Spatial Distribution of Land Use in the North Canal of Beijing Subsidiary Center and Its Impact on the Water Quality

Authors : Alisa Salimova, Jiane Zuo, Christopher Homer

Abstract : The objective of this study is to analyse the North Canal riparian zone land use with the help of remote sensing analysis in ArcGis using 30 cloudless Landsat8 open-source satellite images from May to August of 2013 and 2017. Land cover, urban construction, heat island effect, vegetation cover, and water system change were chosen as the main parameters and further analysed to evaluate its impact on the North Canal water quality. The methodology involved the following steps: firstly, 30 cloudless satellite images were collected from the Landsat TM image open-source database. The visual interpretation method was used to determine different land types in a catchment area. After primary and secondary classification, 28 land cover types in total were classified. Visual interpretation method was used with the help ArcGIS for the grassland monitoring, US Landsat TM remote sensing image processing with a resolution of 30 meters was used to analyse the vegetation cover. The water system was analysed using the visual interpretation method on the GIS software platform to decode the target area, water use and coverage. Monthly measurements of water temperature, pH, BOD, COD, ammonia nitrogen, total nitrogen and total phosphorus in 2013 and 2017 were taken from three locations of the North Canal in Tongzhou district. These parameters were used for water quality index calculation and compared to land-use changes. The results of this research were promising. The vegetation coverage of North Canal riparian zone in 2017 was higher than the vegetation coverage in 2013. The surface brightness temperature value was positively correlated with the vegetation coverage density and the distance from the surface of the water bodies. This indicates that the vegetation coverage and water system have a great effect on temperature regulation and urban heat island effect. Surface temperature in 2017 was higher than in 2013, indicating a global warming effect. The water volume in the river area has been partially reduced, indicating the potential water scarcity risk in North Canal watershed. Between 2013 and 2017, urban residential, industrial and mining storage land areas significantly increased compared to other land use types; however, water quality has significantly improved in 2017 compared to 2013. This observation indicates that the Tongzhou Water Restoration Plan showed positive results and water management of Tongzhou district had been improved.

Keywords : North Canal, land use, riparian vegetation, river ecology, remote sensing