

EXPLORATION OF THE URBAN WATERFRONT GREENWAY SYSTEM BASED ON THE ‘INTEREST GRAVITATION’

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ABSTRACT: The thesis attempt to propose a ‘Urban Waterfront Greenway System’ (UWGS), in order to create a healthy, abundant and efficient life circle in urban waterfront. It aims at how to make full use of the urban waterfront, which acts as the interest origin, to guide the healthy life style at first. States the concept of ‘interest gravitation’, points out it is the power and emphasizing its importance in helping the waterfront to realize its aim. Then, the thesis brings forward a kind of space carrier UWGS, which can generate interest gravitation. It takes behavior habits of different people as breakthrough points, and analysis the daily activities type and demand of different people in different frequency. Furthermore, the features of UWGS can strengthen its effect of interest gravitation which can attract people along UWGS to the waterfront and the riverbank. Finally, it discusses interest gravitation facilities arrangement in UWGS.

KEYWORDS: urban planning, interest gravitation, greenway, space reintegration

PREFACE

With the development of modern science and technology as well as the enormous progress of productivity since the 20th century, on one hand, the greatly increasing material wealth of society leads to an obvious decline of people’s necessary labor time; on the other hand, people’s physical and psychological health have not been improved as time goes on. However, with the accelerated urbanization process, a growing number of urban residents go into both physically and psychologically sub-health status, such as tiredness, fidgetiness and anxiety.

It is reported by investigation data that, recently, there is an obvious change in disease spectrum of residents in our country, which lies in the rapid growth of incidence rate and mortality rate of chronic but non-communicable diseases. In 2004, the number of patients suffering from hypertension and diabetes reached approximately 160 million and 20 million respectively; while the figure for overweight and obesity was about 200 million and 60 million respectively. This situation is mainly caused by deficient physical exercises. According to the synchronous statistics data of the Department of Health, The burden of psychological diseases on society, which has outnumbered that of cardio-vascular disease, respiratory disease and malignancy, accounts for 1/5 of the total disease burden of our country. Although mental handicap and psychonosema can result from a various number of factors, no one can ignore the influence of space environment to psychological health. The environment with excessive congestion, monotony and confinement, caused by high-density development, leads to the privation of outdoor communication activities and moreover, nervous psychological condition, such as anxiety, fidgetiness, irritation and disappointment.

From this point, relaxing leisure and outdoor activities can be considered as efficient measures to solve a large number of healthy problems mentioned above. Currently, citizens have more spare time, but they cannot actually perceive the increase of leisure time. One reason for this involves that a great deal of leisure time is occupied by fast-paced job; another has to do with the inflexible and dehumanized urban inhabited environment, which makes it unrealistic for leisure activities in many forms. On this point, urban design discipline, aiming at ‘designing high-quality urban spatial environment for people’, is responsible to pay close attention to healthy problems in cities.

What kind of urban spatial environment can be so attractive that people are more likely to do outdoor leisure activities after rush work or heavy housework rather than watch TV or surf on Internet at home? First of all, we need a strongly attractive interest origin and urban waterfront is undoubtedly the best player of this

role for the sake of its ecological function, landscape aesthetic features, open-wide space and presentation of urban culture. Followed by making clear the position of interest origin, it is more important to create interest gravitation, because only this can induce citizens to interest origin, covering in certain paths, and do all kinds of leisure activities during this process. Consequently, the main problem discussed in this thesis lies in how to create a space carrier with strong gravitation of interests.

1 INTEREST GRAVITATION

In the 1990s, Western scholars have found the aggregation of commercial entertainment venues with the meaning of life and behavior value form the city's multi-entertainment 'interest gravitation area'. The size of its gravity proportionality with the number, diversity and attributes of the attraction field directly, which is composition of this area.

American scholar engaged in research on commercial micro location, and put forward the concept of 'interest of gravity' (attractiveness, novelty and convenience).^[1] The convenience mainly refers to the traffic. Attractive and novel issues are primarily achieved by the business of advertising, promotion, store decoration and business, and to the urban morphology is identify issues, something about the level of easy to find.

As early as 1897, Fredrick • Law Olmsted aimed at creating a natural connection between Boston downtown and the Park District in the design of Boston's Emerald Necklace Plan. The philosophy behind the design idea is to create the universal accessibility of public space beyond the class differences. Then, these series and links can achieve the purpose of attracting the people, generate in the role of interest gravitation actually. Nowadays, interest gravitation has been applied to a large number of subjects in urban planning and design, in order to enhance people's chances of outdoor activities, and create a variety lifestyle experience, while increasing the quality of life in various regions and community acceptance.

2 URBAN WATERFRONT GREENWAY

2.1 The Greenway

The Greenway Planning Movement widely developed in Western countries from 1990s plays an essential role in the improvement of city and regional ecological environment^[2], the protection of culture heritage and resources, and the providing of recreational spaces.

Conceptions: The concept of greenway provided by Ahern is widely accepted now^[3], which considers the greenway to be the planned, designed and managed linked linear open space system with the multi-function of ecology, recreation, culture and appreciation, and a sustainable land use pattern. 5 meanings could be implied from this concept: linear contour figure, connectivity, multi-function, meeting the requirement of sustainable development strategy.

From the perspective of rationality, its significance of connecting broken natural spaces and recombine natural ecological systems is also obvious^[4].

The Classification: From the description of Charles E. Little in his American Greenway, greenways can be divided into 5 types: city riverside greenway, recreational greenway, natural corridor with ecological meanings, landscape lines and historical lines, and all-sided greenway system or network. In practice, since these types are always overlapped, the type of greenway is determined by the content of the specific program. Some classifications are also provided according to other standards^[5]. For example, Little classifies it by purpose and scale, Fabos by attribute¹, and Chinese professor Yu Kongjian by shape and function. According to him, the three types of greenways in China are riverside greenways, parkway greenways or greenways with the function of traffic, and garden city greenways².

According to the analysis of the waterfront greenway cases home and abroad and the relationship between greenway and waterfront line, this essay divides greenways into greenways parallel to the waterfront line, greenways vertical to the waterfront line and greenways neither parallel nor vertical to the waterfront line. Moreover, this essay explores the greenways which are led to waterfront zone and vertical to

¹ Fá bos, J., 'Introduction and overview: the greenway movement, use and potentials of greenways', Landscape and Urban Planning, Vol.33, No.1-3, 1995, pp1-13.

² Yu K., Li D., Li N., 'The evolution of greenways in China', Landscape and Urban Planning, Vol.76, No.1-4, 2006, pp 223-239.



Figure 1 Waterfront greenway type analysis

the waterfront line. (Fig. 1)

2.2 The Greenway Features

1) Linearity and High Accessibility: The greenway is traverse between the city and the water. The urban

waterfront greenway is the low-density, linear urban space of scenically and ecological significance. Therefore, it has wide visual field and open line of sight. The vertical bank greenway enables the people to enjoy the horizon of the whole city directly from the city center; it provides the interface for watching the water not only for the district near the water, but also for the city interior. This raises the land prices near the greenway, stimulates the advance of the land prices within the city too. Simultaneously, the greenway has the function of attracting the people to the waterfront, boosting up its accessibility.

The Greenway is the buffer zone of high strength exploitation. As a public open space, the vertical bank greenway and the low-density zone insert into the ‘gaps’ of waterfront horizon. They could help to space pressure caused by the waterfront high-rise buildings, clear up the high strength construction of the waterfront and part of the center zone, obtain the whole balance of the floor area ratio in large area coverage, and form the buffer zone of waterfront and the center zone. (Fig. 2)

The greenway is a wind channel for adjusting the microclimate. Because of the low-density construction and nice ecological environment, vertical bank open greenway will drive the appreciation of the surrounding land and the high strength exploitation; form the high-rise building aisle besides the greenway. Thus the natural aeration channel could be formed, by which the sea and land wind could be lead into the city directly. So, the airs in the cities could be purified and the heat island effect could be weakened.

2) High Connection

Urban ecological passage system ‘weaved’ by the vertical and horizontal greenways. Greenway could reduce the fragmentation of the landscape. As the space carrier, the greenway connects the work place, residence, and the waterfront. Its core function is the connection of the spaces. These ones include the connection between the resident environment and the natural environment, and the connection among the park, natural site, historical ruins and the open spaces. So, in the construction of the greenway, connectivity is the sticking point; forming network is the objective. [6]

Security channel. Greenway becomes the appropriate carrier of the linear sports, such as the bicycle and the ambulation, because of its feature of linearity, high connection, and high accessibility. It can be used as the work route for the workers, the security route for the children, the transit environment and space for the foot passenger, cyclist, handicapped, slide plate player, and slider, etc.

Social intercourse space. Compared with any other open spaces, greenways have the social and individual intercourse function. This type of non-motor trip mode could not only reduce the dependence on vehicles, but also promote the social connect and intercourses, connect the leisure space, residential space, and the work space, and advance the spirit and physical health. Lusk advocates that the planning of greenways should follow the human need theories and the location spirit and make it the rules to obey³.

Urban public facilities traverse and emergency channel. Greenway could provide the public service facilities to the buildings besides it, including the sewer, public facilities, optical cable and railway. This type of low-density space could provide evacuation channels and disaster relief channels.

3) Natural Ecology and Conservation:

The attractive sources of outdoor sports. Greenway can be called as the breathing corridor and pressure



Figure 2 Manhattan greenway systems in New York

³ Lusk A. C., “Guidelines for greenways: determining the distance to, features of, and human needs met by destinations on multi-use corridors”, Doctoral Dissertation of University of Michigan, 2002

relief belt with its special ecological featureistics and the function of water cleaning, air purifying, noise reducing and pressure relief, which are quite qualified to attract the attention of sub-health population who are too busy to rest all the year round, and make it possible for them to do healthy outdoor sports after or



Figure 3 The outdoor sport facilities provided by the greenway

on their way to or back from work. (Fig. 3) Greenway can provide a good space for walking or bicycle riding, and serve for outdoor sports including hiking, jogging, walking, riding, fishing, boating and picnic, and reduce the expenditure of medical treatment by decreasing the incidence rate of cancer, diabetes and heart diseases.

The function of cultural and ecological protection. Greenways can fully reveal the cultural and historical heritage of the region, protect buildings and geomorphic features of historical and artistic importance, increase the economic use value of relative establishment, increase the prices of circumjacent land, and thus produce great social benefit.

By ecology, the major aim of greenways is to sustain and protect the existent physical environment and biological environment in nature and thus protect the biodiversity and water resources. For instance, as the smallest nature reserve and the only which is located in the city, Shenzhen Mangrove Park with an area of 368 hectare is a green corridor in urban district. Along the beautiful esplanade and facing the green waves of Shenzhen Bay, the park is the paradise of the birds, plants as well as human beings⁴.

4) Compact Function and Diversity

The function of amusement and leisure. Urban waterfront greenway is different from the traditional urban park. Except for the low-density and graceful landscape, it also could organize different activities with the landscape to create health, comfortable, natural and enterable leisure district; build the pride of the residence. The waterfront urban greenway not only provides weekend and holiday service, but also meet the need of people by offering various recreational activities which enable them to enjoy the beautiful scenery when finishing daily affairs. A good example is the multi-functional public buildings constructed in or along the greenway including aquariums, hotels, shopping centers, restaurants and office buildings.

Low-carbon living mode. We can lay out public buildings of mixed function in the greenway, which connects several residences. This will not only enrich the people's daily life, but also shorten the trip time, reduce the trip degree, depress the trip frequency; provide a sort of low-carbon living mode.

Catalysis to the economy development. The construction of the greenway is propitious to increase the tour incomes, drive the commercial boom of the whole district. This could achieve the aim of attracting the tourists, boost the commercial development, and revive the old city. For instance, the revenue of Little Miami Scenic Trail in Warren County of Ohio is over 2,000,000 dollars from 150,000-175,000 customers, which brings an income of at least 2,770,000 dollars per year indirectly^[7]. As a public environment resource, greenway helps to increase the real estate price substantially^[8].

2.3 Urban Waterfront Greenway

Urban waterfront is a particular region of the space in a city. It means the land or buildings which are adjacent to the city part of the water body such as the rivers, lakes and oceans, and it plays an important role in the city.

Urban waterfront own the advantage of landscapes and traffic, could supply the people's lives hydrophilic sites, and attract a large number of people and business to be gathered here to view the water,

⁴ <http://baike.baidu.com/view/946976.htm> referred on 22/05/2009.

play with water, and enjoy the water. As a word, the urban waterfront can provide people with health, leisure and quality of life. The greenway has the feature of the linearity, high connection, and high accessibility. It will exert the advantage and the feature of the greenway that we use it in the space plan and design of the waterfront.

Urban waterfront greenway should locate in urban built-up area with high population density, which can be considered as the 'ventilation corridor' or 'decompression zone' in high-density urban environment. As the space carrier connecting workplace, inhabitation and urban waterfront line, connection is its core effect, which includes the link between inhabited environment and natural environment, between parks, natural yards, ancient ruins and other open spaces, between economic development, environment protection and living quality.

Urban waterfront greenway is not only undertaking the mission for people to play and leisure, but also guiding the people from the city center to waterfront. However, drive people to move forward to urban waterfront and do all kinds of leisure activities, we need a space carrier with strong gravitation of interests and, utilizing relative implication of 'Greenway' in landscape planning as a source of reference, the author puts forward the concept of urban waterfront greenway in order to create interest gravitation.

2.3 Function Components of Urban Waterfront Greenway

Generally speaking, the functions of urban waterfront greenway constitute two parts: publicity and commerciality. The former is in dominant position, because, unlike shopping mall for commercial purpose, urban waterfront greenway is a low-density linear urban space with important landscape and ecological significance. Merely after the fulfillment of this premise, it can be endowed with 'ventilation corridor' or 'decompression zone' in high-density urban environment and make the positive effect of the improvement of the health condition of citizens come true. These public spaces are made up of rich-plants little gardens or landscape way, rich-pavement small plaza, small public buildings and their affiliated spaces.

Meanwhile, urban waterfront greenway is different from traditional urban parks, for the reason that the later lacks of various commercial facilities which are necessary for citizens' daily life, as a result, when people cannot spend a long period on strolling around, the attraction of urban parks will decay dramatically. This is why people are more likely to visit urban parks at weekends. Accordingly, apart from low-density and graceful landscape of urban waterfront greenway, it should have various commercial functions closely interrelated to people's daily life so that it can not only provide a comfortable natural environment to citizens on and off duty, from and to school and after dinner, but also help them accomplish some necessity. From this point, the commercial function of urban waterfront greenway should be mainly made up of all types of shops and outdoor selling posts which are small, distinctive and closely related to daily life.

To sum up, the interest gravitation of urban waterfront greenway, which needs to be flexible enough to adjust to different groups of people, different usage time and different activity targets, should be attributed to the diversity of its functions and landscapes.

3 SITE COMPONENTS OF URBAN WATERFRONT GREENWAY

3.1 Features of lifestyles of different groups of people

Lifestyle means all the activity forms and behavior features for an individual's self living necessity under the control of certain social conditions and instruction of certain values. It depends on age structure, income level, educational background and vocation situation, among which the first and the second factor are more important and directly influential. Due to these different factors, the lifestyles of citizens also present evident heterogeneity, diversity and individuation, moreover, different lifestyles means different requirements of urban space. In consequence, if there exists enough interest gravitation of urban waterfront greenway, it will be ought to meet different space requirements of citizens' behaviors based on different lifestyles.

Borrowed ideas from international criteria of age classification, people can be divided into following stages based on lifestyles of different groups:

1) 0~14 years old, juvenile stage. The outdoor activities of this group can be divided into two types: with families and with friends. Children usually spend time to go to school and leave school with their friends and tend to choose interesting public spaces, small fast-food restaurants, and distinctive retail stores and excite places of entertainment with low consumption. While with families, often at weekends, they

prefer quite public spaces or the ones with holiday celebrations as well as public or commercial retail stores in culture category.

2) 14~25 years old, adolescent stage: The outdoor activities of this group can be divided into two types: by themselves and with friends. They usually spend time to go to school and leave school alone and tend to choose distinctive retail stores and the ones selling daily living goods whilst with friends, often at weekends, they favor food and beverage places at intermediate level, popular gyms and excite places of entertainment with moderate consumption, such as bars and KTVs.

3) 25~45 years old, youngster stage: The outdoor activities of this group can be divided into two types: by themselves and with friends. They usually spend time on and off duty alone and tend to choose retail stores selling daily living goods or fast-food restaurants in medium-to-high grade while with friends, often at weekends, they favor food and beverage places at high level, excite places of entertainment, gyms and leisure sites suitable for chat and discussion.

4) 45~60 years old, middle-aged stage: The outdoor activities of this group are largely influenced by their income levels and those activities can be divided into two types: by themselves and with families. Among them, the group at intermediate income level is likely to do morning exercises in public spaces before go to work and also visit breakfast retail stores and food markets. While on their way home, they usually choose retail stores selling daily living goods. The group at low income level tends to favor retail stores, food markets, the ones selling daily living goods and public spaces. The places preferred by the group at high income level involve mainly in high-grade entertainment places as clubs, cinemas and concerts coupled with high-grade cultural places as art galleries and musical instrument stores; in the afternoons, high-grade leisure places like coffee shops; in the evenings, high-grade food and beverage places; at weekends, high-grade gyms.

5) Above 60 years elder stage: This group often does outdoor activities by themselves in the mornings, afternoons and after supper. They love quiet public spaces, places with convenient medical treatment and service places.

3.2 Types of Daily Activities in Different Frequency

According to different incidence frequency, the types of citizens' daily activities are made up of four levels: daily, weekly, monthly and yearly. As a spatial carrier supporting these activities, urban waterfront greenway has different proportions of all types of places related to different frequency of counterpart activities. Having concerned this factor, we can take full use of its limited resources and create the strongest interest gravitation.

1) Daily activity type: The amount of the activities in this type is the largest and meanwhile, most citizens have to do these every day. It mainly contains: fast-food, purchase of family living goods, morning exercises and all kinds of convenient services, and the places they need have to do with small fast-food restaurants and distinctive restaurants, food markets, Convenience stores, public spaces as well as convenient facilities, all of which represent the biggest proportion of place types in urban waterfront greenway.

2) Weekly activity type: The amount of the activities in this type is intermediate and meanwhile, most citizens have to do these at weekends or short-term holidays. It mainly contains: dinners, purchase of family generally-used things, parties, entertainments, sports and setting-up exercises, and the places they need have to do with commercial places in medium-to-high grade, which determine the environmental quality of the whole urban waterfront greenway, such as dining rooms, stores or supermarkets, gyms, healthy places and entertainment places.

3) Monthly activity type: Citizens have to do these activities at weekends or in holiday celebrations. It mainly contains: charity activities, holiday celebrations and bulk purchase, and the places they need have to do with large public venues, commercial places and public spaces, which locate in marked important nodes of the whole urban waterfront greenway, such as large public and cultural buildings, large supermarkets or stores, large plaza and parks.

4) Yearly activity type: Citizens usually do these activities in long-term holidays and it mainly aims at tourists to strange lands. As for urban waterfront greenway, it is not necessary to include the places supporting these activities, whereas for the ones facilitating these activities, they just stand on some architectures, blocks or parks with crucial historic significance.

3.3 Types of Places Relative to Different Activity Requirements

Urban waterfront greenway has to satisfy the activity requirements at different frequency levels of different groups of people in order to reach great interest gravitation. For the target to appeal people to all kinds of outdoor activities, it should offer those place types which can support people's various activities everyday, every weekend and even in long-term holidays. Based on the analyses before, place types of urban waterfront greenway include following categories:

1) Health category: It mainly contains: outdoor spaces such as green lands, plazas, little gardens, ball-game courts; gyms utilized for swimming, bowling, ball games and body building.

2) Food and beverage category: It mainly contains: dinner rooms, Chinese and Western fast-food restaurants, food and beverage stalls and vehicles and stores for beverage and cold drinking.

3) Shopping category: It mainly contains: stores for finery, hats, shoes, and clocks, pairs of glasses, make-ups, jewels, sports goods, household appliances and communication facilities.

4) Daily necessities category: It mainly contains: convenience stores, shopping malls, newsstands and stores for grain and oil, pastries, vegetables, stationery, medicines and audio and video products.

5) Entertainment category: It mainly contains: cinemas, KTV, game rooms, Internet bars, bars and handmade studios.

6) Literature and art category: It mainly contains: art galleries, libraries, musical instrument stores, tea rooms, concerts, museums, memorial halls, cultural palaces and art communication sites.

7) Service category: It mainly contains: photo studios, barber shop, post offices, banks, agencies, travel agencies, welfare houses, ticketing centers and consultation centers.

After the analysis of the place constitution of urban waterfront greenway, the focal point will be shifted to the following problems: how to plan these places on this spatial carrier? What are the relationships and distances between these places? What should be paid attention to when designing details?

4 'INTEREST GRAVITATION' FACILITIES ARRANGEMENT MODES AND CHARACTER

4.1 Linear Ligament

1) We can connect each residence by greenway, improve the ecology and compound degree of the 'Interest Gravitation' facilities, and ensure that the 'Interest Gravitation' facilities is close to the residence. Thus the convenience and accessibility of the 'Interest Gravitation' facilities could be enhanced, and the trip time and distance could be shortened. Low-carbon trip is realized.

2) We can ensure the open line of sight between the facilities and the residence. This will not only boost up the domain sense and guidance by using the linear guidance, but also guarantee the security of the 'Interest Gravitation' facilities.

3) We can add the entrance to the 'Interest Gravitation' facilities, ascertain the exit location, and enhance the accessibility.

4) Heightening the convenience of the 'Interest Gravitation' facilities by using the continuity and the accessibility of the greenway. (Fig. 4)

4.2 Increasing Function Mixture and Advocating Compact Layout

1) We can make the 'Interest Gravitation' facilities land use intensively. Through combination the 'Interest Gravitation' facilities of different rank (such as community level, block level, district level and municipal level etc.), we can form the sharing and the compound spatial layout, which include the community public center, the business street and resident daily facilities. And through link the 'Interest Gravitation' facilities with the important transport hub and the ancillary facilities, we can raise the frequency of land use, and reduce the demand of parking lot, and decline the consumption of energy and expense. At



Figure 4 Linear space layout patterns of the public facilities in waterfront greenway

the same time, we also can enhance the convenience and the accessibility of the 'Interest Gravitation' facilities.

2) We can provide the 'one-stop' work style service in 'Interest Gravitation' facilities by mixing different kinds of functions. It can raise the trip frequency, and reduce the essential long-distance trip times. Simultaneously we must strengthen the relationship between the commercial facilities and the connection between various commercial spaces by establishing a skyway system, which can enhance the continuity of pedestrian system also.

3) Because of the land and the function centralism of the 'Interest Gravitation' facilities, we can provide a place for the around communities activity. It can enhance the community harmony and form the community sense of pride, while we carry on the community education and community activities. (Fig. 5)

4.3 Interest Gravity Spot Diversity

1) Natural ecology landscape attraction. We can create high quality landscape for the 'Interest Gravitation' facilities and take advantage of natural environment re-creation to reflect the personality of the 'Interest Gravitation' facilities, to produce the landscape full of interest.

2) Trip comfort level is another kind of interest gravity spot. In order to increase the trip comfort level, we should provide an enjoyment vision for the non-mobile trip to improve trip quality of the resident.

3) Outdoor activity place and the facilities is the best interest gravity spot. According to each group people's demand and their behavior characteristic, we should increase the outdoor activity places and the facilities nearby the community, and arranges massive low cost sports facilities according to their sports custom. The more community activity places and facilities we have, the more group activities (such as sport, entertainment, leisure and so on.) opportunity we make. (Fig. 6)

CONCLUSION

Healthy city should be the cities which have citizen with healthy body, healthy psychology and healthy lifestyle. To achieve these health goals, leisure and relaxation and outdoor activities are essential. Based on its excellent qualities, urban waterfront area has the necessary good objectives characteristic of interest gravitation birthplace. As a space carrier of contact living environment and natural environment, the urban waterfront greenway system can both have the advantages of Park and Commercial Street which can be able to produce strong interest gravitation through rational analysis and design. Then, the interest gravitation points can attract the people to the outdoors and enjoy variety of convenience eventually. At the same time, close to nature and with nature can make people received a comprehensive upgrade on physical and mental level. Therefore, as an important constitute element of healthy urban space, the urban waterfront greenway system with interest gravitation should be attention and reflection by all the waterfront cities.



Figure 5 land use intense and function mix of public service facilities in waterfront greenway



Figure 6 Interest gravitation facilities in waterfront greenway system

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