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Abstract

Population growth and its spatial distribution serve as critical indicators of demographic transition and regional development. To understand patterns, this study examines the spatio-temporal dynamics of population growth in Maharashtra over a 110 year period (1901–2011). By leveraging Census of India data, the research analyses historical trends, which reveal that the state experienced initial stagnation (1901–1921), rapid post-independence expansion (1951–1981), and a recent deceleration signalling a mature transition. However, despite this overall slowing growth, internal spatial distribution remains highly asymmetric. Classifying 2011 Census data into six growth categories reveals that the western industrial corridor, including Thane and Pune, exhibits explosive growth driven by substantial in-migration. Conversely, the Konkan coastal belt and eastern Vidarbha demonstrate stagnant growth due to out-migration, challenging topography, and agrarian distress. By integrating geospatial visualization, this paper maps these disparities through physical, economic, and sociocultural lenses. In short, these widening regional gaps prove that the state urgently requires, decentralized regional planning to mitigate primate city congestion, revitalize stagnant rural economies, and foster equitable, sustainable development across all geographical regions of Maharashtra.

Keywords: Spatio-temporal Dynamics, Population Growth, Regional Disparities,

Demographic Transition, Decadal Variation, 1901-2011, Maharashtra.

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1. INTRODUCTION:

The spatial and temporal dynamics of population growth represent a fundamental theme in population geography and demography, serving as a mirror to the socio-economic, cultural, and environmental transformations occurring within a region (Chandna, 2016). Population is not merely a statistical aggregate but a dynamic resource that interacts continuously with the physical environment and institutional economic structures (Zelinsky, 1966). Understanding how these populations grow, distribute themselves, and change over time is essential for resource allocation, infrastructural development, and regional development strategies. In the context of developing nations, demographic transitions are often highly volatile, characterized by localized surges in population growth, intense rural-to-urban migration, and stark regional disparities that challenge traditional, centralized planning frameworks (Clark, 1982).

On a global scale, the twenty-first century marks a critical turning point in human demography, characterized by a highly uneven progression through the standard Demographic Transition Model (DTM). While the global population has expanded dramatically over the past two centuries- climbing from approximately one billion in 1800 to over eight billion today- the absolute rate of global population growth has peaked and is steadily decelerating (United Nations, 2024). This macro-level stabilization, however, conceals an unprecedented demographic divide between developed and developing macro-regions. Advanced economies are currently grappling with industrial stagnation, sub-replacement fertility rates, and rapidly aging populations. Conversely, parts of the global South continue to experience rapid population growth driven by strong demographic momentum, even as their overall fertility rates begin to decline (Bongaarts, 2009). This global divergence underscores the fact that demographic processes do not manifest uniformly across space but are highly dependent on localized socio-economic catalysts.

This global demographic polarization is vividly mirrored within Asia, a continent that houses nearly 60% of the world's population and has historically functioned as the epicentre of the global "population explosion" (Worldometer, 2026). During the mid-twentieth century, across most Asian nations, steep declines in mortality achieved through public health advancements were not immediately matched by declines in fertility, leading to unprecedented rates of natural population increase (Caldwell, 2006). In recent decades, however, Asia has entered a mature phase of demographic transition, led by sharp fertility drops in East Asia and a gradual winding down of population momentum in South Asia (Jones, 2013). As growth rates decline across the continent, the spatial distribution of Asia's population has shifted profoundly,

characterized by hyper-concentration in sprawling urban corridors and massive economic disparities between industrialized seaboard and stagnant agrarian hinterlands (Dyson, 2010).

Positioned at the heart of this South Asian demographic shift is India, which has officially overtaken China to become the most populous country globally (United Nations, 2024). Over the past century, India has undergone a complex demographic journey, transitioning away from a phase of high birth rates and catastrophic mortality spikes—caused by historical famines and epidemics—into a phase of prolonged population expansion, and finally toward its current phase of declining fertility and significantly reduced mortality (Premi, 2011). While the country's national Total Fertility Rate (TFR) has recently dropped near the replacement level of 2.1, India's absolute population size continues to expand due to demographic momentum, creating a unique "demographic dividend" that offers vast economic potential if managed correctly (Bloom, 2011). However, India's demography is structurally lopsided; a severe spatial dualism exists between the southern and western states, which have achieved population stabilization, and the northern and eastern states, which continue to experience higher growth rates and intense out-migration pressures (Bose, 2001).

Within the framework of the Indian Union, the state of Maharashtra occupies a paramount position, acting as a critical engine of economic growth, industrialization, and demographic concentration (Government of Maharashtra, 2023). Located in the western and central peninsular part of India, Maharashtra spans an extensive geographical area of 307,713 square kilometres and boasts a diverse physical landscape ranging from the rugged Sahyadri mountains to the expansive Deccan Plateau and the narrow Konkan coastal strip. According to the 2011 Census of India, Maharashtra recorded a total population of 112,372,972, making it the second most populous state in the country after Uttar Pradesh. To contextualize this magnitude, if Maharashtra were an independent nation, it would rank as the 12th most populous country in the world, accounting for approximately 9.28% of India's total population while occupying 9.36% of its landmass. However, this vast population is not distributed uniformly across the state's territory. The state is marked by deep structural inequalities and spatial population imbalances, primarily driven by historical processes of industrial agglomeration around the Mumbai-Pune corridor, which acts as a powerful magnet for both intra-state and inter-state migrants (Desai, 2012).

Looking back at how Maharashtra's population shifted between 1901 and 2011 shows how major historic events like famines, diseases, medical progress, and economic changes shaped the state. In the first two decades (1901–1921), the population stalled and even shrank. This early decline happened because of severe famines alongside deadly outbreaks of cholera, the

bubonic plague, and the devastating 1918 flu pandemic (Mills, 1986). Experts call 1921 the "Year of the Great Divide" because, after this point, falling death rates led to steady, unbroken population growth. The real turning point came after independence, especially from 1951 onward, when the state's population exploded. Better food supplies from farming reforms, medical leaps, and wiping out major diseases fuelled this growth (Bhagat, 2011). This rapid growth peaked between 1961 and 1981, matching the high-growth second stage of the standard Demographic Transition Model.

Yet, these state-wide averages hide deep imbalances. Across Maharashtra's 35 districts (based on the 2011 census boundaries), growth is wildly uneven. Industrialized and urbanized districts in the west show massive population gains, mostly because people move there for work. On the flip side, outer regions like Marathwada and Vidarbha tell a completely different story. Because their economies rely on farming tied to unpredictable monsoons, these areas grow much slower due to economic hardship (Mohanty, 2005). Meanwhile, the Konkan region faces a unique demographic paradox, experiencing negative or near-stagnant growth in rural areas- a phenomenon of demographic hollowing out because generations of workers have moved away to the Mumbai metro area (Prabhu, 1989).

Understanding these local, district-level shifts is crucial for creating realistic public policies today. Broad, state planning completely misses local challenges, like overcrowding in big cities or shrinking populations in remote rural areas. Because of this, analysing these 110-year trends is far more than an academic exercise. It is a necessary tool for building fair resource distribution, decentralized regional plans, and sustainable infrastructure across Maharashtra.

2. OBJECTIVES:

1. To evaluate the spatial patterns and distribution of population growth across Maharashtra.
2. To analyse the historical demographic trends in Maharashtra using Census data over the period of 1901 to 2011.
3. To identify regional disparities in population growth and classify regions based on growth levels.
4. To assess the factors influencing regional variations in population growth.

3. STUDY AREA:

The geographical locus of this empirical demographic investigation is the state of Maharashtra, a prominent macro-region situated in the western and central peninsular belt of India. Extending longitudinally from 72°36' E to 80°54' E, and latitudinally from 15°44' N to 22°6' N, the state covers an expansive territorial landmass of 307,713 square kilometres,

making it the third-largest state in India by spatial area. Maharashtra is bounded to the west by the Arabian Sea and shares administrative land borders with Gujarat and the Union Territory of Dadra and Nagar Haveli to its northwest, Madhya Pradesh to the north, Chhattisgarh to the east, Telangana to the southeast, and Karnataka and Goa to the south. To maintain strict data consistency across the historical, long-term timeline of this study, the administrative framework of the 2011 Census is utilized. Under this framework, the state is analysed based on its 35-district structure (prior to the bifurcation of Thane in 2014 to form Palghar district). These districts are clustered into six major revenue divisions—Konkan, Pune, Nashik, Aurangabad, Amravati, and Nagpur—which correspond to five distinct socio-cultural and historical regions: The Konkan coast, Western Maharashtra, Khandesh, Marathwada, and Vidarbha. These administrative divisions function as the primary regional spatial units through which localized population growth, decadal changes, and density trends are measured.

The spatial variation in population growth and density across Maharashtra is deeply influenced by its physical landscape. The state's geomorphology is dominated by the extensive basaltic lava flows of the Deccan traps, forming three parallel physical macro-regions: the narrow, low-lying Konkan coastal plain, the rugged Sahyadri mountain range (Western Ghats), and the expansive Deccan Plateau. The Western Ghats act as a primary hydrological and physical barrier, while the plateau slopes gently eastward and is drained by major river basins, including the eastward-flowing Godavari and Krishna systems, and the westward-flowing Tapi and Narmada systems. Historically, these fertile, water-abundant river basins have served as core demographic magnets, supporting dense rural settlements and high agricultural population clusters, whereas the rugged, forested terrain of the Sahyadri remains sparsely populated.

Climatic conditions across these physical divisions further accentuate the state's demographic disparities. Maharashtra experiences a tropical monsoon climate with a distinct wet season from June to September. However, monsoonal precipitation is highly unequal; the windward coastal Konkan belt receives torrential annual rainfall exceeding 2000 mm, fostering a high concentration of resources and settlements. In stark contrast, immediately east of the mountain range lies a dry, rain-shadow zone spanning parts of Western Maharashtra and Marathwada, which receives erratic rainfall often below 600 mm. This climatic vulnerability exposes these inland districts to recurrent agricultural droughts, creating powerful socio-economic push factors that drive migration toward the state's industrialized coastal and western corridors. Meanwhile, the eastern Vidarbha region benefits from more stable, moderate rainfall. Ultimately, these natural environmental and climatic divides dictate regional economic

viability and resource distribution, directly driving Maharashtra's uneven population growth trajectories and highly polarized spatial densities.

4. LITERATURE REVIEW:

The study of population growth and its spatial distribution has been a subject of extensive inquiry in both Indian and international contexts. Numerous geographers, demographers, and economists have contributed significantly to understanding the complex mechanisms driving demographic changes in Maharashtra and India at large.

Chandna (2014) in his seminal work on Population Geography emphasizes that population growth is the most powerful index of the economic development, social awakening, cultural background, and political ideology of a region. He argues that regional disparities in population growth are direct manifestations of the uneven distribution of resources and economic opportunities. Similarly, Bose (1973) extensively documented the urbanization process in India, noting that the demographic transition in states like Maharashtra is intricately linked with industrialization policies that heavily favour a few primate cities.

Bhagat (2011) has extensively researched migration and demographic patterns in Maharashtra. His studies highlight that the demographic expansion of the Mumbai Metropolitan Region (MMR) and the Pune urban agglomeration is driven not by natural increase but by a massive influx of interstate and intrastate migrants. Bhagat's analysis of Census data reveals that economic liberalization post-1991 accelerated this agglomeration, exacerbating regional inequalities between western Maharashtra and the underdeveloped regions of Marathwada and Vidarbha.

Mukherji (2013) focused on the spatial patterns of demographic attributes in India, noting that Maharashtra presents a classic case of dualism. On one hand, it houses highly modernized, cosmopolitan urban centres with stabilizing fertility rates; on the other hand, it contains vast agrarian tracts characterized by traditional demographic behaviour, agrarian distress, and seasonal migration.

Recent empirical studies, such as those by Patil and Suryawanshi (2020), have utilized spatio-temporal analysis to demonstrate that population density and growth in Maharashtra are highly correlated with the availability of irrigation, industrial infrastructure, and transport networks. They observed that the central plateau region experiences moderate growth, acting as a transitional zone between the hyper-growth western corridor and the low-growth eastern extremes.

Turkar, Ahmad, and Rahman (2024) explored the spatiality of disparities in socio-economic development within the Vidarbha region, concluding that historical neglect and lack

of secondary sector development have led to demographic stagnation and youth out-migration in districts like Wardha and Bhandara.

This extensive body of literature provides a robust theoretical foundation for the present study. While previous studies have examined urbanization or specific regions, this research provides a holistic, century-long temporal analysis (1901-2011) combined with a detailed spatial categorization of all districts based on the most recent complete Census data, addressing a vital gap in comprehensive demographic geography of the state.

5. DATABASE AND METHODOLOGY:

The present study employs a descriptive and analytical approach to examine the levels and trends of population growth in Maharashtra. The study is based on secondary data obtained from the Census of India published by the Office of the Registrar General and Census Commissioner, India. and other relevant governmental and non-governmental reports. The analysis covers the decennial Census period from 1901 to 2011.

The collected data were systematically organized, tabulated, and analysed using appropriate statistical techniques. Decadal population growth rates were calculated to track and evaluate demographic shifts over the designated time periods. To present these patterns visually, choropleth maps were generated to display the spatial distribution of population growth, while line and bar graphs were prepared to depict temporal trends. Spatial visualization was performed using QGIS software. The findings are interpreted from a geographical perspective to highlight regional variations and the changing patterns of population growth in the study region.

6. DATA ANALYSIS AND RESULTS:

6.1 District-wise Spatio-Temporal Variation in Population

Table 1: Spatio-Temporal variation in population across districts of Maharashtra

Spatio-Temporal variation in population across districts											
State/District	Decadal Variation										
	1901-11	1911-21	1921-31	1931-41	1941-51	1951-61	1961-71	1971-81	1981-91	1991-01	2001-11
Nandurbar	24.77	6.20	20.33	18.29	25.36	25.17	22.35	22.46	25.30	23.45	25.50
Dhule	24.77	6.20	20.33	18.29	25.36	29.13	23.49	23.98	22.53	15.94	19.96
Jalgaon	7.76	4.04	12.02	10.17	11.46	19.96	20.29	23.32	21.75	15.53	14.71
Buldhana	9.01	4.44	8.95	7.08	6.01	21.78	19.18	19.46	25.02	18.35	15.93
Akola	4.52	1.12	10.26	3.58	4.76	27.40	26.23	23.67	20.86	20.58	11.60
Washim	4.52	1.12	10.26	3.58	4.76	21.68	26.27	18.65	21.74	18.32	17.23
Amravati	8.20	-5.17	13.74	4.98	4.31	19.55	25.02	20.78	18.19	18.50	10.77
Wardha	19.37	0.63	11.34	0.59	3.77	17.70	22.91	18.86	15.19	15.87	4.80

Nagpur	7.72	-2.03	18.61	12.76	16.47	22.59	28.79	33.26	26.97	23.74	14.39
Bhandara	16.64	4.63	14.89	16.81	11.28	17.95	23.09	16.34	20.10	11.23	5.52
Gondiya	16.64	4.63	14.89	16.81	11.28	18.63	25.90	15.51	10.04	10.54	10.13
Gadchiroli	26.99	-1.92	15.09	14.42	11.77	18.90	35.15	22.04	23.48	23.29	10.46
Chandrapur	26.99	-1.92	15.09	14.42	11.77	16.99	31.26	26.75	25.06	16.88	5.95
Yavatmal	25.53	3.39	14.46	3.55	4.98	17.86	29.61	22.04	19.55	18.35	12.90
Nanded	21.95	-3.17	8.76	10.97	12.65	22.20	29.46	25.15	33.21	23.42	16.70
Hingoli	20.50	-1.76	11.50	6.82	10.54	22.14	23.81	22.79	25.75	19.81	19.43
Parbhani	20.50	-1.76	11.50	6.83	10.54	16.43	25.63	22.60	30.96	18.14	20.18
Jalna	20.08	-14.93	27.99	11.95	9.23	26.49	24.07	14.86	32.48	18.23	21.84
Aurangabad	19.99	-18.08	32.71	13.18	8.93	31.92	31.61	28.08	39.56	30.83	27.33
Nashik	11.25	-7.64	19.37	11.69	26.81	29.75	27.70	26.28	28.73	29.66	22.33
Thane	8.42	-1.12	10.44	12.02	45.36	28.86	38.06	46.89	56.62	54.92	35.94
Mumbai (Suburban)	23.79	20.17	1.26	28.87	66.23	107.4	110.1	70.97	36.15	27.99	8.01
Mumbai	23.79	20.17	1.26	28.87	66.23	19.02	10.77	6.99	-3.35	5.14	-5.75
Raigad	-0.93	-5.15	11.62	6.46	12.91	16.48	19.28	17.69	22.76	20.99	19.36
Pune	7.43	-6.14	15.46	15.45	32.45	26.44	28.83	31.04	32.85	30.73	30.34
Ahmadnagar	12.88	-22.32	34.77	15.87	25.59	25.88	27.76	19.32	24.35	19.80	12.43
Bid	25.97	-25.12	35.88	12.21	13.44	20.99	28.85	15.47	28.95	18.61	19.65
Latur	19.58	-5.30	12.57	11.18	10.07	23.81	28.17	23.29	29.68	24.07	18.04
Osmanabad	18.96	-3.99	11.46	11.18	10.10	20.35	27.85	10.93	23.95	16.47	11.69
Solapur	8.16	-4.91	17.63	14.83	22.57	23.66	21.17	15.88	24.84	19.14	12.10
Satara	-1.69	-5.85	13.81	13.21	16.17	21.50	20.79	18.02	20.24	14.59	6.94
Ratnagiri	2.53	-4.24	12.68	6.04	5.21	6.52	11.56	7.89	11.92	9.89	-4.96
Sindhudurg	1.93	-4.04	12.76	6.45	6.08	7.17	4.57	3.03	6.56	4.41	-2.30
Kolhapur	-9.17	0.25	14.30	14.42	21.97	22.49	28.94	22.73	21.67	17.85	9.96
Sangli	-4.95	-2.67	18.66	14.90	22.83	23.25	25.11	18.91	20.45	16.93	9.18
Maharashtra	10.74	-2.91	14.91	11.99	19.27	23.60	27.45	24.54	25.73	22.73	15.99

Note: Population variation in percentage.

Source: Census of India, (1901-2011).

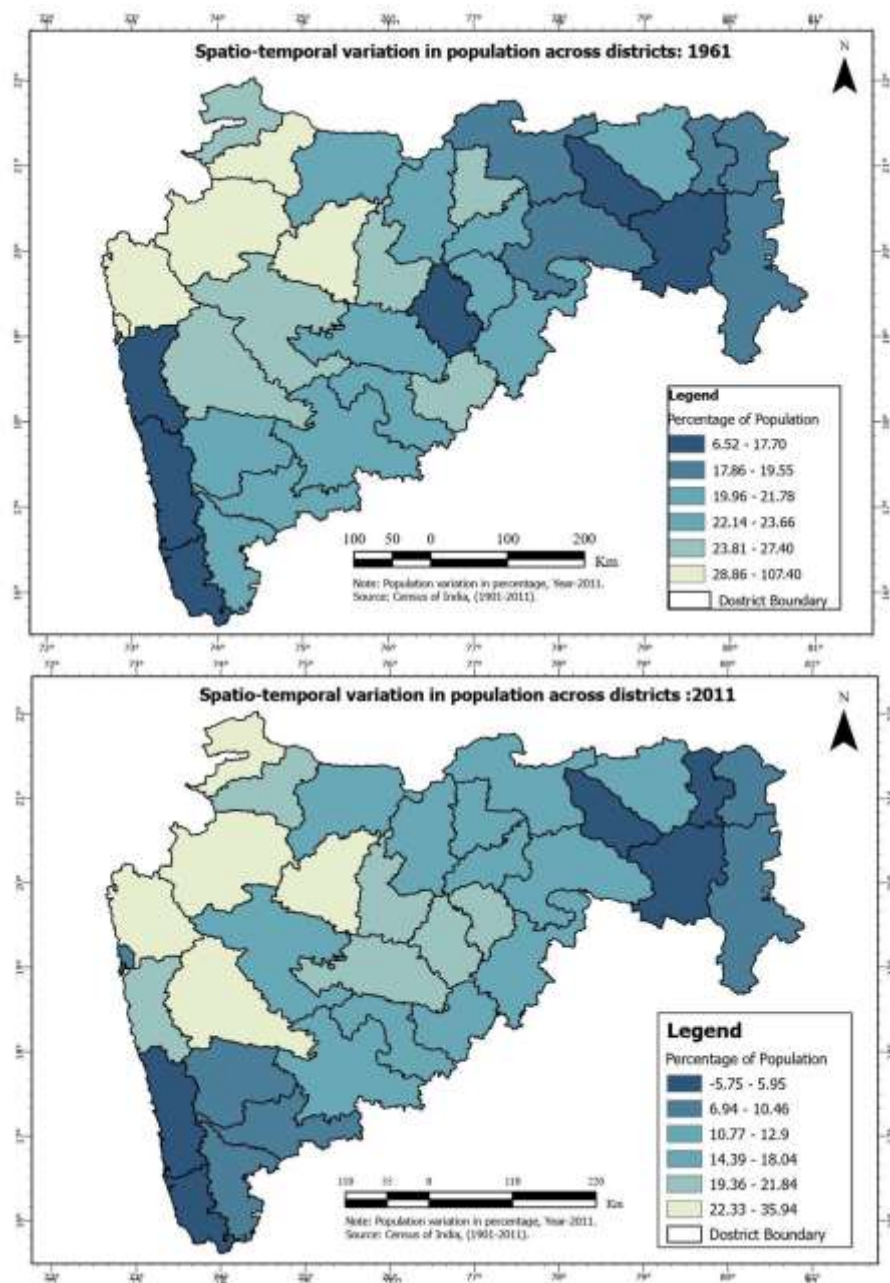


Figure 1: Spatio-Temporal Variation in Population across Districts

Source: Census of India, (1961 and 2011).

Phase 1: Era of Demographic Instability (1901–1921)

As shown in Table 1, during the 20th century, Maharashtra experienced severe volatility characterized by frequent population contraction. The data reveals that multiple districts recorded negative growth rates, reflecting a demographic landscape highly susceptible to crises. For instance, during 1911–21, districts such as Bid and Ahmadnagar recorded sharp negative growth rates of -25.12 percent and -22.32 percent, respectively, while others like Kolhapur, Sangli, Satara, and Raigad also saw negative variations in the preceding 1901–11 decade. This demographic contraction was not unique to Maharashtra but was a Pan-India

phenomenon resulting from a series of severe calamities. The bubonic plague, smallpox, cholera, and most significantly, the global Influenza pandemic (Spanish Flu) of 1918-1919 decimated the population. Concurrently, severe consecutive famines in 1911, 1913, 1915, 1918 and 1921 crippled the agrarian economy, inducing widespread food shortages that pushed mortality rates well above birth rates. Strikingly, the 1911-1921 decade registered a negative national growth rate-the only time in modern history that India's absolute population shrank. Due to this significant decline, the year 1921 is universally referred to by Indian demographers as the Demographic Divide.

Phase 2: Era of Steady Transitional Growth (1921–1951)

Following the Demographic Divide, Maharashtra entered a phase of steady and continuous population growth. During these three decades, the population grew from 20.84 million in 1921 to 32.00 million in 1951. The decadal growth rates were 14.96% (1921-1931), 11.99% (1931-1941), and 19.27% (1941-1951). This phase marked the initial stages of the epidemiological transition. The establishment of basic public health infrastructure under the colonial administration, the introduction of modern sanitation, and the gradual control of mass epidemics like cholera and plague led to a steady decline in the death rate. Concurrently, the birth rate remained traditionally high, leading to a widening gap between birth and death rates, which fuelled steady natural increase. Because this population growth was predominantly driven by a sharp decline in mortality, demographers classify this period as a '*Mortality-induced Growth*'.

Phase 3: Era of Rapid Demographic Expansion (1951–1981)

This period represents the most explosive demographic shift in Maharashtra's history, driven by large-scale industrialization and rapid urbanization. During this thirty-year span, the state's head count nearly doubled, shot up from 32.00 million in 1951 to 62.78 million by 1981. Decadal growth rates climbed to historic highs, hitting 23.60% between 1951 and 1961, peaking at 27.45% from 1961 to 1971, and levelling off slightly at 24.54% between 1971 and 1981. This massive expansion was highly polarized, anchoring heavily in specific areas. For instance, Mumbai Suburban recorded an astonishing 110.14% surge during the 1951-61 decade, while Thane rapidly emerged as another major growth hub, expanding by 56.62% during the 1981-91 period.

This unprecedented growth was primarily triggered by falling mortality rates, driven by expanded healthcare infrastructure, mass vaccination drives, the wiping out of malaria and smallpox, and better crop yields from the early Green Revolution. At the same time, birth rates stayed high due to traditional socio-cultural norms, low female literacy, and agrarian labour

needs. On top of that, the sudden boom of industries along the Mumbai-Pune corridor pulled in a massive wave of workers from other states, pushing the overall population numbers even higher.

Phase 4: Era of Mature Transition and Regional Polarization (1981–2011)

In the final phase, the state moved toward a more mature demographic transition, though growth remains highly asymmetric. The population grew from 62.78 million in 1981 to 112.37 million in 2011. While the absolute numbers added during each decade remained immense- such as the addition of over 15.5 million people between 2001 and 2011-the percentage growth rate began a decisive downward trajectory. The decadal growth rate dropped to 25.73% (1981-1991), further declined to 22.73% (1991-2001), and finally experienced a sharp drop to 15.99% during the 2001-2011 decade. Regionally, Major metropolitan corridors continued to act as "growth magnets," with Thane and Pune recording growth rates of 35.94% and 30.34 % respectively, during the 2001–11 period. Conversely, a distinct demographic reversal occurred in the Konkan coastal belt and central city areas, where districts such as Mumbai City, Ratnagiri, and Sindhudurg reported negative growth rates of -5.75 %, -4.96 %, and -2.30 %, respectively, by the 2001–11 census. This phase signals the "hollowing out" of city cores and the persistent economic challenges of rural coastal tracts. Increased urbanization, higher literacy rates (particularly female literacy), widespread acceptance of family planning measures, and shifting socio-economic aspirations have led to a substantial decline in the Total Fertility Rate (TFR), which currently hovers around or below the replacement level of 2.1 in many urban districts.

Table 2: Micro-Regional Classification of Districts by Demographic Transition Phase (2001-2011)

Transition Phase	Demographic Characteristics	Associated Districts (Examples from Data)	Main Driver of Population Dynamics
Phase A: Advanced Migratory Transition	High overall growth rates, but very low natural biological birth rates.	Thane, Pune, Mumbai Suburban, Aurangabad	Driven by massive economic in-migration and industrial agglomeration.
Phase B: Late / Stabilizing Transition	Moderate, steady growth matching national replacement trends.	Nashik, Jalna, Parbhani, Dhule, Nagpur	Driven by balanced economic development and stabilizing natural fertility.

Phase Declining Hollowing Transition	C: Low, stagnant, or negative decadal growth rates.	Ratnagiri, Sindhudurg, Raigad, parts of Bhandara/Gadchiroli	Driven by heavy out-migration of youth and declining local birth rates.
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Source: Compiled by the Researcher.

Based on the spatial patterns structured in Table 2, the modern demographic realities of this final phase (1981–2011) reveal three distinct regional trajectories:

- I. Advanced Migratory Growth Cores: Industrialized hubs experiencing high artificial growth driven by economic inward shifts, despite achieving biological fertility declines.
- II. Stabilizing Development Zones: Inland districts displaying steady, organic growth in line with baseline socio-economic advancement.
- III. Demographically Hollowing Peripheries: Vulnerable agrarian and coastal tracts characterized by stagnant or negative growth due to intense out-migration and localized aging.

These micro-regional disparities highlight that a singular, centralized planning strategy is inherently inadequate for the state; rather, a dual policy approach balancing urban infrastructural absorption with rural economic stabilization is urgently required.

6.2 Analysis of Decadal Trends in Population Growth Rates

The demographic evolution of Maharashtra over a 110-year period (1901–2011), as detailed in Table 3, reveals a clear transition through three distinct historical phases. In the early pre-transition period, the state experienced slow and fluctuating growth, notably recording a unique negative decadal growth rate of -2.91% during 1911–1921 due to high mortality from severe epidemics and famines. Following independence, rapid improvements in healthcare and sanitation led to a population explosion phase, with the growth rate peaking at an all-time high of +27.45% in the 1961–1971 decade. However, since 1991, Maharashtra has entered a steady stabilization and decline phase; the decadal growth rate decelerated from 25.73% (1981–1991) to 15.99% (2001–2011), illustrating a progressive demographic maturity driven by rapid urbanization, higher female literacy, and widespread acceptance of family planning measures.

Table 3: Decadal Variation in Population Growth Rates

Year	Population Growth Rate
1901-1911	10.74
1911-1921	-2.91
1921-1931	14.91
1931-1941	11.99
1941-1951	19.27

1951-1961	23.60
1961-1971	27.45
1971-1981	24.54
1981-1991	25.73
1991-2001	22.73
2001-2011	15.99

Note: Population growth rate in percentage.
Source: Census of India, (1901-2011).

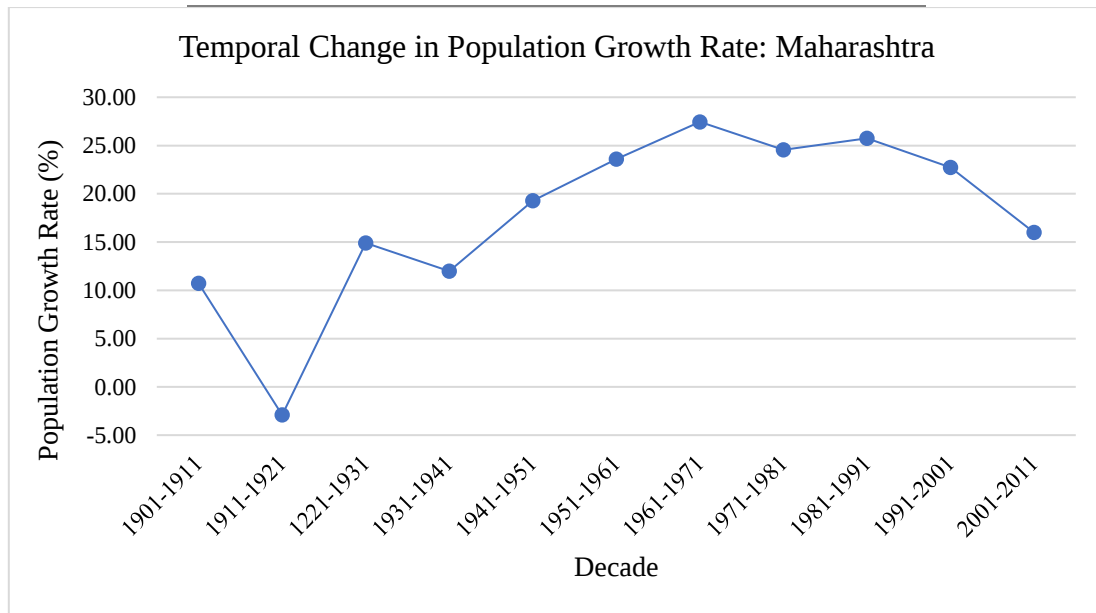


Figure 2: Temporal Changes in Population Growth Rate: Maharashtra

Source: Census of India, (1901-2011).

The spatio-temporal dynamics of population growth in Maharashtra between 1961 and 2011 are marked by significant volatility rather than a uniform demographic transition. As illustrated in the decadal differences in growth rates, the state's demographic trajectory is characterized by alternating periods of acceleration and deceleration, reflecting the responsiveness of population change to shifting socio-economic conditions, industrial policies, and migratory flows.

Table 4: Maharashtra: Difference in growth rates during 1961-71 to 2001-2011

State/District	Difference in growth rates (%)				
	1961-71	1971-81	1981-91	1991-01	2001-11
Nandurbar	-2.8	0.1	2.8	-1.8	2.1
Dhule	-5.6	0.5	-1.5	-6.6	4.0
Jalgaon	0.3	3.0	-1.6	-6.2	-0.8
Buldhana	-2.6	0.3	5.6	-6.7	-2.4
Akola	-1.2	-2.6	-2.8	-0.3	-9.0
Washim	4.6	-7.6	3.1	-3.4	-1.1

Amravati	5.5	-4.2	-2.6	0.3	-7.7
Wardha	5.2	-4.0	-3.7	0.7	-11.1
Nagpur	6.2	4.5	-6.3	-3.2	-9.4
Bhandara	5.1	-6.8	3.8	-8.9	-5.7
Gondiya	7.3	-10.4	-5.5	0.5	-0.4
Gadchiroli	16.3	-13.1	1.4	-0.2	-12.8
Chandrapur	14.3	-4.5	-1.7	-8.2	-10.9
Yavatmal	11.7	-7.6	-2.5	-1.2	-5.4
Nanded	7.3	-4.3	8.1	-9.8	-6.7
Hingoli	1.7	-1.0	3.0	-5.9	-0.4
Parbhani	9.2	-3.0	8.4	-12.8	2.0
Jalna	-2.4	-9.2	17.6	-14.3	3.6
Aurangabad	-0.3	-3.5	11.5	-8.7	-3.5
Nashik	-2.0	-1.4	2.5	0.9	-7.3
Thane	9.2	8.8	9.7	-1.7	-19.0
Mumbai (Suburban)	2.7	-39.2	-34.8	-8.2	-20.0
Mumbai	-8.3	-3.8	-10.3	8.5	-10.9
Raigarh	2.8	-1.6	5.1	-1.8	-1.6
Pune	2.4	2.2	1.8	-2.1	-0.4
Ahmadnagar	1.9	-8.4	5.0	-4.6	-7.4
Bid	7.9	-13.4	13.5	-10.3	1.0
Latur	4.4	-4.9	6.4	-5.6	-6.0
Osmanabad	7.5	-16.9	13.0	-7.5	-4.8
Solapur	-2.5	-5.3	9.0	-5.7	-7.0
Satara	-0.7	-2.8	2.2	-5.7	-7.6
Ratnagiri	5.0	-3.7	4.0	-2.0	-14.9
Sindhudurg	-2.6	-1.5	3.5	-2.2	-6.7
Kolhapur	6.5	-6.2	-1.1	-3.8	-7.9
Sangli	1.9	-6.2	1.5	-3.5	-7.7
Maharashtra	3.9	-2.9	1.2	-3.0	-6.7

Source: Compiled by the researcher.

Data presented in Table 4 indicates that Maharashtra experienced inconsistent growth pacing, with the most pronounced deceleration occurring in the 2001–2011 decade, which recorded a state-wide growth rate difference of -6.7. This trend suggests a move toward demographic stabilization, likely driven by advancements in literacy, urbanization, and the broader demographic transition associated with the state's economic development. However, this state-level trend masks the profound regional disparities observable at the district level.

The data reveals a stark divide between highly urbanized centres and agrarian-dominated regions. Metropolitan districts such as Thane and Mumbai (Suburban) exhibit extreme volatility, particularly in the later decades; for instance, the record deceleration of -

19.0 and -20.0, respectively, during the 2001-2011 period suggests a saturation effect where the pace of in-migration stabilizes or shifts toward peripheral districts. Conversely, districts like Gadchiroli and Chandrapur show erratic patterns-marked by large positive spikes followed by sharp negative declines- which indicate that demographic growth in remote or agrarian regions is highly vulnerable to localized factors including agricultural instability, infrastructure projects or sudden economic shifts.

Furthermore, districts such as Aurangabad and Jalna underscores how targeted development policies and regional industrial expansion can trigger localized surges in population growth. Ultimately, the volatility index data demonstrates that population growth across Maharashtra is far from uniform. Instead, it functions as a dynamic spatio-temporal process, with individual districts experiencing distinct demographic pressures shaped by their specific placement within the state's shifting economic and urban hierarchy.

6.3 Spatial levels and regional disparities of population growth

Although aggregate state-level data indicates a slowing of population growth, a district-wise analysis reveals a landscape characterized by extreme spatial polarization. As detailed below in Table 5, the 35 districts of Maharashtra exhibit a profound variance in decadal growth rates during the 2001-2011 census period. This computed data allows for the classification of the state into distinct geographic categories based on these localized population growth levels, ranging from highly expansive economic corridors to demographically decelerating zones.

Table 5: Classification of Districts According to Decadal Growth Rate (2001-2011)

Classification of districts according to growth rate					
High growth rate above 25%		Medium high growth rate above 20 to 25%		Medium growth rate 15 to 20%	
District	Growth rate	District	Growth rate	District	Growth rate
Thane	35.94			Dhule	19.96
Pune	30.34	Nashik	22.33	Bid	19.65
Aurangabad	27.33	Jalna	21.84	Hingoli	19.43
Nandurbar	25.5	Parbhani	20.18	Raigad	19.36
				Latur	18.04
				Washim	17.23
				Nanded	16.7
Medium low growth rate 10 to 15%		Low growth rate above 0 to 10%		Negative growth rate less than 0%	
District	Growth rate	District	Growth rate	District	Growth rate
Jalgaon	14.71				
Nagpur	14.39	Kolhapur	9.96		
Yavatmal	12.9	Sangli	9.18		

Ahmadnagar	12.43	Mumbai (Suburban)	8.01	Sindhudurg	-2.3
Solapur	12.1	Satara	6.94	Ratnagiri	-4.96
Osmanabad	11.69	Chandrapur	5.95	Mumbai	-5.75
Akola	11.6	Bhandara	5.52		
Amravati	10.77	Wardha	4.8		
Gadchiroli	10.46				
Gondiya	10.13				

Source: Compiled by the researcher.

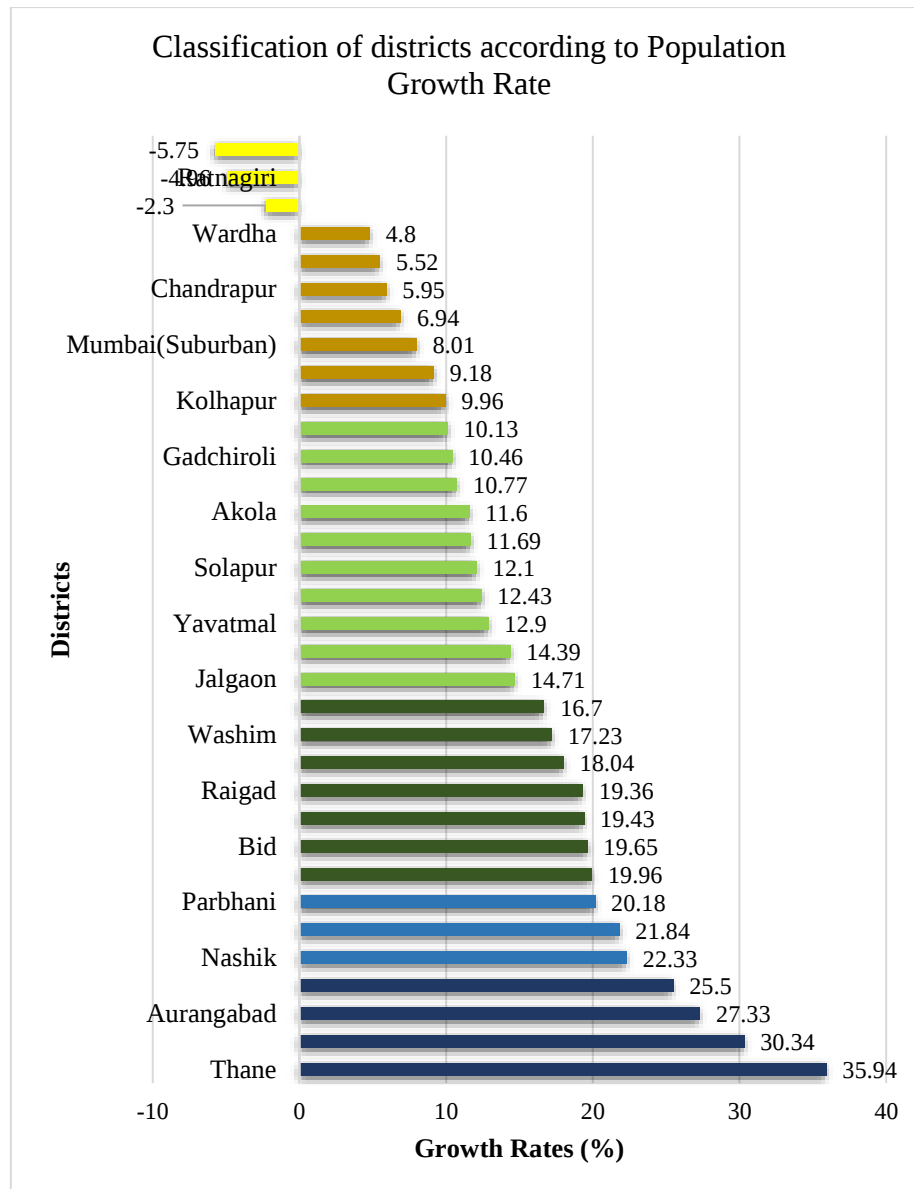


Figure 3: Classification of districts according to Population Growth Rate

Source: Census of India, (1901-2011).

6.3.1 Regions of High Growth Rate (Above 25%)

This category comprises four districts: Thane, Pune, Aurangabad, and Nandurbar. This group represents the demographic extremes of the state but for fundamentally different reasons. Thane recorded the highest growth rate in Maharashtra at an astronomical 35.94%, followed closely by Pune at 30.34%. This explosive growth is not biological; it is overwhelmingly driven by the 'pull' factors of economic opportunity. Thane acts as the primary spill-over destination for the saturated Mumbai metropolis, absorbing massive residential and industrial displacement. Pune has emerged as a global IT and educational hub, attracting youth from across India. Aurangabad (27.33%) serves as the industrial and administrative capital of the Marathwada region, drawing immense intra-regional migration. Interestingly, Nandurbar (25.50%) falls into this category not due to urbanization, but due to its predominantly tribal demographic profile, where natural biological increase remains high due to lower literacy, limited access to family planning, and socio-cultural adherence to larger family sizes.

6.3.2 Regions of Medium High Growth Rate (20% to 25%)

This category encompasses Nashik (22.33%), Jalna (21.84%), and Parbhani (20.18%). Nashik's growth is closely linked to its geographic proximity to Mumbai and Pune, forming the third vertex of Maharashtra's "Golden Triangle." The development of heavy engineering, automobile, and agro-processing industries in Nashik, alongside its rich agricultural hinterland, drives strong economic retention and in-migration. Meanwhile, Jalna and Parbhani in Marathwada represent districts experiencing late-stage demographic expansion, where improved healthcare has reduced mortality, but fertility rates are only now beginning to decline, keeping the natural increase relatively high.

6.3.3 Regions of Medium Growth Rate (15% to 20%)

A significant portion of central and eastern Maharashtra falls into this transitional zone, including Dhule (19.96%), Bid (19.65%), Hingoli (19.43%), Raigad (19.36%), Latur (18.04%), Washim (17.23%), and Nanded (16.70%). These districts are predominantly agrarian economies with emerging tertiary sectors within their district headquarters. Among these, Raigad is experiencing rapid industrial expansion spilling over from Mumbai/Thane (Navi Mumbai influence), which fuels its growth. In contrast, growth in the Marathwada districts (Bid, Latur, Nanded) has stabilized near the state average. These areas frequently face recurrent droughts, leading to the seasonal out-migration of agricultural labourers (e.g., sugarcane cutters from Bid to western Maharashtra), which acts as a mechanism preventing higher permanent population retention.

6.3.4 Regions of Medium Low Growth Rate (10% to 15%)

This category is the most extensive, comprising 10 districts: Jalgaon, Nagpur, Yavatmal, Ahmadnagar, Solapur, Osmanabad, Akola, Amravati, Gadchiroli, and Gondiya. These districts are largely located in the Vidarbha region and the rain-shadow belt of western Maharashtra. The demographic behaviour here is characterized by a mature natural increase mechanism tempered by considerable out-migration. Nagpur (14.39%), despite being the winter capital and largest city in central India, has a growth rate below the state average, indicating that its urban sprawl is not expanding at the pace of Pune or Thane. Gadchiroli (10.46%) and Gondiya (10.13%) are heavily forested, geographically isolated, and affected by left-wing extremism, leading to a lack of industrialization and consequently, very low in-migration and moderate natural growth.

6.3.5 Regions of Low Growth Rate (0% to 10%)

Districts exhibiting low growth rates include Kolhapur (9.96%), Sangli (9.18%), Mumbai Suburban (8.01%), Satara (6.94%), Chandrapur (5.95%), Bhandara (5.52%), and Wardha (4.80%). Kolhapur, Sangli, and Satara form the affluent sugarcane belt of western Maharashtra. The low growth here is a positive indicator of high socio-economic development; high literacy, exceptional healthcare, and deep penetration of family planning have brought the Total Fertility Rate (TFR) down to replacement levels. Mumbai Suburban (8.01%) exhibits low percentage growth because its base population is already saturated, and real estate costs push new migrants further north to Thane and Palghar. Wardha and Bhandara in Vidarbha suffer from severe agrarian crises and lack of employment, leading youth to permanently migrate to Nagpur or Pune, suppressing local population growth.

6.3.6 Regions of Negative Growth Rate (Less than 0%)

This is the most critical and distinct demographic category, comprising Sindhudurg (-2.30%), Ratnagiri (-4.96%), and Mumbai City (-5.75%). Ratnagiri and Sindhudurg, situated in the rugged Konkan coastal tract, have historically suffered from a "money-order economy." The deeply dissected lateritic plateaus offer virtually no scope for large-scale agriculture, and environmental regulations restrict heavy industrialization. Consequently, the working-age male population migrates to Mumbai in large numbers for employment, leaving behind a population heavily skewed toward the elderly and females. This massive out-migration results in an absolute demographic decline. Conversely, the negative growth in Mumbai City (island city) is a classic geographic phenomenon of central business district (CBD) hollowing. As commercial real estate takes over and land prices skyrocket, the residential population is displaced to the suburbs and neighbouring districts, causing the core city's population to shrink.

6.4 Factors Influencing Regional Variations in Population Growth

The vast regional disparities elucidated in the spatial analysis are not accidental but are the result of complex interplay between multiple determinants.

6.4.1 Physical and Topographical Determinants

Relief and topography are foundational controls on human settlement. The rugged terrain of the Sahyadri mountains and the undulating plateaus of the Konkan (Ratnagiri, Sindhudurg) limit agricultural expansion and hinder the development of dense transport networks. This physical isolation directly correlates with negative population growth. Conversely, the flat, fertile river valleys of the Krishna and Godavari basins support dense agrarian populations. Climate, particularly rainfall variability, acts as a massive 'push' factor. The drought-prone rain-shadow region encompassing parts of Solapur, Ahmadnagar, and Bid forces seasonal and permanent out-migration, suppressing growth rates. In contrast, districts with assured rainfall or extensive canal irrigation (e.g., Kolhapur) maintain stable demographics.

6.4.2 Economic Determinants

Economic geography serves as the primary catalyst for spatial disparities across contemporary Maharashtra. Historically, Capital investment, infrastructural development, and industrial policies have disproportionately favoured the Mumbai-Thane-Pune-Nashik corridor. This agglomeration economy generates vast opportunities in the secondary and tertiary sectors, acting as massive economic 'pull' factor that drains human capital from rural areas. Consequently, the exponential expansion seen in districts like Thane and Pune stems directly from globalization and the booming IT industry. On the other hand, the Vidarbha and Marathwada regions suffer from chronic deficit in the manufacturing sector. Their reliance on rain-fed, mono-crop cultivation makes their economy highly vulnerable. This economic imbalance ultimately reflects in the low to medium-low demographic growth observed in districts like Wardha, Yavatmal, and Amravati.

6.4.3 Socio-Cultural and Demographic Determinants

Social development indices, particularly female literacy and healthcare access, heavily influence natural biological growth. In the affluent sugarcane belt of western Maharashtra (Satara, Sangli, Kolhapur), high literacy rates and cooperative movements have empowered communities, leading to widespread adoption of family planning and resulting in low, stable growth rates (below 10%). In stark contrast, tribal-dominated districts like Nandurbar exhibit high growth (25.50%) primarily due to social isolation, lower literacy, and higher infant mortality rates, which historically compel families to have more children to ensure survival.

6.4.4 Policy and Governance Factors

Government policies related to urbanization and land use play a crucial role in shaping these demographic shifts. The strategic development of satellite cities such as Navi Mumbai, alongside specialized industrial zones (MIDCs) determines where population surges will occur. Meanwhile, the negative growth recorded in Mumbai City is primarily a policy-driven outcome of decongesting the island city and shifting commercial hubs like Bandra-Kurla Complex and residential zones further north.

7. CONCLUSION:

The detailed spatio-temporal analysis of Maharashtra's population dynamics from 1901 to 2011 distinctly reveals a highly active yet deeply polarized demographic landscape. Temporally, the state has systematically progressed through distinct historical epochs. It transitioned from the Era of Demographic Instability (1901–1921), through the Era of Rapid Demographic Expansion (1951–1981), to its current stage of stabilization. The notable deceleration in the decadal growth rate during the 2001–2011 census period underscores the positive impact of social awareness, expanded literacy, and healthcare advancements in curbing natural population growth.

However, spatial assessment indicates that this demographic transition is highly uneven, revealing stark regional imbalances. The classification of districts highlights a concerning polarization: the western industrial corridor faces severe strain due to explosive, migration-led hyper-growth (exceeding 30% in Thane and Pune), resulting in infrastructural deficits, rapid informal housing expansion, and environmental stress. Conversely, peripheral regions like Konkan and eastern Vidarbha face demographic stagnation or absolute population declines driven by persistent out-migration, which systematically drains these areas of their youth and vital human capital.

These spatial disparities are deeply rooted in geographical constraints, historical biases in industrial capital allocation, and the sharp economic divide between prosperous irrigated agricultural zones and vulnerable, rain-fed farming belts. To foster sustainable and balanced regional growth, state planners must move beyond aggregate, state-level strategies. There is an urgent need to implement decentralized economic policies that actively divert industrial investment away from the saturated Mumbai-Pune-Nashik belt. This strategy should focus on developing robust secondary and tertiary urban centres in Marathwada and Vidarbha, promoting agro-processing units at the taluka level to anchor rural populations, and designing targeted development frameworks to address the unique topographical challenges of the Konkan region. Only through equitable spatial economic distribution can Maharashtra

harmonize its demographic landscape and sustainably leverage its human resources for future development.

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