

# Research on Pedestrian Space Design Strategy under the Background of Low-Carbon City -- Taking the Central Area of Kunming as An Example

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**Keywords:** Low carbon city, Healthy living, Pedestrian space.

**Abstract:** As the main area of greenhouse gas emission in China, the construction of "low-carbon city" is particularly important in the research and discussion of urban design methods. The concepts of low-carbon city and healthy life complement each other in the process of urban operation. The choice of low-carbon travel mode is based on the guiding effect of good space design on human behavior. In urban design, good pedestrian space design can lead to higher probability of pedestrian activities. Rapid urbanization has brought a noticeable impact on urban ecology and pedestrian environment, one of which is that pedestrian space is repeatedly sacrificed. Taking the old urban area of Kunming as an example, this paper makes a field investigation in three areas to explore the practical problems existing in pedestrian space in urban development, so as to seek solutions.

## 1. Low carbon city and healthy life

China low carbon eco city development report 2020 points out that under the transformation of the concept of ecological civilization construction, low-carbon cities need to achieve energy conservation and emission reduction, eco-friendly, build urban resilience and create a healthy microclimate environment, which is an important means of ecological civilization construction. China strives to achieve "carbon peak" in 2030 and "carbon neutralization" in 2060. In order to achieve this goal, cities must achieve low-carbon sustainable development. As the main area of greenhouse gas emission in China, the construction of "low-carbon city" is particularly important in the research and discussion of urban design methods.

The new urban residential area standardizes the concept of urban life circle and advocates that the basic needs of life can be met within the reach of certain walking activities and slow traffic. In addition, after the outbreak of New Coronavirus, the country has been more active in promoting healthy living and healthy city. This series of changes has brought impetus to the development of pedestrian space and its connected external public activity space.

The concepts of low-carbon city and healthy life complement each other in the process of urban operation. The choice of low-carbon travel mode is based on the guiding effect of good space design on human behavior. This requires that the urban pedestrian space should provide people with a space for walking, leisure and entertainment, gathering activities, physical exercise and other activities. Therefore, the capacity of sidewalks, city squares, green parks and other urban pedestrian spaces to accommodate health activities is becoming a new criterion to measure the quality of urban pedestrian space.

## 2. Pedestrian space design

Walking is the most basic travel mode of human beings. It is a healthy, low-carbon and low-cost activity mode. By walking, human beings can not only strengthen their physique, but also get in touch with the city, feel the city culture and promote social activities. In urban design, good pedestrian space design can lead to higher probability of pedestrian activities.

However, in the process of urban development, rapid urbanization has left behind a large number of urban diseases, one of which includes the early automobile traffic oriented urban traffic

construction, which has brought a non-negligible impact on the urban ecology and pedestrian environment. Pedestrian space has been sacrificed repeatedly, which is the most easily ignored space.

### 3. Taking Kunming as a case study

This phenomenon is particularly prominent in the old urban area of Kunming. It is difficult for people to have a smooth and safe walking experience. Therefore, this study selects three representative areas in the old urban area of Kunming for research, which are centered on NanYa Business District, Tongde Plaza business district and Henglong Plaza shopping district, with a radius of one kilometer.

The pedestrian space is divided into point space and linear space, including: (1) Point type- whether the public space (square green space, park, street, etc.) is commercialized, paid, difficult to use, can only be viewed from a distance, etc. (2) Line type - whether the pedestrian space is sacrificed, whether it is safe, and whether the scale is reasonable.

#### 3.1 The area around NanYa business district

Investigate the plots around the South Asian style city and within 1.5km of NanYa area. A large number of motor vehicles and bicycles are parked on the sidewalk. The scale of sidewalks in some sections is too small to meet the daily traffic needs.

According to the survey, some sidewalks are full of shared bicycles and motor vehicles, occupying people's pedestrian space. It is very inconvenient to walk, and the environment is chaotic and uncomfortable.

Some sections can't even find sidewalks, and pedestrians can only pass through the roadway, which is of great danger.

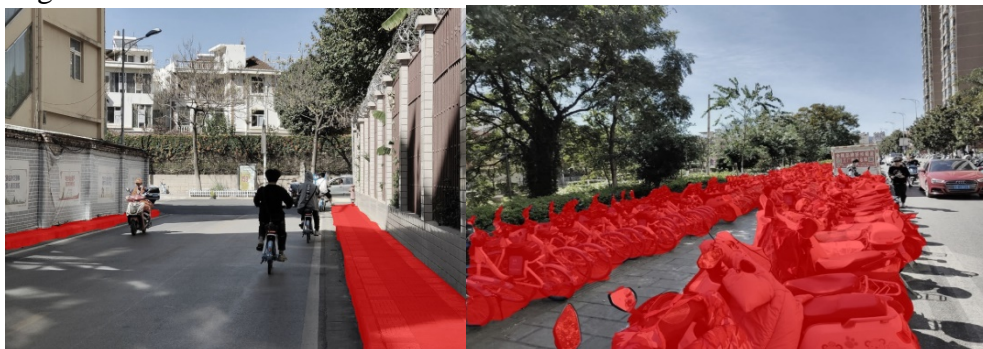


Figure 1. The sidewalk is too narrow and occupied

The sidewalk is too narrow and there is a broken road, which cannot be passed on foot.

In addition, the commercialization of the public square connected to the sidewalk is more serious, and the shops in the commercial area occupy a lot of public space. It makes the public space smaller and pays for it, which loses the original meaning of public space.

#### 3.2 The area around Tongde square

In the early stage, baidu map was used to preliminarily understand the green space of the plot to be investigated. There are 50 large-area green spaces in the plot, of which 4 under the Jinxing overpass are protective green spaces.

(1) According to the size of the green space area, the green space in different ranges is divided. The basis for the division is that the green space with a service radius of 500 meters is a centralized public green space with an area of more than 5000 square meters; The green space with a service radius of 300 meters is a public green space with an area of more than 2000 square meters and less than or equal to 5000 square meters; The rest is dotted green space with a green area of less than or equal to 2000 square meters.

(2) According to the rough area measurement, taking Tongde square as the center and with a radius of 1km, there are 50 green spaces in the area. Among them, there are 10 green spaces with an area of more than 5000 square meters, 4 protective green spaces near Jinxing interchange, 16 green spaces

with an area of more than 2000 and less than or equal to 5000 square meters, and 20 green spaces with an area of less than or equal to 2000 square meters.

(3) Through the comparison between green space and house price, we find that the distribution of green space is more concentrated in areas with better living quality, which shows that green space and living quality are interrelated.

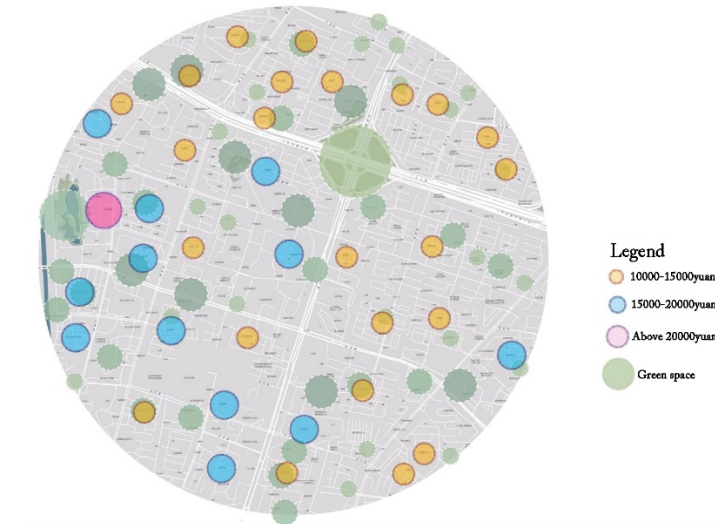


Figure 2. Map of park area

### 3.3 The shopping area of Henglong Plaza is the plot around the center

(1) The main function of sidewalk is to meet the needs of pedestrian traffic and does not affect the driving of road traffic flow. When the sidewalk is occupied and there is still a width for pedestrians to pass through, the space for pedestrians to pass becomes smaller, the walking of pedestrians is limited, the speed is reduced, and the comfort is reduced. When the sidewalk is completely occupied, pedestrians use the outermost carriageway to bypass the occupied pedestrian road section, which directly conflicts with vehicles. The driving of vehicles poses a threat to the safety of pedestrians and makes people feel afraid. The safety of pedestrians is not guaranteed. When the sidewalk is fully occupied, pedestrians occupy the roadway, which reduces the traffic capacity of the road, reduces the driving speed of vehicles and increases the driving delay.

(2) The roads around the park are one-way streets, only 3 meters, mixed with people and vehicles. There is no place for people to visit on the side near the river. The lane occupied by vehicles can be seen everywhere inside. There are no parking spaces and no underground parking spaces. Most sidewalks are occupied by non-motor vehicles. There is no serious commercialization in the park, which can be used for people to play and rest. The service radius of Jinniu Park and Camellia Park is 500m, the surrounding service facilities are complete, the internal environment is good, there is no serious commercialization, and the problem of road occupation by vehicles still needs to be improved.



Figure 3. Parking occupies sidewalk

## 4. Results

In general, there are the following major problems in the pedestrian space in the old urban area of Kunming

**4.1** Pedestrian vehicle conflict, a lot of limited walking space. In order to meet the development of automobile traffic, the roads in most cities are continuously widened, from two lanes to four lanes and from four lanes to six lanes, striving to create more convenient conditions for motor vehicle travel, and sacrificing walking space to preserve the scale of carriageway; Large scale planning leads to improper block scale and reduces the possibility of walking on the block. With the increase of residents' travel distance, owning and using private cars has become a rigid demand, and walking activities are gradually reduced due to space discomfort.

**4.2** Non motor vehicle and pedestrian space are mixed, and pedestrian safety is poor. Due to the characteristics of Kunming city scale, electric vehicles have become the first choice for a large number of people to travel. In addition, the popularity of shared electric vehicles and low cost has led to a sharp increase in the number of trams and bicycles. In order to meet the demand of non-motor vehicles without affecting the driving of motor vehicles, a large number of non-motor vehicles are mixed with sidewalks in the old urban area. Or, place a large number of non-motor vehicle parking spots in the sidewalk, greatly squeezing the original pedestrian space.

**4.3** The design of pedestrian space is single and the content is boring. The prominent contradiction between people and vehicles and unclear functions lead to the continuous decline of the safety and comfort of urban pedestrian space. In addition, the lack of activity facilities reduces people's willingness to travel on foot and the time to stay outdoors. Therefore, more and more urban pedestrian spaces have lost their spatial attributes as the carrier of social communication and public activities, and become pedestrian channels only as a single function of "passing". It also affects the coherent design of public activity places such as squares and parks. However, with the reduction of functional complexity, the activity places are difficult to meet the activity needs of all kinds of people, further weakening people's willingness to participate, resulting in the continuous low vitality of the space.

## 5. Conclusions

The quality of pedestrian space affects the living habits of residents. Good pedestrian space design can promote residents to participate more in walking and social activities, which is conducive to the formation of a healthy social environment. In view of the current problems such as unsafe, unsmooth, need to pay and unsmooth pedestrian space and connected public space, we hope to attract more attention in future urban design and solve the actual needs of each region according to local conditions.

## Acknowledgements

This work was financially supported by Yunnan Provincial "Fang Guanfu" Scientific research foundation project in 2019, which named<A research on the impact on public from "Gentrification" of urban space, take the downtown of Kunming as an example>, NO. 2019-1-C-25318000002159.

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