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Study on Determination of Demand Intensity for Tourist Transit of Open Expressway Service Area

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Abstract

In order to forecast the demand intensity for tourist transit of open expressway service area more accurately, according to the generation principle of tourism intensity, fully considering the influence of three forces including tourists travel demand thrust, tourism cities attraction and travel cost resistance on the strength of tourism, combining gravity model and giving a new meaning to the supply and demand parameters of the prediction model, this paper proposed a new model based on the three interaction forces to predict the demand intensity for tourist transit. In the face of lack of the status quo of tourism data, in order to verify the validity of the model, the method transforming the tourist receipts of tourist city into tourist traffic generation of a particular city was put forward. Finally, in the instance of Shuifu city of Yunnan province, this paper predicted the strength of tourists to travel in Shuifu. Numerical results showed that the model can be calibrated by the instance data and well explain the generation and distribution mechanism of traffic. This work can provide a certain basis for traffic service facilities planning.

Keywords: *Traffic engineering; Open expressway service area; Demand intensity predicting for tourist transit; Gravity model based on three forces; Empirical study*

1. Introduction

The opening of expressway service area is the effective way to promote local economic and social development and to improve the lives of the local residents [1]. Opening expressway service area is different from the traditional closed-end service area. Open mode can expand the service area function over the close mode, break its function of sealing ability, and make the service area give full play to their roles as the high speed highway network hub and radiation effect. At the same time, the opening functions can greatly use and develop the local folk culture, tourism resources, agricultural products, catering and other special characteristics. Also they can effectively promote upgrade of the service area’s size and service level. Open mode is beneficial to improve the service’s income, and it is an effective way to improve the condition of living beyond its means of the current expressway service area [2].

This paper studied and discussed the method and model to determining the demand intensity of additional tourism transit service in service area from the perspective of local social economy requirements for open functions of expressway service area.

Empirical study showed that the proposed model and method can be calibrated by the instance data, and well explain the generation and distribution mechanism of traffic.

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As early as the 1940s, some scholars have begun to study gravity model based on tourism destination, but because of being too simple study factors, the early gravity models often was quite different from the actual situation, and have great limitations [3-4]. And then many scholars tried to make all kinds of original gravity model corrections through continuous experience. Crampon (1966) proved that the gravity model is practical in the study of tourism for the first time, but the proposed gravity model had some weaknesses which were exaggerating short distance and making small in long-distance to forecast passenger volume [5]. Subsequently Wilson (1967), Ferrario (1979), Sheldon (1985), Witt (1995), Song (2008) and others also undertook different correction forms of gravity model and put forward wide variety of gravity models to calculate the tourists demand [6-12]. Among them, Wilson's work was one of the most influential studies. Also, Zhang (1989) summarized the tourism gravity models of destination, proposed a new gravity model according to the generating mechanism of tourism attraction with the charge of physics attract formula, and worked at some beneficial attempts in practice [13]. Bao (1992) revised the gravity model for unconstrained problem [14]. Zhang (2000) redefined independent variables of the model, then compared the modified gravity model and time series model, and proved that the fitting effect of the gravity model is better [15-16].

2. Methodology

2.1. The Idea of Prediction

In this paper, the prediction approach of the tourism transit demand strength in expressway service area is as following: firstly, through analyzing the three forces including tourists travel demand thrust, tourism cities attraction and travel cost resistance, give a new meaning to the supply and demand parameters in Wilson's gravity model, and propose a new model based on the three forces to predict the demand intensity for tourist transit of service area. Secondly, according to the changed trend of historical total tourist receipts in recent years, predict the tourist traffic generation of tourist destination, take the economy and traffic parameters into consideration at the same time, and assign the tourism traffic volume to each traffic zones. And then evaluate the attractive degree of the tourism resources from the various views including famous degree of tourism city, richness of tourism resources, scenic area density and so on. Apply the evaluation result of attraction degree coefficient, the related economic data and traffic data to implement the gravity model parameter calibration, and determine the travel intensity calculation model of various tourism-generating regions. Finally, synthesize the travel strength of generating regions within the scope of radiative regions along the expressway, and calculate the passengers' traffic by tourist buses in accordance with the vehicle type proportion. The calculation result can be regarded as the service demand intensity for tourist transit in service area.

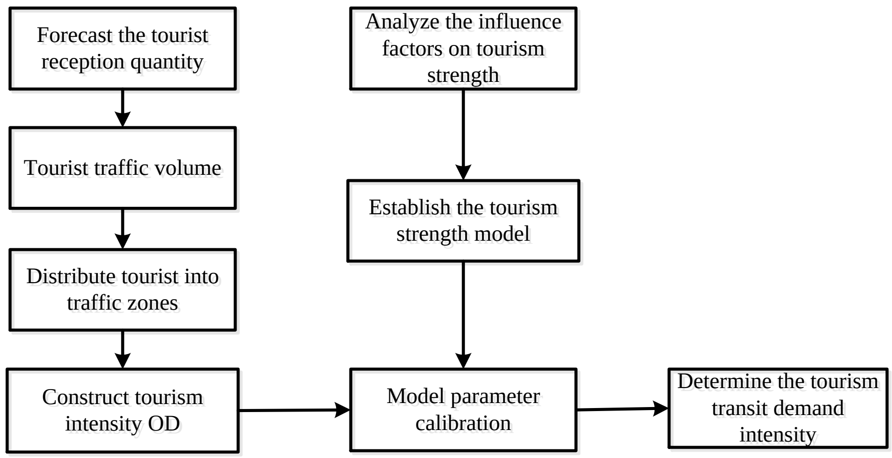

Figure 1. Tourism Transit Demand Strength Calculation Processing

2.2. Parameters Definition of Three Forces

Previous studies have indicated that the economy and transportation are the main factors influenced the intensity of tourism, and most researches have put forward the different gravity models which are getting from almost improving and amending the influences of the two ways. In this paper, we get rid of the traditional model limited to the economic and traffic parameters, give a new meaning to the supply and demand parameters of traditional gravity model to predict the demand intensity for tourist transit from a certain origin to tourism city, and analyze the problem of expressway service area demand intensity for tourist transit respectively from the influence of three forces including tourists travel demand thrust, tourism cities attraction and travel cost resistance on the strength of tourism.

2.2.1 Travel Demand Thrust of Tourist Generating Regions: Both travel demand thrust and tourism cities attraction are equally important. The attraction of the tourism resources and the thrust of travel demand will become meaningful only when the consumers have the tourism demand and tourist willing. With the development of the social economy, tourism is gradually regarded as a way of self-realization to consumers. On the premise of their own conditions permit, tourism is the main way to spend the leisure time, and it also brings tourist destination a large number of potential customers. Travel demand thrust is a force acting on tourists and pointing to tourist resources, and it promotes the tourism activities smoothly. The magnitude of the thrust force is mainly decided by the economic conditions of tourists. The better the economic condition is, the stronger the tourists willingness to travel, hence the tourism thrust; on the contrary, the lower the income of residents is, the weaker their tourism willingness, even no intention, so the smaller travel thrust. Therefore, this paper selected the economic parameters as independent variables, and proposed a method to calculate the tourism strength of the generating regions. The calculation function is shown in Equation 1.

$$A_i = k_1 G_i^{\,a} \tag{1}$$

Ai: tourist generating regions' travel demand thrust; Gi: tourist generating regions' economic parameter, always use urban per capita GDP to express; a: travel demand thrust index; k1: travel demand thrust adjustment coefficient.

2.2.2 Tourism Cities Attraction: The attraction of the tourism city is mainly related to the tourism resources attraction degree, the tourist city socio-economic development status, the urban size and other related factors. The degrees of tourism resources attraction are codetermined by the tourism resources characteristic strength, surrounding environment, and other factors. The more the tourism resources of the local and surrounding cities own, the more distinctive the resources are, the greater the attraction to tourists. The characteristic strength of tourism resources mainly reflects in the national cultural characteristics and the natural environment characteristics. The city has only a unique geographical and cultural characteristics and a good reputation can attract more people to travel. It should consider comprehensively from the rank of the scenic spots, the richness of tourism resources, the scale of the tourist scenic spots, the tourism cities popularity, the tourism environment, the complete degree of tourism facilities, the tourism catering services, the tourism accommodation services and more aspects to assess the attractive degrees of tourism resources. In this paper, the coefficients of the tourist city attraction getting from comprehensive evaluation were used to describe the local tourism resources attraction degree. The attraction degree coefficient and the urban attraction are positively correlated relationship. In addition, tourist cities attraction is also related to the local economic development level and the city scale, and they are both positively correlated relationship with city attraction. It is namely that the higher the level of economy developing level, the large city scale, the stronger the attraction. On the contrary, the less the attractive is. Based on the above cognitive theory this paper proposed the calculation method of tourist city attraction.

$$B_j = k_2 G_j^{\,b} S_j^{\,c} R_j^{\,d} \tag{2}$$

Bi: tourism city’s attraction; Gj: tourism city’s economic parameter, always use urban per capita GDP to express; Sj: tourism city’s scale parameter, always use gross population to express; Rj: tourism resources’ attraction degree coefficient, gain by comprehensive assessment; b,c,d: tourist city attraction index; k2: tourist city’s attractive adjustment coefficient.

2.2.3 Travel Cost Resistance: Travel cost mainly contains two types which are transportation cost and economic cost. This paper mainly considered the influence of transportation cost on the strength of tourism. The transportation cost is reflected in the convenience degree of traffic, such as tourist travel modes, travel distance, travel time and so on. This paper chose the distance between tourist generating region and tourist destination to describe the size of the transportation costs. Obviously, the travel cost is an obstacle factor for travel intensity. The higher the cost of travel is, the lower the possibility choosing to travel. Only when the travel costs is within the scope of travelers acceptable, people will choose to travel to the area. Past studies have proposed many different forms of the generalized cost function to describe the travel cost resistance, mainly including power function, exponential form function, half a bell-shaped function and the type compounded power-exponent function. The exponential function are selected in this paper as the generalized cost function of the gravity model, the calculation method is as follows.

$$f_{ij} = k_3 e^{\alpha D_{ij}} \tag{3}$$

fij: travel cost resistance from city i to city j; Dij: travel cost from city i to city j; α: index coefficient of cost resistance;

k3: cost resistance adjustment coefficient.

2.3. Construction of the Gravity Model

This paper redefined the supply and demand parameters in Wilson's gravity model, and presented a new model taking full consideration of the three forces including tourists travel demand thrust, tourism cities' attraction and travel cost resistance on the demand intensity for tourism. And on the basis of the original Wilson model, we introduce a constant term to increase the accuracy of the prediction and establish the new model of the travel demand strength. The concrete form is shown as the Formula 4.

$$T_{ij} = k_0 \frac{A_i B_j}{f_{ij}} + \varepsilon_{ij} \tag{4}$$

In the Formula 4, T_{ij} is the demand intensity for tourism from city i to city j, namely the passenger number, A_i is the tourists' travel demand thrust of city i, B_j is the tourism cities' attraction of city j, f_{ij} is travel cost resistance from city i to city j, k_0 is the original coefficient of Wilson model, and ε_{ij} is the additional adjusting coefficient.

The Formula 5 is the result of substituting the Formula 1, 2 and 3 into the Formula 4, and is the new model aiming at calculating the travel intensity of residents.

$$T_{ij} = g \frac{G_i^{\,a} G_j^{\,b} S_j^{\,c} R_j^{\,d}}{e^{\alpha D_{ij}}} + \varepsilon_{ij} \tag{5}$$

In the model, g is the new gravity coefficient, g=k0k1k2/k3, the size depends on the residents' component structure, their travel behavior, the developing situation surrounding the tourism cities and the original cities, and so on. For example, the young people prefer to travel more than the older, hence the tourism demand intensity of the ageing cities is relatively lower; the passenger volume of the high economic level of surrounding tourist city will also be higher than others relatively. ε_{ij} is the additional adjusting coefficient.

2.4 Calculative Processing

2.4.1. The Determination of the Coefficients of Tourism Resources to Attract: Montanic tourism resources mainly form by the interactive of historical factors, social cultural factors and natural factors with strong national regional characteristics. According to evaluating the tourism resources scientifically and analyzing the characteristics strength deeply, it will be conducive to the development of local tourism resources, the long-term growth of the attraction of regional tourism resources, promoting the rapid development of tourism, and providing basis for planning of the related service facilities. Tourism resources evaluation must follow the principles of the systematic, the scientific, the data availability and the combining qualitative and quantitative. Use the attractive degree coefficient of resource to represent the evaluation results of tourism resources. The greater attracting degree coefficient, the greater the degree of tourist city, namely attracting the number of passengers will be more, and have a stronger positive role in promoting the development of other local tourism resources and the increase of tourist income. Use the weighted average method to calculate index evaluation coefficient, and the specific calculation is shown in Formula 6.

$$r = \sum_{i=1}^{k} \omega_i x_i \tag{6}$$

r: resources evaluation coefficient, namely attraction degree coefficient; k: the number of evaluation index; ω_i : weight coefficient of index i, meets $0 \le \omega_i \le 1, \sum_{i=1}^{k} \omega_i = 1$; x_i : evaluation value of index i;

The value of ω_i and x_i can be achieved through the questionnaire and Delphi method.

The tourism attraction of tourism resources is mainly decided by the level of tourism destination, the strange degrees of the tourism destination, the richness of tourism resources, and the tourism situation around the destination. The specific indicators are shown in Table 1.

Table 1. Evaluation Indicators of Tourism Resources Attractiveness

	evaluation indicators
attraction of the resource	tourism resource grade assessment
	richness of tourism resources
	density of scenic area
	tourism popularity
	appreciation of tourism resources
	integrated environment of tourism destination
	the degree of tourist facilities
	diet and accommodation services
	the quality of operating and servicing

$$\text{tourism resources level value} = \sum \text{the weight of grade scenic spot} \cdot \text{the number of the grade scenic spot}$$

$$\text{richness of tourism resources} = \frac{\text{the total number of tourist scenic spots}}{100}$$

$$\text{scenic area density} = \frac{\text{the total number of tourist scenic spots}}{\text{covering area}}$$ (Covering area is the area of a circle whose diameter is the longest distance between two scenic spots.)

2.4.2. The Determination of Tourist Traffic Generation Volume: The reception number chooses the time series model to forecast treating as a basic way of linear growth. Due to the one passenger may continuously to multiple scenic in a same city, but in the statistical process, scenic area regard it as different tourists, so it will produce repeated measurement. Usually choose the largest number of tourist traffic generation to take the place of the reception. And in the case of lack of travel data, it is necessary to convert the number of the reception to get tourist traffic generation volume, the conversion coefficients obtain from historical data.

$$y = ax + b \tag{7}$$

$$Q = \delta \cdot y \tag{8}$$

y: the reception number of tourists; x: time series; δ : correction coefficient, its size determined by historical data; a,b: empirical coefficient.

Tourists of scenic area received usually come from different cities, distributing these passengers in each city accurately is conductive to planning the service facilities along the highway. Considering the strength of a city's tourism is related to the urban economic development and traffic conditions to tourism destination, this paper’s distribution scheme is as follows:

$$Q_i = q_i Q \quad (9)$$

$$q_i = \frac{G_i / D_i}{\sum_{j=1}^{k} (G_j / D_j)} \quad (10)$$

Qi: tourist numbers of traffic area i; Q: the total number tourist numbers; qi: passenger distribution coefficient of the traffic area i; Gi: economic parameter of traffic area i, always use per capita GDP to express; Di: traffic parameter of traffic area i, always use the distance from the traffic area to the tourist city to express.

2.4.3. Determination of Tourism Transit Demand Intensity: The result getting from the above steps is the total number of tourists arrived at destination for the different modes of transportation. But in practice, not all travelers who arrive to the expressway service area need tourism transit service. Considering the different tourist conversion rate for different vehicle models, the travel transit rate of bus is maximal in the process of determining tourism transit demand intensity. The process firstly forecast the proportion for different vehicle and average number of passengers carried per vehicle in according to the traffic survey data of study area. And then through the Formula 11, calculate the value of the total number (X) of vehicles to service area in planning years. Finally, taking full consideration of the passengers arriving to the service area by bus, the part of passengers are all listed as the part that will need the tourism transit service in the service area, so the team travel number is considered as the number of passengers needed for tourism transit, the calculation method is shown in Formula 12.

$$\sum Q_i = \sum_{j=1}^{t} R_j \cdot M_j \cdot X \quad (11)$$

$$Q' = R' \cdot M' \cdot X \quad (12)$$

Q_i: passenger arrivals from traffic area i, the equation on the left stands for the total number of passengers from the various traffic area to the service area; t: the total number of vehicles models; Rj: the proportion of vehicles model j; Mj: the average number of passengers of vehicles model j; X: the total number of vehicles to service; Q': the number of tourism transit demand; R': the proportion of the bus; M': the average number of passengers of the bus.

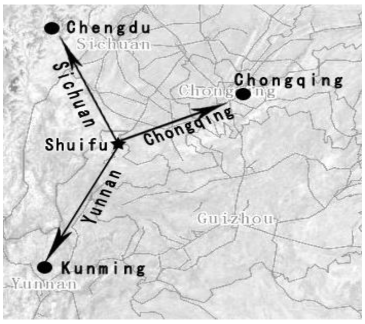

Figure 2. The Classified Methods of Traffic Area

3. Case Study

The highway from the starting point of Maliuwan to the destination of Zhaotong is one section of the national expressway network G85 between Chongqing and Kunming. Also it is an important part of our country highway skeleton. Highway G85 between Chongqing and Kunming is beginning with Yibin in Sichuan province to Shuifu in Yunnan province, by way of Zhaotong, and enter into the capital of Yunnan province—Kunming. The mileage within Yunnan province is 550 kilometers. Road from Zhaotong to Maliuwan began to construct in 2012, and expected to open to traffic in 2015. In order to provide better service for passing vehicles and passing persons, the government planned to establish an open service area in the sections in Shuifu to improve the service facilities along the expressway. Because of the unique geographical advantages of Yunnan province, it has a lot of special tourism resources and a large number of tourists. Tourism transit demand becomes the important factors influencing the size of open service area. Here use Zhaotong of Yunnan province to Maliuwan area as an example, calculate tourism strength in the expressway service area and provide a certain basis for tourism transit function of open service area. The radiation regions of service area will be divided into five sections which are Shuifu, Yunnan, Sichuan, Chongqing and other parts, the distribution is shown in Figure 2. The case mainly analyzed the tourism transit demand in the expressway service area from Yunnan, Sichuan and Chongqing to Shuifu.

By the time series method, predict the tourist receipts in Shuifu county of Yunnan province from 2007 to 2013. Tourist receipts in Shuifu increases linearly with year from the fitting results (as shown in Figure 3), the growth curve is y = 12.70 + 32.27 x (regarding 2007 as the base year, namely the x value in 2007 is 1).

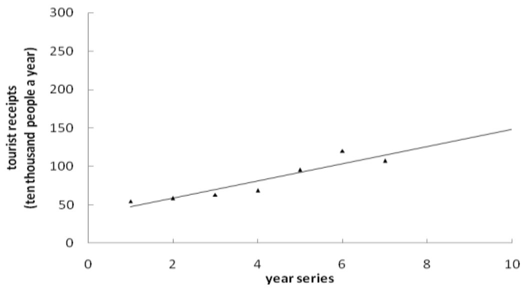

Figure 3. The Distribution of Tourists Receipts in Shuifu from 2007 to 2013

Passenger volume using the growth curve above can be acquired forecast the tourist receipts of Shuifu in the next few years. Through analyzing the data in statistical yearbook of Yunnan province and Yunnan tourism yearbook, the value of correction coefficient δ is closing to 0.6, and the tourist number of the other areas in addition to Yunnan, Sichuan and Chongqing travelling to Shuifu accounted for nearly 30% (including local and other areas in the country). Combine with the Formula 8 to calculate tourist travelling to Shuifu in the next 10 years, the results are shown in Table 2.

Table 2. Passengers Forecasts Results of Shuifu (δ=0.6, Ten Thousand People Per Year)

Years	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tourist receipts y	159.3	172	184.7	197.4	210.1	222.8	235.5	248.2	260.9	273.6
Tourists number Q	66.89	72.23	77.56	82.9	88.23	93.56	98.9	104.23	109.57	114.9

Table 3. The Passenger Distribution Results of Shuifu (Ten Thousand People Per Year)

Year	Passenger distribution coefficient of Sichuan	Passenger distribution coefficient of Chongqing	Passenger distribution coefficient of Yunnan	Number of tourists from Sichuan	Number of tourists from Chongqing	Number of tourists from Yunnan
2008	0.37	0.46	0.18	8.93	11.03	4.26
2009	0.37	0.46	0.17	10.84	13.65	5.06
2010	0.36	0.47	0.17	12.73	16.35	5.81
2011	0.36	0.48	0.16	14.59	19.12	6.51
2012	0.36	0.48	0.16	16.42	21.96	7.17
2013	0.36	0.49	0.15	18.23	24.87	7.79

Table 4. The Evaluation Results of Tourism Resources' Attractiveness in Shuifu

Evaluation indexes	Weight coefficient ω_i	Evaluation value x_i	$\omega_i x_i$
Tourism resource grade assessment	0.21	3.79	0.7959
Richness of tourism resources	0.15	2.34	0.351
Density of scenic area	0.14	0.108	0.01512
Tourism popularity	0.154	6.2	0.9548
Appreciation of tourism resources	0.12	7.31	0.8772
Integrated environment of tourism destination	0.07	7.8	0.546
The degree of tourist facilities	0.08	6.37	0.5096
Diet and accommodation services	0.076	6.8	0.5168

Combine economic parameter (per capita GDP) with the traffic parameters (distance between the origin and the end point), turn them into the Formula 10, and gain the passenger distribution coefficient in each traffic area. Then distribute the tourist volume of Shuifu into each traffic area by the computing way of Formula 9, the distribution results are shown in Table 3.

The attraction evaluation results of tourism resources of Shuifu can be obtained by the method of Delphi and the survey results are shown in Table 4. The evaluation value of the index parameter follows 10 points system standard, namely all value must be from 0 to 10. According to the corresponding weight coefficient and evaluation values, use the calculating function shown as Formula 6 to obtain the attracting degree coefficient of tourism resources in Shuifu (the attracting degree coefficient of tourism resources in Shuifu is $r=\sum_{i=1}^{k}\omega_i x_i \approx 4.5662$). To some extent the value can characterize the attraction strength of the tourism resources to tourists, and can be used as the basic data of tourism strength model parameters calibration.

When calibrating the model parameters, in order to calculate conveniently, use the distance between the provinces in central point to take the place of the distance of tourists and tourist destination, namely the traffic parameters. For example, regard the distance from Chengdu to Shuifu as the distance between Sichuan province and Shuifu in Yunnan province. Use regional per capita GDP to replace the economic parameters in the model, and the population size to replace the scale parameters. Per capita GDP, population data and other original date are from the Yunnan statistical yearbook and the Yunnan tourism yearbook over the years. Take advantage of SPSS software method to estimate the parameters in the model. The calculation results are as follows:

Yunnan to Shuifu:

$$T_{Yunnan} = 0.11 \times \frac{G_{Yunnan}^{0.00} G_{Shuifu}^{0.355} S_{Shuifu}^{0.00} R_{Shuifu}^{0.848}}{e^{0.00 D_{Kunming, Shuifu}}} - 9.396 \quad (R^2 = 0.989)$$

Tourism intensity from Sichuan to Shuifu:

$$T_{Sichuan} = 0.14 \times \frac{G_{Sichuan}^{0.03} G_{Shuifu}^{0.473} S_{Shuifu}^{0.08} R_{Shuifu}^{0.099}}{e^{0.00 D_{Chengdu, Shuifu}}} - 21.241 \quad (R^2 \approx 1)$$

Tourism intensity from Chongqing to Shuifu:

$$T_{Chongiqing} = 0.415 \times \frac{G_{Chongiqing}^{0.357} G_{Shuifu}^{0.146} S_{Shuifu}^{0.00} R_{Shuifu}^{0.00}}{e^{0.005 D_{Chongiqing, Shuifu}}} \quad (R^2 = 0.991)$$

From value of R^2, the goodness of fit of the gravity model is very good, so the gravity model of this paper has certain reliability and can be used to forecast the strength of tourism. From the result of the parameters estimation, the influence of tourist urban economic development, tourist city attraction and the economy developing situation of the origin is the most significant, and these influences actively play a promoting role, which are consistent with the producing mechanism of travel demand. Use the time series method to analyze and predict the related parameters of the model. And then integrated the travel intensity models of Sichuan, Chongqing and Yunnan, forecast the reception passenger volume in Shuifu in the future ten years, the results are shown in Table 5. The based data——tourism strength values is from the Table 2, calculating by the Formula 9 and 10. From the data in the Table 5, the tourism strength value has no significant difference between the two ways, and can further prove the feasibility and effectiveness of the model.

Table 5. Tourism Intensity Forecasts (Ten Thousand People Per Year)

Year	Basic values of tourism intensity (Sichuan)	Predicting values of tourism intensity (Sichuan)	Basic values of tourism intensity (Chongqing)	Predicting values of tourism intensity (Chongqing)	Basic values of tourism intensity (Yunnan)	Predicting values of tourism intensity (Yunnan)
2015	20.9	21.13	32.26	31.64	8.39	8.34
2016	22.54	22.69	35.49	34.07	8.85	8.76
2017	24.15	24.22	38.79	36.68	9.28	9.16
2018	25.73	25.73	42.16	39.45	9.67	9.54
2019	27.27	27.21	45.59	42.42	10.03	9.91
2020	28.78	28.68	49.09	45.59	10.35	10.27
2021	30.26	30.13	52.65	48.97	10.65	10.62
2022	31.7	31.56	56.28	52.59	10.91	10.96
2023	33.11	32.98	59.97	56.45	11.15	11.28
2024	34.49	34.38	63.72	60.58	11.36	11.60
2025	35.83	35.78	67.53	65.00	11.54	11.91

Road from Zhaotong to Maliuwan was due to open towards the year of 2015. Regard ten years as the year of planning, convert the travel intensity values in 2025 in Table 5 (ten thousand people per year) into the tourism intensity of one day to Shuifu county (people per day), the total number of tourism in 2025 from Sichuan, Chongqing and Yunnan to Shuifu is that:

(35.78+65+11.91)*10000/365=3087 (people per year)

According to the investigation result of vehicle model scale and the number of passengers in national highway No.213, calculate the tourism transit number in service area:69.24%*2X + 2.14%*22X + 28.62%*5 X = 3087, in which X is the total number of vehicles; 2.14%, 28.62% and 69.24% respectively stand for the proportion of buses, cars and truck in 2025; 22, 5 and 2 respectively stand for the average number of passengers of buses, cars and truck in 2025, these values are derived from the traffic survey results of national highway No.213 in 2009, and the total vehicles is 1019. Assuming that the tourist who arrive to the expressway service area all need tourism transit service, thus the demand intensity of tourism transit service in service area is that: 1019*2.14%*22= 480. The actual value and the predicted results of travel regarding Shuifu as the destination are basically identical with higher reliability.

4. Conclusion

The improvement of highway service system makes the tourist volume increase rapidly for tourist city as Yunnan province. The planning of service facilities along the highway network has become the focal point in transportation planning engineering, and the research of tourism transit demand strength in highway service area plays an important role to determine the scale of service facilities, and it can convert travel transit demand intensity to the size of the service function of facilities combining the related facilities specification of facilities scale in the process of service area planning. This paper analyzed the influence factors of tourism strength from the perspective of the supply and demand, and established a new strength calculation model combined with these influence factors. The work had a strong pertinence and practicability, and could provide a certain basis for highway service facilities planning for tourism resources development. The determination of related functions scale in service becomes the next problems in the planning of service area needed to research.

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