



Spatiotemporal Dynamics of Land Surface Temperature and Its Impact on the Vegetation

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Abstract

Due to global warming under climate change scenarios, Indus delta region of Pakistan is under serious threat since the last few decades. The present study was thus conducted to determine the spatiotemporal variations in the LST and its impact on the vegetation of the Indus delta, using satellite data for the past 27 years (1990-2017). The analysis revealed that on average, there was an increase of 1.74 °C in LST during the last 27 years. The temporal variation in the Normalized Difference Vegetation Index (NDVI), an indicator of vegetation, showed the highest NDVI of 0.725 in the year 2005 followed by the year 2010 with NDVI of 0.712. While the lowest NDVI of 0.545 was observed during the year 2017. The LST was integrated with NDVI which showed a fair but negative statistical correlation with a coefficient of determination $R^2 = 0.65$. A correlation analysis between NDVI and the yield of the wheat crop of the Delta showed a positive relationship with $R^2 = 0.89$. Several factors may contribute to an increase in LST, such as an increase in residential areas, change in the cropping pattern and overall global climate change. Such studies are important for determining the climatic influences on ecological parameters.

Keywords: LST; NDVI; Crop Yield; Spatiotemporal Analysis; Coastal Areas.

1. Introduction

Due to the global climate change issues, the land surface temperature (LST) has increased, which has affected land use, land cover, vegetated areas, water resources, etc. Chan and Yao [1], and Choudhury et al. [2] reported that such changes are responsible for various environmental problems. LST refers to the temperature of the earth surface including the temperature of bare soil, the canopy of vegetation, etc. [3-4]. For hydrologists, agronomists, amenagists, meteorologists, the information of different terms, which interfere with the energy balance of the surface is very important. However, the LST is one of the key parameters which plays a vital role in the processes of interaction between hydrosphere, biosphere, and atmosphere. The LST is also used in many fields such as climate change, evapotranspiration, hydrological cycle, vegetation, etc. [5]. It is the main parameter which is affected by the properties of land surface such as land use, land cover, vegetation, and type of vegetation as well as the permeability of the surface of the soil [3]. Numerous studies have been conducted to observe the changes in the LST in the result of variations in land use land cover, vegetation. Most of the studies have reported an inverse relation between LST and vegetative cover, which refers that crop cover decreases the LST.

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