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IMPACTS OF JAPANESE INDUSTRIAL PARK ON LAND USE AND LAND COVER CHANGE IN NIMRANA, ALWAR

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Abstract:-Most developing countries like India across the world have recognized the importance of facilitating international trade for the sustained growth of the economy and increased contribution to the GDP of the nation. As a part of its continuing commitment to liberalization and to trigger larger flow of foreign and domestic investment for the generation of additional economic activity and creation of employment opportunities, government of India started promoting export oriented industrial parks. Land use and Land cover change is one of the main driving forces of global environmental changes and central to the sustainable development debate. Understanding landscape patterns, changes and interactions between human activities and natural phenomenon are essential for proper land management and decision improvement. Land use gives an over view of how different patches of lands are being utilized under various anthropogenic activities. Nimrana, in recent years has been witnessing significant land use changes. While there is a progressive decline in area under Aravali Hills and fallow land, built up areas are increasing. These all changes have come mainly as results of industrialization. The study is based on Landsat 7 ETM+ and Landsat 8 imageries, owing to their good spectral and temporal resolution and moderate spatial resolution.

Keywords: Industrialization, Industrial Parks, Land Use- Land cover, Change Detection, Investment, Technology, Export

INTRODUCTION

India as fast developing country needs to survive and compete with rest of the world in international trade. To compete and increase the volume of international trade output is to be increased for which huge capital investment for industrialization is needed. Since the beginning of economic liberalization in 1991, the attractiveness of India as an investment destination has grown at a steady pace. According to a study by Goldman Sachs, Indian economy is expected to continue growing at the rate of 5% or more & is slated to become the fourth largest economy by 2050. This favorable scenario has been made possible through an increased level of flexibility & rationalization of the policies by the government as regards foreign direct investment.

Land use and land cover are two important components to understand the global land status; they shows present as well as past status of the earth surface. Land use and land cover are two separate terminologies which are often used interchangeably (Dimyati et al 1994). Land cover is a basic parameter which evaluates the content of earth surface as an important factor that affects the condition and functioning of the ecosystem. Land cover is a biophysical state of the Earth surface, which can be used to estimate the interaction of biodiversity with the surrounding environment. Nowadays, land use land cover analysis plays an important role in the field of environmental science and natural resource management. The Land cover reflects the biophysical of state of the earth's surface and immediate surface, including the soil material, vegetation and water. Land use refers to utilization of land resources by human beings and land cover changes often reflects the most significant impact on environment due to excessive human activities. Land use and land cover is dynamic in nature and provides a comprehensive understanding of the interaction and relationship of anthropogenic activities with the environment (Prakasam, 2010). Land Use/ Land Cover changes also involve the modification, either direct or indirect, of a natural habitats and their impact on the ecology of the area. Land Use/ Land Cover change has become a central component in current strategies for managing natural resource and monitoring environmental changes (Tiwari and Saxena, 2011). Land Use/ Land cover pattern of a region gives information about the natural and socio-economic factors, human livelihood and development. Like

other resources, land resource is also delimiting due to very high demand of agricultural products and increasing population pressure day by day. Hence, information of land use/cover and possibilities of their optimal use is essential for the selection, planning and implementation of the land use schemes tomeet the increasing human needs and welfare. This also provides the information for managing dynamics of land use and meeting the demands of increasing human population.

Change detection is the process of identifying difference in the state of an object or phenomenon by observing it at different time (Anderson, 1977). Change detection in Land use/cover can be performed on temporal scale such as decades to assess landscape changes caused due to anthropogenic activities on the land (Gibson and Power, 2000). These anthropogenic activities are due to rapid growth of human population and demands of food resources. Land use land cover changes have been recognized as important drivers of global environment change (Turner et al 1996). High temporal resolution, precise spectral bandwidths, and accurate georeferencing procedure are factors that contribute to increase use of satellite data for change detection analysis (Jensen, 1996). Processing of multi-temporal images and change detection techniques has been developed in the past three decades. Change information of the Earth's surfaces is becoming more and more important in monitoring of the local, regional and global environment.

Land use and land cover change are more prone to take place around developing centers and along highways or road networks as these give better connectivity and accessibility to grow various economic activities, connected with agricultural, industrial and services, both production and distribution. Highways and road transport is concerned with the movement of people and material with a specific purpose from place to place. It is an important key to the development of any region. Quality highways constitute the basic infrastructure that propels the development process through connectivity and opening up the backward regions to trade and investment. Better the highways and the transport facilities in a region; the higher is the standard of living of its people and vice-versa. The extension of highways and transportation to rural areas helps in spreading the agricultural activities to fallow land and cultivable wasteland, marketing of agricultural products, growth in rural industries, with the expanded market network and social transformation through greater accessibility to basic amenities.

The present paper aims to analyse the dynamics of land use and land cover around Japanese Industrial Park, Nimrana; Alwar for the period of last fourteen years, 2000 to 2014. It also tries to delineate the urban sprawl in the Panchayat Samiti of Nimrana along the National Highway-8 and other roads. GIS and computer software like Arc GIS 10.2.1, Erdas Imagine 2011, ENVI 4.7 and LANDSAT satellite imageries for different years have been used for this purpose.

The Study Area

Nimrana Panchayat Samiti is situated in the north of Alwar district in Rajasthan between 27°55'17" and 28°10'55" north Latitudes and 76°10'29" and 76°30'7" east Longitude. It lies on the stretch of DMIC (Delhi Mumbai Industrial Corridor) which is going to be one the longest industrial corridor in India. Nimrana has geographical area of 32,927 acres with 87 villages. Out of 87 villages, 85 villages are inhabited.

The region is surrounded by a series of low rocky hills of Aravalli Mountain Range. River Sahibi is flowing near in the eastern side. It is bounded in the east by Mandawar Panchayat Samiti (Alwar District) and Bawal Panchayat Samiti (Haryana), in the north by Rewari (Haryana) and in the west by Narnaul (Haryana). A dominant majority of the population is engaged in agricultural activities. Nimrana is situated on National Highway- 8 and also well connected with railways with rest of India.

Table - Nimrana: Population Totals (2001)

Sr. No.		PanchayatSamiti: Nimrana
1.	**Total Population**	**1,43,329**
	Male Population	74,428
	Female Population	68,901
	S. T. Population	2,236
	S. C. Population	23,159
2.	**No. of House Holds**	**23,682**
3.	**Literacy**	**74.4 %**
	Male	88.6%
	Female	59.5%
4.	**Total Workers**	**74,941 (52.3%)**
	Main Workers	41,050 (28.6%)
	Marginal Workers	33,891 (23.6%)

Source: Census of India, 2001
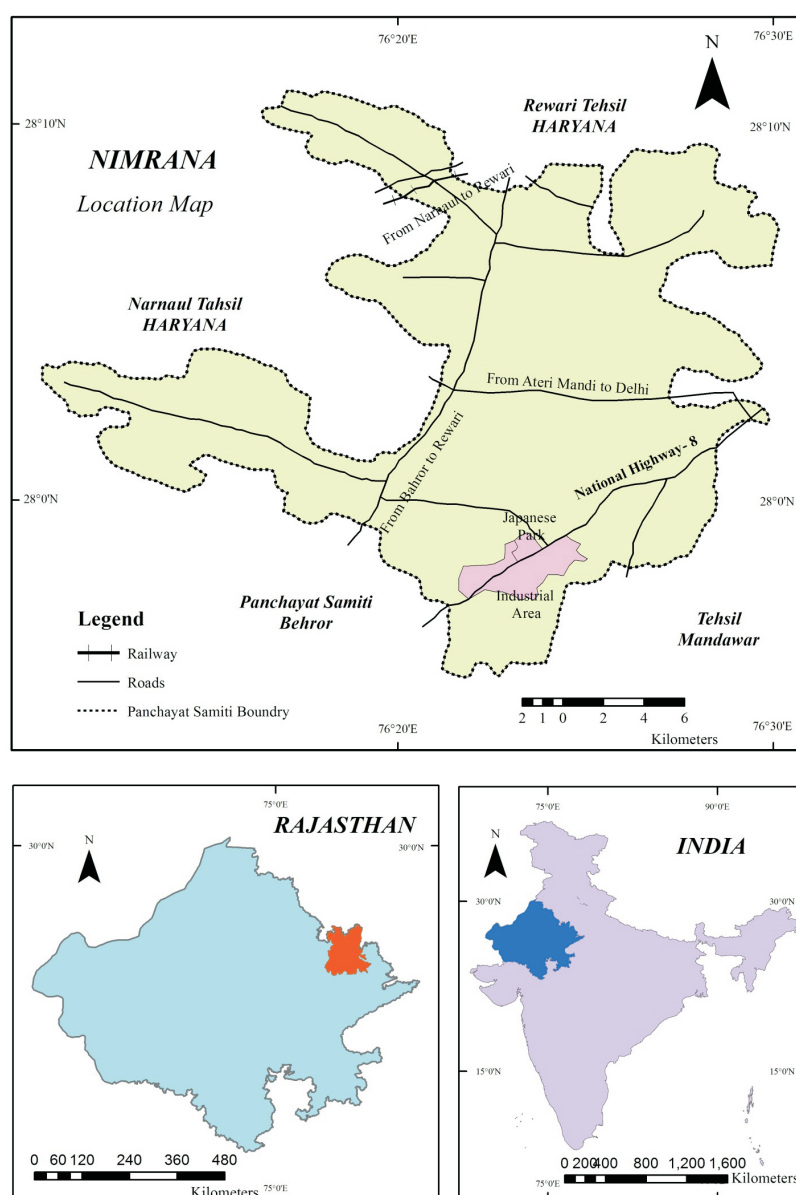
Industrialization and Investment in Nimrana

Rajasthan constitute 39% of the total length of the alignment of the DMIC. The Delhi-Mumbai Industrial Corridor is a $90 billion infrastructure project coming up with the financial and technical aid from Japan, covering an overall length of 1,483km between the political capital (Delhi) and the commercial capital (Mumbai).

With improving infrastructure and fast connectivity along the NH-8, Nimrana is emerging as a 'little Japan' with the presence of majors industry like Daikin, Nissin Brake, Toyota, and Mitsubishi, which have already set up huge state-of-the-art manufacturing facilities here.

Apart from the Japanese zone, other industry giants like Parle Biscuits, Hero Moto Corp, Terry-Plus India, Liberty Whiteware, Havells, Tops and Rochees Breweries are running successfully along with other industries in Nimrana within the Rajasthan State Industrial Development and Investment Corporation Zone (RIICO). Over the last few years, this quiet town has been slowly emerging as the next industrial hub surpassing other towns of the NCR. Nimrana is now on the radar of top investors and IT giants as their next business centre, which has further spurred its growth. The entry of the BPO industry and the Japanese MNCs has played a vital role in taking property prices to unimaginable heights here.

RICCO Initiative to Promote Investments

The RIICO has signed a MoU with the JETRO (Japan External Trade Organization) to facilitate the entry of more Japanese companies into the Nimrana Industrial Area. As the place is equidistant from Delhi and Jaipur and will also be a part of the proposed DMIC, it will be a strategic location for these companies. The RIICO has so far allotted 303 acres to 22 Japanese companies in this area. Several MNCs like Nissin, Mitsui, Nippon, Disking, and Mitsubishi have been allocated land in this industrial area for establishing their units; some are already operational. It is expected that around Rs 2,150 crore will be invested on the already allotted land creating employment opportunities for over 3,000 people. The rise of industrialization and lack of residential accommodation here has given developers the opportunity to bridge the huge demand and supply gap.

Extension of Nimrana

Industrial Area/ Phase	Transferred to RIICO in the year	Land acquired (in Acres)	No. of Plots	Land plotted (in Acres)
Nimrana - 1	1992	644.75	154	434.36
Nimrana - 2	2007	314.58	94	235.34
Nimrana - EP IP	2006	210.51	225	132.67
Nimrana – NIC (M)	2006.	1166.63	127	182.63

Source- RIICO office, Alwar

Nimrana; Emerging Global City

The Rajasthan government is developing a 'Global City' on 40,000 acres in the Shahjahanpur- Nimrana-Behror area. This city will have a capacity to house 1 million people and will also have a cyber-city, a knowledge city, an entertainment city, an SEZ city, a world trade city, and a bio-diversity park. It will also have projects by renowned developers like Ashiana Housing, Anantraj Group, Annapoorna, Eldeco, APTP Group and Nemaha Central.

Apart from corporate MNCs, the EPIC core industrial area, the Japanese Township and the education hub in Nimrana are the major growth drivers and will contribute significantly to the growth of city's realty. After Bhiwadi, Nimrana is on a fast track offering great investment opportunities.

Data Source and Research Methodlogy

Changes in the pattern of land use and land cover has been detected by using Landsat TM and Awifs imagery, owing to their good spectral and temporal resolution and moderate spatial resolution (Lillesand et al 2004; Short 2004). For carrying out this study following data and softwares were used:-

Table 1.Softwares used

Software	Techniques and Functions
Arc GIS 10.2.1	Preparation of thematic map, Data base generation, Analysis
ERDAS Imagine 2011	Layer stack, Mosaicking, Subset,Natural Images, Image classification, Accuracy assessments and Change Detection
ENVI 4.7	Dark Object Subtraction

Fig. 3 Workflow Diagram
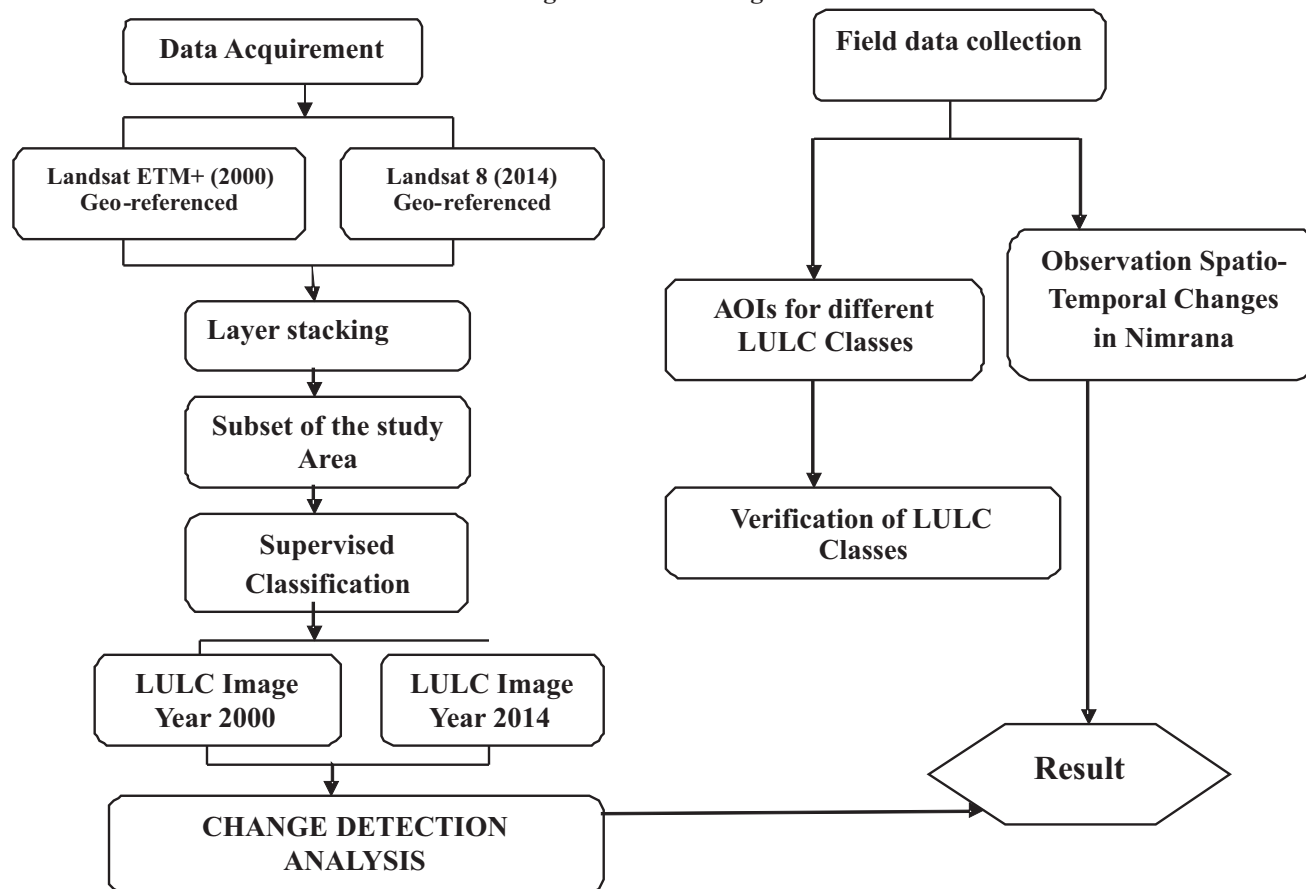
Land Use and Land Cover Change Detection with the help of Satellite Imagery

Land use and land cover change of Nimrana has been observed with the help of two satellite imageries of two time frames. Landsat ETM+ image (2000) and Landsat 8 image (2014) has been stacked and then the subset of Nimrana panchayat samiti has been cut. After stacking and cutting the image of the study area, the images are classified by Supervised Classification in ERDAS IMAGINE and finally change detection analysis has been done.
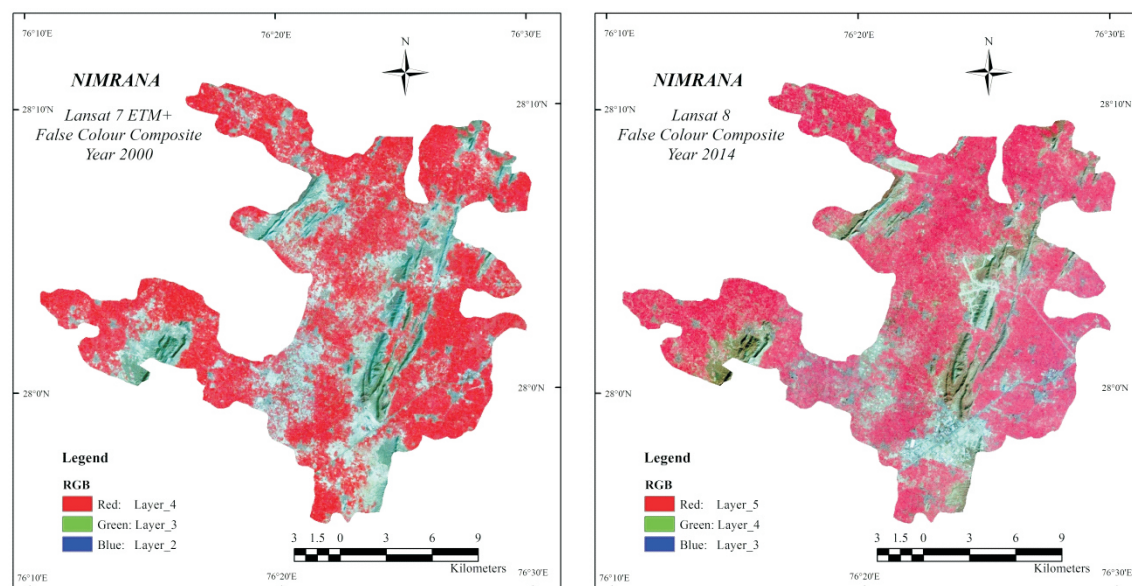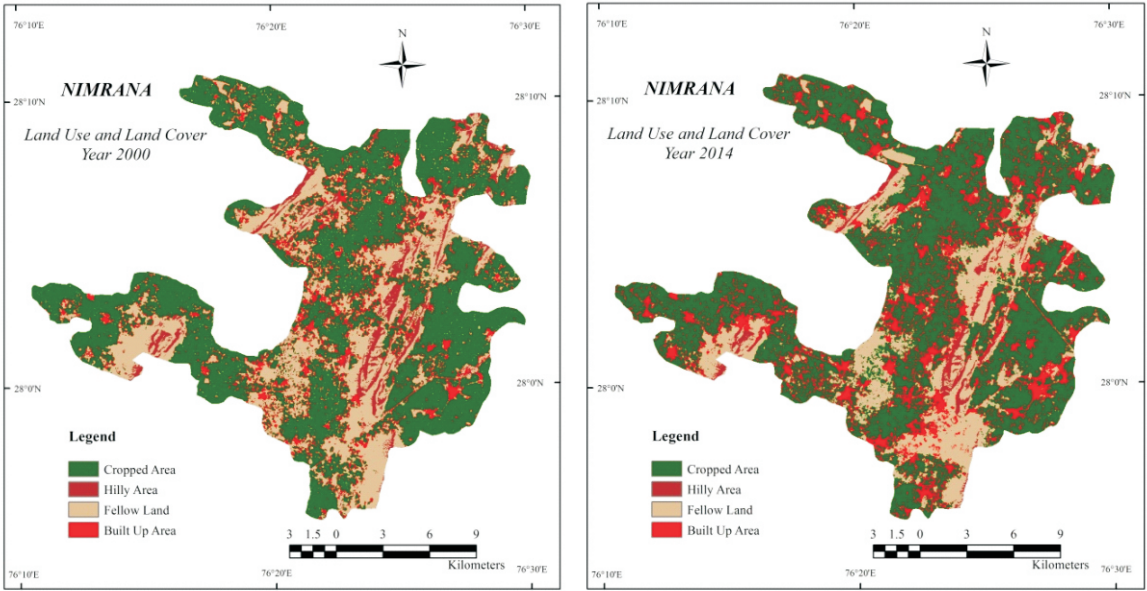
Change Detection Matrix of Nimrana

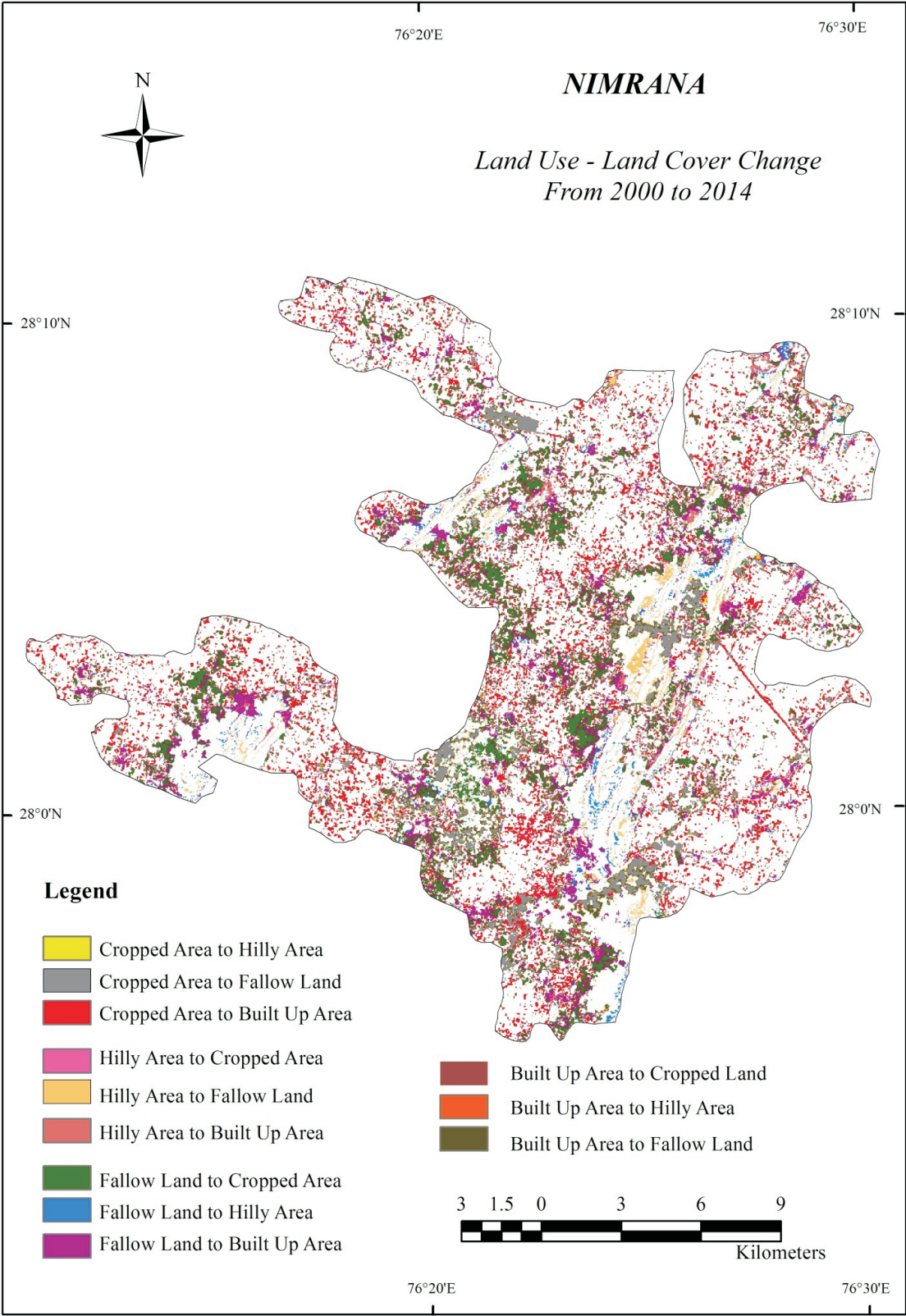| 2000	LULC	2014				
		Cropped Area	*Hilly Area*	*Fallow Land*	*Built Up Area*	*Total*
	Cropped Area	45.48	0.10	3.48	8.30	*57.36*
	Hilly Area	0.21	2.80	1.32	1.26	*5.59*
	Fallow Land	6.20	0.82	13.33	5.28	*25.63*
	Built Up Area	5.22	0.12	1.63	4.45	*11.43*
	Total	**57.11**	**3.84**	**19.76**	**19.29**	**100**

RESUI

Over the period of about one and half decade, fallow land had been reduced in Nimrana. Fallow land and Hilly area have been reduced by 5.87% and 1.75 % while agricultural land by 0.25%. Meanwhile built up areas like roads and settlements

etc. have been increased. These all changes have come mainly as results of industrialization. Most of the built up area has come up mainly in the eastern part of the panchayat samiti of Neemrana which has enjoyed good investments in industrial areas and has good network connectivity as National Highway-8 is passing through these areas. One important change has been observed along NH-8 that large fellow land has been converted into the either built up area or converted into agricultural land with the help of modern agricultural technology investments and this is happening because of the presence of plain areas, better connectivity with more developed regions like National Capital Territory and better transport facilities for people to export outputs. People have started agriculture because they can sell their production nearby and can get more profit in these areas. Highway has been playing an important role in the expansion of the industrial sprawl and most of the development activities are taking place along the highways.

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