# The pedestrian and cycling planning in the medium-sized city: a case study of Xuancheng

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**Abstract.** Walking and cycling are important component in the urban transportation, residents' life and leisure activities, especially in the medium and small cities. Improving the pedestrian and cycling environment is important, and the pedestrian and cycling planning plays an important role in the process. A pedestrian and cycling planning is introduced in this paper, taking Xuancheng, a medium-sized city as an example. Basing on the analysis of the existing conditions and issues of walking and cycling in Xuancheng, and considering the requirement of residents and the visions of upper level plannings, the planning goals including safety, priority and vibrancy are proposed as well as five objects to support these goals. Then, the planning strategies and actions including structure planning, differentiation district control, important district improvement, public transit access and advanced design guidelines are introduced in detail. At last, some suggestions are given to the planning implementation and management.

## Introduction

Walking and cycling are increasingly recognized as important forms of transportation in China. All people are pedestrians at one time or another, even those who generally use other modes of transportation, such as automobiles or transit. Walking and cycling are important in making intermodal connections as well as being travel modes of themselves. Many other benefits, including travel choice, affordability, reduced road congestion, infrastructure savings, improved health, recreation and enjoyment, environmental protection, are brought to users and nonusers alike by walking and cycling.

A good pedestrian and cycling planning in urban areas would create a more pleasant urban environment and encourage people to walk or cycle. The pedestrian and cycling planning provides a comprehensive vision for improving walking and cycling conditions. The purpose of the planning is to define an approach for the development of a safe, convenient and effective system that requires walking and bicycling as viable transportation options connecting work, shopping, residential, and recreational uses. The planning is also crucial in the plan to project delivery process. Success in construction of pedestrian and cycling facilities will only take place through good plan-to-project delivery process.

Chinese cities traditionally rely on walking and cycling daily travel, and many cities still have relatively low motorization levels despite the current surge in personal vehicle ownership. In the medium and small sized city, the pedestrian and cycling are very important in all forms of

transportation, while the mode share of these two forms are always more than 60% in the whole transportation [1]. A good pedestrian and cycling planning can help the city become pedestrian and cycling friendly. Taking Xuancheng as an example, the main contents of the pedestrian and cycling planning are introduced in the paper to provide good reference to other medium or small size cities in China.

## Existing Conditions and Issues

Xuancheng is a medium-sized city in the Anhui Province, which is in the middle part of China. The population was 2.76 million and the total area was 12340km$^2$ in 2010. The per capita GDP was 21 thousand Yuan. In the central city which is the planning area, the population was 0.43 million. The total area was 565.5km$^2$ and urban construction area was 65km$^2$ in 2010.

The city recognizes that walking and cycling are currently more inconvenient than ever and dangerous than necessary, which causes unnecessary injuries, discourages non-motorized travel, and imposes economic costs on the community. The city therefore seeks to make walking and cycling safer and more convenient.

According to resident travel survey made in 2010, 39.7% of trips in the city were made by walking, and 23.7% were made by cycling. Walking and cycling are key forms of transportation in the city, especially through neighborhoods, around schools, and in business districts.

The planning is based on an assessment of walking and cycling network and a survey of the city's existing walking and cycling conditions. The identification of problems is fundamental in clarifying the goals and objects. The problems are always at different geographical levels, such as districts and local levels, and in various aspects such as connectivity, capacity, safety and comfort. In Xuancheng, four main problems are existed for the pedestrian and cycling:

(1) The right of way cannot be guaranteed which causes the safety of pedestrians and bikers are affected. In some roadway, the widths of sidewalks and bike lanes are too narrow to satisfy the demands for passing or activities. For another reason, the sidewalks and the bike lanes are always occupied by parking because of lacing parking space in the central city. The pedestrians have to walk with bicycles and the bikers have to ride with the automobiles;

(2) Crossing the road is difficulty and unsafe in some districts. The traffic signals in most intersections are two phase controls. The pedestrians or bicycles are in conflict with the right-turn automobiles when crossing the intersection. These phenomena are unsafe especially in some intersections around the schools or kindergartens. In addition, the crosswalks in the roadways are always not enough to meet the crossing demand for pedestrians or located in the improper places, for example, too far away from the bus station or the school;

(3) The number of bicycle parking facilities is insufficient, especially in the commercial area, around the hospital or school. Radom bicycle parking always affects the passing of pedestrians and other bicycles;

(4) Xuancheng is a landscape garden city and filled with a lot of hills and rivers. But the waterfront space and the green space are not treating well to supply walking or cycling space for exercise, relaxation and recreation.

## Planning Goals and Objects

When setting the goals of the pedestrian and cycling planning, the requirements of residents and the visions of the upper level planning, including the city general planning, comprehensive transportation planning and other related plannings should be considered. The pedestrian and

cycling planning of Xuancheng includes three goals, i.e. safety, priority and vibrancy, to make a friendlier environment for walking and cycling. Then five objects are proposed to support the goals:
(1) Create vibrant public spaces that encourage walking and cycling;
(2) Plan, design, and build pleasant streets to meet the demand of pedestrians and bikers;
(3) Improve the connectivity of the existing pedestrian and cycling routes;
(4) Reduce the number and severity of vehicle crashes involving pedestrians and bikers;
(5) Get more people walking for transportation, recreation, and health.

**Planning Strategies and Actions**

Appropriate strategies and actions are developed to achieve these objects. The strategies and actions include space structure planning, differentiation district control, important district improvement, public transit access and advanced design guidelines.

**Space Structure Planning.** The macro pedestrian and cycling spaces includes corridors and nodes. The nodes are the plazas and parks. The corridors are the linear space combined with roadways, hills, rivers, and landscape green belts, which always have good landscape and high quality space for walking and cycling for travel and leisure.

In Xuancheng, twelve plazas and parks are planned with a total area of 4.19km$^2$. Three kinds of pedestrians and cycling corridors (total six corridors) are planned, including four waterfront corridors, one hill-city-lake corridor and one city form corridor as Fig.1 shows.

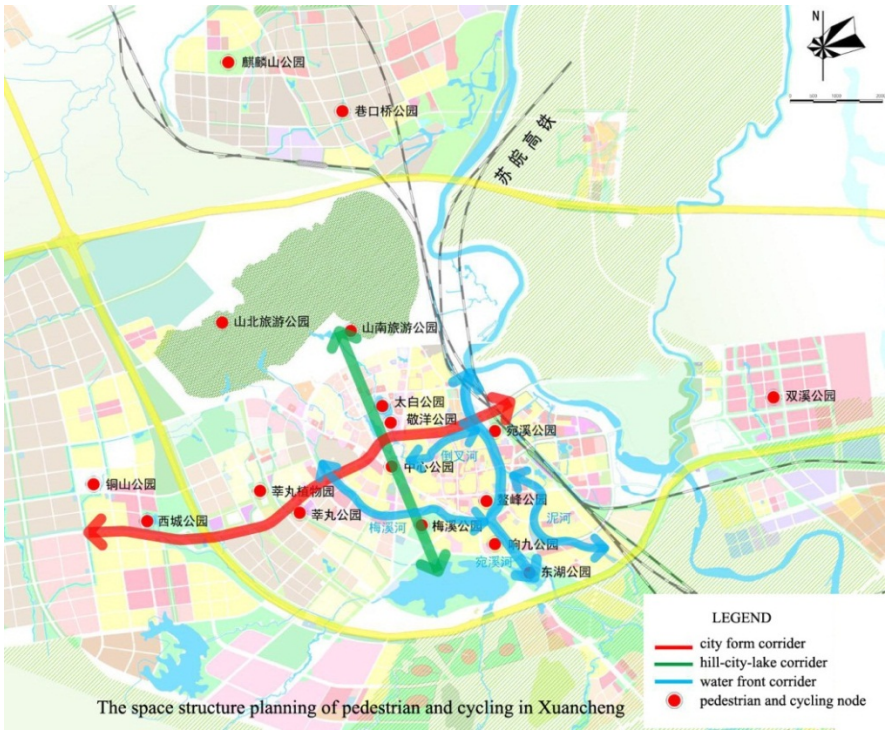


Fig. 1 The space structure planning of pedestrian and cycling in Xuancheng

**Differentiation District Control.** Not all districts in Xuancheng have the same level of demand and the built environment. This strategy is to match the planning standard of pedestrian and cycling facilities to the demand in the different districts.

The standards are reviewed which are used by city departments that affect walking and cycling conditions. According to the preference survey to the pedestrians and bikers, the new planning and design standards for pedestrian and bicycle facilities (e.g. bike lanes, sidewalks and crosswalks) are established. In the old city, all the roadways have already been built, the work is to reallocate the road space to satisfied the demand of pedestrian and cycling. In the new districts, minimum width

standards for pedestrian and bicycle facilities (e.g. bike lanes and sidewalks) are proposed which should be obeyed in the roadway planning and design, because most of the roadways are not implemented. The standard of the distance between adjacent crosswalks is reviewed too. The standard mainly depends on the road hierarchy, the land usage and the crossing demand as the Table 1 shows.

Table 1 The distance between adjacent crosswalks in the roadways (m)

| Land usage/ intensity | Residential, administration and public service | | Commercial and business facilities | | Regional transportation | Green space | Industrial, logistics and warehouse |
|---|---|---|---|---|---|---|---|
| | high | normal | high | normal | | | |
| Secondary Road | 200 | 250 | 200 | 300 | 300 | 300 | 400 |
| Major Road | 250 | 300 | 250 | 350 | 350 | 400 | 500 |
| Express Way | 300 | 350 | 300 | 400 | 400 | 500 | 600 |

**Important District Improvement.** The old town is chosen as the important district to do detail planning for two reasons: (1) the agglomeration of pedestrian and cycling demands; and (2) the most deficiencies of the built pedestrian and cycling facilities. The fundamental issue is how to reallocate space to meet the pedestrian and cycling needs efficiently while maintaining proper vehicular space for parking, local access and through movement, how to systematically retrofit currently deficient of sidewalks and bike lanes, and how to give the pedestrian and bicycle more routs.

In the old town pedestrian planning, except the traditionally pedestrian space, namely the roadway sidewalks, the walkways in the streets and alleys are planned and the corresponding traffic management strategies are proposed to guarantee the walking space. The waterfront walkways and pedestrian bridges are planned combing with the waterfront urban design as Fig. 2 shows.

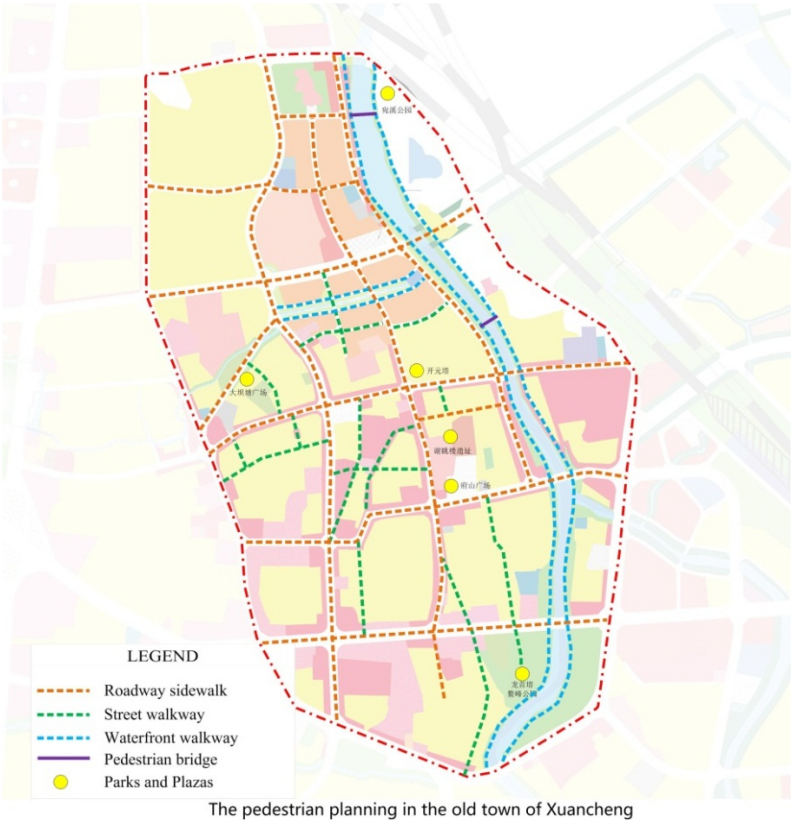


Fig. 2 The pedestrian planning in the old town of Xuancheng

In the old town cycling planning, the bike lanes are classified in isolated bike lane, mixed bike lane and street and ally bike lane. The bike lanes with high bicycle volume are physically isolated with the automobiles, and the street and ally bike lane are proposed to supply more passing space. The on road parking is also coordinated with the bike lane planning.

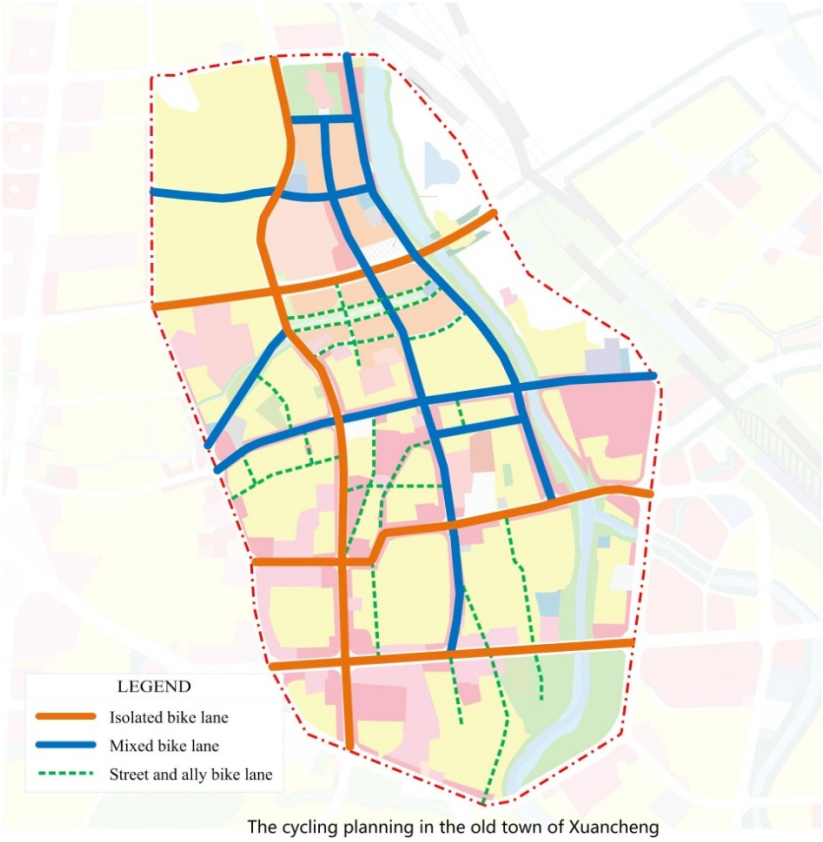


Fig. 3 The cycling planning in the old town of Xuancheng

**Public Transit Access.** Accommodating the pedestrian and cycling with the public transit can convenient residents and increase the public transit ridership. Three actions are proposed: (1) make all bus stops conveniently accessible by waling and cycling; (2) integrate cycling into the public transit system by supporting enough bicycle racks and parks; and (3) promote smart land use development surrounding transit facilities to enhance the environment for walking and cycling.

**Advanced Design Guidelines.** The purpose of advanced design guidelines is to regulate the basic pedestrian and cycling facility design principle and method. The guidelines will provide technical guidance to planners and designers. The design guidelines are not only focus on the transportation function of the facilities, but also emphasize the qualities of the environment, shown in Fig. 4.

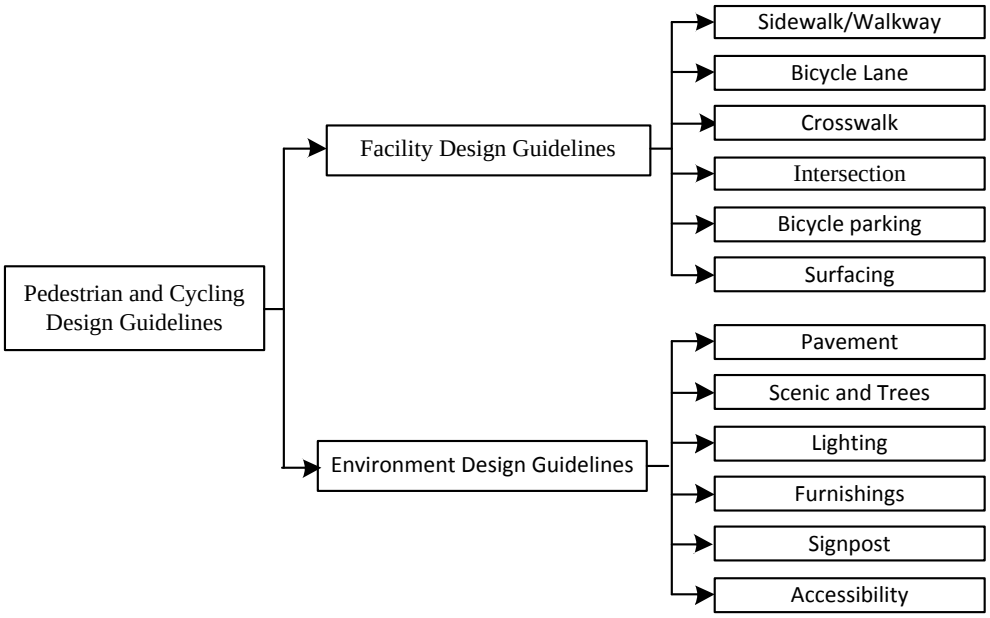


Fig. 4 The content of pedestrian and cycling design guidelines

## Conclusions

The pedestrian and cycling planning plays an important role to improve the pedestrian and cycling environment. However, whether a plan, project or program will lead to an improvement of pedestrian and cycling environment, to a large degree, depends on the policy makers and plan executors. The city ought to prioritize the pedestrian and cycling facilities expenditures, based on the reasonable assessment of the funds, obey the standards and the schemes of the pedestrian and cycling planning in implementation.

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