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Strategies of Living Streets Based on POI  
Data—Taking Qianshan District of Zhuhai City  
as an Example

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## *Research on the vitality, problems and Strategies of living streets based on POI data——Taking Qianshan District of Zhuhai City as an Example*

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**Key words:** life-style streets; GIS; points of interest; Qianshan area of Zhuhai City; Ancient village

**Abstract:** From the general direction, urban roads can be divided into township roads, county roads, provincial roads and other types. Urban life streets can be divided into life service streets and leisure and entertainment streets from the function. Urban point of interest (POI) is a geographical entity closely related to the life of urban residents, such as wholesale shops, savings offices, primary and secondary schools, etc. This paper takes Qianshan District of Zhuhai City as the research object, and divides the surrounding streets of Qianshan District into life service street and leisure entertainment street. Using geographic information system to integrate the data of different functional facilities of the street, and the data after integration are overlapped and analyzed. According to the relevant results of software analysis, we find the existing problems of life-style street in Qianshan area at this stage, and finally put forward corresponding suggestions for the future development direction of life-style street in Qianshan area.

## **1. RESEARCH BACKGROUND**

Since the reform and opening up, in recent years, with the continuous development of the economy in Qianshan area, the residents' thinking has also been continuously improved, and the consumption level has been increasing year by year. Businesses are more willing to settle in the low-level shops of high-end residential buildings instead of investing money in ancient villages. The main business objects of the business are residents in high-end communities. From a commercial point of view, it can radiate various types of floating population around the periphery and other areas of the city, and consume the flow of people. The commercial service radius is large and it has better commercial functions.

## 2. DATA SOURCES AND RESEARCH PROCEDURES

### 2.1 Data source

In mid-to-late September 2020, use Python to crawl the road network and POI data of Zhuhai City, first repair the geometry, and then use the clipping tool (Clip) to intercept the road network in the Qianshan area, and then filter the various types and types of the Qianshan area by location. POI data of functional living facilities, including shopping (4406), residential areas (281), catering (246), medical services (135), scientific research and education (103), financial services (118), Automobile related (82), leisure and entertainment (46), accommodation (44), parking lot (37), government unit (36), hospital, building (30 each, 60 in total), tourism (13 There are 2483 POI data in total, gas stations (6), railway stations (1), and mountain peaks (1). The relevant data is combined with the road network space, as shown in Figure 1.



Figure 1. POI and road network data in Qianshan area  
Image source: the author's self-painted



Figure 2. Distribution map of the number of facilities around the streets in the Qianshan area  
Image source: the author's self-painted



Figure 3. Distribution map of the number of recreational facilities around the streets in Qianshan area  
Image source: the author's self-painted

### 2.2 Research steps

According to the construction of buildings on both sides of the streets in Qianshan area, the POI data of various types are divided into two categories: formal activities such as serving people's life, travel and affairs, and POI data related to people's leisure, play and other entertainment activities.

Firstly, establish buffer values around each street, and then observe the points closely related to the people's life and entertainment activities in the area affected by the buffer radiation range values of different streets after establishment, to see how many points fall in the buffer zone, and then overlay and analyze the data of different types of interest points, And in the normal walking range of people, the street nuclear density analysis is carried out, and finally statistical analysis is carried out respectively. If there are more interest point data of life service nature, it indicates that the street function is closer to the life service nature. By finding the problems existing in Cuiwei Street within the buffer radiation range at this stage, the impact on Cuiwei village, and putting forward corresponding solutions, this paper puts forward countermeasures for improving the street vitality of Qianshan area in the future and driving the protection, renewal and development of Cuiwei historical street.

### 2.3 Problem prediction

If there are more interest point data of life service nature, it indicates that the street function is closer to the life service nature. By finding the problems existing in Cuiwei Street within the buffer radiation range at this stage, the impact on Cuiwei village, and putting forward corresponding solutions, this paper puts forward countermeasures for improving the street vitality of Qianshan area in the future and driving the protection, renewal and development of Cuiwei historical street.

## 3. ANALYSIS OF THE EXTERNAL ENVIRONMENT OF THE QIANSHAN AREA IN ZHUHAI

First, subdivide the street life service facilities and leisure and entertainment facilities. The life service facilities include: catering, residential quarters, shopping, government units, hospitals, car-related, parking lots, buildings, medical services, scientific research and education, accommodation, railway stations And financial services; leisure and entertainment facilities include: Internet cafes, chess and card rooms, KTV, newspaper construction and clubs. Among them, there are 46 leisure and entertainment facilities POI points and 4340 life service facilities.

Then use the geospatial system to create a buffer, unify the street buffer range to a radius of  $R=50\text{m}$ , and then perform overlay analysis on different types of POI data falling on the radius of  $R=50\text{m}$ , and perform the relevant results after data sorting. The spatial connection is connected to the layers of the road network of Qianshan Street. According to the natural discontinuity method, the living service facilities and entertainment facilities of Qianshan Street are divided into 5 levels from low to high: weak, weak, normal, strong, and strong. The darker the color, the higher the street life service facilities and entertainment facilities, combined with POI points of interest, as shown in *Figure 2-3*. It can be seen from *Figures 1-3* that the Cuiwei area is located on the northwest side of the Qianshan area, and the number of POIs in the Qianshan area is too large. The POIs in the Cuiwei area are concentrated on both sides of Cuiwei North Street, Market Straight Street, and Dafang Street. The three streets connect the north and south sides of the village, and there are a certain number of POIs on both sides of Changshui Street. It shows that these four streets have good vitality, and they are the concentrated areas of street vitality in the whole area. However, there is no POI in the eastern area of Cuiwei area, and its vitality is poor. The POI types distributed on both sides of the four streets are all POIs with a life nature, and there are few POIs with a leisure and entertainment nature. The four streets in the east, south, west and north outside the area are reddish in color, and there are a large number of POIs on both sides, indicating that the streets have strong vitality. The density on the west side is larger and the distribution is more uniform, followed by the east and south sides, which are distributed in the middle and the left side respectively, and the distribution on the north side is relatively less and even. The streets inside and outside the site are connected, and various types of POI are closely connected and interact with each other. Finally, according to different streets in the area, different levels are generated, and their functions are different. Using GIS to reclassify them to get the proportions of different functions, it can be concluded that there are a total of 5132 roads, which are closely related to

people’s lives. There are 5,082 streets with a POI level of normal and below, accounting for 99%; the streets with a strong level are Mingzhu South Road, Gangchang Road and the south side of Santaishi Road (highlighted in *Figure 4*), a total of three; There are a total of 2566 roads. The number of POIs related to people’s leisure, play and other entertainment activities is 2,563, or 99%. Streets with strong levels are Mingzhu South Road, Gangchang Road, and Anlian There are three roads near No. 6 (highlighted in *Figure 5*), all located on the west side of Cuiwei Village. It can be concluded that the surrounding services and leisure facilities of Mingzhu South Road and Gangchang Road are classified as relatively strong, indicating that the life functions of the two streets are relatively concentrated and the streets have high life vitality.

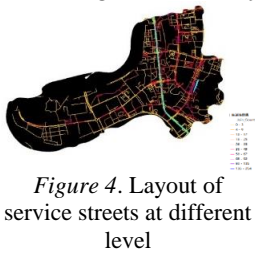


Figure 4. Layout of service streets at different level

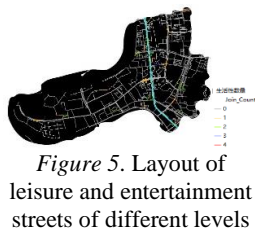


Figure 5. Layout of leisure and entertainment streets of different levels

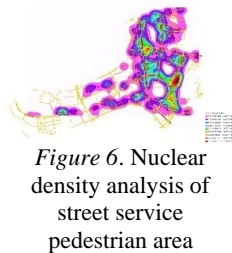


Figure 6. Nuclear density analysis of street service pedestrian area

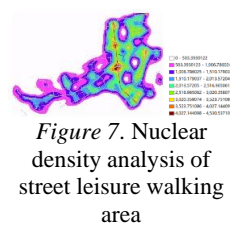


Figure 7. Nuclear density analysis of street leisure walking area

Image source: the author's self-painted

## 4. MACRO LEVEL-ANALYSIS OF STREET VITALITY IN QIANSHAN DISTRICT OF ZHUHAI

### 4.1 Analysis of life service streets

Cuiwei village, located in Qianshan District, is a representative ancient village in Zhuhai. There are many business forms near the district. The relevant residents rent the space to businesses, which transform it into bakery, porridge and flour shop, mobile phone maintenance shop, Jinji pig belly chicken, bicycle repair shop and Meiyijia, so as to provide convenience for nearby residents. It has strong accessibility, but the radiation range is not wide, This also leads to the fact that Cuiwei village has little influence in the whole Zhuhai City and even other provinces and cities, and the overall public transport accessibility is not high.

Life style streets mainly provide people with the function of walking. In this paper, during the macro analysis, they are classified based on the level of life style streets in Qianshan, and the nuclear density analysis is carried out by using GIS. As shown in *Figure 6*, it can be seen that the area with the strongest life style service space in Qianshan area is distributed from Zhuhai Campus of Jinan University to Qianshan market, because Jinan University is a university in Qianshan area, There are abundant educational resources. There are many residential areas in the east of Qianshan market, as well as two larger hotels and one larger hotel, namely Qianshan Dianbai hometown chicken Hotel, qiahe restaurant and vitality hotel. The main business types on the west side of the road are home sales and Qianshan market, with large traffic and people flow in the morning and evening peak. Strong areas are distributed in the southwest, northwest, northeast and east of Cuiwei village, mostly concentrated in the intersection areas, namely Mingzhu South Road,

Renmin West Road, Mingzhu South Road, Cuiwei West Road intersection, Cuiwei Road, Cuiwei village south area and Qianshan Town.

## 4.2 Analysis of leisure and entertainment streets

After using GIS to analyze the core density of POI data with leisure properties in the Qianshan area, it can be seen that the area with the strongest recreational street in the Qianshan area is at the intersection of Mingzhu South Road and Jinji Road, and the radiation range is weaker and stronger. Mainly concentrated at the two intersections on the west side of Cuiwei Village, with weak radiation range. Chess and card rooms, KTV, Internet cafes, and bathing and health care are distributed on both sides of such regional intersections, which are distributed in a scattered form. Leisure around other streets The facilities are less distributed, low density, less places for people to relax, and do not have the function of cross-level life and entertainment services. On the whole, from the small area of Cuiwei Village to the large area of Qianshan, nearly 30% of the areas lack venues for cultural and sports activities, such as basketball courts, tennis courts, and swimming pools. And there is a lack of medical and health facilities, such as community health service centers, temporary medical treatment centers, and larger markets. The overall current situation is that the proportion of construction land is out of balance, supply and demand are unbalanced, and the per capita density of large-scale public infrastructure and green space systems is insufficient. Compared with Gongbei, Xiangzhou, the leisure and entertainment functions are at the bottom, and the level of entertainment functions is low (*Figure 7*).

On the whole, from Cuiwei Village area to Qianshan area, nearly 30% of the areas lack venues for cultural and sports activities, such as basketball court, tennis court, swimming pool, etc. And there is a lack of medical and health points, such as community health service centers, temporary medical treatment centers and large markets. The overall current situation is that the proportion of construction land is unbalanced, the supply and demand is unbalanced, the per capita density of large-scale public infrastructure and green space system is insufficient, the leisure and entertainment function is at the bottom compared with Xiangzhou Gongbei, and the level of entertainment function is low (*Figure 7*).

## 5. PROBLEMS IN LIFE-STYLE STREETS

### 5.1 The spatial distribution of life-style street services is relatively loose

In the macro analysis of the Qianshan area where Cuiwei Village is located, it can be concluded that the living nature and functional space of Qianshan Street presents the spatial characteristics of being stronger in the east and weak in the west, and the strongest areas are concentrated in the southeast. The service streets closely related to people's real life and leisure and entertainment are mainly concentrated in the areas on the left and right sides of Mingzhu South Road to Gangchang Road and Santaishi Road on the west side of Cuiwei Village. The functions of life and leisure services in the western region are weak. It can be seen that the development gap between

the east and the west is relatively obvious, and the distribution is unbalanced. The side reflects the huge development potential of Cuiwei Village in the future, and the advantages are obvious. There is more development space for the living public space in the eastern area.

With the continuous development of the area around Cuiwei Village in recent years, life-style streets have gradually been replaced by traffic roads, life-style functions have been gradually lost over time, and the balance between supply and demand has been disrupted, facing greater threats.

## **5.2 The historical and cultural functions of the life-type show a state of singularity and fragmentation**

From a macro perspective, the Qianshan area is a stock-type development area. There are four villages, namely Cuiwei Village, Meihua Village, Qianshan Village, and Zabei Village. These villages once had a long history and relatively prosperous commercial functions. There are many historical buildings with cultural value. At the beginning of the period, the government did not issue relevant policies and invest corresponding funds to protect these historical relics. The continuous and disorderly development of streets is not conducive to the formation of The street space with characteristic value and the street space also lack vitality, thus losing the spirit of the place, leading to the continuous decrease of the potential and value of the street, which is not conducive to the development of the street. Cuiwei Historic District has many second-class buildings. The disorderly development in the early stage did not construct a reasonable functional zone.

## **6. STRATEGIES TO ENHANCE THE VITALITY OF LIFE-STYLE STREETS**

### **6.1 Focus on recognizability**

Cuiwei Village, Meihua Village, Qianshan Village, and Zaobei Village have lost their original historical features during the process of reconstruction and renewal, and the material space has gradually lost its recognizability. In the renewal process of the historical district, considering that the Qianshan area now retains the ancient city wall of Qianshan and the Zhongshan Pavilion and other architectural ruins, the population of the area accounts for one-sixth of Zhuhai City. A small number of community parks have a relatively strong cultural life atmosphere, and at the same time , Qianshan area also has a Qianshan river waterscape, Banzhangshan mountain view. It is necessary to reflect the cultural connotation of the community in different plots of the area, create a good external environment atmosphere, and combine the local historical context, important historical buildings and The surrounding environment enhances the landscape characteristics of the areas along the mountains, waters, and roads, shapes the style of the area, and further enhances the vitality of the city.

## **6.2 Focus on the overall effect**

Qianshan belongs to the older part of Zhuhai City. Because there are more areas to be renovated, there are more urban villages. The old village buildings are mostly low-rise buildings, which have a large height difference with the surrounding new residential buildings in recent years. In the optimization of life-style streets, it is necessary to integrate motor vehicle lanes, non-motor vehicle lanes, and isolated landscape belts between the roads to enhance the integrity of the street's vitality.

## **6.3 Focus on identifiability**

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## **6.4 Facility improvement strategy**

In the promotion strategy of life-oriented service streets, the historical characteristics and local humanities of the area should be continued. Actively improve the problem of insufficient public infrastructure in life-style streets. In the process of improving the vitality of streets and lanes, attention should be paid to the protection of the spatial pattern and the network system of streets and lanes.

In the relatively prosperous commercial area of Qianshan, there are many high-rise residential buildings, commercial and educational supporting facilities nearby, which often have high functional carrying capacity. How to effectively and rationally use its main functions and values, and to integrate Zhuhai's diverse culture Integration is the main focus that people must dig deep into the vital genes of the Cuiwei Historic District, including modern service facilities such as commerce, culture, leisure, entertainment, and viewing, and revive the unique urban spirit and neighborhood vitality of century-old commerce .

Cuiwei Village, Meihua Village, Qianshan Village, and Zaobei Village have more service facilities and fewer entertainment facilities. In the process of organic renewal, we should pay attention to the principle of integrity, actively improve the surrounding infrastructure environment of historic districts, and enhance the vitality of human settlements. , Increase the construction of entertainment infrastructure, create tourist attractions, and continue the historical style of the street. The buildings on both sides of the street where the core density of entertainment facilities are relatively low



shall be newly built, expanded, and rebuilt. Effectively control the height of the buildings on both sides of the street, optimize the facade of the buildings along the street, and maintain the unity of the overall style. Special design is carried out at the important node positions of individual road sections, and facilities for rest, entertainment and sports are set up to add color to the street and enhance the interest of the street.

On both sides of the street with a large number of service-oriented facilities, the control of the overall style should be strengthened, and the form of asymmetrical surface should be adopted to increase the area of the activity space. In the historical district, the land is used for compound use. Set up office areas to effectively mix residential functions, cultural functions, community services and other functions. Mix the external life service street with the internal street, thereby increasing the vitality of the internal space of the street. While increasing leisure and entertainment facilities, the safety of the disabled, the elderly with mobility impairments and young children should be taken into consideration when playing, and corresponding protective facilities, such as fences and handrails, should be set up to ensure their safety. Important traffic nodes should be equipped with large-scale entrances and exits, and corresponding seats, conversation areas, newsstands, etc. can be arranged on both sides of the pedestrian street. Corresponding plants are equipped next to it to ensure that people can appreciate the plants around them when they are talking, so that the pressure accumulated in their work, study and life can be well released, and they have a feeling of returning to nature. When the flow of people is large, it can provide short-term rest and realize the diversity of functions.

## **6.5 Upgrading strategy of street space system**

For the Qianshan area, there are many ancient villages with hundreds of years of historical blocks inside. In terms of coordination of styles and features, the original streets and lanes are preserved, and the interfaces along the streets are rationally rectified, and the necessary entrances and exits of the streets and the external urban roads are added. The necessity of connection, and the nodes of each functional zone are connected in series at the same time to create a continuous spatial interface, establish a rhythmic walkable spatial order, and meet the needs of fire fighting. In the event of a fire, fire trucks can be used to quickly achieve the purpose of extinguishing fire. To make daily transportation convenient and fast, open up the Cuiwei historical style area, revitalize the Cuiwei village stock, establish a new production space skeleton, and establish a new life for the villagers in the village. In the planning and design of the street, because the lot is close to the city center, drawing on the advantages of the city center development, the 5G network is fully covered, and the Cuiwei historical district global tourism intelligent guide system and VR panoramic map are built, which is on the side of the entrance arch Set up a guide map and a QR code of a block map to facilitate online browsing by tourists and build a smart business district system. Create spatial characteristics to make the space easier to be recognized by people, so that visitors can better grasp the overall spatial form of the area, enhance the overall understanding, and improve the wisdom. Provide tourists and urban residents with a consumer carrier that is more comfortable, convenient, and smart. In the future, at least 3 orchestras will be set up to perform in different corners every night. The market culture and the street will be perfectly integrated, highlighting the nightlife

characteristics of the historical district business district, and giving tourists a good experience. Stimulate the development vitality of the area, restore the commercial advertising signs along the street, combine tourism with cultural background, and also have a strong style.

## **6.6 Upgrading Strategies for Medieval Buildings in Historic Districts**

For the Qianshan area, there are many ancient villages with hundreds of years of historical blocks inside. In terms of coordination of styles and features, the original streets and lanes are preserved, and the interfaces along the streets are rationally rectified, and the necessary entrances and exits of the streets and the external urban roads are added. Necessity of connection, connect the nodes of each functional zone in series at the same time, create a continuous spatial interface, establish a rhythmic walkable spatial order, and meet the needs of fire fighting. In the event of a fire, fire trucks can be used to quickly achieve the purpose of extinguishing fire. , To make daily transportation convenient and fast, open up the Cuiwei historical style area, revitalize the Cuiwei village stock, establish a new production space skeleton, and establish a new life for the villagers in the village.

The protection and renewal of the historical blocks in the ancient villages in the area includes the control of the facades of historical buildings, street planning, and landscape design. Effectively control the design, protection and restoration of the building's façade, as well as the selection of different materials and the overall modeling style. This is an indispensable element of the vertical facade of the street space. Bricks, stones, concrete and loess can be used to protect building materials, respect history and reduce the use of new materials. Its height should be in line with the height of the ancient building, and the number of construction floors should be controlled within one or two floors. The shape can be changed and adjusted according to the internal space layout, function and transformation style of the building.

In the planning and design of the street, because the lot is close to the city center, drawing on the advantages of the city center development, the 5G network is fully covered, and the Cuiwei historical district global tourism intelligent guide system and VR panoramic map are built, which is on the side of the entrance arch Set up a guide map and a QR code of a block map to facilitate online browsing by tourists and build a smart business district system. Create spatial characteristics to make the space easier to be recognized by people, so that visitors can better grasp the overall spatial form of the area, enhance the overall understanding, and improve the wisdom. Provide tourists and urban residents with a consumer carrier that is more comfortable, convenient, and smart. In the future, at least 3 orchestras will be set up to perform in different corners every night. The market culture and the street will be perfectly integrated, highlighting the nightlife characteristics of the historical district business district, and giving tourists a good experience. Stimulate the development vitality of the area, restore the commercial advertising signs along the street, combine tourism with cultural background, and also have a strong style.

## **6.7 Strategies for the improvement of ancient buildings in historical districts**

Among the four villages of Cuiwei Village, Meihua Village, Qianshan Village, and Zaobei Village, the historical buildings on both sides of the block can be upgraded by means of activation, protection, utilization and renewal. Among them, there are three types of protection measures, namely repair, original site reconstruction, off-site reconstruction and new construction. Repairs include in-situ repairs and elevation repairs. According to the laws and regulations promulgated by the government, in the process of building repairs, the shape and plane of the original objects should not be changed, the original structure should be retained, and the original features of the building should be displayed to the people as much as possible. come out. The new building includes coordination of style and modern functions. Reconstruction at the original site or at a different location does not change the original state of the cultural relics. The original shape, structure, materials, and craftsmanship of the building are retained, and the use of modern materials should be reversible and concealed. The original object should be kept intact when it is dismantled, and the component should be fixed during reconstruction, and try not to interfere with it to achieve minimal intervention.

## **6.8 Strategies for upgrading business layout in historical districts**

The ancient villages of Cuiwei Village, Meihua Village, Qianshan Village, and Zaobei Village are rich in market culture, changing the original only single residential function and adopting costumes and fixed spots along the streets of Cuiwei North Street, Market Straight Street, Dafang Street, etc. The main forms of business such as pharmacies, convenience stores, gourmet stores, restaurants, and dentistry.

Historical and cultural monuments, traditional living and recreational space, and rich local culture should be jointly established in an open and transparent space, interconnected with surrounding historical elements, and together constitute a relatively complete main line of village history and the main line of overall memory of the area. Therefore, it is necessary to advocate the strategy of cultural continuation of synergy and series and organic symbiosis to realize the organic symbiosis of historical blocks, historical traditions and modern culture on three levels.

It is also necessary to strengthen the attraction of space node structures to tourists. When landmark arches are built outside ancient villages in the future, modern technology lighting methods can be used on the basis of the original traditional nighttime quantification, such as 3D Mapping art structure projection and other emerging media To make a light show, the two nodal spaces are strengthened, the architecture, the human body, and the landscape become the carrier of projection, and the surface is transformed into light and shadow animation, so that the relationship between the digital light media and the material world becomes vivid and has a better Strong visual impact.

As there are many historical buildings in the block, it is necessary to dig out the cultural heritage, the effect and the catalytic function of cultural form on a huge scale. Under the mutual stimulation of the two, we will inject

multi-cultural functions, focus on the existing historical buildings, and vigorously develop the cultural and creative industries. Combining business culture, traditional houses, and consumption with a strong sense of experience among residents in the Qianshan area, it enhances the experience of residents in the area and allows more people to participate to create a business model that conforms to the business format. Make full use of the functional carrying capacity of the block, implant modules in commercial development, and determine the function of the business and the area of the commercial form.

According to the long-term historical and cultural value and location conditions of the existing villages, the overall positioning of the block is determined based on the commercial functions. The education, housing, catering and commercial facilities around the village are relatively complete. There are residences, schools, department stores, mobile and tablet stores, restaurants, hotels, book reading rooms, display kiosks, etc., as well as indoor activity spaces with cultural and entertainment functions and financial services, as well as basic business forms such as commercial banks. The development of mixed use can not only improve the quality of life and living standards of urban residents, but also improve the vitality of the neighborhood and the attractiveness of the city. The symbiosis of the lot.

The legacy of folk traditional customs, textile industry, etc. will be left behind and carried forward to make Cuiwei more vigorous while inheriting the historical context of Cuiwei. Let the history and culture of Cuiwei District go out, let more people come to visit and inspect Cuiwei Village after they understand Cuiwei Village, so as to achieve the effect of two-way linkage, achieve a better transformation goal for the internal functional conditions of the block, and involve all local interest developers. The process of village development and promotion through a strong brand marketing.

## **7. CONCLUSION**

The results of the study are as follows: At this stage, the commercial service radius of Qianshan area is relatively small, the commercial function is poor, and it is unable to radiate the floating population in the surrounding area and other areas of Qianshan area, and consume the flow of people outside the area. The number of block facilities is one of the factors in the evaluation of the vitality of the block, which is mainly manifested in the fact that the more the number of block facilities and the closer the location to the city center, the higher the vitality of the evaluation.

According to the existing problems in the service space of life-style streets in Qianshan area, corresponding solutions are proposed to contribute to the economic development of Qianshan area in the future, so as to improve the service quality and overall service quality of life-style streets and leisure streets in Qianshan area. The quality of public space serves the majority of urban residents. The results obtained through the analysis are more practical and have good guiding significance. It provides good reference value and reference significance for design institutes, planning institutes, ancient village protection units, cultural, sports and tourism bureaus, and natural resources bureaus.

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