

Slow Traffic System Planning Should Pay Attention to Several Issues in Central Area of Cold Region—Take Harbin for Example

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Abstract. Starting from the definition of slow traffic system, taking Harbin for example, and by analyzing the characteristics and trip features of slow traffic system in cold region, the paper proposes that the central area should increase the pedestrian streets and underground warm gallery in cold city to improve walking environment in winter. At the same time, the paper puts forward that road cross-section planning and design should emphasis focus on the safety of non-motorized mode, and proposes specific measures, such as setting limited time of non-motorized vehicle lanes, slow integration design of non-motor vehicle lanes and sidewalk.

Introduction

In cold region, the winter that has large snowfall, short daytime and long night is long and cold. The outdoor season usually lasts six months or six months following. The negative impact of climate cold city is manifested in many ways. Climate has a significant impact not only on the residents travel, the city traffic, but also on slow traffic.

The concept of slow traffic appeared earlier at the Shanghai Urban Transport Development White Paper[1]. Slow traffic refers to is travelling on foot or by bicycle that occupy the highest priority in the green transport system. Specifically it refers to the speed below 15km/h, people-oriented, the focus on equity and sustainable development in close travel modes of transportation. Slow traffic, including pedestrian and non-motorized transport, contains walking, wheelchair, bicycle, tricycle, electric bicycle, car batteries, roller skating and jogging and other various modes of transportation in the broad sense. Because non-motorized transport in many cities is the bicycle traffic, so the main body of slow traffic generally is to walk and bicycle traffic[3].

Domestic and international planning and design to slow traffic often only consider the state of the warm season, neglect of alternating periods of climatic factors and lack planning and design in accordance with the needs of the seasonal characteristics of countermeasures. It leads that slow traffic planning and design in cold region are lack of geographical conditions, climatic characteristics the geographical and cultural considerations and local characteristics. Therefore, walking and bicycle traffic planning and design in cold region must take full account of the climate characteristics of the cold region, reflecting people oriented and the cold city's natural environment, geographical and cultural characteristics.

Research status

In order to reduce the impact of the cold climate of pedestrian traffic and bicycle traffic, many winter cities provide effective climate protection measures to make the residents get more humanistic care, compensation of adverse weather conditions brought negative effect. For example, Toronto and Montreal are famous for huge system of underground public space that is not subject to seasonal effects. St. Paul, the United States and Canada, Calgary, Minneapolis and other cities have vehicle-separation and winter weather protection footbridge trail system. Many European and

American Cold City have also established a large indoor public space, such as indoor public street and indoor activity center and it brings outdoor sunlight, plants, water and other natural factors into indoor by air conditioning technology to make the room warm as in spring. People in these public spaces can still fully enjoy the flowers and lush spring beauty, and completely forget the outdoor ice and snow of winter. There are a number of other climate protection measures. For example, Canadian winter city construct the glass roof of the sidewalk that can open or close according with season and internal heating device of the bus shelters, rest kiosks. Japan, Iceland and other countries in Cold urban construct the sidewalk which can melt the snow and is of the convenience of passers-by walking on. Stuttgart, in 1974-1978, constructed the Kaer Wei indoor pedestrian street. This is the world's first modern indoor pedestrian street.

Slow traffic in China's urban development is slow. Developed cities in the south ,such as Shanghai, Hangzhou, Shenzhen, completed the preparation of the slow transport system planning. However, slow traffic in the cold northern region city system planning studies is still in its infancy and planning for the protection of pedestrians and bicycles in the winter safe and comfortable travel is in the blank.

Slow traffic characteristics and the characteristics of the trips in cold region

Slow traffic characteristics in cold region.

(1) The difficulties of Winter walking traffic

The negative impact of climate on cold city's largest winter is traffic problems. Due to frequent snowfall and not timely clearance, the cold weather makes the road continued smooth and leads to walking slowly. Thus it affects a variety of consumer and leisure activities in the commercial street.

(2) The limited Behavior

In cold region, climate affects people's behavior, including the person's lifestyle and leisure. Winter outdoor temperature is low and a long duration. In order to avoid the cold and traffic inconvenience, people travel is less than that in other seasons, Especially the elderly, children and people with disabilities. Pedestrian street usage is affected. Sunshine time is short and the nightlife of urban public has been greatly affected.

(3) Climate impacting on the way to travel

Winter temperatures are low and the sunshine is short, so non-motorized travel that people choose is greatly reduced.

Characteristics of walking and cycling trips in cold region

(1) Trip distance

By investigating, Harbin summer walking distance is less than 30 minutes and the average trip distance is 1.8 km; winter walking distance is less than 12 minutes and the average trip distance is 0.8 km. In winter, residents' travel time and travel distance drop significantly, decreased by about 60%.

(2) Travel changes in the number

According to the Residents Travel Survey Harbin (2000), summer daily number of trips per capita is 2.2 times; the number is 2.02 times in winter. The resident trip times in winter decreased by about 8% than in summer.

(3) Travel pattern

Comparing city in cold region with any other city, walking and bicycle travel has obvious seasonal characteristics. Generally speaking, walking and bicycle travel are no significant difference in cold region in the spring, summer and autumn. Walking is one of the main modes of travel of the residents. The average walking travel of China's urban residents is 34% and the distance is 1.2km at now. According to the survey in Harbin, walking travel accounts for 37.2% and bicycle travel accounts for 15% in summer. Then walking travel accounts for 25.7% and bicycle travel accounts for 5.7% in winter. It can be seen that the non-motorized travel declines in the proportion of about 25% during up to six months in Harbin.

Pedestrian traffic is necessary from trip starting point to the end, so share rate does not change significantly in winter and summer. And there are three reasons for declined share rate of bicycle traffic:

- (1) With the development of the city, the increased average distance of resident trip is more than the range of the bicycle travel's advantage. Currently, the average trip distance of residents is nearly 7 km in Harbin and greatly exceeds the 5km range of the advantages of travel of the bicycle traffic.
- (2) As the urban infrastructure has improved steadily, cars, regular public transport and rail transport get to great efforts to develop, further reducing the competitiveness of bicycle traffic.
- (3) As people's incomes increase, the travel traffic requires a significant comfort level. In winter, the weather is cold and the pavement is smooth. It leads that less and less people choose the bicycle mode to travel year by year.

Several key issues that need to be addressed in slow traffic planning in Harbin central area

Compared to other cities, Harbin winter is long and climate has a great influence on urban environmental quality and human activity patterns. In winter, people will minimize the number of trips in order to escape the harsh outdoor weather, resulting in reduced time outdoors. Residents in cold region relative to the residents in the mild climate are more eager to have a comfortable outdoor living. Therefore, requirements about the slow system are higher. The slow system is not only the residents' leisure, the main way of exercise, but also the main way of short-distance travel. Slow system is the real green transportation. So, walking streets are essential in the lives of residents in the cold. But at the same time it is also affected by climate and need to be improved.

Cold climate and pedestrian travel

Usually walking travel contains travel behavior and travel environment. From the walking behavior, literature will group walk into four forms: passing behavior, travel / arriving behavior, pause behavior and free movement. And the travel environment contains comfortable environment and uncomfortable environment. Walk behavior is greatly affected by the environment. To improve the walking environment is the focus of planning of the central area in Harbin.

In Harbin, the annual average temperature is 3.6 °C. Harbin central area is divided into seven major functional areas: Fanghong tower square, central avenue business district, O luoba business district, Mai-kai business district, Ha yibai business district, Sofia Leisure Square and Manhattan shopping center. The seven functional areas are relatively independent and are lack of organic walk contact system among them. Walking links between the various functions of the status quo take rely mainly on the ground crosswalk and underground commercial street connection. Because of concentration of people and vehicles in the region, ground traffic walking system is inefficient. Underground shopping street for their own camps, most can only use as a cross-channel. Therefore the region both ground system on foot and in the underground shopping center is without forming a complete set of contact 7 Ribbon pedestrian traffic system.

Measures:

- (1) Perfect ground walking system, improved pedestrian environment

Considering the central street, Mai-Kai shopping mall and 100 Central Avenue area are lack of walk traffic contact system, plan to build Ten West Road walking street(central street-Shangzhi Street). After the completion of the street, it will greatly improve the accessibility of central walk and bring big improvement in walking environment.

- (2) Build underground warm gallery system as the principal centre of winter walking system

Plan to build new underground civil air defense engineering along Shangzhi Street and it will connect nine west road and thirteen west road civil air defense engineering, connect Rail transit Line 2 and Line 3 on line interchange station(Zhao Lin Park Station) and connect Ha100 Shopping Plaza. Plan to build new underground civil air defense engineering along Youyi Street (Tongjiang Street-Shangzhi Street) and it will connect Fanghong tower square, central avenue business district, Ha100 and so on. Plan to build new underground civil air defense engineering along Touloung Street

(Maimai Street-Shangzhi Street) and it will connect Shangzhi Street, Rock Street, Maimai Street and Zhaolin Street civil air defense engineering. It will form underground pedestrian system and contact 7 ribbon pedestrian traffic systems.

Cross section design of roads in winter and in summer

Cross section of road is one of the key elements of the planning. Cross design affects road traffic function of traffic environment with the traveler and to some extent determines the taste and image of the city. Cross section type of road in Harbin city is rich in one, two and three plate's type of cross section. As cities of the growing number of cars, and non-motorized vehicle usage continues to decline, it result that three silver shift gradually to a board. Bicycles give way to vehicles, bike paths being seriously compressed, and there is only one lane. Bike has no independent security driven space and cross section's change shows that the Harbin road function changes to mobile service delivery. Compared to other seasons, Harbin winter bicycle traffic space is greatly compressed. Snow cover over the original narrow passage space and bike has to contend with a motor vehicle, leading to frequent traffic accidents.

Measures:

(1) For characteristics of Harbin, in order to make road function into full play, road cross-section planning should ensure that use on road of travelers in different season, fully reflect the human text.

(2) For all new and rebuilding road, pavement width in accordance with specifications increases by 1 m, as a response to the snow of sidewalks during the winter reservations.

(3) For three panels on the center road, it is proposed to retain its cross section form and increase the sidewalk width. Des Voeux Road Central is set to limit non-motorized vehicle lane (every year from April 1 to November 1), and in the remaining time, it is set to bus lane. Slow bicycle road and sidewalk design use slow integration. Bicycle lanes and sidewalks are designed in the same plane and use bridges between wooden flexible isolation.

(4) Center one plate and two plates of roads use slow integration. Bicycle lanes and sidewalks are designed in the same plane and use bridges between wooden flexible isolation.

Conclusion

Resident's travel in cold region is affected by climatic conditions, especially wind, snow in winter and low temperature environment. So, slow system planning of city in cold region should take full account of the climate characteristics to reflect people oriented and adapt to the natural environment and local culture. It should focus on slow systems of safety, comfort and accessibility and gradually standardize and guide the city facilities to meet travel needs in different ways as far as possible to build harmonious traffic.

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