PROCEEDINGS ARTICLE

Research on the Construction and Management of High-Quality Public Spaces of Zhuhai in the Post-Epidemic Era

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ABSTRACT

How to govern the urban public space as an important place of urban public life has become a common problem many cities face. In this article, the researchers make an objective comparison with the urban statistical yearbook to conclude that Zhuhai is relatively leading in constructing urban public spaces in China. And then, through text analysis, the public image of Xiangshan Lake Park, representative of the Zhuhai public space, is constructed from the subjective perspective of citizens. Finally, to create development spaces beneficial to physical and mental health, increase functional redundancy, and strengthen the construction of public spaces at the community level, measures and suggestions based on citizen-centered policy are put forward for the construction and management of high-quality public spaces in the post-epidemic era.

1. INTRODUCTION

Since the reform and opening up, China has completed a round of rapid urbanization through urban scale and urban space, and the urbanization rate increased from 17.9% in 1978 to 58.5% in 2017 [1]. Along with the rapid development of cities, the problem of "urban diseases" such as inefficient utilization of urban space and rough sprawl of area has also emerged. The 19th CPC National Congress proposed that China has a new stage of high-quality development from high growth. Accordingly, urban planning should change from the previous incremental step to stock and high-quality urban development. It is suggested to create and manage urban public space in a more in-depth and qualitative way, in response to the proposition of "strengthening and innovating social governance, in order to create a social pattern of common construction and governance," as proposed in the 19th CPC National Congress, and to create high-quality urban public space from the height of governance. To provide a better living environment for the public, to change the elitist concept of "top-down" in the past incremental planning, establish a

government-led mechanism with citizen participation, and attract more social forces to promote the improvement and sustainability of the urban ecological environment and public space quality have become the policy goals of governments at all levels for an extended period in the future.

With the global spread of Covid-19 starting in 2020, the epidemic has had an irreversible and far-reaching impact on global social governance for quite some time. In terms of municipal construction and urban management, how cities in the world respond to the long-term effects of the epidemic, face up to the challenges, establish new urban governance models, effectively improve the quality of urban public space, and enhance the happiness and satisfaction of citizens will be a real issue that needs to be addressed urgently by city managers at all levels worldwide.

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2. LITERATURE REVIEW

2.1. Urban Public Space

Public space is an essential part of the overall urban environment. In foreign literature, it generally refers to the space that allows public access, which contains a number of public facilities and a specific natural ecological scale, an area or region with landscape characteristics, and similar words such as open space, external space, etc. [2]. In the 1980s, the urbanization process in China accelerated, and domestic scholars gradually began to pay more attention to public space and conducted academic studies. Wang Peng (2001) established a theoretical framework of public space systematization and countermeasures [3]. Yang (2007) defined public space as an outdoor, free, all-day, public-oriented, artificially developed and provided activity space in cities [4]. Fu Guoliang (2004) proposed that public space included spatial interfaces, green squares, artworks, and other elements and that the starting point for public space design should be human perception [5]. Along with the development of urbanization to stock quality, the meaning of urban public space is also gradually broadened. Yu Shunnian (2012) proposed to divide urban public space into two categories: public space with relatively independent and exclusive public property rights and public space attached to the interior of non-public property plots. The former mainly includes public green areas, squares, and streets. In contrast, the latter mainly has squares formed by building retreat lines, inner courtyards, sky corridors, breezeways, vertical public traffic, etc. [6].

2.2. Urban Public Space Quality

From the users' perspective, the quality of urban public space refers to the extent in which it meets the needs of urban people in terms of both "quantity" and "quality". Its connotation includes the comprehensive quality of urban public space in four aspects: physical space, psychological environment, place meaning and cultural purpose [7]. From the perspective of economics, foreign scholars have proposed that urban quality of life refers to the extent in which the objective environment or conditions provided by a city meet the personal needs of residents and can be evaluated through economic, cultural, landscape and other multidimensional indicators [8,9]. In the field of domestic architecture and urban planning, in the study of the quality of public space such as street space and historical and cultural districts, objective environmental elements such as traffic network, green landscape, etc. are mainly considered as the quality of public space. In the field of architecture and urban planning in China, objective environmental elements such as traffic networks, green landscapes, etc. are mainly used as indicators for evaluating the quality of public spaces [10,11,12].

3. RESEARCH METHODS

This article evaluates and analyzes the current quality of public space in Zhuhai from two perspectives. Firstly, based on statistics on the quality of urban public space in the city statistical yearbook, it compares Zhuhai with relevant indicators of representative cities in China to evaluate the position and development level of Zhuhai's public space quality in the country from an objective perspective. Secondly, the research takes a representative public space in Zhuhai as an example, uses data mining tools to obtain a large number of public review texts on the review platform, and then analyses the public sentiment and attitude towards this public space, such as satisfaction, accessibility, etc., through text analysis tools, and then evaluates its quality. Finally, in the context of the change from incremental to stock mode of urban development and the normalization of epidemics, suggestions are made for the construction of high-quality public space in Zhuhai.

4. LEVEL OF URBAN PUBLIC SPACE CONSTRUCTION IN ZHUHAI

The comparison cities are based on two criteria. Firstly, level of urbanization, municipal construction, public services and city branding are leading in the country. Secondly, the cities have convenient access to statistical information (official website of the Bureau of Statistics), the statistical indicators are generally consistent (for horizontal comparison among cities) and the data are updated promptly (2021 City Statistical Yearbook has been published). Under these criteria, Beijing, Hangzhou, and Shenzhen are selected for comparison with Zhuhai.

Although scholars have not agreed on the connotation of urban public space, all kinds of parks, green areas, and city streets must be essential to urban public space. In the "Urban Construction and Environmental Protection" section of the statistical yearbook of the sample cities, we selected several indicators, such as "green coverage area of built-up areas, the green coverage rate of built-up areas, green area of parks, green area of parks per capita in urban areas, and several parks in urban areas," together with the indicators of "year-end resident population and population density," which can indirectly reflect the quality of urban public space, were used to compare Zhuhai with the other three cities, forming Table 1.

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	Beijing	Hangzhou	Shenzhen	Zhuhai
Resident population (millions)	21.89	11.97	17.63	2.45
Population density (persons/km^2)	1,334	710	6,484	1,411
Greening coverage area of built-up area (hectares)	N	28,885	41,457	6,996
Greening coverage of built-up areas (%)	49.00	43.36	43.00	45.77
Park green space area (hectares)	35,720	9,951	20,160	6,193
Green space per capita in urban areas (m^2)	16.32	8.32	11.43	25.28
Number of parks in the city	N	305	1206	476

Table 1. Comparison of public space quality indicators in four cities in 2020. Statistics are from the City Statistical Yearbooks 2021 published by the statistical office of each city. For the horizontal comparison between cities, the per capita park green area in urban areas is set as "park green area / yearend resident population", and the value obtained differs from the data in the statistical yearbooks of some cities.

Through the comparison, we can conclude that "Zhuhai is at the forefront of the construction and development of urban public space in China" because the comparison cities Beijing, Shenzhen, and Hangzhou are all recognized as the highest level of municipal construction in China. In comparison with these three cities, Zhuhai ranks second in "greening coverage of built-up areas," " green park area per capita in urban areas" is located in the first place, and on a substantial lead over the other three cities, but limited to the size of the city, in the "built-up area green coverage, green park area, the number of urban parks "and other aspects of ranking behind. At the same time, because Zhuhai has a small population and low population density, it can be judged that Zhuhai can also be in the leading position in the country in other urban public spaces such as roads, neighborhoods, community plot ratios, and other open spaces.

5. EVALUATION OF THE QUALITY OF URBAN PUBLIC SPACE IN ZHUHAI

5.1. Selection of Case Sites

Due to the diverse types and scales of urban public space, a comprehensive survey is almost impossible, so this study selects Xiangshan Lake Park as a research case, which is located in Xiangzhou District, Zhuhai City, Guangdong Province, with a total planned area of about 2.69 million m^2. The overall green area of the park is 180,000 m^2, and the water body area is 60,000 m^2, which is currently the largest park in the water system of Zhuhai City. As an essential practical project for people's livelihood, it has received wide attention from the public after its completion. It has quickly become a famous scenic spot and star park in Zhuhai. There are two reasons for selecting Xiangshan Lake Park as the representative of urban public space: firstly, the park has the characteristics of openness, publicness, and general welfare, and the citizens of Zhuhai, especially the permanent residents in the surrounding areas as its primary audience; secondly, the park has the most concentrated and significant area of public green space and water space in Zhuhai, which can be regarded as the representative of urban high-quality public space.

5.2. Evaluation Methods

Post-Occupancy Evaluation (POE) is "a process of evaluating facilities that have been built and used for a period using a systematic and rigorous approach" [13]. Scholars in China have introduced this method and conducted various empirical studies on the quality evaluation of urban public spaces such as parks, squares, green landscapes, and commercial districts. However, traditional methods such as questionnaire surveys and behavioral observations are limited because they are time consuming and challenging to carry out on a large scale. With the development of information technology and social media technology, the acquisition and utilization of big urban data have become a reality, and researchers can conduct post-use evaluation studies of built environments such as parks, green spaces, commercial streets, and historic districts by crawling through the data of public reviews on online platforms and computer-aided means.

5.3. Text Information Acquisition

The information in this article was mainly obtained from the reviews of visitors to the park on the popular review website Dianping in China. The Dianping website is one of the world's first independent third-party consumer review sites, established in 2003, and the reviews have accumulated since 2006. This study used web crawler technology to simulate account login and crawled 555 reviews on this website until 29 January 2022, including 552 positive and 3 negative reviews. The overall data volume is low, and to increase the number of text information, 44 data from Ctrip.com are supplemented. Because the audience on Ctrip.com is inclined toward outside tourists, three reviews obviously from outside tourists and invalid reviews are manually excluded, and 41 valid reviews are retained, resulting in a total of 595 helpful text messages.

5.4. Text Information Pre-Processing

Text analysis was performed using ROST CM6, an easy-to-use natural language processing software developed by Prof. Shen Yang of Wuhan University, which is capable of text mining, including word segmentation, word frequency statistics, sentiment analysis, and semantic network analysis, ensuring the extraction of critical information and analysis of sentiment tendencies from large amounts of text data, while avoiding cumbersome code procedures.

The public freely express their emotions through online texts, and their expressions are affected by various factors such as language habits and cultural levels. To make the text analysis more scientific and unified, it should be processed manually, eliminating irrelevant contents like emoticons and punctuation marks, translating English expressions into Chinese, etc. After the preliminary processing, the raw text data will be converted into TXT documents in ANSI format (ROST CM6 software can only read TXT documents in ANSI format).

5.5. Semantic Analysis of High-Frequency Words

Using the word separation function in the software, the text was divided into words and processed. Then word-frequency analysis was performed, and the system automatically generated high-frequency words. Considering the number of readers, we selected the first 60 high-frequency words and established the following high-frequency vocabulary table (Table 2) to provide a database for subsequent analysis.

From the above 60 high-frequency words, we can see that the public's evaluation of Xiangshan Lake Park is quite positive and can be regarded as a representative of high-quality urban public space. The meaningless words such as "Phase I", "Phase II" and "suggestion" were removed from the list. The 44 retained high-frequency words were visualized and displayed in Fig. 1, which showed that Xiangshan Lake Park is a high-quality urban public space with a good environment and suitable for public leisure.

No.	Word	Frequency	No.	Word	Frequency	No.	Word	Frequency	No.	Word	Frequency
1	Park	807	16	Scenery	78	31	Transportation	48	46	Area	37
2	Xiangshan	499	17	Plank road	76	32	Convenient	47	47	Full range	37
3	Zhuhai	231	18	Hour	75	33	Advice	46	48	Past	35
4	Swan	195	19	Beautiful	74	34	Comfortable	45	49	Litchi	35
5	Suitable	125	20	Fresh air	71	35	Place	45	50	Waterfall	35
6	Walk	116	21	Phase III	67	36	Little kids	45	51	Exercise	34
7	Phase II	109	22	Nearby	60	37	Camping	45	52	Gate	34
8	Environment	104	23	Picture	59	38	Parking spot	42	53	Fresh	34
9	Place	102	24	Open	58	39	Play	41	54	Afternoon	34
10	Picnic	96	25	Phase I	57	40	Weather	41	55	First Middle School	34
11	Duck	95	26	Parking	56	41	Tent	39	56	Running	33
12	Weekend	89	27	Leisure	54	42	Naughty	39	57	Free	33
13	Parking Lot	83	28	Scene	54	43	Suggestion	39	58	Walk around	33
14	Take a walk	81	29	Time	53	44	Cloud road	39	59	Daytime	32
15	Evening	80	30	Friend	48	45	Citizens	38	60	Pretty	32

Table 2. Top-60 high-frequency words.

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Figure 1. Visualization of high-frequency words.

Further analysis of the top-60 high-frequency words can be grouped into the following four categories: first, functional descriptions, such as park, walk, picnic, play, picture, leisure, running, etc., reflecting Xiangshan Lake Park as a representative of leisure-oriented urban public space; second, environmental descriptions, such as environment, scenery, ducks, plank road, etc., reflecting its superior natural environmental features; third, accessibility descriptions, such as parking lot, nearby, open, convenient, free, etc., reflecting its publicness, openness, and accessibility; fourth is the emotional expression, such as beautiful, comfortable, fresh, etc.

Through domestic and foreign research, Jiawei Dong (2020) summarized the core indicators of urban public space quality evaluation, including accessibility (connectivity), functionality, vitality, comfort, and scale [14]. In this article, the social network text analysis method based on post-use evaluation (POE) can reflect the quality of Xiangshan Lake Park as a representative public space in Zhuhai.

6. SUGGESTIONS FOR CONSTRUCTION AND MANAGEMENT OF URBAN PUBLIC SPACE UNDER THE IMPACT OF THE EPIDEMIC

Covid-19, which began in 2020, brings unprecedented opportunities and challenges to the construction and management of public space in cities worldwide. First, the high epidemic transmission has limited human interaction and made long-distance travel, especially international travel. Now the epidemic has entered a normalized phase. As an important place for the general public to live, relax and socialize, urban public space has become increasingly prominent. Its level directly reflects the city's development level and determines the public's quality of life. In the context of epidemic normalization and even post-epidemic, the construction and management of urban public space need to adhere to the principle of health first, meet the diversified needs of residents, and achieve both improvement of the urban living environment and strengthening of urban disaster prevention and mitigation capacity.

6.1. To Reflect Equality and Inclusiveness Based on Citizen-Centered Principle

In November 2019, President Xi Jinping proposed that "the city is ultimately a city of the people, a happy paradise for the common people. Public space should be expanded and upgraded so that the people can have a sense of access and happiness here" [15] during his visit to Yangpu District waterfront public space in Shanghai. Adhering to the people-centered development concept, creation of urban public space is to take the citizens as the driving force and home of urban development, respect citizens' right to know, participate and supervise the governance of urban space, encourage all social details to participate in the construction of urban area through various ways, and truly realize the shared construction, management, and entertainment of urban public space [16]. At the same time, it is necessary to promote the equity and inclusiveness of urban public space, and to pay more attention to the needs of the elderly, the disabled, children, and other disadvantaged groups, so that public space can return to the human dimension and genuinely serve the people.

As representative of public leisure space in Zhuhai, Xiangshan Lake Park obtained a high score of 4.9 out of 5 on the public review website Dianping, precisely because it implemented the citizen-centered concept and met the daily leisure needs of the public. Still, the textual analysis of visitors' evaluations found that the sporadic negative evaluations were also due to the "citizen-centered" concept. Room for improvement is there in service attitude and admission restrictions.

6.2. To Place Space Safety as the Premise for Physical and Mental Health

Space safety is a prerequisite for the public, and health is a higher demand for development of public space [17]. In 2016, the CPC Central Committee and the State Council issued and implemented the "Health China 2030 Plan", which set "building and sharing, health for all" as strategic theme for building "Health China" in the new era [18]. Under the influence of the current epidemic, the demand for healthiness in urban public spaces has become increasingly vital. Studies have shown that the environment is the primary source of health problems. Creating high-quality public spaces is beneficial to cultivating healthy living habits and developing healthy cultural, sports, and leisure activities, ultimately improving citizens' sense of well-being and access.

6.3. To Increase Functional Redundancy and Improve Spatial "Resilience"

Under the normalization of the epidemic, urban public spaces should consider daily and emergency states. In the daily form, public space carries the activities of citizens and maintains the public interest of the city; in the public health emergency state, the reason of population flow restriction makes urban public space no longer have the function of carrying activities, and various types of the urban public area should be able to guarantee the functions of diverse emergency resources collection, reserve, flow, and recovery as well as personnel placement, isolation, and treatment [19]. Zhuhai's urban public spaces of various types and levels, represented by Xiangshan Lake Park, have already assumed the work of nucleic acid testing and vaccination during the epidemic, reflecting the multifunctionality of urban public spaces.

6.4. To Strengthen the Community Level of Urban Public Space Construction

Under normalization of the epidemic, public spaces at the city and district levels are often shut down due to closure and control. In contrast, various medical functions such as epidemic prevention and detection, isolation, and treatment require continuous sinking from city to community. Therefore, in response to the normalization of epidemics, cities should build small-scale, multifunctional neighborhoods according to residents' daily needs and reduce daily transportation distances; at the same time, they should strengthen the arrangement of public spaces such as community parks and green spaces near residential areas to achieve the dual functions of epidemic prevention and stress reduction at the community level.

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