



Determining the effect of urbanization on green spaces by NDVI analysis: Bilecik City example

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ABSTRACT

The acceleration of human activities on earth has caused positive or negative effects on the physical environment. These effects have become visible with the advancement of science and technology. Satellite images of Bilecik province used in this study, belonging to three different years, were obtained from Landsat 4-5 TM, Landsat 7 ETM and Landsat 8 OLI satellites. These satellite images were transferred to GIS software and NDVI vegetation analysis was performed. As a result of these analyzes, the parts with intense green color indicate that the vegetation is high, while the parts with the intense red color indicate that the vegetation is low and the settlement is high. The yellow color highlights the transition zone between these two parts. As a result of this analysis, the effect of urbanization on green areas was clearly observed.

Introduction

It is an indisputable fact that humans have a direct or indirect effect on the physical environment. This has sometimes manifested itself as a positive and sometimes a negative effect. It has been observed that natural areas have changed rapidly for human and economic activities with the changing world order. These environmental changes have caused very serious pressures on green areas. Industrialization and the speed of urbanization that occurred in parallel with it have caused significant changes on the natural environment [1]. Today, in parallel with the development of science and technology, changes in the physical environment are revealed more clearly. In this context, it is possible to perform many analyzes with Remote Sensing and GIS techniques. When we look at the studies in the literature, it is seen that NDVI Analysis is generally preferred in vegetation, green areas, temperature and climate research [2]. NDVI Analysis, which means “Normalized Plant Index”, is the easiest and healthiest method in understanding and evaluating the impact of natural and human activities on the earth [3]. Because plants absorb rays 400-700 μm in length and recorded kind of change [4]. In this study, the situation of the central district of Bilecik province was evaluated (Figure 1). Satellite images of Bilecik province of 1990, 2011 and 2021 were processed in ArcGIS, a GIS software, and current analyzes were carried out and its relationship with urbanization was evaluated.

Material and Method

For NDVI Analysis, satellite images of Bilecik province for the years 1900, 2011 and 2021 were obtained from Landsat 4-5 TM, Landsat 7 ETM and Landsat 8 OLI satellites Later, these satellite images obtained were integrated into ArcGIS software and the following formula was added to the raster calculator section of the software, and current analyzes were made [5].



Figure 1. Location map of study area

Results and discussion

As can be seen in Figure 2, red and yellow tones are less and green tones are more in 1990. The main reason for this is the low urbanization and industrial activities.

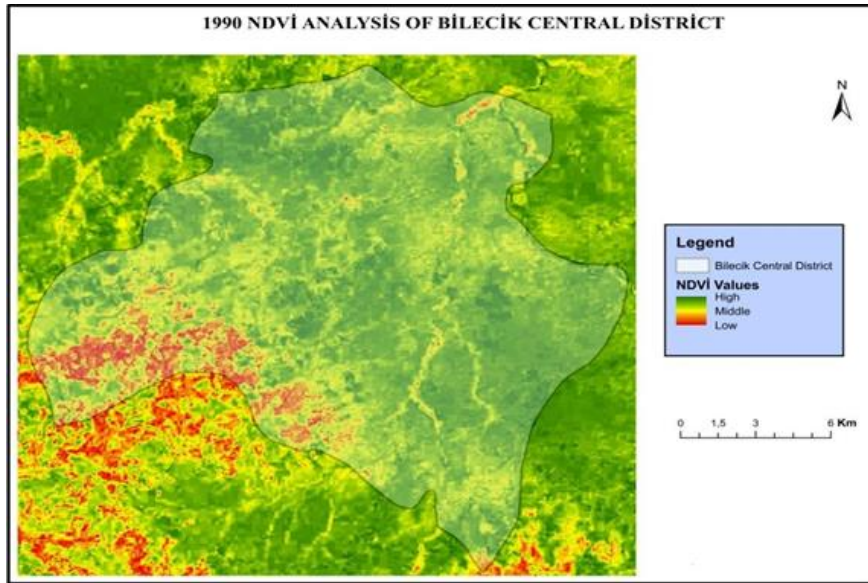


Figure 2. Bilecik Province NDVI Analysis Map dated 26.9.1990.

When it comes to 2011, it is seen that green tones have decreased and yellow and red tones have increased. The main reasons for this situation can be evaluated as the increase in agriculture, industry and tourism activities and the effect of Şeyh Edebalı University, which was established in 2007. The establishment of the university led to an increase in education, accommodation and social areas, and thus, the green areas were opened for development.

When 2021 is examined, there has been an increase in red and yellow tones compared to 2011, while a decrease in green areas has occurred.

Conclusion and suggestion

In our world, where the natural environment and its sustainability are gaining importance day by day. It is important and necessary to know the benefits of green areas and to protect the areas where green is intense. One of the measures to be taken against the global warming problem caused by the increasing temperature levels with the urbanization phenomenon is to protect the existing green areas and make them more sustainable. In

order to increase the quality of life in urban areas and to create healthier cities, the value of green areas is being understood more and more every day. Today, various studies are carried out with different analysis methods in order to reveal the changes in plant densities, to monitor them and to take necessary precautions for their protection. In this study, the density, distribution and change over time of green areas in the Merkez district of Bilecik province were tried to be explained. According to the 1990 NDVI analysis of Bilecik city, it is seen that the green color tone is dominant. When the NDVI analyzes of 2011 and 2021 were examined, it was observed that yellow and red tones became more dominant. Although Bilecik is a small city, it is developing day by day and experiencing an increase in population. In addition to the intensification of industry, trade and tourism activities, Sheikh Edebali University, which was established in 2007, is seen as an important factor in population growth. Considering the development, spread rate and population growth of cities, green areas come to the fore even more. In this context, misuse of green areas should be prevented and long-term and sustainable studies on city plans should accelerate.

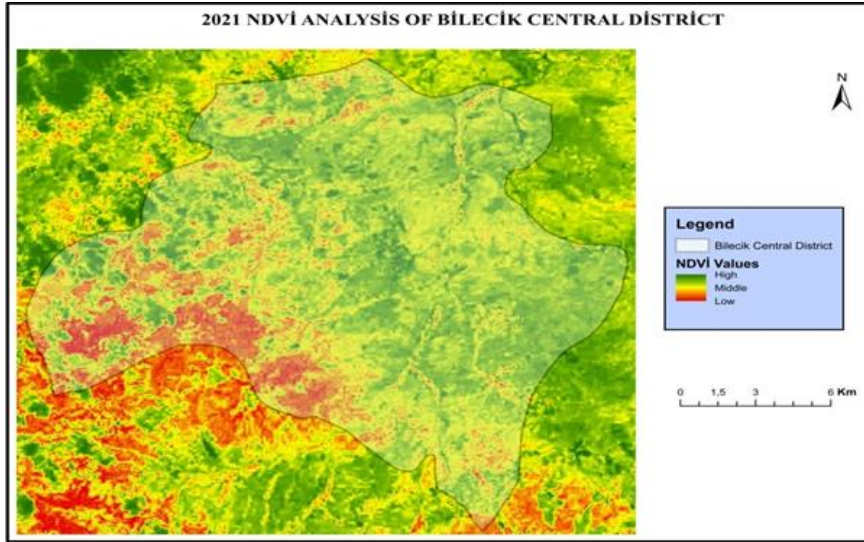


Figure 3. Bilecik Province NDVI Analysis Map dated 14.8.2021

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