Preliminary Study on Spatial Structure of Xiushan Rural Areas in Chongqing Based on GIS Analysis

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ABSTRACT:

The rapid development of China's urbanization has led to rural industries decline, rural exodus and the growing gap between urban and rural. So China needs to find the new spatial strategies of development to achieve the goal of urban-rural integration. Then it is necessary to explore the rural areas' spatial structure and the affecting factors of its development. With its large rural population, Chongqing was chosen as the pilot zones for Urban-rural Integration Reform. So this paper chosen Xiushan county of Chongqing as an example to analyze the rural spatial structure and its affecting factors. Firstly, we develop a database which stores the information such as population, land-use and industry in a format supported by GIS (Geographic Information System) based on the questionnaire for the 260 villages of Xiushan. Secondly, with the aid of GIS visualization function，it is convenient to study the spatial distribution characteristics of administration maps of Xiushan rural areas from aspects of location, topography, population, industry, public services and so on. After a preliminary study on the inequality distribution of each villages based on the maps, the results showed that the terrain and the traffic play a notable role in the economic development of rural area in Xiushan. And there are some close relationships between the spatial distribution of population, land-use and Industrial structure.

KEYWORDS:

Rural transformation, Spatial inequality，Urban-rural integration, GIS , Urbanization of China,

1. Introduction

1.1 The Urban-rural Integration Reform in Chongqing

The rapid development of China's urbanization has led to rural industries decline, rural exodus and the growing gap between urban and rural. So China needs to find the new spatial strategies of development to achieve the goal of urban-rural integration. Then it is necessary to explore the rural areas' spatial structure and the affecting factors of its development. With its large rural population, Chongqing was chosen as the pilot zones for Urban-rural Integration Reform. So this paper chosen Xiushan county of Chongqing as an example to analyze the rural spatial structure and its affecting factors.

1.2 rural planning and rural survey

Rural planning is the comprehensive strategies about the village's social, economic, technological development, and also the basic guidelines for the rural development and construction. The plan includes the analysis and evaluation of economic and natural resources; the strategic objectives and the distribution of the rural social and economic development and last the implementation of the rural planning. Therefore, the rural planning should be based on its resources, the existing production conditions, the nation's economic development objectives and policies and then choose the optimal solution.

Through filed research，it is reasonable to identify existing problems in rural areas, and establish the main content of the Rural Planning , the framework of rural living environment improvement and municipal management model. With the establishment of Chongqing rural management system including the content of rural planning，the index system such as rural land use classification (as distinct from urban land use classification), land scale per person and the public facilities and infrastructure to explore the new paradigm of rural planning and new models of Chongqing rural construction, for example, the public participation, community planning. Chongqing, as the urban and rural reform experimental zone, its rural planning requires special consideration to the relationship of the villages with its surrounding cities in transport planning, industry, and functions of the floating population of migrant workers. The optimal hierarchy structure of the villages and the spatial pattern should be researched to achieve the urban and rural public service facilities equalization. The villages at different location advantages should take diverse planning strategies.

1.3 GIS analysis function

Geographic information systems (GIS) is a set of tools that captures, stores, analyzes, manages, and presents data that are linked to location(s). In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology. GIS systems are used in geography and urban planning. With the aid of GIS, it is convenient to study the urban space structure combined with the social and economic attributes. As in a thematic map, GIS requires both spatial data and attribute data: information attached to each object in a layer. Within the program the attributes most often are in spreadsheet format. The initial data consist of the map of the administrative regions and the attribute data such as GDP (GDP measures the value of all goods and services produced in the county during the year)，the total population and the proportion of Xiushan. Several datasets were used to generate variables that measure the geophysical and socio-economic attributes of each county. One of the distinguished properties of themiatic map is that it can provide an effective visualization of population density from statistical density functions of spatial distributions.

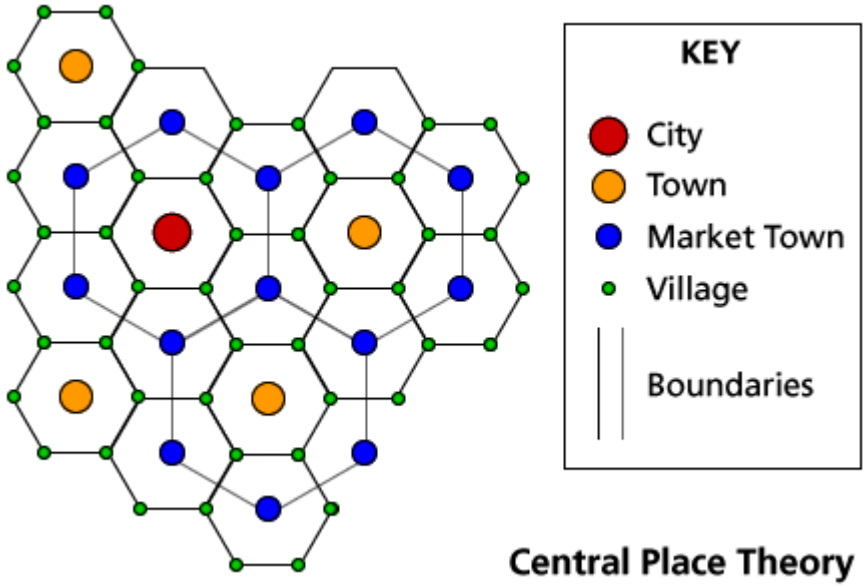
2. Theory

2.1 Central place theory

Central place theory is a geographical theory that seeks to explain the number, size and location of human settlements in an urban system. The theory was created by the German geographer Walter Christaller, who asserted that settlements simply functioned as 'central places' providing services to surrounding areas. The result is that a system of centers of various sizes will emerge. Each center will supply particular types of goods forming levels of hierarchy. In the functional hierarchies, generalizations can be made regarding the spacing, size and function of settlements.

The larger the settlements are in size, the fewer in number they will be, i.e. there are many small villages, but few large cities. The larger the settlements grow in size, the greater the distance between them, i.e. villages are usually found close together, while cities are spaced much further apart. The higher the order of the goods and services (more durable, valuable and variable), the larger the range of the goods and services, the longer the distance people are willing to travel to acquire them.

At the base of the hierarchy pyramid are shopping centres, newsagents etc. which sell low order goods. These centres are small. At the top of the pyramid are centres selling high order goods. These centres are large. Examples for low order goods and services are: newspaper stalls, groceries, bakeries and post offices. Examples for high order goods and services are: jewellery, large shopping arcades and malls. They are supported by a much larger threshold population and demand.



http://watd.wuthering-heights.co.uk/mainpages/sustainability.html

2.2 G. William Skinner's Chinese rural hierarchy theory

G. William Skinner's groundbreaking research into rural Chinese economic systems displayed the value of spatially explicit theories such as central place theory in applied situations that served to explain or even fundamentally reshape our understanding of social and economic systems in a way that other approaches could not.At the root of rural economic activity in China was the village. The average peasant lived here with his family and engaged in a largely subsistence existence, producing goods for immediate consumption. It would be wrong, however, to view such a family or a village as being a closed system, entirely self-reliant. Excess food, clothing or other goods were produced. Such items flowed upward to the next step in the hierarchy: what Skinner dubbed the standard market town. "What [the village] household produced but did not consume was normally sold there," Skinner observed of the standard market town. In addition, "what [the village household] consumed but did not produce was normally bought there." The standard market town itself only had a limited range of goods available. Itinerant merchants would travel to and from intermediate market towns which represented the next level. At the top of the rural

hierarchy were the central market towns, which were the most rarified and had the most exclusive items available. Beyond the central market town, we move into local cities and regional cities, which were beyond the scope of Skinner's rural model.

3. Framework

3.1 Rural information questionnaire

This paper chosen Xiushan county of Chongqing as an example to analyze the rural spatial structure and its affecting factors. Firstly, we develop a database based on the questionnaire for the 260 villages of Xiushan and the formulation of rural basic information questionnaire will based on the direction and significance of the study. The content of the questionnaire was based on the social and economic structure of rural area including the indicators such as settlements in land area per capita, the public services and facilities per capita area， arable land change rate, rural population change rate, a production share of employment, agricultural real estate rate, agricultural labor productivity , etc.

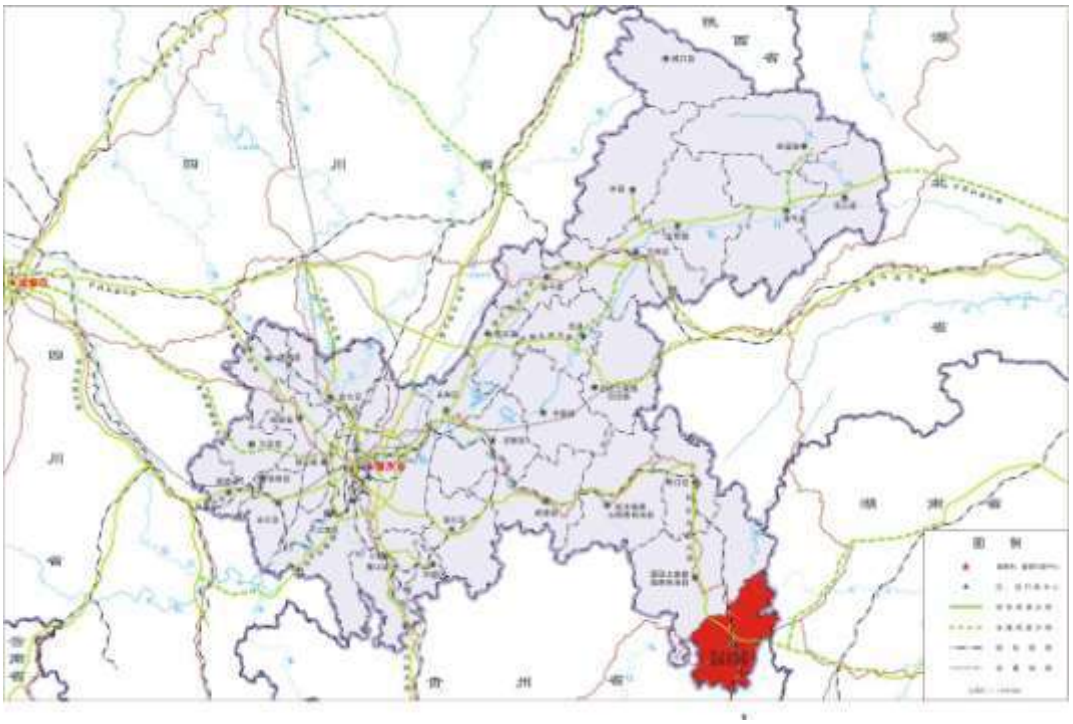
3.2 乡村地理信息系统数据库核心数据与指标体系

3.2 Rural geographic information system data index system

Rural geographic information system database core data index system		
空间数据 Spatial data	镇行政边界 Township border	
	村行政边界 Village administrative boundaries	
	镇政府位置 The location of the town government	
	县政府驻地 County Government Resident （区位）(Location)	比如秀山县城的位置 Such as Xiushan county location
	公路、铁路路线 Highway, railway line （交通）(Traffic)	比如秀山：国道 326、国道 319、包茂高速公路、渝怀铁路 Such as the Xiushan: State Road 326, State Road 319, the package Maoming Expressway Chongqing-Huaihua Railway
	地形地貌 Topography	比如山地、丘陵、平坝，山脉走向 Such as mountains, hills, flatland, the mountains toward
	河流走向 River toward	比如长江 Such as the Yangtze River

属性数据 Attribute data	**人口 Population**	户籍人口 Household population
		常住人口 Resident population
		进城务工人口 Migrant population
		常住人口密度图（即常住人口/村域面积）Resident population density map (ie, the resident population / village field area)
		进城务工人口密度图（即进城务工/村域面积） Migrant population density map (ie, migrant / village field area)
		人口迁出率图（进城务工人口/户籍人口*100%） Emigration rate map (migrant population / household population * 100%)
		人口流动性（进城务工人口/常住人口*100%） Population mobility (migrant population / resident population * 100%)
	产业 Industry	总产值（亿元） Output (million)
		农业产值 Agricultural output
		工业产值 Industrial output
		服务业产值 Services industry
		农业产值占比（农业产值/总产值*100%） Proportion of agricultural output (agricultural output value / output value * 100%)
		工业产值占比（工产产值/总产值*100%） Industrial output value accounted for (public production output value / output value of 100%)
		服务业产值占比（服务业产值/总产值*100%） Services industry accounted for (service industry output value / output value * 100%)
		人均总产值（总产值/常住人口*100%）Per capita output value (GDP / resident population * 100%)
		人均农业产值（农业产值/常住人口*100%） Per capita agricultural output (agricultural output / resident population * 100%)
		人均工业产值（工业产值/常住人口*100%） Industrial output per capita (industrial output / resident population * 100%)
		人均服务业产值（服务业产值/常住人口*100%） Per capita services industry (services industry / resident population * 100%)
	土地 Land	镇/乡总面积（平方公里） Town / rural area (square kilometers)
		农用地面积 Agricultural land area
		工业用地面积 Area of industrial land
		耕地面积 Arable land
		国有建设用地面积 State-owned construction land area
		集体建设用地面积 Collective construction land area
		宅基地面积 Homestead area
		农用地占比（农用地面积/村域面积*100%） Agricultural land accounted for (/ Village is an area of agricultural land area of

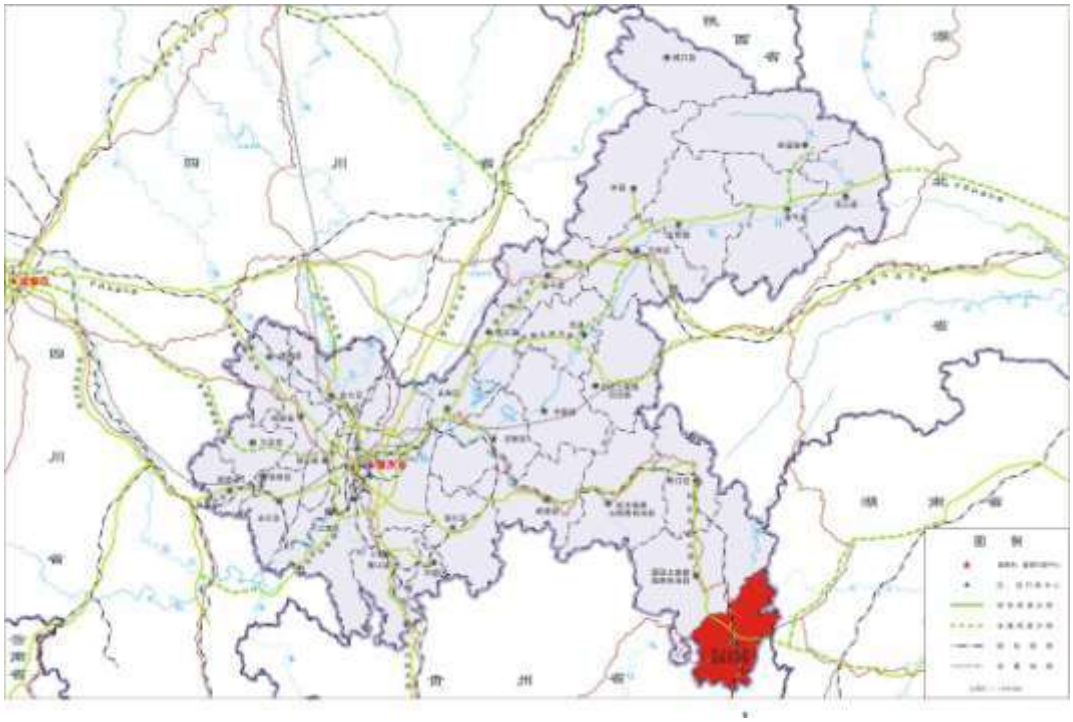
		100%)
		工业用地占比（工业用地面积/村域面积*100%）Proportion of industrial land (area of industrial land / Village is an area of 100%)
		国有建设用地占比（国有建设用地面积/村域面积*100%）Proportion of state-owned construction land (state-owned construction land area / village of domain area * 100%)
		集体建设用地占比（集体建设用地面积/村域面积*100%）Collective construction land accounted for (collective construction land area / village of domain area * 100%)
		宅基地用地占比 1（宅基地面积面积/村域面积*100%）Homestead land accounted for 1 (homestead area area / village domain area * 100%)
		宅基地用地占比 2（宅基地面积面积集体建设用地面积*100%） Homestead land accounted for 2 (homestead area of area of collective construction land area * 100%)
	公共服务设施 Public service facilities	变电站 Transformer substation
		垃圾处理厂 Garbage disposal plant
		体育设施 Sports Facilities
		公益事业设施 Public welfare facilities
		供水方式 Way of water supply
		污水处理厂 Sewage treatment plant
		中学 High school
		学校分布 Distribution of these schools
		小学分布 Elementary school distribution
		幼儿园分布 Kindergarten distribution



4. Analysis (case study)

4.1 Location and introduction of Xiushan County

Xiushan Tujia and Miao Autonomous County, or Xiushan County for short(Pinyin: XiùShān) is located in southeastern Chongqing Municipality, China. Xiushan has a special location position among 38 districts and counties for it is at the junction of Hunan, Hubei, Guizhou Province and the No.326 and No.319 National Highway runs through the county. However, Xiushan county's terrain is mostly low mountains, valleys and the hillside area. The county accounted for 28% plains, hills for 29%, mountain for 43%. Hills account three quarters of the area. In particular, more than 10 surrounding townships are in a bad situation for the steep and inaccessible mountains. Paddy fields are mainly located in the flatland and hilly region.



4.3 Population (such as Resident population, the total population, urbanization rate)

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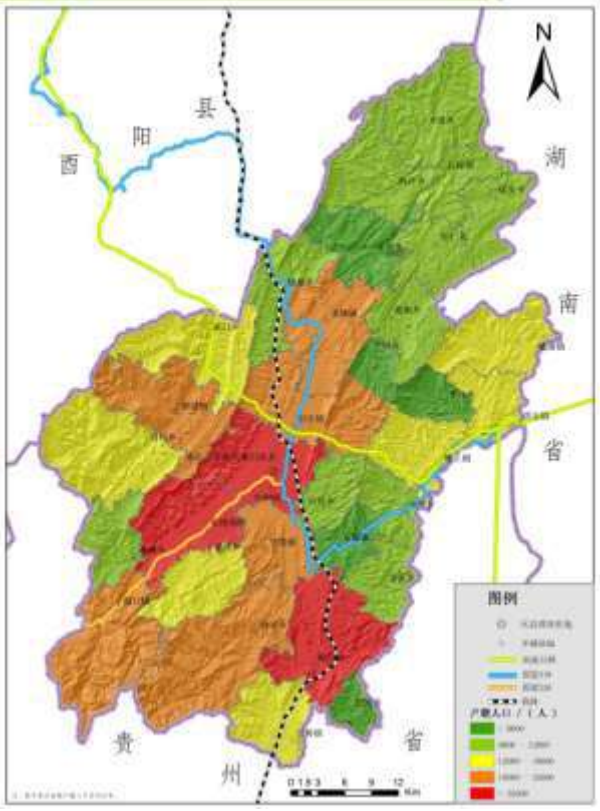
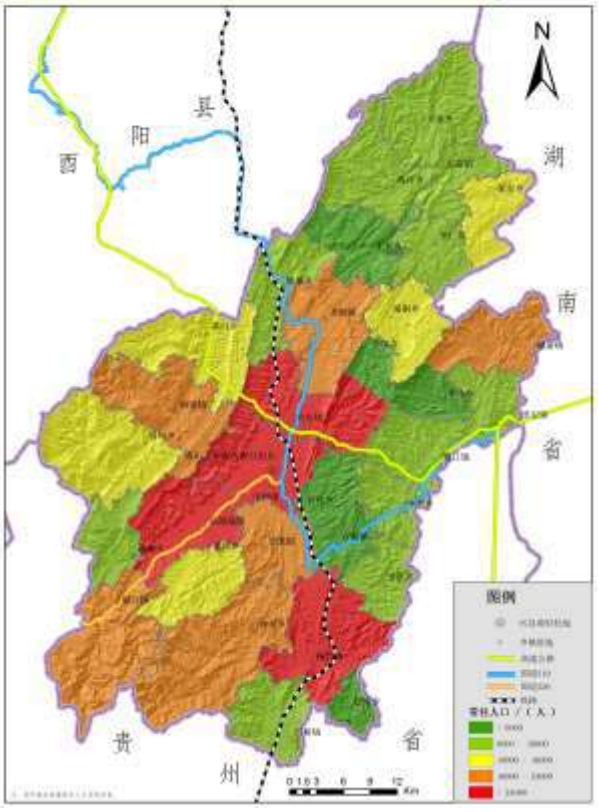
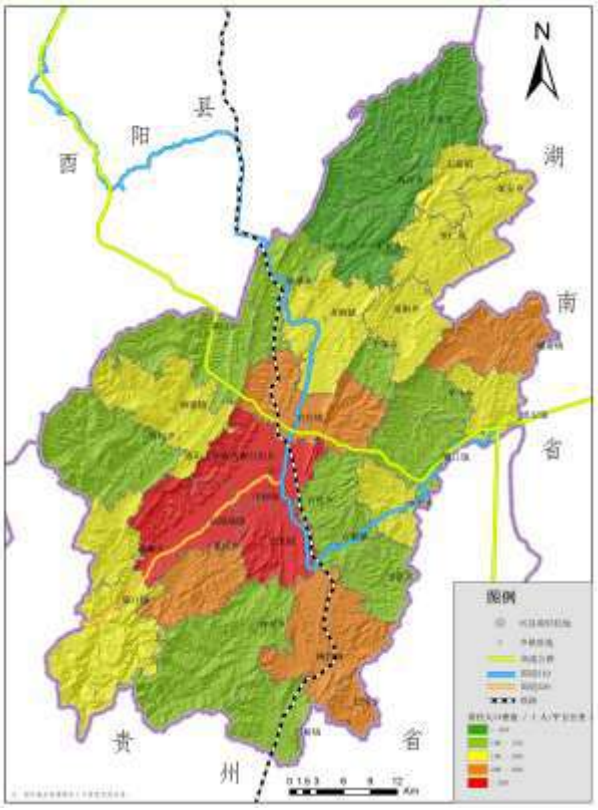
秀山县镇域户籍人口分析图



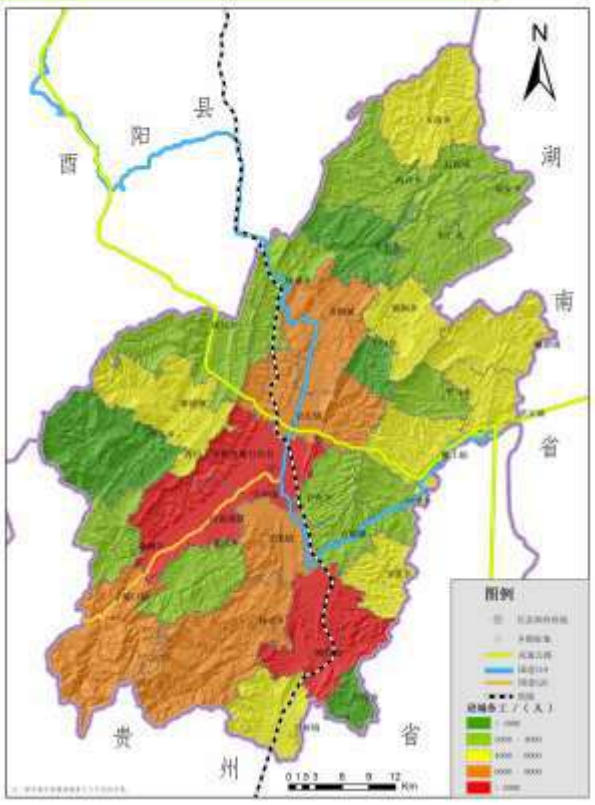
秀山县镇域常住人口分析图



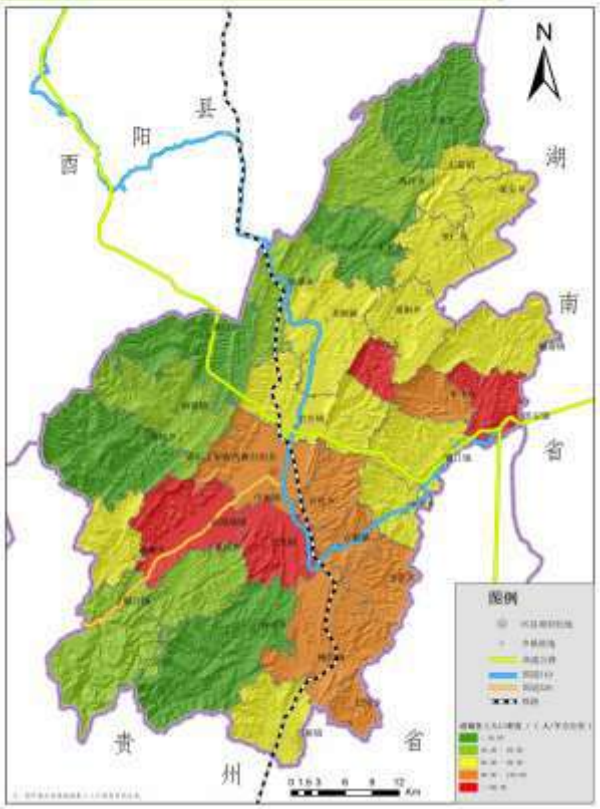
秀山县镇域常住人口密度分析图

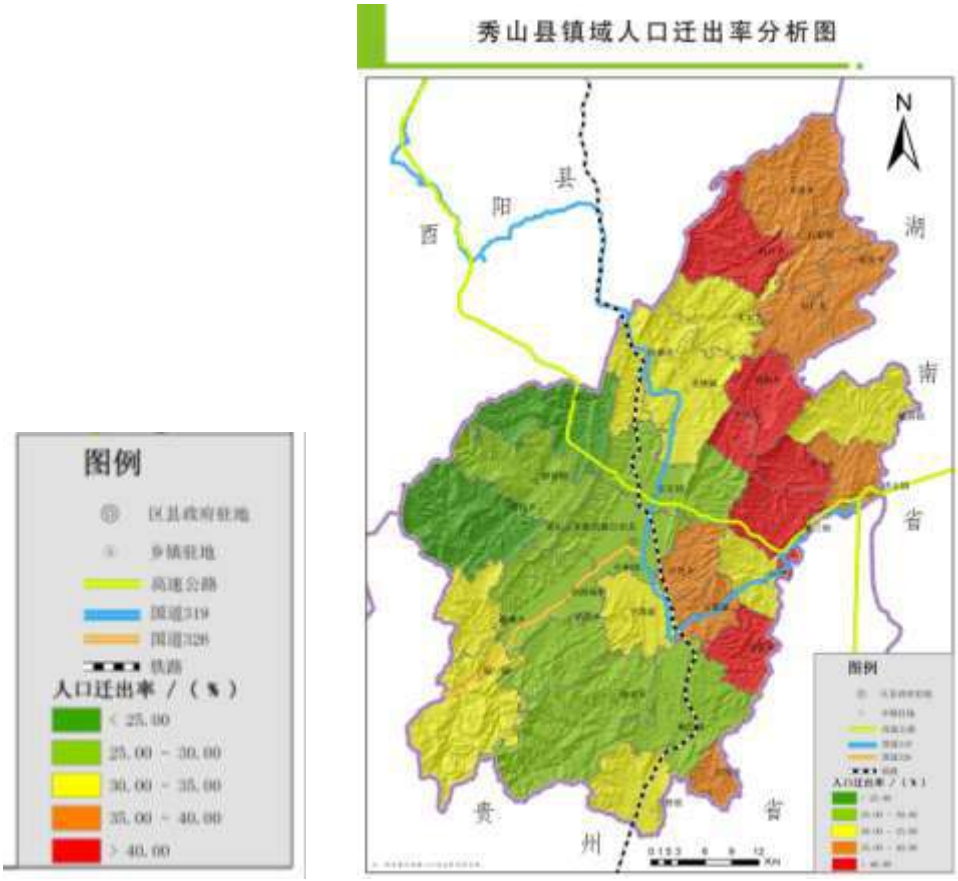


秀山县镇域进城务工人口分析图

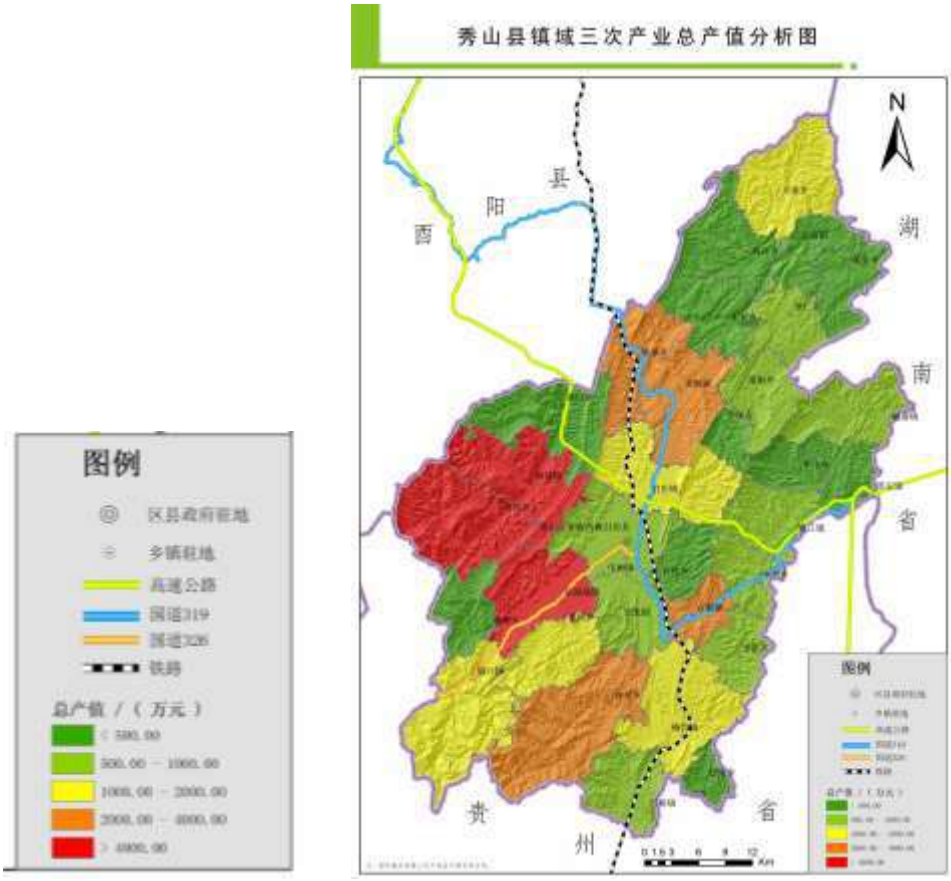


秀山县镇域进城务工人口密度分析图

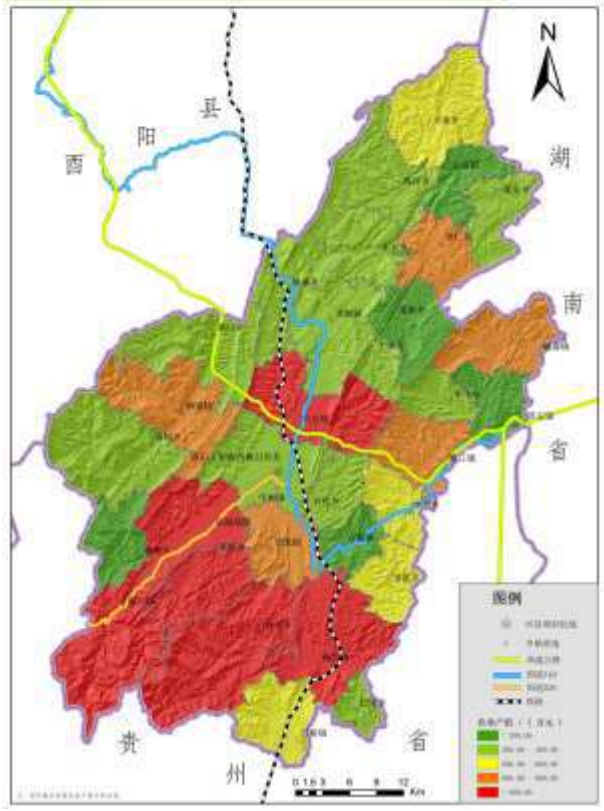


- 
秀山县镇域人口迁出率分析图
N
县
阳
西
湖
南
省
贵
州
省
图例
区县政府驻地
乡镇驻地
高速公路
国道319
国道320
铁路
人口迁出率 /（%）
< 25.00
25.00 - 30.00
30.00 - 35.00
35.00 - 40.00
> 40.00

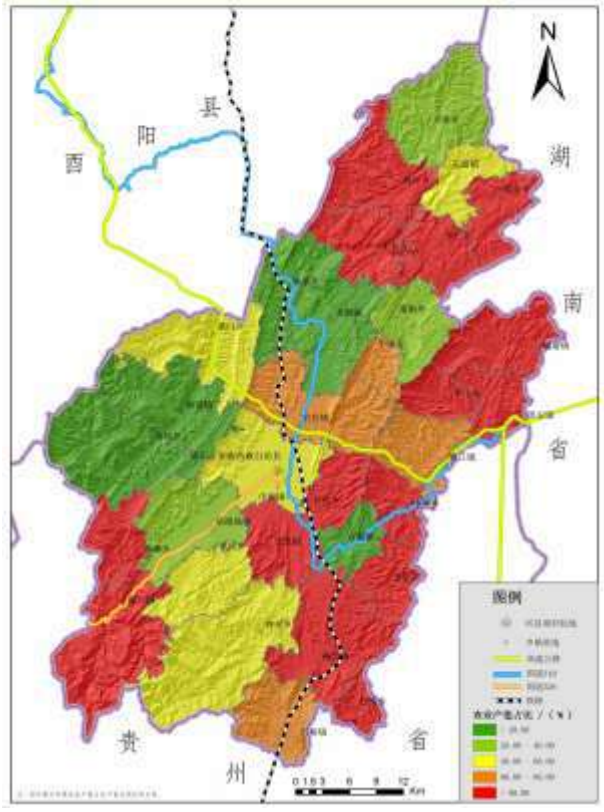
4.4 Industry

- 
秀山县镇域三次产业总产值分析图
N
县
阳
西
湖
南
省
贵
州
省
图例
区县政府驻地
乡镇驻地
高速公路
国道319
国道320
铁路
总产值 /（万元）

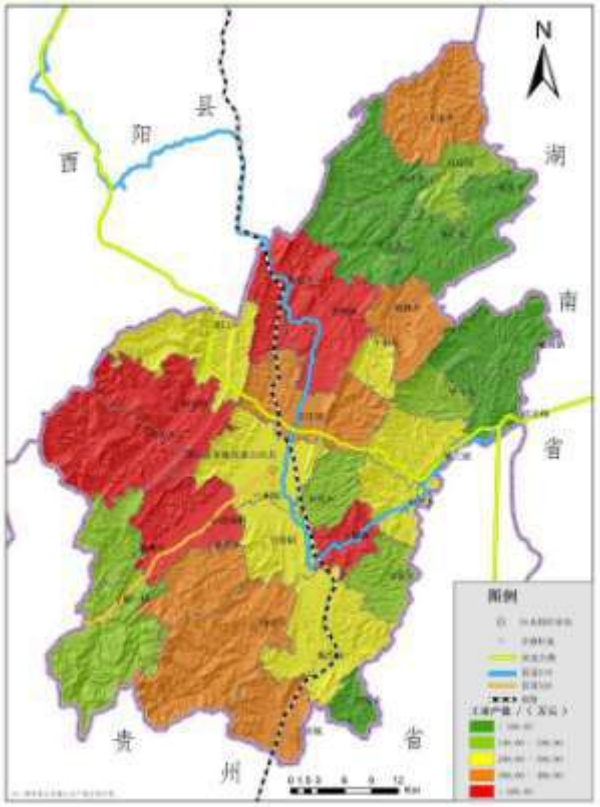
秀山县镇域农业产值分析图



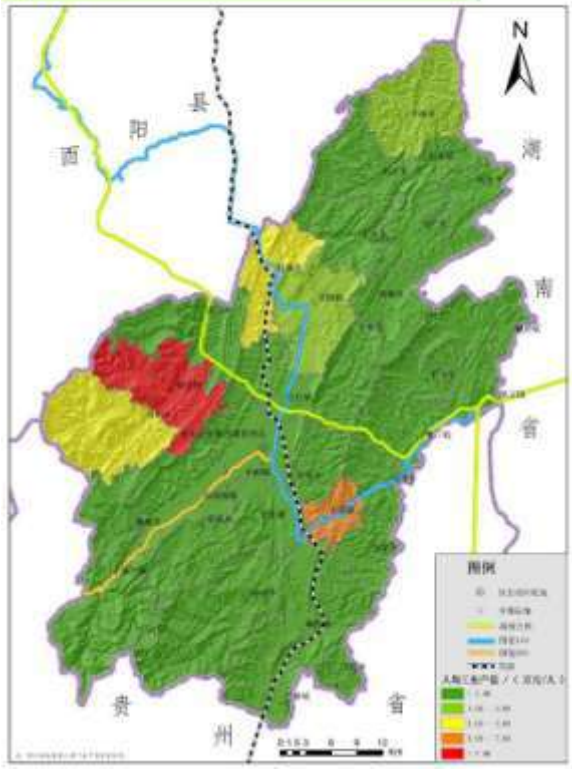
秀山县镇域农业产值占总产值比例分析图



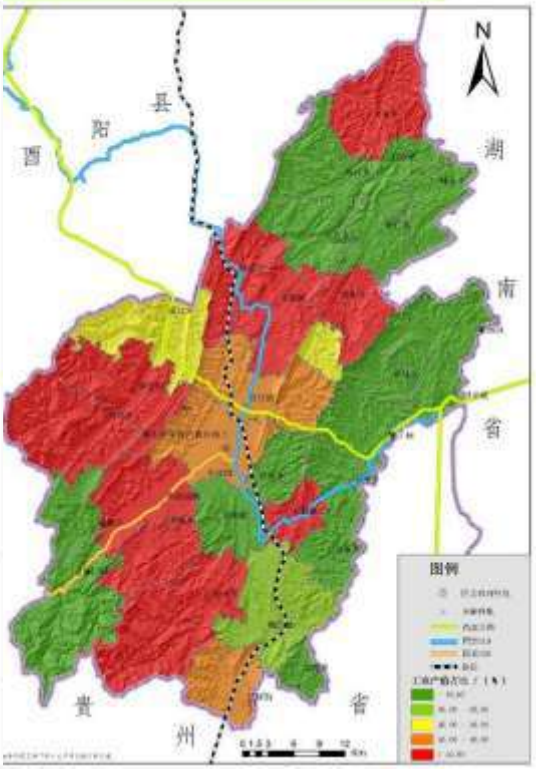
- 秀山县镇域工业产值分析图



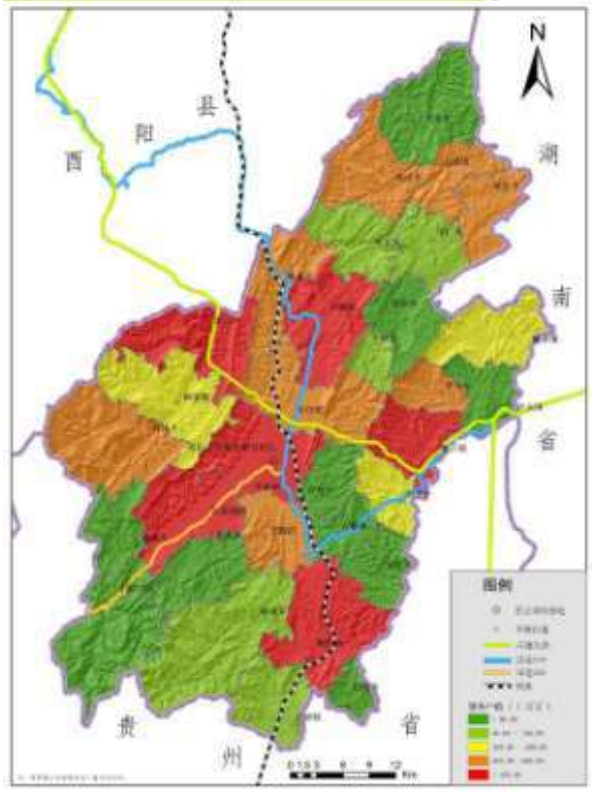
- 秀山县镇域人均工业产值分析图



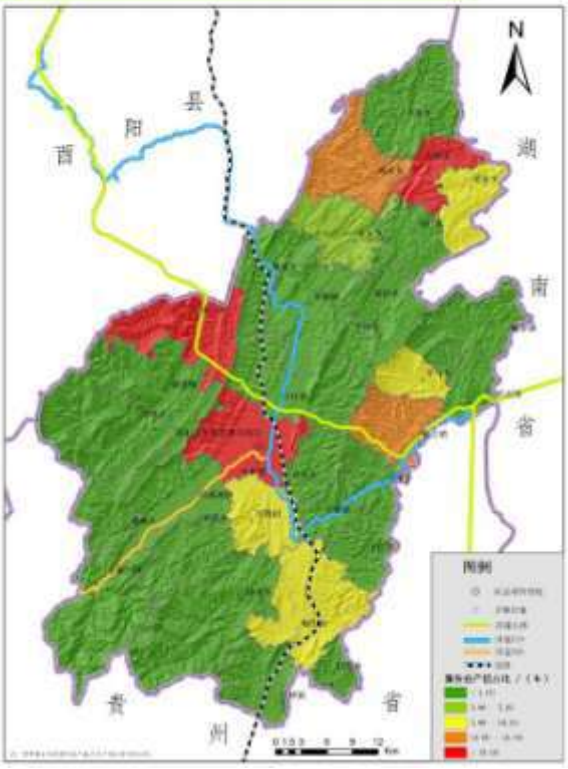
- 秀山县镇域工业产值占总产值比例分析图



- 秀山县镇域服务业产值分析图



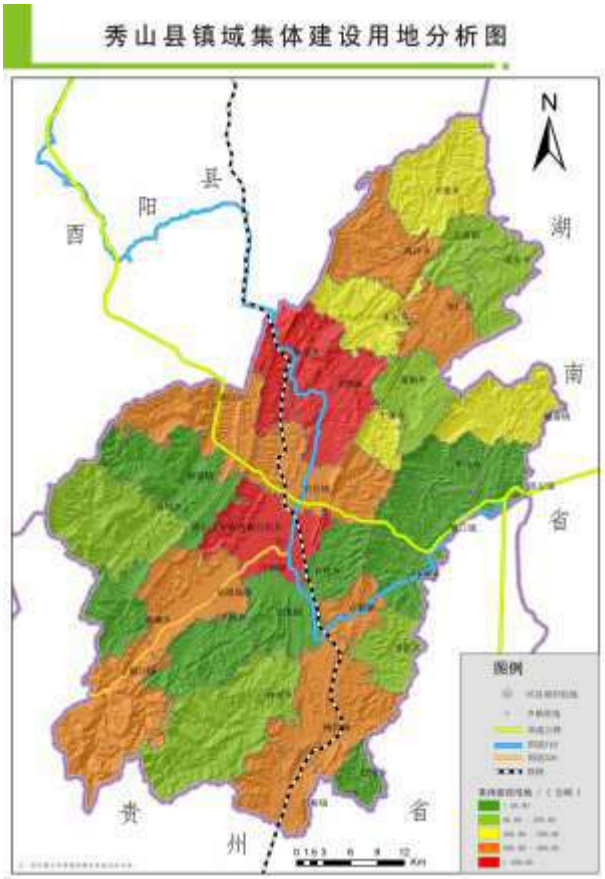
秀山县镇域服务业产值占总产值比例分析图



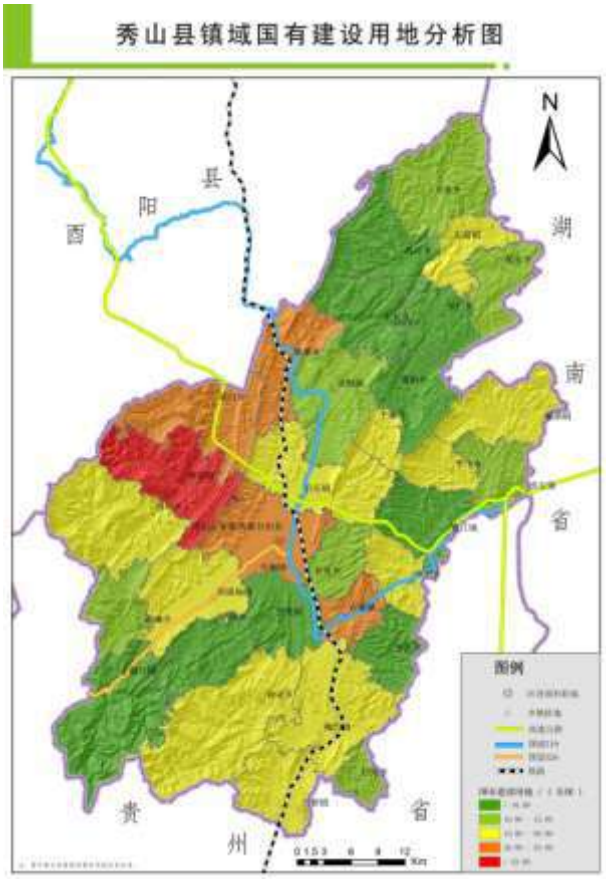
秀山县镇域人均服务业产值分析图

4.5 Landuse

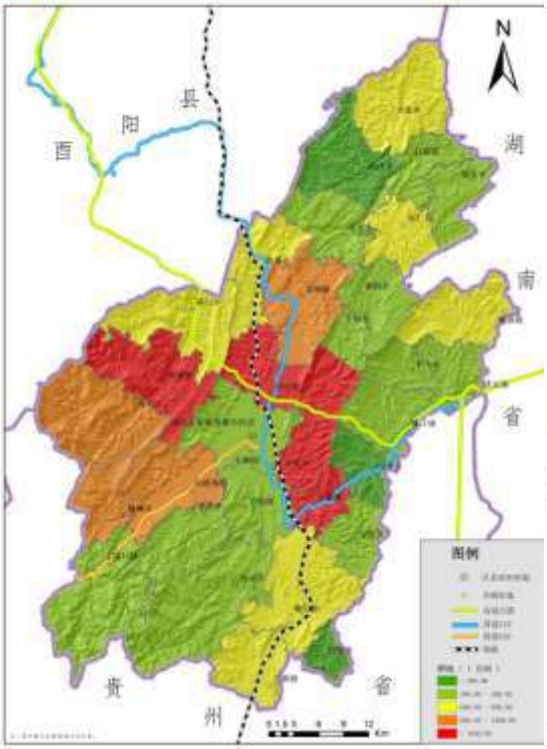
- 秀山县镇域集体建设用地分析图



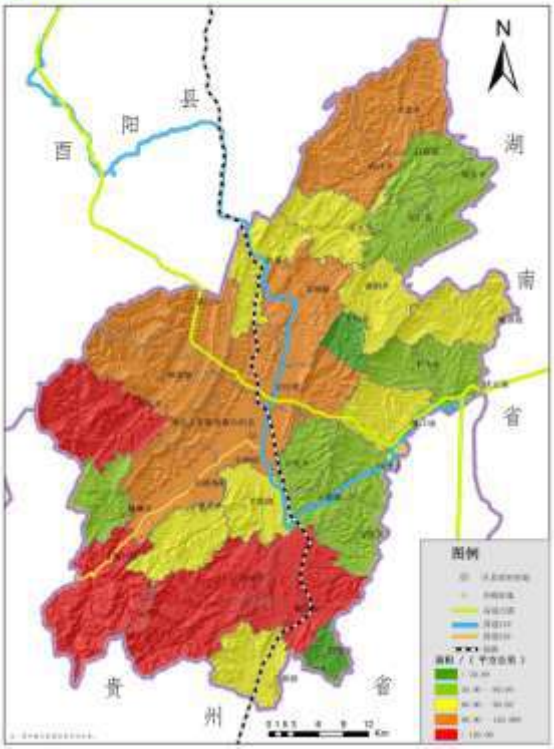
- 秀山县镇域国有建设用地分析图



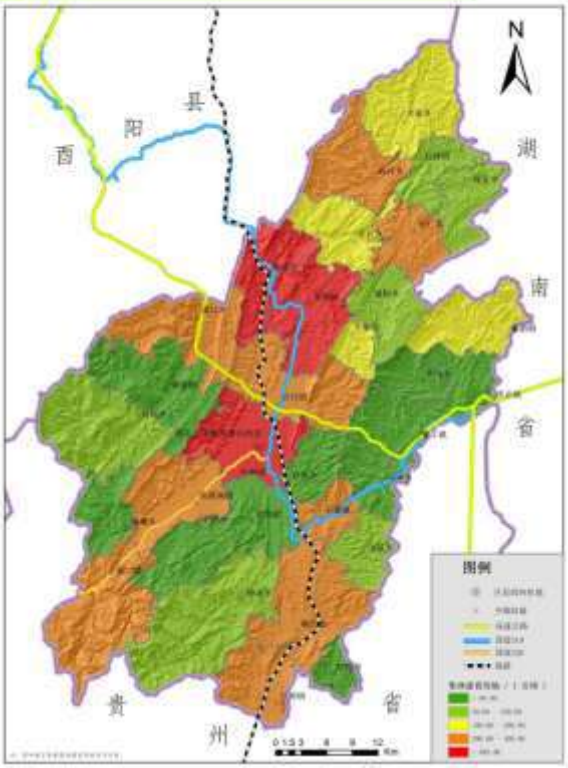
秀山县镇域耕地分析图



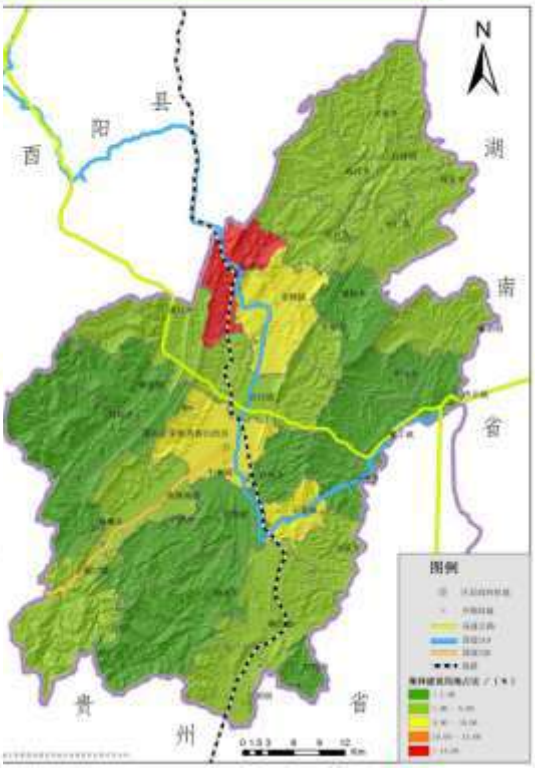
秀山县镇域面积分析图



秀山县镇域集体建设用地分析图

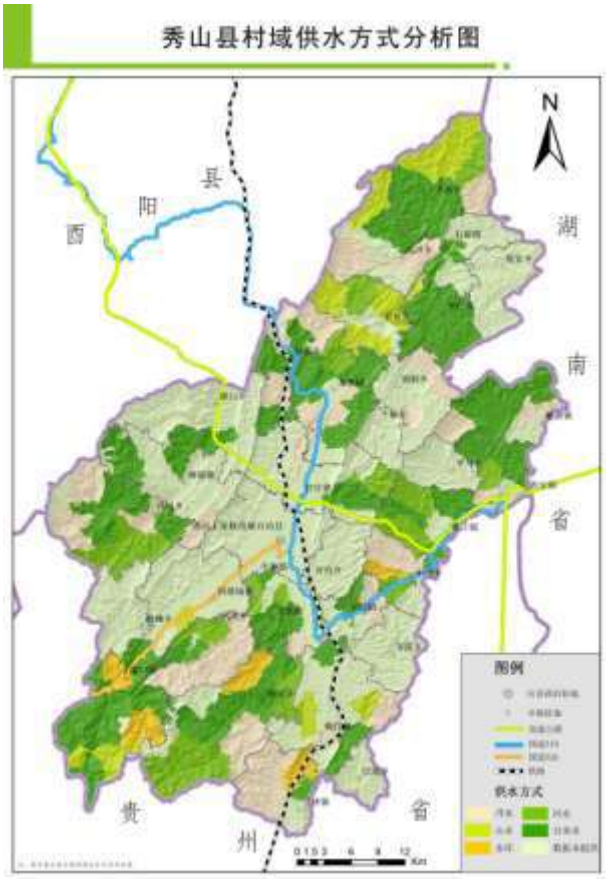


秀山县集体建设用地占镇域面积比例分析图

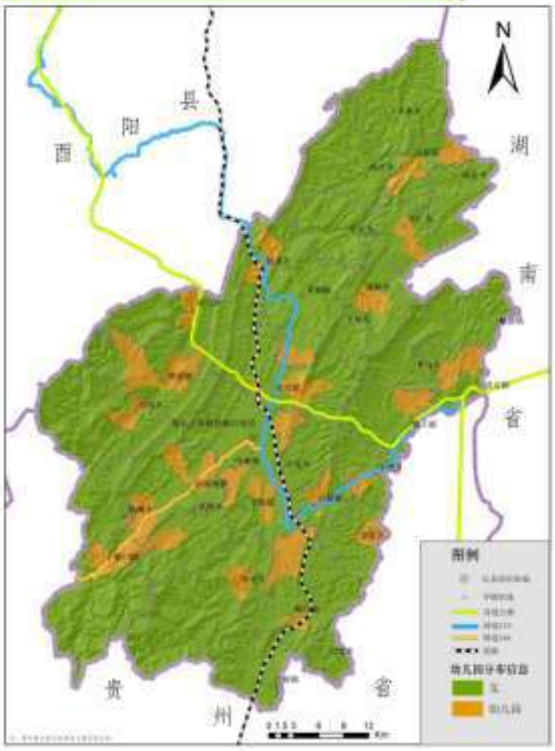


4.6 Public service distribution

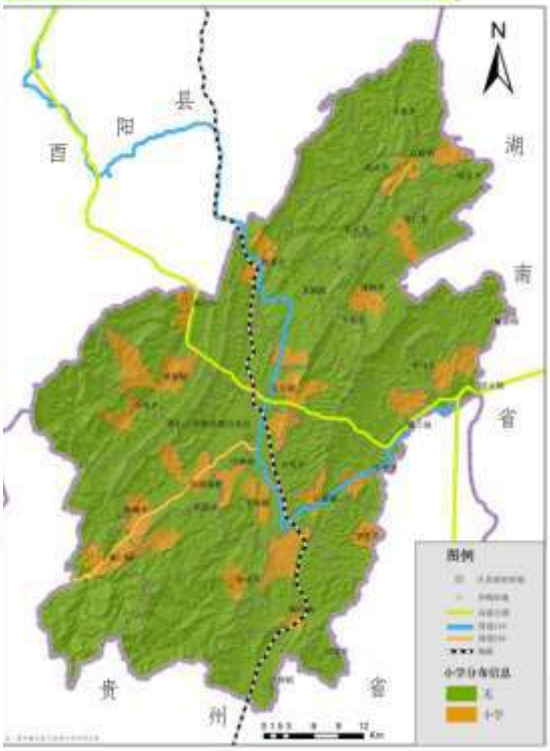
- 供水方式资料收集不全，大多没有统计。
- 有统计信息的地区主要以自来水和河水供水为主
- 中学分布较离散，分布密度相对比较均衡



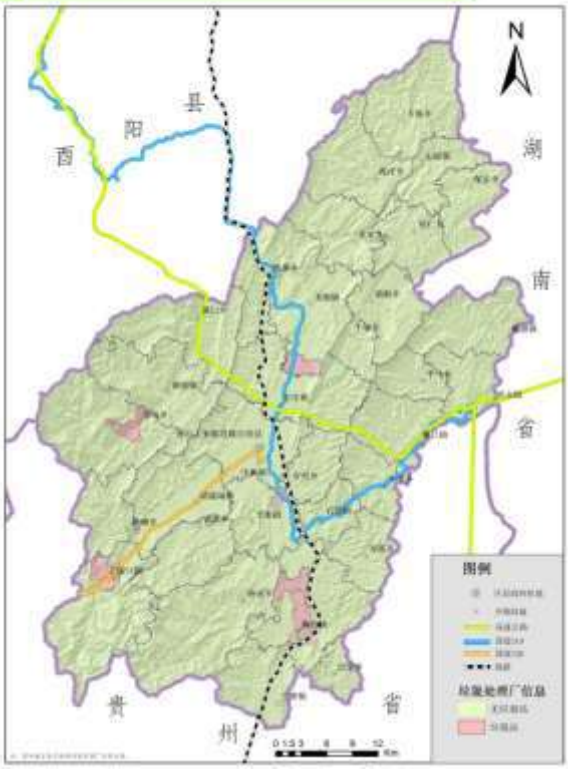
秀山县村域幼儿园分布图



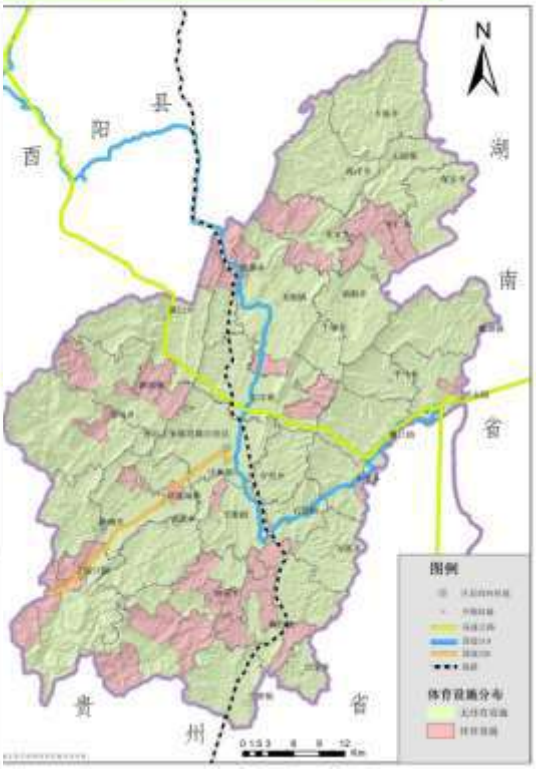
秀山县村域小学分布图

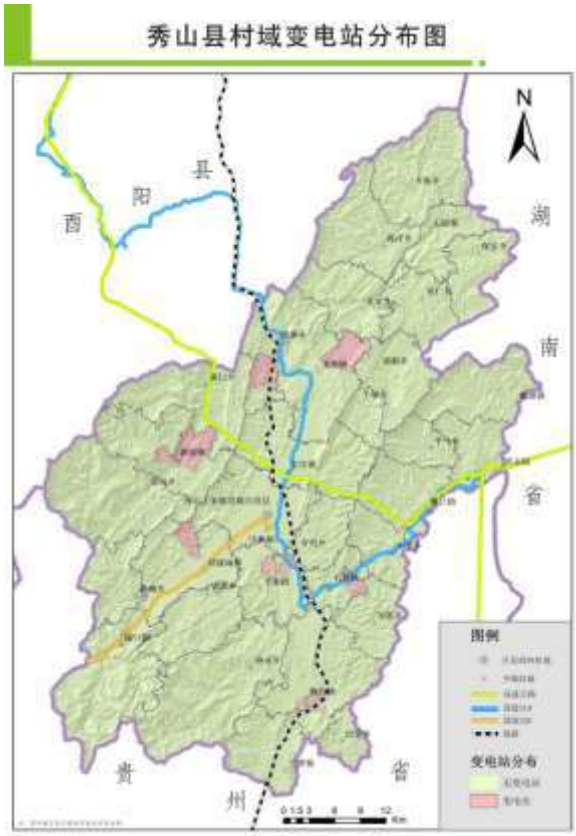


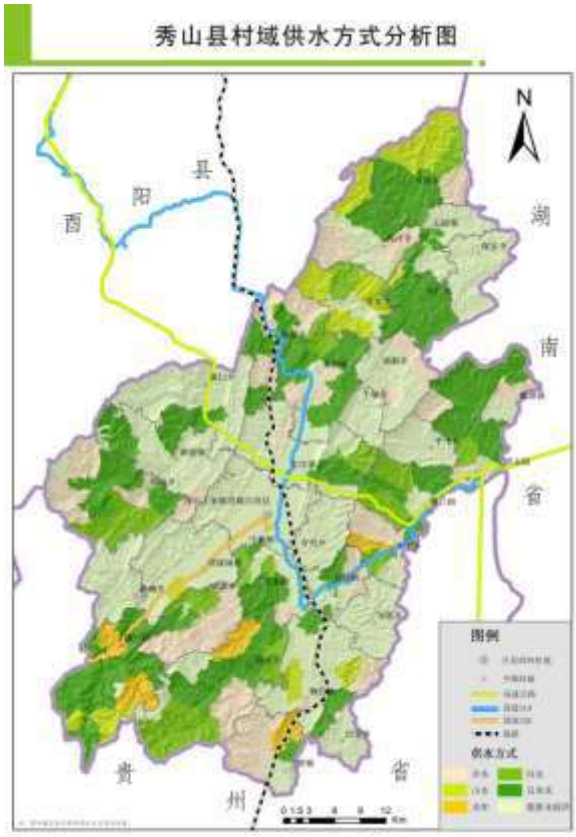
秀山县村域垃圾处理厂分布图



秀山县村域体育设施分布图







5. Conclusions

5.1 The Driving Forces of economic elements' distribution

(1) The traffic has a huge role in promoting the economics:

(2) The restrictive effect of the terrain:

(3) The unique role of the mineral resources, for example, the village near the mines often has a higher industrial output or GDP compared to other villages.

5.2 The characteristics of economic elements distribution

5.2.1 Population distribution:

(1) the resident population and the migrant population tend to located along the main roads;

(2) the transport and land terrain conditions have a great impact on the population density distribution, which was the core radial distribution pattern;

(3) the northern mountainous area has a high population mobility and the rate of moving out accounts for 35%;

5.2.2 Industry distribution:

(1) The output value of the western is higher than that of the east;

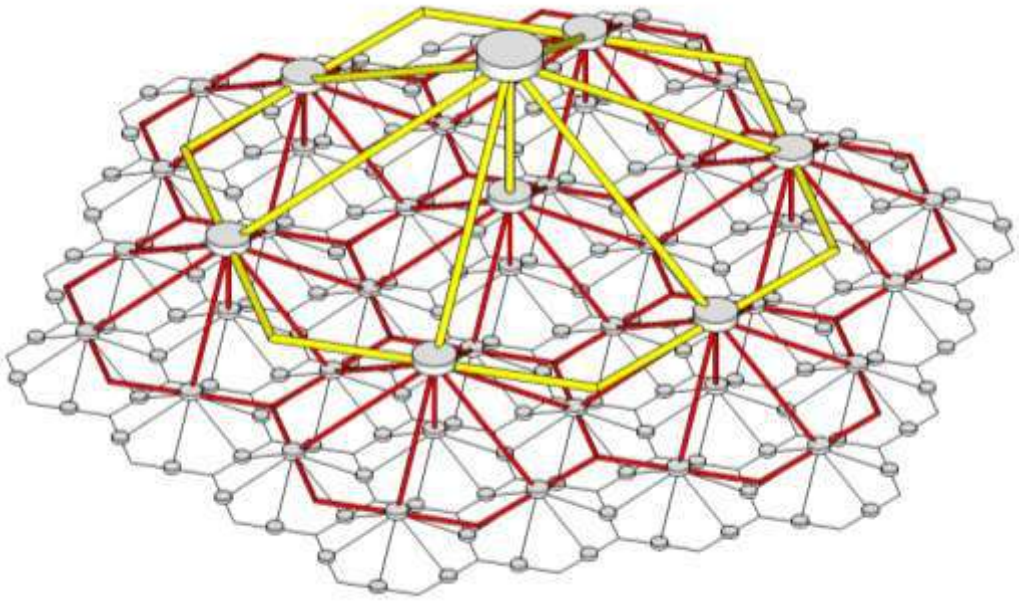
(2) Agricultural output in the south villages is higher than those in the north, the eastern mountains of agricultural output value accounted up to 80%, the main industry of Xiushan County is agriculture;

(3) The services is distributed along the roads.

5.2.3 Land use distribution:

(1) The distribution of the state-owned land for construction was associated with the industrial land layout, which was concentrated mainly in the western mountainous edge regions with rich mineral resources;

(2) The collective construction land of the villages distributes along the roads and has a close relationship with the transport, indicating that the farmers spontaneously gathered to the road;



6. Reference

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