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Spatio-temporal analysis of educational convenience in ethnic mountainous areas with road network constraints—A case study of Yunnan Province, China



APPLIED GEOGRAPHY

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ABSTRACT

Education is the foundation and strength of a nation, and educational equity is the basic right of every citizen. However, in China, there are vast differences in education levels between the eastern and western areas, urban and rural areas, and ethnic and non-ethnic areas. This is especially so in China's mountainous areas in the rural southwest. In this region, Yunnan Province is selected as study area. This study proposed an educational convenience index (ECI), and established an evaluation model for educational convenience in mountainous regions. In this model, we investigated the road networks that connect settlements to schools in ethnic mountainous areas, and considered the vulnerability, complexity and accessibility of the road networks from settlements to schools. In road vulnerability analysis, a new concept of "only link" is introduced. Based on this model, the ECI of each settlement in Yunnan Province in 2011 and 2015 was calculated. The improvement of ECI for each settlement in the 4-year period between 2011 and 2015 was analyzed. The findings show that: (1) Educational convenience of non-ethnic autonomous regions (65% settlements > = " good") was far better than that of ethnic autonomous regions (53% settlements > = "good"). (2) The educational convenience level in both ethnic and non-ethnic autonomous regions have improved. The improvement was slightly lower in ethnic autonomous regions (5.44%) than in non-ethnic autonomous regions (6.23%). (3) The comparison of improvements in educational convenience between 2011 and 2015 showed that such improvements formed a significant "substantially improved - greatly improved - moderately improved" three-tier pattern and a "greatly improved moderately improved" two-tier pattern.

1. Introduction

Education is the foundation and strength of a nation, and educational equity is the basic right of every citizen; however, the distribution of educational resources is very unbalanced in China. Basic education in less-developed areas of China has attracted the attention of many scholars. Li and Liu (2014) studied the impact of local primary school availability on children's education in rural China. Wang, Wang, Li, and Li (2017) analyzed the reasons that China failed to achieve desired improvement levels in rural education systems using Teaching and Research Groups. Liu and Xing (2016) analyzed how the closure of rural primary schools impacted the migration of rural residents in China. Chen (2015) found that raising the admission age of rural primary schools in China led to a high ratio of boys repeating grades or dropping out before entering junior high school, and Cai, Chen, and Zhu (2017) analyzed the impact of primary and secondary school

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Fig. 1. Study area and distribution of its ethnic autonomous regions.

consolidation on the Chinese household economy.

The level of educational development is relatively low in the southwestern ethnic mountainous region, which is a typical ethnic minority area. This particular region is located at the junction of the Eurasian, Indian, and Pacific Plates, where the Earth's surface is very rugged. Its relatively closed geographical environment, as well as the abundant resources formed under unique geographical and climate conditions, has created a natural barrier against the migration and integration of human communities. This has resulted in the formation of a region with the world's highest distribution density of ethnic groups. The chosen area of study is the Yunan Province in China. Yunnan is situated on the border of the southwestern ethnic mountainous region of China, and is home to 25 ethnic minorities (Fig. 1). Evaluation of educational convenience in this ethnic areas and analysis of its spatiotemporal changes are very important. The convenience of education refers to the convenience of students taking the motor vehicle from a settlement to school on the basis of the available road network.

The ethnic minorities in Yunnan are mostly distributed in villages in mountainous and border areas, whereas the middle schools were mainly located in urban areas in towns and cities. According to the results of the first Yunnan Geological Survey (2015), the total area of the Yunnan Province was 394,000 square kilometers, in which there were 14,232 administrative villages but only 1679 middle schools. On average, there were more than eight settlements but only one middle school per each 235 square kilometers. Based on the calculation of the shortest distance between the villages and the schools, the average distance was approximately 19 km. Apart from a few exceptions, the middle school students in most administrative villages have to take the school bus to go to school.

In this situation, road networks are an important safeguard for students attending school. However, road networks in this region have a very obvious characteristics of vulnerability.

Yunnan is situated near the southwestern margin of China, along the intersection among the Eurasian, Indian and Pacific plates. The territory mainly consists of mountains, plateaus, and hilly terrain, with mountainous regions accounting for 94% of the province's total area. The topography of Yunnan is high in the northwest, and low in the southeast, with vast differences in elevation. The road network is mainly constructed zigzag along ravines and cliffs.

Meanwhile, the road networks and traffic in mountainous areas are affected by various conditions, such as terrain and climate. Due to its climatic and geographic properties and the frequent occurrence of natural disasters, such as debris flows, it is highly vulnerable to natural damages, which cause severe impacts on the outdoor activities of the Download English Version:

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