

Spatio-Temporal Changes of Water Surface Area of Lakes by Using Remote Sensing Techniques: A Case Study of Seyfe Lake Wetland and Its Catchment Area

Cansu Yurteri¹

¹Hacettepe University

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Abstract

Lakes and wetlands are natural sources and have an important role for hydrological cycle. They are also affected by climate change and anthropogenic activities such as precipitation regime, diminishing water bodies, uncontrolled groundwater extraction, drainage and irrigation channels, agricultural activities and discharge of domestic and industrial waste. For this reasons monitoring the lake surface areas are very crucial. In this paper; the Seyfe Lake was selected as a case study. The study area is located at the southern part of the Seyfe basin with a catchment area of 1447 km² in Central Anatolia. Seyfe Lake wetland is located in a closed basin. The lake area and its surroundings is a Ramsar site and have the status of Grade 1 Natural Site and Protected Natural Area. This study aimed to evaluate the spatio-temporal changes of the surface area of Seyfe Lake by using Geographical Information Systems (GIS) and remote sensing techniques. For this purpose Landsat (MSS, TM, ETM+, OLI/TIRS) satellite images used for a period between 1987 and 2020. A total of 34 images were processed and, using unsupervised classification method, water body was extracted according to the spectral information of the image bands and the historical change of the lake surface area was calculated by using Image Analysis Function of ArcGIS 10.6.1 software. In addition to these satellite images, long-term hydrometeorological data and field observations were analyzed to determine the changes of the Seyfe Lake surface area and understand the effects of climate change and antropojenic activities. According to the old and recent satellite images of Seyfe Lake area, the persisting shrinkage of lake area and diminishing of the water resources over the years in the Seyfe Lake basin still continue. Maximum and minumum surface area of the lake was calculated 43 km² and 18 km² respectively during 1987-2020. In August 2008; the lake area is completely dried. Nowadays the 58% of the lake area is dried up. These variations could probably be related with the antropogenic effects and climatic changes in the study area. As a result, Satellite based techniques might provide a historical data to identify changes on the lake surface area. Remote sensing techniques are also effective to evaluate temporal and spatial changes on water resources resulted by human activities and local climate change. In-situ observation and hydrogeological monitoring are another important tools to support findings of remote sensing study. Keywords: Spatio-temporal change, Wetland, Seyfe Lake, Unsupervised Classification, Remote Sensing

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