

Land use change and their implications in Barda Sanctuary, Gujarat, India

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ABSTRACT

Barda Sanctuary is located between Porbandar and Devbhumi Dwarka district of Gujarat. This research deals with the land use pattern of Barda sanctuary, Gujarat. The data from the year 2020, 2021, and 2022 was downloaded from Sentinel-2 by the means of ESRI land cover explorer. All the downloaded data was processed in QGIS software. The results indicate 2.3687 km² increase in scrubland and 2.3092 km² decrease in trees. Increase of scrubland depicts formation of woody species, which is helpful in soil properties and ecosystem change.

Key words: Land use, Barda sanctuary, QGIS, Sentinel-2

Introduction

Barda sanctuary is located between Porbandar and Devbhumi Dwarka districts of Gujarat, India. It is also the home of nomadic tribes known as 'Maldhari'. This sanctuary is having a total of 191.32 km² area and it is lying between the latitude 20° 40' to 21° 55' North and longitude 69° 40' to 69° 50' East (Raviya and Pandit, 2003). Barda is also the part of Kathiawar peninsula of Gujarat (Pandit and Raviya, 2003a). It is mostly hilly (Jadeja *et al.*, 2006) and the forest is of dry deciduous (Raviya, 2020). Land Use – Land Cover (LUCL) is a general term that denotes earth's cover whether it is man-made or artificial, but 'land use' means the sum of total activities which are performed by people in a particular study area (Anandkumar *et al.*, 2019). QGIS is open-source software which is often used to study land use (Ramadhan and Hidayati, 2022). Many Research in India show use of QGIS in studying the land use

pattern (Lekha and Kumar, 2018; Mishra *et al.*, 2020; Padma *et al.*, 2022). Previous studies of Barda are mostly related with biological spectrum (Jadeja *et al.*, 2006), plant diversity (Pandit and Raviya, 2001, 2004a, 2004b), and phytosociology (Pandit and Raviya, 2003b). To the best of our knowledge, no one has ever attempted to study land use pattern. This research focuses the quantitative study of Barda sanctuary's land use pattern with the help of QGIS.

Materials and Methods

Land use data from the year 2020, 2021, and 2022 was downloaded from the Sentinel-2 by the means of ESRI land cover explorer (Esri%Sentinel-2 Land Cover Explorer). All the downloaded data was processed in QGIS Desktop 3.26.2 software. After processing a total of three land use maps for Barda sanctuary were created (Fig. 1).

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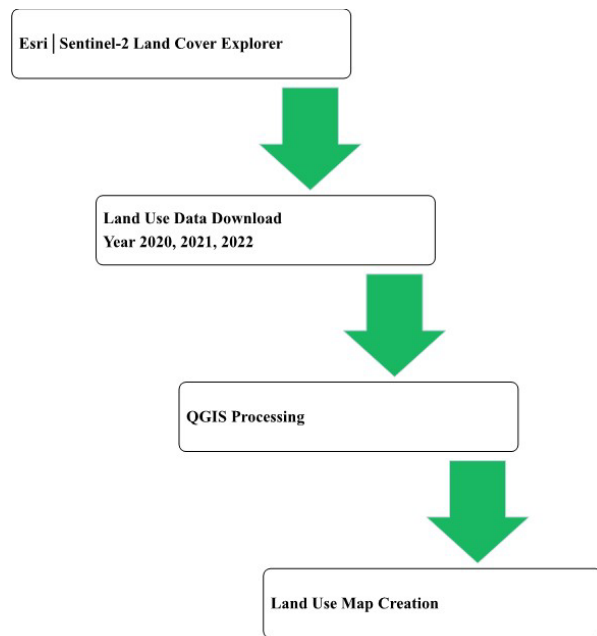


Fig. 1. Land use map creation process

Results and Discussion

Three years land use pattern analysis of Barda sanctuary shows increase in scrubland and built up by

2.3687km² (1.2337%), and 0.0244 km² (0.0127%) respectively; while decrease in trees, water body, and cultivated land by 2.3092 km² (1.2027%), 0.0822 km² (0.0428%), and 0.0013 km² (0.0016%) respectively (Table 1) (Figure 2 to 4) show changes in the land use pattern of Barda sanctuary from the year 2020, 2021, and 2022.

Barda sanctuary harbours 76.90% of herbs and shrubs but only 16.04% trees, that is why most of the part is scrubland (Pandit and Raviya, 2003a). Water body decreasing is may be due to annual average rainfall decreasing in Barda sanctuary in the three consecutive years 2020, 2021, and 2022 (CHRS Data Portal). Previous studies in Baramulla district (Meer and Mishra, 2020), Cachar district (Ashwini and Sil, 2022) of India, also show decrease in water body. It is also one of the reasons for decrease in trees in Barda sanctuary. Another reason for trees decreasing is because of 'Cyclone Tauktae' that hit Gujarat in 2021, which had damaging effects in Brada and Gir sanctuary. Similar studies in Imphal city (Pandey *et al.*, 2022), and Nainital district (Rathore *et al.*, 2022) of India also show decrease in trees. Decrease in cultivated land is supported by previous studies of Ramsar (Paonam and Chatterjee, 2023), and Tirupati (Mallupattu and Sreenivasula Reddy,

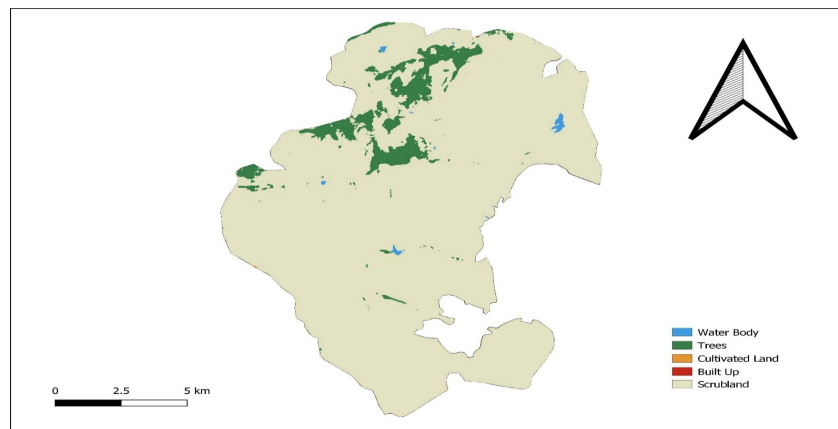


Fig. 2. Land use pattern of Barda Sanctuary (2020)

Table 1. Changes in land use pattern of Barda sanctuary

Land use category	2020		2021		2022		Changes from 2020 to 2022	
	km ²	%	km ²	%	km ²	%	km ²	%
1. Water Body	1.4650	0.7630	1.4038	0.7311	1.3828	0.7202	-0.0822	-0.0428
2. Trees	14.4925	7.5481	10.1509	5.22869	12.1833	6.3454	-2.3092	-1.2027
3. Cultivated Land	0.0115	0.0059	0.0117	0.0061	0.0084	0.0043	-0.0013	-0.0016
4. Built Up	0.0086	0.0044	0.0034	0.0017	0.0330	0.0171	+0.0244	+0.0127
5. Scrubland	175.1118	91.2040	179.5197	93.4998	177.4805	92.4377	+2.3687	+1.2337

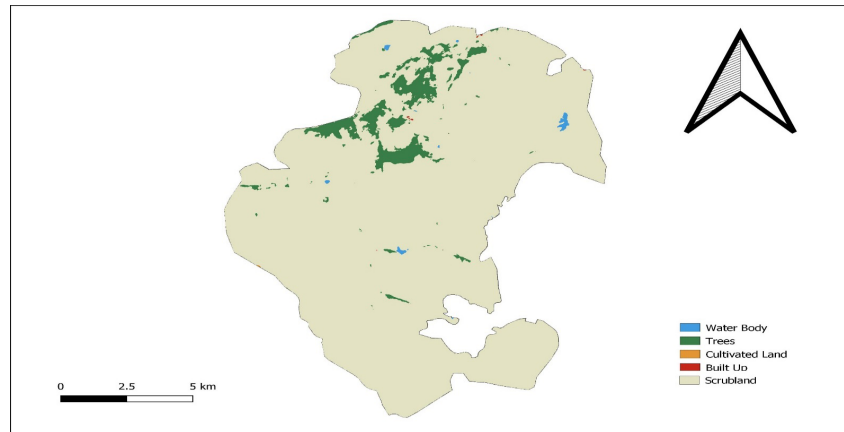


Fig. 3. Land use pattern of Barda Sanctuary (2021)

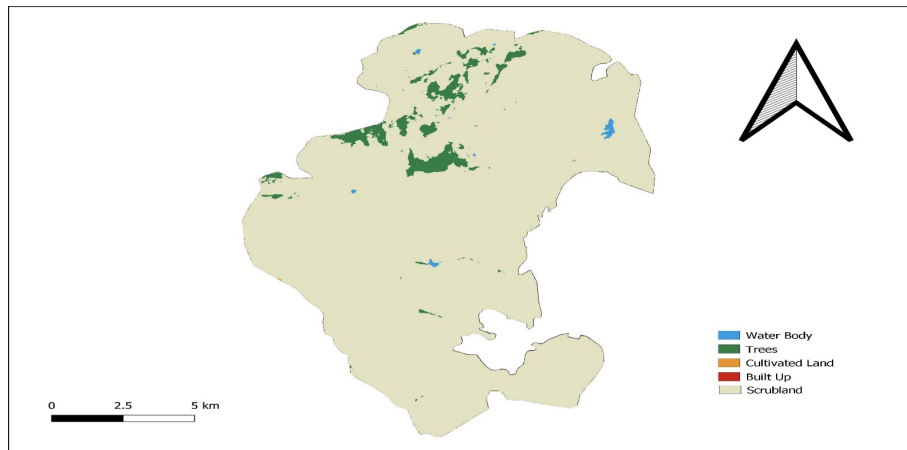


Fig. 4. Land use pattern of Barda Sanctuary (2022)

2013), India. Increasing built up is due to the Maldhari nomads, who often change their locations. Previous studies of Morena district (Tiwari *et al.*, 2021), and Bharathapuzha (Raj and Azeez, 2010), India supports decrease in cultivated land. Increasing scrubland is supported by previous studies in South Haldwani (Bora *et al.*, 2018), and Aizwl District (Lalhmachhuana *et al.*, 2022) of India.

Conclusion

To the best of our knowledge, this is the first land use pattern study of Barda sanctuary. This research studied the land use pattern of Barda sanctuary from the year 2020, 2021, and 2022, with the help of Sentinel-2 and QGIS. The changes, especially from trees to scrubland dictated a positive direction for the ecosystem by the formation of woody species. It is also helpful in soil properties and ecosystem

change. This research utilises QGIS and Sentinel-2 imagery, which are some of the important technological aspects in the field of ecology research. Since Barda sanctuary is a protected area, this study shows the important of the sanctuary by the means of understanding its type of vegetation, which will also be helpful for future studies.

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Conflict of interest

The authors have no conflict of interest.

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