

Impact of Land Use on Flood Vulnerability Based on Remote Sensing

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Abstract: With urban development and construction, land use will change to a certain extent. While improving local economic development and residents' living standards, flood disaster vulnerability will also change. Based on remote sensing images of Yongning district, Nanning City in 2005 and 2015, this paper evaluated the impact of land use change on flood disaster vulnerability and discussed the relationship between land use and flood disaster vulnerability. The results show that there is a certain correlation between the change of land use type area and flood disaster vulnerability index in Yongning District.

Key words: Remote Sensing Imagery; Land Use Change; Flood Vulnerability

1. Introduction

Promoting urbanization is one of the roads to build a well-off society in an all-round way. With the rapid development of the world economy, the development of urbanization is becoming more and more important, which leads to corresponding changes in land use. The vulnerability of regional flood disasters is closely related to land use change, thus causing harm to people's life and property safety and local economic development^[1-2]. The use of remote sensing technology to analyze and evaluate regional land use change based on multi-phase remote sensing images is of certain importance to its economic development, urban construction and people's life and property safety. Meanwhile, the study of land resource use change and its response to flood disaster vulnerability provides guidance for land resource management, enhances disaster prevention and disaster reduction capabilities. It has promoted the utilization of land resources and the harmonious development of society and economy^[3-4].

2. Study Area and Data Source

2.1 Study Area

Yongning District is located in Nanning City, Guangxi Zhuang Autonomous Region of China. Yongning landscape is mainly hilly, located in the Yongjiang River edge, the area has many beautiful scenery, is a very good leisure tourist resort. Yongning is located in the south subtropical monsoon climate zone, south of the Tropic of Cancer, where the sun is abundant and the rain is abundant, which is conducive to the development of agricultural production. The data in this paper are derived from geospatial data cloud (<http://www.gscloud.cn>), and remote sensing images of Yongning District of Nanning City were obtained with Landsat-7 in 2005 and Landsat-8 in 2015.

3. Experimental Results and Analysis

3.1 Land Use Classification and Evaluation

Supervised classification refers to the process of identifying pixels of other unknown categories with sample pixels that

confirm the category. Before classification, through visual interpretation and on-site inspection, a prior knowledge of the category attributes of image features in some sample areas of remote sensing images is obtained. A certain number of category training samples are selected and statistical information or other information of a single training sample is calculated by computer. Then, the decision function is used to classify other data, compare each pixel with the training sample, and separate the most similar sample classes according to the rules to complete the classification of the whole image. This paper divides land use into building land, forest land, cultivated land, water, and other five categories.

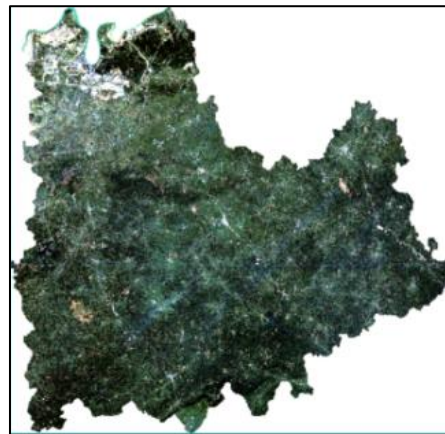


Figure 1 Study area

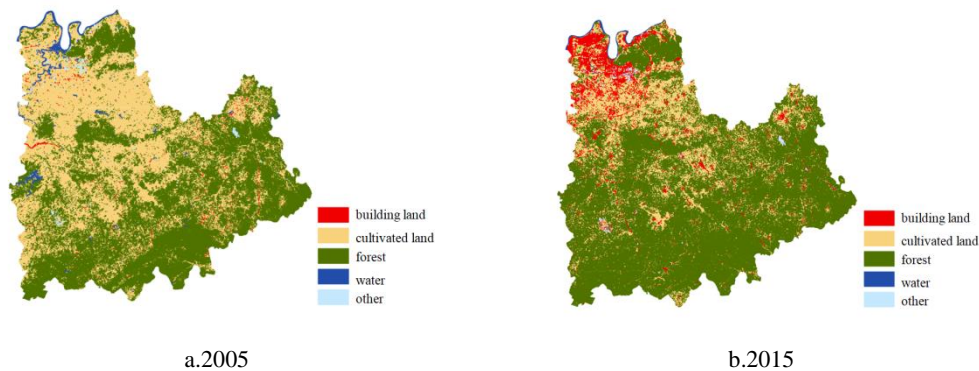


Figure 2 Classification results

Table 1 The proportion of different types of land area

Land-use type	2005Year		2015Year	
	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)
Building land	4.28	0.34	65.96	5.26
Cultivated land	795.30	63.37	563.07	44.87
Forest	418.50	33.35	585.41	46.65
Water	5.69	0.45	2.44	0.19
Other	31.23	2.49	38.12	3.03

3.2 Impact of Flood Disaster Vulnerability

Vulnerability refers to the probability of disaster damage and the difficulty of damage. Among them, the vulnerability is mainly determined by the conditions of the victims themselves and the local social and economic conditions. The first part mainly includes the types, values and distribution of the victims. The second part includes population distribution, urban construction, commercial arrangement, transportation and communication facilities, etc. The main object of vulnerability assessment is the subject affected by the disaster. The significance of the evaluation lies in the statistical analysis of the ability of human society to withstand natural geological disasters under the existing economic and technological conditions, and the determination of the vulnerability parameters of different social and economic factors. The economic vulnerability parameters

and population vulnerability parameters of Yongning District calculated by citing relevant literature^[4] are shown in Table 2 and Table 3.

Table 2 Vulnerability parameter table

Land-use type	Building land	forest	Cultivated land	Water	Other
Economic vulnerability parameters	0.5594	0.0520	0.2594	0.0863	0.0429
Population vulnerability parameters	0.5814	0.0575	0.2239	0.0721	0.0651

Table 3 Flood disaster vulnerability index of Yongning District 2005-2015

Land-use type	Weight	2005Year		2015 Year	
		Area (km ²)	Vulnerability value	Area (km ²)	Vulnerability value
Building land	0.5704	4.28	2.4413	65.96	37.6236
Forest	0.0547	418.50	22.8920	585.41	32.0219
Cultivated land	0.2416	795.30	192.1445	563.07	136.0377
Water	0.0793	5.69	0.4512	2.44	0.1935
Other	0.0541	31.23	1.6895	38.12	2.0623
Total	1.0000	1255.000	219.6185	1255.000	207.9390

As can be seen from the area proportion of each land use type in Yongning District, the area of building land in Yongning District increased by 61.68km² in 2015 compared with 2005, an increase of 4.92%, indicating that the area where land use type is building land has a greater impact in the face of flood disasters and is most likely to produce the most serious economic losses and population disaster losses. On the other hand, compared with 2005, in 2015, due to the implementation of returning farmland to forest, the area of woodland area increased and the proportion of arable land area decreased, resulting in the area of woodland and arable land use type to reduce the impact on flood disaster, which is conducive to the economic development and the improvement of people's living standards in Yongning District. Compared with the change of water area proportion in 2005 and 2015, the area with water type of land use has less impact on flood disaster vulnerability, and relevant measures can be taken.

4. Conclusion

With the continuous development of urbanization construction in Yongning District, the area of building land in the district has increased. In the process of urbanization construction and development of a well-off society in an all-round way, the majority of other land use types in Yongning District have been transformed into construction land, which leads to the continuous increase of construction land area in Yongning District, and the change of construction land area has a certain impact on flood disaster vulnerability.

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