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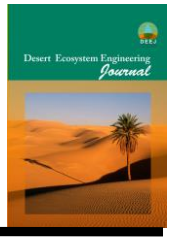

Investigating the Trend of Desertification Changes in Different Land Uses of Gavkhoni Basin Using Change Vector Analysis Method

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Extended Abstract

Introduction: Desertification refers to the decreased biological potentials in the ecosystem of hyper-arid, arid, semi-arid, and humid semi-arid regions because of climate change and human activities. The phenomenon occurs due to a combination of direct and indirect factors whose intensity varies according to time and place, making the scientific, replicable, and systematic evaluation of desertification an essential task. Remote sensing technology which is based on spatial information collected at regular intervals by aircraft and satellites plays a prominent role in assessing and monitoring land degradation and desertification on a local, regional and global scale. On the other hand, Change Detection is a process that evaluates spatial changes in various phenomena caused by natural and human factors, using multi-time satellite images. As an effective method for detecting and describing land cover changes, the change vector analysis method provides information on spectral changes in terms of magnitude and direction. Therefore, considering the significance of determining the intensity of desertification in different parts of Iran and evaluating methods for investigating the changes in desertification intensity, the present study sought to evaluate desertification using the change vector analysis for different land-uses of the Gavkhoni basin.

Materials and Methods: This study used the change vector analysis (CVA) method to determine desertification changes in the Gavkhooni basin based on algorithm-driven classification, producing two components of magnitude and the direction of change. Moreover, to evaluate the intensity of desertification via the change vector analysis method, EVI and BSI were used for examining the study area's vegetation and bare soil. Possessed with 13 layers to assess the land use, the MCD12Q1 product with annual temporal resolution and spatial resolution of 500 m was used as a Level-3 network product in the sine image system to evaluate the land use. In addition, the IGBP standard was also used to assess land cover and land use.

Results: The results of analyzing the changes made in the BSI during 2001-2005 and 2000-2016 indicated that throughout the latter period, BSI values decreased in central, western, northwestern, eastern, and southeastern regions of the study area. On the other hand, the results of analyzing the changes in the EVI revealed that during the same

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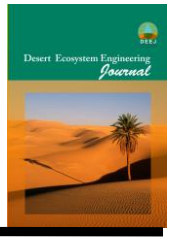

period, the index values increased in the west and northwest of the region, while the index value decreased in the eastern, southern, and southeastern parts of the region. Moreover, the results of analyzing the changes in desertification showed that the number of changes in some areas of the center, west, southwest, and southeast of the region was greater than other areas, which could be attributed to rehabilitation or destruction in the study area.

The results of analyzing desertification-related changes in terms of direction suggested that the intensity of destruction in the center, south, east, southeast, and northeast of the region was higher than that of other regions. The rehabilitation has occurred in the northern, northwestern, and southwestern regions. Among the areas that were under rehabilitation process, 14.15%, 12.04%, and 10.31% of the basin area were found to be in the low, medium, and high rehabilitation classes, respectively. On the other hand, in terms of the extent of destruction in the region, 12.02% of the study fell under the medium destruction class, while 8.24% and 8.91% of the study area were placed under the low and high degradation classes, respectively. However, 34.33% had remained unchanged in terms of desertification status.

According to the results of analyzing the intensity and direction of changes in each land use, 0.42% of agricultural lands were found to be in the high destruction class. Furthermore, the greatest percentage of high rehabilitation class belonged to grasslands, which covered 5.40% of the study area. However, 28.5% of the area which comprised of barren lands was divided under the trend-free class. It was also found that 1.88% of non-dense shrubs and 0.36% of residential lands were under the high destruction class.

Discussion and Conclusion: As desertification is among the serious ecological crises in today's world, it is necessary to well identify and recognize the causes and processes involved in desertification on a regional and global scale. Therefore, this study used the vector analysis method to evaluate the desertification status in different land-uses of the Gavkhoni basin. The multivariate CVA technique was used in the pixel-by-pixel analysis of bands or spectral indices. The changes that occurred throughout two different periods (as mentioned earlier) were identified by placing the quantitative value of the pixels on the two axes of the Cartesian plane, out of which two componential elements, i.e., magnitude and direction were obtained.

In general, the results of the present study indicated that while the east and center of the Gavkhoni basin were in a state of destruction and desertification, the bare soil in the western and northwestern regions of the Gavkhoni basin had been replaced by vegetation due to agricultural activities and cultivation and that these regions were in a state of rehabilitation. Therefore, the vector analysis model is recommended to be used for analyzing changes in other basins. In fact, unless a more accurate and better evaluation model is introduced, this model could be used confidently to assess the severity of future desertification.

Keywords: Rehabilitation, Destruction, Remote Sensing, EVI, BSI, Changes Intensity, Changes Direction.