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Land use changes and their implications in Gir Sanctuary, Gujarat, India.

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Abstract- The understanding of land use pattern is important for any area whether it be a protected area, urban area or even a small village. This study was initiated with the aim of studying the changes in the land use pattern of Gir Sanctuary of Gujarat from the year 2018 to 2021. The data analysis was performed with the help of QGIS software and the necessary data was downloaded with the help of semi-automatic classification plugin. This study revealed that out of the major six categories, two of them have shown noticeable changes. Over the course of four years, trees have increased from 3.1015% to 10.5578% and scrublands have decreased from 92.1266% to 84.8109%. This study concludes that as a protected area of Gujarat state, the increase in the tree diversity is a very good indicator for the conservation aspect of the flora of Gir Sanctuary.

Key words: Gir Sanctuary, Land Use Pattern, Semi-automatic classification, QGIS

INTRODUCTION

In the world, most of the parts have seen the changes in the land use.[1] Most of the time changes in the land use is associated with the people of a particular area.[1] Study of changes in land use is required because it provides a view on how resources are being used.[2] Land use changes help to understand how a particular ecosystem service is functioning.[3] One of the reason to study changes in the land use is because it provides an understanding that how people have changed the way they have been using the land over the years.[3] By studying the land use changes, it can help to prepare better strategies of sustainable development.[1] Land use changes also helps to predict the changes in a particular ecosystem.[3] Some of the negative changes related to land use for example: run-off, over-grazing, degradation of water quality can also be understood by studying the changes in the land use.[1]

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In India, Gir Sanctuary is known as "The Home of Asiatic Lion". It is distributed in 1412 km^2 of Gujarat state, covering three districts: Junagadh, Gi-Somnath and Amreli. It is also the home of nomadic tribes known as "Maldharies", as well as many floras and fauna. Most of the Gir Sanctuary Forest is dry deciduous. Because of its versatility in being distributed in three districts, different climatic conditions and weather makes it a rich region for studying the land use pattern.

MATERIALS & METHODS

This study was undertaken with the aim to use remote sensing with the help of computer software QGIS and also by the means of personal observation to classify the land use pattern of Gir Sanctuary from the year 2018 to 2021. Methods by which land use changes can be studied consists of remote sensing.[2] The necessary data was obtained by the use of QGIS software. All the processing related to studying the changes in land use was performed with the help of Semi-automatic classification plugin.[4] A total of

four maps consisting of land use changes pattern of Gir sanctuary in the years: 2018, 2019, 2020 and 2021 were created with the help of QGIS software.

RESULTS

This study reveals that the land use pattern of Gir Sanctuary can be categorized into six major categories: Water bodies, Trees, Grasses, cultivated land, Built up, Scrubland. In this study, it has been observed that in the course of four years: from 2018 to 2021, water bodies have increased from 0.4649% to 0.6917%, trees have increased from 3.1015% to 10.5578%, grasses have increased from 0.0002% to 0.0205%, built up has increased from 0.1599% to 0.1848%, cultivated land has decreased from 3.8531% to 3.7341%, and scrubland has decreased from 92.4149% to 84.8109%.

DISCUSSION

Some of the research has been done to study the changes in land use changes in the different parts of the world which includes Golpayegan city, Iran.[10] Mid hills, Himachal Pradesh, India.[5] Cameron Highlands, Malysia.[6] Kajiado Country, Kenya.[5] Gangetic Plains, Uttar Pradesh, India.8 Nainital district, India.[9]

Similarities have been observed with previous findings with respect to increase of grasses and built up.[5,7,9,10] Contradictions have been observed with the previous findings with respect to decrease in cultivated land.[5,10] Also changes from shrubland to trees to has been observed with previous research.[11]

CONCLUSION

Gir Sanctuary has a very diverse climate and because of this it harbors some of the very important plant and animal species of India. Because of the findings in our study, with respect to increase in water bodies, grasses and tress of the Gir Sanctuary, it shows a positive impact on the ecology of the area. It shows that the ecosystem is progressing in the right direction and this leads to sustainable ecosystem services. It is also a good indicator related to the conservation aspect of this protected area. The results which have been provided here shows the importance of studying the changes in land use pattern and also benefits of using remote sensing. Changes from trees to shrubland indicates formation of new patch of the woody species and it can lead to positive changes in new ecosystem properties and soil quality.

Table 1. Changes in the land use pattern of Gir Sanctuary: 2018 to 2021

Land use category	2018		2019		2020		2021		Changes from 2018 to 2021	
	km²	%	km²	%	km²	%	km²	%	km²	%
Water bodies	6.5643	0.4649	7.3621	0.5214	9.8444	0.6972	9.7668	0.6917	+3.2025	+0.2268
Trees	43.7931	3.1015	61.0167	4.3213	127.6038	9.0371	149.0761	10.5578	+105.2830	+7.4563
Grasses	0.0028	0.0002	0.0593	0.0042	0.3177	0.0225	0.2894	0.0205	+0.2866	+0.0203
Cultivated land	54.4057	3.8531	54.4961	3.8595	51.3600	3.6374	52.7254	3.7341	-1.6803	-0.1190
Built-up	2.2577	0.1599	2.3298	0.1650	2.5345	0.1795	2.6093	0.1848	+0.3516	+0.0249
Scrubland	1304.8983	92.4149	1286.7075	91.1266	1220.0597	86.4065	1197.5299	84.8109	-107.3684	-7.6040

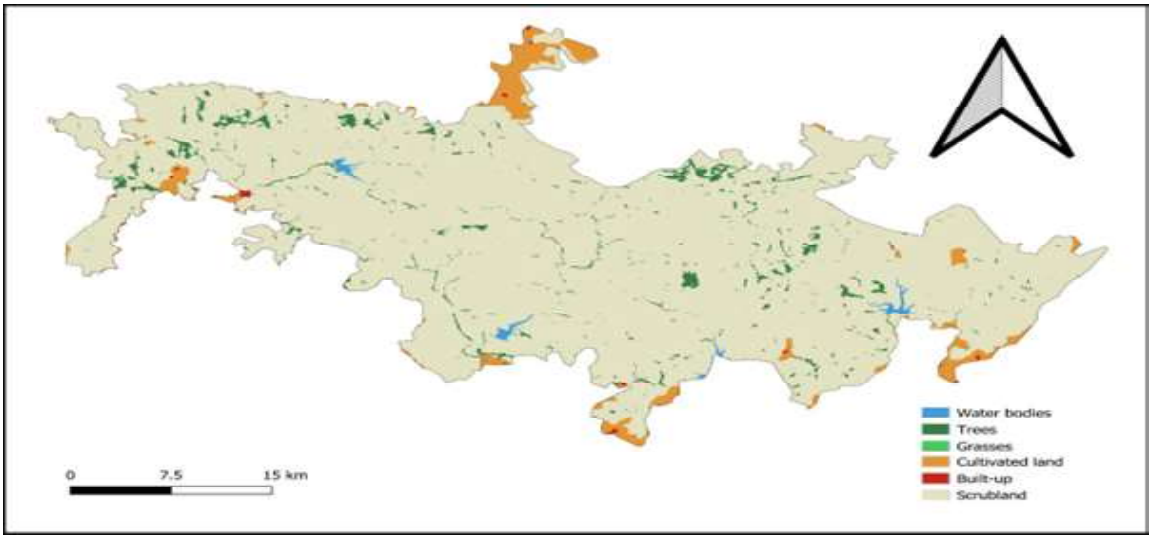

Figure 1. Land use pattern of Gir Sanctuary, 2018

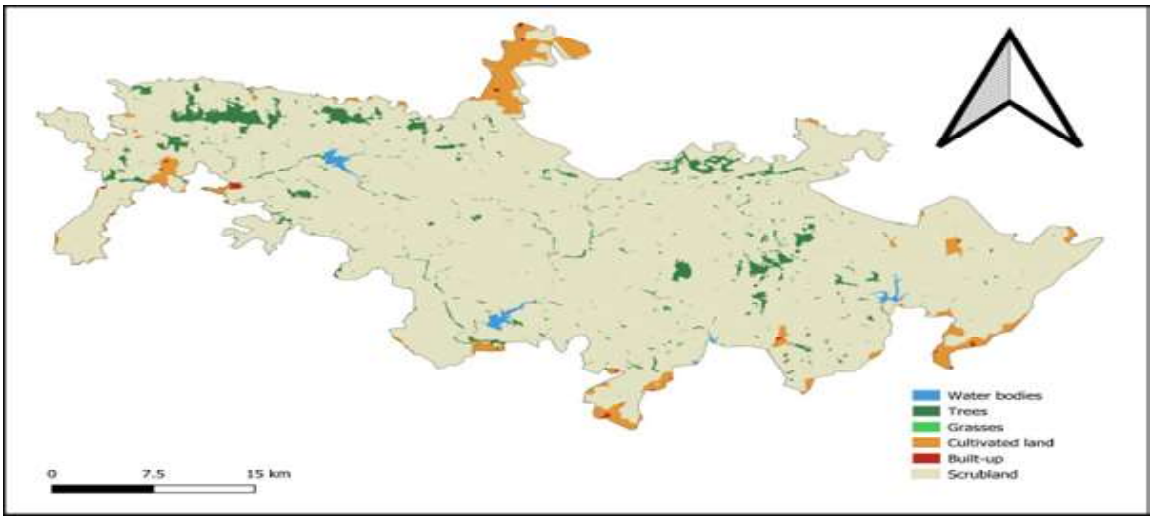

Figure 2. Land use pattern of Gir Sanctuary, 2019

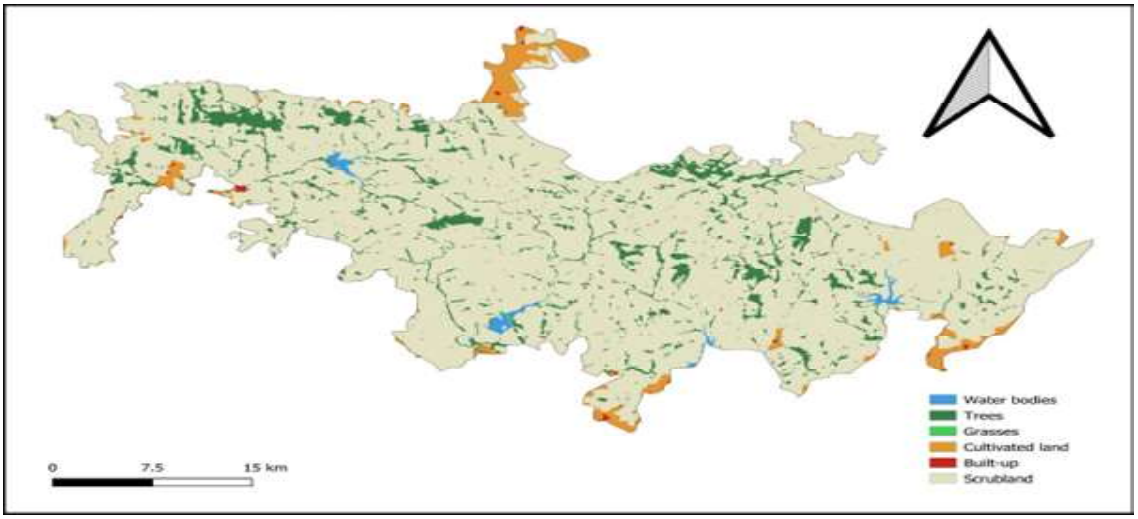

Figure 3. Land use pattern of Gir Sanctuary, 2020

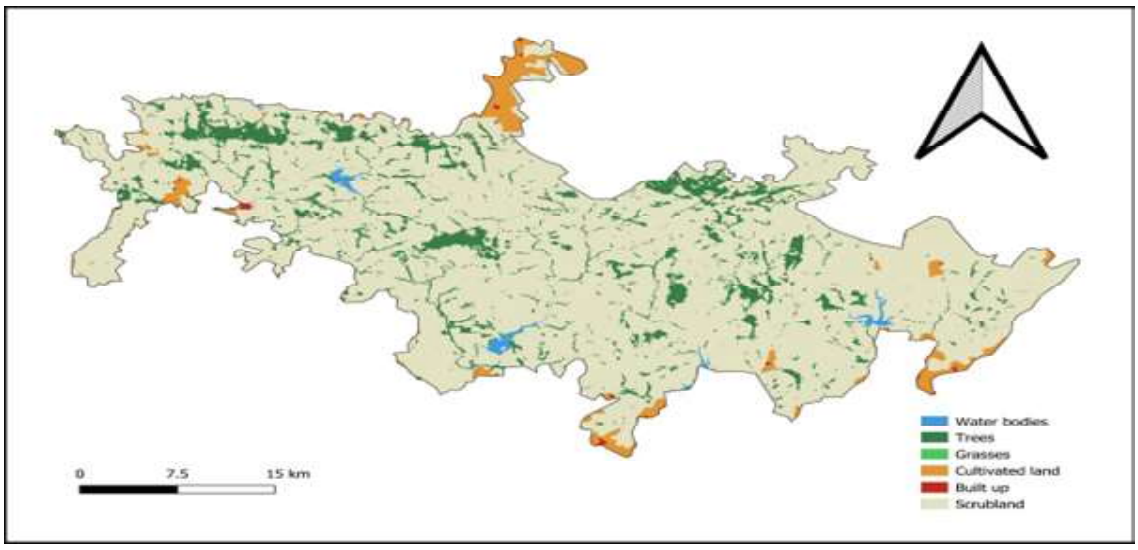

Figure 4. Land use pattern of Gir Sanctuary, 2021

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