

# Madurai: a shrinking and segregated city

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This study examines the internal structure of Madurai city, India, maps the neighbourhoods that have formed and developed over time and analyses the differences between them with regard to health, educational and infrastructural facilities.

It explores the patterns and processes of urban expansion through analysis of land-use and land-cover changes in and around the city.

## KEY FINDINGS

- Madurai is an ancient city built in the 3rd century B.C. around the famous Meenakshi Amman Temple to showcase the power of the then-ruling dynasty.
- The temple has played a pivotal role in the development of Madurai. Caste-based residential segregation has continued from ancient times through the city's sacred geometric planning, which sees that upper-caste groups reside close to the temple and lower-caste groups at the outskirts.
- Madurai exhibits the characteristics of a shrinking city with a declining population – the city's core is saturated and undergoing de-population, whereas its peripheries are growing at a rapid pace.
- Close to a third of the city's population live in informal settlements (27%), while the share of those living in rented housing (60%) is high compared to elsewhere in India.
- Unplanned development, sprawling peripheries and a high share of informal settlements have adversely affected vegetation cover and the natural recharge points of the city. Once with plentiful water tanks, ponds and other natural recharge systems, Madurai now suffers from acute water shortages.
- Inequality is deep-rooted, with residents in the core of the city enjoying better facilities, particularly in the provision of physical infrastructure.
- Madurai fairs well in indicators such as literacy, female labour force participation and sex ratio compared to other Indian cities, thus revealing socially progressive gender values with low intra-ward disparity.

# About the study

This study<sup>1</sup> seeks to understand the shrinking nature and complex social characteristics of Madurai – a city on the banks of the river Vaigai in the state of Tamil Nadu, India, that was primarily built around the ancient Meenakshi Amman Temple.

According to the Population Census 2011,<sup>2</sup> Madurai is the third largest city in the state of Tamil Nadu with a Municipal Corporation in place since 1971 and a total population of 1.47 million people.

The development of the city beyond the temple precinct mainly took place during the British colonial period from the mid-19th century. In the initial decades following Independence in 1947, the population growth of Madurai was high. Development of new industries and educational facilities meant that the city established itself as a key economic and cultural centre in the region. However, from 1981 onwards, due to the growth of other neighbouring cities in Tamil Nadu such as Salem, Coimbatore and Chennai, Madurai gradually began to diminish in importance. Currently, Madurai exhibits features of a shrinking city.

The study is divided into three parts to gain an overview of how Madurai's neighbourhoods have developed over time. First, satellite images<sup>3</sup> for the years 2001, 2011 and 2018 have been used to analyse changes in patterns of land use and land cover. Second, we have conducted a quantitative analysis of the internal structure of the city. This includes socioeconomic characteristics and access to basic amenities, and draws on secondary data from the Population Census of India (2001 and 2011).<sup>4</sup> Finally, neighbourhood identification and auditing have been attempted using Google Earth data through Arc-GIS and ground truthing that same data through neighbourhood audits. Focus group discussions and interviews have also been conducted with key informants such as officials from the Madurai Municipal Corporation, Resident Welfare Associations and local leaders.

## Research results

### Changing patterns of land use and land cover

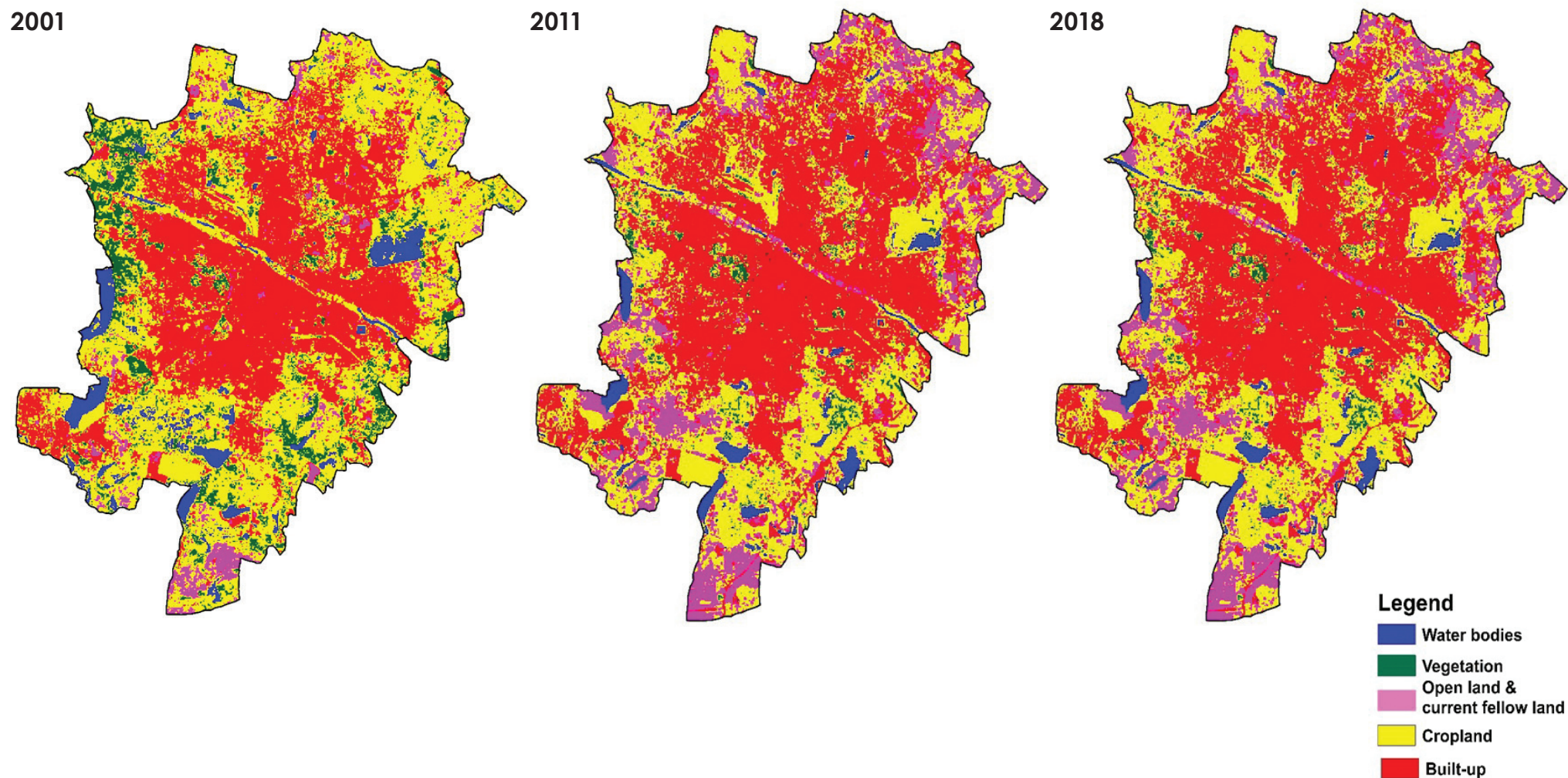
The city of Madurai has experienced constant change in its land use and land cover.

Several water bodies, forests and land parcels that were previously under agricultural use have been engulfed by concretised urban development over time. This is especially true in areas that have been newly urbanised. Built-up areas of Madurai have expanded more than two-fold from 30.4 km<sup>2</sup> in 2001 to 66.3 km<sup>2</sup> in 2018. Additionally, in 2010, the city boundary of Madurai Municipal Corporation expanded from 51.82 km<sup>2</sup> to 147.99 km<sup>2</sup> and consequently its jurisdiction extended from 72 to 100 wards.

As with other temple cities of the southern Indian, water tanks were an essential feature of Madurai's original city planning and it was around these that human settlements first developed. However, these tanks have gradually been filled with earth, rendered inutile or converted for other purposes. The High Court, Periyar Bus Stand, Madurai Law College, World Tamil Sangam and many other government buildings are examples of such unsustainable forms of development which now stand in place of natural re-charge points.

While the core of the city largely comprises compact urban forms, dispersion is the main form of development observed in its surroundings. The built-up core of the city is characterised by very dense settlements, narrow lanes and limited open space. Gradual extension of the built-up area in the south western part of Madurai occurred during 2001–2018 and sprawl has been the major form of urban extension in the newer neighbourhoods located in the northern part of the city (see Figure 1).

Figure 1: Change in land-use and land-cover in Madurai, 2001–2018



Source: NIUA-SHLC Team, 2019



## Internal structure: a ward-level analysis

Madurai exhibits the characteristics of a shrinking city – the population growth rate has declined since 1981 and negative growth was registered in 2001 (-0.13%).

Yet, while the core city has depopulated (the 2001 and 2011 Census reveal that 30 out of 100 wards registered negative growth, of which 20 are located in the historic core), the peripheral wards have grown over the same period. Indeed, the growth rate of some peripheral wards has been considerable, with several recording high annual growth rates ranging between 6% and 8%. In addition, the city has a large 'floating' population, due to religious tourism.

**Slum resettlement programmes that have relocated poor households to peripheral townships outside the city boundary have considerably deepened existing economic disparities**

Caste-based residential segregation is very evident in the demography of Madurai. Very few people of Scheduled Castes (SC) and Scheduled Tribes (ST) – both highly marginalised social groups in India – reside in the historic houses in the core of the city. Before the extension of the city boundary in 2010, SC and ST social groups were primarily located in the periphery of Madurai. The extension of the municipal boundary resulted in the integration of SC and ST groups; however, our analysis shows that four wards in the historic core area have no SC and ST households.

A high proportion of Madurai's population (27.3%) live in slums. This is due to the emergence of industrial units in and around the city, which have attracted low-income populations from neighbouring districts of Ramanathapuram, Theni and Virudhunagar. Between 1967 and 1981, the number of slums in Madurai increased from 36 to 127, and by 2011 had reached 331. Wards around the temple precinct have the lowest concentration of slums. Instead, the slums are mostly concentrated along the banks of the Vaigai and Kiruthammal rivers, in the central city, near the railway line, in the eastern side and in the fringes of the city. Slum resettlement programmes that have relocated poor households to peripheral townships outside the city boundary have considerably deepened existing economic disparities, since most of these households were formerly dependent on informal employment located near the city centre.

Unlike other parts of urban India, Madurai has a high share of rental housing (60%). These dwellings are mainly concentrated in the core of the city and decrease in propensity as one moves towards the periphery. Due to density, congestion and high real-estate prices, new affordable housing for the middle – and upper-middle classes has sprung up in the peripheries. However, the city government has not been able to provide commensurate infrastructural services in these areas, which has led to inequalities in the provision of public utility services.

Inequalities are particularly evident in the case of higher-order amenities such as access to treated tap water, water within premises, piped sewerage and closed drainage. For example, more than 80% of households residing in the wards surrounding the temple are connected to a water source within their premises compared to less than 20% of households in many peripheral wards. Such high disparities are also visible in terms of access to piped sewerage, with the top five wards (located in the centre of the city) having near to full access versus only between 3.49% and 8.76% in the peripheral wards. In contrast, disparities are very low between wards in terms of quality of education and gender equality.

## Neighbourhood analysis

The historic core around Meenakshi Amman Temple is the oldest neighbourhood in Madurai.

Its ancient planning survives through continued forms of caste-based segregation, although this formerly residential neighbourhood has developed into a commercial centre over the years. Other neighbourhoods have also undergone varied transformations, resulting in a diverse typology of housing in the city.

While some areas have been developed into residential colonies for groups of middle – and low-income households, others have been used to rehabilitate slum dwellers. Public housing agencies have also developed

some neighbourhoods to house government employees. Private townships and gated colonies are relatively newer features and have only emerged in the last 30 years. Slums along the river Vagai, on the other hand, date back much further and are still predominantly occupied by people who first migrated to Madurai when it was a flourishing industrial town.

Unsurprisingly, comparative analysis of the different types of neighbourhoods in Madurai city shows that high – and middle-income neighbourhoods have better housing, basic amenities and other urban infrastructure compared to low-income neighbourhoods. Neighbourhoods in the newly merged areas of Madurai city – which include suburban towns and villages – still do not have access to certain amenities such as piped water, under-ground sewerage and closed drainage systems. Water shortage is a major issue in Madurai city, and is common across most neighbourhoods.

In terms of social infrastructure, the provision of health facilities and services is fairly adequate across all types of neighbourhoods, mainly owing to the presence of functioning primary health centres set up by the state government. With regard to education, however, despite the presence of government run primary and senior secondary schools in most neighbourhoods, such schools are largely attended by children from low-income communities. This is because households in high-income neighbourhoods prefer to send their children to private schools. Public transportation remains a major challenge in poorer areas, suburban villages and sprawling neighbourhoods. In addition, poorer neighbourhoods are completely deprived of municipal infrastructures such as parks, green spaces and streetlights, which are otherwise developed and maintained by Resident Welfare Associations in high-income neighbourhoods, suburban towns and colonies.

## Way forward

Madurai has performed well in terms of many social indicators with low intra ward disparities, but inequalities remain in infrastructural development. Furthermore, the outdated city Master Plan<sup>5</sup> of Madurai city fails to address the emerging issues and challenges of urban development.

The upcoming Master Plan needs to strategise sustainable urban development. This should include efforts to revitalise water bodies, address acute water shortages and extend piped sewerage across the city. Another priority should be the expansion of Madurai's economic base through the creation of job opportunities in order to reverse the shrinkage of the population in the core of the city and achieve sustainable growth.

*This paper summarises key findings of a report on the city as part of an international comparative study coordinated by the Centre for Sustainable, Healthy and Learning Cities and Neighbourhoods (SHLC). The wider study examines urbanisation and sustainable development in 14 cities in Africa and Asia and this part explores patterns of neighbourhood distribution and changing socio-spatial structures in response to recent urban expansion and migration. Geographic information system (GIS) data and remote sensing image analysis have been used to explore land-use changes and urban sprawl at city level and official statistics such as the population census and other secondary data have been used to map internal structural changes.*

<sup>2</sup><https://census2011.co.in/census/district/45-madurai.html>

<sup>3</sup><http://glovis.usgs.gov>

<sup>4</sup>See [https://censusindia.gov.in/2011-common/census\\_data\\_2001.html](https://censusindia.gov.in/2011-common/census_data_2001.html) and <http://www.spc.tn.gov.in/DHDR/Madurai.pdf>

<sup>5</sup>[https://www.tn.gov.in/tcp/lpa\\_office.htm](https://www.tn.gov.in/tcp/lpa_office.htm)

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