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# Assessment of Land Use Development Trends along Transport Corridors in Chennai Metropolitan Area

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## **Abstract**

The Chennai Metropolitan Area (CMA) is a rapidly evolving region that experiences significant changes in land use patterns over time. Analogous to other Indian cities, these transformations are particularly evident in the periphery of Chennai's urban core, where substantial land use shifts have occurred between 2001 and 2021. These changes were assessed utilizing LANDSAT 7 Thematic Mapper (TM), LANDSAT 5 Enhanced Thematic Mapper plus (ETM+) for the years 2001 and 2011, and LANDSAT 8 (OLI) for 2021. This study employs unsupervised classification to investigate major land use/land cover alterations. Findings indicate that CMA has undergone substantial land use modifications over the past two decades. Notably, there has been a marked decline in open land and vegetation due to extensive reclamation for urban and commercial development. The results demonstrate that the area covered by open land and vegetation decreased by 70.23% and 4.56%, respectively, while the built-up area increased by 56%. The study also identified a pattern of urban expansion primarily along the GST road, OMR road, and Thirupati highway. The research further examines land use changes by creating buffer zones at distances of 500 meters, 1 km, 1.5 km, and 2 km. The detailed analysis, along with the spatio-temporal differentiation maps and tables generated through geospatial data, will be invaluable for understanding the growth dynamics of CMA. This information will also support the decision-making process for local planners, stakeholders, and academicians.

**Keywords:** Land use land cover, buffer, transport, built-up, Chennai.

#### 1. Introduction

The increasing rate of urbanization in India over the past few decades can be considered a significant population change that affects the socioeconomic development of the country (Kundu, 2013; Lakshmana, 2013). Many Indian cities have experienced very high rates of urbanization since India became an independent country in 1947 (Sarin 2019). Currently, urban population growth over each decade is 31.8%, with nearly 70% of the population residing in urban areas (Census, 2011). This has resulted in massive demographic shifts, with more people moving to urban areas, specifically to cities, in search of better livelihoods and living standards (Srivatsa, 2015). This has considerably affected land use, since agricultural land is being converted to urban land for the expansion of infrastructure to meet the increasing population

(Pandey & Seto 2015). The process of urbanization involves transforming the countryside into residential, business, and industrial zones (Bharath et al., 2018). It reflects the need to support the growing urban population and its economic activities (Haque & Patel 2018). This pressure has also fostered the creation of other structures with a focus on the need for urbanization, such as the transport infrastructure that links such growing urban centers (Maparu & Mazumder 2021). The necessity for sustainable land use planning, the protection of green spaces, and the control of peripheral urban expansion are some of the issues brought about by this fast urbanisation (Ramaiah & Avtar 2019). Such changes are not only indicative of demographic shifts but also of the changing structure of the economic system in India in which cities are equally important in driving economic activities (Mishra, 2019; Chatterji, 2017).

Urbanization has remained a significant driving force in the development of cities across the globe and Chennai being one of the developed cities in India cannot be left out (Ahluwalia, 2016). Industrialization and economic growth in the past three decades that have seen a mores influx of people to Chennai has resulted in the improvement of transport facilities that in turn have facilitated physical development of the city (Krishnamurthy & Desouza 2015). Transport infrastructure such as roads, railway, and metro rail transport channels have influenced the outward city expansion; suburban zones have built up nowadays along the transport corridors to develop new residential, business, and industrial areas (Lata et al., 2021; Vijayalakshmi & Umadevi 2014). These corridors do not only promote the integration and interconnectivity throughout the Chennai Metropolitan Area (CMA), but also they determine the land use status and future of urban growth (Jajo, 2016). The significance of those corridors is based on their capacity to connect various district of the city, encourage economic activities for the growth of the city and to meet the transport needs of the increasing population (Chatterjee et al., 2023). However, the increase in transport infrastructure has its downside in form of congestion, pollution, and inequalities in the society and hence there is need to evaluate the trends in land use along transport corridors (Afrin & Yodo 2020).

Transportation infrastructure and land use patterns relationship is one of the most researched aspects in urban systems. Major transport infrastructures like Grand Southern Trunk (GST) Road, Old Mahabalipuram Road (OMR), Chennai Suburban Railway System, have greatly influenced the spatial transport structure of Chennai (Kanchanamala & Sekar 2015; Sekar & Kanchanamala 2011). These corridors have emerged as focus of development of urban fabric and witnessed residential, commercial as well as industrial development (Suresh et al., 2022). Consequently, many land use changes have occurred around transport routes whereby agricultural lands are transformed into urban lands, vegetation into built-up areas, and traditional residential areas into modern urban developments (Sekar & Gangopadhyay 2017). The rate at which these changes occur is has significant repercussions in the area of urban and town planning because it impacts not just the geography of the urban environment but the social and economic demographics of neighborhoods in the city (Mathan & Krishnaveni 2020). It is essential to comprehend the trends and forces influencing land transformation along these transportation corridors in order to create urban policies that support balanced development throughout the metropolitan region, encourage sustainable growth, and tackle the problems brought on by increasing urbanisation.

The assessment of land-use development trends along transport corridors is therefore important for several reasons. First, it allows to determine the spatial distribution and pace of urban development, the probable areas for new growth, and the potentially saturated regions that might need more investments in infrastructure. Therefore, relying on the shifts in chronological data on changes in the landscape of land use, one can compare the dynamics of the growth of the city, the nature of the growth, and the direction of the growth in relation to the availability of transport infrastructure. Second, the analysis of land use against transport networks helps to define transport-based urbanization factors. These include Population pressure which put pressure on land, economic expansion which also put pressure on land, Real estate market which determine the uptake of land, and more importantly government policies which influence the usage of land in any given country (Aithal & Ramachandra 2016). By studying these causes, planners may possibly develop strategies to mitigate expansion better than by employing approaches now used to deal with some of the problems of urban development such as congestion, housing unavailability, and environmental impacts.

The transport infrastructure has expanded a lot over the years in Chennai and purely owes for change in the use of the land (Owens et al., 2018). Through improvement of new metro sections and road constructions, suburban train systems have played a major role in the continued development spreading across the city (Kanthavel et al., 2021). Consequently, new centres have been created and grow alongside transit transportation routes and the periphery of urban regions have become business cores. The growth of urban structures has risks that include urban sprawl or physical growth that is uncontrolled, traffic problems and difficulties in the control of construction of physical facilities as well as utilities (Priyadarisini & Umadevi 2023). Furthermore, this kind of spatial distribution results in imbalance where some areas along the corridors have transformed and can even start developing infrastructure while other areas remain stagnant (Chandrashekar & Aithal 2021). Potential planning policies in metropolitan areas should consider the conversion patterns of Chennai's corridors to ensure sustainable development and address the implications of sprawl transitions and compact integrated development.

The main outcomes of this research are the aims which seek to analyze comprehensively the land-use and developmental trends along the transport corridors in Chennai Metropolitan Area (CMA) over the last 20 years (2001-2021), to investigate trends in land use and land cover dynamics in that region. Understanding such developments and their underlying causes is imperative for the comprehension of the processes leading to population growth of Chennai as a megacity. This study seeks to assess the changes in land use patterns around the road networks and the Chennai Suburban Railway and the impact of better transport provision on the patterns of development within the study area. In addition, this paper will look into the role of policies, economies, and demographies of the society impact the geography of the city of Chennai. In addition, the research seeks to introduce a buffer analysis approach that will evaluate the distances of various transport means including what geographical characteristics augment or lessen the effectiveness of transport corridors. This method is going to use satellite imagery data of higher resolution in addition to various other methodologies in order to measure and characterize the degree and type of land-use alterations within these buffer zones (e.g. 500 m, 1 km, 1.5 km, 2 km) over the period of 20 years (2001-2021). An innovative tool in urban studies that might yield more precise and thorough insights than conventional survey techniques is the use of high-resolution satellite images to examine land-use change in various buffer zones surrounding transportation routes.

This research is not only interested in the changes over time in the land cover but also the subsequent developments with respect to the cities' growth pattern. In this regard, this research aims to enhance the knowledge of the relations of transport and spatial development which are vital in the design of sustainable cities. Findings from this study will be of use to urban planners, policy makers and other parties concerned in the development activities of Chennai City. Coverage will show areas that need additional coverage and suggest future investments in infrastructure development. This way, the study seeks to assist in transforming urbanization trends in Chennai such that development in an urban area that is home to people of various nature is maintained. The present research fills in the understanding regarding the interaction of land use changes with transport corridors in the case of Chennai, which is one of the critical factors in achieving sustainability in urban planning.

#### 2. Literature review

Land use refers to how people use their land, with a focus on practical applications such as economic endeavours (Jansen & Di Gregorio 2003; Yadav & Sharma 2018). Land cover, on the other hand, denotes the features of the planet that have been brought about by human activity in the past and present, including flora, water, soil, and other land qualities. (El-Hattab 2016; Cao et al. 2017). This discussion is framed on the interaction of theories of land use and transport that seeks to explain the relationship between transportation systems and the development and structuring of land uses (Crecine, 1968; Wilson, 1998). These models more particularly in the past were developed in the context of a monocentric bid rent theory pointed out that it is distance to transportation which causes variation in land use, that is the closer the area is to transportation centre the higher the density in the area and mixed land uses (Alonso, 1964). Further research has improved on these principal assumptions by considering the impact of the current polycentric urban systems, where radial transit line corridors penetrate the periphery and support multiple centers of economic activity (Muth, 1969; Mills, 1972). This conceptual perspective stresses the importance of transport networks in interpretation and reconstruction of urban structure as well as their consequences for land usage alterations and the distribution of economic activities across metropolitan area borne spaces.

Numerous studies on the transformations of land uses adjacent to transport corridors have established a sound premise for these theories, making evident the power of transport engineering in reshaping the urban physical environment (Xiao et al., 2024; Appleyard et al., 2017; Harrison & Gimpel 2020). Transportation axes are considered the fundamental and crucial factor in determining population and employment concentration distribution in metropolitan area peripheries, as studies from North America, Europe, and Asia align perfectly. (Pojani & Stead, 2015; Vinokurov & Tsukarev 2018; Narayanaswami, 2017; Rode et al., 2017; Knowles et al., 2020). American scholar have researched highway building and how the transportation corridors encouraged the formation of urban sprawl and edge cities (Addie, 2016). In some studies, those transportation networks have also been associated with the emergence of new metropolitan

regions and the development of regional economies (Okraszewska et al., 2019). Likewise, in some developing Asian metropolitan areas which showed a sudden urban expansion in recent years, transit corridors have emerged as one of such land use change drivers that convert farmland into cities (Suzuki et al., 2013; Dong et al., 2021; Köhler, 2014). Thus, these studies indicate importance of transportation infrastructure integration into urban planning for its impact on the land use and overall path of city's development.

The diversity in urbanisation trends in relation to large Indian cities has been extensively examined, having been shaped by history, culture, and economics (Scrase et al., 2015; Chatterji, 2017; Ramachandra et al., 2012). In the same way, Taubenbock et al. (2009) employed the techniques of remote sensing to investigate the outward expansion of megacities of India and identified an important encroachment on the periphery along the transport corridors. Castán Broto et al. (2019) was concerned with the qualitative analysis of the shifting landscape of Bangalore concentrating on the role of the IT corridor as a catalyst of urban sprawl with pronounced land use transformation and leapfrogging. Jain et al. (2020) investigated this industry in terms of how the extension of the metro system influenced the changes in land use intensity and development prices in the neighborhood of metro stations in Delhi. The collective findings of these studies have illustrated a development pattern and occasionally disjointed scaffolding axis along transport corridors, accompanied by a complicated job of achieving climate change resilient economies and providing infrastructure in Indian metropolitan cities.

The metropolitan expansion of Chennai and the transportation system development are particularly useful for analysis of the interrelationship between land use and transportation (Maparu & Mazumder 2017). Historically, Chennai's development was centered around its port and central business district, with growth radiating outward along major roads and railway lines (Mani & Jayalakshmi 2024). Regarding the given research location of Chennai, it has been noted that studies on urban development and transportation infrastructure in the city have gained momentum in recent years (Jajo, 2016; Mandal & Gnanasambandam 2024). The pioneering study of Arabindoo (2016) revealed how this transport infrastructure transformation altered the southern outskirts of Chennai along the IT Corridor (Old Mahabalipuram Road) and intensified social polarization within the city. The analysis reveals that agricultural and wetlands in this corridor are being rapidly converted to urban uses, causing significant environmental and social impacts (Kennedy et al., 2014)

Kulshrestha (2021) put forth a perspective on the transportation network of Chennai that has gone through a transformation from a radial to polycentric layout due to the growth of ring roads and bypasses. The loss of green spaces and water bodies in the surrounding landscapes was one of the environmental impact of this development that was addressed in a different research Sridhar & Sathyanathan (2020). Balakrishnan (2013) described Chennai's "bypass urbanism," which refers to how new transportation connectivity, such as the Information Technology Corridor and the East Coast Road, has resulted in the formation of urban areas that bypass congested core city regions. According to Narayanan (2022) research, several challenges faced by Chennai in effectively integrating transportation and land use planning were outlined, and the author criticized the dichotomy between the city master planning process and transport infrastructure development. In recent years, quantitative analytics have been used to assess the

extent of land use changes in transportation corridors of Chennai (Razi et al., 2024). Ramachandra et al. (2019) studied using remote sensing data to examine changes in land use and observed significant urbanization with the loss of agricultural land in the Chennai-Bengaluru Industrial Corridor. Bharti & Bhaskaran (2021) examined the impact of Chennai metro rail on land uses, revealing immediate changes in urban environments due to the construction of new mass transit systems. Nevertheless, there appears to be a research gap in detailed, evolving empirical work that integrates advanced spatial data analysis with a more accurate contextual understanding of Chennai's socioeconomic and policy environment. The extant literature, however, seems to offer case specific studies rather than analyzing the progressive dynamics of the city's urban change processes. This gap indicates a paucity of studies that seek to capture the chronology of the marshalling of transport corridors for changes in land use and the evolution of the transport system in Chennai.

## 3. Methodology

## 3.1 Study area

The Chennai Metropolitan Area (CMA) is defined by its geographic location, which falls between the latitudes of approximately 12° 51′ N to 13° 15′ N and longitudes of 80° 1′ E to 80° 19' E. The CMA is situated on the south-eastern coast of India, facing the Bay of Bengal, and its climatic conditions are characterized as tropical due to its proximity to the equator, resulting in hot and humid conditions throughout the year. The area is almost entirely flat, with a mean height above sea level of just 6 meters, and it gradually slopes towards the Bay of Bengal. The CMA is intersected by sandy shores, rivers such as the Cooum and Adyar, and wetlands like the Pallikaranai Marsh. Spanning an area of over 1,189 square kilometers, the CMA is home to an estimated population of 10.8 million people (estimate of 2022), making it one of the largest and most densely populated areas in the country. The CMA is governed by various administrative bodies, including the Greater Chennai Corporation, Ambattur and Avadi Corporation, Tambaram Corporation, five Municipalities, and three Town Panchayats, as well as ten Panchayat Unions (179 village Panchayats). The transport infrastructure in the CMA is welldeveloped, with roads serving as the backbone of the area and railway transport playing a crucial role in its economic life. The road network of Chennai Metropolitan area is radial pattern. Key arterial roads such as the Grand Southern Trunk (GST) Road, Old Mahabalipuram Road (OMR), and the Inner Ring Road facilitate movement within the city and between other cities, catering to commuting, commercial transport, and goods transportation. The GST Road, which is part of the National Highway 45, is a significant commercial and industrial belt in Chennai and the southern parts of Tamil Nadu. Another important road is also known as the OMR or IT Corridor and is home to numerous tech parks, offices, and apartment complexes. The road network is furthermore backed up by a number of bus lines managed by Metropolitan Transport Corporation (MTC), the key public bus company in the whole CMA area.

The CMA's railway network further enhances its connectivity, with the Chennai Suburban Railway and Chennai Metro playing key roles in shaping the region's urban form. The Chennai Suburban Railway network, one of India's oldest and most extensive systems, consists of four

major lines: North, South, West, and the MRTS (Mass Rapid Transit System) lines. These lines cover areas within and outside central business districts and adjoining towns and suburbs, and are used by thousands of people daily to commute. The suburban railway system has contributed to the growth of satellite towns and periphery, which has determined the spatial distribution of the population and economic activity within the region. Newly introduced Chennai Metro has rapidly expanded, easing road congestion and encouraging transit-oriented development along its routes. This developed transport network fosters the efforts of the regional economic activities that are numerous and vibrant that include manufacturing and automotive products, information technology and services among others.

Demographically, the CMA is marked by a diverse population with varying socio-economic backgrounds. Total population was 89 lakhs in 2011 which is estimated 108 lakhs in 2022 (Table 1). This area has had a relatively high population density criteria for regional migration and equally it boasts a good economic base hence encouraging people to move in hence fostering the growth of urbanization. CMA has a roaring economy with players in automobile manufacturing, IT services, ports & trade making this area a very economically significant region of the southern part of India. The research on urban planning and development focus on the Chennai Metropolitan Area as an interesting study area because it has good physical infrastructure and a diverse and active population, and significant economic activities.

Table 1 Growth of Population and Population Density in Chennai Corporation, and CMA during 1991-2022

	during 1991 2022									
Administrati Population in lakhs				Population	on density			Area (sq	. km.)	
ve unit	1991	2001	2011	2022	1991	2001	2011	2022	2011	2022
				(estima				(estimate		
				ted)				d)		
Chennai	38.43	43.43	46.46	60.4	21836	24963	26553	14178	176	426*
Corporation										
CMA (total)	58.18	70.41	89	108	4894	5921	7485	9083	1189	1189

\*Chennai corporation area extended from 176 sq. km. to 426 sq. km. after 2011

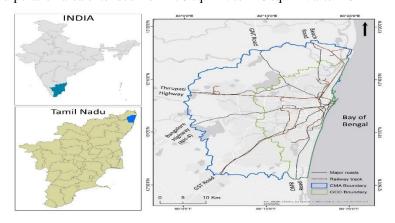


Fig. 1 Location map of the study area

#### 3.2 Data sources of LULC

To evaluate the changes in the land cover and its spatial patterns over time, a set of three LANDSAT images was acquired for the years 2001 (using the Enhanced Thematic Mapper Plus (ETM+) sensor), 2011 (using the Thematic Sensor sensor), and 2021 (using the Operational Land Imager/Thermal Infrared Sensor (OLI/TIRS) sensor) with cloud cover less than 5% for the study region (Table 2). The images were obtained from the open source data center of the US Geological Survey (USGS) in GeoTIFF format. The images were geometrically and radiometrically rectified to ensure accuracy. The table below summarizes the details of the images acquired for this study. The datasets used for the analysis is given in the following table.

Source	Sensor	Acquisition	Bands	Wavelength	Spatial	Nodal
		Year	(number)		Resolution	Agency
LANDSAT-8	Operational Land Imager (OLI)/TIRS	2021	1 to 11	0.43-0.67 (RGB), 0.85– 0.88 (NIR), 1.57–1.65 (SWIR 1), 2.11–2.29 (SWIR 2), 0.50–0.68 (panchromatic), 1.36– 1.38 (cirrus), 10.60– 11.19 (TIRS 1), 11.50– 12.51 (TIRS 2)	30 metres	USGS
LANDSAT-5	Thematic Mapper (TM)	2011	1, 2, 3, 4, 5, and 7	0.45-0.69 (RGB),0.77- 0.90 (NIR), 1.55-1.75 (SWIR), 2.09-2.35	30 metres	USGS
LANDSAT-7	Enhanced Thematic Mapper Plus (ETM+)	2001	1, 2, 3, 4, 5, and 7	0.45-0.69 (RGB),0.77– 0.90 (NIR), 1.55–1.75 (SWIR), 2.09–2.35	30 metres	USGS

Table 2 Details of land use analysis dataset

Note: RGB- Red, Blue, Green; SWIR -Short Wave Infrared; TIRS- Thermal Infrared Sensor; NIR- Near Infrared; USGS-United States Geological Survey

#### 3.3 Methods

The goal of this research project was to evaluate land use change by utilizing satellite images and demographic data. Specifically, this study applied pixel-wise and buffer-wise feature-based change detection methods. Satellite images produced various maps of changes that were distinguished according to the LULC aspects and analysis was done using change detection matrix at the pixel values. The research methodology can be outlined in the following steps: (1) processing of rectified data, (2) LULC classification, (3) accuracy assessment of the classified data, (4) analysis of transitions between LULC classes, (5) transport corridor identification (6) creation of buffers around LULC classes and quantitative analysis of each buffer zone.

## 3.3.1 Processing of rectified data

The Level 1 Terrain Corrected (L1T) LANDSAT imageries used in this study was corrected for geographic coordinates and prepared for spatial analysis. (Zhu and Woodcock 2014; Zhu 2017). This False Color Composite (FCC) was created by layering spectral bands of the Landsat images, facilitating the identification and distinction of various land features. After that, radiometric correction proceeded where pixel values were altered to Top of Atmosphere (TOA) and

atmospheric effects were removed to prevent high quantities of errors concerning the values of reflectance and surface features. Majority filtering was employed to reduce the amount of additional noise in the images caused by the majority of blank spaces, resulting in improved image visualisation. The images were then transformed to the WGS 84/UTM zone 45 North projection and overlaid with other data sets. For better understanding, red-green-blue (RGB) and the mosaic clips were used in order to provide a continuous view of mosaic build up essence. Finally, the mosaic image obtained was clipped to extract the area of interest so that extra information that may interfere with the desired output was removed.

#### 3.3.2 LULC classification

Using unsupervised classification methods is a commonly employed practice in remote sensing for categorizing land use and land cover (LULC) into various types of cover, such as forests, water bodies, and urban areas, using the spectral signatures of image pixels obtained from satellite or other aerial platforms (Enderle et al., 2005). Unlike supervised classification, which requires the provision of training data for reference, unsupervised classification groups pixels together based on their spectral characteristics, forming clusters in the spectral domain. These clusters are then designated as the LULC classes. The classification technique relies on clustering algorithms, such as K-means, the most frequently used method. K-means aims to minimize the sum of distances between objects within a cluster while maximizing the distances between objects in different clusters (Sinaga & Yang 2020).

K initial centroids are chosen at the start of the procedure, one for each cluster. These centroids are selected using a heuristic or at random (Yuan & Yang 2019). A point that symbolises a cluster's centre is called a centroid. A distance metric, often the Euclidean distance, is used to allocate each data point (pixel) in the collection to the closest centroid. The cluster with the closest centroid is allocated to each pixel. The distance to a centroid  $C_k$  for a pixel  $x_i$  with spectral values through several bands (features) is computed as follows:

$$D(x_{i,}C_{k}) = \sqrt{\sum_{m=1}^{n} (x_{im-C_{km}})^{2}}$$
(1)

Where: (1)

x<sub>im</sub> represents spectral value of pixel i in band m

 $C_{km}$  is the spectral value of centroid k in band j.

 $D(x_{i_{\text{\tiny k}}}C_k)$  is the distance between pixel i and centroid k.

The mean location of every pixel inside each cluster is computed to recalculate the centroids once every pixel has been assigned to a cluster. For cluster k, the new centroid  $C_k$  is provided by:

$$C_k = \frac{1}{N_k} \sum_{x_i \in C_k} x_i \tag{2}$$

#### Where:

N<sub>k</sub> is the number of pixels in cluster k.

C<sub>k</sub> is the set of all pixels assigned to cluster k.

x<sub>i</sub> represents the spectral values of pixel i within the cluster.

Centroids are computed again after every assignment, and pixels are redistributed to the closest centroids. This method keeps on until either a certain number of repetitions is reached or the centroids stop changing noticeably (Zhang et al., 2008). When the centroids stabilise, the method converges, which means that the distribution of pixels within clusters remains mostly constant during rounds. The clusters have now been finalised.

The ground truth data was used to collect the signature training set for each land-use class in the image. According to Strahler (1980), the reflectance of the matching pixel value was used to calculate the spectral signature of each class. To develop a meaningful LULC map, it is necessary to incorporate a relevant land use class to depict all features of the land use type. Since each of the land use and land cover units possesses a particular digital value or reflectance value, it is advantageous to create training sites using those values. This approach ultimately facilitates the execution of an unsupervised classification. Anderson (1976) made the initial attempt to develop a comprehensive system of land use classification. At present, all agencies and institutions that utilize satellite images have their own land use classification system; in the present study, we employ the classification system used by USGS Level-I for land use classification. Moreover, an additional advantage of the local study region was its applicability for obtaining accurate and supervised classification results with the aid of local knowledge and visual interpretation. The entire the study area was classified into five distinct classes: (i) Open land, (ii) Built-up, (iii) Vegetation, (iv) Waterbodies, and (v) Others.

#### 3.3.3 Accuracy assessment

The evaluation of accuracy is an essential step in the LULC classification process, as it helps to gauge the quality of the resulting classification. This process involves comparing the classified LULC map with ground data truth to determine the accuracy with which the classification process has categorized land cover classes (Chughtai et al., 2021). Making ensuring that all of the results are correct and suitable for additional analysis or decision-making is essential. The accuracy of assessment results is based on measurement standards, but the checker must ensure the quality of reference data used, which is typically obtained through field questionnaires, highresolution satellite images, aerial photographs, or land cover databases. An accuracy assessment was performed on the resultant classified imagery of LULC for 2001, 2011 and 2021. Verification of LULC was done with the use of satellite images and Google earth imagery. A random sampling technique was used to obtain 275 stratified points from all the three classified images using the spectral signatures. These sampling points were distributed in the five LULC classes which had been specified for the accuracy assessment. For evaluating the accuracy of classified images, three measures: Producer's Accuracy, User Accuracy and Kappa Coefficient test were computed (Stehman, 1997). The accuracy of assessment results is based on measurement standards, but the checker must ensure the quality of reference data used, which is

typically obtained through field questionnaires, high-resolution satellite images, aerial photographs, or land cover databases (Lillesand et al. 2015). The present study employed the following equation to assess the Kappa coefficient (Congalton 1991).

$$K = \frac{N\sum_{i=1}^{r} x_{ii} - \sum_{i=1}^{r} (x_{i+} * x_{+i})}{N^2 - \sum_{i=1}^{r} (x_{i+} * x_{+i})}$$
(4)

Here, N is the total number of samples, K is the Kappa Coefficient, r is the number of rows/columns in the error matrix,  $x_{ii}$  is the sum of samples that were properly categorised,  $x_{i+}$  is the row i total, and  $x_{+i}$  is the column i total.

The images were sufficient for in-depth analysis and change detection, as shown by overall accuracy and Kappa values of greater than 0.8 (Lea and Curtis 2010). The overall accuracy values for the LULC classes are 92.72%, 89.09%, and 86.54% in this research. The corresponding values for the Kappa coefficient for the categorised LULC map of 2001, 2011 and 2021 were 0.9, 0.86, and 0.83.

Table 2 Accuracy assessment test for the year 2001

Groun	Ground Truth (2001)							
LULC	Class	Built up	Vegetation	Waterbodies	Open land	Others	Total	User Accuracy
	Built up	52	1	0	2	0	55	94.55
S	Vegetation	1	53	1	0	0	55	96.36
lass	Waterbodies	0	2	53	0	0	55	96.36
C	Open land	3	1	0	49	2	55	89.09
1	Others	2	1	0	4	48	55	87.27
17	Total	58	58	54	55	50	275	
	Produce Accuracy	89.66	91.38	96.30	89.09	96.00		

Overall accuracy = 92.72 % and kappa coefficient = 0.9

Table 3 Accuracy assessment test for the year 2011

Groun	d Truth (2011)		•					
LULC	Class	Built up	Vegetation	Waterbodies	Open land	Others	Total	User Accuracy
	Built up	51	3	0	1	0	55	92.73
ς.	Vegetation	2	49	1	2	1	55	89.09
las	Waterbodies	0	3	52	0	0	55	94.55
S	Open land	3	1	0	46	5	55	83.64
	Others	2	1	0	5	47	55	85.45
n L	Total	58	57	53	54	53	275	
	Produce Accuracy	87.93	85.96	98.11	85.19	88.68		

Overall accuracy = 89.09 % and kappa coefficient = 0.86

Table 4 Accuracy assessment test for the year 2021

Ground Truth (2021)								
LULC	Class	Built up	Vegetation	Waterbodies	Open	Others	Total	User Accuracy
		_	_		land			-
	Built up	47	6	0	2	0	55	85.45
2	Vegetation	8	44	0	2	1	55	80.00
ΩΊ	Waterbodies	0	2	53	0	0	55	96.36

Open land	3	3	0	46	3	55	83.64
Others	2	0	0	5	48	55	87.27
Total	60	55	53	55	52	275	
Produce Accuracy	78.33	80.00	98.11	83.64	92.31		

Overall accuracy = 86.54 % and kappa coefficient = 0.83

## 3.3.4 Analysis of transitions between LULC classes

Change detection is a process that aims to identify the transition of land-use classes into one another. Various methods are employed to simplify and generalize the landscape, including the comparison of land cover statistical data, image overlay, principal component analysis, change vector analysis, image differencing, and normalized difference vegetation index (Lu et al., 2004). This research used the available land cover statistics to compare classifications. The images analysed through geometric, radiometric, and atmospheric correction and spatial comparison of the area under the land use classes for both images were done to enable generation of similar land use classes (Fichera et al., 2012). The resultant matrix allowed description of land use changes as most of the arithmetic operations were performed using difference tool in a geospatial platform. The secondary change matrix was calculated from the classified maps for three distinct time points, including 2001, 2011, and 2021, using the difference operator (Deka et al., 2019). The cell size function was taken into account when performing multiplication; operation maximum, minimum, or mean, where raster input sizes differ, the cell size of the output is worked out (Langat et al., 2019). The extend function enabled determining the extent of the output feature if the input rasters were registered at different times. Other operations like intersection and union were also used in this work in order to carry out the change information.

## 3.3.5 Transport corridor identification

Transportation infrastructure within the study area is defined and mapped from the results of LULC classification. The major transportation links, such as roads and railway lines, serve as the focus for the subsequent buffer analysis. It is found that major transport corridors like Grand Southern Trunk (GST) road, Old Mahabalipuram Road (OMR), Thirupati Highway has impact on land use land cover transformation. However, GST road and Thirupati highway that stretching parallel to the railway line heading towards Bangalore and Tirupati respectively. To minimize the bias of the results, proper buffer distance is set around the transportation corridors at certain distance levels of 0.5 kilometer, 1 kilometers, 1.5 kilometers, and 2 kilometers (Zheng et al., 2021). These predetermined zones of varying distances from the transportation infrastructure allow for an evaluation of the differences in land use density at different distances from the transportation corridors.

## 3.3.6 Creation of buffers around LULC classes and Quantitative analysis of each buffer zone

An effective GIS tool for assessing land use patterns along transport corridors is buffer analysis. By creating a fixed-width corridor around a linear transport feature, researchers can investigate the distribution of land use types within the specified area. The process involves georeferencing or digitizing transportation infrastructure, such as highways and railways, as a linear feature in a geographical information system environment. Next, buffer polygons are generated around the linear feature, with the width of the buffer determined by the study's objectives but can be

arbitrary (0.5 km, 1 km, 1.5 km, 2 km). Subsequently, land use and land cover data are overlaid on the buffer zones to determine the type of land use in the specified area surrounding the transport corridor. Finally, the areas and proportions of various land use types within the buffer zones are computed, which may include residential, commercial, industrial, agricultural, and natural classes of land cover. Buffer analysis provides valuable information on the spatial interaction between transportation facilities and land uses.

#### 4 Results

The dynamics of land use transformation are prominently observed in the Chennai Metropolitan Area (CMA). The diversity of land uses in a settlement typically increases with proximity to the urban core. The intensity of land use changes tends to exhibit an inverse correlation with distance from the urban center. To elucidate the evolution of the CMA, land use and land cover maps from 2001, 2011, and 2021 were analyzed. Key land cover categories include built-up areas, water bodies, vegetation, open land, and others. These broad land classes are generally employed to quantify changes in land use and cover. The methodology involved image extraction, rectification, and classification using standard image processing techniques to delineate the land use and cover of the Chennai Metropolitan Area. The trend analysis of land use and land cover was conducted in two phases: the first phase encompassed 2001 to 2011, and the second phase focused on the period between 2011 and 2021. Comparing these two periods revealed spatiotemporal changes in LULC classes. The total geographical area of the study region encompasses 1189 square kilometers.

Table 5 Area and amount of change in different land use/cover categories during 2001, 2011 and 2021

una 2021									
LULC	2001		2011		2021		Rate of	Change	in
Class							Percentage		
	Area (km²)	%	Area (km²)	%	Area (km²)	%	2001 to 2011	2011 2021	to
Built up	316.06	26.33	423.99	35.33	473.03	39.41	34.14	11.56	
Vegetation	571.79	47.64	590.95	49.24	563.96	46.99	3.35	-4.56	
Waterbodies	74.22	6.18	64.85	5.40	89.44	7.45	-12.62	37.91	
Open land	197.96	16.49	72.19	6.01	21.48	1.79	-63.53	-70.23	
Others	40.03	3.33	48.08	4.00	52.14	4.34	20.11	8.44	

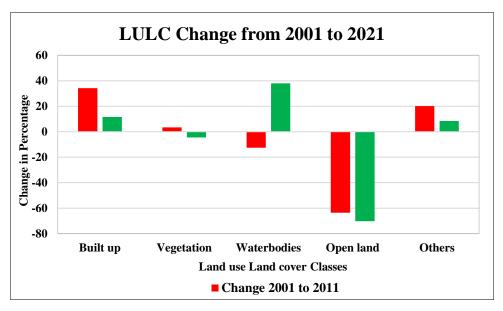


Fig. 2 Gain and loss of Land Use Land Cover from 2001 to 2021

## 4.1 Characteristics of Major Land Use dynamics from 2001 to 2011

The land use and land cover patterns in the Chennai Metropolitan Area have undergone significant changes over the past two decades, as evidenced by an in-depth examination of the LULC data provided for the area from 2001 to 2021. LANDSAT imageries from 2001 and 2011 are utilized to map changes in land use and land cover. Table 5 and Figure 2 clearly demonstrate substantial alterations in land usage within the CMA. The aforementioned statistics indicate positive changes in the built-up area and other categories, whereas negative changes are observed in open land, vegetation, and water bodies.

The built-up area under consideration demonstrates a notable expansion, increasing from 316.06 km² in 2001 to 473.03 km² in 2021, representing 13 percent increase overall (Fig. 2). Very sharp increase of built up happened between 2001 to 2011 about 34.14%. This growth in built-up areas is indicative of rapid alterations in urbanization and development within this region. The expansion of social, commercial, and industrial facilities has likely encroached upon these categories of land use, resulting in the loss of vegetation cover, open land, and vehetation. This pattern has become more pronounced in recent decades, particularly from 2011 to 2021, with a growth rate of 39.41 percent, suggesting accelerated urban development. The expansion of built-up areas has significant implications for resource utilization, waste generation, and pollution within the region, emphasizing the necessity for more efficient urban planning and management.

The vegetation class, on the other hand, has experienced a decrease of 4.56 percent from 590.95 km² in 2011 to 563.96 km² in 2021. However, vegetation has increased 3.35% from 2001 to 2011 (Fig. 3). The decrease of vegetative covers can be associated with several reasons such as the

changes of the physiognomy of rural constructions and agricultural areas due to urban expansion and possible agricultural practices and land use, deforestation practices and vegetation clearance, ecosystem destruction or cropping change. The reduction of vegetation is particularly concerning due to its detrimental effects on climate, air quality, and the quality of life for residents in the region, as vegetation is an integral component of the natural environment. Measures to enhance vegetation cover include the implementation of strategies to increase urban green infrastructure, restoration of degraded ecosystems, and the formulation of sustainable land-use practices to mitigate the impact in this regard.

The Waterbodies class has experienced a more complex trajectory in fulfilling its objectives. It has observed a 12.62% decrease from 74.22 km² in 2001 to 64.85 km² in 2011. After that again sharp increase happened from 2011 to 2021 with 37.91%. This decrease in the availability of water bodies in the Chennai Metropolitan Area can be attributed to several factors, including infrastructure development, urban expansion, and changes in water management approaches (Fig. 4). It is crucial to recognize that the depletion of water bodies has significant adverse consequences, including altered hydrology, degradation of aquatic ecosystems, and water insecurity for residents. Addressing this concerning trend would be facilitated by promoting sustainable management of water bodies, implementing integrated water resources management, and adopting water sensitive urban planning practices.

The destruction of open land was the most pronounced, experiencing the maximum area loss, equivalent to 70.23% from 197.96 square kilometers in 2001 to merely 21.48 square kilometers by 2021. The diminishing utilization of open spaces such as natural areas, fields, and non-built-up regions aligns with the increasing trend of urban expansion, where development is prioritized over green spaces and scenic vistas. The reduction of these green and open spaces not only alters the ecological structure of the area but also impacts the availability of recreational areas and the potential for sustainable urban planning. Future land use strategies should place a strong emphasis on maintaining and growing the Open land category, which is essential for improving the region's liveability, biodiversity, and climate resilience.

The category of others which encompasses diverse land uses, has exhibited an increase of 20.11%, expanding from 40.03 km² in 2001 to 52.14 km² in 2021. Multiple factors may account for this growth in this land use category, including the heterogeneity of land use patterns, the implementation of novel land use infrastructure or land based activities, or modifications to the classification and identification of land use categories. A comprehensive analysis of the specific factors influencing the changes in this category could provide valuable insights into the overall land use dynamics within the Chennai Metropolitan Area.

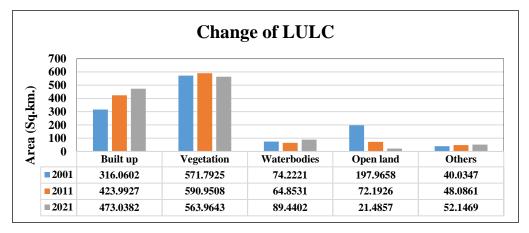


Fig. 3 Year wise change of Land Use Land Cover

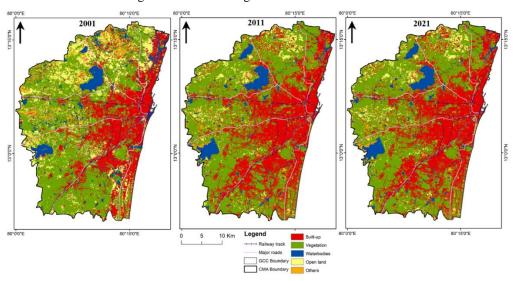


Fig. 4 Spatio-temporal land use land cover pattern for the year 2001, 2011 and 2021

## 4.2 Transport corridor analysis

The CMA is connected with different arterial roads and railway lines. These transport corridors make large impact on land use land cover. The GST Road and railway track towards Bangalore are stretching continuously (Fig. 5). This corridor is also known as industrial corridor. Most of the automobile companies are located in this network. Similarly, Thirupati Highway and railway line of Tirupati going almost same direction. So these two corridors are most important transport corridor within CMA. Besides that Bangalore highway and OMR road are also important corridor. OMR road is also known as information technology corridor. This road is stretching

along the Marina beach of Chennai corporation. International high-tech offices are located in this beach road. So land transformation is happened in these transport corridors due to industry or IT hub. Buffer zones are created along these transport corridors with the interval of 500 metres and upto 2 km. Following map is representing the buffer in different colours. This study will identify prominent changes of LULC in these buffer areas.

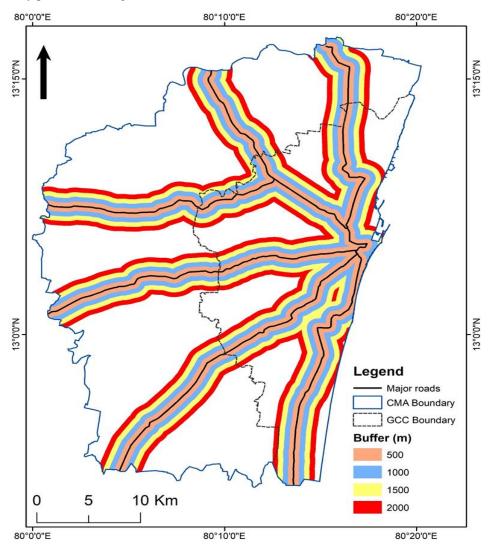


Fig. 5 Buffer of different transport corridors

#### 5 Discussion

## 5.1 Change detection analysis

The analysis of the changes of the earth's features is helpful to improve the understanding of the relationship between the people and environment (Seif and Mokarram, 2012). Change detection is a method applied to assess the changes in each land use category in a predetermined period and express the changes in a relative format for area, that is, the extent to which one category has increased or decreased relative to the other categories (Mosammam et al., 2017). The main difficulty when quantifying and identifying features of land use change locations is the dynamic nature of the process (Alsharif and Pradhaan, 2014). These results established patterns of transition of land use and land cover and the rates at which they transitioned. From the spatial analysis, it was evident that vegetation was the leading land use category in all the three decades being studied because it covered nearly 50% of the total study area. Further, the study showed that built up areas have expanded and are now the second largest land use type after vegetation particularly with the latest period depicting the highest increment. This calls for more comprehensive analysis of the factors that have led to growth in the area of built up areas as mentioned to have influenced decline in other land use types. To support a more detailed analysis of the changes within each land use category, a transition matrix was utilized for the study area. The subsequent statistics illustrate the evolving patterns of individual land use categories.

Table 6 Transformation matrix of land use and land cover from 2001 to 2021 (area in km<sup>2</sup>)

	C category 2021						
ory		Built up	Vegetation	Waterbodies	Open land	Others	Total (2001)
category	Built up	283.66	36.65	6.66	4.30	6.05	337.32
cat	Vegetation	142.47	357.59	20.29	4.91	16.31	541.57
	Waterbodies	30.82	13.37	45.01	2.19	1.93	93.32
· .	Open land	62.86	89.02	11.73	4.35	13.23	181.19
LC I	Others	9.75	12.23	1.91	4.14	8.09	36.13
172	Grand Total (2021)	535.56	509.86	85.60	19.88	45.62	1189.53

Bold values represent the unchanged land use and land cover area

The analysis indicates that about 142.47 square kilometres of built-up area, 4.91 square kilometres of open land, and 16.31 square kilometres of other categories have transitioned from vegetation to their current land use. Comparably, open land converted 62.86 square kilometres of built-up area, 89.02 square kilometres of vegetation cover, and 11.73 square kilometres of waterbodies. The area that was once covered by waterbodies has also altered, with 2.19 sq. km. of open land, 13.37 sq. km. of vegetation, and 30.82 sq. km. of built-up space. Over the past 20 years, it has been noted that other categories have also seen a conversion of more than 9.75 sq. km. of land into built up areas and 12.23 sq. km. into vegetation (Table 6). The study found no substantial changes in the overall vegetation cover; nevertheless, any increase or decrease in vegetation cover may be attributed to open land, which was classified as built up. Because of the need for urbanisation, there was a greater intensity of land conversion between 2001 and 2011 than in the decades that followed. CMA has been regulated built up growth after 2011. So that pace of urbanization has been decreased. Because there is a higher chance of converting land to built-up areas closer to their transportation corridors, it should be highlighted that built-up areas

tend to encroach on other land use categories depending on accessibility (Fig. 6). Most likely, this conversion resulted from population increase that was unabated and improved livelihood demands that accelerated the urbanisation process.

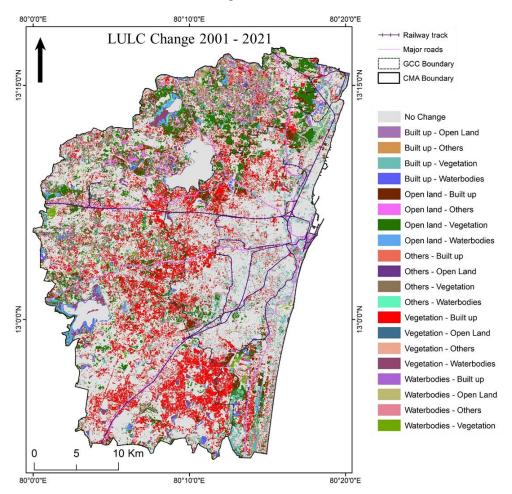


Fig. 6 Land transformation from 2001 to 2021 associated with different colour indicates the change

# 5.2 Buffer analysis along road and railway network

The buffer analysis can quantify how transport of changes in land use can affect the range of related influence. The analysis of the land use changes and the transport network indicated that built up areas were located farther from roads and railways. GST corridor has more significant changes among the all corridors. It is found that all these transport corridors have significant built-up change as distance increases (Fig. 7). Similarly, vegetation cover drastically diminishes

in 2011 and 2021 in all buffer zones (Table 7). The intensity of deforestation was always higher in more distant buffers of the region. Settlements and industries require construction of stations and other structure which in turn call for quality transport channels through roads. When the buffer zone was greater than 500 meters then the transition to the built up is quite evident. The highest degree of correlation with the change in land use and transport network was obtained at distances ranging from 1000 to 2000 m, which can be regarded as the distance between built-up areas. The specific relationship between suitable transport infrastructure and built-up areas in the CMA can be documented by the localization of automobile industries and information technology sector. Thirupathi highway and GST corridor are merged with railway lines. So, these two transport corridors are more prominent transformation. This analysis clearly indicated that open land gradually decreases at all buffer zones in 2001 and 2011. The area in this category is negligible as it is transformed to another category. All the transport corridors have shown built up increase from the open land. The results of this paper on the comprehensive dynamics of land use in the different buffer zone of these transport corridors established that the extent of a change in land use rises with distance from the highway.

Table 7 Land use in CMA in different buffer zones from 2001 to 2011

## For the year 2001

Area in sq. km for buffer 0-500 meters							
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road			
Built up	10.72	16.70	11.93	13.60			
Vegetation	16.30	14.32	12.59	8.59			
Waterbodies	0.64	1.04	0.65	1.29			
Open land	4.82	2.14	4.61	2.53			
Others	0.20	0.18	1.07	0.96			

Area in sq. km for	r buffer 500-1000 meters			
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road
Built up	19.80	32.25	20.70	24.97
Vegetation	32.91	29.57	25.61	13.96
Waterbodies	1.92	2.44	1.07	2.94
Open land	10.80	4.58	9.97	5.84
Others	0.56	0.28	2.14	1.73

Area in sq. km for bu	Area in sq. km for buffer 1000-1500 meters								
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road					
Built up	29.84	47.13	27.63	35.09					
Vegetation	47.61	46.25	38.45	17.85					
Waterbodies	4.93	3.76	2.08	3.60					
Open land	16.07	6.64	13.80	8.87					
Others	1.48	0.42	2.72	2.15					

Area in sq. km for buffer 1500-2000 meters							
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road			
Built up	39.90	59.37	33.91	39.18			
Vegetation	62.80	62.99	49.99	21.06			
Waterbodies	8.92	4.90	3.58	3.85			
Open land	20.51	8.87	16.89	12.08			

Others	2.52	0.82	3.02	2.29
For the year 2011				
Area in sq. km for	r buffer 0-500 meters			
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road
Built up	17.54	23.02	16.01	16.68
Vegetation	13.40	10.01	12.18	7.66
Waterbodies	0.60	0.17	0.25	0.56
Open land	0.54	0.56	1.39	0.48
Others	0.63	0.66	1.03	1.60

Area in sq. km for buffer 500-1000 meters					
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road	
Built up	31.78	43.99	28.30	28.11	
Vegetation	28.50	21.91	25.16	15.66	
Waterbodies	2.53	0.66	0.64	1.20	
Open land	1.22	1.10	2.99	1.27	
Others	1.96	1.47	2.41	3.21	

Area in sq. km for buffer 1000-1500 meters						
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road		
Built up	43.52	34.56	37.75	23.43		
Vegetation	6.35	1.15	1.41	1.81		
Waterbodies	2.09	1.63	3.92	1.87		
Open land	2.97	2.50	3.92	4.40		
Others	0.00	0.00	0.00	0.00		

Area in sq. km for buffer 1500-2000 meters						
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road		
Built up	59.60	47.19	48.01	29.58		
Vegetation	10.65	2.04	2.60	1.98		
Waterbodies	2.81	2.26	4.82	2.42		
Open land	3.78	3.67	6.22	5.08		
Others	0.00	0.00	0.00	0.00		

For the year 2021

Area in sq. km for buffer 0-500 meters					
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road	
Built up	17.79	19.09	17.66	15.33	
Vegetation	13.08	13.89	11.47	9.19	
Waterbodies	1.16	0.47	0.55	0.85	
Open land	0.20	0.15	0.33	0.43	
Others	0.48	0.80	0.86	1.18	

Area in sq. km for buffer 500-1000 meters					
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road	
Built up	34.3	36.9	33.0	27.0	
Vegetation	27.1	28.8	22.4	18.2	
Waterbodies	3.2	1.5	1.4	1.9	
Open land	0.4	0.3	0.8	0.6	
Others	1.0	1.6	1.9	1.7	

Area in sq. km for buffer 1000-1500 meters				
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road

Built up	42.10	43.73	32.69	27.54
Vegetation	6.90	2.44	2.83	3.08
Waterbodies	0.67	0.39	1.13	0.77
Open land	1.87	2.36	2.93	1.95
Others	0.00	0.00	0.00	0.00

Area in sq. km for buffer 1500-2000 meters						
LULC class	Thirupati Highway	GST corridor	Bangalore highway	OMR Road		
Built up	57.10	58.33	42.04	33.07		
Vegetation	11.60	3.99	4.85	3.54		
Waterbodies	0.91	0.59	1.24	1.02		
Open land	2.80	3.23	3.72	2.05		
Others	0.00	0.00	0.00	0.00		

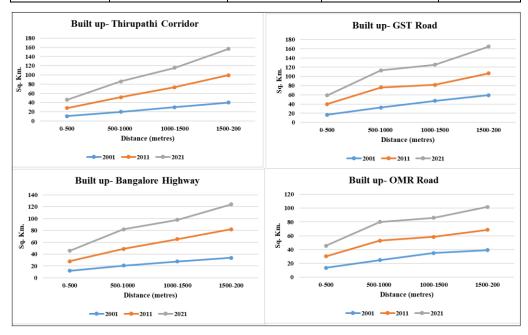


Fig. 7 Built up for the year 2001, 2011, 2021 in different transport corridors

#### 6 Conclusion

This study employs satellite imagery, remote sensing, Geographic Information Systems (GIS), and an innovative quantitative technique known as buffer analysis to investigate land transformation along transport corridors. The transition of land between vegetation, open land, water bodies, and other categories occurred between the periods 2001-2011 and 2011-2021. The most significant indicator of urban growth is the expansion of the built-up area along transport corridors, resulting in associated changes in land use. Land adjacent to transport boundaries, particularly along arterial roads and railway lines within the Chennai Metropolitan Area (CMA),

exhibits increased susceptibility to conversion. Generally, greater physical proximity between settlements of different types results in more diverse land use in the receiving settlement. The Chennai Metropolitan Area, including the Greater Chennai Corporation (GCC), has recently undergone substantial transformation due to rapid population growth and the development of residential and industrial buildings. These changes are notably evident along GST Road, OMR Road, and the Thirupati Highway. The study classified satellite images to analyze land use and land cover changes over time in the CMA and GCC. Utilizing LANDSAT ETM+, TM and OLI/TIRS satellite images from 2001, 2011, and 2021, the study analyzed 20 years of land use changes. It was observed that the CMA experienced significant transformations over the two decades, particularly in the conversion of open land, vegetation, and water bodies into residential and industrial areas. In 2001, the study area comprised 197.96 sq. km of open land, which decreased to 21.4 sq. km by 2021. Conversely, the built-up area exhibited a substantial increase from 316 sq. km in 2001 to 473 sq. km in 2021. Built-up and open land experienced the biggest changes throughout the two-time period, with Built-up increasing by around 56% and open land decreasing by nearly 70.2 %. Vegetation cover experienced a net increase from 2001 to 2011 due to government initiatives but after 2021, its total area decreased due to built up expansion in this land cover category. The study area has also seen a decrease in waterbodies due to uncontrolled urbanization till 2011. After that local government took strong initiatives to restore the all waterbodies within CMA. So that area of waterbodies increased from 2011 to 2021 which very good nature of land cover. It is found that about 142.47 square kilometres of built-up area, 4.91 square kilometres of open land, and 16.31 square kilometres of other categories have changed into their present form from vegetation. Moreover, the degree of land use change is not the same in all the parts of CMA. The maximum built-up expansion happened from west to south direction.

The transport network is one of the most significant driving force of land transformation. More and improved transport structures are required for the realisation of connections that are flawless and balanced in terms of interconnectivity. Urbanisation process was evidently associated with transport, because transport was considered to be a connection between settlements. The spatial closeness with the area of transport was linked mainly to the placement of industrial area. To understand transport network and LULC change, buffer analysis is done. The analysis of transport network structure have utilize a significant part in expanding the knowledge base concerning with land transformation. The transport network buffer analysis has shown agglomeration of flow right up to the CMA boundary to Chennai corporation. It has also found concentration higher density of built up around the transport network. GST road has more built up other than transport corridor of CMA. A good percentage source of the settlement was identified within the coverage of the 1000-2000 metres radius.

In conclusion, this research presents significant information regarding the interaction between transport infrastructure and changes in land use in the Chennai Metropolitan Area. The results emphasize the importance of planning and implementing initiatives that would make development of transport routes possible without detrimental impact on the environment and at the same time improve the quality of life in cities. Therefore, there is a need to undertake further research that investigates the temporal and spatial dynamics of these trends in addition to their

socio-economic implications for more effective formulation of urban policies and developmental procedures pertinent to Chennai and other budding metropolitan cities.

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