Deterioration characterization of land cover and land use in Muqdadiya district center for the period 1995 to 2019

Alaa Mahdi Saleh Al-Zuhairi¹ and Tanzeeh Majeed Hameed²

¹ The General Directorate of Education in Diyala, Iraq
² University of Diyala, College of Education for Humanities, Iraq

Email: n20162017386@uodiyala.edu.iq

Abstract. The research dealt with the analysis of environmental changes in the types of land cover and land uses within the Muqdadiyah district center in Diyala governorate and revealed between 1995 and 2019 in order to determine the environmental deterioration of the land cover and land uses and the resulting environmental changes. For the American satellite (Landsat). It turned out that there were changes during the research period, as the amount of change in the area of agricultural land amounted to (-91.16) km², and the area of pastures decreased as the amount of change reached (-39.89) km², while the amount of change in the area of urbanization was (44, 38) km², while the change amount was recorded (100,19) km² for barren lands, which means a decrease in the area of agricultural and pasture lands in favor of built-up lands and barren lands, which negatively affected the biodiversity within the study area.

Keywords. Land cover characterization.

1. Introduction
The distinction and identification of the types of land cover and land uses in the Muqadadiyah district, and by relying on satellite images, relied on a number of foundations of interpretation, namely: (shape, size, shadow, pattern, color intensity, degree of darkness, texture, and geographical location) [1] Therefore, The process of monitoring the development in the land cover and the uses of the earth by means of the data provided by the remote sensing data has become an important application of space data through which the changes that occurred in the land cover and the land uses of a region are determined by means of multi-date satellite visuals used to detect the change that occurred during a period Given time. As the detection of changes in land cover and land uses provides the basis for understanding the change that has occurred in the environment, which has negatively affected biological diversity and the local climate on it. The researchers used these data to study the changes that occurred in the land cover and land uses within the Muqadadiyah district center in Diyala governorate and to reveal the change that occurred on Agricultural lands resulting from urban encroachment on it for the period using space data.
2. Research problem
* Is there a change in the land cover and land use within the Muqdadiyah district for the period from 1995 to 2019 AD?

3. Research hypothesis
* There are changes in the land cover and land use within the Muqdadiya district center for the period between 1995 - 2019 AD.

4. Research objectives
The aim of this study is to determine the changes that occurred to the land cover and land use within the Muqdadiyah district center between 1995 - 2019 AD, using geospatial tools and techniques (RS) Remote Sensing and (GIS) Geographic information systems to monitor these changes and know their size by producing digital maps that illustrate these changes.

5. The area of study
The spatial boundaries represent the boundaries of the Muqdadiya district center, which is located between the latitude (33.49 and 34.43) north and longitude (44.48 and 45.15) east, and the Muqdadiya district borders from the north and north-east the Khanaqin district and from the north and northwest the district. Al-Khalis is bordered from the south by Baladruz district, while Al-Wajihiya district borders the Muqdadiya district center from the south and southwest, while Abu Saida borders the study area from the west, Map 1.

6. Temporal limits of research
The temporal limits of the research are represented by studying the changes in land cover and land use in the Muqdadiya district center between 1995 and 2019.

7. Research methodology
The two researchers relied on the descriptive approach and quantitative analysis to determine the types of land cover and land uses in the Muqdadiya district center and the changes that occurred in it between 1995 and 2019.

8. Methods and techniques for change detection
The study began to detect change in the use of multi-band remote sensing visuals, as they provide sufficient information to determine the magnitude and direction of change in land cover and land use. The methods of detecting change for multi-band remote sensing images can be divided into the method of detection by visual analysis, the method of detection by algebra, the method of subtraction of the image, the method of image ratio, and finally the method of detecting the change after classification [2], which is the method used by the researchers due to its advantages. In addition, it is the most common.
Map 1. Of the location of the study area in relation to the district of Muqdadiyah.
9. Results

Satellite visuals are a major source of geographic information and are a product of satellite imagery, as electromagnetic radiation reflected from the Earth’s surface is measured and recorded in multiple spectral ranges [3]. Also, US satellite images (Landsat) are one of the research methods in the field of studying environmental resources and land uses through monitoring, following up and evaluating them. The researchers used two satellite images in the US satellite series (Landsat), as in Table 1.

Table 1. the satellite visuals used in the study

| N  | the moon | Allergy type | History Visual capture | Row | Path | The number of spectra |
|----|----------|--------------|------------------------|-----|------|----------------------|
| 1  | Landsat 5 | TM           | 10(8|1995                 | (36) (37) | 168 | 7                   |
| 2  | Landsat 8 | OLI-TIRS     | 27(7|2019                 | (37) | 168 | 11                  |

10. How to detect change after classification

The post-classification change detection method is the simplest of the classification-based change-detection analysis technique. After the classification process, the comparison method can be used with two or more images, as each of the images with multiple time periods are classified separately, and then the images resulting from the classification process are compared. One of the disadvantages of this method is the high requirements and the many details for classifying the required categories for space visualization [4]. While it is characterized by the ability to calculate quantitative data (areas) for the total change in the land cover and land uses within the study area, as well as the ability to calculate the areas of each cover or use separately. As in Map 2 and 3. The directed classification was also used, which is the most used by researchers, as it is based on prior information about the spectral reflectivity characteristics of the land cover features to visualize the study area. And that is through geographical knowledge, field visits, or aerial photograph of the region [5].

11. Land cover change and land use for the period (1995-2019)

The changes that occurred during the period from 1995 to 2019 were monitored by comparing the results of the classification directed to the satellite visual that covered the study area for the year 1995 and that resulted from the mosaic process with the results of the same classification of the satellite visual that covered the study area for the year 2019 and it was found that the amount of the total change in the land cover and land use between these two years within the Muqdadiya district center, it has reached (289.14) km² with a change rate of (51.54%). In addition, the percentage of change that occurred in some types of land cover and land uses is very high and will take place in the next Speak a review of these percentages and the amounts of change as shown in Table 2. and Figure 2. as follows:
Figure 1. Visuals used in the study
Map 2. classification of land cover and land use in Muqdadiyah district center for the year 1995

Map 3. classification of land cover and land use in Muqdadiyah district center for the year 2019
11.1 Built-up Land: The change detection process indicates an increase in built-up lands (urbanization), as it is evident from Table 2. and Figure 2. that the amount of change in built lands between 1995 and 2019 amounted to (44.38) km² with a positive change rate of (204.42). After the built-up land covered an area of (21.71) km² in 1995, it increased significantly to become in 2019 (66.09) km². The reason for this urban expansion and the major change in the built up area (urbanization) is due to several reasons, including:

A- The increase in population numbers within an area for study, whether by natural increase or migration, as its population reached (174791) people in 2019 after its population did not exceed (109,106) people in 1997 [6], and this increase in turn required an increase in the number of housing units in order to accommodate the increase in the number of families, as well as the need for additional service, commercial and industrial institutions.

B- The improvement in the economic level of the population and the accompanying need for commercial and industrial establishments, in addition to other land uses.

11.2 Agricultural Land Table 2. and Fig 2. indicate a decrease in the agricultural land area within the district of Muqdadiyah during the period between 1995 - 2019, as the amount of change reached (-91.16) km² with a negative change rate of (-56.58), after the agricultural lands used to occupy an area that amounted to 161.12 km² of the total area of the study area in 1995 (69.96) km² in 2019 and the reason for this apparent decrease in agricultural lands is due to a number of factors, including:

- Agricultural lands have been subjected to urban sprawl and expansion at its expense, as a result of the reluctance of many peasants to cultivate and abandon their lands for several reasons, including:
  1. The deteriorating security situation in the center of Al-Muqdadiya district, which had its effects on agricultural lands and fruit orchards, as a result of the migration of farmers and leaving their agricultural lands.
  2. The high costs of producing agricultural crops offset by their low economic return.
  3. Entering all kinds of imported agricultural crops at low prices that compete with the local crop.
  4. Most of the population engaging in productive trades such as trade and industry and other trades and businesses that provide a better financial return than what agriculture provides.
  5. The enrollment of a large number of young people, especially the countryside, who prepare the labor force in agriculture in the ranks of the army and the police, in order to secure stable income for them and their families.

11.3 Almarai (Rangeland) Table 2. and Figure 2. show that the pastures witnessed a decrease in their area during the period between 1995 and 2019 within the Muqdadiyah district center. As it recorded an amount of change of (-39.89) km², and a negative rate of change of (-27.05%). As pastures formed an area of (147.49) km² in 1995, this area decreased to reach (107.6) km² in 2019. This is due to the prevalence of drought in general and within the date of visual capture in particular, as well as to overgrazing as well as urban sprawl.
### Table 2. Land cover change and land use between 1995 – 2019

| No | Cover type and land uses | Area, km² for the year 1995 | Area, km² for the year 2019 | The amount of change (**) | Percentage change (**) (%) | Type of change |
|----|--------------------------|-----------------------------|-----------------------------|--------------------------|--------------------------|----------------|
| 1  | Urbanism                 | 21.71                       | 66.09                       | 44.38                    | 204.42                   | a plus         |
| 2  | Farmland                 | 161.12                      | 69.96                       | -91.16                   | -56.58                   | Shortage       |
| 3  | Pastures                 | 147.49                      | 107.6                       | -39.89                   | -27.05                   | Shortage       |
| 4  | Water                    | 32.93                       | 19.41                       | -13.52                   | -41.06                   | Shortage       |
| 5  | Barren lands             | 197.75                      | 297.94                      | 100.19                   | 50.66                    | a plus         |
| 6  | Total                    | 561                         | 561                         | 289.14                   | 51.54                    | -              |

(*): The amount of change: it is the difference in area between two different years and the researcher was able to obtain it through the following formula:

\[
\text{Amount of change} = A_{2019} - A_{1995}
\]

(##): percentage change: the percentage change was extracted through the following formula:

\[
x = \frac{A_2 - A_1}{A_1} \times 100
\]

whereas:

- \( X \) = percentage change
- \( A_1 \) = Land cover area in the oldest.
- \( A_2 \) = Area of land cover in the most recent year.

See: DalalZureikat, The change of land cover and land use in Azraq district, Zarqa Governorate between 1978-2015 using geographic information systems and remote sensing, Jordan Journal of Social Sciences, Volume 9, Issue 3, 2016, p. 290.

#### 11.4 Water
Show the change in the area of water to decrease, as the amount of change reached (-13.52) km² with a negative change rate of (-41.06) due to the change in climatic conditions that characterized the fluctuation of the amount of rain falling in the study area. On the other hand, which contributed to increasing the water area in the study area in the year 1995. After the water used to occupy an area that amounted to (32.93) km² of the total area of the study area in 1995, it decreased to reach in 2019 (19.41) km² of the total area of the study area as shown in Table 2 and Figure 2.

#### 11.5 Barren Land:
Barren lands continued to increase and its area expanded within the district of Al-Muqdadiya between 1995 and 2019, as it recorded an amount of change of (100.19) km² and a positive change rate of (50.66%). After it covered an area of (197.75) km² in 1995, its area expanded in 2019 to constitute (297.94) km², as shown in Table 2 and Figure 2. As a result of converting agricultural lands and fruit orchards to residential land, as well as changing climatic conditions and the prevalence of drought.

#### 12. Conclusions:

**12.1** The research revealed that there are five types of land cover and land uses within the Muqdadiya district center.
12.2 The decline of agricultural lands, pastures and water, which was matched by the expansion of barren lands and urbanization, which created environmental changes that had their effects on the environment and local climate of the study area.

13. Recommendations:

13.1 Limiting the phenomenon of urban expansion on agricultural lands and green areas and working on the sustainability of agricultural lands within the study area.

13.2 The trend towards vertical housing (vertical expansion) for urbanization in order to preserve agricultural lands and limit the phenomenon of urban expansion in its direction.

13.3 Work to enact strict laws against transgressors of agricultural lands.

14. References

[1] Sabaa A M and Najm A H 2018 Observing changes between land cover and landuse in the Amiriyat al-Fallujah district Tikrit University for Human Sciences Journal 25 189
[2] Campbell J B 2007 Introduction of Remote sensing New York: Guilford Press 325
[3] Campbell D B 1996 Introduction of Remote sensing New York: Guilford Press 149
[4] Stuart M R 2007 A remote sensing change detection study in the arid Richtersveld region of South Africa Cape: University of Western 20.
[5] Shaoqing Z 2008 The comparative study of three methods of remote sensing image change detection magazine the international archives of the photogrammetry remotesensing and spatial information sciences 1596 – 1597
[6] Ministry of Planning. Central Bureau of Statistics Diyala Statistics Directorate unpublished data
[7] Al-Dzai S A 2013 Iraq’s Old and Contemporary Climate Baghdad: House of General Cultural Affairs 317