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Spatio-Temporal Analysis of Land use Land cover Change in Sultanpur National Park

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ABSTRACT

This study examines the change in land use and land cover of Sultanpur National Park between 2013 to 2023. It is located in Gurugram, Haryana. In this study, Lulc maps have been prepared with the help of QGIS software to analyse the land use and land cover changes in the last 10 years (2013-2023) of Sultanpur National Park. Landsat 8 imagery was used to prepare these Lulc maps. The supervised maximum likelihood method was used to calculate both 2013 and 2023 lulc maps. And the accuracy of Lulc maps is measured by the error matrix and kappa coefficient. The accuracy of Lulc 2013 and Lulc 2023 maps is calculated to be 100%. Sultanpur National Park's land cover and use are changing quickly, as can be seen by comparing the LULC maps for 2013 and 2023. The result shows that the availability of water was 4.57% in 2013, decreasing to 3.35% in 2023. A reduction in areas of low vegetation may also be observed; The area of low vegetation was 39.56% in 2013, which has reduced to 14.76% in 2023. While, the area of high vegetation (sparse vegetation), barren land and built up area have been increased between 2013 and 2023. The lulc map show the greatest change in high vegetation. It's area is 15.59% increased from 2013 to 2023. It concluded that there was a significant change in the land use and land cover of the Sultanpur National Park between 2013 and 2023.

Keywords: Haryana, LULC, National Park, Vegetation.

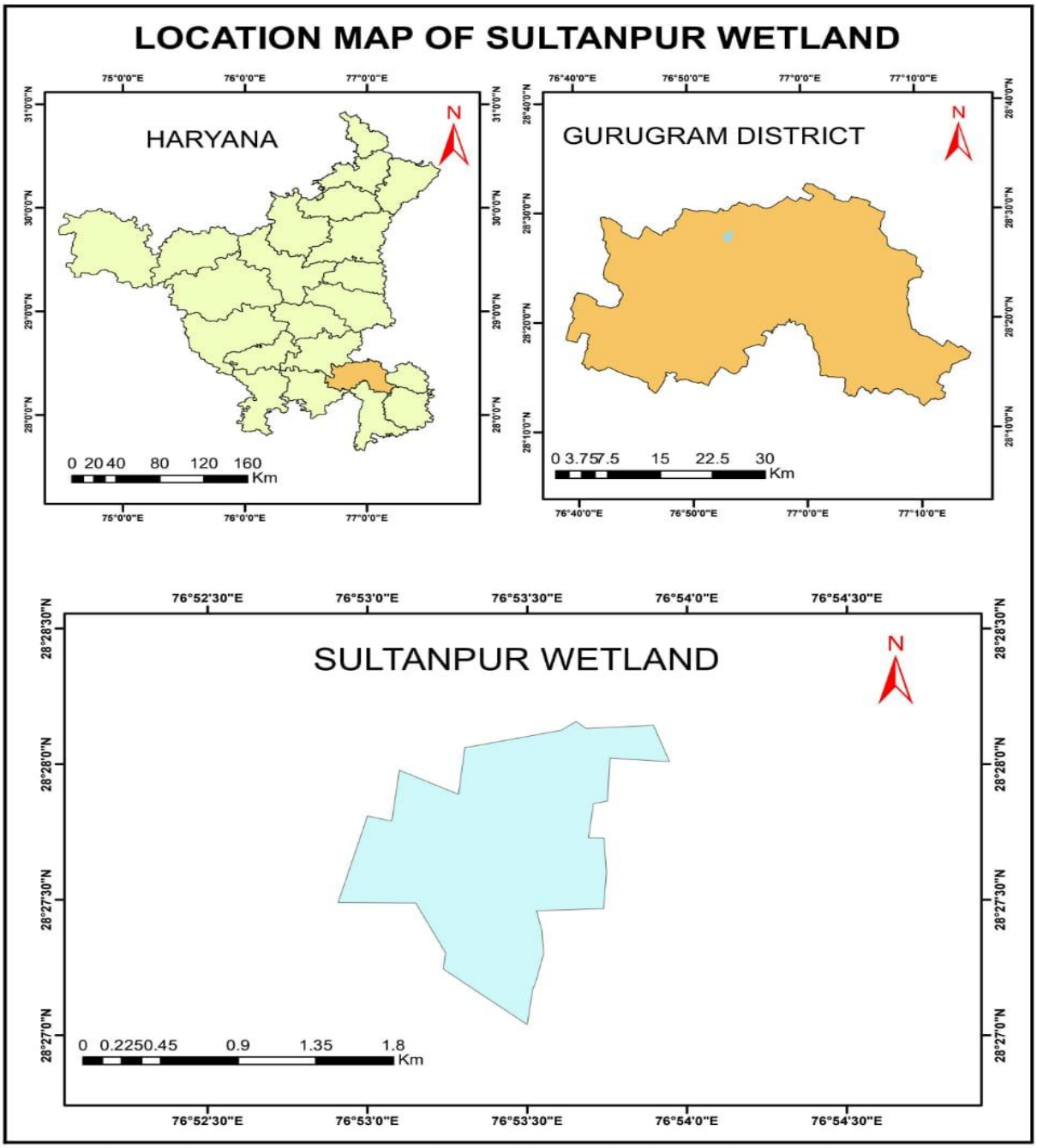
INTRODUCTION

Wetlands are identified as "lands transitional zones between terrestrial and aquatic eco-systems where the water table is high and land is covered by shallow water (Gebresllassie et al., 2014). The Ramsar convention defined wetlands as "areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six meters." It is estimated that wetlands cover about 4 to 6% of the world's land (Demissie & Addis, 2015; Junk et al., 2013). Wetlands are essential part of an ecosystem because they maintain the biodiversity of flora and fauna as well as the recharge of groundwater.

And protect the water from being polluted. It is known as the kidneys of the earth because they filter the pollutants into land. Even wetlands consume carbon and reduce the emission of carbon in the environment. But they have been rapidly declining over the years.

Many human activities, such as unplanned urban sprawl, irregulated development of agriculture, solid waste, pesticides in catchment areas, and the inflow of fertilizer and silt in wetlands, are responsible for the degradation of nature and the area of a wetland's ecosystem (Alam A et al., 2011). Sultanpur National Park is identified as a Ramsar site in 2021. It is the main focus to examine the changes in Sultanpur National Park between 2013 and 2023 with the help of a land use and land cover map.

Study area:
The Sultanpur National Park, Gurugram (28.46′71″ N 76.89′90″ E to 28.45′46″ N 76.88′15″ E) is located in Sultanpur village of Gurugram, Haryana. It is 15 km from Gurugram and 50 km away from Delhi. It spans 13727 hectares, including agricultural land and forest patches covered with vegetation. This lake received water from the Gurgaon canal of the Yamuna River. Although the water table is high during the monsoon and winter seasons, it becomes dry in the summer season. Sultanpur National Park is declared a Ramsar site in 2021.



Source: Create with the help of QGIS software

Figure 1: Location Map of Sultanpur National Park

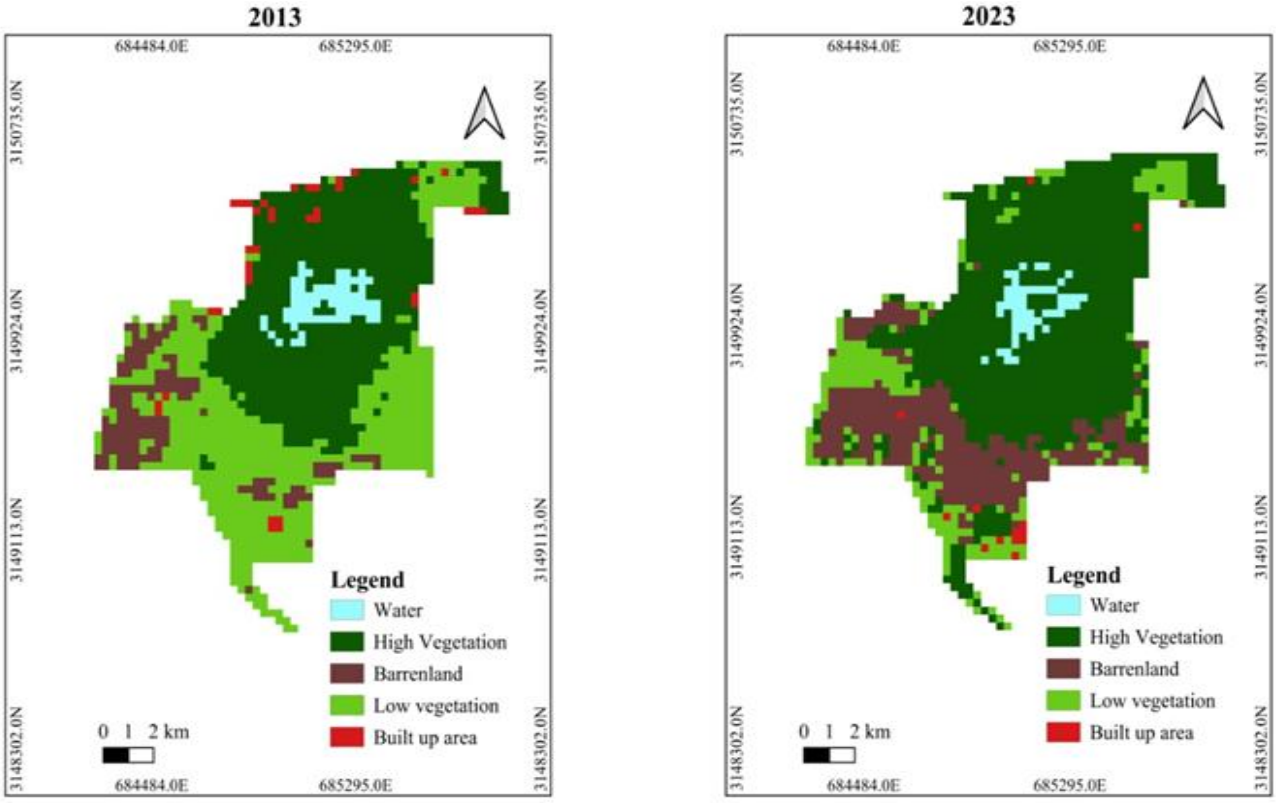
Objective:
To understand the spatio-temporal changes in land use and land cover of Sultanpur National Park with the help of the LULC map from 2013 to 2023.

Data base
Landsat 8 imageries for the year 2013 LULC map and Landsat 9 imageries for the year 2023 LULC map are obtained from the United States Geology Survey (USGS) Earth Explorer (https://earthexplorer.usgs.gov/). To acquire cloud-free data, imageries of data for the month of June have been taken. "Oll TIRS" used for both the years 2013 and 2023 (Path 147 and row 40). The resolution of all imageries are 30 m. In this research, all imagery was projected onto the Universal Transverse Mercator Projection Zone 43°N and the World Geodetic System 1984 datum.

METHODOLOGY

Landsat 8 imageries (2013) and Landsat 9 imageries (2023) were used to prepare LULC maps with the help of the semi-automatic classification plugin of QGIS software version 3.36.01. These LULC maps are classified into 5 classes such as water, high vegetation, low vegetation, agricultural land and built up area. The supervised maximum likelihood algorithm was used for these Lulc maps. The accuracy of these LULC maps is measured by the error matrix and kappa coefficient. The accuracy of the LULC map of the year 2013 is 100%, and the accuracy of the LULC map of the year 2023 is 99.8%. After this process, the area of each class was measured by the SCP plugin classification report.

RESULT AND DISCUSSION



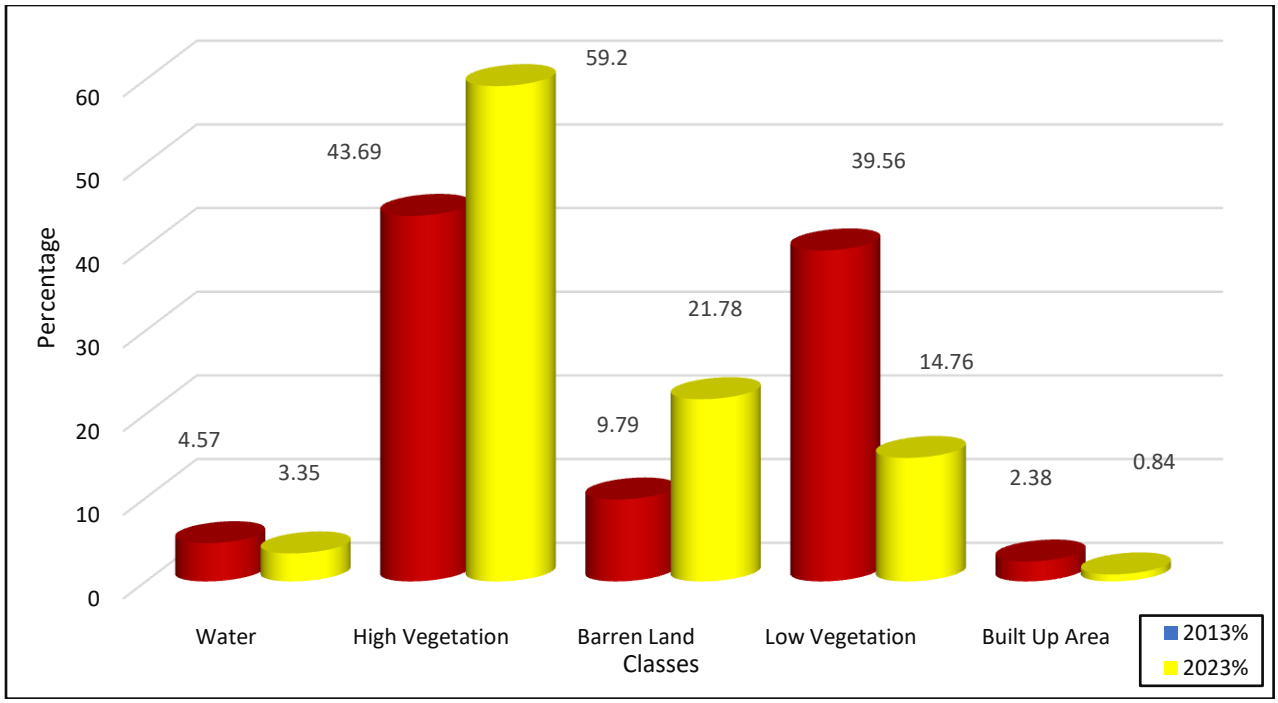
Source: Create with the help of QGIS software

Figure 2: Land use Land cover Map of Sultanpur National park

Table 1: ***Land use land cover change of Sultanpur Wetland 2013 and 2023***

Classes	**2013**		**2023**	
	Area (Square Meter)	Area (%)	Area (Square Meter)	Area (%)
Water	63900	4.57	46800	3.35
High Vegetation	610200	43.69	828000	59.2
Barren Land	136800	9.79	304200	21.78
Low Vegetation	552600	39.56	206100	14.76
Built Up Area	33300	2.38	11700	0.84
Total	**1396800**	**100.00%**	**1396800**	**100.00%**

Source: Source: Prepared with help of QGIS and MS Excel



Source: Compiled with help of table 1 data

Figure 3: Land Use Land Cover change of Sultanpur National Park, Gurgaon 2013 and 2023

Significant changes in land use and land cover of Sultanpur National Park have been observed between 2013-2023. These two LULC maps were prepared with the help of QGIS software. Landsat 8 imageries was used for preparing these LULC maps. The accuracy of these two LULC maps is 100%, accuracy measured by the error matrix and Kappa coefficient. These LULC maps are shown 5 classes such as water, high vegetation, barren land, low vegetation and built up area. The area of barren land is increasing day by day. In the 10 years between 2013 to 2023, you can see that barren land was only 9.79% in 2013, and in 2023, it has increased to 21.78%. On one hand, the area of barren land has continuously increased, while on the other hand, the area of water has decreased. In 2013 the water area was 4.57%. Which continued to decrease and reached 3.35% in 2023.The area of sparse vegetation is gradually decreasing. The area of low vegetation in 2013 was 39.156. Which reduced to 14.76% in 2023. The area of high vegetation has increased. The LULC map of 2013 shows that high vegetation was 43% but gradually increased to 59.28% in 2023.

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