International Journal of Research Studies on Environment, Earth, and Allied Sciences (IJRSEAS)
| *Volume-2 Issue--5* |*October-2025* | *ISSN: 3066-0637* | *Website:* https://eesrd.us

Manuscript ID:
IJRSEAS-2025-020522

OPEN ACCESS

Quick Response Code:

Website: https://eesrd.us

DOI: 10.5281/zenodo.17532357

DOI Link:
https://doi.org/10.5281/zenodo.17532357

Volume: 2

Issue: 5

Pp. 123-127

Month: October

Year: 2025

E-ISSN: 3066-0637

Submitted: 10 Sept. 2025

Revised: 15 Sept. 2025

Accepted: 10 Oct. 2025

Published: 31 Oct. 2025

Address for correspondence:
Dr. Shelar Suresh Kautik
Asso. Prof. & Head. PG Dept. & Research centre of Geography, G.E.T. Arts, Comm. & Sci. College, Nagaon, Dhule
Email: dr.skshelar@rediffmail.com

How to cite this article:
Shelar, S. K., & Patil, N. U. (2025). Patterns and Determinants of Urban Growth in Nashik City. International Journal of Research Studies on Environment, Earth, and Allied Sciences, 2(5), 123–127.
https://doi.org/10.5281/zenodo.17532357

Patterns and Determinants of Urban Growth in Nashik City

Dr. Shelar Suresh Kautik[1], Patil Naresh Uttamrao[2]
[1]Asso. Prof. & Head. PG Dept. & Research centre of Geography, G.E.T. Arts, Comm. & Sci. College, Nagaon, Dhule
[2]Asst. Prof. Dept. of Geography, RNC Arts, JDB Comm. & NSC Sci. College Nashik Road, Nashik, Maharashtra

Abstract

In the last twenty years, Nashik City, which is in the northern part of Maharashtra, India, has grown and changed a lot. It has become a key place for building up the economy, industry, and infrastructure. This study aims to examine the spatial dynamics of urban expansion in Nashik from 2000 to 2020 and to identify the principal factors driving these changes. The research employs multi-temporal satellite imagery alongside Geographic Information System (GIS) techniques to provide a comprehensive spatial analysis of alterations in land use and land cover. We put together information about the economy and society, like population numbers, industrial output, and transportation infrastructure, to get a better understanding of what causes cities to grow. The study also shows where growth is happening and how much land that used to be open, agricultural, or forested has been turned into built-up areas. This shows how quickly and in what direction cities are growing in different parts of the city. The results show that cities grow mostly in a radial way, and that peri-urban areas see the most land conversion. The main reasons for this growth are more industries, more people moving to the area, and better roads and transportation systems. The data also shows how quickly urbanization affects natural resources, like bodies of water, forest cover, and farmland. Comprehensive data tables that track changes in land use and growth rates provide an unequivocal empirical basis for assessing the spatial and temporal dynamics of urban transformation. By combining quantitative spatial analysis with socio-economic factors, the study gives Nashik useful information for making long-term plans for cities and policies. These findings underscore the necessity of integrating environmental conservation, resource management, and infrastructure development into planning frameworks to ensure sustainable and resilient urban expansion in the future.

Keywords: *Urban Growth, Nashik City, Spatial Patterns, Determinants, GIS, RS.*

Introduction

Indian cities have grown a lot faster in the last few decades than they did before. This is because of a mix of economic reforms, large-scale population transfers, and quick infrastructure building. India's economy opened up in the early 1990s, which led to new business and industrial opportunities that have attracted investments from both inside and outside the country. A lot of people have also moved from the countryside to the city, which has made the cities more crowded. Cities have also been able to grow out more easily because of better transportation, communication, and civic infrastructure. These groups have worked together to make big changes to cities' physical, social, and economic environments all over the country.

Nashik City, which is in the north of Maharashtra, is a good example of these bigger trends in the country. Nashik has always been known for its rich religious history, which includes the famous Kumbh Mela, and its fertile agricultural hinterlands. But over time, it has turned into a busy city and industrial center. The city has changed a lot in the last twenty years. It used to be mostly a farming town, but now it is a quickly growing city with residential complexes, business areas, and industrial estates. Because of this change, land use has changed a lot. More and more, built-up areas are taking the place of farmland, open spaces, and forests. To plan and run things well, you need to know a lot about the spatial patterns and reasons behind Nashik's urban growth. Knowing how and where the city is growing, as well as the social, economic, and infrastructure factors that are affecting these trends, can help with changes to policies, zoning laws, and plans for managing resources. This kind of knowledge is important for making sure that urban growth is done in a responsible way that balances development goals with protecting natural resources and the health of local communities. Policymakers and planners can use these changes to guess what land, infrastructure, and services will be needed in the future. This will help cities grow in a way that is stronger and includes everyone.

Study Area

The present study has selected Nashik City. Nashik City is about 175 square kilometers big and is located at 20°00'N latitude and 73°47'E longitude. The city is on the banks of the Godavari River and is surrounded by the Sahyadri hills. The climate is semi-arid, with 800 to 900 mm of rain falling every year.

Objectives

1. To see how Nashik City's growth changed from 2000 to 2020.
2. To learn about the social, economic, and infrastructure factors that are making cities grow.
3. To offer ideas for cities to grow in the long term.

Literature Review

The analysis of urban growth patterns has increasingly relied on advanced tools such as remote sensing and Geographic Information Systems (GIS), which facilitate precise observation and assessment of spatial and temporal fluctuations in land use and land cover. Scientists use satellite pictures and spatial modelling techniques to find out how fast, how far, and how strong cities are growing. This tells them a lot about how cities change over time. These methods have been very helpful for understanding how cities work, especially in areas that are growing quickly where traditional field surveys might not be enough to keep track of big changes.

Empirical studies conducted in various Indian cities, including Pune and Bangalore, have uncovered distinctive patterns of urban expansion. When this happens, growth usually happens in both radial and leapfrog ways. This is because of the effects of industrial hubs, important transportation corridors, and pushes for development in the areas around cities. For instance, industrial zones and highways often make cities grow outward, leaving gaps of development between rural areas. This is called leapfrog growth. These trends are closely related to social and economic factors such as a growing population, more business activity, investments in infrastructure, and the use of city policies and master plans. These factors not only change the speed of urbanization, but also where it happens, how land is used, and how it affects the environment.

There is a lot of research on how big cities grow, but not much has been written about Nashik City. The city has experienced rapid industrialization, population growth, and infrastructure improvement; however, there is a lack of research specifically focused on its urban expansion utilizing remote sensing and GIS technologies. The lack of focused research underscores the need for thorough analyses of Nashik's land use changes, development centers, and the socio-economic and infrastructural elements propelling urbanization. Filling this research gap is important for making plans, long-term development plans, and policy changes that are based on facts and are right for Nashik's unique situation. By looking at these processes, this study helps us understand how cities are growing in tier-II cities, giving planners, policymakers, and scholars who are interested in sustainable urban development important information.

Data Sources

1. Satellite imagery: Landsat 5 TM (2000), Landsat 7 ETM+ (2010), Landsat 8 OLI (2020).
2. Socio-economic data: Census of India (2001, 2011), Maharashtra Economic Survey.
3. Infrastructure data: Road network maps, industrial zone locations from Nashik Municipal Corporation.

Analytical Methods

1. Image preprocessing and supervised classification to delineate built-up areas.
2. Spatial analysis using GIS to map urban growth patterns.
3. Statistical correlation analysis between urban growth and determinants such as population, industry, and infrastructure.

Results

1. Spatial Patterns of Urban Growth

Table 1: Built-up Area Growth in Nashik City (2000-2020)

Year	Built-up Area (km²)	Percentage of Total Area (%)	Annual Growth Rate (%)
2000	35.0	20.0	-
2010	58.3	33.3	5.0
2020	84.0	48.0	3.8

Source: Satellite image classification and GIS analysis.

The data in Table 1 shows that Nashik City has grown a lot in built-up land over the past twenty years, from 2000 to 2020. This is because the city is growing quickly and its infrastructure is getting better. In 2000, the built-up area was 35.0 km², which was 20% of the city's total area. By 2010, it had grown to 58.3 km², or 33.3% of the city's total size, with an annual growth rate of 5.0%. The fact that cities grew so quickly in the first ten years shows that they were growing quickly. This could have been because more people moved in, more businesses opened, and better roads and homes were built.

Between 2010 and 2020, the built-up area grew even more, reaching 84.0 km², which is 48% of the city's total area. On the other hand, the yearly growth rate fell slightly to 3.8% over the past ten years. This means that cities kept growing quickly, but not as quickly as they had in the previous decade. There might not be much open land in the middle of the city, land use rules might be stricter in some areas, or the city might be growing up instead of out. In general, the trend shows that Nashik is quickly changing from a mostly rural and semi-urban area to a

more urbanized city. By 2020, about half of the land will have been built on. As cities grow, they put more stress on forests, farmland, and other natural resources. This shows how important it is to plan for future growth in a way that protects the environment and keeps things in balance.

2. Determinants of Urban Growth

Table 2: Correlation Coefficients between Urban Growth and Determinants

Determinant	Correlation with Built-up Growth (r)
Population Growth	0.91
Industrial Development	0.87
Road Network Expansion	0.79
Economic Growth (GDP)	0.75

The correlation coefficients in Table 2 show how strong and in what direction the correlations are between the main factors and the growth of built-up areas in Nashik City. The coefficient of 0.91 shows that population growth is most strongly linked to built-up development. This means that the city's growing population was the main cause of urban sprawl. This means that as more people moved to or were born in Nashik, the need for housing, services, and infrastructure grew. This directly caused the growth of built-up land. Urban growth is also very closely linked to industrial growth, with a correlation of 0.87. This shows that industries like manufacturing, wine making, and others draw in workers and help commercial and residential areas grow around them. Industries growing not only create jobs, but they also build roads, utilities, and homes, which speeds up the process of urbanization even more.

There is a positive correlation of 0.79 between the extension of the road network and urban growth. This shows how important better access and transportation facilities are for cities to grow. New roads and transit corridors make it easier to get to peri-urban areas, which makes people want to move there and businesses want to open in places that weren't already developed.

Finally, GDP, which measures economic growth, has a moderate positive correlation of 0.75. This means that Nashik's overall economic growth has helped cities grow by raising people's incomes, making it easier to invest, and increasing the need for city services. It is important, but its connection to population and industrial growth is not as strong. This shows that changes in land use are more affected by demographics and industry than by macroeconomic growth alone.

The study shows that Nashik's urban growth is mostly due to population growth and industrial development. Infrastructure improvements and economic growth are also important factors. These connections are very important for city planners and policymakers to understand so they can make plans that protect the environment while also allowing for growth.

Discussion

Nashik City has grown in a way that is very similar to how cities usually grow, which is by spreading out from the center. This radial expansion is most obvious in Nashik, where the peri-urban and periphery areas are growing the fastest. The main reason for this trend is that there isn't enough land in the heavily built-up central areas, which drives up land prices. This makes both residential and commercial growth move to the edges of the city. Because of this, the peri-urban areas are changing quickly, with more and more open spaces and farmland being built on. These patterns show the spatial spillover effect, which is when growth pressures from the core cause urban activities to spread to areas that weren't developed before. Industrial zones in Nashik are important places for growth that change the way cities grow even more. There are a lot of businesses nearby that make things, make wine, and other things that bring in a lot of workers. This, in turn, causes the housing, retail, and service industries in the area to grow. Better roads and transportation systems make it easier for people to get to work, move goods, and connect these industrial centers to residential areas. This speeds up the process of uneven growth. So, cities are growing faster because of industrial growth and better infrastructure, especially along major transportation routes and peri-urban belts. This makes a pattern of growth that is both focused and spread out.

The overall increase is fast, but the data shows that the yearly growth rate has gone down a little, from 5.0% from 2000 to 2010 to 3.8% from 2010 to 2020. This slowdown could mean that some parts of the city are getting close to their maximum capacity. This could lead to a gradual shift away from horizontal expansion and toward vertical development and densification. But the problems that come with uncontrolled growth in peripheral areas don't go away just because the growth rate is slower. It is very important to stop taking over farmland, destroying natural ecosystems, and putting more stress on city infrastructure. If the government doesn't plan and control this kind of growth, it could make food less safe, lower green cover, put a strain on water and sanitation systems, and make social and economic differences worse.

In conclusion, Nashik's growth as a city is part of a bigger trend of radial expansion that is happening because of things like the economy, population, and infrastructure. But the city needs to find long-term solutions for planning. Finding a balance between the needs of fast urbanization and the need to protect agricultural land, natural resources, and infrastructure capacity is important to make sure that both central and peripheral areas stay strong and grow fairly over time. To keep the city environmentally and economically sustainable while managing these growth dynamics, it's important to have good policies, make sure everyone can use the land, and get people involved.

Conclusion

Like other tier-II cities in India that are growing quickly, Nashik City has changed a lot in the last 20 years. The city's growth has mostly come from more people moving there, new businesses opening, and better public works and transportation. There is a greater demand for housing, services, and commercial spaces as the population increases. At the same time, the establishment and expansion of industrial zones have significantly contributed to urbanization by attracting workers and facilitating additional economic activities. Building roads and other infrastructure has also made it easier for people to get around and connect with each other. This has allowed the city to grow into areas that weren't very developed before.

The way Nashik has grown is mostly in a radial pattern, moving out from the old city center to the edges. This growth into peri-urban areas shows how limited central land supply and rising land costs have made it necessary to turn agricultural land and open spaces into built-up areas. The city's economy is more dynamic and people's quality of life has improved, but the growth has also caused big problems, like the loss of green space, damage to the environment, stress on infrastructure, and social inequality. These problems show how important it is to plan cities carefully and with the future in mind so that development can happen while keeping the environment safe and making sure everyone has fair access to resources.

To sum up, the way Nashik's cities have grown over the last twenty years shows both the good and bad things that can happen when cities grow quickly. You need to know the spatial patterns, growth drivers, and socio-economic effects of this change in order to make good decisions and policies. Nashik can achieve sustainable urban growth that supports long-term resilience, economic prosperity, and improved quality of life for all its residents by using integrated planning methods that balance population pressures, industrial growth, and infrastructure development with environmental protection and social inclusion.

Recommendations

There are a number of strategic steps that can be taken to make sure that Nashik's rapid urbanization is handled in a fair and long-lasting way. First, zoning laws should be put in place to keep farmland and areas that are important to the environment safe from unplanned development. The city could stop agricultural and natural habitats from being turned into built-up areas by clearly marking off residential, commercial, industrial, and green spaces. Not only do we need to protect these areas to keep the ecology and biodiversity healthy, but we also need to make sure the region has enough food and can handle climate change in the long run. Second, promoting vertical growth and mixed-use development can help cities make the most of their limited land. Encouraging tall homes and businesses instead of spreading out horizontally makes better use of the space that is already there. Mixed-use planning, which puts places to live, work, and play all in one area, can shorten commute times, make cities more lively, and help the economy grow over time. This method also helps keep parks, open spaces, and green belts in cities, which makes the air cleaner, the temperature lower, and life better for people who live there.

Third, making public transportation better is very important for lessening the bad effects of more people living in cities. Adding more buses and making them more modern, as well as better last-mile connections, can greatly cut down on traffic jams, air pollution, and the need for private cars. A good public transportation system not only makes it easier for people to get around, but it also helps with land use planning by directing growth along transit lines. This helps keep cities from growing in random ways.

Last but not least, promoting environmentally friendly industrial growth is important for cities to grow in a balanced way. When businesses grow, there should be strict rules to protect the environment, such as programs to control pollution, manage waste, and get green certification. Getting businesses to use eco-friendly methods can help protect water and soil resources, cut down on damage to the environment, and make cities healthier. Combining plans for the growth of cities with plans for industry makes sure that economic growth doesn't hurt the environment or people's health.

In conclusion, Nashik can use these integrated measures, such as good zoning, vertical and mixed-use development, strong public transportation, and environmentally friendly industrial practices, to create a model of urbanization that supports both economic growth and environmental sustainability. The city can make the city a strong, friendly, and liveable place for people now and in the future by balancing growth with protecting the environment.

Acknowledgment

The authors express their sincere gratitude to G.E.T. Arts, Commerce and Science College, Nagaon, Dhule, and R.N.C. Arts, J.D.B. Commerce and N.S.C. Science College, Nashik Road for providing the necessary institutional support and research environment to complete this study.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

References

1. Census of India. (2001, 2011). *Population Data*. Office of the Registrar General & Census Commissioner.
2. Maharashtra Economic Survey. (2022). *State Economic Report*. Directorate of Economics and Statistics.
3. Sudhira, H. S., Ramachandra, T. V., & Jagadish, K. S. (2004). Urban sprawl: Metrics, dynamics and modelling using GIS. *International Journal of Applied Earth Observation and Geoinformation*, *5*(1), 29-39.

4. Taubenböck, H., et al. (2012). Urbanization in India – Spatio-temporal analysis using remote sensing data. *Computers, Environment and Urban Systems*, 36(6), 179-188.
5. Nashik Municipal Corporation. (2020). *Urban Development Plan.*
6. Bhatta, B. (2010). *Analysis of Urban Growth and Sprawl from Remote Sensing Data.* Springer-Verlag, Berlin Heidelberg. https://doi.org/10.1007/978-3-642-05299-6
7. United Nations Human Settlements Programme (UN-Habitat). (2020). *World Cities Report 2020: The Value of Sustainable Urbanization.* UN-Habitat, Nairobi.
8. Patel, S., & Crooks, A. T. (2021). Evaluating urban growth patterns in Indian cities using geospatial technologies: A case study of Ahmedabad. *Cities, 110*, 103073. https://doi.org/10.1016/j.cities.2020.103073
9. Mahajan, S., & Joshi, P. K. (2013). Mapping of urban sprawl and its impact on land use in Pune using remote sensing and GIS techniques. *Journal of the Indian Society of Remote Sensing, 41*(4), 897–904.
10. World Bank. (2023). *India: Urban Development Overview.* Retrieved from https://www.worldbank.org/en/topic/urbandevelopment