

Study on the Tourist Traffic Characteristics of People Entering Tibet and People in the Area

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Abstract. Because Tibet's unique geographic location creates different modes of tourist transportation, this paper aims to study its tourist travel modes as well as transportation accessibility to tourist attractions. It has two parts: in-region and out-of-region. (This article "in-region" refers to in Tibet and "out-of-region" refers to out of Tibet.) Research on the transportation mode of people entering Tibet from outside the region: calculate the utility value of different travel transportation modes, establish a sharing rate model to get the respective rate of transportation modes entering Tibet, and get the characteristics of travel transportation outside the region based on the above research. Research on travel traffic network of people in the region: observe the spatial distribution of tourist attractions in each area of Tibet based on the differentiation of Tibet's administrative regions, establish a spatial distribution model of attractions, and further study the traffic network characteristics of tourist attractions in the region with the distribution of attractions; analyze the accessibility and reachability of tourist attractions in each urban area of Tibet to study the characteristics of the travel traffic network in the region. In this paper, it is found that travelers going to Tibet mainly rely on the railroad to enter Tibet, and the attractions in the area are gathered and the tourist traffic is mainly centered in Lhasa, forming a tourist traffic network throughout the whole Tibet area. The study of Tibet's tourism traffic characteristics is of great significance to the layout of tourism traffic modes outside the region and the optimization of tourism traffic network in the region.

Keywords: Tibet, People in the region, Research on travel traffic network.

1. Introduction

China adheres to the development concept that green water and green mountains are golden mountains and silver mountains, and vigorously supports the tourism industry to promote economic development, especially in Tibet, where tourism is the main source of economy, and the government has introduced a series of relevant policies. In addition, Tibet is rich in natural resources and tourism resources, and has a strong religious color. All kinds of superior conditions, resulting in the number of people coming to Tibet tourism is increasing, but Tibet is located in remote areas of tourism transportation is not convenient, and from outside the region into the Tibet tourism road is longer, tourism transportation mode is more, the cost is higher, choose what kind of transportation becomes an important issue; Secondly, there are many tourist attractions in the region, but the distribution is not balanced, some attractions are not high correlation degree and span is large, resulting in attractions within the region accessibility. Secondly, there are many tourist attractions in the region, but their distribution is not balanced. The study and analysis of the sharing rate of tourist transportation modes outside the region and the spatial distribution and accessibility of tourist attractions in the region can help tourists come to Tibet to better choose the transportation routes and plan the tourist attractions to be visited.

Overseas scholars such as Meyer (1994)[1] studied the reasons for the differences in the development of transportation in different countries from the development differences of regional transportation structure, and Joanne Connell (2007)[2] studied the impact of tourism transportation on tourism destinations. Domestic scholars Zhang Luyu (2022)[3] used BP neural network as the basis to study the sharing rate of transportation modes, to forecast the transportation travel model and to carry out the transportation demand analysis; Bing Zhang, Nana Huang, Weishuo Xu, Xin Zhe,

Yunqiang Xue (2020) [4] used the traveler's travel SP/RP survey data as the basic data, and adopted MNL model Multinomial Logit Model used the MNL model (Multinomial Logit Model) as the base model and the utility function to determine an optimal sharing rate prediction model; Yao Li [5] (2020) studied the internal traffic classification and traffic function of scenic spots through the DeFeuer method and the hierarchical analysis method, and evaluated and analyzed the traffic characteristics of scenic spots; Hu Huimin, Hao Xu, and Wei Liu (2023) [6] analyzed accessibility to the scenic spots and spatial distribution of the scenic spots to determine the distribution of open space greenland resources outside of the city's built-up land. Pei Zibo (2023) [7] used the nearest neighbor index and kernel density estimation method to study the spatial density and spatial distribution characteristics of A-class attractions in Heilongjiang. Many scholars optimize the transportation network layout by studying the transportation network and its characteristics, such as spatial characteristics, temporal characteristics, and accessibility (Zhu Xueqin, 2021) [8]. Other scholars have studied the transportation accessibility by using the spatial difference of GIS (Chen Guoqiang, 2021; Ma Rui, 2021) [9,10], but few have studied the tourism transportation travel to the plateau area.

The research contribution of this paper is in the following aspects: firstly, this paper studies the plateau region where tourism is the main source of economy, and there are fewer literatures to study this aspect, and secondly, this project is to study the characteristics of tourism traffic in Tibet including the traffic into Tibet from outside the region as well as the characteristics of the traffic to regional tourist attractions within the region, scholars such as Dzogar Tsom, Tudeng Khedrup (2018) [11] only studied the impact of the tourism traffic for the inner region of Tibet, and there are few articles that study both inside and outside the Tibetan region. In addition, this paper studies the spatial aggregation value of Tibetan tourist attractions, and radiates the accessibility of tourist attraction transportation through the aggregation value. Finally, the data in this paper are collected by on-site questionnaire survey and on-site data collection, which have high timeliness and authenticity.

2. Research scope and data sources

2.1. Research Scope

Travelers from the origin to reach the destination through the transportation route network, travelers arrive at the destination, visit the tourist attractions within the Tibetan region. In addition, it also includes the transportation route network that connects the tourist attractions to each other.

2.2. Data Source

Amap obtains the source of tourist routes, obtains the train schedule into Tibet from the ride software, and obtains the data sources of various service parameters of different transportation modes through the traffic timeliness data of previous documents. Its field tour and for Lhasa, Naqu seven areas attractions surrounding groups in four to May 700 questionnaire questionnaire, for the missing data and duplicate data for invalid questionnaire survey, valid questionnaire, 583, the lack of data and data identification for effective questionnaire processing for Tibet scenic spots layout data, get the data results after the calculation.

3. Out-of-area tourists' travel transportation to Tibet

3.1. Utility function modeling

Through four aspects to calculate the utility function value of different transportations mode in the following formula:

$$U_{AB} = \left(\frac{\theta_1}{S_{i2}} + \frac{\theta_2}{S_{i3}} + \frac{\theta_3}{S_{i4}} \right) \times S_{i1} \quad (1)$$

Which U_{AB} represents the different utility values of different modes of transportation between two places, θ_i represents the service characteristic parameters of different modes of transportation, which parameters include safety, economy, timeliness and comfort of their respective service characteristic parameters, S_{in} respectively represent the utility parameter values of different modes of transportation from A to B. Based on the utility function model, the four kinds of utility value parameters are calculated as follows:

(1) Safety Analysis of Transportation to Tibet

The primary consideration of transportation is safety. The safety of train passage is related to the performance of the train itself, and also related to the surrounding traveling environment at that time, such as the ground road condition and environmental conditions at that time, as well as the train crew's own mental condition. It is generally believed that the safety of the mode of transportation is not only related to the safety coefficient of the mode of transportation itself, but also affected by the mode of transportation in a short period of time in the event of an accident. Generally speaking, train transportation accidents have fewer sudden accidents and the safety fluctuates between 0 and 1. This time S_{i1} is used to indicate the utility value parameter of safety.

$$P_{(U_1)} = \frac{\text{Vehicles involved in accidents}}{\text{Total number of vehicles}} \quad (2)$$

$$P_{(U_2)} = \frac{\text{Number of drivers involved in accidents}}{\text{Total number of drivers}} \quad (3)$$

$$P_{(U_3)} = \frac{\text{Days of environmental abnormalities}}{\text{Days from location A to location B}} \quad (4)$$

$$H_{(U)} = -[P_{(U_1)} \log_2 P_{(U_1)} + P_{(U_2)} \log_2 P_{(U_2)} + P_{(U_3)} \log_2 P_{(U_3)}] \quad (5)$$

$H_{(U)}$ for the safety of transportation from A to B, $P_{(U_i)}$ the parameter values representing the impact of different factors on safety.

(2) Economic analysis of transportation to Tibet

Tourists in the choice of travel mode of economic strength is also an important factor, the economic basis of different people will choose a different way of travel, so you can put the travelers in the travel cost to measure the economy of this indicator. This time S_{i2} the utility value parameter used to represent the economy.

$$F_{AB}^i = \frac{1}{J_{AB} \times \alpha_1 + \phi} \quad (6)$$

F_{AB}^i represents the average freight rate, which refers to the cost of transferring to different transportation modes from A to B, J_{AB} is the spatial distance from A to B, α_1 represents the average freight rate of different transportation vehicles, and ϕ represents other costs consumed in the transfer process.

(3) Analysis of timeliness of transportation into Tibet

It refers to the same thing at different times has a great nature to get differences. The main criterion for its judgment is time. Whether the traveler inquires about the timeliness of the tourist transportation information, the length of time spent by the traveler in the process of waiting for the bus, the time spent by the traveler in getting on the bus and getting off the bus and leaving the station, and the length of time spent by the traveler in getting on the bus and arriving at the destination. This time S_{i3} is used to indicate the utility value parameter of timeliness.

$$T = t_{\text{boarding time}} + t_{\text{departure time}} + t_{\text{travel time}} + t_{\text{query train information time}} \quad (7)$$

$$P = \frac{T}{T_{\text{travel time}}} \quad (8)$$

P denotes the proportion of time spent on a certain mode of transportation in the total time of travel, which is used to indicate the timeliness of this mode of transportation in tourism travel.

(4) Comfort analysis of transportation into Tibet

Comfort refers to the fatigue felt by travelers on this ride and the degree of satisfaction with the services received on this ride, and to a certain extent, travel fatigue is correlated with the ride time. The longer the travel time, the stronger the fatigue felt by the traveler, and the lower the comfort level of this tour. Satisfaction was assigned using subjective evaluation method with different weights. The assigned values include the comfort of the seat on the train, the comfort of the train conductor's service during the trip, and the comfort of the traveling environment. This time S_{i4} is used to indicate the utility value of comfort.

$$g_{AB}^i(t) = \frac{h}{1 + \alpha_i e^{-\beta_i t_{AB}}} \quad (9)$$

$$P_1 = \frac{\text{Number of people satisfied with their seats}}{\text{Total number of trains}} \quad (10)$$

$$P_2 = \frac{\text{Number of people who are satisfied with the service}}{\text{Total number of trains}} \quad (11)$$

$$P_3 = \frac{\text{Number of people satisfied with the driving environment}}{\text{Total number of trains}} \quad (12)$$

$$P = 30\%P_1 + 30\%P_2 + 40\%P_3 \quad (13)$$

$$S_{i4} = 60\%g_{AB}^i(t) + 40\%P \quad (14)$$

h is the time taken by the traveler to return to the limit α of β fatigue, is the value of different fatigue coefficient parameters for different modes of transportation, t_{AB}^i is the time taken by different modes of tourist transportation, and P is the level of satisfaction of the traveler during the trip.

(5) Transportation mode share for travel into Tibet in Tibet

$$P = \frac{\text{The utility value of a certain mode of transportation}}{\text{The total utility value of tourism transportation modes}} \quad (15)$$

P the relative utility value of a kind of transportation is reflected by the ratio of the utility value of a certain travel transportation mode to the total utility value of all travel transportation modes, and the sharing rate of a certain transportation mode can be seen from the relative utility value.

3.2. Railway Train Routes to Tibet

From Table 1, we learn about the departures of railroad running trains, and study the routes of travelers into Tibet by analyzing the stations, so as to get the characteristics of travelers' transportation into Tibet.

Table 1. Tibet Railway Train Operation

Train number	Route type	Station of departure	Passing station	Terminal
Z21	Long-distance	Beijing West	Lasa	Lasa
Z22	Long-distance	Lhasa	Lasa	Beijing West
Z163	Long-distance	Lhasa	Lasa	Shanghai
Z164	Long-distance	Shanghai	Lasa	Lasa
Z223	Long-distance	Chongqing West	Lasa	Lasa
Z224	Long Distance	Lasa	Lasa	Chongqing West
Z263	Long Distance	Lasa	Lasa	Guangzhou
Z264	Long Distance	Guangzhou	Lasa	Lhasa
Z4166	Long Distance	Lasa	Lasa	Shanghai
Z4321	Long Distance	Lasa	Lasa	Chengdu West
Z4981	Long-distance	Lasa	Lasa	Xi'an

3.3. Table of utility values of passenger travel modes and sharing ratio

Table 2. Utility function table

Service Characteristics	Rapidity	Economical	Convenience	Comfort
Short distance (less than 300KM)	0.2861	0.1569	0.4010	0.1713
Long distance (more than 300KM)	0.4090	0.1612	0.2097	0.2110

Table 3. Transportation Mode Sharing Ratio Table

Mode of transportation to Tibet	Railroad transportation	Road transportation	Air transportation
Transportation sharing rate	0.53	0.28	0.19

Table 2 describes the various needs and expectations of travelers, and from the comparison of the utility values of long and short trips, it can be seen that travelers going to Tibet have a greater demand for fast arrival and comfortable travel. Sharing ratio refers to the proportion of transportation modes (e.g. road, railroad, waterway, air, etc.) in the total transportation volume. It can reflect the competitive position and transportation efficiency of different modes of transportation in the transportation market, in which the greater the transportation mode share rate is, indicating that the mode of transportation is dominant. From Table 3, it can be seen that the railroad occupies a dominant position in the passengers' entry into Tibet, and it is important to understand the status quo of the mode of transportation into Tibet as well as the trend of development, and plan the layout of tourism transportation into Tibet.

3.4. Transportation of tourists from outside the region into Tibet

There are mainly three ways for tourists from outside the region to enter Tibet, through the study of tourism transportation utility value, analyze its different modes of transportation sharing rate, from the results of the study can be seen that tourists mainly through the railroad to enter Tibet, and the route network into Tibet is mainly concentrated in the southeast region, the traffic route network shows a "Y" shape, there are 25 stations in the cities outside the region that can reach Lhasa, these routes into Tibet must pass through Xining station, from Xining station to Lhasa all over the world, which is consistent with the traffic route network. There are 25 stations in cities outside the region that can directly reach Lhasa, and these routes to Tibet must pass through Xining Station, which leads to all places in Lhasa, which is in line with the transportation route network.

4. Tourists in the area travel and traffic

4.1. Spatial aggregation model of attractions in the region

$$CR_n = \frac{\sum_{i=1}^n X_i}{\sum_{i=1}^N X_i} \quad (16)$$

Using spatial aggregation to calculate the degree of aggregation of each tourist attraction across Tibet, where CR_n represents the proportion of N multiple regions, X_i is the relevant value of an attraction in the i -th region, and X is the total number of regions. n is the number of individual regions to be examined. In this paper, the value of n is 7.

4.2. Accessibility model of attractions in the region

Accessibility refers to the ease of traveling from one region to another, which is the average of the sum of the shortest paths of two points in space.

$$T_i = \sum_{j=1}^n \frac{D_{i,j}}{n-1}, (j \neq i) \quad (17)$$

which T_i indicates the accessibility of the scenic spot (point) i , where the higher the value obtained from the calculation of accessibility indicates that the higher the accessibility of the attraction, the better the function of tourism. $D_{i,j}$ represents the shortest path distance between scenic area (point) i and scenic area (point) j , the shortest path distance between them. In the paper, the accessibility of seven regions in the interior of Tibet was calculated respectively.

4.3. Connectivity model of scenic spots in the region

In the tourism transportation network, different attractions have different transportation network environments, but when tourists visit the next attraction they need to transfer to the next attraction through the local tourism attraction transportation as well as the route network, which leads to the fact that each attraction is differently associated with other attractions, and the degree of connection between the various attractions is the connectivity. The formula is:

$$CONNECT = \left[\frac{\sum_{j=k}^n C_{ijk}}{\frac{n_i(n_i-1)}{2}} \right] \times 100 \quad (18)$$

$$C_{ijk} = 1 (\text{When two scenic spots are related}) \quad (19)$$

$$C_{ijk} = 0 (\text{When two attraction s are not related}) \quad (20)$$

The formula C_{ijk} indicates the connectivity situation between the scenic plate i block and the related scenic plate j and k within the critical distance in the scenic area, which n_i indicates the number of attractions in a certain attraction with the same type of attraction i . The degree of connectivity is then equal to the number of connections between all the related attraction panels in a certain attraction divided by the number of all the possible connections, and the size of the calculation result is used to compare the size of the connectivity. Where the larger the calculation result is, the higher the connectivity is.

4.4. Spatial layout of tourist attractions in Tibet

Tibet has a unique plateau scenery, more tourist attractions, but mainly distributed in Lhasa and Nagqu city, the following table is calculated from the tourist space, which reflects the spatial accumulation of tourist attractions in Tibet.

Table 4. Spatial aggregation values of tourist attractions in Tibet

	Lhasa	Chamdo City	Linzhi City	Shannan	Nagchu	Rikaze	Ali
Main Attractions of CR_7	0.156	0.085	0.098	0.084	0.165	0.093	0.153

It can be seen through the research and analysis in Table 4 that the attraction aggregation value of Lhasa and Nagqu City is higher, which indicates that these two regions have high similarity and complementarity of tourism resources, and have a better tourism industry chain.

4.5. Results of Tibet tourism accessibility

When tourists travel in Tibet, they need to go from one attraction to the next attraction to visit during their travel, and the accessibility analysis of tourism transportation in this process is shown in the table. According to the analysis in Table 5, Lhasa has the best traffic accessibility and accessibility.

Table 5. Accessibility analysis table of each urban area in Tibet

Prefecture	Accessibility/km	Connectivity
Lhasa	51.06	0.023
Chamdo	51.08	0.023
Linzhi City	51.19	0.019
Shannan	52.21	0.017
Nagchu	52.30	0.015
Rikaze	52.32	0.012
Ali	52.33	0.012

4.6. Tourism transportation in the region

From the point of view of spatial accumulation of tourist attractions in the region, tourist attractions in Tibet are mainly concentrated in Lhasa City and Nagqu City, so there are more tourists concentrated in these two places when traveling, and the highway network is the main transportation network system in Tibet tourism transportation network, which spreads out in all directions centering on Lhasa City and Nagqu City, forming a transportation network of tourist attractions all over the whole of Tibet. Among the seven urban areas in Tibet, from the analysis of accessibility and reachability, Lhasa has the best accessibility to the next attraction, and the transportation network highlights the connectivity of the important town nodes, and the urban public transportation network centered on Lhasa builds up the transportation network for tourism in Tibet.

5. Conclusion

This paper found that in the railway train running to Tibet tourism all are long distance, according to the utility function table service features, the speed of long travel, can travel tourist train, let passengers on the train to Tibet can feel the unique charm of Tibet tourism, improve the passenger travel experience. The two modes of highway and air transportation leading to Tibet are also essential. Diversified traffic flows have complementary advantages and coordinated development, and jointly form a transportation network system into Tibet. In the mainland of Tibet, there are limited tourism transportation infrastructure and single transportation mode, mainly road and railway, air and water transportation is relatively few, and tourists choose the mode of transportation when traveling is relatively limited. Therefore, Tibet should strengthen the construction of tourism and transportation and the construction of roads at all levels, and then vigorously develop air transportation to build a

diversified transportation network in Tibet. According to the concentration degree of tourist attractions, the transportation construction should be done well in the areas with high concentration degree of tourist attractions, so as to improve the travel efficiency of passengers when traveling in Tibet. By increasing the traffic construction in the areas with dense scenic spots, we can reduce the damage to the surrounding environment, reasonably plan the traffic, and guide tourists to use environmentally friendly tourist transportation modes. Good transportation facilities can also enhance the passenger for the Tibet tourism satisfaction, establish a good image of the city, attract tourists outside the area to travel, better promote the development of Tibet tourism economy. Tibet has rich natural landscape and unique national culture, tourism has become one of the pillar industries in Tibet. The study of tourism transportation in Tibet is helpful to optimize the allocation of transportation resources, improve tourism accessibility, and provide better tourism experience for tourists, so as to promote the prosperity and development of tourism.

This paper studies the characteristics of the tourist traffic into Tibet and the spatial aggregation and accessibility between the tourist attractions in Tibet. Compared with other authors, the traffic into Tibet and the tourist traffic in Tibet are studied, which has more practical guiding significance. However, due to the limited research ability and professional knowledge, the author failed to put forward solutions to the problems in the tourism transportation in Tibet. In the next step, we can further optimize the tourism transportation network in Tibet by solving the single problem of tourism transportation in Tibet and conducting in-depth study on the timeliness in the utility model of this paper.

Tibet tourism through diversified transportation constructed Tibet tourism transportation "big world", in the key transfer station and towns and cities under the role of transportation node, make Tibet tourism transportation continue to improve, constitute the linkage pattern inside and outside of Tibet. The study of Tibet tourism transportation can promote the construction and improvement of transportation infrastructure, improve the degree of accessibility, and provide basic guarantee for the economic and social development of Tibet.

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