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Analysis on Influencing Factors of Green Travel Behavior

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Abstract

Although the popularity of automobiles has brought convenience to people's lives, it has also caused a series of serious urban traffic pollution and energy consumption problems, which have seriously affected the living environment of urban economic residents, and even posed a certain threat to their lives. As the most active but unstable factor in the urban transportation system, urban residents guide residents to green travel to alleviate urban traffic problems It is an inevitable measure to build a green urban travel environment. Starting from the serious traffic pollution, this paper lists the characteristics of three green travel modes, analyzes the influencing factors of green travel behavior, and gives corresponding measures and suggestions

Keywords

Traffic pollution; Green travel behavior; Measures and suggestions.

1. Research Background

In the past decade, the number of private cars in China has begun to grow rapidly, increasing by nearly 200 million from 2009 to 2020. By 2020, the number of private cars in China reached 243 million, including 223 million passenger cars, 19.07 million freight vehicles, and 500,000 other vehicles. With the continuous growth of private car ownership in Chinese cities, the exhaust pollution from cars is becoming increasingly severe in urban pollution. According to the Global Energy Authority, the carbon dioxide emissions from cars in China's transportation sector account for about 20% of the total national carbon dioxide emissions, making it the second-largest source of carbon dioxide pollution among all sectors in China. Moreover, the carbon dioxide emissions from road transportation account for about 70% of the total carbon dioxide emissions from the national transportation sector. Additionally, as the ownership of private cars continues to expand, the proportion of car travel will increase day by day. Correspondingly, the total energy consumption of cars will also increase day by day, and the total energy consumption of cars currently accounts for more than 75% of all passenger transport activities. Various studies have shown that cars have the highest energy consumption per hundred kilometers, while the per capita energy consumption of buses per hundred kilometers is 8.4% of that of cars, subways are about 5% of cars, and trams are about 3.4% of cars. The energy consumption of private cars is severe.

In summary, we can know that the choice of residents' travel methods is of great significance for alleviating urban traffic pressure, reducing energy consumption, and decreasing carbon dioxide emissions. In other words, achieving green travel is imperative for cities in China.

2. Analysis of Factors Affecting Green Travel Behavior

2.1. Main Characteristics of Green Travel Behavior

There are many green travel methods, but the main green travel methods can be roughly divided into three types: walking, cycling, and public transportation.

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Walking is generally short in distance, short in travel time, slow in travel speed, and the travel purpose is relatively fixed, mostly for exercise, leisure, shopping, etc. When the travel purpose is different, the travel time, distance, and speed will also vary greatly. The accessibility and economy of walking are extremely high, there is no energy consumption, and it is an excellent choice for low-carbon and environmentally friendly, but it also has some disadvantages, such as no protective devices for the human body, and the safety is relatively low compared to other modes of transportation. Public transportation mainly includes buses and subways.

Buses are generally suitable for short-distance travel and not suitable for long-distance travel; they have a large passenger transport capacity and short travel time. The economic nature of bus travel is high, and the energy consumption is low, which is more energy-saving and environmentally friendly. However, the flexibility of bus travel is poor, the travel routes and stations are fixed, and it is easy to be affected by traffic congestion and other modes of transportation during peak hours.

Subways have fast travel speed, fixed travel space, not affected by other modes of transportation; they have a large passenger transport capacity and lower energy consumption, smaller pollution, and more environmentally friendly. In addition, subways are generally built underground or overhead, saving ground space, easing road resource tension, reducing ground noise, and protecting the living environment; the travel environment is completely closed, not easy to have conflicts between people and vehicles, and the safety is relatively high, but the travel price is higher than that of buses.

Cycling generally has a short travel distance and time; the travel speed is average, occupies less space during travel, is flexible, mainly consumes human physical strength, there is no energy consumption, the economy is very high, and it is very low-carbon and environmentally friendly. However, cycling is easily affected by the external environment, and it is not easy to travel in bad weather and extremely cold seasons. In addition, there are fewer safety devices for cycling, the safety is not high, although parking is more convenient, but the risk of theft is higher.

2.2. Analysis of Factors Affecting Green Travel Behavior

(1) Traveler Attributes

Traveler attributes mainly include: age, gender; occupation, education, income level; family structure; ownership of private cars.

From the perspective of age, the proportion of young people taking the subway is relatively large among young people, the vast majority of middle-aged people use high-carbon modes of transportation such as cars and motorcycles, and for the elderly, the proportion of walking is the largest, and the proportion of using various high-carbon modes of transportation is very small.

From the perspective of gender, the proportion of women choosing low-carbon travel is higher than that of men. Men prefer high-carbon modes of transportation such as cars and taxis, while women prefer low-carbon modes of transportation such as walking, electric vehicles, cycling, and public transportation.

From the perspective of different family annual incomes affecting the choice of travel modes, families with an annual income per capita of less than 50,000 yuan mainly choose low-carbon modes of transportation such as walking and public transportation; families with an annual income per capita of 50,000-100,000 yuan have the highest proportion of choosing high-carbon modes of transportation such as cars and taxis. The higher the annual income of the family, the higher the probability of owning private cars, and the more inclined to choose high-carbon modes of transportation with high energy consumption and comfort.

From the perspective of family structure affecting the choice of travel modes, family structure will affect the choice of travel modes by influencing the frequency of travel activities of different

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members. The low-carbon travel concepts and practices of relatives and friends often have a positive guiding effect on the choice of low-carbon travel modes of others, and vice versa.

Social status and education are positively correlated with environmental behavior. College students pay the most attention to recycling consumption behavior and are willing to choose modes of transportation with lower energy consumption for travel. People with higher social status and education have higher comprehensive quality, stronger green concepts, and environmental protection awareness, and this group of people may be more inclined to choose low-carbon travel modes.

The ownership of motor vehicles also affects the choice of travel modes. When a family owns a private car, the probability of choosing low-carbon travel modes is greatly reduced. When a family does not have a motor vehicle, they generally choose low-carbon modes of transportation such as buses and subways.

(2) Traveler Psychological Awareness

Traveler psychological awareness mainly includes: environmental cognition, responsibility cognition, and behavior perception.

Traveler psychological awareness is the internal psychological motivation for choosing modes of transportation. Different travelers have different cognitions of green concepts, environmental protection awareness, and responsibility awareness, thus the psychological awareness of travelers indirectly affects the choice of travel modes such as cars or buses.

(3) Travel Characteristics

Travel characteristics mainly include: travel purpose, distance, time consumption, and urgency.

From the perspective of travel purpose affecting the choice of travel modes, when the travel purpose is entertainment, the probability of choosing low-carbon travel modes is relatively high. When the travel purpose is official travel or commuting, residents are more likely to choose high-carbon travel modes. Different travel purposes lead to different travel mode choices because different travel purposes consider different economic aspects.

Without considering the influence of economic factors, considering the impact of travel time on the choice of travel modes, residents traveling at night will basically choose high-carbon modes of transportation such as cars and taxis, while those traveling in the morning and afternoon are more inclined to use low-carbon modes of transportation.

From the perspective of travel distance affecting the choice of travel modes, generally taking 3km as the boundary, it can be found that when the travel distance is large, residents tend to choose high-carbon modes of transportation, and vice versa, they will choose more low-carbon modes of transportation. That is, as the travel distance increases, the probability of residents choosing low-carbon modes of transportation continues to decrease, while the probability of choosing high-carbon modes of transportation continues to increase.

From the perspective of travel urgency affecting the choice of travel modes, emergency travel has a high degree of urgency and requires a high demand for travel time, usually choosing high-carbon modes of transportation such as cars and taxis, which are relatively fast and convenient. When the travel urgency is low, such as shopping and playing, the demand for travel time is lower, and the probability of choosing low-carbon modes of transportation is much higher than that of urgent travel.

(4) Social Norms

Social norms mainly include: group pressure, social atmosphere, and face factors.

Group pressure includes both family pressure within the family and external social pressure. This pressure has a significant impact on the choice of low-carbon travel modes. Demand factors are important factors affecting green travel modes. Face factors will follow the suggestions of friends or the community based on demand factors, or compare with people

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around them. The social atmosphere is mainly related to government propaganda policies. The stronger the overall green consciousness of community residents, the greater the impact of social atmosphere on the choice of green travel modes.

(5) Characteristics of Transportation Tools

The characteristics of transportation tools mainly include: comfort, economy, convenience, and safety.

From an economic perspective, most high-income groups choose to travel by car and do not have high requirements for the economy of travel; while low-income groups mostly use public transportation and bicycles, which have higher economic requirements for travel; and the largest proportion of medium-income groups will consider comprehensively based on specific conditions.

Safety has a great impact on the choice of travel modes when external environmental conditions are relatively bad, such as snow and rain. The vast majority of residents will choose modes of transportation with high safety such as buses under bad external conditions.

From the perspective of comfort, as the standard of living improves, residents have higher requirements for comfort. During peak hours, the congestion of buses and subways is high, the air quality in the car is low, and it is not guaranteed to have a seat. The low comfort of buses and subways during peak hours leads to high-income groups and some medium-income groups choosing high-carbon modes of transportation with higher comfort. Secondly, it is the waiting time, especially for medium and long-distance travel. A long waiting time or uncertain waiting time will affect the mood of residents, causing irritability, and then choosing high-carbon modes of transportation.

(6) Institutional Technical Scenario

Institutional technical scenarios mainly include: urban traffic management systems, reward and punishment mechanisms, publicity and education, and the completeness of public transportation systems.

After the country proposed the policy of developing public transportation, local governments in major cities actively responded by implementing bus subsidies, issuing free transfer policies, building bus lanes, and investing in new rail transit to vigorously develop public transportation. After the country advocated controlling cars in cities and encouraging cars to go to the countryside, local governments in major cities adopted measures such as lottery and paying new car purchase registration fees to limit the rapid growth of cars. The implementation of low-carbon travel is inseparable from the support of the country and the government.

The impact of traffic infrastructure on the choice of low-carbon travel modes for residents in large cities is mainly reflected in: weak traffic infrastructure, low road network density, short per capita road length, few bus lines, low coverage, residents walking for a long time, and unwillingness to take public transportation. Whether parking facilities are convenient or not directly affects whether residents choose bicycles, motorcycles, cars, and other modes of transportation. The novelty of the scenery along the way and the beautiful scenery will make people feel comfortable and generate a desire to protect this environment, which helps residents choose green modes of transportation such as walking and cycling. The implementation of low-carbon travel is inseparable from traffic infrastructure, especially the perfection of public transportation infrastructure, which provides an effective basic guarantee for the realization of low-carbon travel.

3. Suggestions for Measures

(1) Improvement of Travel Environment

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Improve the travel environment to effectively enhance the comfort of the travel environment, such as installing adjustable seats and handrails on buses and subways, and playing pleasant music during the travel process, thereby making residents like to choose green travel modes; improve the congestion and poor air quality in buses and subways during peak hours, thereby causing passengers' irritability, and improve the travel environment during peak hours by increasing the frequency of buses and subways during peak hours.

(2) Strengthen Government Propaganda

Strengthen the propaganda intensity of the government. Relevant government departments can carry out publicity and education at subway entrances and other places, and also cultivate green concepts on the Internet through radio computers and public welfare advertisements. In the education of the younger generation, it is also necessary to strengthen the cultivation of green consciousness and green concepts. Knowledge competitions can be held to let the new generation understand that green travel is beneficial to themselves. The government should also use various propaganda channels and guidance means to let residents understand that environmental issues are closely related to humans, make people realize the necessity of green travel, and strengthen the cultivation of residents' environmental responsibility.

(3) Advocate Group Travel

Through data analysis, it can be found that group travel can effectively increase the probability of choosing green travel modes, among which the probability of walking and cycling in group travel is very high. Therefore, the government should advocate group travel more; in addition, relevant government departments should strengthen the publicity of choosing walking and cycling for travel, and increase the probability of choosing walking and cycling in green travel modes.

(4) Provide Humanized Services

Provide humanized services during travel, such as setting up waiting and rest areas for buses and subways, and setting up electronic information signs for buses to let residents know the waiting time, travel route, and travel time between stations, thereby reducing the difficulty of residents choosing green travel modes. For the commuting and school time of residents and students in the morning and evening, it is necessary to ensure the punctuality of subways and buses, thereby increasing the trust of residents in green travel modes.

(5) Optimize Urban Layout

In urban layout, it is necessary to develop multi-center functional areas and disperse the traffic of the original center, thereby reducing the rigid travel volume of residents. The selection of bus and subway stations should be optimized to reduce the travel distance of residents, reduce energy consumption and environmental pollution. While constructing a multi-development center urban layout, it is also necessary to improve the traffic network, so that the public transportation network can fully cover the city.

(6) Improve Reward and Punishment Mechanism

The government should appropriately reduce the cost of public transportation, adopt measures such as ticket discounts and points for gifts to strengthen the preferences and rewards for using public transportation; secondly, encourage enterprises and residents to use new energy vehicles, reduce the purchase tax of new energy vehicles, and strengthen the subsidies for enterprises to use new energy vehicles. Guide the public to choose energy-saving cars or new energy vehicles, and then increase the purchase tax of cars, especially high-energy and high-emission cars, and appropriately increase the fuel tax.

(7) Improve Restriction Policies

Continue to implement tail number限行 policies and continuously increase the coverage of cities; continue to implement lottery purchase restriction policies based on families and

continuously increase the coverage of cities; set restrictions on vehicle types based on travel peak and road congestion; appropriately restrict the number of official cars, reasonably allocate, and reduce usage requirements; appropriately reduce the number of free parking spaces in enterprises and institutions and public places, etc.

(8) Increase Investment in Public Transportation and New Energy

Continue to increase investment in the construction of the public transportation system, increase the sources of funds for the construction of the public transportation system, ensure the feasibility and sustainability of the construction, increase the coverage density of public transportation, increase the coverage of stations and routes, combine with urban public bicycles, build a seamless connection between public transportation, bicycles, and walking, achieve rapid accessibility of the city's transportation, improve the service level of public transportation, increase the research and development of new energy vehicles, further improve the research and development of new energy public transportation, and gradually replace high-energy-consuming public transportation on a larger scale; increase the research and development of intelligent transportation, increase the research and development of platforms for the public to obtain real-time information about public transportation operations, provide information for public travel planning, save waiting time, improve travel efficiency, and attract the public to use public transportation while facilitating public travel.

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