

Ecological Planning Path of Road Traffic in Chongqing Villages

Jingyuan Shi^{1,*} and Qiuna Li²

¹senior engineer and lecturer, school of architecture and urban planning, Chongqing Jiaotong University

²senior engineer and lecturer, Chongqing real estate vocational college

Abstract. This paper takes village road traffic in Chongqing area as the research object to promote the ecology of road traffic planning as the research objective, combined with the village external traffic, internal traffic, road engineering, road materials, road construction, supporting facilities and roadside greening and other 7 major planning elements, respectively put forward "improve the village of foreign traffic", "internal road ecological layout", "ecological function to build road engineering", "road ecological material selection", "road construction ecological conflict resolution", "ecological planning road facilities", "the road greening ecological design", the corresponding ecological optimization path, and carry out analysis.

Keywords: Chongqing Village, Road Traffic, Ecological Planning, Path

Introduction

Village road traffic is an important channel and link to ensure the smooth transportation of agricultural materials and the sustainable development of production, and is closely related to the daily travel and living conditions of rural residents. In recent years, the road traffic construction of villages in Chongqing area is vigorous, the mileage is increased, the quality is improved quickly, and the quantity and spatial characteristics of village traffic have undergone fundamental transformation, and achieve better social and economic benefits. At the same time, the road traffic situation is also increasingly complex, the flow of people, logistics, vehicle flow increased significantly, road traffic on the rural human land system has produced multiple and profound impact. In addition, the topography, geology and hydrology of rural areas in Chongqing are relatively complex, and face the trend of diversification of land use and farming types, therefore, the network structure, planning and design, construction and even ecological landscape properties of village roads are different from those of high-grade highways. The ecological adaptation relationship among residents' life, vehicle demand, village road, traffic organization and natural environment needs to be studied. Therefore, this paper attempts to analyze the ecological planning path of Chongqing village road traffic planning based on the main elements of external traffic, internal traffic, road engineering, road materials, road construction, supporting facilities and roadside greening.

Ecological planning path of village road traffic in Chongqing

Improve the external traffic of villages. The external traffic of villages is mainly realized by village roads. At present, rural areas in Chongqing have an increasing demand for deep processing and transportation of agricultural products, rural tourism is increasingly booming, migrant workers are highly mobile, and the material exchange, personnel flow and energy transfer between villages and surrounding towns and cities are continuously enhanced. Therefore, villages put forward new requirements for external traffic, so as to establish a benign channel between villages and the external environment of the town, ensure the ecological flow of

materials, energy and resources, and achieve the harmony and balance of urban-rural relations.

The external traffic of villages should be arranged comprehensively first, and the traffic relations with surrounding towns and even the rural roads of counties, cities and provinces should be fully considered in the early planning stage of villages, supplement and improve the structure framework of rural roads in the region, establish a smooth and convenient rural road network system, and truly realize the "village access". In the investigation of Dazhai village, Qingxichang town, Xiushan county, Chongqing, it was found that the village was close to national road 326 and county road, but only connected with the village road, so the traffic was weak and inconvenient. Through planning and overall planning of external traffic, the two village roads connected with the external relations of Dazhai village are upgraded to county roads and connected with the national road. Therefore, through the county road and the national road can reach the village directly from Xiushan County.

Secondly, need to consider rural residents' needs, such as the transport of large-scale agricultural production equipment, the traffic needs brought by different industrial characteristics of each village, and the construction of bus stations required by rural passenger transport.

Second, should solve the practical problems. There are many problems in the village roads in Chongqing, such as out-of-order building of farm houses, many curved roads and narrow road surface. According to 2016 data, "the original rural road surface is mostly within 4.5 meters, which is inconvenient to meet cars and often causes accidents." Should consider road width at the beginning of planning and should control roadside farm houses. In the built area, the road surface can be appropriately widened to 6-7 meters according to the actual situation to meet the basic requirements of two-way driving. In addition, a certain number of passing lane with appropriate width and length can be built on single-lane rural roads, and curved roads can be widened to meet the needs of driving and passing car safety in rural areas. In addition, there are still some illegal phenomena that seriously affect the traffic, such as using the road to dry grain without permission or building on the two sides of the road, so should strength the publicity and management to realize the "management, maintenance and protection" of the village highway. (Chen Yan, 2015)

The external traffic section of many villages in Chongqing belongs to the mountain road and the external traffic environment is much more complicated than the traffic inside the village. Such as Chongqing Xiushan county Hongan access to the Chuanhegai scenic area of the rural road, the numbers of turns have 45, safety issues are particularly important. (Figure 1) should combine with the complex mountain terrain in chongqing, improve the rural highway security project. Set up guardrail, warning signs, mirrors and deceleration facilities to strengthen the security of key sections such as water and cliff road, curve and steep road, and intersection. For the roadbed 3.5 meters wide restricted section, should focus on strengthening the security facilities (Zhejiang institute of standardization, 2015)。



Figure1. Chongqing Xiushan county, Hongan access to the Chuanhegai scenic area of the rural road 45 turns

Figure Source: Xinhua News Agency reporter Chen bisheng

Finally, should also pay attention to the publicity work of village external traffic. Signage and village name signage should be set at the main entrance of the village, standardized traffic signage should be set on the main highway, and signage should be set separately for important tourist villages and Nongjiale with more than 4 stars.

Ecological layout of roads in villages.On the premise of ensuring safety, the planning and design of internal roads in Chongqing villages can be summarized as the ecological adaptation principles of "coordination, nature, moderation, primary and secondary, avoidance and isolation".

It is necessary to coordinate the relationship between the internal road planning of the village and the road planning of the county urban system and the new rural road planning, so as to effectively connect the internal road with the national road, provincial road, county road and other trunk road network planning, and form a reasonable road network traffic skeleton. On the one hand, it can ensure the connection between the road inside the village and the road network on the upper level and promote regional coordination. On the other hand, it can realize the convenient road network between villages and inside villages^①.

Should adapt to local conditions, adapt to the natural terrain trend of rural areas in Chongqing, not forced to take straight and regular design, but according to the slope, natural layout. For example, dazhai village, xiushan county, chongqing city, combines the unique mountain terrain and rural scenery, and relies on the current line shape to improve the footpath system, so as to build a green and leisure "mountain-house" type rural footpath system. Mountain trail width is 2 meters, organic links to natural attractions. The footpath between houses is constructed with local materials to facilitate villagers' internal travel and communication needs, and achieve the goal of facilitating production and leisure life. The "mountain-house" rural trail system ensures a natural, continuous and comfortable walking traffic environment inside the village. (Figure 2)

^① Guo ruijun, wang wanxiang. Analysis of rural road traffic planning methods [J]. North China traffic, 2007 (4) : 72-75.

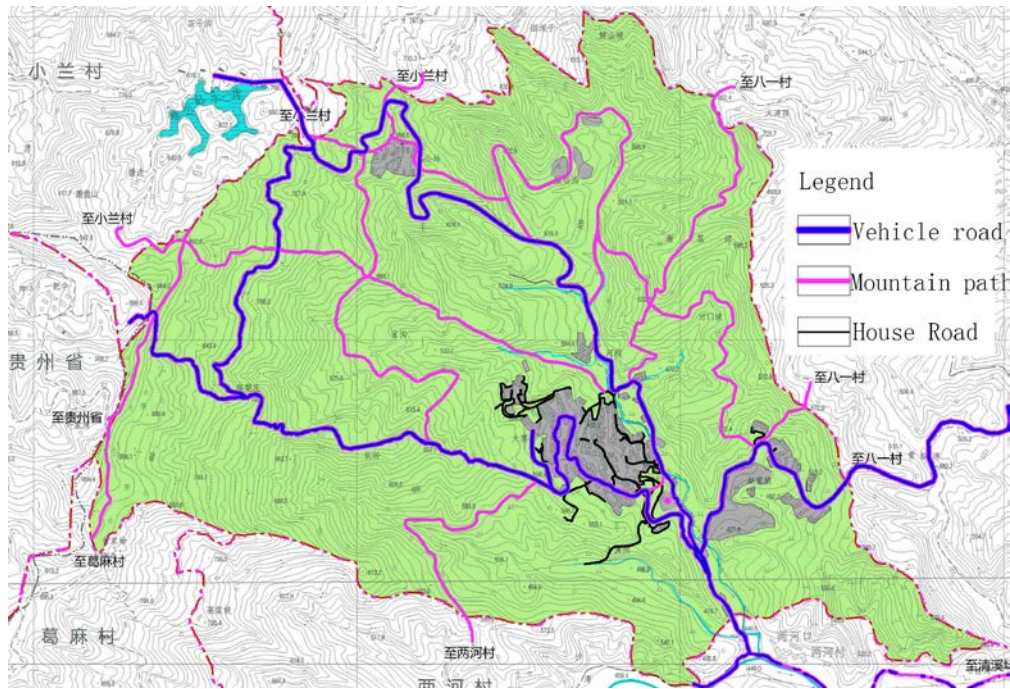


Figure 2. Organic trail planning in accordance with the rural natural landform in dazhai village, xiushan county, chongqing
Figure Source: Chongqing planning and design institute. Land layout planning of dazhai village, qingxichang town, xiushan county, chongqing [Z].2014.

Should follow the principle of moderation and intensification, and connect the most convenient path with more space units and natural resources. So as to reduce the density of road network in the village, reduce the amount of engineering construction.

The primary and secondary principle of the road inside the village refers to the priority given to the transportation links of resource producing areas, primary and secondary schools, tourist attractions, cultural landscapes and peasant gathering areas, and distinguish the key tasks.

The principle of avoidance refers to that in the layout planning of internal roads in villages, avoid the ecological environment conservation area and isolation area, restrict the intersection of village roads and ecological corridors, so as to protect the integrity of village field ecological landscape and avoid the fragmentation of ecological environment.

Segregation principle is to separate the living space inside the village and traffic space as far as possible. In the living space, vehicles can be limited to a lower speed (40-60 km/h) by means of traffic classification and road width design, form medium and low speed traffic state, guide the transit vehicles to the traffic space, and form the rural traffic calm zone under the separation of speed. (Traffic—Calmed Rural Area, TCRA) , so as to reduce traffic noise, dust and other interference to village living areas ^①. (Figure 3)

^① Xu dawei, qiao jingya. Rural road landscape -- macro planning, micro design [J]. Cryogenic architecture technology, 2013 (1) : 20-21.

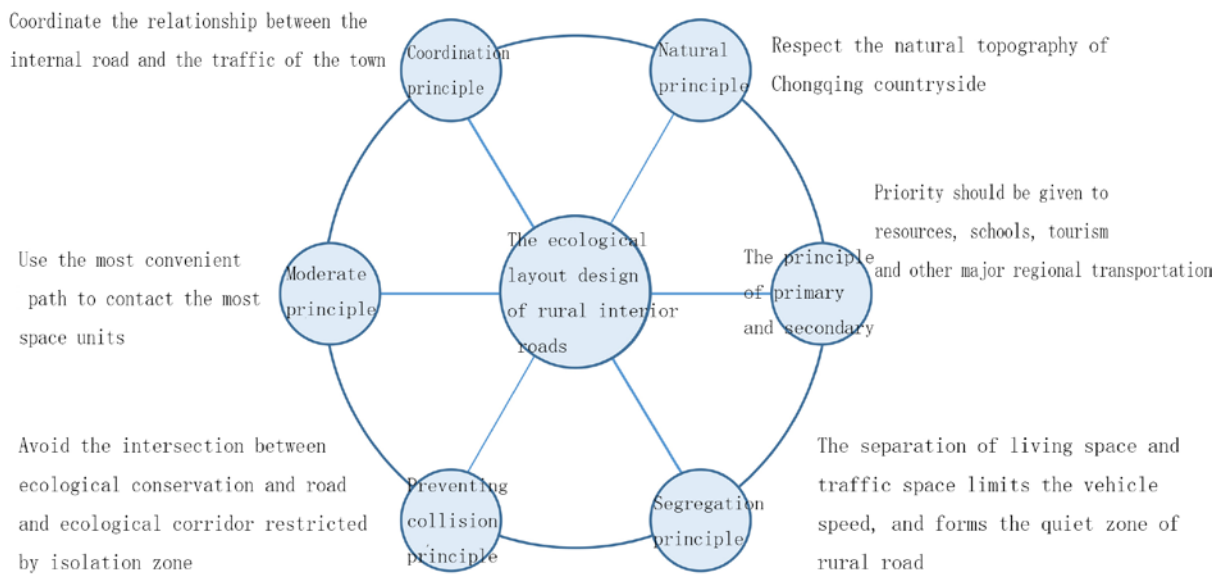


Figure 3. Analysis diagrams of the planning principles of ecological layout of rural internal roads

Figure source: author drew

Construct the ecological function structure of village road engineering. In the village ecosystem in Chongqing area, the road is not only the traffic skeleton at the level of physical spatial form, but also the important ecological corridor elements rather than simple pavement hardening and grade upgrading. The ecological environment in rural areas of Chongqing is fragile and highly sensitive, roads at all levels undertake a variety of tasks. Therefore, planning is not completely limited to the standard of "100% hardening rate of main road", but should also consider the ecological corridor characteristics of village traffic, and through planning to protect the rural ecological environment.

Under the thought of constructing the ecological function of the rural traffic corridor, can put forward the concept of the artificial ecological function of the village traffic corridor in Chongqing. (Li dan & Wang cheng, 2013) Taking Da-Zhu village, Qiantang town, Hechuan, Chongqing as an example, the rural road engineering is defined as the three-layer ecological functional structure system of skeleton layer, functional layer and epidermis layer. The skeleton layer is the structure layer, which is the foundation of road space trend and biological passage. It has good permeability, water permeability and air permeability, which can effectively protect the water environment and soil environment and generate good road adaptability. The biological passage of the skeleton layer can satisfy the migration and diversity of the organisms in the road area. For example, in the laying process of field road in Da-Zhu village, bury PVC pipe, so that frogs, snakes and other small animals that were originally blocked by field road can complete natural migration. The functional layer refers to the material layer, which should make full use of local ecological construction materials to protect the ecological function of the road. The epidermis layer refers to the cultivation of ecological landscape of village roads. Through the planting of roadside greening, it integrates the road landscape system with the village landscape system, stitches up the broken landscape patches caused by road separation, and creates an ideal walking and recreation landscape environment for rural residents. The village road under the three-level ecological function structure of "skeleton

-- function -- epidermis" can effectively connect various functional plaques and landscape matrix, promote the exchange and flow of materials and energy, and guarantee the integrity and continuity of the ecological space of rural settlements in Chongqing ^①. (Figure 4)

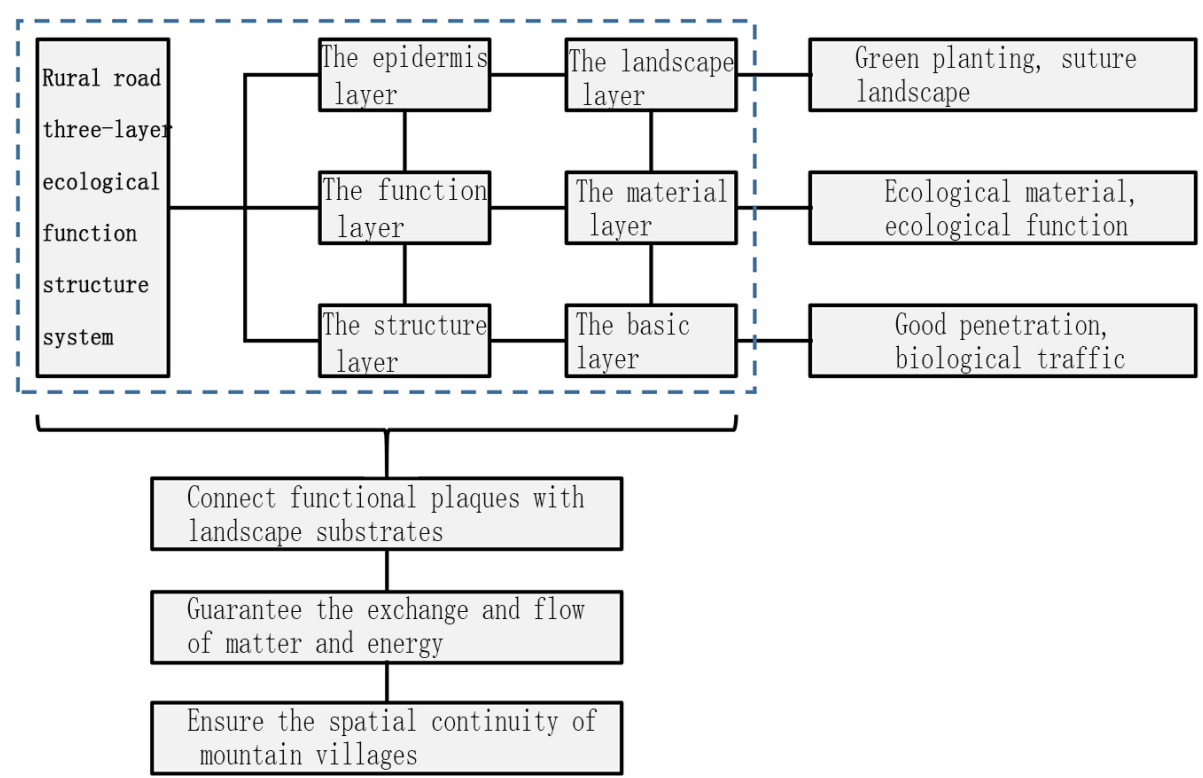


Figure 4. Analysis diagram of three-layer ecological function structure system of rural road

Figure source: author drew

Complete the ecological selection of village road materials.The material of village road in Chongqing area usually consists of roadbed material, shoulder material and pavement material. On the one hand, the ecological selection of road materials is local selection; on the other hand, "hard and solid" should be minimized and "soft and transparent" materials should be selected. Choose local and ecological materials as far as possible, use local materials to save material transport costs, reduce vehicle transport rate to save energy and reduce pollution.

In terms of roadbed material, Chongqing rural areas are rich in stone, so can use stone gravel and other stone materials to build the roadbed of village road, main road and branch road.

In terms of shoulder materials, "green shoulder" can be used on both sides of the road in the field, that is, soil filling and planting flowers and plants to facilitate water seepage, save building materials and form an ecological landscape effect.

In terms of pavement materials, high-grade pavements generally have hardening requirements, so should use permeable concrete materials. Roadside pavements can choose hollow concrete boards and grass bricks. These materials have the characteristics of good permeability and water permeability, improve the surface

^① Li Dan, wang cheng. Design and demonstration of ecological road construction in hilly and mountainous areas of chongqing [J]. Agricultural engineering, 2013 (6) : 110-115.

permeability, make the air and water above and below the road flow circulation, protect the plant and microbial environment. Chongqing mountain terrain is changeable, gentle and complex areas coexist, rural road pavement can choose cement concrete wheel track road and other materials with strong adaptability and good ecological effect laid way. (Xing Zhenzhen, 2006) In villages with flat terrain, can adopt cement concrete wheel track pavement, and can appropriately increase compound RCC pavement in complex and changeable terrain areas.

(Liang chunyu, 2011) The pavement is laid according to the vehicle passage track and generally consists of two or three concrete track slabs, which is economical and convenient for construction. The track board can be paved with mud and gravel, with good permeability of water and air, and has a protective effect on animals and plants, with higher ecological efficiency. In order to avoid the ecological problems caused by excessive hardening, can select the paving method of the soil stone pavement and the concrete slab overhead pavement. Block stone, pebble, sand stone, slag, broken brick and so on can be used for laying the road in front of the house and the field path, with good water permeability, cost economy and pastoral characteristics.

Solve the ecological contradiction in the process of village road construction. In the process of road construction in Chongqing villages, ecological environment is often damaged, mainly in soil environment, water environment, atmospheric environment and biological environment ^①.

The imbalance of excavation and filling in road construction will aggravate the soil loss of cultivated land, and the road laying process will change the physical properties and fertility of soil^②, the intensity of its use also tends to cause soil pollution. In terms of water environment, excavation and filling in road construction will erode the surface, and lead to the decrease and rise of underground water level in the road area, triggering vegetation degradation; Road laying also leads to a significant increase in runoff coefficient, shortened rainwater collection time and decreased self-purification capacity of natural vegetation, bringing in a large amount of household garbage and dust along with the rain and seriously polluting the surrounding waters. In addition, the production of hard road will reduce the seepage degree, leading to underground heat accumulation, speed up the flow of water, leading to soil erosion (Chen Sujin, 2012). In terms of atmospheric environment, dust and solid particles caused by the mixing of lime and soil in road construction will form dust, and various engineering vehicles in transportation will produce a lot of tail gas and carry a lot of dust, resulting in atmospheric environment pollution. In terms of biological environment, a large number of procedures such as digging, filling, topsoil cleaning and river channel modification in rural road construction will lead to surface change and valley disappearance, destroy the growth environment of plants, affect the living conditions of animals and microorganisms, and cause great damage to the biological environment.

Therefore, we should pay attention to and predict the adverse impact of road construction on the natural ecological environment, and adopt elastic planning in the construction link. Introduce advanced land consolidation and utilization technology to avoid large area felling of vegetation, and ditches and culverts are

^①Yang xinyue, wei zhaofu, Chen hua. Rural road layout design and landscape ecological effect research [J]. Agricultural engineering, 2011 (4) : 62-66.

^② Laying roads compacts soil, reduces soil porosity, creates steep slopes, reduces precipitation interception, and causes soil nutrient loss.

built according to the change of terrain to integrate road drainage with terrain drainage trend (Zhang wenli, 2014), use local transportation and take dust protection measures such as covering and sprinkling. In order to reduce the erosion of soil surface by rainwater, the exposed roadside ground caused by the hard rural road can be covered with fast-growing grass or mixed grass and leguminous grass in Chongqing, use grass mulch to shade and cool the surface, and use the fallen leaves and roots form a humus layer to accelerate soil formation and restore the rural ecological environment (Zou Yongyi, 2016). In a word, the ecological damage caused by digging, filling, compaction, laying and transportation in village road construction should be avoided as far as possible through pre-judgment and planning.

Ecological planning of village road supporting facilities. Supporting facilities for roads in Chongqing villages mainly include street lighting facilities, residence facilities, parking facilities and meeting car facilities.

There are usually street lamps beside the external traffic roads in villages, can select energy-saving and environment-friendly lamps, such as solar street lamps. If the economy allows, the floor lamp can be installed on the road inside the village. In economically backward areas, can install simple floor lamp with high cost performance, simple street lamp on the pole, plug-in street lamp applicable to areas where the foundation cannot be lowered, etc. In addition, can install simple street lamp fixed on the roadside buildings. (Hu Qian, 2012)

Stay facilities include rain pavilion, gallery rack, flower rack, etc. In rural areas of Chongqing, summer is hot and rainfall is high. Set stay facilities in key areas of production and field roads, such as intersections, which can provide shade and shelter for farmers. In the village road layout stay facilities can adapt to the villagers rest and other living needs. In addition, local materials such as wood, bamboo, brick and tile can be used locally for pavilion, gallery and flower stand. Flower shelf can choose climbing plants such as parthenocissus to shade the sun and adjust the climate at the same time. The above stay facilities should pay attention to the rationalization of service radius and localization of external modeling, so as to enrich the road landscape and enhance the rural landscape.

Parking facilities should make full use of the road periphery and spare space, properly plan the public parking lot, and combine the surrounding greening, planting grass brick paving and other ways to carry out ecological design. Some of the above parking facilities can also be scaled up to accommodate non-motor vehicles in rural areas. The vehicle meeting facility is the vehicle meeting point, which can be set up about 3 meters × 15 meters vehicle meeting point every 300-500 meters for narrow field roads (less than 3.5 meters) to solve the vehicle meeting problem of large agricultural machinery vehicles.

Ecological design of roadside greening on village road. Roadside greening is the "softening agent" of monotonous road surface. Good roadside greening can reduce road dust pollution and noise pollution, and effectively fix the soil environment to reduce soil erosion, provide habitats for birds and other organisms to protect species diversity, it can also beautify the space environment of the village and show the unique charm of the beautiful countryside.

Roadside greening should first consider tree species suitable for rural areas in Chongqing. Preferential select local tree species and appropriate arrange strong vitality, small adverse effects, the environment has

beautification and purification effect of exotic tree species. Chongqing area temperature is relatively high, abundant rainfall, suitable for planting trees including Huangge tree, south Sichuan jackfruit, Beibei tree, Sichuan head tea, Shantongzi, camphor, osmanthus, and so on.

Secondly, should consider the width and function of the village road, and reasonably select trees and shrubs to make the height of trees and shrubs match reasonably, so as to better play the function and enrich the visual hierarchy.

Finally, should emphasize the selection and design of road trees. For village roads more than 3 meters wide, can plant road trees to define and strengthen the linear trend of the road. Main road trees are vulnerable to dust pollutants and harmful gases, and their roots are also easy to be restricted by the buildings on both sides of the road and the land on the road surface. Therefore, should prefer choose tree species with developed roots, strong vitality and abundant canopy, and according to the canopy size to arrange plant spacing. (Guo Qi, 2014) The branch road and the two sides of the field road can adopt "asymmetric" planting method according to different sunshine conditions to adapt to the change of sunlight intensity^①. The function of asymmetric planting method is more reasonable, and it is easy to form a more organic rural road landscape. The roadside trees can be planted with ornamental fruit trees with both leaves and flowers. The ornamental period is long and the economic benefits are good, it also can highlight the rural landscape of Chongqing. (Cao Dihuan&Liu Jing, 2015) In addition, it can also combine with rural tourism, select outstanding landscape effect of the tree group to create a typical scenic spot. In addition, the road in front of the village house can also carry out economically feasible roadside greening design. (Figure 5) In Pengshui Langxi township, Chongqing, the green path in front of the house is combined with the garden, which not only effectively rectifies the "dirt and mess" of the original environment, but also obtains better ecological, economic and landscape benefits.

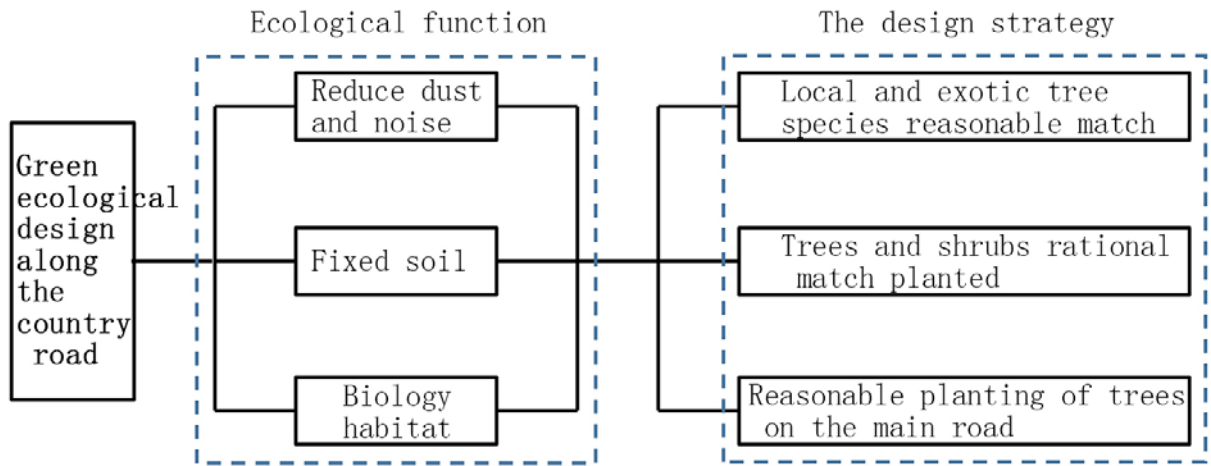


Figure 5. Analysis chart of roadside greening ecological design of rural roads

Figure Source: The author draw

Conclusion

This paper puts forward the ecological path of rural road planning in Chongqing at the theoretical level, and

^① On the side with stronger sunshine, large and medium-sized trees with larger canopy and luxuriant foliage can be used, while on the side with weaker sunshine, small trees with smaller canopy and looser branches and leaves can be used.

analyzes the relevant principles and laws based on various elements. In the future, we can try to improve the ecological adaptability in the planning and construction of villages in Chongqing according to their paths. The research content of this paper is not only a collation of previous scattered research results, but also a process of reintegrating, revising, condensing and further thinking. In view of the rapid pace of planning and development in China, the content of this paper still needs to be further integrated and discussed with new fields such as territorial space planning and smart rural planning.

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