and used the canal to expand the demand that the residential building itself could originally respond to.

2.2 Relationship with the rain

Continuous rainy weather is the common feature of these two cities. Whether it is Amsterdam or Suzhou, the long-term rainy weather has brought different degrees of impact on the lives and buildings of the residents of these two places. For the waterfront dwelling in Amsterdam, due to the limitation of the width of the house, the proportion of windows on the facade was large, and the rainwater could easily damage the glass when it hit the windows. Therefore, the builder increased the inclination of the dwelling, buffered the strength of the rainwater hitting the glass, and reduced the probability of rainwater hitting the window surface, thus forming the protection of the windows and preventing the rainwater from flowing into the interior. The rainwater falling on the roof was directly drained through the sloping roof. But for the waterfront dwelling in Suzhou, the builder did not choose to completely drain the rainwater from the four edges of the house, but divided the whole roof into more slopes by setting patios which were initially for lighting and ventilation. The roofs around the patios sloped towards the center of these patios, and part of the rainwater was introduced into the courtyard through these subdivided sloping roofs [9]. From this difference, it can be seen that the residents of the two places had different attitudes on the issue of rainwater. When these attitudes were mapped to the design vocabulary of the dwelling, the same basic roof form eventually derived two completely different final forms.

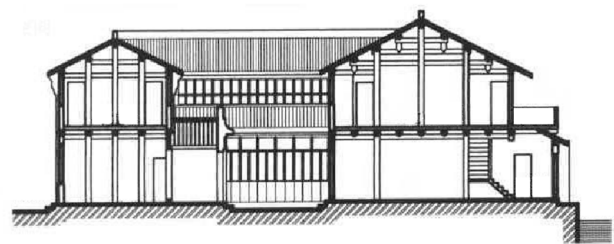
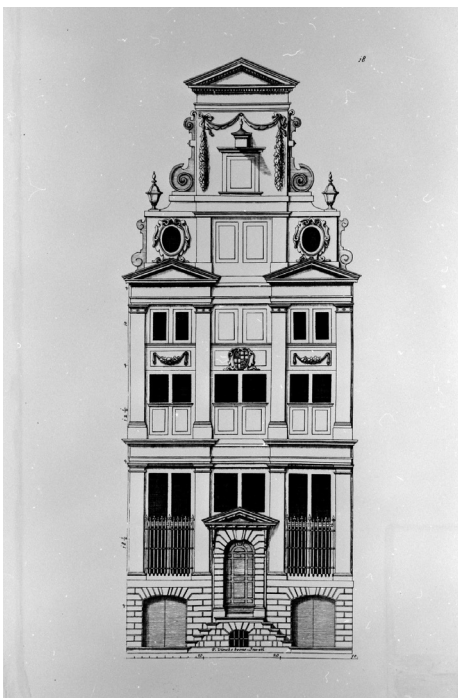


Figure 2.7 Typical section of Suzhou waterfront dwelling with patios inside its volume arrangement

Figure 2.8 Typical elevation of Amsterdam waterfront dwelling show the characteristic of its roof

[9] Xiaoxiao Xu. (2018). Application of Regional Cultures in Architectures: A Case of Suzhou Ancient Residential Buildings, *Urbanism and Architecture*, 36, 112-113.

Conclusion

There are many differences between the two waterfront dwellings on the topic of water environment. For the canal, they have different openness, undertake different functions and activities, and have different space treatment methods corresponding to these functions and activities. For the rainy weather, they apply the same basic drainage method, but the final results represent different design directions. In general, the waterfront dwellings in Suzhou have a more open attitude towards the surrounding water environment than the ones in Amsterdam, and take the water environment as a very important consideration when designing the residences. In the next chapter, the reasons for the differences will be further explored through social, human and natural factors.

Chapter 3 The reasons why waterfront dwellings were differently constructed in Amsterdam and Suzhou

Introduction

In this chapter, the reasons for the differences between the two waterfront dwellings will be analyzed from three aspects which are social culture, lifestyle, natural environment and climate. The reason for selecting these three aspects is because they generally cover the basic aspects that need to be considered in architectural creation. From the socio-cultural aspect, we can understand the cultural background and have a basic understanding of the overall orientation of architectural design. From the lifestyle aspect, we can focus on the inhabitants, and through their behaviors, certain understanding on the formation logic of space can be achieved. Starting from the aspect of natural environment and climate, we can understand the possible differences in building construction technologies which are used to adapt to the surrounding water environment.

3.1 Socio-cultural differences between the two places

3.1.1 The position and meaning of water in respective cultures

3.1.1.1 Different attitudes towards water

Culture can give a nation a unique attitude when observing things, while the same thing may represent different meanings in different cultural backgrounds. For the residents of Amsterdam, water was a substance that people worried about but had to rely on. When floods happened, water brought a lot of trouble to residents' lives. Apart from these natural disasters, as an important part of daily routine, the value of water was measured by the residents with functionality as the most crucial criterion. When water existed in the form of a canal, it was needed as a necessary condition for transportation, but when it existed in the form of rainwater, which could not bring any benefit to the residents in most cases, the residents quickly drained the water directly through the high-pitched roofs. These measures and attitudes were quite different from that of Suzhou residents. For Suzhou residents, water not only played a variety of important functional roles in daily life, but also influenced people's cognition culturally. Water has rich symbolic meanings in Chinese culture. Its characteristics can represent different meanings in different contexts [10]. For merchants who make a living by trading goods, water symbolizes wealth. For literati and writers who are far away from home, water symbolizes the emotion of missing. For noble and high-ranking officials, water symbolizes the common people who can influence their regime. This cultural

[10] Xiaoxiao Xu. (2018). Application of Regional Cultures in Architectures: A Case of Suzhou Ancient Residential Buildings, *Urbanism and Architecture*, 36, 112-113.

background, which extended from things in life to some abstract thinking, allowed residents of Suzhou to view water from a more complex perspective than the residents of Amsterdam, and further extended to the architectural construction of waterfront dwellings.

3.1.1.2 The concrete embodiment of attitudes in dwellings

These differences were materialized when these different attitudes were embodied in the waterfront dwellings. As mentioned in chapter 2, although the waterfront house in Amsterdam was close to the canal, its plan form and functional layout did not have a great relationship with the canal. For the residents of Amsterdam, the canal only represented functional transportation, and there was no need to respond to the canal through the design of the dwelling, so the final relationship between the dwelling and the canal was relatively negative. But for the residents of Suzhou, the water environment had multiple meanings that needed to be responded to, and the builders also achieved these responses through corresponding architectural forms. Take the large number of merchants who lived by the canal in the 17th century as an example. For them, water symbolized wealth, and there was a saying that "the water from four directions return to the central hall". When they built their houses, the builders included patios in the design of the dwellings. The patio collects the rainwater from all directions through the sloping roofs and the water flows into the courtyard under the patio, which symbolizes that all the financial resources from all over the place flows into one's home and this scene represents the collection of wealth [11]. In this way, the rainwater that is originally drained to the outside flows into the dwelling instead. If measured by purely functional standards, the existence of the patio affected the environment inside the dwelling in rainy days, but because the merchants have added additional Meaning, these architectural spaces designed for rainy weather instead expressed the more complex attitude of Suzhou residents towards the water environment.

3.1.2 Social class and interpersonal relationship

3.1.2.1 Different classes had different levels of dependence on the canal

Social class affected the generation of waterfront dwellings. Because people of different classes had different needs for the surrounding water environment, such as canals, different waterfront dwellings in the same city also had great differences. For the residents of Amsterdam, the difference in class brought not only the difference in the degree of residential luxury, but also the difference in the location of the dwelling [12]. People of similar classes lived in the same area, which also made the form of waterfront dwellings in the same area roughly the same. However, because the waterfront dwellings themselves maintained a relatively negative attitude towards the surrounding water environment, the different degrees of dependence of different classes on the water environment did not bring about obvious differences in the space design of the houses, whether it was the wealthy family who used the canal as a travel channel, or the ordinary family used the canal for the transportation of goods, the canal as a functional transportation channel had a weak connection with the waterfront dwelling. In contrast, for the waterfront dwellings in Suzhou, it was precisely because they maintained a more positive attitude towards the surrounding water environment, the class differences were clearly reflected in the way residents interacted with the canal and their corresponding residential building forms [13]. Taking high-

[11] Xiaoxiao Xu. (2018). Application of Regional Cultures in Architectures: A Case of Suzhou Ancient Residential Buildings, *Urbanism and Architecture*, 36, 112-113.

[12] Jingjing Chen & Xiaoming Liu. (2015). On the Canals of Amsterdam and Development of the City Space. *Modern City Studies*, 5, 93-98.

[13] Fan Liang. (1982). Talking about the folk houses along the river in Suzhou. *Architecture Journal*, 4, 25-30+82-83.

ranking officials and ordinary residents as an example, the canal was more of a landscape for high-ranking officials to enjoy, while for the ordinary residents, it carried more needs for transportation and commerce. This made the waterfront dwellings of ordinary residents pay more attention to the shaping of functional space in the riverside area of the house than the waterfront dwellings of noble and high-ranking officials.

3.1.2.2 Different social interpersonal relationships resulted in different levels of openness of dwellings to the canal

Social interpersonal relationships were also an important factor affecting the formation of waterfront dwelling. For the waterfront dwellings of ordinary people in Suzhou, the relationship between neighbors and the trade of goods have become important factors that affected the degree of openness of the houses to the canal [14]. These factors made the waterfront dwellings form public spaces for communication in the riverside area. These spaces allowed residents to communicate with their neighbors while washing their clothes, and also provided opportunities for people on boats and those in the riverfront space to trade goods. It was precisely because of the existence of these abundant demands that the waterfront dwellings of ordinary people in Suzhou had high openness towards the canal. But when the social class changed, so did the interpersonal relationship. For high-ranking aristocrats, they pursued higher privacy and security, so the openness of their dwellings facing the canal was reduced. But for the residents of Amsterdam, human interactions were mainly concentrated in the house (inviting guests to their houses) and on public streets (customers buying goods from the shops facing the street, workers loading and unloading goods from transport ships, etc.). This also reflected that the waterfront dwellings did not directly interact with the canal on a human-to-human basis, so there was no reason and no need for these houses to adjust their openness to the canal through architectural techniques.

3.2 Lifestyle differences between the two places

3.2.1 Transportation (commercial transportation of goods and people's travel)

For both cities, the canal served as a transportation channel, where people could transport goods and make daily travel. But as mentioned above, the residents of the two cities had different demands and dependence on canals, so for the topic of shipping, different cities had different situations. For the residents of Amsterdam, because of the huge wealth gap in the society, the main owners of the boats were relatively wealthy families, but for some residents who relied on the canals for water transportation, they also held relatively small cargo wooden boats. Although they were all ships, due to the class differences, the situations for using the boats were different. For ships owned by wealthy families, their large size made them inconvenient to travel in the canals. Usually, they were mainly docked in the larger ports of Amsterdam for entertainment and long-distance travel, while for the small ships used for freight, they were usually docked at the public ferry of the canal (easy access to water level via a flight of stairs) [15]. These situations of using the boats eliminated the need for special spatial and functional adjustments to waterfront dwellings. The situation in Suzhou was the opposite. Due to the extremely developed water network system, people were highly dependent on canals. Most households were equipped with private small boats. These boats have become the main means of transportation in the daily life of residents. In

[14] Fan Liang. (1982). Talking about the folk houses along the river in Suzhou. *Architecture Journal*, 4, 25-30+82-83.

[15] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.

the river-facing part of the waterfront dwelling, a small ferry was usually set up for boat parking. For residents who were not equipped with boats, a space for interacting with boats would also be reserved in the riverfront area of the house [16].

3.2.2 Waterfront activities (different types of activities and different levels of use of the canal)

The generation of waterfront activities first came from people's needs, which adjusted the space for these activities, and on the contrary, these riverside spaces also stimulated people's needs for interacting with water. In both cities, residents tried to respond to their needs by manipulating the spaces, but Amsterdam residents were more dependent on urban space, that was, through public streets between waterfront dwellings and canals to meet their needs. Residents of Suzhou, on the other hand, selectively relied on urban spaces such as streets or waterfront dwellings according to the location of their residences, wherein, by relying on the riverfront space of the waterfront residence, most of the residents met their personal needs for the surrounding water environment, such as fetching daily water, washing clothes, berthing vessels and operating shops, etc. In addition to space, the quality of the water environment also affected the generation of waterfront activities.

For Amsterdam in the 17th century, due to the rapid urbanization process, the surge in population added enormous pressure to the originally imperfect sanitation system and sewage system, and because the residents did not fully realize the pollution of human waste to the canal, the quality of the canal water with poor liquidity has become worse, and the river water also produced toxic gases when exposed to summer sunlight. This difficult-to-use water quality weakened the direct connection between people and the canal to a certain extent, and therefore losing a lot of possibilities to use the canal water. When corresponded to the construction of the waterfront houses, the residents made no special response to the canal by architectural means. Compared with Amsterdam, the high fluidity of canal water in Suzhou kept the water quality within the range that could be used by residents, which also stimulated the emergence of more waterfront activities and inspired the special architectural form treatment of waterfront residences for the activities to a certain extent.



Figure 3.1 Different waterfront activities in Suzhou
Along the River During the Qingming Festival (excerpt) by
Ying Qiu

[16] Matsuura Akira. (2001). Inland River Transportation in Jiangnan in the Qing Dynasty, *Studies in Qing Dynasty*, 1, 35-41.



Figure 3.1 Different waterfront activities in Suzhou
Along the River During the Qingming Festival (excerption) by
Ying Qiu

3.3 Natural environment and climate differences between the two places

3.3.1 Differences in climate

Although the two cities have similar rainy weather and water network conditions, there are still some differences in the weather conditions between the two places due to the differences in the climatic zones. For the Amsterdam area, it is located in the temperate oceanic climate zone, so the weather is quite pleasant and it is mainly affected by the airflow from the North Sea. There are about 175 days of precipitation per year on average, but the average annual precipitation is less than 760 mm. The rainy season is generally from October to March of the following year and the precipitation method is mainly light rain, which leads to the fact that the humidity in the city is not high for most of the time, so there is no special need for dehumidification. Because the Netherlands is located in the prevailing westerly belt of the earth, the westerly wind blows all year round. Based on this condition, the natural ventilation of Amsterdam area is adequate, and there is no damp heat problem caused by the abundant water network due to this reason [17].

However, in the Suzhou area, there is a humid and hot rainy season in summer, so residential buildings are often designed according to the prevailing wind direction and climate in summer. In the overall layout, the dwellings are as close as possible to connect, and the overall shape of the community presents a linear street-like structure to achieve the effects of ventilation, heat dissipation, shading and heat protection. Between the compact buildings, there are some openings leading from the street to the river bank, and these lower estuaries are the air inlets for climate regulation. In summer, cool breezes are introduced to improve the microclimate in the streets. In addition, the narrow and long floor plan of the dwelling affects the lighting and ventilation of the interior, so miniature patios are interspersed in the dwelling to solve the lighting and ventilation problems [18].

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- [17] Liang Shen & Haozhong Yang. (2014). Study On Regional Identity of Amsterdam Residential Architecture. *Architecture and Culture*, 12, 49-55.
- [18] Weihao Yang. (2016). The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan (Master Thesis, Jiangnan University)

3.3.2 Differences in flooding situation

Both Amsterdam and Suzhou are located in areas prone to flooding under natural conditions, so the waterfront dwellings in both places have taken corresponding protection measures against such possible natural disasters. For the waterfront dwellings in Amsterdam, the builders tried to avoid damage to the main living space in the house due to the rising water level of the canal by raising the ground floor. The steps used to achieve the ground floor elevation were made of stone for better durability [19]. For waterfront dwellings in Suzhou, because the water network system of Suzhou City has been built and improved in many dynasties, it has been able to cope with the flooding disasters in most cases, so at the architectural level, builders were more likely to deal with the possible extreme flooding disasters through the selection of materials for the part adjacent to the canal. These waterfront dwellings generally used yellow stone as the material for the wall base and river bank, which is simple in shape, hard in texture, and extremely durable, and can withstand the erosion of the canal flow [20]. The two waterfront dwellings have taken different degrees of protection measures in the face of the same type of disaster, among which the one in Amsterdam was more severely affected and used a different floor design idea from ordinary buildings.

Conclusion

The differences in the above three aspects all have an impact on the final architectural results, but the most important impact is the socio-cultural background. Because of the different perceptions and attitudes towards water, water has different statuses in the concepts of residents in different regions. The residents of Suzhou respected water and cherished the contact and interaction with water, while the residents of Amsterdam regarded water only as an ordinary functional thing in daily life. This kind of difference in attitude established different basic tones for the two types of dwelling, and the differences caused by lifestyles and natural environment are all extensions from this basic tone difference.

Conclusion

Looking at the comparison between the waterfront dwelling in Amsterdam and the one in Suzhou, it is not difficult to see that the architecture is the result of multiple factors. Among these factors, the influence of socio-cultural factor is most significant. When faced with similar construction conditions, different cultural backgrounds make residents choose different coping methods. There is no right or wrong in these coping methods. Although the directions of the methods are different, they can all solve the living problems of residents in an efficient way. Understanding this fact is very crucial for the practice of architects nowadays. Architects need to know how to correctly understand the differences in local cultures and make the most appropriate measures. The cultures of different regions need to be respected by the final architectural form, which is not only the respect for the residents' cultural concept, but also their living habits. Because of this respect and understanding, the architectural form can be brought into harmony with the residents' daily life. Take these two waterfront dwellings as examples, if the form of dwelling of Amsterdam is applied to the Suzhou area, the dwelling form that shows a relatively negative attitude towards water will be difficult to be used by Suzhou residents who are close to canal and live by water.

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- [19] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [20] Weihao Yang. (2016). *The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan* (Master Thesis, Jiangnan University)

In addition, the contrast also shows the impact of architectural form on social culture in turn. Taking the social culture of Suzhou as an example, due to the strong demand of residents for waterfront activities, the part of the waterfront dwellings along the riverside has been transformed into various spatial forms to match the diverse waterfront activities. While accommodating original needs, these spaces were also inspiring new social and cultural changes. For instance, some families chose to set up small platforms in the riverside area to meet the needs of fetching water at the canal, washing vegetables and laundry. During these activities, they met other residents in adjacent areas across the river on other platforms. These encounters and chats between neighbors also promoted the generation of community culture to a certain extent [21]. These waterfront spaces also facilitated the further development of river trade. More and more businessmen chose to open up new trade possibilities on the canal because of the convenience of river trade. So far, because of the existing spatial conditions on both sides of the canal, the river trade has gained a rapid development and its importance in the lives of residents has also risen to an unprecedented level, which led to the fact that the canal has further become an indispensable activity space in the daily routine of residents.

Finally, looking back at the analysis results of the entire study, adapting to local conditions is always an important topic that will never go out of style. Only by truly knowing a land and the people who live there can we make the most appropriate choices for our architectural practice.

[21] Xueying Zhou. (2006). *Research Library of Chinese Architectural Culture: The Chinese Architectural Culture of Jiangnan Watertown* (1st ed.). Hubei Education Press.

Bibliography (primary source)

- Figure 1.1 The map of the fourth expansion of the city of Amsterdam in 17th century
J. de Ram. (1690). The city map of Amsterdam [painting]. <https://iif.lib.harvard.edu/manifests/view/ids:7766500>
- Figure 1.2 Prosperous Suzhou (excerption)
Yang Xu. (1759). Prosperous Suzhou [Handscroll]. <http://lianzai.china.com/books/html/1255/6243/75893.html>
- Figure 1.3 View of the Golden Bend in the Herengracht
Gerrit Berckheyde. (1672). View of the Golden Bend in the Herengracht [Oil painting]. <https://www.rijksmuseum.nl/en/rijksstudio/artists/gerrit-adriaensz-berckheyde/objects#/SK-A-5003,0>
- Figure 2.1 The bend of the Herengracht at the Nieuwe Spiegelstraat in Amsterdam
Gerrit Berckheyde. (1672). The bend of the Herengracht at the Nieuwe Spiegelstraat in Amsterdam [Oil painting]. <https://www.rijksmuseum.nl/en/collection/SK-A-4750>
- Figure 2.2 Prosperous Suzhou (excerption)
Yang Xu. (1759). Prosperous Suzhou [Handscroll]. <http://lianzai.china.com/books/html/1255/6243/75893.html>
- Figure 2.3 Typical plan of Amsterdam waterfront dwelling
Adapted from visitors guide book. (2021). Retrieved from Museum Van Loon
- Figure 2.4 Typical plan of Suzhou waterfront dwelling
Jin Duan. (2002). The plans of a typical waterfront dwelling in Suzhou [Painting]. Scanned from Urban Spatial Analysis: Spatial Structure and Form of Ancient Towns in Taihu Lake Basin 1st edition
- Figure 2.5 Typical plan of Amsterdam waterfront dwelling
Philips Vingboons. (1639). Construction drawing for the ground floor [Painting]. <https://www.metmuseum.org/art/collection/search/347402>
- Figure 2.6 Typical plan of Suzhou waterfront dwelling
Minsu Xu. (1991). The plan of a typical waterfront dwelling in Suzhou [painting]. Scanned from Suzhou Folk House 1st edition
- Figure 2.7 Typical section of Suzhou waterfront dwelling
Jin Duan. (2002). The section of a typical waterfront dwelling in Suzhou [Painting]. Scanned from Urban Spatial Analysis: Spatial Structure and Form of Ancient Towns in Taihu Lake Basin 1st edition
- Figure 2.8 Typical elevation of Amsterdam waterfront dwelling
Philips Vingboons. (1639). Construction drawing for the front view [Painting]. <https://archieff.amsterdam/beeldbank/detail/5c4c9aae-9568-b7b8-529e-a9cde084c934/media/a21424ca-4f16-2732-3c53-e7e02a701d18?mode=detail&view=horizontal&q=Keizersgracht%20319&rows=1&page=3>

Figure 3.1 Along the River During the Qingming Festival (excerption)
Ying Qiu. (Ming dynasty). Along the River During the Qingming Festival [Handscroll].
https://painting.npm.gov.tw/Painting_Page.aspx?dep=P&PaintingId=5568

Bibliography (secondary source)

- [1] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [2] William Temple. (1932). *Observations upon the United Provinces of the Netherlands* (1st ed.). Cambridge University Press.
- [3] Xueying Zhou. (2006). *Research Library of Chinese Architectural Culture: The Chinese Architectural Culture of Jiangnan Watertown* (1st ed.). Hubei Education Press.
- [4] Jingjing Chen & Xiaoming Liu. (2015). On the Canals of Amsterdam and Development of the City Space. *Modern City Studies*, 5, 93-98.
- [5] Weihao Yang. (2016). *The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan* (Master Thesis, Jiangnan University)
- [6] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [7] Weihao Yang. (2016). *The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan* (Master Thesis, Jiangnan University)
- [8] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [9] Xiaoxiao Xu. (2018). Application of Regional Cultures in Architectures: A Case of Suzhou Ancient Residential Buildings, *Urbanism and Architecture*, 36, 112-113.
- [10] llds
- [11] llds
- [12] Jingjing Chen & Xiaoming Liu. (2015). On the Canals of Amsterdam and Development of the City Space. *Modern City Studies*, 5, 93-98.
- [13] Fan Liang. (1982). Talking about the folk houses along the river in Suzhou. *Architecture Journal*, 4, 25-30+82-83.
- [14] llds
- [15] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [16] Matsuura Akira. (2001). Inland River Transportation in Jiangnan in the Qing Dynasty, *Studies in Qing Dynasty*, 1, 35-41.
- [17] Liang Shen & Haozhong Yang. (2014). Study On Regional Identity of Amsterdam Residential Architecture. *Architecture and Culture*, 12, 49-55.
- [18] Weihao Yang. (2016). *The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan* (Master Thesis, Jiangnan University)
- [19] Derek Phillips. (2009). *Well-Being in Amsterdam's Golden Age* (1st ed.). Amsterdam University Press.
- [20] Weihao Yang. (2016). *The Research of Waterfront Treatment Methods of Traditional Residence of Jiangnan* (Master Thesis, Jiangnan University)
- [21] Xueying Zhou. (2006). *Research Library of Chinese Architectural Culture: The Chinese Architectural Culture of Jiangnan Watertown* (1st ed.). Hubei Education Press.

Bio

The author of this paper was born in Chengdu, China. He holds a bachelor's degree in architecture from Chongqing University. He is currently pursuing his academic career in Delft University of Technology as a master student. His previous architectural design project focuses on cinematic city and spatial translation in Rotterdam.

