International Core Journal of Engineering Volume 9 Issue 4, 2023
ISSN: 2414-1895 DOI: 10.6919/ICJE.202304_9(4).0004

Monitoring and Analysis of Land Use Change in Longhua District, Shenzhen City

Menghui Xin and Xiaolei Ju

School of Civil Engineering, Shandong Jiaotong University, Jinan 250037, China

Abstract

Taking Longhua District of Shenzhen City as the research object, the spatial characteristics of land use change were analyzed by using remote sensing images in 2013 and 2021, and using remote sensing technology combined with visual interpretation, computer interpretation and spectral characteristics of ground objects. The study area is divided into five land use types: construction land#1, construction land#2, water body#1, water body#2 and forest land. Among them, construction land#1 refers to urban buildings and construction land#2 refers to industrial land. Based on this, the land use change matrix from 2013 to 2021 is established, and the land use change amplitude in the study area is analyzed. The results showed that the construction land#1 increased, the construction land#2 increased significantly, the area of water body#1 decreased, the area of water body#2 increased, and the area of forest land decreased. Further analysis shows that policy driven and economic development will also affect the change of land use types.

Keywords

Land Use; Dynamic Change; Landsat8; Longhua District; Shenzhen City.

1. Introduction

The earth surface resources are the most basic natural resources for human survival and development. Land resources are imaged by objective factors and human life activities [1-4]. On the contrary, the rational distribution and planning of land resources are closely related to the improvement of people's quality of life and the development of social and economic levels, which is of great significance to the future development of a city.

In recent years, the development of remote sensing technology has progressed by leaps and bounds. It has many characteristics, such as dynamic, timeliness, macro, etc. It also uses the advantages of clear and intuitive remote sensing images to expand the scope of application, and is widely used in disaster monitoring, surface feature extraction, environmental monitoring, digital city construction, etc. At the same time, it provides a more accurate and effective technical means for the extraction of typical urban remote sensing objects and the monitoring of land use change, and improves the work efficiency of land use change monitoring.

2. Materials and Methods

2.1 Area Analysis

Longhua District, located at longitude 114.045441 and latitude 22.696678, is near the Tropic of Cancer. The climate is subtropical monsoon climate with abundant rainfall, so the green area is large. Belonging to Shenzhen City, Guangdong Province, it is located in the geographical center of Shenzhen and the axis of urban development, adjacent to "six districts and one city", Dongguan City and Guangming District in the north, Longgang in the east, Futian, Luohu and Nanshan in the south,

ISSN: 2414-1895 DOI: 10.6919/ICJE.202304_9(4).0004

and Bao'an in the west. Longhua District is mainly composed of hills and platforms, surrounded by mountains on three sides and close to mountains and rivers.

In 2017, Longhua District achieved a significant increase in its GDP in the secondary and tertiary industries. Land use types mainly include urban and rural construction land, forest land, industrial land and water body. In recent years, with the rapid development of social economy, the urban construction land and industrial construction land in Longhua District are increasing rapidly, the water pollution degree is also changing, and the land use type is changing significantly.

2.2 Data Used

The data used in this paper are the remote sensing images of Longhua District, Shenzhen in 2013and 2021[5]. The remote sensing images of Longhua District in 2013 and 2021 were obtained in winter, both of which were ladsat8 OLI data with a resolution of 30 meters.

2.3 Data Processing

The data processing of this study mainly uses remote sensing software ENVI5.3 and ArcMap10.7 to conduct image pre-processing and geometric correction on the images of Longhua District in 2013, 2017 and 2021. The vector data of Longhua District is cut and the coordinate projection is converted to be consistent with the obtained remote sensing images. In order to enhance the useful information in the image and facilitate the identification, the image is enhanced. The image is transformed to eliminate interference noise and improve image quality. Then, the image is inlaid and cut to obtain the third phase image that meets the requirements. Then, the information of the image is extracted, and the support vector machine method is used to supervise and classify the three images respectively, so as to extract the main land use types of the three images, compare their spectral curve features, and improve the classification accuracy. Finally, the accuracy of the classification results is evaluated, and the accuracy is 0.9 or above.

3. Results

Remote sensing image interpretation is a process of identifying and distinguishing the type, shape, size, spatial location information and other attributes of objects on the earth surface according to the characteristics of various objects on remote sensing images. The images are interpreted and classified according to the interpretation marks, which are divided into five types of surface features(Table1). For satellite remote sensing images, the color and texture of the color infrared remote sensing images are used to identify the water body. The water body is generally blue, the heavily polluted water body is black, and the river with large sand content is light green. It is related to water depth, sediment concentration, pollution degree, river flow rate and other factors.

According to the classification results with acceptable accuracy, ArcMap10.7 software is used to form the current land use map of Longhua District in 2013 and 2021 according to the mapping rules. As shown in Figure 1. Combined with historical data and visual analysis, the figure shows that the area of construction land#2 and water #2 has expanded significantly, while the other areas have changed little or remained unchanged.

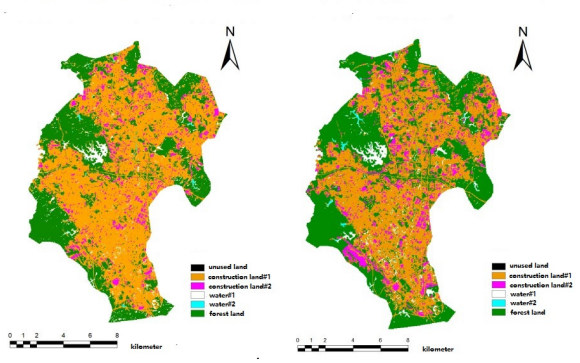
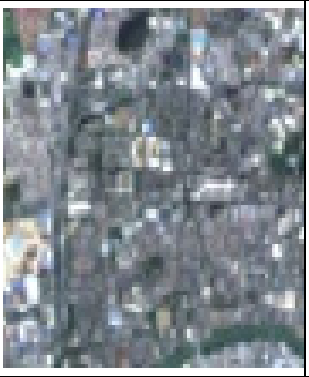
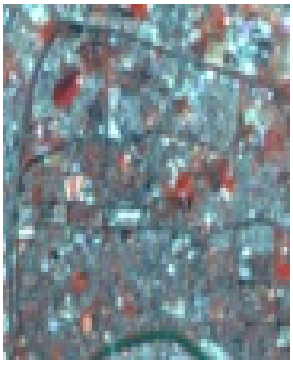
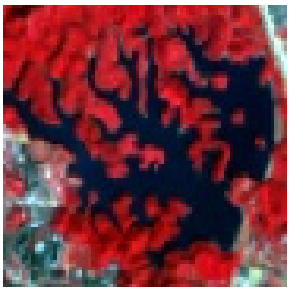
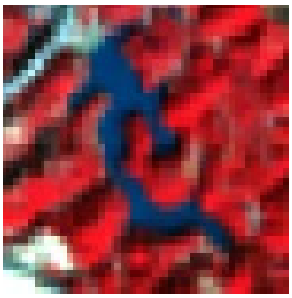
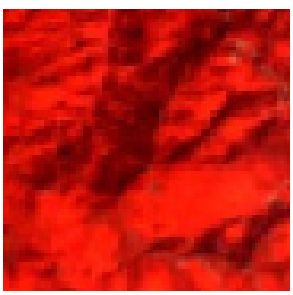


Figure 1. The classification results of 2013 and 2021(left:2013; right:2021)

ISSN: 2414-1895 DOI: 10.6919/ICJE.202304_9(4).0004

Table 1. Interpreting flag

Types	Interpreting flag	Image Example	Pseudo color composition (5,4,3)
Construction land#1	Meaning: land for urban and rural residential areas, transportation, etc. It mainly includes urban land, rural residential area and traffic construction land. Features: regular or irregular block continuous large area distribution. The color is brown gray or gray white; Light red in false color composition. It is distributed in the center of the study area and developed traffic areas.		
Construction land#2	Meaning: refers to the construction land for urban and rural industrial parks. Features: regular or irregular block continuous large area distribution. The color is white, showing the color of blue and white inclusions in false color synthesis. They are mostly distributed around cities and along rivers.		
Water #1	Meaning: refers to natural land waters and land for water conservancy facilities. Including rivers and canals, lakes, reservoir pits and sugar, permanent glaciers and snowfields, mudflats and shoals. Features: The color is blue black, and it is blue black in false color synthesis. It is blocky and irregular in shape.		
Water #2	Meaning: refers to natural land waters and land for water conservancy facilities. Including rivers and canals, lakes, reservoir pits and sugar, permanent glaciers and snowfields, mudflats and shoals. Features: The color is emerald green, and blue in the false color synthesis. It is blocky and irregular in shape.		
Forest land	Meaning: refers to forest land for growing trees, shrubs, bamboos and coastal mangroves. Features: Overlapping with mountains or distributed along rivers, with dark green or green color; Displays in red in false color compositing. Homogeneous, patchy, large-area distribution, irregular shape, no obvious boundary.		

After the classification of surface features is completed, the results of the evaluation will show the of 2013and 2021, and the change values will be summarized as the proportion map of land use in Phase III of Table 4. By comparing the proportion of surface features in each year, the area of surface

ISSN: 2414-1895 DOI: 10.6919/ICJE.202304_9(4).0004

features will increase if the trend is upward, the area of surface features will decrease if the trend is downward, and the proportion will remain unchanged if the area of surface features remains unchanged.

Table 2. The land use changes

year	Construction land #1	Construction land #2	Water #1	Water #2	Forest land
2013	32.67	10.82	10.41	1.93	44.18
2021	35.77	16.18	9.77	4.24	34.04

From this study, we can get the chart of the proportion of various land use features in Shenzhen Longhua Area Phase III (Table2). It can be seen that from 2013 to 2021, the proportion of construction land #1 is on the rise as a whole. Due to the rapid development of the secondary and tertiary industries, the proportion of industrial park construction (construction land#2) is increasing significantly year by year, accounting for 5.36%; It shows a high level of urbanization, indicating that the area of township construction and industrial parks in Longhua District is expanding, and the development of industrial economy is improving. Water#1 shows a decreasing trend, the area of water# 2 is increasing, and the sediment content is increasing, which is of great significance for the monitoring of water pollution. At the same time, the chart shows that the proportion of forest land area is decreasing by 10.14%.

4. Conclusion

We obtain the city land changes of Longhua District, Shenzhen City from 2013 to 2021.After the pre-processing of the remote sensing data, including radiometric calibration and atmospheric correction, geometric correction, image enhancement, image stretching, image color synthesis, image clipping and so on then the supervision classification method is used from analysis. The main conclusions are as bellows:

(a)Using the maximum likelihood classification methods, the city land is classified by five types, and the Overall Accuracy and kappa coefficients can reach to 99.4946%, 0.9923 and 99.6094%, 0.9946.

(b)The results show that the construction land and the water#2 are increasing, and the water#1 and the forest land are decreasing, which should attract the attention of relevant departments to forest land protection.

Acknowledgments

This work is mainly sponsored by Shandong Jiaotong University Research Fund (Z202113) and We thank the Landsat8 data.

References

[1] W.N. Zhan. The city land use analysis of remote images in Wuhan District. Journal of Chifeng University (Natural Science Edition) Vol.31 (2015) No.14, p46-48.

[2] K. Zuliyaer, Y. Ma, M. Mai, et al. Analysis of Land Use Change and Driving Force of Bole City Based on Remote Sensing Image. Agricultural Biotechnology, Vol.7 (2018) No.04, p 229-235.

[3] H. W. Bai, Y F Chen, Q.Q. Cao, et al. Land use change and prediction analysis of Huaishang District, Bengdu City based on Landsat 8 image. Journal of West Anhui University, Vol.37 (2021) No.05, p120-125.

[4] W. Jiang. The Land Use Information Extraction and Analysis of Change Characteristics and Driving Forces in Shenzhen based on RS. East China University of Technology (2013).

[5] J. Irons, R. Dwyer and J. L. Barsi. The next Landsat satellite: The Landsat Data Continuity Mission. Sensing of Environment, (2012) No.122, p11-21.