# CELLULAR AUTOMATA AND MARKOV CHAIN BASED URBAN GROWTH PREDICTION

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**“ABSTRACT:”** The urban share of the Indian population jumped from 18% in 1961 to 31.16% in 2011 (Gupta et.al 2013). This huge spurt in growth of the population is putting a huge demand on available land resource. Increasing population results in outward sprawl and growth of the town. This outward growth is causing the transformation of agricultural land and forest land into the habitant areas. An understanding of spatial extent of land cover changes at a regional scale is of great importance since it would facilitate the quantification of changes over a period of time and its analysis in terms of rate of change (Blaschke *et al.,* 2004; Khanday and Javed, 2009; Yuan *et al.,* 1998). The hybrid Cellular Automata Markov (CA–Markov) method allows multiple classes and can replicate the alteration from one category to another. Thus this hybrid method is an important approach to model both spatial and temporal changes (Eastman, 2006).

To predict urban growth in Gandhinagar, LANDSAT Multispectral, TM, ETM+, and OLI/TIRS images for five decades (1972, 1977, 1987, 1994, 2000, 2008, 2015 and 2019) were used for Land use mapping. In the CA Markov model used for the study, Markov Chain Analysis describes land use change from one period to another and was used as the basis to project future changes. The objective of the study was to predict the land cover maps using CA Markov model in the study area, validate the maps by comparing land cover maps produced by image classification and predict future growth scenarios. The land use land cover for the year 2008, 2015 and 2019 are simulated and the simulation results are compared with the actual classified maps of the same years. To assess the accuracy of the predicted maps and validation of the model, several methods were used like calculating agreement and disagreement parameters etc. The LULC for the year 2025 and 2030 were predicted using the model.

The results show that from 1972 to 2019, there is considerable decrease in the cultivated and vegetation cover. This can be attributed to the rapid urban growth in parts of Gandhinagar planning area. Between 1972 and 2019, the urban area has grown significantly by 42%. The major part of urbanization during the mentioned time interval has occurred in the central and western part of the city. On the eastern side the city is bounded by Sabarmati river which has led to urban expansion on the western front.