

# A Study on the Waterfront Spaces Characterized by the Behaviors of People at Modern Chinese Universities

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## 1.Introduction

### 1.1 Background and Aim

Influenced by Fengshui idea in traditional Chinese culture, natural environment has always been important for a traditional school in China and it is believed that the improvement of the morality is related to the harmony between man and nature. Water is an essential element to create such natural environment even in today's university campuses in China. Especially in those campuses that have been established before 1949, many waterfront spaces are built based on the original Chinese garden or by making use of the topography on the site. Nowadays, waterfront spaces have become popular public spaces on campus both for students, neighborhood and even for tourists faraway. During daily life, many people are willing to spend their free time around waterfront spaces, enjoying the nature. Some special events are also held there. A public way of utilizing these spaces has been developed spontaneously. Through document research and the on-site investigation, this study aims to clarify the spatial characteristics of waterfront spaces related to the behaviors of people in Chinese universities.

### 1.2 Object and Method of Research

In this study, waterfront space is defined as the space between the edge of water and surrounding buildings(Fig.1). In order to have a comprehensive understanding of the behaviors in waterfront spaces, apart from document research, a field survey has also been conducted. After document research of campuses built before 1949 in China, six campuses with water of natural shape are selected. The waterfront spaces there are combined with elements of traditional Chinese gardens.To clarify the relationship between the waterfront spaces and the behaviors that happen there, firstly in chapter 2, the physical elements which form the waterfront spaces are picked out. Then in chapter 3, based on the layout of these elements, environment units are established to analyze the preference of different behaviors. In chapter 4,

distribution of environment units in each waterfront space and the context of the whole campus are discussed.

## 2.Waterfront Spaces

### 2.1 Overview of Research Objects

Firstly, as for the history of these six waterfront spaces, the case of Tsinghua and Peking University are transformed from royal gardens, the rest are reformed from natural lakes or rivers after the establishment of universities.

The location of the waterfront spaces and the function of the surrounding buildings vary from case to case. Three of the spaces are located mainly in the education area while the remaining three are connected both to education and living area (Tab.1).

The shape of water can be categorized into linear shape, planar shape and planar shape with island. The case of Tongji University can be defined as a combination of linear shape and planar shape with island (Tab.2).

### 2.2 Physical Elements

The physical elements which are observed in waterfront spaces can be divided into natural elements and artificial elements(Tab.3). Natural elements are water, lawn, trees and animals. Artificial elements include paths, road as circulation, pavilion, furniture, plaza and stairs as facilities as well as statue and historic remains as landmarks.

## 3.Behavior and Environment Unit

### 3.1 Behavior Types

Various types of behaviors have been observed during the on-site investigation. Behaviors can be divided into moving, stopping and staying behaviors, according to the time people have stayed while conducting that behavior. Moving behaviors include walking and jogging. Stopping behaviors is photo taking, which will only stay at that place for a very short time. And staying behaviors, on the contrary, refer to those behaviors that will stay at a certain place for relatively long time. Staying behaviors can be further divided into concentrating type and relaxing type based on the attention

Tab.1 Overview of Waterfront Spaces

| No. | Campus  | Research Date  | Basic Information of Waterfront spaces |                       |                           |  |
|-----|---|----------------|--|-----------------------|---------------------------|--|
|     |   |                | Shape of Water                         | Area of Water         | Location                  | History  |
| 1   | Wushan Campus<br>South China University of Technology<br>华南理工大学(五山) | 2018.3.9 Fri.  | Planar                                 | 52,900m <sup>2</sup>  | Living and education Area | Natural pond, Enlarged in 1948, Reformed gradually |
|     |   | 2018.3.10 Sat. |  |                       |                           |  |
| 2   | Wushan Campus<br>South China Agricultural University<br>华南农业大学(五山)  | 2018.3.11 Sun. | Planar                                 | 107,600m <sup>2</sup> | Education area            | Natural lakes                                      |
|     |   | 2018.3.12 Mon. |  |                       |                           |  |
| 3   | Putuo Campus<br>East China Normal University<br>华东师范大学(普陀)          | 2018.4.7 Sat.  | Linear                                 | 36,900m <sup>2</sup>  | Education area            | Natural rivers Reformed after 1951 gradually       |
|     |   | 2018.4.9 Mon.  |  |                       |                           |  |
| 4   | Sipinglu Campus<br>Tongji University<br>同济大学(四平路)                   | 2018.4.6 Fri.  | Planar with island+ linear             | 8,553m <sup>2</sup>   | Living and education Area | Constructed in 1956                                |
|     |   | 2018.4.8 Sun.  |  |                       |                           |  |
| 5   | Yanyuan Campus<br>Peking University<br>北京大学(燕园)                     | 2018.4.12 Thu. | Planar with island                     | 30,100m <sup>2</sup>  | Education area            | Royal Garden of Qing Dynasty Reformed in 1920s     |
|     |   | 2018.4.14 Sat. |  |                       |                           |  |
| 6   | Tsinghua-yuan Campus<br>Tsinghua University<br>清华大学(清苑园)            | 2018.4.13 Fri. | Planar with island                     | 24,200m <sup>2</sup>  | Living and education Area | Royal Garden of Qing Dynasty Reconstructed in 1979 |
|     |   | 2018.4.15 Sun. |  |                       |                           |  |

\* For each single day, four rounds of investigation have been done at 8:30(morning), 11:30(noon), 3:00(afternoon) and 7:00(evening) respectively. The main approach is taking photos and videos of physical environment and behaviors, marking the location of behaviors on the map of campus.

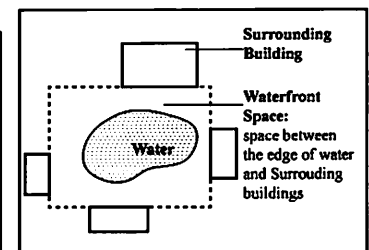


Fig.1 Definition of Waterfront Space

Tab.2 Type of Water Shape

| Linear | Planar | Planar with Island |
|--------|--------|--------------------|
|        |        |                    |

people pay to the environment. Those behaviors that focus on the activity itself can be described as concentrating behaviors, such as mahjong and reading. On the other hand, relaxing behaviors are more closely related to view like drawing and resting, etc.(Tab.4)

3.2 Environment Unit













In order to clarify the relationship between behaviors and the physical elements of waterfront spaces, environment units are established as basic unit for this study. Environment unit refers to the small area where a certain behavior happens respectively and is composed with a set of physical elements. By analyzing the commons and differences between these units, it can be revealed how people can utilize the physical elements and which types of space people prefer for a certain type of behaviors. Based on the different layout of those physical elements, 35 typical environment units that support all the behaviors observed during the investigation have been established for this study. The same behavior happens at different environment units and the same unit can also support multiple behaviors.

3.3 Preferred Spatial Characteristics of Behavior


Spatial characteristics of these environment units can be discussed from three aspects, which are **Functionality**, **View** and **Background**. All three aspects are determined by the elements as well as the layout of that unit.

Among them, functionality guarantees the basic requirements of behaviors, making it possible for behaviors to happen. The functional element for moving behavior is path, while water, trees, statues and historic remains are the main elements that support the stopping behavior. For resting behaviors, related elements are various. For most of the cases, the functional elements are utilized as a facility to sit on or lie down. In some cases like fishing, water can be defined as functional element. Even for the same environment unit, for different behaviors the functional elements can be different. View and background will influence the frequency of the behavior, but not as a pacing factor. For moving and stopping behaviors, only view is important while concentrating behaviors care only about background. Relaxing behaviors are affected by both view and background.

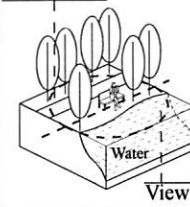
Tab.3 Physical Elements

| Natural Element   |   |   | Artificial Element  |   |   |
|---|---|---|---|---|---|
|    |    |    |    |    |    |
| Water   | Lawn  | Road  | Pavilion  | Plaza   | Historic Remain   |
|  |  |  |  |  |  |
| Tree  | Animal  | Path  | Furniture   | Stair   | Statue  |

Unit 17-Resting



Background



Physical Elements as

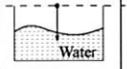
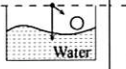

Functionality:  
Furniture  
View:  
Trees and Water  
(Distant & Close)  
Background:  
Path and Trees  
(Enclosed)

Fig.2 Analysis Example






Tab.4 Behaviors and Elements as Functionality

| Type     | Behaviors                  | Element as Functionality                  |
|----------|----------------------------|---|
| Moving   | walking/jogging/group tour | path                                      |
| Stopping | photo taking               | water/tree/historic remain                |
| Staying  | Concentrating              | furniture/pavilion/plaza/stair/lawn       |
|          | Relaxing                   | furniture/pavilion/plaza/stair/lawn/water |

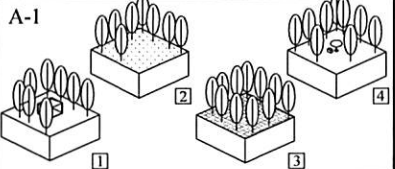
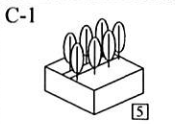
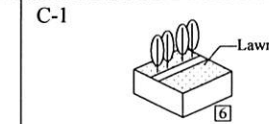
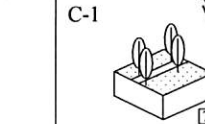
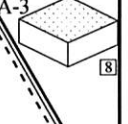
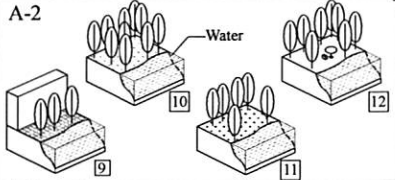
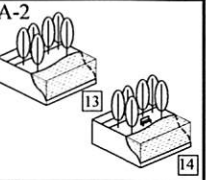
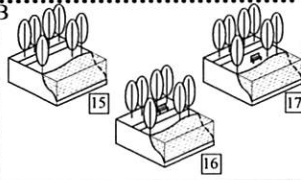
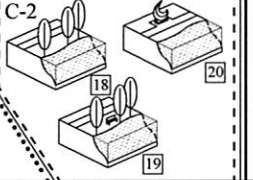

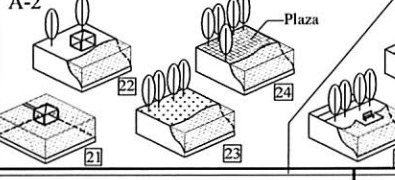
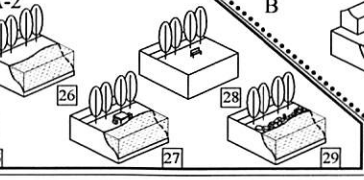
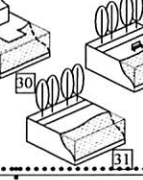
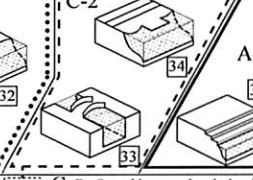

Tab.5 View of Environment Unit

| Only Distant View   | Distant&Close View  | Only Close View  |
|---|---|--|
|  |  |  |
| Water   | Water   |  |

Tab.6 Background of Environment Unit

| Enclosed Background   |   |   | Open Background   |   |
|---|---|---|---|---|
| Without Path  | Path Separated  | Path Not Separated  | With Path   | Without Path  |
|  |  |  |  |  |

Tab.7 Typology of Environment Unit Layout

|      |                      | Enclosed Background  |  |   | Open Background  |  |
|------|----------------------|--|--|---|--|--|
|      |                      | Without Path   | Path Separated   | Path Not Separated  | With Path  | Without Path   |
| View | Close View           | A-1<br> | C-1<br> | C-1<br> | C-1<br> | A-3<br> |
|      | Distant & Close View | A-2<br> | A-2<br> | B<br>   | C-2<br> | A-3<br> |
|      | Only Distant View    | A-2<br> | A-2<br> | B<br>   | C-2<br> | A-3<br> |
|      |                      | A: Preferred by staying behavior   |  |   | B: Preferred both by staying and moving behavior   |  |

Tab.8 Distribution of Units

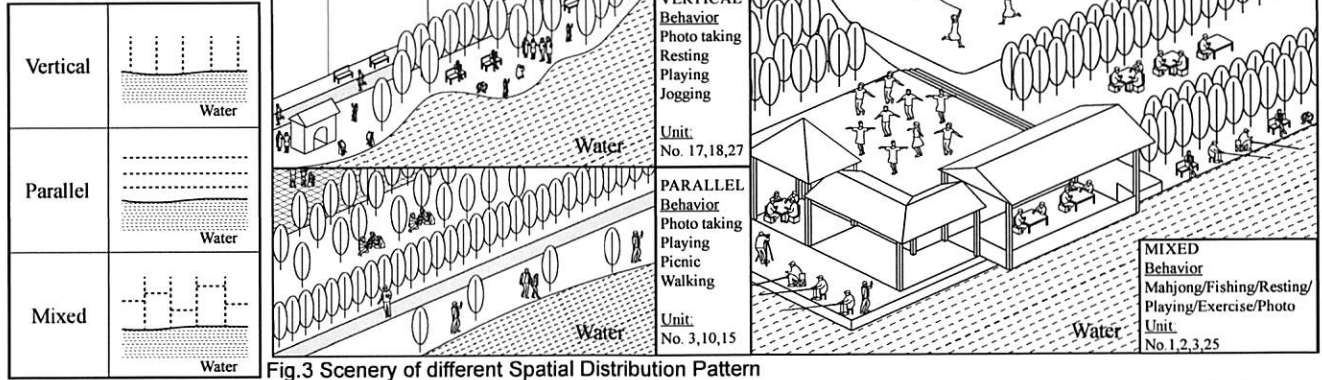


Fig.3 Scenery of different Spatial Distribution Pattern

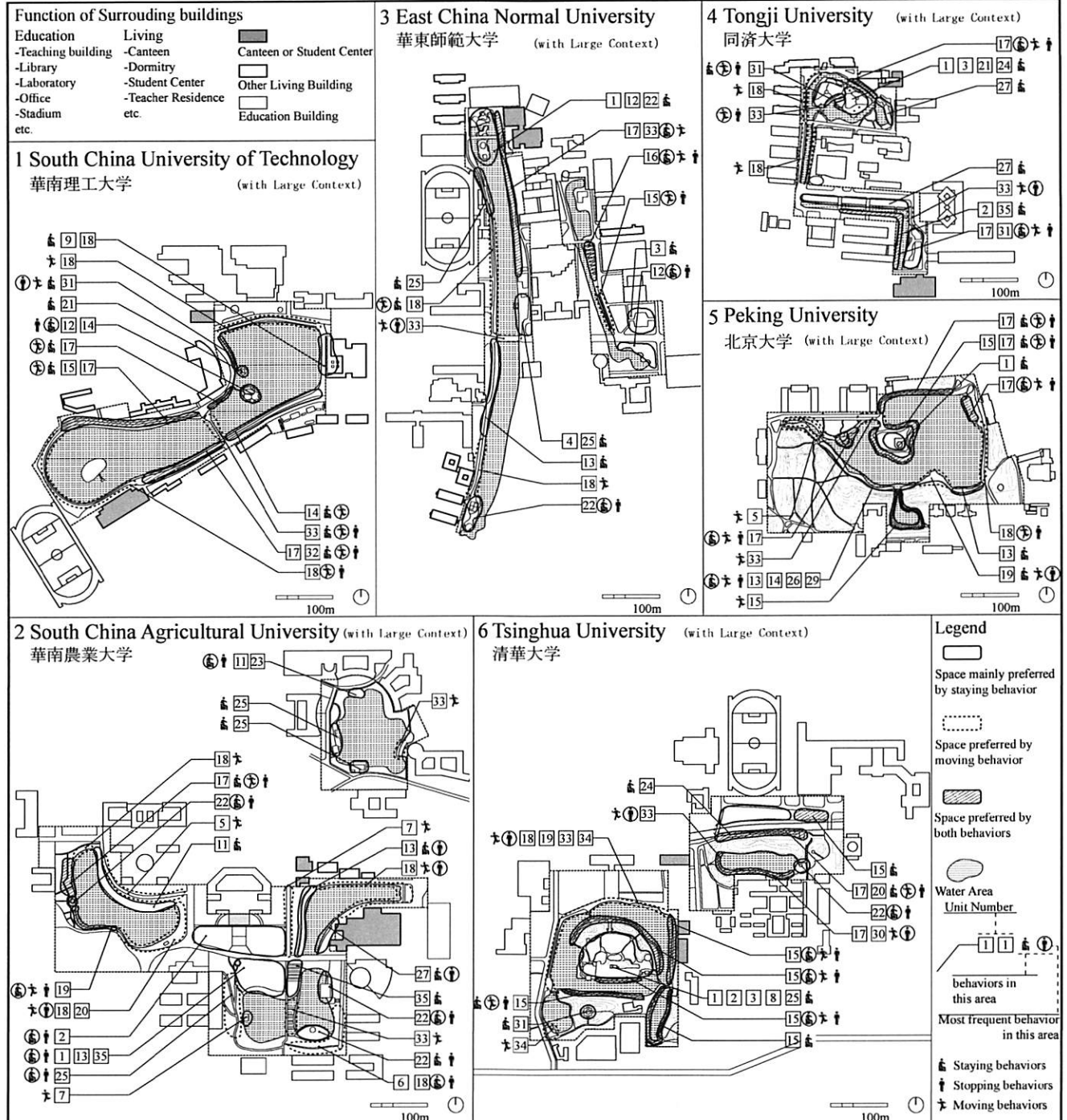


Fig.4 Waterfront Spaces shared by Various Behaviors

There are mainly three types of view of environment units, which can be described as only distant view, distant and close view and only close view (Tab.5). Distant view here is the view of water and close view refers to the objects close to people with ornamental value such as trees and historic remains. It can be discovered that for almost all the behaviors that are affected by view, people mainly prefer distant view as well as distant and close view. Only close view is not so popular. Especially for stopping behavior, people will mainly gather around water to take photos and care much less about other spatial characteristics.

**Background** is mainly decided by the enclosure of the environment unit, which can influence the privacy of that area. The most important element for background is tree. For most of the staying behaviors, private spaces are preferred. But for some behaviors that are usually done by a group of people like exercising, open space is also needed. View and Background are discussed at the happening point of behavior (Fig.2), which means in the same unit, the view can be different for moving and staying behavior.

Taking both view and background into consideration, the environment units can be divided into three types (Tab.7). Spaces of type A are preferred by staying behaviors. There are mainly three kinds of type A units. Those units without path and distant view, which can be divided into type A-1, are particularly popular for concentrating behaviors. A-2 are units with distant view and enclosed background, but without path or with path separated. And A-3 are without path but with open background, which are preferred by certain types of staying behaviors such as playing. Units of type B are preferred by both moving and staying behaviors because this type of units can offer good view for both staying and moving behaviors. The common layout for type B is that path is not separated and view towards water is available. If the path is separated from staying area, the view for moving behaviors will be blocked. Environment units popular only for moving behaviors belong to Type C. There are two kinds of units in Type C. C-1 are those ones with path but without distant view and C-2 are those with distant view as well as open background.

#### 4. Waterfront Spaces shared by Various Behaviors

##### 4.1 Water as a Key Element for Environment Units

27 of the total 35 environment units consist of water. Unlike most of the physical elements which are only related to one aspect of the spatial characteristics mentioned above, water can work as different roles for various behaviors, influencing all three aspects. For moving, stopping and relaxing behaviors, water is essential for creating a good view to attract people. For concentrating behaviors, water can offer privacy as background. In addition, water can be the functional element for playing and fishing as well. Because of this, water makes it possible for the surrounding spaces to accommodate various behaviors even if the spaces only consists of basic physical elements such as trees and path.

##### 4.2 Spatial Distribution of Environment Units

Water can be seen as a core for the whole waterfront spaces and environment units are organized around water

in different patterns.

The patterns can be distinguished by the arrangement of environment units beside water, as vertical pattern, parallel pattern and mixed pattern (Tab.8). Vertical pattern means changing along waterside while parallel pattern is described as changing according to distance from water. Mixed pattern is a combination of two patterns mentioned above. (Fig.3) Even for the same campus, different patterns can all exist. Vertical pattern is the most common pattern in these cases. For the planar water with island, the patterns are usually vertical type along the main waterside and mixed type on the island. The case of South China Agricultural University are the most complicated one since here in this case, there are more than one lake and the distance from the water to the surrounding building is also larger than other cases, which enables the spaces to have more complexity.

#### 4.3 Influence from Large Context of Campus

Apart from the spatial characteristics of the environment units discussed above, some other aspects of the whole waterfront spaces can also influence the frequency and even the types of behaviors.

The location of the environment unit along the water and the shape of the water can be important. Although the type of the environment units are the same, the situation of the water which the units attach to can have an effect on the frequency of behaviors since the quality of view can be different. For instance, in the case of Peking University, there are two parts with almost the same layout in terms of environment units but one of them are much more crowded than the other. After comparing the situation of these two areas it can be found that the popular area is located at the best view point of the whole lake while the other one can only see a corner of water.

The function of the surrounding buildings are also influential. Spaces that are closer to living buildings especially canteens and student centers are more lively during the whole day. On the contrary, spaces surrounded by education facilities are less popular. This kind of phenomenon may have something to do with the living habit of students and teachers.

#### 5. Conclusion

In summary, the types and frequency of behaviors can be influenced both by the spatial characteristics of small range around behavior and the large context of the whole waterfront spaces. After analyzing the behaviors and the corresponding waterfront spaces, it is possible to find people's preference for spaces to do different behaviors. Despite the diversity in many aspects, all of the waterfront spaces in Chinese Universities that are fully utilized by people can offer spaces with different views and backgrounds, satisfying the needs of various behaviors and people. The complexity of these spaces makes them attractive.

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