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# Transformation Journey of Gurugram: Environmental and Governance Challenges

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***ABSTRACT***
*This research paper intends to examine Gurugram's evolution from an Agricultural Landscape to a Global Urban Center, focusing particularly on the transformation of its urban villages within the development framework. The study analyzes data spanning from 1990 to 2023, incorporating land use changes, housing statistics, and development patterns across multiple Master Plans. Analysis reveals dramatic shifts in urban-rural population ratios, from 38.59% urban in 1991 to a projected 95.25% by 2021. The city's housing stock of 5,23,691 census houses shows complex occupancy patterns, with 81.27% occupied and 18.73% vacant, while land use changes indicate built-up area expansion from 623.95 hectares in 1990 to 7,336.69 hectares by 2017. The research examines the integration of 93 villages within the Gurgaon-Manesar Urban Complex (GMUC) 2031 Plan, highlighting challenges in managing traditional settlements within a rapidly modernizing urban framework.*
***Keywords***- *Urban Villages, Transformation, Urbanization, Master Plans, Development.*

## 1. INTRODUCTION

Gurugram, formerly known as Gurgaon, has undergone rapid transformation over the past few decades, evolving from a primarily agricultural area into a bustling urban center within the National Capital Region (NCR) of India. The city's strategic location, coupled with liberalization policies initiated in the 1990s, has attracted significant investment and population influx (Kumar, 1995). This urbanization has significantly impacted the region's socio-economic dynamics, leading to the growth of urban villages that play a crucial role in accommodating the city's workforce (Cowan, 2018). The estimated population of Gurugram in 2021 was 25,89,917, reflecting its remarkable growth trajectory and intensive urbanization process (Census of India, 2011).

The transformation of Gurugram represents one of India's most significant urban development narratives, characterized by private sector-led growth and rapid infrastructure development (Chauhan & Kumar, 2023). The city's evolution has been particularly notable in its urban villages, where dramatic physical, social, and economic changes have occurred while attempting to maintain traditional character within an increasingly modernized urban framework.

The city's development trajectory has been shaped by several crucial factors, including progressive legislative frameworks introduced in the 1960s and 1970s, and the emergence of private sector-led development post-1991 (Kennedy & Sood, 2016). The establishment of major industrial units, particularly Maruti Suzuki in the 1980s, marked the beginning of Gurugram's industrial growth. Subsequently, the IT/ITES sector boom of the late 1990s and early 2000s transformed the city into a leading business hub, attracting multinational corporations and a skilled workforce from across the country (Cowan, 2018).

The rapid urbanization has brought significant challenges, particularly in terms of infrastructure development, housing affordability, and integration of traditional village settlements into the modern urban fabric (Bhan & Sharma, 2021). The city's urban villages have undergone substantial transformation, often serving as crucial providers of affordable housing while facing increased pressure on their infrastructure and social structure (Sinha, 2017).

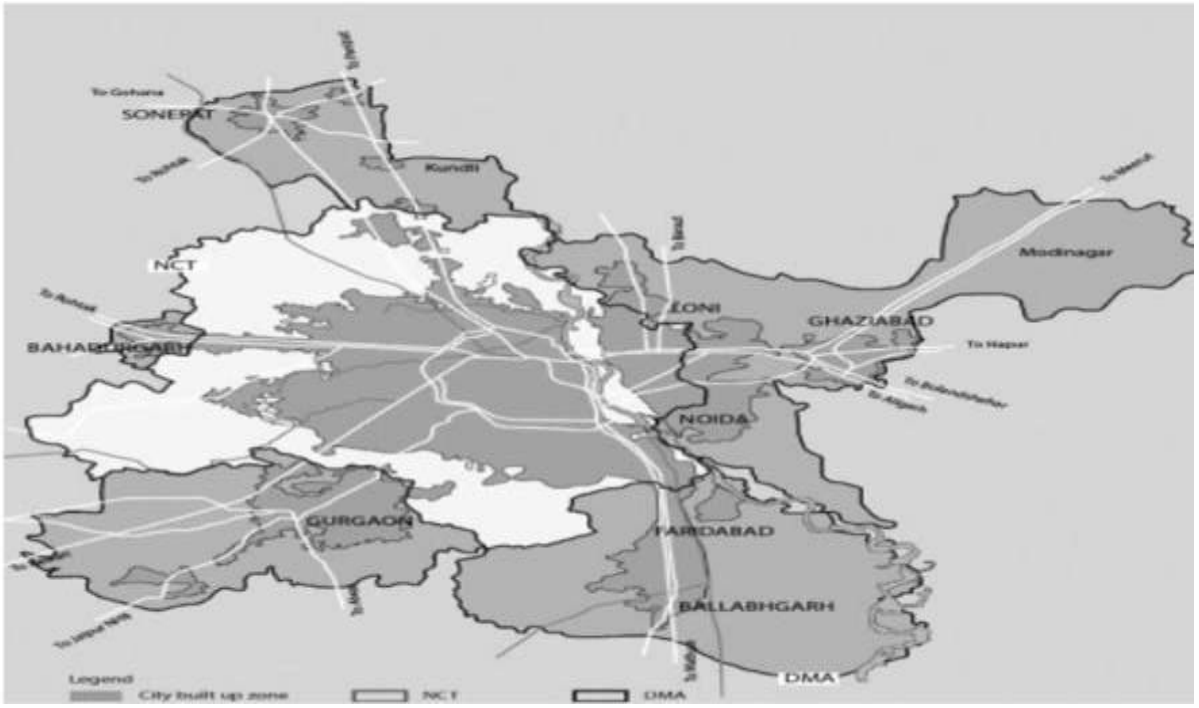


**Figure 1: Map showing Gurugram's location and its proximity to Delhi, including major transport corridors and neighbouring regions.**
**Source: NCRPB**

The objectives of the study shall primarily include:

- To analyze the spatio-temporal patterns of residential development in Gurugram's urban villages (1990-2023).
- To assess the impact of rapid urbanization on housing availability and its quality in urban villages.
- To examine the challenges and opportunities in integrating traditional settlements with modern urban development mechanisms.

This research employs a mixed-method approach, combining quantitative analysis of demographic and land use data with qualitative assessments of development patterns and community impacts. The findings aim to contribute to the broader understanding of urban transformation processes in rapidly growing cities of developing economies while providing specific insights for policy formulation and urban planning strategies.

## 2. HISTORICAL EVOLUTION (1960s-2023)

The transformation of Gurugram from a modest agricultural settlement to a global urban hub is a compelling narrative. During the pre-development phase (1960s-1970s), the region consisted predominantly of agricultural lands and traditional villages, with minimal urban characteristics (Chauhan & Kumar, 2023). The Punjab Scheduled Roads and Controlled Areas Restriction of Unregulated Development Act (1963) marked the first systematic attempt to regulate urban development, while village residential abadi land (laldora) was excluded from this process, shaping the development patterns of urban villages (Cowan, 2018).

The 1970s saw new momentum with the Haryana Development and Regulation of Urban Areas Act (1975) and Gurugram's first Master Plan (1981), establishing a development control area of 7,297 hectares (MCG, 2023). A significant turning point came with the founding of Maruti Udyog in 1983, triggering Gurugram’s industrial growth and laying the groundwork for future economic expansion (Kennedy & Sood, 2016).

The post-liberalization period (1991-2000) brought rapid transformation through commercial developments, the establishment of technology parks, and residential complexes. Gurugram emerged as a leading urban and business hub, often referred to as the "Manhattan of the East" and "Detroit of India" (Bhan & Sharma, 2021). Following 2000, the city gained global recognition for its rapid growth, positioning itself as one of India’s most desirable cities for living and working (Indian Express, 2019).

With a growth rate of 73% over the past decade, Gurugram outpaced other NCR cities, such as Noida and Faridabad (Census of India, 2011; NCRPB, 2021).

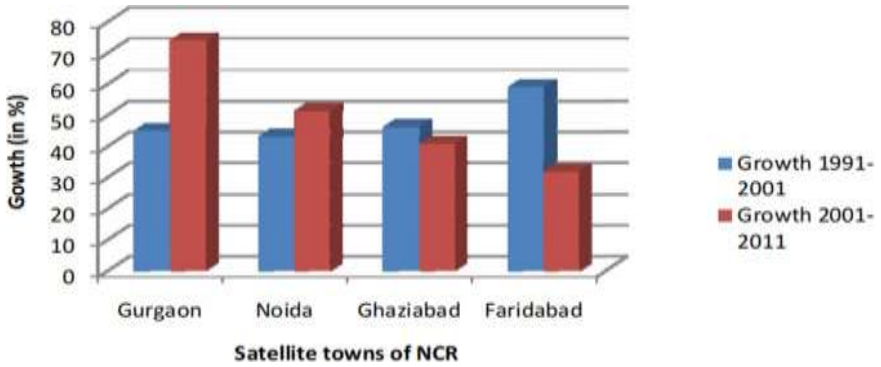


**Figure 2: Comparative Changing Decadal Growth Rates**
**Source: Census of India**

The 2000-2010 period saw Gurugram emerge as India's leading IT-ITES hub with developments like DLF Cyber City, Udyog Vihar, and Golf Course Road, which created significant employment opportunities and triggered substantial population growth (Cowan, 2018). Infrastructure advancements like the Delhi Metro connectivity (2010) and NH-8 expansion played a pivotal role in enhancing accessibility and shaping urban morphology (MCG, 2023).


**Figure 3: Spatial growth of Delhi 1991-2011**
**Source: REAL CORP 2011, CHANGE FOR STABILITY: Lifecycles of Cities and Regions**

Between 2010 and 2020, Gurugram experienced rapid vertical growth and densification. The Gurgaon-Manesar Urban Complex (GMUC) Master Plan 2031 integrated 93 villages into the urban framework, drastically impacting traditional settlement patterns (DTCP, 2023). This period also saw intensive real estate development with high-rise buildings and commercial complexes transforming the skyline, though infrastructure deficits became increasingly apparent, particularly in overburdened urban villages where population densities reached 5-6 times planned limits (Mahadevia & Sanghi, 2022; Kundu, 2023).


**Figure 4: Evolution of Gurugram from 1990 to 2024**
**Source: https://www.linkedin.com/pulse/success-story-gurgaon-viresh-singh/**

Since 2020, efforts have shifted towards addressing urbanization challenges while promoting sustainable practices (MoHUA, 2023). The establishment of the Gurugram Metropolitan Development Authority (GMDA) in 2017 marked a renewed focus on integrated urban planning (NIUA, 2021). Current trends highlight mixed-use developments, transit-oriented planning, and bridging the infrastructure divide between planned sectors and urban villages (Sinha, 2017).

## 3. MASTER PLAN EVOLUTION AND ADMINISTRATIVE FRAMEWORK

Gurugram's urban form has been significantly shaped by its administrative and planning frameworks, particularly successive master plans guiding its rapid transformation (Chauhan & Kumar, 2023). This systematic planning approach, while ambitious, has faced challenges integrating traditional village settlements into the modern urban fabric, creating a complex landscape of development patterns and regulatory overlaps (Sinha, 2017).

Multiple agencies with overlapping jurisdictions govern this transformation, including the Municipal Corporation of Gurugram (MCG, 2023), the Haryana State Industrial and Infrastructure Development Corporation (HSIIDC, 2023), and the Department of Town and Country Planning (DTCP, 2023), leading to fragmented development approaches at times. Master Plans, especially post-1991, have struggled to address the integration of existing village settlements (Anamica, Chatterji, & Heynen, 2020).

Gurugram's spatial planning has evolved through successive master plans. The 2001 Master Plan was the first comprehensive attempt at planned development, incorporating 43 villages, with 23 within planned sectors and 19 on the periphery, establishing an urban-rural interface (MCG, 2023). While laying the city's development framework, it faced challenges related to infrastructure and development control (DTCP, 2023).

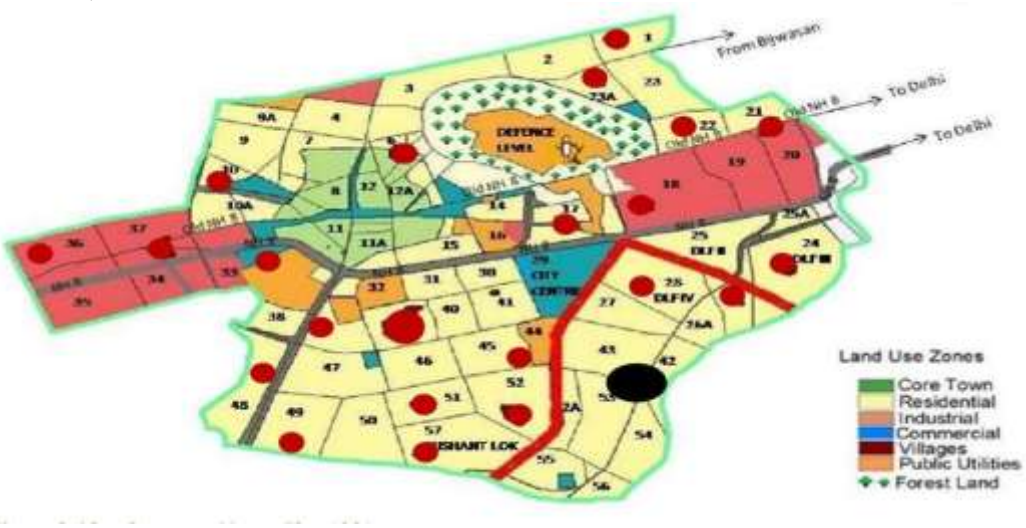


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**Figure 5: Gurgaon Master Plan 2001**
**Source: Town and Country Planning Department, Haryana**

The Gurgaon-Manesar Urban Complex (G.M.U.C.) Master Plan 2031 represents a significant expansion (NCRPB, 2021), incorporating 93 villages, reflecting Gurugram's accelerated growth and evolving priorities (Friedmann, 2004). Its spatial distribution is more complex, with 58 villages within developed sectors, 8 in and around Manesar, and the rest on the outskirts (GMDA, 2023). This reflects Gurugram's rapid growth and the need for systematic urban expansion management (Dupont, 2005). Integrating these zones into a cohesive urban framework highlights the challenge of balancing growth with sustainability (Shaw, 2004).


**Figure 6: GMUC Master Plan 2031**
**Source: Town and Country Planning Department, Haryana**

**Table I: Comparative Analysis of Master Plans 2001-2031**

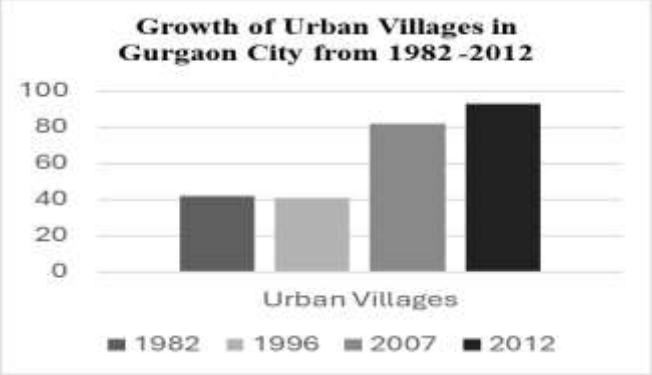
| Development Plan | Date of Notification | Urbanisable Area (ha) | Residential Area (ha) | Village Abadies Area (ha) | Existing Town (ha) | Targeted Population / Density (PPH) |
|---|---|---|---|---|---|---|
| 2001 AD | 08-01-1996 | 9881, applicable to Control Areas of Gurgaon | 6243 | - | - | 10 lacs / 160 |
| 2021 AD | 05-02-2007 | 37069 including 4570 ha SEZ | 14930 | 428 | 406 | 37 lacs / 200 |
| 2025 AD | 24-05-2011 | 37512 including 4570 ha SEZ | 15148 | 428 | 406 | 40 lacs / 250 |
| 2031 AD | 15-11-2012 | 37872 (No SEZ) | 16021 | 478 | 406 | 42.50 lacs / 250 |

**Source: Town and Country Planning Department, Gurugram, compiled by authors**

Urbanization has increased dramatically, from 9,881 hectares in 2001 to 37,872 hectares projected for 2031—nearly fourfold growth—driven by industrial and residential demands (Kundu, 2011; Chauhan & Kumar, 2023). Residential areas have grown from 6,243 hectares in 2001 to a projected 16,021 hectares by 2031, demonstrating efforts to address housing demands through urban planning (Bourne & Simmons, 1978; MoHUA, 2023).

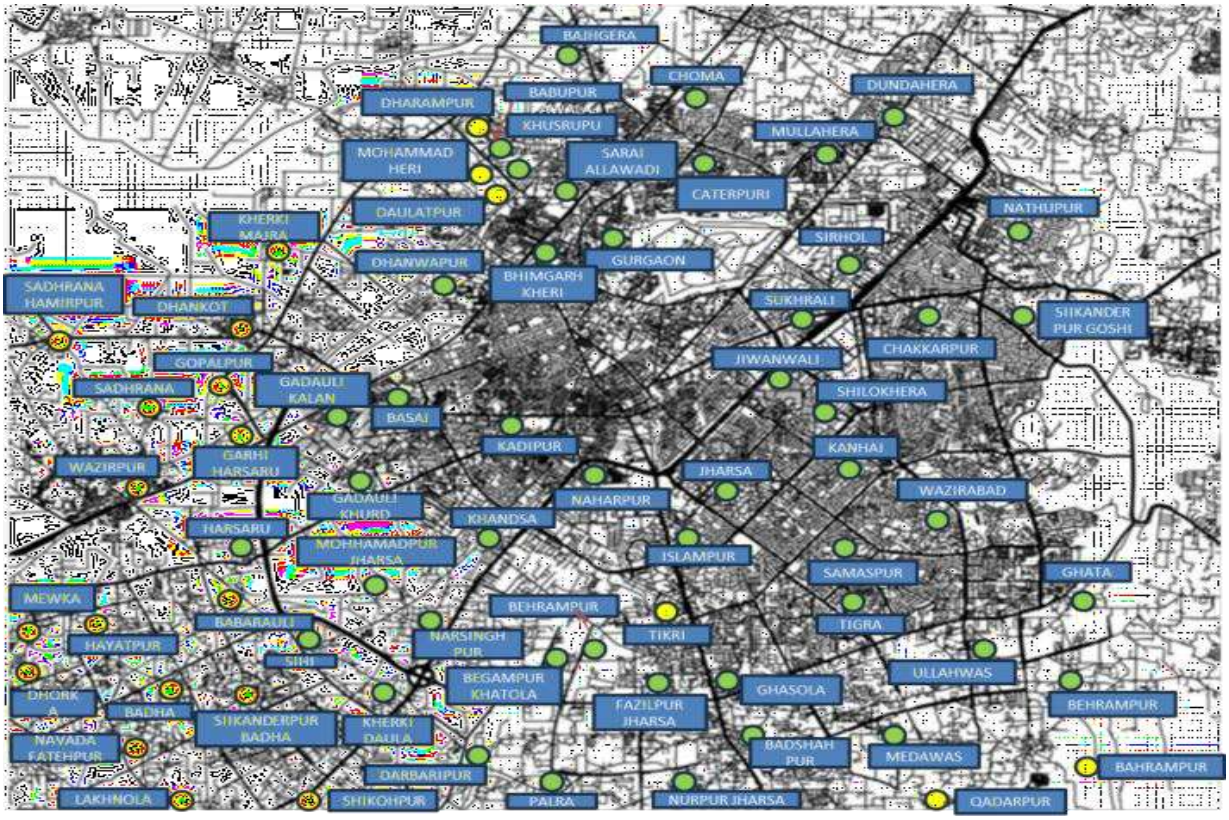
Population density is also projected to increase significantly, targeting 42.5 lacs residents at 250 persons per hectare (PPH) by 2031, compared to 10 lacs at 160 PPH in 2001, reflecting a strategic approach to accommodate growth and optimize infrastructure (Sudhira, Ramachandra, & Jagadish, 2004; NCRPB, 2021). The introduction and subsequent adjustments of Special Economic Zones (SEZs) in the 2021, 2025, and 2031 plans indicate evolving development priorities (Kundu, Pradhan, & Subramanian, 2002; Friedmann, 2004).As G.M.U.C. progresses, these transformations present opportunities and challenges. Increased urbanized area and population density require careful consideration of infrastructure, environmental sustainability, and public amenities (Peng, 2015; Mahadevia & Sanghi, 2022). These challenges are acute in urban

**Figure 7: Growth of Urban Villages in Gurgaon City from 1982-2012, Source- TCP Haryana**




village integration, where traditional settlements must be incorporated while maintaining their socio-cultural integrity (Bhan & Sharma, 2021; Dupont, 2005). Master plan evolution reveals significant changes in land use, residential areas, and urbanization trends, with substantial increases in developed areas and integrated villages (Lin, De Meulder, & Wang, 2011; Cadene, 2005).

The process of village integration into the urban matrix has been particularly noteworthy. As the city expanded, these villages found themselves engulfed by urban development, creating what are now termed as 'urban villages' (Bhan & Sharma, 2021 & Wang, 2011). These settlements, originally defined by their Lal Dora boundaries (revenue estate limits), have experienced significant morphological transformations (Sinha, 2017; Dupont, 2005). The pressure of urbanization has led to vertical growth within these villages, as traditional single-story structures have given way to multi-story buildings. This transformation has been further complicated by the unique regulatory status of Lal Dora areas, which are exempted from many building regulations and development controls that apply to the rest of the city (Department of Town and Country Planning Haryana [DTCP], 2023; Mahadevia & Sanghi, 2022).




Urban Villages 1982-2007
Urban Villages 2007-2012

**Figure 8: Urban Villages of Gurgaon**
**Source-GMUC 2031, TCP Haryana, compiled by Authors**

The integration of these villages into the urban fabric has been far from smooth. While some urban villages have benefited from their proximity to developed areas, many continue to face significant challenges in terms of infrastructure adequacy, service provision, and quality of life (Cowan, 2018; Roy, 2013). The contrast between the modern, planned sectors of Gurugram and its urban villages is often

stark, highlighting the uneven nature of urban development and the challenges of integrating traditional settlements into a rapidly modernizing city (Dupont, 2004; Shaw, 2004).

## 4. DEMOGRAPHIC AND SPATIAL TRANSFORMATION

Gurugram's demographic evolution showcases rapid urbanization and population growth, significantly impacting its spatial structure.From 57,151 residents in 1971, the city's population reached 1.5 million by 2011, marking a dramatic urban-rural shift (Census of India, 2011) Urban population share increased from 38.59% in 1991 to 79.32% in 2011, reflecting rapid urbanization within the National Capital Region. This growth led to uneven density patterns, with urban villages experiencing densities 5-6 times higher than planned sectors.

**Table II: Key Demographic Statistics in Gurugram (1991-2021)**

| Year | Urban Population (%) | Rural Population (%) | Total Population |
|---|---|---|---|
| **1991** | 38.59 | 61.41 | 57,151 |
| **2001** | 42.54 | 57.46 | 87,275 |
| **2011** | 79.32 | 20.68 | 876,824 |
| **2021** | 95.25 (Projected) | 4.75 (Projected) | 2,589,917 |

**Source: Census of India**

Gurugram's spatial transformation unfolds across three distinct phases. From 1990 to 2000, the city underwent an initial rural-to-urban land use transition. GIS-based L.U.L.C. analysis reveals that built-up areas expanded from 623.95 hectares in 1990 to approximately 2,500 hectares by 2000, consuming 6,544.3 hectares of agricultural land. Additionally, 258 hectares transitioned to vacant or acquired land, and 322.1 hectares to vegetation.

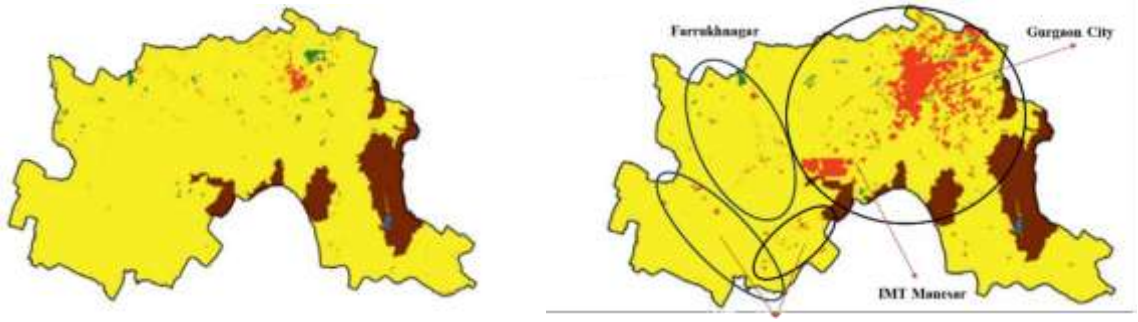



**Figure 9: Transformation of Gurugram:1990-2017, Source- Authors own work**

**Table III: Comparative analysis of LULC from 1990- 2017**

| Class | 1990 Area (ha) | 2000 Area (ha) | 2010 Area (ha) | 2017 Area (ha) | Observed Trend |
|---|---|---|---|---|---|
| **Agricultural Land** | **112,292.40** | **112,511.40** | **111,117.30** | **106,770.30** | **Decrease; lconversion to built-up areas** |
| **Built-up Area** | **623.95** | **1,630.76** | **3,084.05** | **7,336.69** | **Significant increase; from agricultural land** |
| **Barren Land** | **10,903.60** | **10,903.62** | **10,903.15** | **10,903.67** | **Stable, little change** |
| **Vegetation** | **798.65** | **577.36** | **502.76** | **485.93** | **Decrease; possible conversion to built-up** |
| **Waterbodies** | **14.08** | **172.60** | **116.32** | **78.25** | **Fluctuations due to development/management** |
| **Others** | **1,202.17** | **39.16** | **111.60** | **260.80** | **Variations, possible reclassification** |

**Source- Compiled by Authors**

The second phase (2000-2017) saw more intensive urbanization along transportation corridors. Built-up area expanded to 7,336.69 hectares by 2017, while agricultural land decreased from 112,292 hectares to

106,770 hectares. Expansion occurred along National Highway 8 and the Manesar region, driven by industrial development (Shaw, 2004). Vacant areas in 1990 were systematically urbanized by 2017, reflecting rapid growth (Roy, 2013).

The most recent phase (2018-2023) shows nuanced land use transformations, reflecting shifting priorities and environmental considerations (Feng et al., 2016). This period marks a notable increase in waterbodies and vegetation, potentially due to improved natural resource management (Sudhira, Ramachandra, & Jagadish, 2004). However, agricultural land continued declining, with some areas shifting towards sustainable practices (NIUA, 2021). The persistent urbanization trend is evident in the continued growth of built-up areas (Peng, 2015).

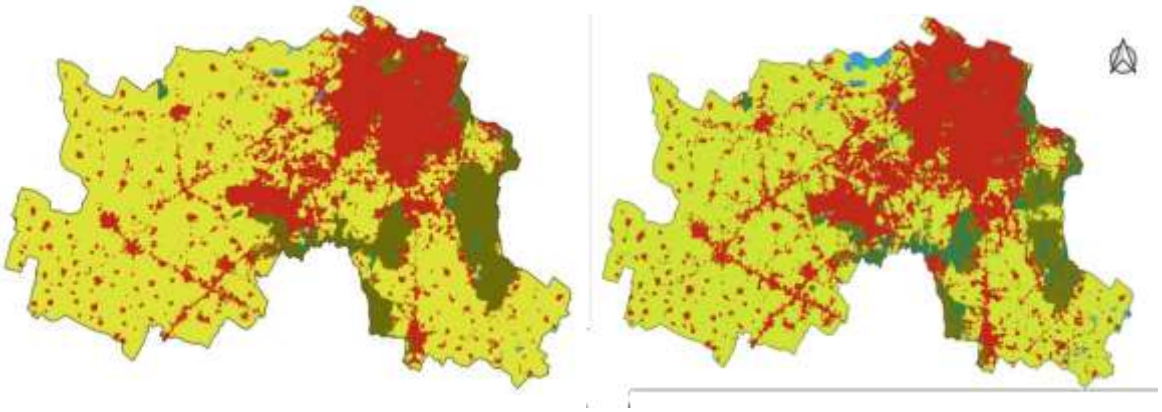


**Figure 10: -Transformation of Gurugram:2018-2023, Source- Authors own work**

The spatial distribution of population growth has been notably uneven, with urban villages absorbing a disproportionate share of the population increase (Dupont, 2004). Census data reveals that while planned sectors maintain relatively stable densities of 150-200 persons per hectare, urban villages frequently exceed 1,000 persons per hectare (Census of India, 2011). This density disparity is particularly evident in villages like Chakkarpur, Sikanderpur, and Nathupur, where building heights have increased dramatically to accommodate the growing population (Kundu, 2023). The transformation of these villages from agricultural settlements to high-density urban neighbourhoods represents one of the most significant aspects of Gurugram's spatial evolution (Sinha, 2017).

## 5. HOUSING DYNAMICS AND RESIDENTIAL DEVELOPMENT

Gurugram's housing evolution reflects a complex interplay of market forces, policy interventions, and social transformations (Roy, 2013). Census 2011 data reveals that out of 523,691 census houses, 81.27% (425,612) are occupied, while 18.73% (98,079) remain vacant, highlighting the dynamic housing supply and demand (Census of India, 2011). Housing quality varies across areas: 93.23% are in good condition, 5.54% are livable, and 1.23% are dilapidated, reflecting the rapid development pace and challenges in maintaining housing quality (NFHS-5, 2019-2021).

Gurugram's residential landscape evolved through distinct phases (NCRPB, 2021). The initial phase (1990-2000) saw the development of plotted colonies and low-rise buildings, primarily in sectors 1-57 (Shaw, 2004). From 2000 to 2010, high-rise apartments and gated communities emerged along Golf Course Road and Sohna Road, driven by demand for premium housing (NCRPB, 2021). The most recent phase (2010-2023) is characterized by mixed housing typologies, including affordable projects under the Deen Dayal Jan Awas Yojana and luxury developments, creating a diverse but segmented market (Mahadevia & Sanghi, 2022).

Urban villages present a unique aspect of Gurugram's housing dynamics (Lin, De Meulder, & Wang, 2011). Traditional single-storey dwellings have transformed into multi-story rental accommodations, often reaching 4-5 floors without formal planning approval (Bhan & Sharma, 2021). This informal densification caters to approximately 35% of the city's workforce, particularly in villages like Chakkarpur, Sikanderpur, and Nathupur (Cowan, 2018). Recent surveys indicate that these urban villages house over 60% of the city's renters, with occupancy rates exceeding 95% (NIUA, 2021).

Property market dynamics vary significantly across Gurugram (Denis & Zerah, 2017). Premium residential sectors along Golf Course Road command prices of Rs. 15,000-25,000 per square foot, while urban village properties trade at Rs. 5,000-8,000 (Roy, 2013). This price differential creates a segmented market where

urban villages provide affordable housing, while planned sectors cater to middle- and upper-income groups (Sudhira & Ramachandra, 2007; NCRPB, 2021).

Recent policies, like the Affordable Housing Policy 2013 and its amendments, aim to address affordability challenges (MoHUA, 2023). These policies mandate that 20% of new residential projects must include affordable housing components (NCRPB, 2021). However, implementation challenges and market pressures have resulted in a continued shortage of affordable housing options (Bourne & Simmons, 1978), estimated at approximately 200,000 units (Sinha, 2017).

## 6. INFRASTRUCTURE AND SERVICE PROVISION CHALLENGES IN GURUGRAM

As Gurugram evolves into a major urban hub, infrastructure and service provision challenges become increasingly evident (NCRPB, 2021). Rapid urbanization has often outpaced infrastructure development, leading to socio-economic and environmental issues (MoHUA, 2023).

One critical challenge lies in water supply and sewage management (Sudhira, Ramachandra, & Jagadish, 2004). Despite population growth, the water supply system struggles to meet demand, with many areas experiencing inadequacy or frequent shortages (Census of India, 2011). Municipal supply averages 120-80 liters per capita per day, falling short of the 135-liter benchmark set by the National Urban Water Supply Policy (NCRPB, 2021). This forces urban village residents to rely on tankers, borewells, and informal sources, exacerbating inequities (Roy, 2013).

Sewage management presents another concern. According to TERI's 2021 water sustainability report, Gurugram generates about 699.4 million liters of sewage daily, but its treatment capacity is only 388 million liters. This results in untreated sewage discharge into drains and water bodies, posing environmental and health risks, especially in densely populated urban villages (NIUA, 2021). The topography of these villages often necessitates outdated disposal methods, further endangering public health (Kennedy & Sood, 2016).

Solid waste management is equally challenging, with the MCG struggling to cope with 1,200 metric tonnes of daily waste, of which only 60% is processed (Cowan, 2018). Inefficient waste segregation and recycling systems result in overflowing dumpsites and illegal dumping (Sinha, 2017). Informal waste management practices are common in urban villages, impacting community health and the environment (Bhan & Sharma, 2021).

Transport infrastructure, despite considerable investment, struggles to match the growth in population and vehicle ownership (NCRPB, 2021). Traffic congestion plagues thoroughfares like the Delhi-Gurgaon Expressway and NH-8, especially during peak hours (Roy, 2013). While the Delhi Metro has improved connectivity, limited coverage forces many to rely on congested roads or inadequate public transport (MoHUA, 2023). Limited public transit integration in urban villages restricts efficient transportation access for a significant portion of the population (NCRPB, 2021).

Social infrastructure, including healthcare and education, faces similar challenges (Dupont, 2004). While private facilities exist, access to affordable healthcare and quality education remains uneven, particularly for urban village residents (Census of India, 2011). Overcrowded and under-resourced public health facilities contribute to healthcare disparities (MoHUA, 2023), and educational resources concentrated in affluent areas limit quality education options for many urban village students (Roy, 2013).

These challenges demand an integrated and holistic approach to urban planning in Gurugram (NIUA, 2021). Policy interventions, public investment, and community engagement are crucial (Ministry of Urban Development, 2023). Policymakers must prioritize infrastructure development that caters to all residents, ensuring the city's sustainable evolution while accommodating its diverse population (NCRPB, 2021).

## 7. SOCIO-ECONOMIC IMPLICATIONS OF URBANIZATION IN GURUGRAM

Gurugram's rapid urbanization has driven profound socio-economic shifts, reshaping residents' lives (NCRPB, 2021). As an economic hub, its growth attracts a diverse population, including migrant workers seeking opportunities in IT, manufacturing, and service sectors (Roy, 2013). This has created a unique socio-cultural environment but also challenges related to integration, income disparities, and housing (Cowan, 2018).

One significant change is the shift in employment patterns (MoHUA, 2023). The service sector now accounts for about 67% of employment in Gurugram, indicating a transition from traditional jobs to skilled positions (Census of India, 2011). The IT and financial services sectors have been instrumental in this shift, fostering higher income opportunities (NCRPB, 2021). However, economic growth is unevenly

distributed. Low-income workers, particularly in urban villages, often face informal, low-paying jobs with limited security or benefits, exacerbating inequality (Roy, 2013).

| Cluster | Total Population | Migrant Population | Dominant Group | Men's Occupations | Women's Occupations |
|---|---|---|---|---|---|
| Gurgaon Central | 200,000 | 120,000 (60%) | Bihar, UP | Factory workers, Drivers, Entrepreneurs | Homemakers, Domestic workers, Labourers, Home-based jobs |
| Kapasehra Cluster | 150,000 | 100,000 (70%) | UP, Bihar | Export Companies, Drivers | Export Companies |
| Nathupur, Sikanderpur | 200,000 | 160,000 (80%) | Bengalis | Labour, Housekeeping, Rickshaw pullers, Security Guards, Vendors | Domestic work, Housekeeping |
| Chakkarpur | 40,000 | 36,000 (90%) | Bengalis | Rickshaw, Auto Drivers | Domestic workers |
| Badshahpur | 80,000 | 48,000 (60%) | Bengalis | Drivers, Labourers, Housekeeping | Housekeeping, Domestic workers |
| Wazirabad, Silokhra, Kanhai | 50,000 | 30,000 (60%) | Bengalis | Drivers, Labourers, Housekeeping | Housekeeping, Domestic workers |

**Source:** **Agrasar**

Urbanization's impact on the standard of living is notable (NCRPB, 2021). While Gurugram offers modern amenities, access is unequal (Ministry of Urban Development, 2023). Planned sector residents enjoy better housing, services, and green spaces, while those in urban villages often face inadequate infrastructure, limited-service access, and lower living standards (Census of India, 2011). This disparity contributes to social tensions and underscores the need for equitable policies (Cowan, 2018).

The demand for housing has surged alongside the population, leading to soaring real estate prices and rental rates (NCRPB, 2021). This severely impacts lower-income residents who struggle to find affordable accommodations, pushing many into informal settlements or overcrowded urban villages (Roy, 2013). This housing crisis can exacerbate public health issues and lower the quality of life (MoHUA, 2023).

Education presents another challenge (Cowan, 2018). Rapid urbanization has strained the educational system, creating a gap between the demand for quality education and available resources (NIUA, 2021). While private schools thrive in affluent areas, public schools, particularly in urban villages, grapple with overcrowding and inadequate facilities (Census of India, 2011). Consequently, families from disadvantaged backgrounds often lack access to quality education, limiting social mobility and perpetuating poverty (Roy, 2013).

Similarly, healthcare access is uneven, with disparities in outcomes between affluent neighborhoods and urban villages (Ministry of Urban Development, 2023). The concentration of private healthcare in developed areas restricts access for lower-income residents who rely on underfunded public services (NCRPB, 2021). This disparity impacts public health, particularly in urban environments facing pollution and disease (Cowan, 2018).

Addressing these socio-economic implications requires inclusive policies that cater to all residents' needs. Efforts to improve infrastructure, expand basic service access, and ensure equitable economic opportunities are crucial for social cohesion and sustainable development (MoHUA, 2023). Community involvement in urban planning is vital to bridge gaps between diverse populations, leading to a more equitable and cohesive urban landscape (NCRPB, 2021).

## 8. ENVIRONMENTAL IMPACTS OF RESIDENTIAL TRANSFORMATION IN GURUGRAM'S URBAN VILLAGES

The residential transformation of Gurugram's urban villages has created unique environmental challenges compared to planned sectors (NCRPB, 2021). Rapid densification and unplanned vertical growth have led to specific environmental concerns requiring attention.

One significant impact stems from informal densification patterns. The replacement of single-story homes with multi-story buildings, often lacking proper setbacks or ventilation, has created urban canyons within villages (Cowan, 2018). This significantly impacts natural air circulation and solar access (MoHUA, 2023). For instance, in villages like Chakkarpur and Sikanderpur, where building heights have increased to 4–5 floors, dense patterns have reduced natural ventilation by up to 60%, contributing to localized temperature increases of 2–3°C compared to nearby planned sectors (Mukta Naik, 2015; Ministry of Urban Development, 2023).

Water management is another critical issue (NCRPB, 2021). The replacement of traditional courtyards and permeable surfaces with concrete has reduced groundwater recharge. Studies show less than 10% permeable surface area in urban villages now, compared to 30-40% previously (Anamica, Chatterji, & Heynen, 2020). This leads to frequent waterlogging during monsoons, especially in low-lying areas, compounded by inadequate drainage systems unable to cope with increased runoff (Roy, 2013; MoHUA, 2023).

Residential transformation has also impacted biodiversity. The loss of community spaces and kitchen gardens due to intensive development has led to a decline in green cover. Villages like Jharsa and Wazirabad have lost over 80% of their original green cover, affecting urban bird species and small mammals (Roy, 2013; Cowan, 2018).

Waste management is another growing concern (NIUA, 2021). Urban villages generate significantly more waste than planned sectors but lack proper collection and disposal systems (Bhan & Sharma, 2021). Narrow lanes hinder waste collection, leading to informal dumping and localized pollution, affecting soil and groundwater quality (MoHUA, 2023; NCRPB, 2021).

Deteriorating air quality is particularly alarming (MoHUA, 2023). Narrow lanes, increased vehicle ownership, reduced ventilation, and informal parking create pollution traps. Particulate matter concentrations are often 1.5 times higher than in planned areas (Mukta Naik, 2015; Bhan & Sharma, 2021).

## 9. INFRASTRUCTURE AND SERVICE PROVISION IN RESIDENTIAL AREAS

Residential transformations in Gurugram have created unequal infrastructure stress across different housing types. In urban villages, rapid vertical expansion and densification strain basic infrastructure originally designed for rural settlements (Mukta Naik, 2015). For example, villages like Chakkarpur, once home to 200-300 households, now accommodate over 2,000 rental units, overburdening water, sewage, and electrical systems (Anamica, Chatterji, & Heynen, 2020).

Water supply infrastructure reveals stark disparities. Premium areas like Golf Course Road enjoy 24/7 supply through dedicated lines. In contrast, urban villages depend on limited municipal supply (2-3 hours daily), private borewells, and water tankers (Bhan & Sharma, 2021). Surveys show 65% of urban village residents rely on supplementary sources, spending ₹1,500-2,000 monthly (Roy, 2013). Middle-income housing societies often use a hybrid system, combining municipal supply with society-maintained borewells and treatment plants (Cowan, 2018).

Sewerage infrastructure poses another critical challenge. Haphazard sewer line connections in transformed urban villages often lead to overflow and contamination (NIUA, 2021). While planned sectors benefit from proper sewerage systems and treatment, urban villages rely on a mix of formal and informal solutions (Mukta Naik, 2015). Only 45% of urban village properties have authorized sewer connections, raising environmental and health concerns (Anamica, Chatterji, & Heynen, 2020). Rapid densification in villages like Sikanderpur and Nathupur has overwhelmed existing infrastructure (Roy, 2013).

Solid waste management varies significantly. Gated communities and planned sectors typically have organized systems with segregation and regular collection (Bhan & Sharma, 2021). Urban villages face irregular collection, with about 40% of waste uncollected or improperly disposed of (Mukta Naik, 2015). Narrow lanes, a result of unplanned expansion, hinder access for garbage vehicles, leading to informal dumping grounds (Cowan, 2018).

Power infrastructure mirrors these disparities. Premium areas enjoy uninterrupted power due to dedicated feeders and backup. Urban villages experience frequent fluctuations and outages because unauthorized

vertical expansion overloads transformers and results in illegal connections (Roy, 2013; Bhan & Sharma, 2021). Surveys indicate that 35% of urban village units rely on informal, risky connections (Mukta Naik, 2015).

Road infrastructure and accessibility present unique challenges. Planned sectors feature well-designed roads, while urban villages have narrow, congested lanes, remnants of village pathways (Cowan, 2018). Vertical expansion without road widening hinders emergency vehicle and service access (Anamica, Chatterji, & Heynen, 2020). Over 70% of roads in urban villages are below the standard width for residential areas (Bhan & Sharma, 2021).

## 10. PLANNING AND POLICY IMPLICATIONS FOR RESIDENTIAL TRANSFORMATION

The rapid residential transformation of Gurugram, particularly in urban villages, necessitates a comprehensive review and reformation of existing planning policies. The current Master Plan 2031, while acknowledging urban villages, hasn't adequately addressed their integration into the broader urban fabric. Analysis reveals that formal sector development follows strict planning norms, while urban villages evolve outside these regulations, demanding immediate policy attention.

The existing policy framework faces critical challenges (Mukta Naik, 2015). The Building Regulations 2017 don't effectively address the unique characteristics of urban village housing (Anamica, Chatterji, & Heynen, 2020). Data shows that 75% of residential structures in urban villages violate building norms, yet enforcement is weak (Bhan & Sharma, 2021). MCG reports from 2020-2023 show only 12% of violations in urban villages resulted in corrective action, highlighting the gap between policy and implementation.

## 11. COMPARATIVE ANALYSIS AND ADAPTABLE INITIATIVES FROM OTHER CITIES

The transformation of residential patterns in urban villages is not unique to Gurugram, and valuable lessons can be drawn from successful initiatives implemented in other cities globally and within India. Mumbai's Cluster Development Policy 2009 showcases the successful redevelopment of old buildings and informal settlements while maintaining community cohesion (Mandal & B., 2011). The success of the Bhendi Bazaar project, which improved living conditions while preserving social fabric, offers a potential model for Gurugram (Mandal & B., 2011).

Singapore's Urban Redevelopment Authority (URA) provides a valuable example of integrated planning, effectively managing density while ensuring livability (Ellenbogen & Trivic, 2022). Their "Selective En bloc Redevelopment Scheme" (SERS) demonstrates a successful balance between preservation and renewal, presenting a framework that Gurugram could adapt (Ellenbogen & Trivic, 2022). Notably, SERS achieved 80% resident satisfaction through community consultation and fair compensation, highlighting the importance of stakeholder engagement (Ellenbogen & Trivic, 2022).

Bangkok's Baan Mankong Program emphasizes the effectiveness of community-driven development approaches. This program successfully upgraded informal settlements through community-led initiatives, demonstrating how to effectively involve local communities (Archer, 2012). The program significantly improved housing for over 96,000 households while maintaining social networks, offering valuable lessons for Gurugram (Archer, 2012). The program's innovative financing mechanism, which blends government subsidies with community savings, is particularly notable (Archer, 2012).

Within India, Ahmedabad's Town Planning Scheme (TPS) offers a compelling example of successful urban expansion management alongside robust infrastructure development (Mahadevia et al., 2018). Its impressive 95% infrastructure provision rate significantly surpasses Gurugram's current rate in urban villages (GMDA, 2024). Similarly, Hyderabad's Heritage Precincts Protection and Development Framework provides valuable insights into balancing development with cultural preservation (GHMC, 2021). This framework demonstrates that preservation and development can coexist successfully, evidenced by the 70% compliance rate in heritage zones alongside facilitated infrastructure upgrades (Rao, 2017; MoHUA, 2022).

Internationally, Ho Chi Minh City's Community-Based Upgrading Program successfully improved living conditions in traditional settlements without disrupting the social fabric, even achieving an 85% resident satisfaction rate (Nguyen & Van Diepen, 2011). Meanwhile, Jakarta's Kampung Improvement Program,

despite facing challenges, provides valuable lessons in community engagement and incremental upgrading approaches (Silver, 2008).

## 12. RECOMMENDATIONS AND FUTURE DIRECTIONS

Drawing upon insights from successful urban initiatives worldwide and acknowledging the unique challenges faced by Gurugram, a strategic roadmap for managing the residential transformation of its urban villages emerges. This roadmap prioritizes immediate action, medium-term planning, and a long-term vision, all underpinned by robust monitoring and community engagement.

The first order of business is addressing the pressing need for safety and infrastructure improvements. This requires establishing an Urban Village Infrastructure Development Program with a two-pronged approach: a modified building amnesty scheme to bring existing structures up to code and a community-led upgrading initiative inspired by successful models like the Baan Mankong Program. This dual approach ensures both immediate safety enhancements and sustained infrastructure development with community ownership.

As Gurugram moves forward, developing comprehensive area development plans becomes crucial. These plans should integrate successful elements from proven approaches like Mumbai's cluster development model. Implementing a graduated Floor Area Ratio (FAR) system, sensitive to existing infrastructure capacity, will be essential for managing growth responsibly. Simultaneously, improving transportation connectivity, particularly through strategic last-mile solutions, can significantly enhance residents' access to opportunities. Preserving the unique cultural identity of urban villages is paramount, achievable by adopting a heritage-sensitive development framework akin to Hyderabad's successful model.

Looking ahead, Gurugram should adopt a comprehensive, long-term planning model similar to Singapore's, emphasizing sustainable urban development. A robust land readjustment mechanism, inspired by Ahmedabad's Town Planning Scheme, can ensure equitable and organized urban expansion. Throughout this transformation, prioritizing environmental sustainability through renewable energy integration and advanced waste management systems is non-negotiable.

Underpinning this entire process is the need for a robust monitoring and evaluation framework. A dedicated Residential Transformation Monitoring System (RTMS) will enable Gurugram to track progress, measure impact, and adapt strategies based on real-time feedback and evolving community needs. By embracing a holistic approach, learning from best practices, and remaining responsive to its residents, Gurugram can successfully navigate the complexities of urban village transformation, creating thriving, inclusive, and resilient communities for the future.

## 13. CONCLUSION

The residential transformation of Gurugram's urban villages presents a complex urban development challenge demanding innovative, context-sensitive solutions. This study highlights the dual nature of rapid urbanization, which while driving economic growth, creates challenges in housing, infrastructure, and social cohesion. By learning from successful urban initiatives and adopting a comprehensive, phased approach, Gurugram can create urban villages that are not only functional and modern but also inclusive, resilient, and culturally rich. To achieve long-term success, Gurugram must commit to community engagement, implement robust monitoring systems, and demonstrate a willingness to adapt strategies based on real-time feedback and evolving urban dynamics

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