

A GIS Approach to Land Use and Land Cover Change Assessment from 2016 to 2020 in Teknaf and Ukhiya Upazila of Cox's Bazar District of Bangladesh Due to Rohingya Intrusion

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Abstract- Bangladesh is a small country located in South-East Asia in Ganges- Brahmaputra- Meghna basin. It shares its border with India in the West, North and East and with Myanmar in the South-East. The Rohingyas are an ethnic, righteous, and philologic minority in Myanmar who initially dwell in the three townships of North Arakan, which borders Bangladesh. They have experienced ethnic cleansing in Arakan Province by the Buddhist majority of Myanmar, compelling them to run away in search of relative safety in Bangladesh. The majority of this population settled in dilapidated makeshift camps, ruining the forested hills of Teknaf and Ukhiya. Rohingya refugee settlement in the Teknaf and Ukhiya areas made a big Stress on Bangladesh's Economy and had negative impacts on the environment and the ecology of the local areas and beyond. Their arrival into these areas has a visible effect on local forests and worsened human and wildlife struggles. This study attempts to identify and assess land use and land cover changes for the years from 2016 to 2020 by using the image of Sentinel-2 (10m resolution) satellite data after the Rohingya intrusion in Cox's Bazar in 2017.

Index Terms- Rohingya, Sentinel-2, GIS, Teknaf and Ukhiya.

I. INTRODUCTION

Teknaf and Ukhiya areas appear as varied types of land, with wet, forested, hilly, coastal and flat land found together within a small stretch of land. Most of these areas consist of hilly areas, which means that the region is not susceptible to vegetation (Mosleuddin & et al., 2018). So, the region is covered with forests, wildlife and natural resources. The effective utility of remote sensing information has been very much acknowledged in mapping and evaluating land attributes such as physiography, soils, land use, land cover, etc. (Solanke Preeti et al. 2005).

Environmental degradation is usually demonstrated through various indicators of environmental parameters i.e., loss of vegetation cover, increasing salinity covered bed of land, decreasing the agricultural land, etc. which might affect the local and regional climate (Gain 1998). Control of resource use, a proper course of action and the authoritarian body of human activities (extemporary settlement, land use, deforestation and underground water use) can enhance the way to deal with executing supportable development and management (Riches 2008).

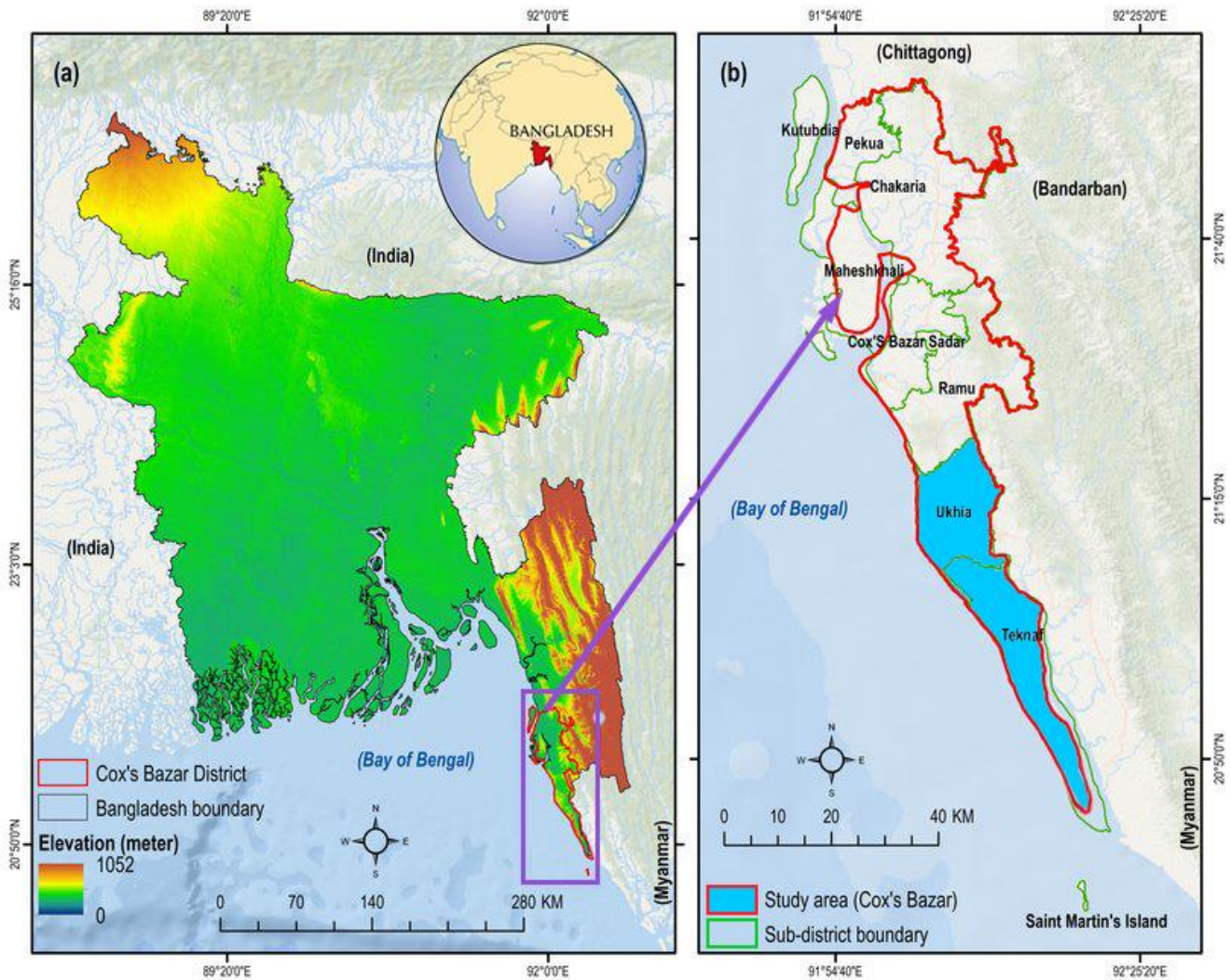
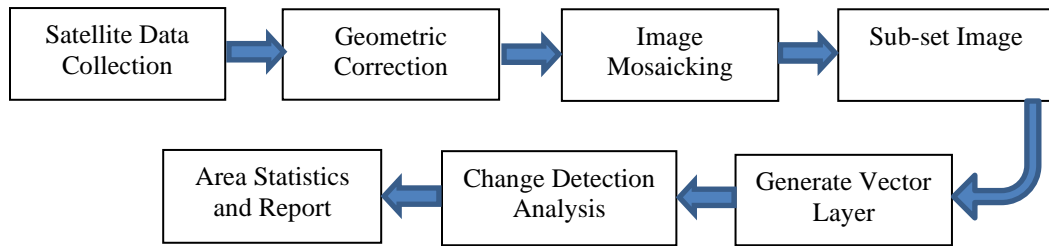


Figure 1: Location map of the study area

II. MATERIALS AND METHOD

Remote sensing data was Geo-referenced to Transverse Mercator (TM) projection system using Linear Transformation Matrix with Nearest Neighborhood re-sampling technique. Pre-processed data were characterized by utilizing on digitization procedure. Land-use changes are resolved between the years 2016 to 2020. Essential spectral bands in Satellite images were utilized for the study of land-use boundaries for the particular necessities of the investigation. ArcGIS and ERDAS Imagine software have been used for data processing, analysis and generation of products-supported data.



Flowchart of Research Methodology.

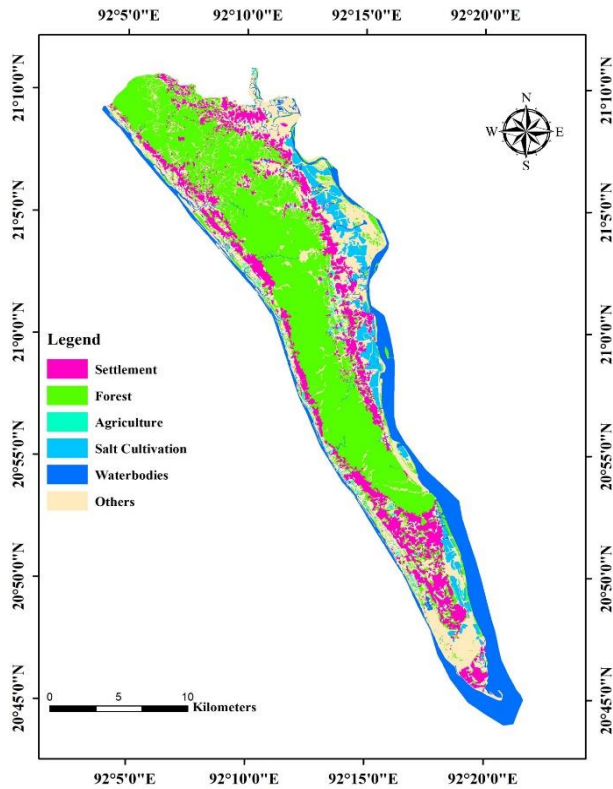
III. RESEARCH FINDINGS AND DISCUSSION

This research work examines the changes in land use and land cover from the year 2016 to 2020 for the Teknaf and Ukhiya Upazila. We found a significant alteration in land use and land cover of that region by satellite image processing. The information gained from the Satellite picture of Teknaf Upazila indicated that in 2016, there were 161.20 sq km of Forest and Shrubs which decreased to 129.32 sq km in 2020. We noticed that the agricultural region of 2016 is diminished by 1.91 sq km in 2020. Besides, land used for settlements in 2016 was 57.26 sq km, and in 2020 was 79.63 sq km showing an increase in the settlement area to 22.37 sq km. In 2016, there were no Rohingya settlements but in 2020 there is 8.44 sq km of Rohingya settlements present. In 2016, 17.72 sq km of land was used for salt cultivation but in 2020 it increased to 26.47 sq km. In 2016, 57.41 sq km of land was covered as water bodies but in 2020 it decreased to 55.82 sq km. It is found that in 2016, Bare Land, Roads and other areas were 91.38 sq km. But in 2020 it decreased to 87.20 sq km.

Class Name	Sentinel-2 Image 2016 (sq.km)	Sentinel-2 Image 2020 (sq.km)	Area Changed from 2016 to 2020 (sq.km)
Settlement	57.26	79.63	22.37 (Area Increased)
Rohingya	00	8.44	8.44 (Area Increased)
Forest and Shrub	161.20	129.32	31.88 (Area decreased)
salt cultivation	17.72	26.47	8.75 (Area Increased)
Agriculture	3.71	1.80	1.91 (Area decreased)
Waterbodies	57.41	55.82	1.59 (Area decreased)
Others	91.38	87.20	4.18 (Area decreased)

Table 1: Land use land cover changes in Teknaf Upazila from 2016 to 2020

Land Use and Land Cover Map of Teknaf Upazila for the Year 2016



Land Use and Land Cover Map of Teknaf Upazila for the Year 2020

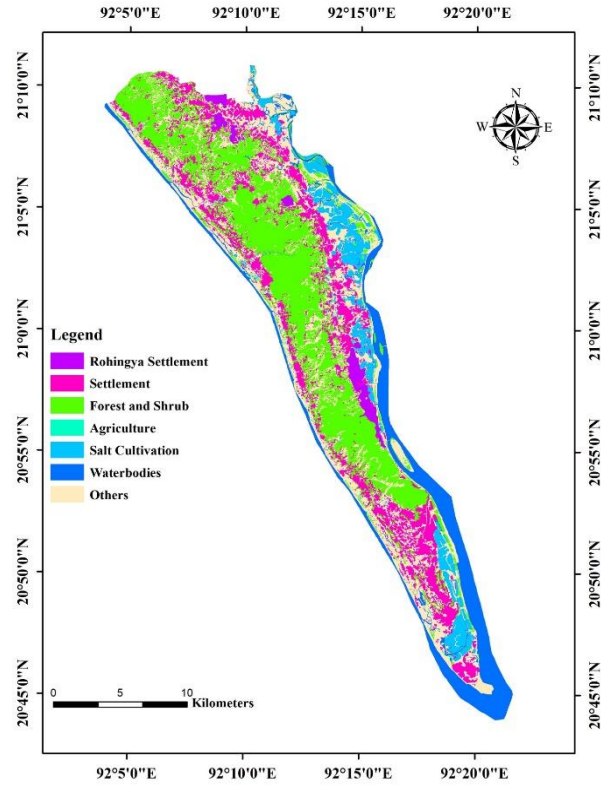


Figure 2: Land use and land cover changes in Teknaf Upazila from 2016 to 2020

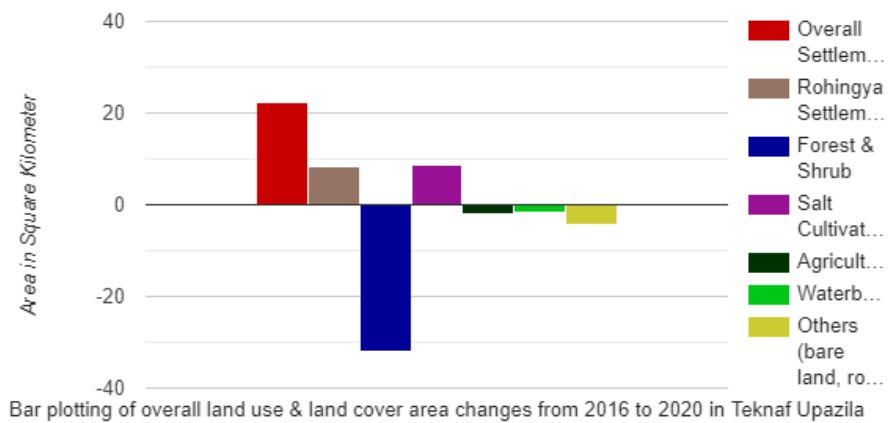


Figure 3: Bar plotting of overall change of land use and land cover area in Teknaf Upazila

Similarly, the information gained from the Satellite picture of Ukhiya Upazila indicated that in 2016, there were 128.13 sq km of Forest and Shrubs which decreased to 78.83 sq km in 2020. We noticed that the agricultural region of 2016 is diminished by 0.45 sq km in 2020. Besides, land used for settlements in 2016 was 61.75 sq km, and in 2020 was 100.98 sq km showing an increase in the settlement area to 39.23 sq km. In 2016, there were no Rohingya settlements but in 2020 there is 11.49 sq km of Rohingya settlements present. In 2016, 8.72 sq km of land was covered as water bodies but in 2020 it decreased to 4.24 sq km. It is found that in 2016, Bare Land, Roads and other areas were 59.29 sq km. But in 2020 it increased to 61.66 sq km.

Class Name	Sentinel-2 Image 2016 (sq.km)	Sentinel-2 Image 2020 (sq.km)	Area Changed from 2016 to 2020 (sq.km)
Settlement	61.75	100.98	39.23 (Area Increased)
Rohingya	00	11.49	11.49 (Area Increased)
Forest and Shrub	128.13	78.83	50.09 (Area decreased)
Agriculture	0.47	0.92	0.45 (Area Increased)
Waterbodies	8.72	4.48	4.24 (Area decreased)
Others	59.29	61.66	2.37 (Area Increased)

Table 2: Land use land cover changes in Ukhiya Upazila from 2016 to 2020

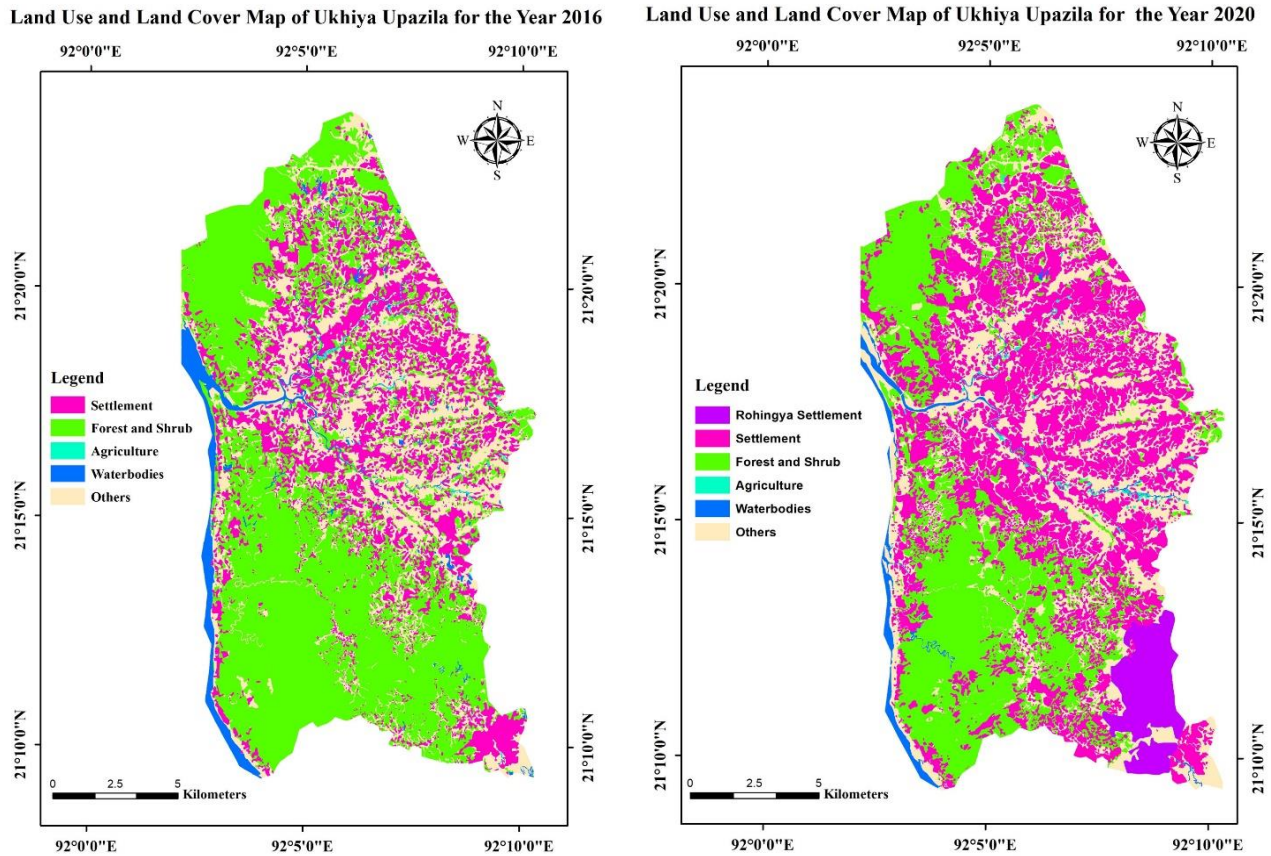


Figure 4: Land use land cover changes in Ukhiya Upazila from 2016 to 2020

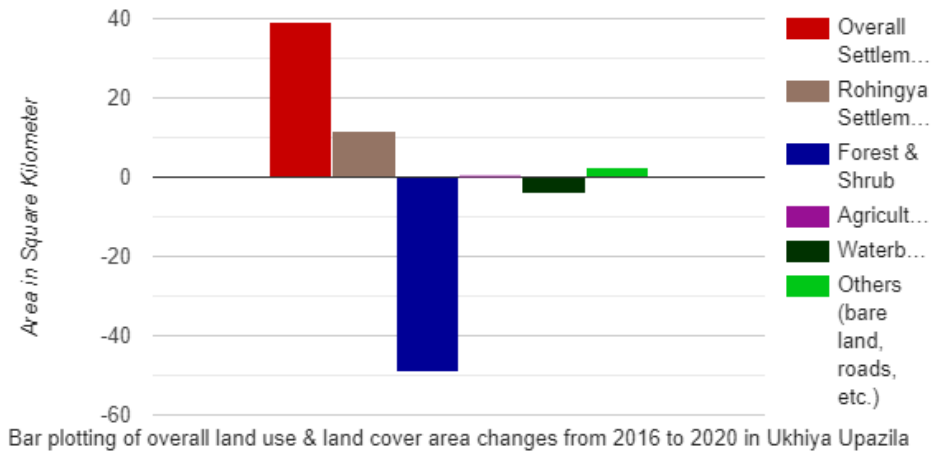


Figure 5: Bar plotting of overall change of land use and land cover area in Ukhiya Upazila

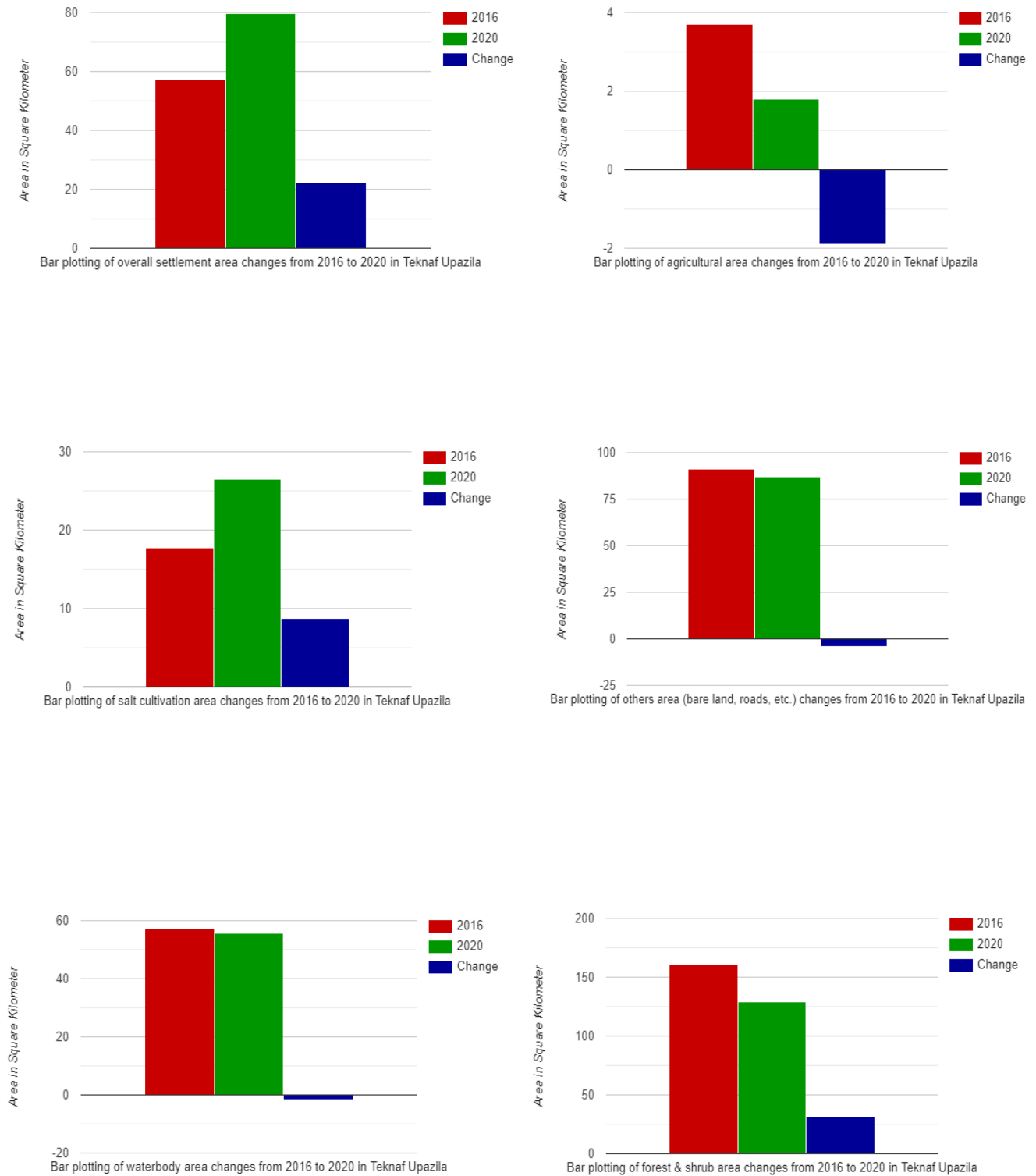


Figure 6: Changes in land use and land cover area in Teknaf Upazila of Cox’s Bazar

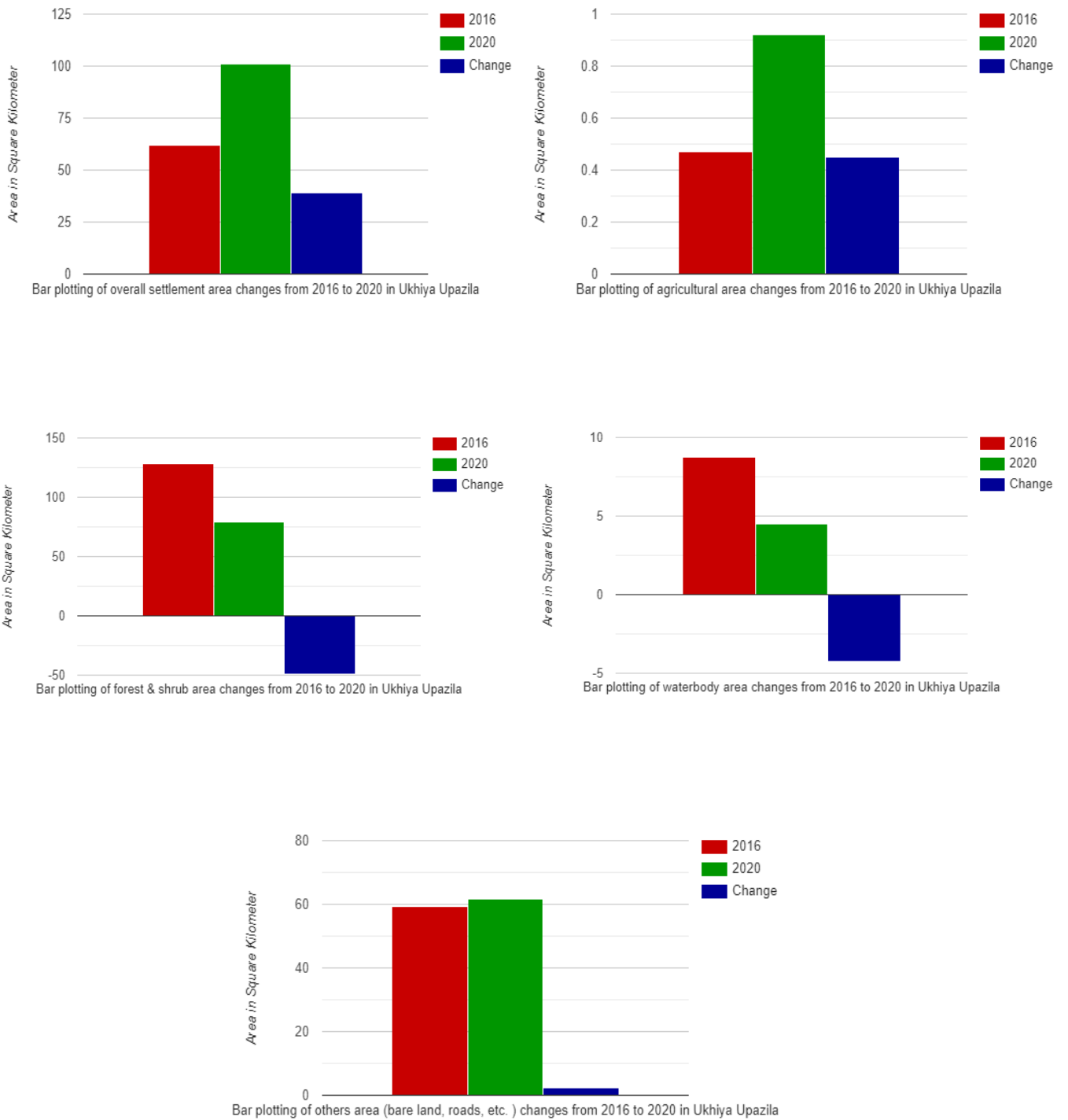


Figure 7: Changes in land use and land cover area in Ukhiya Upazila of Cox's Bazar

IV. CONCLUSION

The study area in Teknaf and Ukhiya provides a critical home for large varieties of both forestland and wetland-dwelling species and avians (Moslehuddin et. Al. 2018). It provides a significant environment for a vast array of plants, including a number of medicinal plants that are used by the local communities (Karim et. al 2008. & Khan et. al 2009), as well as is a source of substantial carbon storage (Pan et. al. 2011). Moreover, this environment contains a sanctuary for wild Asian elephants, settling locales for the vast number of shore birds, and provides food and sanctuary to monkeys, snakes, bats, and other wild creatures. The preserved forest, with its wildlife habitat and other natural capital in the study region, is being ruined and debased at a dreadful rate mainly due to clear-cutting for agriculture, ranching and development, and logging for timber. However, degradation due to rapid conversion to refugee camps and makeshift settlements is the most impactful catalyst of environmental destruction occurring on a large scale in recent times (Rahman et. al. 2018). Assessment of Land Use and Land Cover Changes of Teknaf and Ukhiya Upazila might be helpful to make a proper plan for development activities in the area.

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