

Analysis of the spatial layout of emergency shelters in Guiyang city

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Abstract: Emergency shelter is the government and social response to major sudden disasters when emergency evacuation and temporary resettlement victims of the main place, actively promote the grass-roots (township, streets, community) emergency shelter construction is the main content of strengthening the construction of social emergency rescue system, and balanced layout is the important principle of urban emergency shelter planning and construction. Based on GIS technology, the study analyzes the spatial layout characteristics of population, historical seismic data, fault zone and emergency shelters in Guiyang city respectively, and discusses the relationship between multiple elements and the spatial layout of emergency shelters, summarizes the problems existing in the spatial layout characteristics of emergency shelters and gives relevant decision-making suggestions.

1. Introduction

The background of high intensity of seismic earthquakes, complex secondary disasters, and more shallow earthquakes show that Guizhou is not without major earthquakes. Emergency shelters including schools, parks, green Spaces and squares are relatively safe places for providing emergency evacuation and temporary life for the affected people after the release of pre-disaster forecasts or during the disaster. The planning and construction of urban emergency shelters is an important measure to improve the comprehensive urban disaster prevention capacity at home and abroad, reduce the impact of disasters, and enhance the emergency management capacity of the government. With the acceleration of China's economic development and urbanization, the problem of earthquake emergency avoidance is particularly important under the background of population concentration. Through the analysis of the population, historical seismic data, the spatial distribution characteristics of fault zone and emergency shelters in Guiyang, the existing problems are found, and the relevant suggestions are put forward, which can provide decision suggestions for the planning and site selection of shelters in Guiyang in the future.

Urban emergency shelter refers to the ^[1] site of disaster prevention and mitigation to protect the life and property safety of urban residents, improve the capacity of urban disaster prevention system and after various urban disasters and their secondary disasters, and the temporary resettlement site for post-disaster recovery and reconstruction. The "Technical Standards for the Construction of Urban Emergency Shelters" clearly stipulates that emergency shelters include a certain scale of sites and new or strengthened buildings, that is, the site type emergency shelters and building type emergency shelters, while other scholars are mainly inclined to the site type emergency shelters. Whether the site or the building can be used as long as it can meet the requirements of disaster prevention and shelter. However, this paper believes that urban emergency shelters mainly include urban parks, green Spaces, squares, parking lots, school playgrounds, public venues, nursing homes, village committee and township government venues and buildings.

2. Study area and data sources

2.1. Research Area

Guiyang city is the capital of Guizhou Province, with a total land area of 8,043 km². In the southeast, it borders Weng'an, Longli, Huishui and Changshun counties in Buyi and Miao Autonomous Prefecture in Qiannan, Pingba District in Anshun City and Zhijin County in Bijie City

in the west, and Qianxi City in Bijie City, Jinsha County and Bozhou District of Zunyi City in the north. Guiyang has jurisdiction over six districts, including Yunyan, Nanming, Huaxi, Wudang, Baiyun and Guanhu, three counties in Xiuwen, Xifeng and Kaiyang, and one county-level city in Qingzhen.

In terms of population size, there are 2 counties with > 1 million people, 3 counties with 500,000-1 million people, 3 counties with 300,000-500,000 people, and 2 counties with 100,000-300,000 people^[2]. From 1981 to 2021, 44 earthquakes have occurred in 10 counties of Guiyang for more than 40 years, mainly in Xifeng County, Kaiyang County, Xiuwen County and Huaxi County, especially in Xifeng County and Kaiyang, and the border of counties and Kaiyang County has occurred the most earthquakes^[2]. In terms of fault zone, there are mainly developing NE and NNE faults in Guiyang, mainly including Meitan fault, Wengzhao fault, Baima adong fault, Liangkou fault, Xiaozhaji fault, Longli Chengnan fault, Shanping fault and rock foot fault.

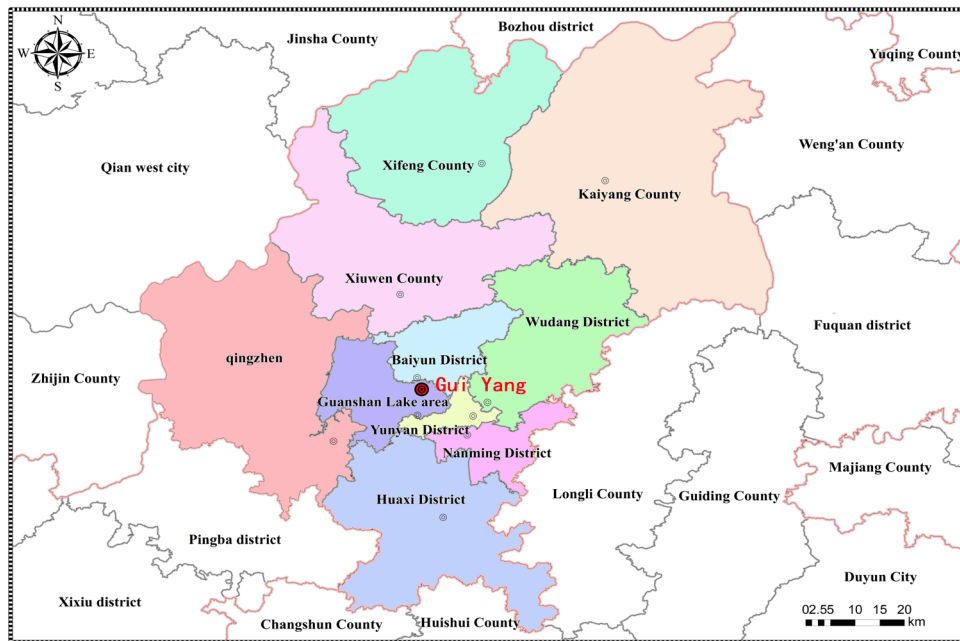


Figure 1 Location distribution diagram of Guiyang city

2.2. Data Sources and Methods

The research mainly involves the data of emergency shelters in Guiyang, population data of Guiyang, fault zone data and historical earthquake data. Among them, the data of emergency shelters comes from the information of Guizhou Provincial Emergency Management Department, Baidu search news and government disclosure, the population data comes from the seventh census data of the official website of Guizhou Provincial Bureau of Statistics, and the earthquake data of magnitude above M0 comes from the earthquake catalog provided by the earthquake station of Guizhou Province. The base map data mainly includes: Guiyang administrative division map and related geographic information data, and the basic geographic data comes from the Seismological Bureau of Guizhou Province and the Guizhou Provincial Department of Culture and Tourism.

This paper mainly analyzes the distribution characteristics of emergency shelters and population, historical earthquake and fault zone in Guiyang, and the characteristics of the number, area and spatial layout; the population refers to Ge Meiling, etc^[3], Luo Ya snow^[4]It divided the geographical distribution of Guiyang population into 9 clusters; meanwhile, according to Li Xudong^[5]Statistical population scale grade method statistics of Guiyang city county population scale special certificate. In terms of historical seismic analysis, the spatial distribution characteristics of M> 0 earthquake from September 1981-2022 were analyzed by nuclear density analysis method in GIS, with a buffer radius of 100m and the layout characteristics of shelters.

3. Current layout status of emergency shelters

3.1. Category and Area Status

The emergency shelters involved in this paper mainly include parks, schools, squares, nursing homes, gymnasiums, parking lots, village committees and township governments, prevention and control basements and welfare homes. The number and area distribution of emergency shelters in each district and county are shown in Table 1:

Table 1 Composition of emergency shelters in the administrative regions of Guiyang city

Administrative statistics	park	school	square	beadhouse	Gymnasium	depot	village committee township government	basement	welfare house	amount
Yunyan district	Quantity (place)	0	3	0	0	1	0	0	1	5
	Area (m ²)	0	22470	0	0	10000	0	0	6000	38470
Nanming district	Quantity (place)	3	3	1	0	2	0	0	0	9
	Area (m ²)	4775394	115519	34000	0	106580	0	0	0	5031493
Guanshan hu District	Quantity (place)	1	1	3	0	2	1	0	0	8
	Area (m ²)	770000	20000	12500	0	264625	10000	0	0	1077125
Baiyun district	Quantity (place)	8	12	5	0	0	1	0	0	26
	Area (m ²)	889000	97000	59900	0	0	6000	0	0	1051900
Huaxi district	Quantity (place)	2	6	2	0	0	0	2	0	12
	Area (m ²)	1598400	29800	2500	0	0	0	2800	0	1633500
Wudang district	Quantity (place)	1	13	0	0	0	0	0	0	14
	Area (m ²)	40952	505103	0	0	0	0	0	0	546055
Xifeng County	Quantity (place)	0	29	8	0	1	1	57	0	96
	area (m ²)	0	267960	19600	0	2400	2800	101300	0	394060
Xiuwen County	Quantity (place)	0	7	1	0	2	0	10	1	21
	area (m ²)	0	70269	1000	0	55333	0	49096	1230	176928
Kaiyang County	Quantity (place)	0	25	5	5	2	1	26	0	64
	area (m ²)	0	188616	23368	6600	17670	1500	35300	0	273054
Qingzhen city	Quantity (place)	0	5	2	0	0	0	7	0	14
	area (m ²)	0	101667	6000	0	0	0	10400	0	118067

By analyzing the relevant data, the following conclusions are obtained:

At present, there are 270 emergency shelters in the 6 districts, 3 counties and 1 city of Guiyang city, with a total area of 10334652m², Accounting for 0.13% of the administrative area of Guiyang city. The types of emergency shelters in Guiyang mainly include parks, schools, squares, nursing homes, gymnasiums, parking lots, village committees and township governments, prevention and control basements and welfare homes. The specific conditions of each district are as follows:

There are 5 emergency shelters in Yunyan District, with a total area of 38,470 m². Among them, there are 3 school land areas, with an area of 22,470 m²; 1 gymnasium, with an area of 10000m²; 1 welfare home, with an area of 6000m². Schools, gymnasiums and welfare homes accounted for 58.41%, 25.99% and 15.60% of the total area of regional emergency shelters, respectively, accounting for 0.22%, 0.1% and 0.06% of the total area of municipal emergency shelters, respectively. The total population of Yunyan District is 1056,819, per capita emergency shelter is 0.04m²/ human being.

There are 9 emergency shelters in Nanming District, with a total area of 5031493m². Among

them, there are 3 park land, with an area of 4775394m²; 3 schools with an area of 115519m²; 1 square, with an area of 34,000 m²; 2 gymnasiums, with an area of 106580m². Parks, schools, squares and gymnasiums accounted for 94.91%, 2.30%, 0.68% and 2.12% of the total area of district emergency shelters, respectively, and 46.21%, 1.12%, 0.33% and 1.03% of the total area of municipal emergency shelters, respectively. The total population of Nanming District is 1047792, and the per capita emergency shelter is 4.8m²/ human being.

There are 8 emergency shelters in Guanshan Lake District, with a total area of 1,077,125 m². Among them, there is 1 park land, with an area of 770,000 m²; 1 school, with an area of 20,000 m²; 3 squares, with an area of 12,500 m²; 2 gymnasium with an area of 264625m²; 1 parking lot with an area of 10000m². Parks, schools, squares, gymnasiums and parking lots accounted for 71.49%, 1.86%, 1.16%, 24.57 and 0.93% of the total area of the district emergency shelters, respectively, accounting for 7.45%, 0.19%, 0.12%, 2.56% and 0.10% of the total area of the municipal emergency shelters, respectively. The total population of Guanshan shanhu District is 642,634, per capita emergency shelter is 1.7m²/ human being.

There are 26 emergency shelters in Baiyun District, with a total area of 1051900m². Among them, there are 8 park land, with an area of 889000m²; There are 12 schools with an area of 97,000 m²; Square 5, with an area of 59,900 m²; 1 parking lot, with an area of 6000m². Parks, schools, squares and parking lots accounted for 84.51%, 9.22%, 5.69% and 0.57% of the total area of district emergency shelters, respectively, and 8.6%, 0.94%, 0.58% and 0.06% of the total area of municipal emergency shelters, respectively. The total population of Baiyun District is 456,250 people, and the per capita emergency shelter is 2.3m²/ human being.

There are a total of 12 emergency shelters in Huaxi District, with a total area of 1,633,500 m². Among them, there are two park lands, with an area of 1598400m²; 6 schools with an area of 29800m²; Square 2, with an area of 2,500 m²; Village committee and township government 2, with an area of 2800m². Parks, schools, squares and village committees account for 97.85%, 1.82%, 0.15% and 0.17% of the total area of district emergency shelters, respectively, and 15.47%, 0.29%, 0.02% and 0.03% of the total area of municipal emergency shelters, respectively. The total population of Huaxi District is 966,276 people, and the per capita emergency shelter is 1.7m²/ human being.

There are 14 emergency shelters in Wudang District, with a total area of 546,055 m². Among them, there is 1 park land, with an area of 40,952 m²; 13 schools with an area of 505103m². Parks and schools respectively account for 7.50% of the total area of the district emergency shelters , 92.50%, accounting for 0.40% and 4.89% of the total area of the municipal emergency shelters, respectively. The total population of Wudang district is 336,363 people, and the per capita emergency shelter is 1.6m²/ human being.

There are 96 emergency shelters in Xifeng County, with a total area of 394,060 m². Among them, 29 school land with an area of 267960m²; Square 8, with an area of 19,600 m²; 1 gymnasium, with an area of 2400m²; 1 parking lot with an area of 2800; 57 village committee and township offices, with an area of 101300m². Schools, squares, gymnasiums, parking lots, village committees and township governments accounted for 68.00%, 4.97%, 0.61%, 0.71% and 25.71% of the total area of the district emergency shelters, respectively, accounting for 2.59%, 0.19%, 0.02%, 0.03% and 0.98% of the total area of the municipal emergency shelters, respectively. The total population of Xifeng County is 219,835 people, and the per capita emergency shelter is 1.8m²/ human being.

There are 22 emergency shelters in Xiuwen County, with a total area of 176,928 m². Among them, there are 7 school land areas with an area of 70,269 m²; 1 square, with an area of 1000m²; 2 gymnasiums, with an area of 55,333 m²; Village committee and township government 11, with an area of 49096m²; 1 prevention and control basement, with an area of 1230m². Schools, squares, gymnasiums, village committees, township governments, and prevention and control basements accounted for 39.72%, 0.57%, 31.27%, 27.75% and 0.70% of the total area of district emergency shelters, respectively, accounting for 0.68%, 0.01%, 0.54%, 0.48% and 0.01% of the total area of municipal emergency shelters, respectively. The total population of Xiuwen County is 288,090 people, and the per capita emergency shelter is 0.6m²/ human being.

There are 64 emergency shelters in Kaiyang County, with a total area of 273,054 m². Among them, 25 are school land, with an area of 188616m²; Square 5, with an area of 23,368 m²; 5 nursing homes with an area of 6600m²; 2 gymnasiums, with an area of 17,670 m²; 1 parking lot, with an area of 1,500 m²; Village committee and township government 26, with an area of 35300m². Schools, squares, nursing homes, gymnasiums, parking lots, village committees and township governments accounted for 69.08%, 8.56%, 2.42%, 6.47%, 0.55% and 12.93% of the total area of district emergency shelters, respectively, accounting for 1.83%, 0.23%, 0.06%, 0.17%, 0.01% and 0.34% of the total area of municipal emergency shelters, respectively. The total population of Kaiyang County is 343,871 people, and the per capita emergency shelter is 0.8m²/ human being.

There are 14 emergency shelters in Qingzhen city, with a total area of 118,067 m². Among them, there are 5 school land areas with an area of 101,667 m²; Square 2, with an area of 6,000 m²; Village committee and township government 7, with an area of 10400m². Schools, squares, village committees and township governments accounted for 86.11%, 5.08% and 8.81% of the total area of the district emergency shelters, respectively, accounting for 0.98%, 0.06% and 0.10% of the total area of the municipal emergency shelters, respectively. The total population of Qingzhen city is 629,088 people, and the per capita emergency shelter is 0.2m²/ human being.

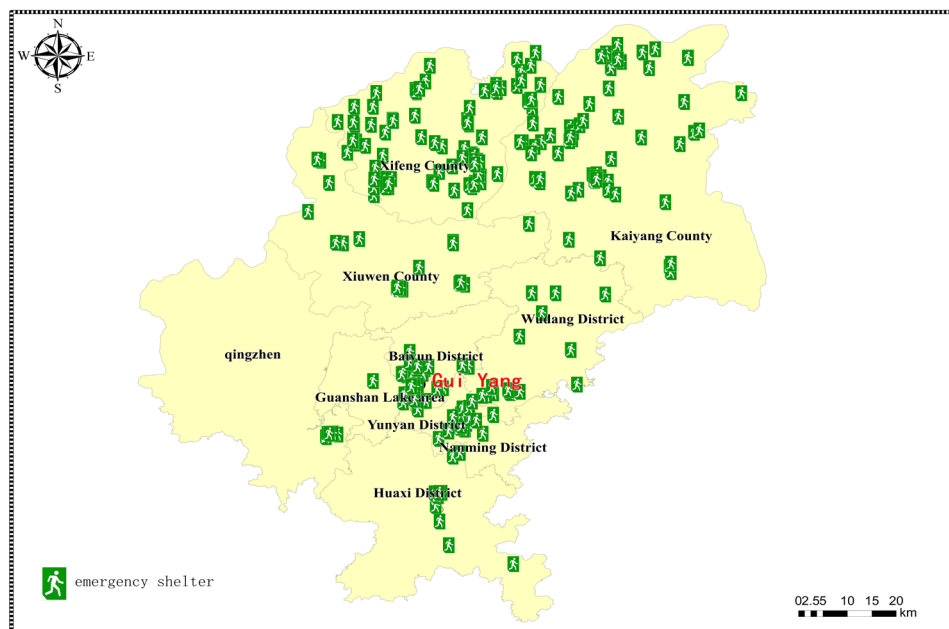


Figure 2 Distribution map of emergency shelters in Guiyang city

3.2. Layout Characteristics of Emergency Shelters

According to the Urban Seismic Disaster Prevention Planning Standard (GB50413-2007), according to the scale of earthquake absorber evacuation sites, the emergency shelters in Guiyang are divided into emergency shock absorber evacuation sites and fixed shock absorber evacuation sites, and statistical analysis is carried out on the counties and districts of Guiyang (see Table 2).

According to Table 2, there are 200 emergency shock shelters in Guiyang, with an area of 427983.211m², Accounting for 4.14% of all emergency shelters in Guiyang city, and 70 fixed shock absorber places, with an area of 9912668.789m², Accounting for 95.86% of all emergency shelters in Guiyang city. The number of fixed shock absorber is small, but the area is large. This paper (500m) is selected as the service radius of emergency shock absorber evacuation place, and 3km is the service radius of fixed shock absorber evacuation place. GIS was used to make the service radius buffer zone of two types of shock absorber places, and there were 58 repeated service areas within the radiation area of 3000 meters, and 82 repeated service ranges in the emergency shelters within the radiation area of 500 meters.

Table 2 Scale and distribution table of emergency shelters in each administrative region of Guiyang city

administrative statistics		Emergency shock absorber Evacuation place	The site is less than About 1,000 square meters	Fixed shock absorbers Evacuation place	The site size is less than 10,000 square meters
Yunyan district	quantity	2	0	3	0
	area (m ²)	7470		31000	
Nanming district	quantity	1	0	8	0
	area (m ²)	7732		5023761	
Guanshanhu District	quantity	4	0	4	0
	area (m ²)	17125		1060000	
Baiyun district	quantity	11	0	15	1
	area (m ²)	56400		995500	
Huaxi district	quantity	9	3	3	0
	area (m ²)	14300		1619200	
Wudang district	quantity	3	0	11	0
	area (m ²)	9450		536605	
Xifeng County	quantity	89	23	7	0
	area (m ²)	164300		229760	
Xiuwen County	quantity	14	1	8	1
	area (m ²)	42133		134795	
Kaiyang County	quantity	54	18	10	0
	area (m ²)	83673.211		189380.789	
Qingzhen city	quantity	13	2	1	0
	area (m ²)	25400		92667	

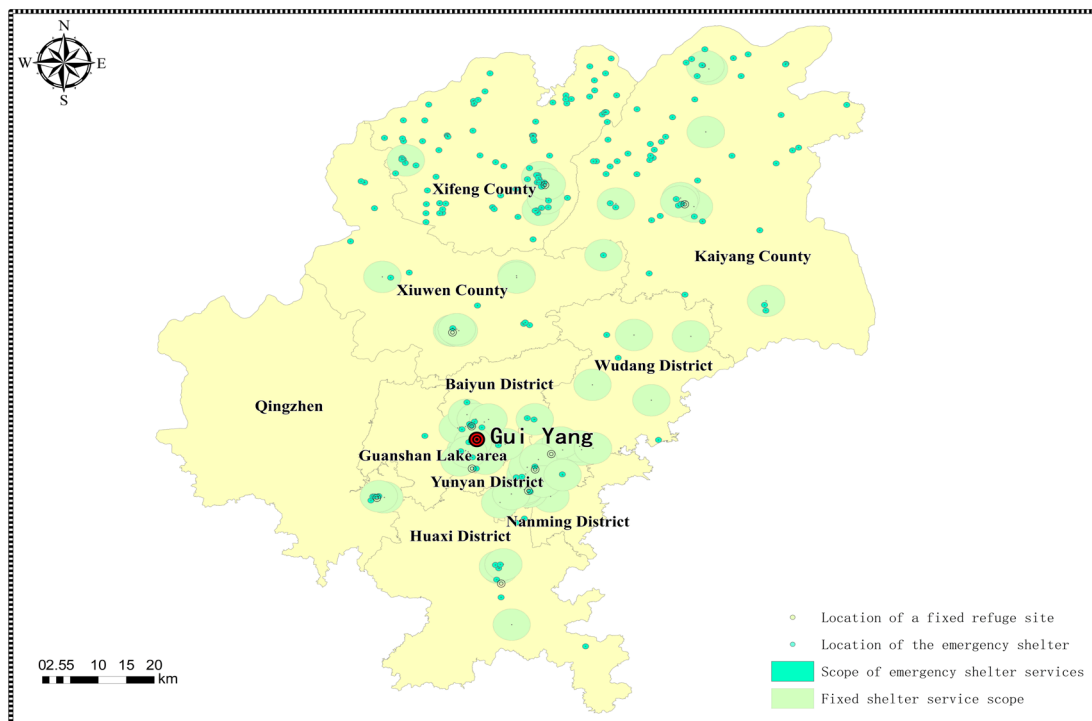


Figure 3 Distribution diagram of the buffer zone of the emergency shelters in Guiyang city

In general, in terms of the number, with Guiyang city as the center, Guiyang City has the largest number of emergency shelters in Xifeng County in the north direction and Kaiyang County in the northeast direction, followed by Baiyun District and Xiuwen County, and Yunyan District has the least number of emergency shelters. In terms of area, Nanming District has the largest area, followed by Huaxi District, Guanshan Lake District and Baiyun District, and the smallest area is the

Yunyan District. The number of emergency shelters in Guiyang does not correspond to the area, and the area with a large number of shelters is not necessarily large.

4. Multi-element distribution characteristics

4.1. Population Distribution Characteristics

According to the statistical methods of population agglomeration type and population size, Yunyan District, Nanming District, Guanshanhu District, Baiyun District and Huaxi District of Guiyang city are obtained as the core areas of the agglomeration, while Yunyan District has the largest population density with 11,294 people / square kilometer. The medium cluster area is Wudang District and Qingzhen City, the general transition area is Kaiyang County, and the low concentration area is located in Xiuwen County and Xifeng County in Guiyang City (see Table 3).

From the population size (Figure 4), Nanming District and Yunyan District are cities with more than 1 million people, Guanshanhu District, Huaxi District and Qingzhen City are 500,000-100,000 people, 300,000-500,000 District, Wudang District and Kaiyang County, and Xifeng County are 100,000-300,000 people. See Figure 4. In general, among the 10 counties in Guiyang, 500,000-10000,000 and 300,000-500,000 are the largest. 3 counties are the same, accounting for 60% of the province;> 1 million and 100,000-300,000,000 are the same, accounting for 20% of the province.

Table 3 Population Cluster Type and Population Scale Distribution Table in Guiyang City

City state	county territory	Population number (person)	Population density (person / km 2)	Cluster type	Population size (ten thousand people)
Guiyang City	Nanming district	1047792	5005	Cluster core area	> One million people
	Yunyan district	1056819	11294	Cluster core area	> One million people
	Guanshanhu District	642634	2093	Cluster core area	50 million-1 million people
	Baiyun district	456250	1677	Cluster core area	300-500,000 people
	Wudang district	336363	490	Moderate concentration area	300-500,000 people
	Huaxi district	966276	1002	Cluster core area	50 million-1 million people
	Qingzhen city	629088	454	Moderate concentration area	50 million-1 million people
	Kaiyang County	343871	170	General transition zone	300-500,000 people
	Xiuwen County	288090	268	Low concentration area	100-300,000 people
	Xifeng County	219835	212	Low concentration area	100-300,000 people

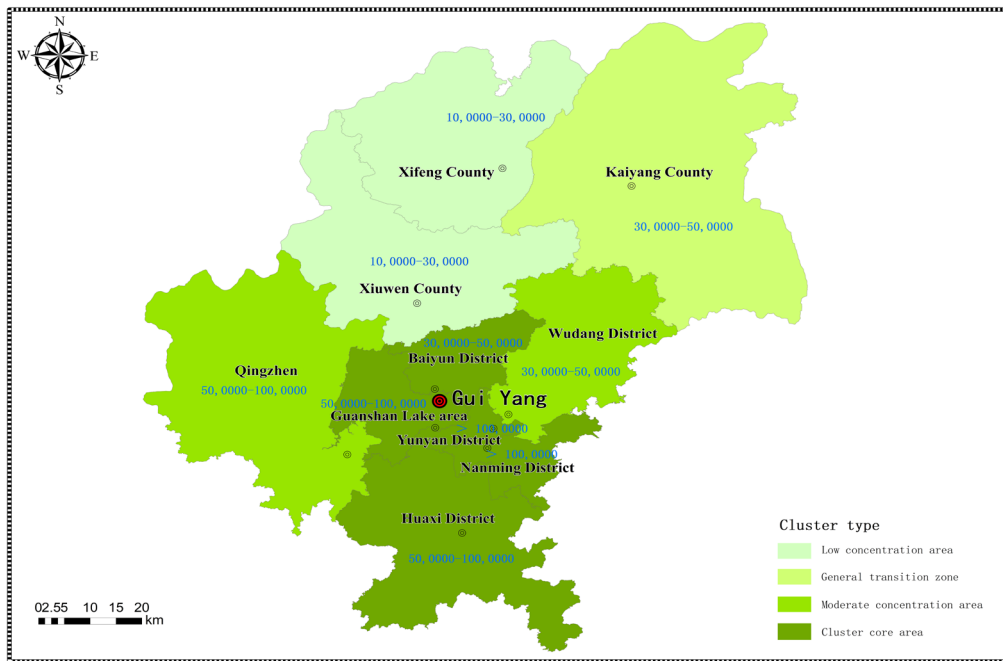


Figure 4 Distribution diagram of population agglomeration type and population size in Guiyang city

4.2. Historical Seismic Distribution Characteristics

Through the analysis of the historical earthquake catalogue data from 1981 to 2022 by year, months and magnitude: (1) Guiyang city since 1981, $M > 4.4$ magnitude 0 earthquakes, among, From 1981 to 1990, one earthquake, two earthquakes in 1991-2000, 10 earthquakes in 2001-2010, and 31 earthquakes in June 2011-2022, The highest number of earthquakes in the June 2011-2022 time period, The maximum magnitude earthquake occurred during this time period; (2) Most earthquakes below $M 2.0$ in Guiyang, $> M 0-M 2.0$ earthquake 32 earthquakes, $M 2.0$ earthquakes occurred between 2000 and 2021, among, $M 2.0-2.9$ magnitude earthquake 11 times, No earthquakes above magnitude $M 3.0-3.9$, $M 5.0-M 5.9$, $M 6.0$, The $M 4.6$ -magnitude earthquake that occurred in Xiuwen County on November 24, 2021 was the largest earthquake-magnitude earthquake since 1981.

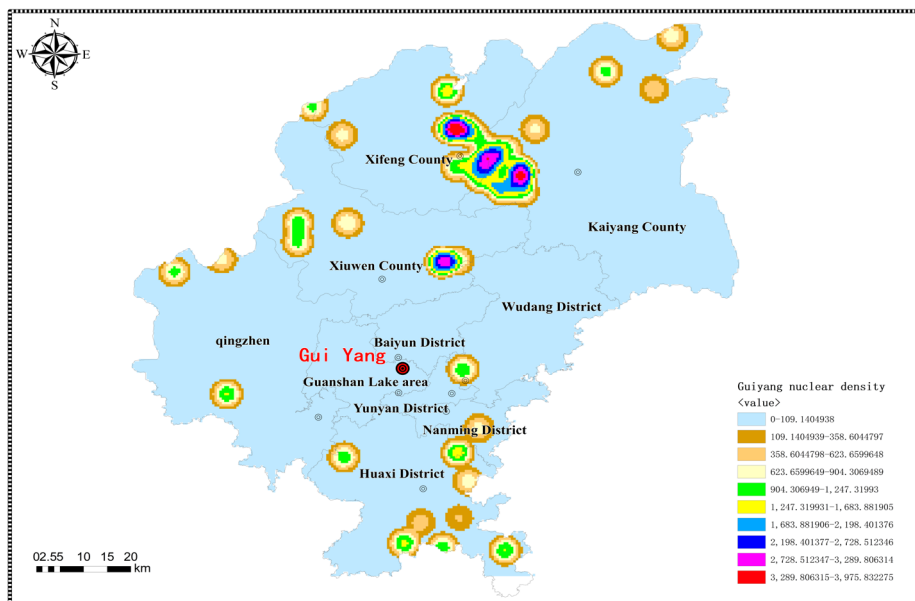


Figure 5 Distribution diagram of historical seismic hot spots in Guiyang city

Using the nuclear density analysis of the Spatial Analyst tool in GIS, Population is the magnitude field, and the search radius is the default, each seismic point is calculated according to the magnitude size, and the calculation results are reclassified to finally form the seismic thermal map

of Guiyang city, as shown in Figure 5. As can be seen from the figure, between 1981 to June 2022, the nuclear center of seismic space in Guiyang was mainly concentrated in Xifeng county, Kaiyang County, the border and Xiuwen County.

4.3. Distribution Characteristics of Fault Zones

In terms of fault zone, there are rock foot fault zone, Meitan fault zone, Wengzhao fault zone, Baima along fault zone, two intersection fault zone, Xiaozhaji fault zone, Longli south fault zone and Shanping fault zone, and the fault zone passes through the earthquake-prone areas. It can be divided into NE and NNE. Except for the rock foot fault with NNE direction, all the other faults are NE direction(Figure 6).

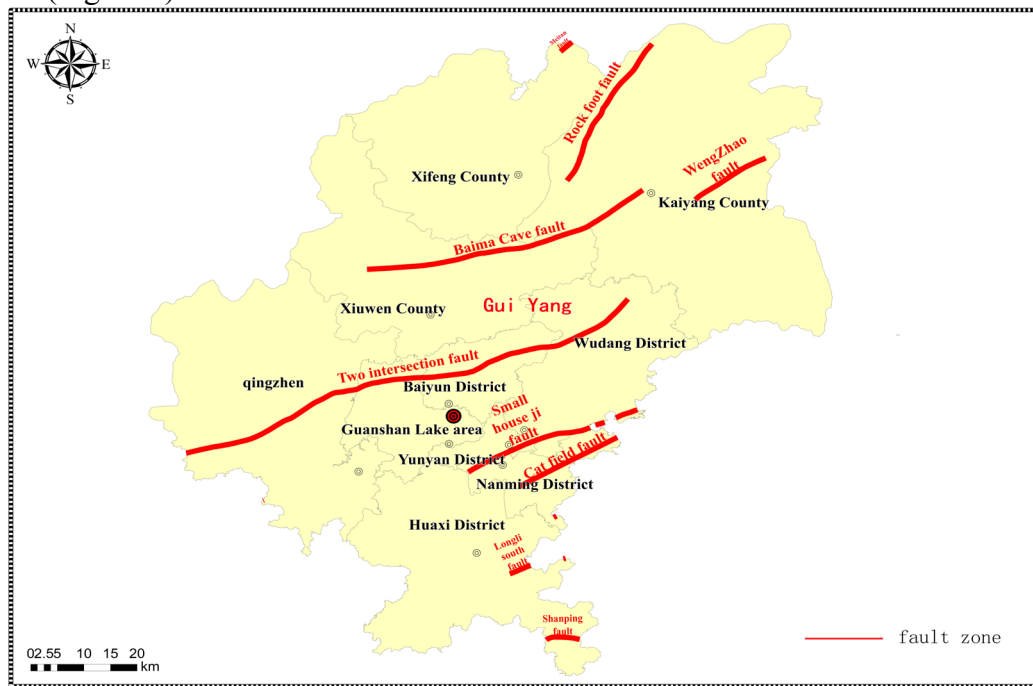


Figure 6 Distribution diagram of the fault zone in Guiyang city

4.4. Emergency Shelter and Multi-Factor Distribution Characteristics

By superposition the data of population size, population agglomeration type, historical earthquake, buffer zone and emergency shelter in Guiyang city (see Figure 7), the layout characteristics of emergency shelters and other elements are analyzed as follows:

The 100 m buffer zone of the fault zone of Guiyang city, and intersects with all emergency shelters in Guiyang city, obtains the conclusion that the emergency shock evacuation site of Zhaizi Village, Jinhua Village and Maopo Village in Jinzhong Town is located in the buffer zone of the rock foot fault, and the rest shelters are not in the buffer zone of the fault zone. In terms of population analysis, the population agglomeration types of Xifeng and Kaiyang are low-degree agglomeration areas and general agglomeration, respectively. The population of Kaiyang County is larger than that of Xifeng County, and the number of shelters in Xifeng is at most 96, followed by Xifeng with 64 places. Yunyan District, Nanming District, Guanshanhu District, Baiyun District and Huaxi District are the core areas of population agglomeration, but the emergency shelters in these areas are characterized by a small number and a large area. From the perspective of historical earthquakes, the number of earthquakes occurred more in Xifeng County, Kaiyang County and the border and Xiuwen County, while in most of the places around the historical earthquakes, the number of emergency shelters, and the historical earthquake places show the characteristics of a large number and wide distribution. From the point of view of the whole city of Guiyang city, the current emergency shelters in Guiyang city have uneven distribution, unreasonable layout and overlapping service areas.

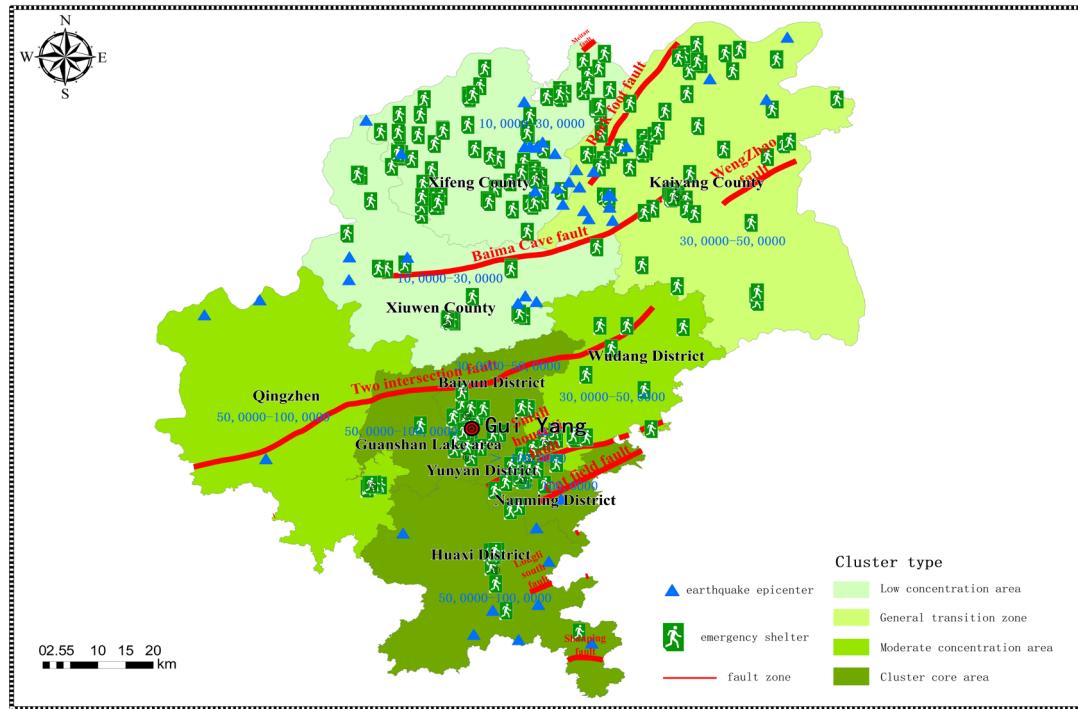


Figure 7 Multi-element distribution map in Guiyang city

4.5. Existing Problems

By analyzing the layout characteristics of emergency shelter, population size, population agglomeration characteristics, historical earthquake and fault zone in Guiyang city, The following problems are summarized: (1) there is no grade and scale division of emergency shelters in Guiyang city, and there is no word of emergency / fixed shelters marked on the site sign board; (2) Earthquake emergency shelters should avoid major hazard sources, geological fault zones, reservoir dam near, At present, there are located in the buffer zone; (3) Unreasonable layout of emergency shelters in Guiyang City, Although the number of emergency shelters in some areas is small and large, But there is no reasonable distribution, Centralized layout, In some areas, the number of emergency shelters is too large but relatively small; (4) The service overlap of emergency shelters and fixed shelters in Guiyang is large, The distribution of the spatial layout is more concentrated, The shelters are not very efficient.

5. Conclusion

As a whole, Guiyang emergency shelters show the largest number and small area, Nanming District, Huaxi District, Guanshan Lake District and Baiyun District, the number of small, large area characteristics; at the same time, The larger population and the core area have the least number of shelters and the smallest area; By emergency and fixed categories, The number of fixed shelters in Guiyang is 130 less than the number of emergency shelters, But it is more than twice the size; Guiyang emergency shelters show the number of emergency shelters and the area do not correspond, Area refuge is not necessarily large, Regional refuge areas with a large population concentration and population size are also large, But the number of small phenomena; There have been many earthquakes in the area of the number of shelters, wide distribution, However, there is the disadvantage of not choosing a refuge place far away from the fault zone, In addition, the existing shelters have the problems of overlapping service areas and low use efficiency. In short, the current number of emergency shelters in Guiyang is far from meeting the requirements of covering the whole city. There is no clear scale classification of emergency shelters, and the construction of each district is not balanced. In the future, the layout of earthquake emergency shelters in Guiyang needs to be optimized in Guiyang.

The construction and planning of future shelters should consider to avoid fault zones, landslides,

debris flow and other geological disaster areas, Stay away from the dangerous goods warehouse, Avoid the flood threat areas, Ensure its safety; The size of the shelters, And clearly marked the publicity, It is beneficial for people to choose nearby when they encounter danger; Shelterges have their service areas, Its planning and construction should take into account the use of all the people, And to avoid excessive service area overlap phenomenon; Form relevant laws and regulations on local planning and construction, Establish an effective construction and management system for earthquake emergency shelters, Establish a unified emergency information release platform, Such as the emergency shelter database management system, So that the affected residents can quickly find the nearest emergency shelter and a safe and effective refuge path; at the same time, Consider the material reserves in emergency shelters, According to different scale of are equipped with corresponding materials and replaced regularly. Improving the urban disaster prevention and mitigation strategy system is a long and arduous task, and we need to actively act and strengthen the response.

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