Study on Planning and Design Forest-themed High-quality Service Area

Jianrong Ma^{1*}

¹Research Institute of Highway Ministry of Transport, Beijing, 100088, China

Abstract. In order to speed up the construction of green transportation system and promote the development of tourism services and service areas, this study takes the Yongning service area of Huaguan highway in Guangzhou as an example, on the basis of analysing the theory and technology of the construction of national forest cities, garden cities and green service areas, defines the concept, concept and goal of building high-quality service areas on forest theme; About 20 species of trees and shrub species suitable for the highway forest theme service area were selected, and the second study analysed the design techniques of the forest theme service area, the design techniques of the forest theme space planning and layout, the creation of the characteristic landscape of the buildings, the creation of the forest landscape of each green functional area, etc., to improve the quality, ecological function and tourism function of the service area.

1 Introduction

By 2019, china's total highway mileage has exceeded 149,600 kilometres, the number of service areas reached more than 2000 pairs. According to the results of the 2018's Beijing, Jiangxi and Yunnan provinces and other service areas, 80% of the service areas have problems such as too small scale, inadequate facilities, unreasonable planning and layout, weak combination with business model consumption lines, commercial dead ends and insufficient business conditions, and can no longer meet the existing demand for efficient, high-quality, diversified travel services. In 2014, the Ministry of Transport issued the Opinions on Further Improving the Quality of Service of Highway Service Areas, proposing the goal of "creating a modern service area with reasonable layout, economic and practical, clear marking, service specification, safety and order, ecological and environmental protection in 3-5 years' time". In 2018, the General Office of the Ministry of Transport issued the Notice on the Key Points of work of the National Highway Service Zone, which proposed "strengthening the construction of smart service areas, thematic service areas and green service areas, and actively promoting green technologies for environmental protection". Highway service area construction is completing the transition from a survival service area to an enjoyment service area, and has built a number of high-quality, consumer-oriented service area success stories, such as business mall service area, green culture service area, etc., but due to the traffic flow scale, regional characteristics, operating costs, more service areas do not know how to choose their own theme form to create. Under this form and requirement, it is very necessary to make an in-depth analysis and summary of the theme

selection, key technology and operational prospects in the construction of high-quality service areas of highways, so as to provide reference for the construction and transformation of modern high-quality service areas in the future.

2 Background

China as a whole is still a forest-scarce green, ecologically fragile country. In recent years, with the acceleration of urbanization process, population aggregation, industrial aggregation, economic growth and social production, lifestyle changes, but also large-scale resource consumption, space aggregation, natural landscape pattern destruction, urban construction in the ecological problems more and more prominent, especially the transformation and upgrading of urban forest landscape appears more urgent. In order to construct the regional ecological security pattern and enhance the overall ecological function of the region, in 2016 the Pearl River Delta region was awarded the "National Forest City Group Construction Demonstration Zone" and the city of Guangzhou was awarded the "National Green model city", boldly exploring the construction of forest cities mainly in the form of urban clusters[1]. The concept is put forward and implemented to alleviate the development trend of regional natural ecosystem fragmentation, improve the overall ecological quality of urban clusters, and solve the imbalance of urban and rural greening level. The green environment of forest can bring people physical and mental pleasure, eco-tourism service function is an important part of forest ecosystem service function, so the concept of forest ecological construction is also part of the construction of forest cities, intended to improve the urban ecological environment, improve the quality of life of

*Corresponding author's e-mail: jr.ma@rioh.cn

urban residents, promote the harmonious development of people and nature. On the other hand, from the perspective of comprehensive national economic and social and transportation industry, national tourism development plan and strategy, speeding up the development of green transportation, tourism transportation, improving and improving service quality is an important and long-term task, and focusing on providing the public with more safe, convenient, high-quality and efficient services has become the main theme of the times. Therefore, the construction of forest-themed high-quality service areas is the concrete embodiment of the implementation of the concept of safe, green and low-carbon development put forward by the CPC Central Committee, the State Council and the transportation industry, the need to accelerate the construction of a green transportation system, to promote the construction of ecological landscape, improve regional plant carbon sinks, the creation of forest tourism, tourism service-oriented transportation, service area development of new forms, intelligent transformation and upgrading to promote regional economy and social livelihood plays an important role and significance.

3 The concept and objectives of forest-themed high-quality service area

3.1 Concept

According to the embodiment form of ecological culture construction of forest city in Guangzhou, the highway service area belongs to the category of mesh corridor and is a regional road corridor[2]. According to the General Specification for highway traffic engineering and the design of facilities along the route, the highway service area is an important "window" for the highway industry economy to provide good service for long-distance and high-speed travel crews, to provide refueling, testing and maintenance services for vehicles, and to ensure the safety and smooth flow of highways. Therefore, the forest theme high-quality service area can be literally seen from the forest landscape, forest city, service area concept extension, with higher quality, better service road service area construction of an innovative concept, is the forest as the main landscape of the highway service area, for drivers and passengers to provide some landscape rich in change, recreation, health, cultural exchanges.

3.2 Relevant regulations

"Forest Law" stipulates that the national forest coverage rate should reach 30%, of which the mountainous counties should generally reach more than 40%, the hilly counties should reach more than 30%, and the plain counties should reach more than 10%. According to the March 2020 survey data, China's average forest cover of 22.96 percent, forest area of 220 million hectares.

"National Forest City Evaluation Index" (LY/T2004) requires: urban forest coverage of southern cities reached more than 35%, northern cities reached more than 25%. The green coverage rate of urban built-up areas (including

the built-up areas of cities and counties in the lower jurisdictions) reached more than 35%, the green space rate reached more than 33%, the per capita area of public green space was more than 9 square meters, and the per capita public green space in urban reached more than 5 square meters.

"General Specification for Highway Traffic Engineering and Facility Design along the Route" (JTG D80): The green space of the highway service area should be 1 to 1.2 times the area of the parking lot, and the coverage of the green space should not be less than 20% of the land area of the service area. Green space dividers should be set between the service area and the main line and should be no less than 20m.

"Green transportation facilities assessment technical requirements Part 2: Green service area (JT/T 1199.2) in the secondary indicators of outdoor environment of the site greening three indicators: a) the use of housing greening or vertical greening form, get 4 points; Among them, the area of roof greening is not less than 40% of the total roof area, get 7 points. The site selected native plant greening, and the green space rate reached more than 25%, get 8 points.

As can be seen from the above regulations and provisions, although China's high-speed service area service model and functional facilities are constantly improving, but at present to meet the needs of passengers driving and rest as the primary purpose, the environmental attention is not limited investment, and according to the 2016 survey of the national highway service area green space rate, the average indicator is less than 25%. According to the Ministry of Transport, the country's highway construction investment in 2019 was 1150.4 billion yuan, up from 15.36 percent in 2018. In addition, in 2017-2019, China's highway construction investment in the country's highway construction investment increased year by year, in 2019 for the first time exceeded 50%. It can be seen that at this stage, China attaches great importance to highway-related construction, and the future development prospects of highway and service area along the way are good.

3.3 Construction objectives

According to the Guidance of the State Forestry Administration on Focusing on Forest Urban Construction, the Guidance on the Implementation of Green Highway Construction by the Ministry of Transport, and the Implementation Plan for promoting Green Highway Construction in Guangdong Province by the Guangdong Provincial Department of Transportation, with the concept of nature, green, ecology, simplicity and science and technology as the guiding ideology, the construction of high-quality service areas on forest themes, the acceleration of innovative practices in the ecological environment and green roads, the promotion of forestry modernization and the construction of ecological civilization, and the active adoption of rational planning and greening[3-4]. The three-dimensional greening of the roof walls and other ways, increase the amount of green road corridor, create forest ecosystem function, fully

display the diversity of vegetation and landscape richness, with portal and iconic forest tourism service area destination, promote regional tourism economic development.

Therefore, the goal of forest-themed service area construction should be that the greening coverage rate should exceed the national forest coverage index stipulated in the forest law, close to or reach the forest city, landscaping city green space rate and green coverage index of the regional province and city. Therefore, with reference to the 2019 standard of Guangzhou City, Guangzhou city forest theme high-quality service area greening rate target of 39.22%, green coverage target of 45.13%, forest closure of more than 0.3.

4 Forest-themed service area planning and design

4.1 Plant selection

The project is located in the nearby urban area of Guangzhou City, with abundant resources of native tree species, which provides a good foundation for improving the quality of forest and building forest ecological corridor. The forest-themed high-quality service area finally protects the existing forest vegetation in the area as the premise, and gradually forms a more complete blocky plant community combining multi-tree species, multi-level, joe irrigation rattan grass, which improves the value of sightseeing and protection function. Therefore, the forest theme service area green vegetation species selection area typical forest tree species, carbon sink oxygen release capacity is high, and beautiful landscape shape of plants. Based on the investigation of regional afforestation, highway greening and urban landscaping in Guangzhou City, and on the basis of the comprehensive factors such as seedling source, seedling quantity and cost, 20 kinds of plant materials are initially identified for the forest-themed service area in Guangzhou City, which are cinnamomum camphora, bombax formosana, Ficus microcarpa, canarium microphylla, dachshuna, renmianzi, frangipani, dahonghua, bougainvillea, safflower, bauhinia tinctorius, kandelial candel, lagerstroemia indica, huanghuafeng suzuki, jacaranda, michelia shenshanensis, ficus salicifolia, oriental cherry, etc.

4.2 Design techniques

Forest theme service area design is through macro control, mid-view planning, micro-refinement method. Among them, macro control is to determine the forest landscape patterns around the service area, including vegetation distribution, road traffic, tourism demand analysis, to determine which different forest landscape construction methods. Secondly, the medium-view planning, on the basis of macro-planning, through the functional positioning of each green zoning, ecological priority as the criterion, ecological, practical, aesthetic as the concept, to protect, optimize, restore as the goal, according to the function of green open space, nature and land conditions,

such as the entire service area forest landscape to make a distinction. Finally, micro-refinement is to implement the design of plant landscape to each small green scenic spot and attractions, follow the principle of local conditions, analyse the main features and functional requirements of its position, and maximize the creation of different forest landscapes for each attraction.

4.3 Design content

Yongning service area is initially designed for a total construction area of 8836 square meters, a total green area of 24085 square meters, a volume ratio of 0.09, green coverage of 25.14 percent, small car parking spaces 255, truck parking spaces for 69, livestock cars, large truck parking spaces for 7 cars, tourist cars 9, charging pile parking space 14. From this, it can be seen that the greening area and green coverage of Yongning service area are too low, far below the requirements of Guangzhou forest coverage and green coverage of Guangzhou built-up areas. Therefore, to build a forest-themed service area, the first must increase the area of green space, in terms of coverage to maximize, and strive to raise to the average level of greening in Guangzhou, and to achieve green as green. Secondly, the high-quality service area should reflect the forest theme, reflect the taste, improve the quality, the whole forest theme design combined, pay attention to the building (integrated building) interior and exterior decoration, through decoration design, to create a forest theme atmosphere. The design is as follows:

- In order to reduce the fragmentation of open space, the layout form is changed to the central service area, the size of the car diversion zoning arrangement, reduce the safety hazard, and the car parking space all 30 degrees oblique design to add green isolation zone, narrow the lane 12 meters to 8 meters, increase the car parking area 4 meters green isolation to increase the green area, parking green isolation belt planting shade trees, reduce the summer parking surface temperature, to improve the comfort of the service area, as well as the use of terrain and greening to create a guide green belt, Improve service capabilities in the service area.
- Under the condition of ensuring the safety of sight, increase the green space in the parking area of large cars and tour bus parking areas, and increase the vertical 2 m wide green belt along the car at intervals of 3 parking spaces. In order to ensure the effect of the landscape, the rim stone flat, in the green lead tail of a variety of large trees shade, other turf greening.
- In order to maximize the quality of forest landscape, the surrounding ring green space of the service area to take preferably native species, in order to create evergreen broad-leaved secondary forest, needle wide mixed forest as the goal, to maintain the surrounding natural forest landscape status.
- In the middle of the hall area of the complex building, the "Forest Garden" central landscape

design was added to further create the forest theme of the service area. In different areas, the addition of a design sense of green landscape skits, roof and floor paving color, graphics, etc. should actively cater to the forest theme; It is suggested that the entrance foyer of the bathroom adopts the forest theme design, adds the green planting landscape sketch with the design sense, the decorative design of the wall should be combined with the forest theme, can use patterned tiles or painting, etc., the door frame can adopt the original wood design style.

- The complex uses three-dimensional greening, echoing the "forest green theme" and creating the roof of the building in the direction of the "private garden". Vertical and combined roof greening with roofing allows for the use of a small number of low-shrubs and medium-sized flower-tree vegetation to create a high-low landscape. Secondly, under the premise of giving priority to the use of native species, the roof greening system should also ensure a certain degree of species diversity.

3. Dan Qiuxin. (2011) Theoretical Methods and Key Technologies of Forest City Construction. China Forestry Press.
4. Lu Min, Wang Fei. (2012) Approaches and Strategies of Low-carbon Forest City Construction: a case study on Jinan City. Journal of Shandong Architecture University. In:2012 China Academic Journal Electronic Publishing House. pp.496-500.

5 Conclusion

This study by optimizing the planning layout of the service area to increase the area of green space, and inside and outside the construction of forest-themed service areas to enhance the taste of landscape-building technology, to create Yongning service area for the forest-themed service area, to achieve green, green coverage and strive to maximize, and finally Yongning forest-themed service area greening rate of 25.14% adjusted to 40.5%, far exceeding the national forest coverage index stipulated by the forest law, more than the Guangzhou city greening rate of 39.22%. The service area is rich in green plant species, the proportion of tree vegetation is greater than 70%, the peril-ringed zone landscape depression can reach more than 0.3, improves the landscape quality of the whole service area, the local plant species is rich, has obvious hierarchy, inter-species structure, season-phase change, to meet the forest theme service area construction index requirements.

References

1. Li Zhihua, Zhan Guoqiang, Feng Chao, et al. (2019) Construction Concept and Strategy of National Forest City Cluster in Pearl River Delta. Forest Inventory and Planning. 44(1): 194—199.
2. Dan Xinqiu, Xiong Zhiping. (2019) Exploration on Ecological Culture System and Construction Content during Establishment of National Forest City----taking establishment of national forest city in Guangzhou City as an example. In:2019 China Academic Journal Electronic Publishing House. pp.1648-1652.