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Evaluating the Land Use and Land Cover Change of Unprotected Wetland Situated in the Khultabad Tehsil of Aurangabad District, Maharashtra

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Abstract: *The study investigated the effects of Land Use and Land Cover (LULC) change dynamics on the state and status of an unprotected wetland in semi-arid regions of India. The effects of the LULC shift on the wetland during a 15-year period were mapped and quantified using the long-term satellite image data collection. Using the supervised analysis approach, a multi-source satellite image analysis was carried out. The complete research area's Landsat data series were utilised to evaluate, map, and track LULC change over time. Wetland detection maps created for the 2007–2013–2016–2022 temporal periods were examined. According to the findings, the amount of agricultural land remained essentially constant during the comparative period, ranging from 29.71% to 31.43%. The percentage of waste land progressively grew from 14.29% to 22.86% between 2007 and 2016. By 2022, the plantation area will have shrunk from 15.43% in 2007 to 5%. Similarly, it is anticipated that the habitat would grow from 8.07% in 2007 to 12.93% in 2022. Farmland and fallow area figures are different because both land uses were determined using different season satellite pictures. But there is no obvious increase or decrease in the total agricultural area. These results may be used to create specialised wetland management plans and perhaps even a framework for restoring wetlands that are not currently under protection.*

Keywords: LULC, Wetland, Khultabad Tehsil, Maharashtra

I. INTRODUCTION

Wetlands, which are defined as regions of land that are either temporarily or permanently covered by water, vary greatly in terms of their genesis, geographical position, water regime, and chemistry (Jamal et. al., 2020; Ozesmi and Bauer 2002; Adeli et. al. 2020; Suvarna et. al. 2022; Berkessaet. al., 2023; Thamaga et. al. 2021). Wetlands are among the most productive ecosystems and play an important part in the hydrological cycle. Wetlands directly and indirectly provide services such as storm and flood management, clean water supply, food, fibre, and raw materials, scenic beauty, educational and recreational advantages to millions of people. According to the Millennium Ecosystem Assessment, wetlands encompass 7% of the earth's surface and provide 45% of the world's natural production and ecosystem services. However, the very survival of these unique resources is threatened by development and population pressure.The grasses, rushes, and other plants mostly rule them. Bogs are wetlands that, in most cases, accumulate peat, which is a deposit of dead plants, frequently mosses. Spagnol moss. One of the four primary wetlands kinds. Bogs are also referred to as Inland Ponds, Quagmires, and Muskegs. Fens resemble mires along the bogs. Fences are wetlands that form pits and receive groundwater. Fens are wetlands that are nourished by groundwater and create peat. Rushes, sedges, grasses, and wildflowers frequently cover fens(Alqurashi and Kumar 2013; Chamling and Bera 2020; Rahimi et al. 2020;Patil et. al., 2022; Wang et al., 2013). Despite the important role that wetlands play in their surrounding terrestrial ecology, only a few major ones have been investigated so far. Considering this, research study which includes detecting changing LULC has been done. As a result, the Pangra lake wetland, Khultabad are the primary subjects of this research. The goal of this study is to compare the LULC variations between 2007 and 2022 in a 2km radius. The primary goal of this study is to detect drone data and standard land use change utilising satellite imageries of Landsat TM and Landsat OLI-TIRS using geospatial algorithms. This study investigates an unknown wetland in the

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Aurangabad area. The results of this study will aid in identifying the historical and contemporary land situations in this study area, which may benefit policy makers and managers by providing them with facts to support better wetland management.

II. STUDY AREA

Within the Marathwada area, there are eight districts. The regional office is in Aurangabad. The area is located between latitudes $17^{0}37'$ to $20^{0}39'$ north and longitudes $74^{0}33'$ to $78^{0}22'$ east. The area is in located on a plateau with undulating plain topography. The area is in the state's centre. It has a huge number of both major and minor irrigation projects, and it is drained by the main river Godavari, also called the "Deccan/Ganges" in popular culture. The Ajanta and Balaghat hill ranges are also expanding in this area. It is bordered by the regions of Amravati in the north, Nashik in the west, Pune in the south, and Karnataka and Andhra state in the south.Out of the surveyed wetlands, two inlands, constructed ponds / tanks are chosen for study: Khultabad Ponds. The lake wetland is in the city of Aurangabad's Khultabad tehsil. The codes for Khultabad Wetlandare10603 according to the National Wetland Atlas. The wetland in Khultabad is known as Pangara Talav. The renowned Khultabad wetland share an area of 2.99 hectares Inland(Fig. 1).

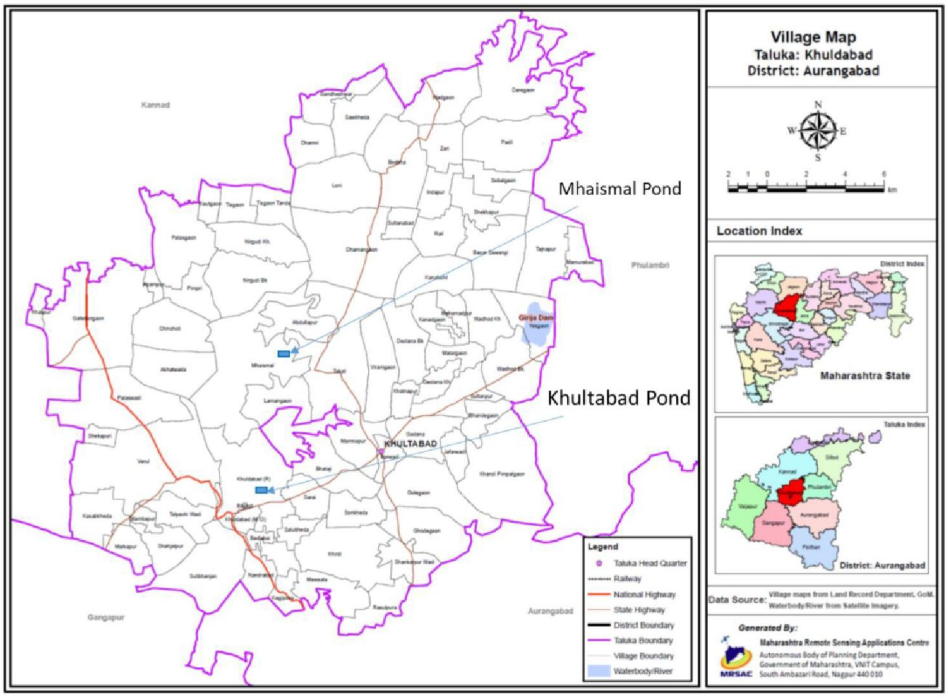

Figure 1: Location map of the selected wetlands

III. METHODOLOGY

The present study will focus on following objective to analyse the environmental status for sustainable management of wetlands in Khultabad Tehsil of Aurangabad District, Maharashtra. Changes in the land use of the wetland during the time series using satellite data/ Google Images. Change in land use status of the fringe area (2 Km) around the wetland. Identification of sources of changes in the land use status**.**The change in LULC in the research region was assessed using two time-series satellite images, namely Indian Remote Sensing Satellite (IRS R2A) and LISS-IV sensor images obtained in the years 2007, 2013, 2016, and 2022. The change detection investigation will last 5 to 6 years. Geometrically correcting the 2021 photos to the common local UTM coordinate system and WGS 84 zone 43N. For each photograph, the region of interest was clipped off. Space-borne data from Indian satellites with the highest resolution were utilised to determine changes in land use and land cover. Because optical data is susceptible to cloud cover, particularly in the research location near the Arabian Sea, efforts were undertaken to get the optimum cloud-free data storage.

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Table 1: Characteristics of IRS Satellite Data

Satellite & Sensors	Path / Row	Date of Pass	Spectral Resolution (in meter)	No. of Band & Bandwidth (in micron)
RESOURCESAT-2 (IRS–R2) LISS-IV	94/57(C)	3rd March 2022	5.8 meters	G: 0.52 - 0.59
				R: 0.62 - 0.68
				NIR: 0.77 - 0.86
RESOURCESAT-2 (IRS–R2) LISS-IV	94/57(A)	3rd March 2022	5.8 meters	G: 0.52 - 0.59
				R: 0.62 - 0.68
				NIR: 0.77 - 0.86

IV. RESULT AND DISCUSSIONS

The research area consists of a 2.99 ha inland pond regarded a village in Khultabad Tahsil of Aurangabad District as the Core Zone and a 2 km buffer zone surrounding the Core Zone. Using Google photos, land use / land cover analysis was performed separately for the core zone and the buffer zone. With the availability of Google images from 2007, 2013, 2016, and 2022, a comparison of 2007-2022 satellites is also made and provided in this Section. The original satellite imagery used for visual interpretation in 2007 is shown in the figure below.

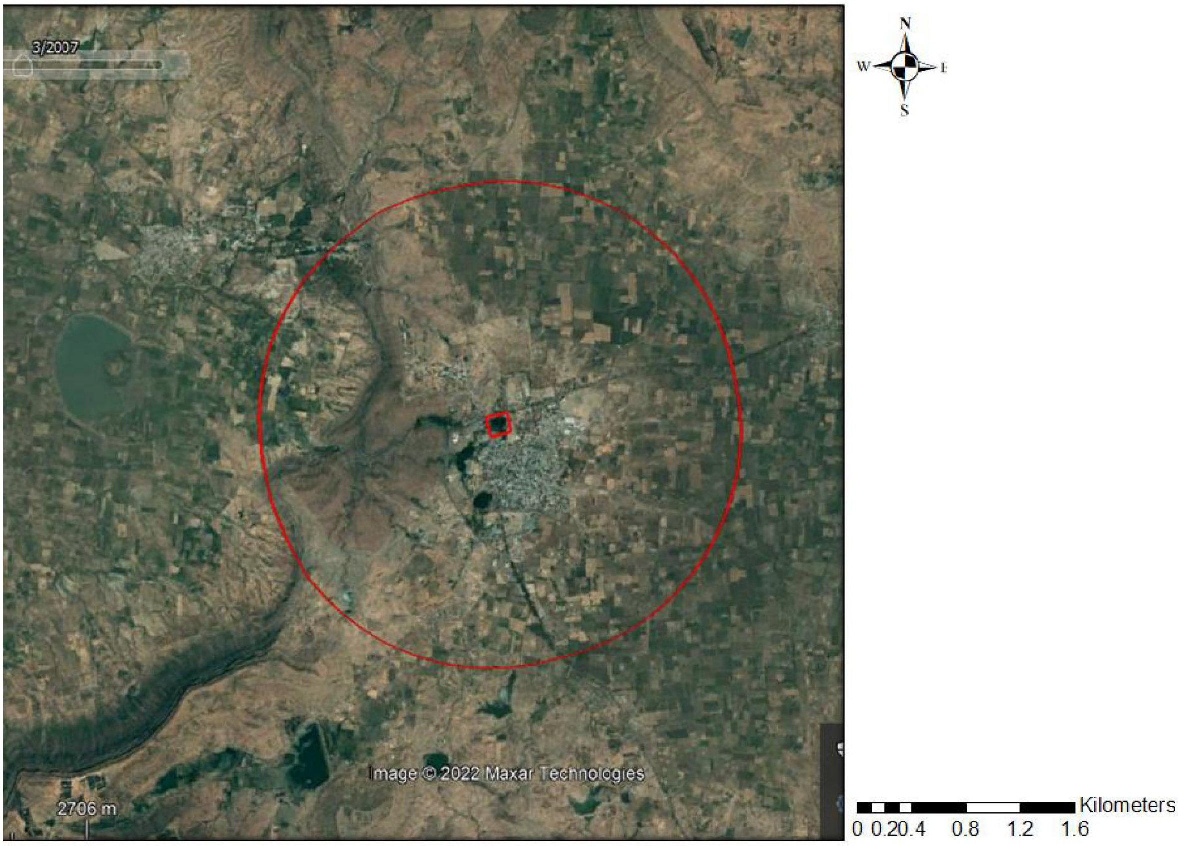

Figure 2: Google Image of Khultabad wetland Buffer Zone: 2007(2 km Buffer Zone)

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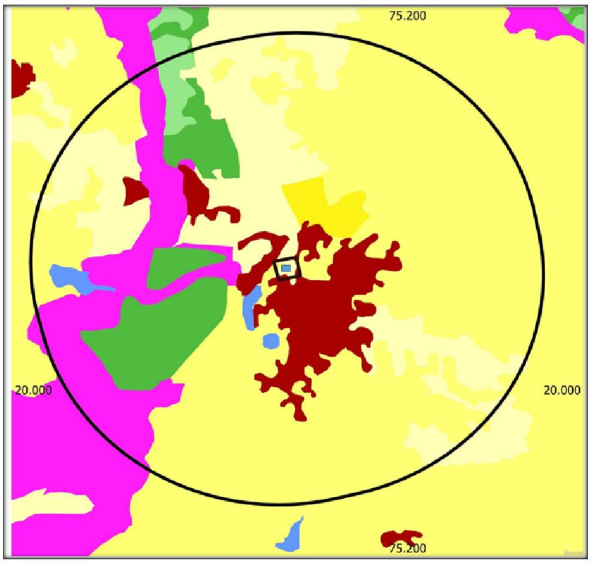

	LULC Class	2007 (Area in Sq.km)	Area (%)
	Crop land	6.34	45.29
	Deciduous Forest	1.3	9.29
	Fallow land ,Plantation	3.16	22.57
	Rural habitation	1.13	8.07
	Scrub Forest	0.2	1.43
	Scrub land	1.8	12.86
	Urban habitation	0	0.00
	Waterbodies	0.07	0.50
	Total	14	100

Figure 3: Landuse Landcover of Khultabad wetland Buffer Zone: 2007 (2 km Buffer Zone)

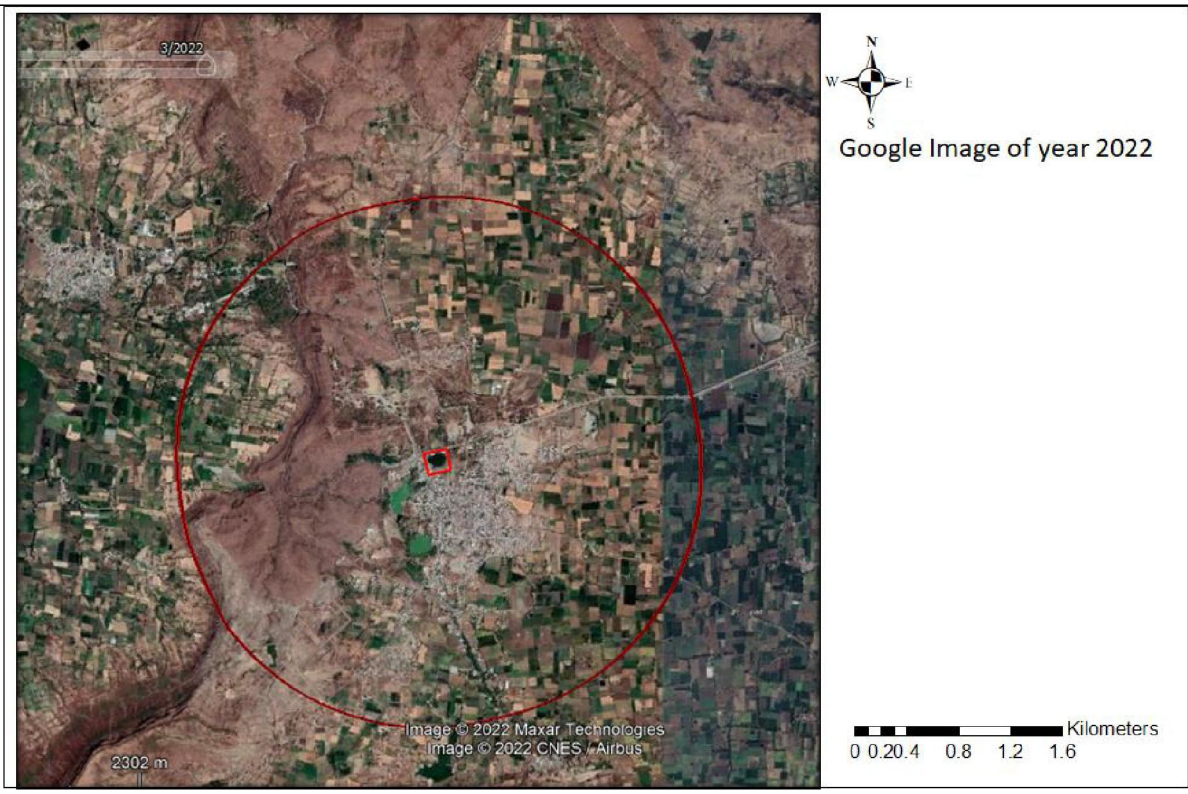

Figure 4: Google Image Khulatabad Pond Buffer Zone: 2022

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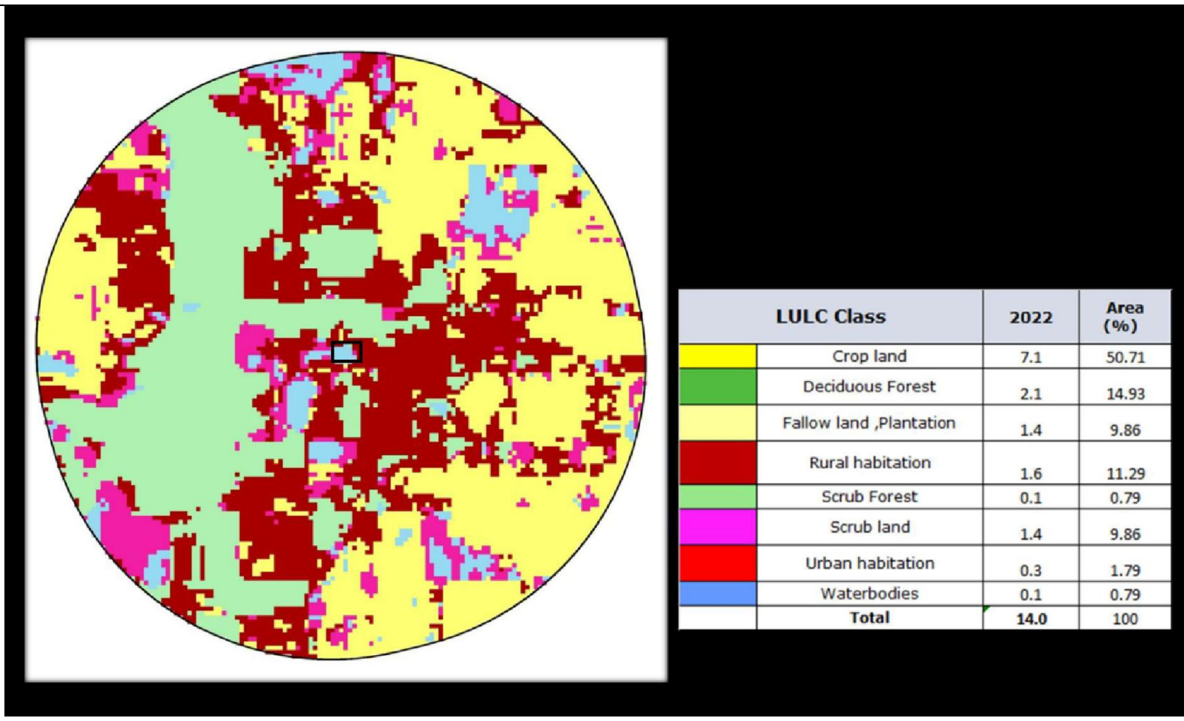

Figure 5: Landuse Landcover of Image Khultabad Pond Buffer Zone: 2022

The following is a description of several land use types and their scope. As previously stated, the study region has 15 land use / land cover classifications. Most of the land in the 2 km radius research area is agricultural land consisting of standing crops and fallows. Another classification is plantation, built-up, and so forth. The dominating category of Inland Ponds and associated landuses such as plantation, water bodies, and so on are also visible. The different Landuse Landcover categories are discussed below.

Table 2: Landuse Land cover Change of Buffer Zone year of 2007,2013,2016,2022

LULC Class	3rd March 2007		11th November 2013		4th April 2016		3rd March 2022	
	(Area in Sq.km)	(%)	(Area in Sq.km)	(%)	(Area in Sq.km)	(%)	(Area in Sq.km)	(%)
Waste land	2	14.29	3	21.43	3.2	22.86	3.0	21.43
Agriculture Land	4.34	31.00	4.16	29.71	4.4	31.43	4.1	29.29
Deciduous Forest	1.5	10.71	1.36	9.71	2.14	15.29	2.2	15.71
Fallow land	1	7.14	1	7.14	0.86	6.14	0.7	5.00
Plantation	2.16	15.43	1.36	9.71	0.4	2.86	0.7	5.00
habitation	1.13	8.07	1.15	8.21	1.4	10.00	1.8	12.93
Scrub land	1.8	12.86	1.9	13.57	1.49	10.64	1.4	9.86
Water bodies	0.07	0.50	0.07	0.50	0.11	0.79	0.1	0.79
Total	**14**	**100**	**14**	**100**	**14**	**100**	**14.0**	**100**

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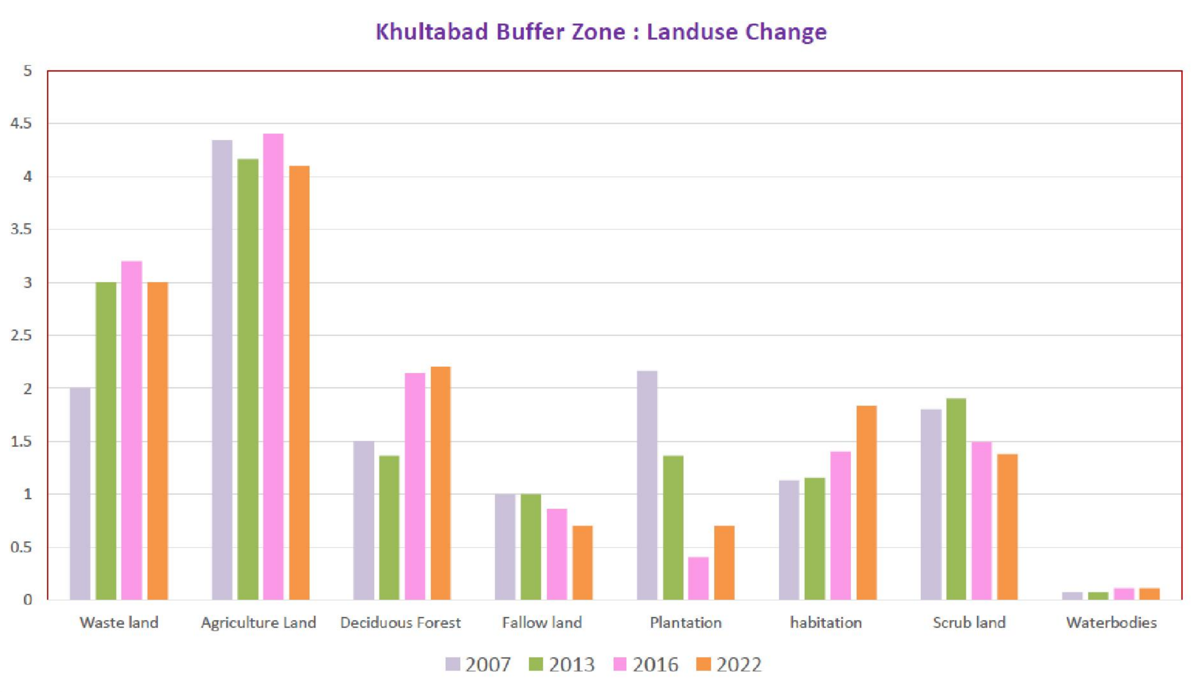

Figure 6: Land use/Landcover Graph of 2007,2013,2016

V. CONCLUSION

The evaluation of land use/cover using satellite imagery delivers trustworthy and precise information that is both cost and time effective. It also provides a comprehensive perspective of wide regions, allowing for improved monitoring of land use/cover incidence and distribution. As a result, satellite remote sensing and GIS techniques are effective tools for analysing land use / land cover, which is a key component for monitoring, planning, and development of a region. Monitoring, planning, and development of a certain area. Based on the examination of the four cycles of landuse landcover mapping for the specified years 2007,2013,2016, and 2022, which span 4 to 5 years, it can be determined that the Inland Ponds region has no significant influence on the surrounding ambient geo-environment. Agriculture land was found to be nearly steady across the comparison period, ranging from 29.71% to 31.43%. Between 2007 and 2016, waste land increased gradually from 14.29% to 22.86%. However, it is expected to fall to 21.43% in 2022. The forest land within a 2km radius has continuously risen from 10.71% in 2007 to 15.71% in 2022. The plantation area has been decreased from 15.43% in 2007 to 5% in 2022. The habitat is likewise expected to increase from 8.07% in 2007 to 12.93% in 2022. Because both land uses were carried out using distinct season satellite images, farmland and fallow area statistics vary. However, there is no discernible growth or decrease in overall agricultural area.

VI. ACKNOWLEDGEMENT

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