Evaluation and Improvements Of Epidemic Prevention And Control: A Case Study In Haikou And Harbin Cities

Shuqi Miao[1, †], Zidong Zhang[2, *, †]

[1] HNU-ASU Joint International Tourism College, Hainan University, Haikou, China

[2] Urban and Rural Planning Department, School of Architecture, Harbin Institute of Technology, Harbin, China

[*]Corresponding author. Email: 1183450301@stu.hit.edu.cn

[†]These Authors contributed equally.

Abstract. In today's COVID-19 era, cities, where residents do not maintain proper social distancing in public spaces, are more vulnerable to the outbreak. In order to investigate social distancing and the symbiotic relationship between urban public spaces and the factors of the spread of the epidemic, this paper selects Haikou and Harbin cities to analyze their current situation of external residential and commercial street public areas through questionnaires, discusses their commonalities and differences in the process of epidemic prevention and control, and proposes design interventions. Results show that Haikou people prefer to go out collectively through public transport, do not pay attention to maintaining social distance, and most people do not have good epidemic prevention habits. The enthusiastic Harbin residents tend to chat with the shop assistants and don't have the habit of keeping a social distance and wearing masks. Facing COIVD-19, their commonalities in poor epidemic prevention mainly reflect three aspects: the streets of both belong to the more closed and narrow streets of the old city, the residents are warm and cheerful, as well as the protective facilities are inadequate. In addition, there are significant differences in climate, cultural practices and architectural styles between the two cities, leading to poor epidemic prevention. Haikou is located in the tropics, and the annual average temperature is five times that of Harbin, a high-latitude city. Moreover, the urban culture of Haikou is a mixture of southern China and Southeast Asia, while Harbin is a mixture of Russian and northern Chinese cultural practices. In contrast to Haikou's arcade architectural style, Harbin combines traditional northern Chinese blocks with the European Baroque system. Considering their commonalities and differences, it is suggested to adopt flexible modular design in public spaces, widen the sidewalks, increase isolation points, and set up the greening belt to isolate the gathering crowd.

Keywords: Public Spaces, Epidemic Prevention, Haikou, Harbin, COVID-19.

1. Introduction

In the era of the COVID-19, more than 3.8 billion people around the world have been infected with the new crown virus, and many cities and countries have been shut down and placed under control, the importance of public space in cities is becoming more and more prominent [1]. People tend to carry out entertainment and social activities in public spaces near residential areas. However, in this process, they are easily influenced by the current situation in public areas before the epidemic, resulting in close social distance between people. In the process of preventing and controlling the epidemic, it is very important to keep a distance between people. During the COVID-19 pandemic, social distancing is one of the most recommended policies in China to reduce the risk of transmission. Therefore, in Chinese provinces that strictly abide by this rule, the epidemic prevention effect is very obvious [2]. In contrast, about 40 percent of Americans do not follow social distancing policies well, so the development of the new crown epidemic in the United States has not been optimistic [3].

As a country with a large population, China has a high density of people, which makes the contradiction of epidemic prevention more prominent, and the public space faces greater pressure. Increasing studies focused on public space, Wuhan city in China proposes to redesign public spaces for social, entertainment, community building, and epidemic prevention functions [4]. Haikou and

Harbin are two provincial capital cities in southern and northern China with great differences in climate, culture, and architectural styles. This paper selects Haikou and Harbin for comprehensive consideration to investigate the current situation of outward residential commercial streets in public areas, and discusses the impact of factors such as north-south climate differences on people's social distancing in urban public spaces. Considering city public space design and environment, some suggestions have been proposed, further for exploring the dynamic symbiotic relationship between the diversity of public space and people's social distance.

2. Background Of Study Areas

2.1 Haikou City

Haikou city we investigated is located in Hainan Province, the southernmost province in China. It is located at 20 degrees north latitude and 110 degrees east longitude. Haikou City is the capital of Hainan Province.

On the environmental level, Haikou is adjacent to the sea in the north, with an existing land area of 2304.84 square kilometers. It is rich in landscape, animal and plant resources, and its air quality ranking first in China all year round. It is one of the popular tourist cities in China and has also been rated as the most livable city of the year for many times. It belongs to tropical monsoon climate, with long sunshine time and good water and heat combination conditions.

From the perspective of the population situation, according to the results report of the seventh census of Haikou City, the permanent resident population of the city has exceeded 2.87 million [5]. On the aspect of economic level, Haikou's GDP in 2021 was 205.706 billion yuan, an increase of 11.3% year-on-year. Compared with the primary and secondary industries, the tertiary industry in the city has the most obvious year-on-year growth.

Due to its geographical location close to South Asia, its language system, architectural style and cultural customs have a strong Nanyang style. Most islanders are easy-going and desultory with group culture, leading to a large social circle of people.

Furthermore, Haikou has high ecological and economic value. The city has high forest coverage and rich water resources. Moreover, China has a major strategic deployment for Hainan Island to build it into a world-class international tourism island, which is conducive to deeply tap the economic and tourism value of Haikou.

2.2 Harbin City

Harbin is the capital of Heilongjiang Province, the northernmost province in China. It is located at 45 degrees north latitude and 126 degrees east longitude.

From the perspective of geographical conditions, Harbin has a temperate continental monsoon climate, with four distinct seasons, which have long winter and short summer. The precipitation is 529mm, mainly from June to August, accounting for 66.8% of the annual precipitation. The average temperature in winter is about minus 19 ℃ and the average temperature in summer is 23℃. The soil in Harbin is very suitable for the growth of crops and it is an important grain base in northern China.

In the aspect of the population, according to the results report of the seventh census of Harbin City, the permanent resident population of the city was just over 10 million. It's worth noting that Harbin is losing a lot of population every year. From an economic point of view, Harbin's GDP in 2021 was 5351.7 billion yuan, increasing by 3.24% year-on-year. The primary and tertiary industries grew at a similar rate of 6.6% and 6.1% respectively. However, as the old industrial base of China, Harbin's secondary industry grew more slowly, by 3.2 percent.

People in Harbin are forthright and willing to help others. As Harbin was one of the first Chinese cities to build socialism, people here have a very strong sense of community. Residents of a neighborhood are usually familiar with each other and enjoy various offline gatherings, which is determined by the traditional unit compound relationship network.

Harbin's urban planning and architectural style are worth introducing. Harbin has always been known as "Little Paris of the East" and "Moscow of the East". The original urban form of Harbin was planned by Russian architects, and many of the buildings here have distinctive Baroque and Rococo styles. The urban planning of Harbin follows Howard's idea of a garden city, with the whole city centered on Nicholas Cathedral and the roads radiating out. The local people combined the western architectural style with the local traditional architecture and invented a new style -- Chinese Baroque.

In short, Harbin is a famous historical and cultural city with Chinese and Western characteristics. It is the old industrial base of China and the political and economic center of northeast China. It has its own value in primary and secondary industries, although it faces slow economic growth and a population loss.

3. Method

The questionnaire survey is the main research method in this study. In order to identify the focal points of conflicts in public space in residential areas in the post-COVID-19 era, a nationwide survey was firstly conducted by collecting 301 questionnaires. Next, a questionnaire for residential commercial streets especially was conducted. The content of the questionnaire mainly covers people's activities and habits in the residential commercial streets, changes in behavior before and after the epidemic, attitudes to epidemic prevention measures, and views on infrastructure. The questionnaires were distributed separately in Harbin and Haikou, with the same contents. The data collection is mainly using the Questionnaire Star platform, and partially data were collected from the paper questionnaires.

In order to investigate the specific situation in the public space of residential areas in Haikou City, a total of 108 questionnaires were issued. The questionnaires were distributed mainly in Haidian Island, Qilou Arcade Street and Shuixiang entrance of Haikou, which are in the old city. Questionnaires were distributed at random on weekends, mainly in the form of the Questionnaire Star platform. The respondents were mainly from surrounding communities, with more young and middle-aged people and fewer children and elderly people.

In order to investigate the specific situation in the public space of residential areas in Harbin City, 112 questionnaires were issued. The distribution place of the questionnaire is mainly in the old city of Harbin—Nangang District. The questionnaire was distributed randomly on three main commercial roads in residential areas (Company Street, Songhua Street, and Post Office Street), mainly on weekends, in the form of Questionnaire Star platform and paper. The respondents are mainly residents of residential areas around the road, and the age composition is mainly elderly and middle-aged, with fewer children and young people.

4. Results

4.1 Haikou City

The survey results show that 50% of people prefer to go to the commercial street together with two or more people, accounting for nearly 90%, and only 11.11% of residents like doing this alone. In addition, this study analyzed people's activities in the commercial street according to the questionnaire. They would like to choose to visit retail stores, restaurants, cafes, bars, gyms and other places in the commercial street, among which restaurants and retail stores are most popular with the people of Haikou.

The main contact activities are roughly divided into chatting with waiters, physical contact during cash payment, dining with friends and buying goods. Among them, 72.22% of the respondents said they would contact people through the latter two activities. As most of the commercial streets in Haikou City are equipped with an external table layout, people traveling together tend to eat outdoors with good ventilation. The survey result shows that 27.78% of people stay in the commercial street for 30 minutes to 1 hour, which is just consistent with the dining time. As for people's epidemic

prevention behavior and epidemic prevention facilities, 22.22% of people never disinfect their hands before entering the bottom business, 66.67% disinfect occasionally, and only 5.56% disinfect every time. The most important thing in epidemic prevention behavior is to maintain social distance. The respondents obviously don't pay attention to it. Nearly 80% of them said that their social distance is within 1.5 meters, and 88.89% of residents agree that it's really difficult to maintain an appropriate social distance in commercial areas. The negative fact is that 44.44% of residents do not wear masks when traveling. Because of this, 33.33% of people think that shopping in the commercial street in cool autumn is more enjoyable than in summer.

A total of 66.67% of people are dissatisfied with the epidemic prevention facilities in the commercial street. 71.43% of the respondents said that the distribution points of masks should be increased, and the facilities such as thermometers and thermometers are also in people demand. Affected by the epidemic, many changes have taken place in the mode of transportation for people to commercial streets. For example, 33.33% of residents will take public transport buses before the outbreak, while 66.67% of residents will walk after the outbreak, and 39% of people choose a bicycle.

Since 2019 when COVID-19 swept the world, China has been greatly affected by the whole world. However, Cohen researched the weak resistance of the virus to the outside world and its sensitivity to heat [6]. Therefore, the epidemic situation in hot Haikou is not serious in China. People are still keen to travel together on weekends and holidays, and the public space in the city is constantly springing up like bamboo shoots after rain, but this is not conducive to the smooth progress of epidemic prevention.

4.2 Harbin City

The survey results show that 50% of people would like to go to the residential commercial street alone, and 37.5% of residents like to go to the commercial street with only one person. Only 12.5 percent of respondents like to go to a residential commercial street with more than two people. Some possible activities such as retail stores, restaurants, cafes, bars, gyms and other places, among which restaurants and retail stores are most popular with the people of Harbin.

According to this questionnaire, 75% of respondents have made physical contact with store employees while handing over goods. More than half of the respondents have a lot of contact with people around them while eating in restaurants. It's worth noting that in Harbin, 35% of residents like to chat face to face with shop assistants. As for the duration of people’s activities, all respondents spent less than 30 minutes in residential commercial streets. Among them, 43.75% of residents like to spend 5 to 10 minutes in the commercial streets. Next, only 12.5% of respondents often or always disinfect or wash their hands before entering a store. Fifty percent said they occasionally clean their hands, while the remaining 37.5% never clean their hands. Then it comes to masks, 43.75% of respondents like wearing masks in this area. Another 25% do not like wearing masks, but still wear them, whereas 18.75 % do not like and would not wear masks.

From the results of the questionnaire, 93.75% of respondents said it is difficult to maintain social distance from people around them on commercial streets. 62.5% of people do not deliberately keep 1.5 meters of social distance from others. Especially, about half of restaurant diners are often less than 1.5 meters apart. 75% of the respondents agree that the infrastructure in the commercial streets is good, but 62.5 percent think there is a lack of quarantine facilities. 62.5% of people said the ventilation in stores is general. When it comes to what kind of quarantine facilities people want to put around the streets, the most popular request is to increase the number of mask-dispensing machines and disinfection facilities, to 60%. From the point of view of transportation mode, people prefer to walk to residential commercial streets before and after the epidemic. 56.35% of respondents said they like to eat indoors, and 87.5% of respondents would like to eat on the pavement of the street in spring and summer, which remained unchanged before and after the pandemic.

5. Discussion

5.1 Commonalities And Differences

5.1.1. Commonalities

The common problems of Harbin and Haikou are mainly reflected in road conditions, cultural customs and epidemic prevention facilities.

First, the composition and scale of residential streets in Harbin and Haikou are similar. The streets around residential areas are generally composed of two motor vehicle lanes, two sidewalks and green belts, and both lack non-motor vehicle lanes. The width-to-height ratio of streets in the old city is mostly between 1 and 0.5, which is more suitable for residents to communicate and walk, with a certain sense of closure and privacy. The first floor along both sides of the street is generally commercial and open for a long time. The sidewalks have the phenomenon of temporary commercial activities, which are called morning markets and night markets, concentrated in the morning from 6:00 to 8:00 and the evening from 5:00 to 7:00.

Second, people in Harbin and Haikou share the same cultural identity, there are a lot of Harbin people go to Haikou for the winter holiday. According to the survey, each year during the winter, people in northeast of China who migrate to Hainan for the winter is close to 2 million, most of them coming from Harbin. This makes the cultural customs of the two places intermingle. The people of Harbin and Haikou are both very warm and sociable, although Haikou is more lively, probably due to its hot climate and open economy. The character of people in Harbin and Haikou leads people to like to communicate with others in the residential commercial space, the social distance between people is shortened, and everyone is eager to have a better image and harmonious atmosphere in the community.

The epidemic prevention facilities in Harbin and Haikou are not perfect. Both Harbin and Haikou lack professional entry-type temperature measuring doors, and many places do not have temperature measuring facilities such as temperature measuring guns. Moreover, both places lack machines to issue or purchase masks, and there is no special disinfection area. Many stores simply check the health code and allow customers to enter, causing a lag in quarantine and affecting people's experience of business activities. The inability to obtain masks and disinfect people on time increases the risk of infection once a positive patient enters the area, and as people in the area further spread, the disease can spread throughout the city. Epidemic prevention and disinfection must be carried out on the spot, and work must be done at both ends to prevent the epidemic from entering and spreading out.

5.1.2. Differences

Haikou and Harbin have significant differences in three perspectives including climate, culture, and architectural style, leading to poor epidemic prevention situations in the two cities.

The climate is undoubtedly one of the most striking differences between the two cities. From a geographical point of view, the two latitudes differ by 25 degrees. Harbin is located in the northernmost province of China, and Haikou is located in the southernmost province. The annual average temperature in Harbin is only 5.6 degrees Celsius, which is only one-fifth of the annual average temperature in Haikou. Furthermore, the annual temperature span of Harbin and Haikou is also very different. The annual temperature span of Harbin, located in the high latitude region, exceeds 60 degrees Celsius and reaches 64.9 degrees Celsius, which is more than twice that of Haikou. The annual temperature span of Haikou is only 27.7 degrees Celsius, the temperature is stable throughout the year, and the temperature difference is small [7]. Therefore, the difference in climate has caused the individuals in Haikou are not used to wearing masks, and the residents in Harbin have shortened their social distance, which is both not conducive to the epidemic prevention effect of the two cities.

In addition, although the people of Haikou and Harbin are warm and cheerful, they have each other's regional cultural characteristics. The urban culture of Haikou is a mixture of styles from South China and Southeast Asia. The old arcade street is a typical representative of Haikou's historical and

cultural blocks. Here, people have the habit of gathering on the street to drink "morning tea" and "daddy tea", which is the cultural memory and connotation of Haikou [8]. Harbin, located on the northern border of China, also has the shadow of a dual culture. According to the research of Zhang, at the beginning of the 20th century, the arrival of the Russian diaspora enriched the development of Harbin city and formed a diverse cultural custom [9]. For example, the people in Harbin are cheerful and enthusiastic, and they can chat with strangers in a short time. It is clear that despite the cultural differences between Haikou and Harbin, both have led to higher gatherings of people in commercial streets, making it difficult to maintain proper social distance.

More importantly, the two cities also have obvious differences in architectural styles. Due to the hot and rainy climate conditions in Hainan, its buildings are mostly set up as semi-closed or semi-open spaces, with colonnade supporting the eaves of the entrance, which belongs to the transition between indoor and outdoor spaces and is conducive to ventilation [10]. Harbin's urban architecture combines traditional Chinese northern blocks and European Baroque styles [11]. In the early years, in order to develop small-scale production and promote urban development, and at the same time influenced by the culture of Russian expatriates, Harbin's unique and multi-street system was thus formed. Although the architectural styles are different, the overall structure is dense. This is not beneficial to epidemic prevention and control, but accelerates the spread of the virus.

5.2 Suggestions

Based on the commonalities and differences between Hainan and Harbin, three suggestions related to city public space designs and environment are proposed.

5.2.1. Modular Design

Considering the little space of residential streets and crowded shops in Hainan and Harbin, the modular design of street businesses is carried out to increase the functions of shops and stores. It is flexible business module and the functions of street businesses can be changed according to the different development stages of the epidemic. Functionality changes are not arbitrary, but based on the infrastructure of different modules. For example, the deck chairs could be used in different commercial situations (Figure 1). It could be used in the dental clinic, the barbell chair in the fitness room, and in the barbershop. Therefore, this module can handle these three different functions. Similarly, shelves can perform different functions in different situations. Before the pandemic, shelves served as store shelves; during the epidemic, shelves can be used by logistics personnel, after the outbreak subsided, the shelves could be used as bookshelves. It means that the functions of these identical elements could be changed and then serve the surrounding residents anytime and anywhere.

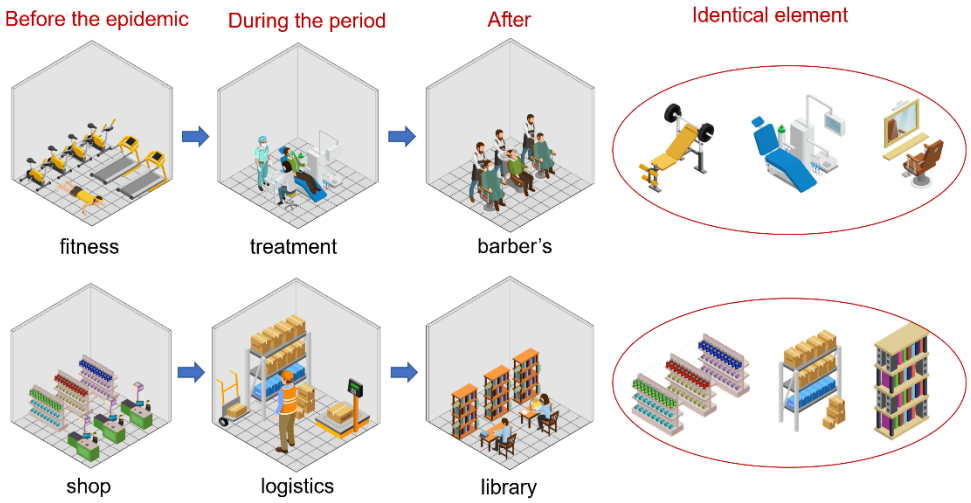


Figure 1 Modular flexible design

5.2.2. Improving Transport System

Similarly, residential streets can be undertaken the flexibility design by artificial control. It can increase the proportion of pedestrians in the epidemic. When the epidemic is serious, streets can be used as activity places for local residents, or in some old communities lacking public space, streets can be used as places for emergency prevention and control (Figure 2).

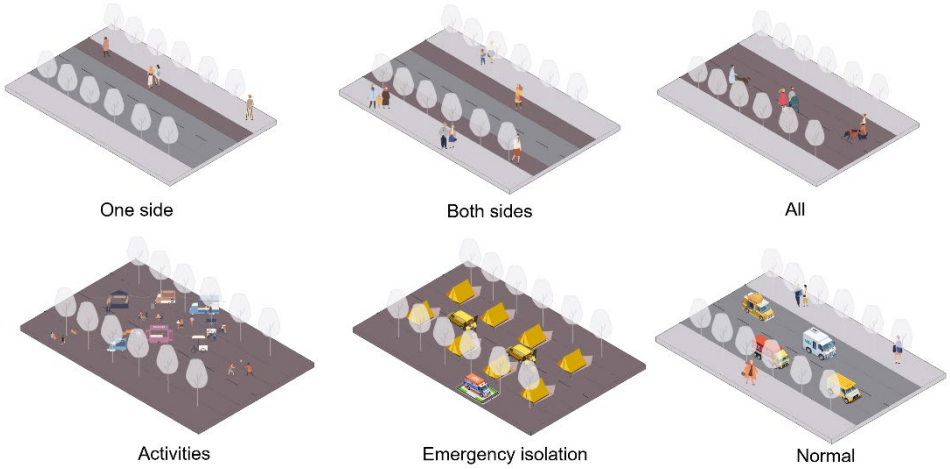


Figure 2 Improving transport system

5.2.3. Green Belts

Building more street parks and combining their functions with shops could effectively control people's activity track in the residential commercial street. Through the green plants and facilities of the park, people can keep enough social distance. Street parks should play the role of greening, catering, social and commercial auxiliary. They constitute the main body of commercial roads in post-epidemic residential areas, together with the flexible modular street commerce (Figure 3).

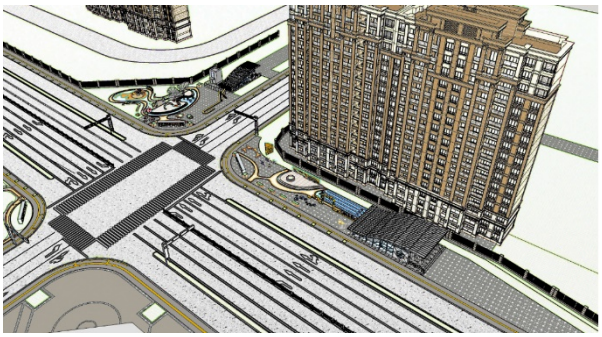


Figure 3 The whole view of the street

6. Conclusion

This study selects Haikou in southern China and Harbin in northern China, investigates their current situation in external residential and commercial street public areas as well as people's behavior during the period of Covid-19, and discusses their prevention effects during the epidemic period.

People in Haikou prefer to go out in groups by public transport and do not pay attention to maintaining social distance. They tend to eat and chat outdoors in commercial streets. When they enter the shops inside the commercial street, most individuals do not have good epidemic prevention habits, such as hand disinfection and wearing masks. From the view of Harbin residents, they prefer to walk alone to commercial streets in residential areas. Restaurants and retail stores in public spaces are their frequent destinations. In particular, the enthusiastic Harbin people like to chat with shop assistants and do not pay attention to maintaining social distance and wearing masks.

The commonalities and differences between Haikou and Harbin lead to their poor epidemic prevention situations. Their commonalities are mainly reflected in three aspects: road conditions,

cultural identity and epidemic prevention facilities. In terms of the composition and scale of residential streets, they are very similar and belong to the old city streets with a certain sense of closure and privacy. In addition, many people from Harbin often go to Haikou for vacation. The residents of both places are warm and cheerful and have similar cultural identities. However, from the perspective of epidemic prevention, the facilities in these two places are not perfect, and there is a lack of professional temperature measurement doors, disinfection areas and emergency isolation cabins.

Haikou and Harbin have significant differences in climate, cultural practices and architectural styles. The average annual temperature of Haikou, located in the tropics, is five times that of the high-latitude city Harbin, one in the southernmost part of China and the other in the northernmost region of China. In terms of cultural customs, although the residents of both places are hospitable, the urban culture of Haikou is a mixture of southern China and Southeast Asia, while Harbin is a mixture of Russian and northern Chinese cultural customs. Haikou is characterized by the arcade architectural style, and Harbin combines the traditional Chinese northern block with the European Baroque system.

In order to improve the epidemic prevention effect, keeping the social distance in public areas is very essential. Combined with the commonalities and differences between the two cities, three improvements have been proposed. A flexible modular design is raised, so that the function of the ground floor store changes with the change of the epidemic situation. In addition, it is desirable to widen sidewalks, implement the policy of "vehicles give way to pedestrians", improve the transportation system, and increase isolation points. Finally, it is also to increase the green belt on the street to isolate the gathering crowd.

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