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A Study of Delhi's Master Plans: Focus on Green Priorities

January 2025

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Abstract

This research paper investigates the progression of urban planning in Delhi, focusing on environmental concerns, climate change, and sustainability. Each Master Plan (1962, 2001, 2021, and 2041) provides insight into the changing urban objectives and the city's aspirations to synchronise growth with sustainable practices. By conducting a comparative analysis of planned versus actual results, financial allocations, and institutional frameworks, the paper illuminates persistent challenges in execution, inadequate inter-agency collaboration, and deficiencies in policy implementation. By drawing lessons from global best practices, the study suggests a progressive, rules-based framework to direct future urban planning in Delhi, which additionally acts as a benchmark for urban planning in other Indian cities.

Contents

1. Introduction

"*Hamin asto, Hamin asto, Hamin asto*" are the timeless words engraved on the Diwan-E-Khas, Red Fort, Delhi. The profound words, which translate to "This is it, this is it, this is it", serve as a powerful tribute to the city's Mughal architecture and its historical grandeur. From the Qutub Minar to the grandeur of the Mughal era in Red Fort, and from Humayun's Tomb to the British-era architectural masterpiece Rashtrapati Bhavan, Delhi's architectural fabric is interwoven with its political and historical narratives (Frykenberg, 1986; Nath, 2007).

The political and administrative capital of independent India, New Delhi occupies a central geographical position located within the mainland (Kundu et al., 2020). This prime positioning has historically placed Delhi at the forefront of trade routes, making it a vital hub for commerce (Sarkar & Mishra, 2015). Nonetheless, the city was also susceptible to various foreign invasions, which have influenced its economic and social structure throughout the centuries (Singh, 2009). In recent era, as a bustling metropolis in the global south, Delhi stands at a pivotal juncture where rich heritage converges with rapid urbanisation (Singh & Department of Geography, 2019). This delicate interplay of the past and the future is hardly seen in a few cities across the world. The city's landscape is a complex interplay of the past and future, where ancient alleys and once-dilapidated structures coexist with modern developments like broad avenues, metro lines, and towering skyscrapers (Bhan, 2012).

Delhi ranks as one of the most urbanised cities in India, with an urbanisation of more than 90 per cent. Present-day Delhi, part of the National Capital Region (NCR), spans 23 adjoining districts across the states of Rajasthan, Haryana and Uttar Pradesh (Census of India, 2011). The country's administrative capital has magnetically attracted migrants from other states in pursuit of better life opportunities. This influx of migrants has positively impacted the city's urbanisation rate. Urbanisation in Delhi has resulted in both significant opportunities and complex challenges. While rapid urbanisation has equally driven the economic growth of the city leading to better living standards for many, it has also resulted in issues such as housing shortage, traffic congestion, environmental degradation, pollution, and lack of accessibility to social amenities (Glaeser, 2019). The swift pace of urbanisation coupled with external factors such as the impacts of climate change further complicates the urbanisation challenges faced by the cities (Rayhan, 2024).

These urban challenges require a systematic and detailed approach to solve them. One of the most strategic approaches to tackling urban challenges is the development of comprehensive

master plans (Nallathiga, 2016). A master plan is a statutory document that serves as a blueprint for a city's development, envisioning its growth and tackling urban challenges systematically over a 10- to 20-year horizon (Khadour et al., 2023; Puri, 2012). These represent "spatial or physical strategies that illustrate on a map the condition and layout of an urban zone at a later date when the plan is 'actualised' (Pethe, et al., 2014). Master planning seeks to enhance the urban landscape, as the effectiveness of urban communities significantly relies on the quality of their planning, the economic viability of their development, and the efficiency of their management (Nallathiga, 2016). The first master plan for the city of Delhi was formulated in the year 1962. Over the years, three additional plans have been drafted for the year 2001, and 2021, and most recently for the year 2041 (Delhi Development Authority, 2021).

The concluding segments of the paper provide various challenges that could potentially arise based on the analysis of the master plans and recommendations put forth based on the shortcomings analysed. Furthermore, the paper also strives to facilitate a meaningful discourse on the process of urbanisation in Delhi, ensuring that the city continues to serve as a lighthouse of heritage, urbanisation and sustainable advancement for generations to come.

Through this exploration, we seek to answer the essence of the "*ami asto*" praise—whether it can be correlated with the contemporary efforts aimed at reshaping the ecological urban landscape of Delhi.

In section two, titled Literature Review, a comprehensive analysis of Delhi's urban planning history is conducted. This examination helps understand the master plans from the ecological point of view and thereby elucidates the evolution of the goals and objectives of the master plans over the years. Additionally, it also deals with the analysis of the Master Plan of 2021 and the Master Plan of 2041. Section two analyses the provisions and recommendations of the said plan, drawing insights from a variety of secondary sources available in the public domain as well as reports from numerous organisations. The section titled Barriers focuses on the potential challenges the forthcoming master plan may face based on the above analysis. The following section makes recommendations derived from successful case studies worldwide aimed at addressing the challenges or barriers delineated in section three. The penultimate section is an attempt to construct a template for urban planning in India. The final section provides a conclusion to the paper and its analytical discourse.

2. Literature Review

Delhi has experienced significant transformations in its framework since ancient times. The city of Indraprastha, which was once the capital, has witnessed the reigns of Prithviraj Chauhan, the Delhi Sultanates, the Mughal Empire, and British Colonialism (Mughal, 2023). The relocation of the capital from Kolkata to Delhi in 1911 by the British Empire solidified the city's role as the political hub of the subcontinent. Following Independence, Delhi was reaffirmed as the National Capital of the Republic of India. (Deval, 2006; WaCquant et al., n.d.)

In 1962, the city received its inaugural master plan after the formation of the Delhi Development Authority (DDA, 1962). The DDA's primary responsibility is to devise urban policies and a Master Plan for the National Capital Territory of Delhi in collaboration with various entities, including the NCR planning board, the Delhi Government, the Ministry of Housing and Urban Development, the Municipal Corporation of Delhi, and other pertinent stakeholders. (Deval, 2006)

a. 1962 Master Plan

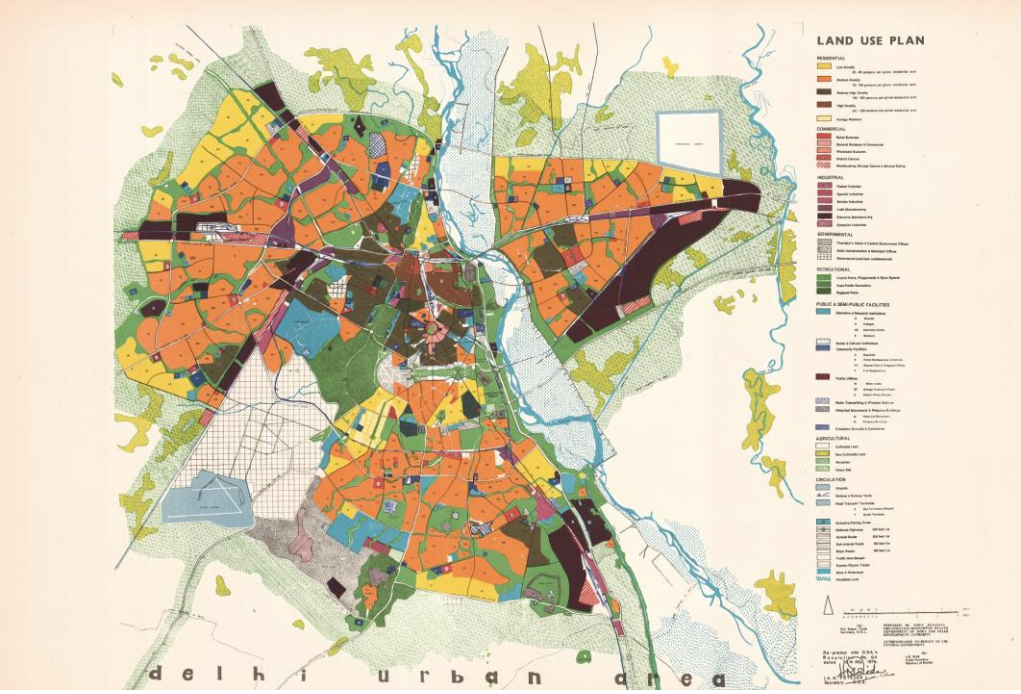

Figure 1: Proposed Land Use Plan, 1962

Source: MPD, 1962

The first master plan was crafted in partnership with the Ford Foundation. The goals of this master plan included:

Regulating unplanned growth and ensuring balanced development; creating a hierarchy of urban spaces and establishing land-use zoning; implementing green spaces and safeguarding the city's environment; and enhancing housing, transportation, and civic amenities (DDA, 1962).

The plan established the foundation for the "inviolable" Green Belt concept, riverfront development, and zoning for green spaces, among others. But it failed to enumerate measures against violation of the green belt (Puri, 2012). Successful case studies such as that of Los Angeles and Minneapolis have created green zones (Green Zones – Sustainable Development Code, n.d.). It delineated the governance framework, positioning the DDA at the forefront. The DDA was tasked with enforcing land-use zoning and the green belt concept; guaranteeing the development and maintenance of open spaces, parks, and recreational areas; and supervising the planned development of residential, commercial, and industrial zones while adhering to environmental standards (Aijaz, 2023). While emphasising the financial aspects of the plan, it envisioned generating revenue through government allocations, land monetisation, and development charges. The second plan was drafted in 1981, but its implementation was postponed due to the commencement of the 1982 ASIAD games. The subsequent comprehensive plan for Delhi was the Master Plan 2001.

Shortcomings of the Plan: The initial master plan for the city was marked by an absence of a clear vision or objectives regarding the city's development. Consequently, it concentrated on addressing the unplanned urban expansion that occurred after the Partition of India. Additionally, the plan suggested a thorough methodology for the Delhi Metropolitan Area (DMA), which included surrounding towns, yet it failed to incorporate the guiding principles from its preliminary studies (Puri, 2012). In terms of environmental concerns and climate change, the Master Plan of 1962 highlighted the need to halt sewerage discharge into the Yamuna River, relocate hazardous industries, and transform empty spaces into community facilities. Unfortunately, none of these suggestions were put into action. Apart from the first master plan's inability to preserve Delhi's physical heritage, it also neglected to address the ecological threats and did not support mixed land use. This demonstrates that although Delhi's Master Plan of 1962 provided a general direction, it was ultimately the civic authorities and the

government's institutional incapacity that failed to formulate local and zonal plans and also operational strategies necessary for effective implementation.

b. 2001 Master Plan

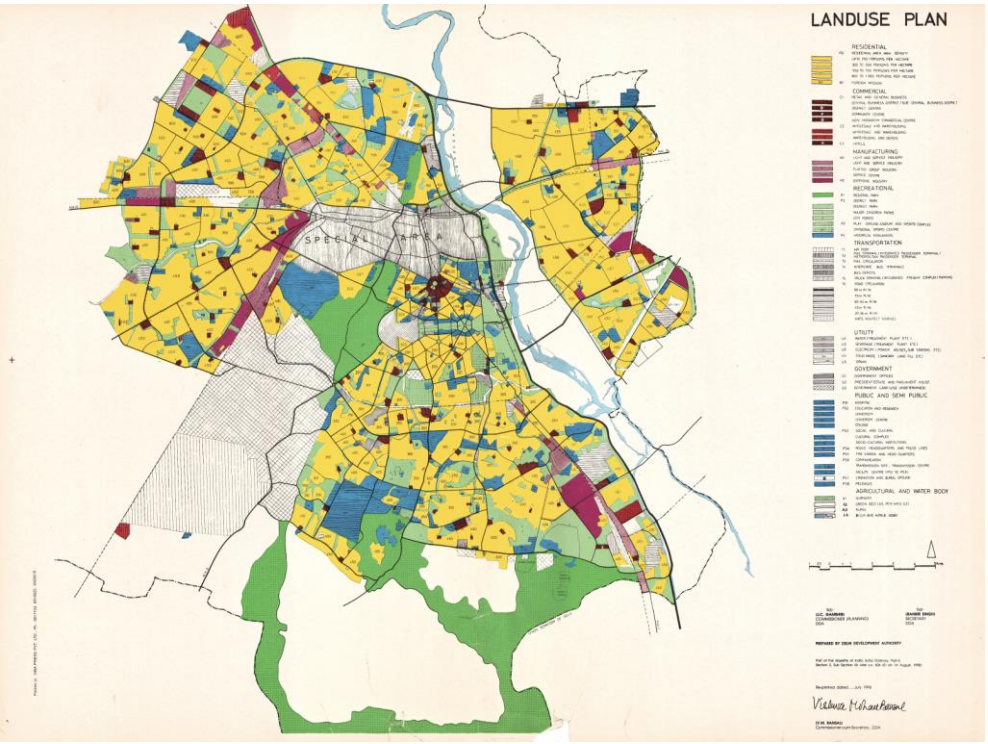

Figure 2: Proposed Land Use Plan, 2001

Source: *MPD, 2001*

The 2001 plan was a response to the swift urbanisation that the city was undergoing and the escalating pressure on its resources and infrastructure. It integrated various lessons learned from prior experiences and included more extensive strategies for environmental management and sustained urban growth, among other aspects. The objectives of this plan were:

i. Regulating unplanned growth and urban sprawl.
ii. Enhancing infrastructure, housing, and transportation systems.
iii. Strengthening environmental protections and increasing green spaces.
iv. Encouraging sustainable and equitable development throughout the city.

Regarding environmental priorities, the plan emphasised the necessity of conserving and expanding green spaces, developing and protecting the Yamuna riverfront, and safeguarding the ridge area, while also concentrating on pollution control measures within the city.

The governance framework outlined in the environmental management plan proposed that the DDA would continue as the primary agency responsible for executing the provisions of the Master Plan. It also underscored the significant role of municipal corporations and their associated agencies in the upkeep of parks, gardens, and recreational spaces within the city. The second Master Plan of 2001 expanded upon the strategies of MPD 1962 and included new services. The concept included storm water management to address rising pollution levels in the Yamuna River (Vali, 2021). For the first time, the plan introduced the concept of Environmental Impact Assessment (EIA) for larger projects requiring city permits. Additionally, it emphasised the necessity for improved collaboration among various government entities, parastatal organisations, NGOs, and other stakeholders.

The previously mentioned strategies considered planning to be an initiative primarily driven by the public sector, exhibiting minimal engagement from the private sector. Furthermore, the notion of environmental improvement does not adequately capture the ecological dimensions pertinent to the urban landscape (Puri, 2012). Additional shortcomings recognised in the plan encompassed inaccuracies in demographic forecasts. The projected population figures were significantly lower than the actual population growth, leading to overall miscalculations. There were also considerable inconsistencies between the total area of land acquired and the actual land developed. Simultaneously, the city witnessed a rise in the construction of illicit structures.

This phenomenon was predominantly attributable to a lack of adherence to regulations that mandate explicit approval from the DDA prior to any construction activities. Given the limited involvement of the private sector and the restricted capacity of the public sector to meet housing demands, the issue of providing sufficient housing continued to prevail even subsequent to the execution of two master plans. This circumstance, in turn, further facilitated the unauthorised construction of properties within the city's boundaries. The stipulations articulated in the 2001 Master Plan became outdated due to the rapid urban growth and development of the city. This situation necessitated the development of a new master plan that integrated insights and lessons derived from the deficiencies observed in the 2001 Master Plan. The conclusive draft of this revised plan was made accessible for public scrutiny in 2005. The following section offers a more comprehensive examination of the Master Plans for the years 2021 and 2041, respectively.

Shortcomings of the Plan: The 2001 Plan concentrated on and prioritised the three shortcomings of the 1962 Master Plan, namely the preservation of the physical heritage of

Delhi, protection against ecological threats, and the allowance for mixed land use. Nevertheless, the plan found itself entangled in the same issues that plagued its predecessor. A significant shortcoming was the lack of sufficient data and the presence of contradictions. While the plan outlined land use figures, it did not clarify the rationale behind the preferred distribution. Another critical issue identified in the master plan pertains to migration. Delhi experienced a population surge due to in-migration, rising from 8.76 lakh in 1971 to 22.22 lakh in 2001 (NCRPB, 2008). The proposed solution in the master plan was to discourage labour-intensive activities in the nation's capital. This approach appears more like a deliberate restriction on the city's burgeoning economy. Additionally, a notable deficiency was the disregard for the genuine needs of residents living in special areas and urban villages, all in the name of preserving urban heritage. Although the initiative to relocate industrial units from within the walled city to other regions was approved, adequate compensation in the form of alternative land and shops was not offered to those affected. This was compounded by insufficient infrastructure in the new areas, leading to higher rental costs for residents (Correspondent, 2018). The notion of environmental enhancement lacks a comprehensive approach that considers both the ecological dynamics of the urban environment and the sociocultural aspects related to security. The only reference made is concerning the River Yamuna and the Ridge. The growth of the automotive sector is not adequately addressed (Puri, 2012).

c. Analysis of the Master Plan 2021

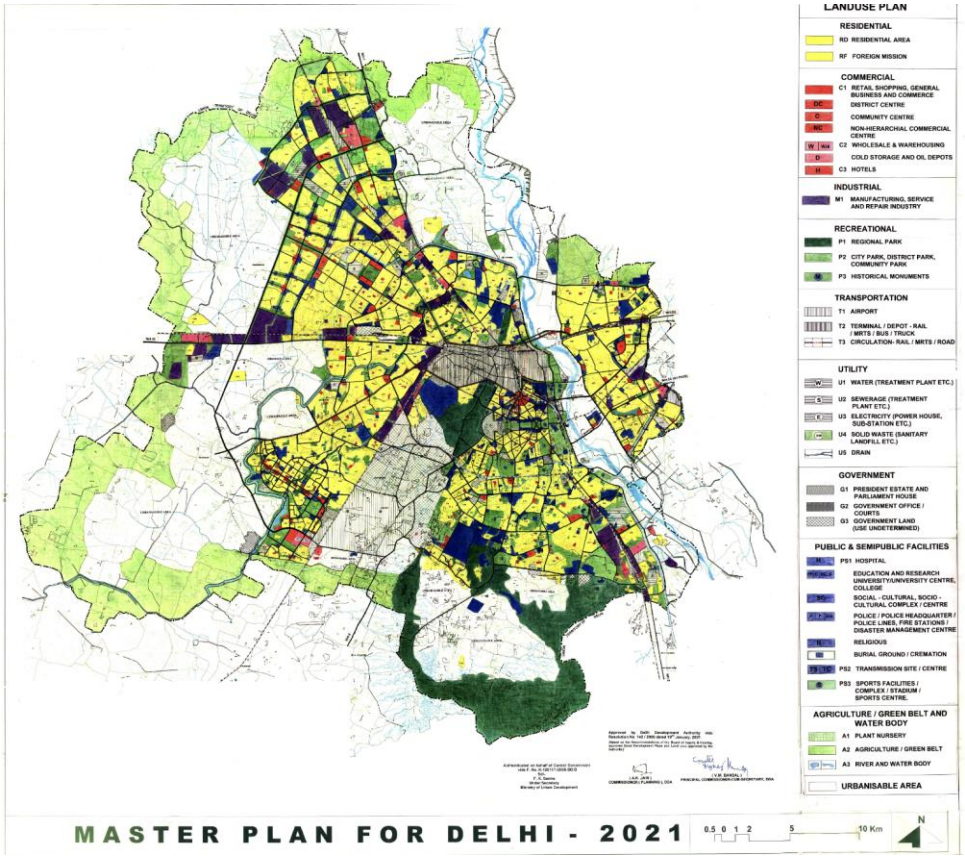

Figure 3: Proposed Land Use Plan, 2021

Source: MPD, 2021

At the beginning of the twenty-first century in India, the Master Plan for Delhi 2021 was regarded as one of the most comprehensive plans among all cities (Bhat et al., 2021). The draft outlines the plan's primary goal as developing Delhi into a "world-class city and global metropolis" where every citizen participates in productive employment and enjoys a decent quality of life within a sustainable environment (MPD Draft Proposal, 2021). The 2021 Master Plan places a heightened focus on environmental sustainability, ecological preservation, and climate change adaptation (Vali, 2021). The Master Plan aligns closely with the Sustainable Development Goals, namely SDG 11 (Sustainable Cities) and SDG 13 (Climate Action) (Zeb-Obipi et al., 2023). A detailed examination of the environmental section of the Master Plan 2021 delves into the following areas:

Protection and Expansion of Green Spaces: Drawing insights from earlier plans, the 2021 Master Plan establishes ambitious goals for green spaces. It aspires for 20 per cent of the city's geographical area to be designated as green space, encompassing neighbourhood parks,

gardens, city forests, and more. The plan also introduces the idea of "green buffers" between various land uses, such as industrial zones, thereby helping to reduce pollution and enhance air quality (DDA, 2007). The green/recreational area covers 8,722 hectares of land according to the Master Plan of 2001, which constitutes 19 per cent of the 44,777 hectares which is the total urban area. This also includes 1,577 hectares under the Southern Central, Central, and Northern Ridge. The remaining area of 7,145 hectares is comprised of district parks, city parks, community parks, and similar spaces, making up 15 per cent of urban land. (MPD, 2007). The expansion of green cover is additionally backed by the central government's EnviStats report. This report emphasises the increase in the area of green cover from 15 sq. km in 2011-12 to 23 sq. km in 2015-16. (MoSPI, 2024).

Additionally, the plan addresses the development of the Yamuna Riverfront. The riverfront initiative was initially outlined in the 1962 Master Plan. The 2021 Master Plan advocates for the rejuvenation and conservation of the Yamuna River through a comprehensive approach. This encompasses the development of the riverfront as an ecological and recreational zone. It also ensures that sewerage treatment facilities are functional to prevent untreated wastewater from entering the river and aids in the establishment of natural floodplains (DDA, 2007).

The increase in population has led to a concurrent rise in vehicular movement, resulting in heightened air pollution. The Master Plan of 2021 proposes strict measures to control emissions from industries, transportation, and construction activities. The plan advocates for the promotion of cleaner fuels, the expansion of public transportation, and the encouragement of electric vehicles to mitigate pollution.

The Aravalli ridges in the northern part of the country form an important ecological feature of Delhi's geographical landscape. The ridge finds mention in the 2021 Master Plan classified as a Regional Park, and reinforced measures to protect it from encroachments. The ridge was considered a critical carbon sink and its conservation is a priority to enhance Delhi's ecological resilience.

Four parts of the Regional Park were identified in the 2001 Master Plan of Delhi

Table 1: Regional Park distribution with area

Name	Area
Northern Ridge	87 ha
Central Ridge	864 ha
South Central Ridge (Mehrauli)	626 ha
Southern Ridge	6200 ha

The rise in living standards brought about by industrialisation and economic growth has significantly transformed consumption behaviours, leading to a surge in inorganic waste and complicating the management of solid waste, which has now become a worldwide concern (Gour & Singh, 2022). The Master Plan of 2021 adopted the decentralised approach to waste management, encouraging waste segregation at source, recycling, and composting. The document further recommends the development of waste-to-energy plants and converting landfill sites into green zones (DDA, 2007). The plan also laid its emphasis on the importance of rainwater harvesting, groundwater recharge and wastewater recycling to address the issue of water scarcity. It proposed the creation of water bodies and lakes to enhance groundwater recharge (DDA, 2007).

i. Governance Framework:

Agencies such as DDA, NDMC, CPWD, Forest Department, and Ministry of Defence exercise control over various environmental features such as District Parks, Community Parks, Biodiversity Parks, and Ridges, while other governmental agencies, like the Delhi Pollution Control Board (DPCB), oversee environmental regulations and pollution control. Furthermore, sports complexes which are included in the green/recreational use category in Master Plan 2001 are managed by DDA and various other private agencies. The Master Plan of 2021 seeks to correct the mistakes of the previous two master plans – 1962 and 2001. The absence of involvement from the private sector obstructed the effective realisation of the master plan's goals. In the 2021 Master Plan, greater public engagement through Resident Welfare Associations (RWAs) ensured the conservation of the environment, water harvesting activities, and waste management. The plan also seeks the introduction of the monitoring and evaluation mechanism in the progress of environmental projects and its compliance with environmental

regulations. This included the establishment of an environmental monitoring cell to track air quality, water pollution and waste management. (DDA, 2007)

ii. Financial Mechanisms:

The Master Plan of 2021 proposed more diverse and innovative financial mechanisms such as Public-Private Partnerships (PPPs): The plan encouraged the development of parks, waste management infrastructure, and renewable energy projects through the PPP model, thus aiming for private sector expertise and investment.

Green Bonds and External Funding: The need for substantial investment calls for raising funds from green bonds and seeking financial assistance from agencies such as the Asian Development Bank (ADB), Global Environment Facility (GEF), and World Bank. User

Charges and Development Fees: The plan recommended updating the user charges for water, waste management and green space maintenance, ensuring the generated revenue is further reinvested back in environmental projects.

Budgetary Allocations: The plan further suggests the proper utilisation of the state and the municipal budget for environmental sustainability, particularly in areas of pollution, water treatment and green infrastructure development. (DDA, 2007)

Shortcomings of the Plan: Although the Master Plan of 2021 emphasises both macro and micro-level interventions aimed at achieving ecological equilibrium, critics (Dewal, 2006; Puri, 2012) have labelled its vision as overly ambitious and challenging to execute. This results in the plan being perceived as merely tokenistic since the proposed strategies often fail to be realised in practice (Vali, 2021). The stark inability to rejuvenate the River Yamuna through the Yamuna Action Plan has been highlighted once more. The suggested measures appear to be utterly ineffective, particularly in light of the significant financial resources already squandered on them, while slums, which largely contribute to untreated sewage, are permitted to release waste into the river (Puri, 2012). It is essential to eliminate informal settlements along the riverbank; nevertheless, one must interrogate the original justification for their presence in such a vital area. Moreover, the objective of transforming Delhi into a "Green City" is inconsistent with its goals of preservation, management, conservation, and development. The vision for the 2021 Master Plan aspires to establish Delhi as a "world-class city and a global metropolis." Consequently, the vision fails to adequately prioritise the concept of a "Green City" or environmental issues (Puri, 2012). From a financial perspective, the plan neglects

tackling the fiscal dimensions of the situation. There are no projections regarding the additional costs incurred due to increased demands and the methods by which these funds will be sourced. Additionally, there is no assessment of the rents and revenues the state department is expected to generate and how these resources will be allocated for urban development (Dewal, 2006).

d. Analysis of the Master Plan 2041

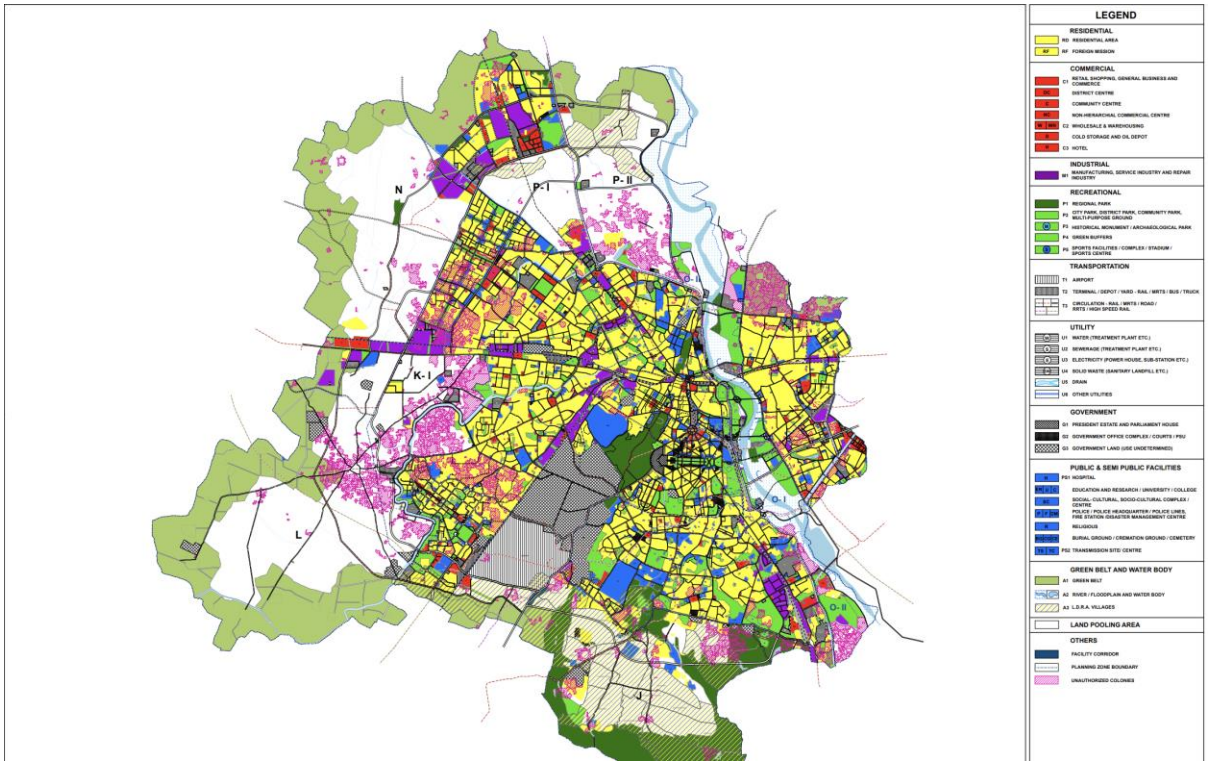

Figure 4: Proposed Land Use, 2041

Source: MPD, 2041

The Master Plan of 2041 carries forward the objectives of the 2021 Master Plan with a more nuanced approach, rectifying the mistakes of the previous master plan. One of the primary objectives related to the environment in Master Plan 2041 is to "develop a city that is environmentally sustainable, providing a healthy environment for its inhabitants while effectively responding to the challenges presented by climate change.

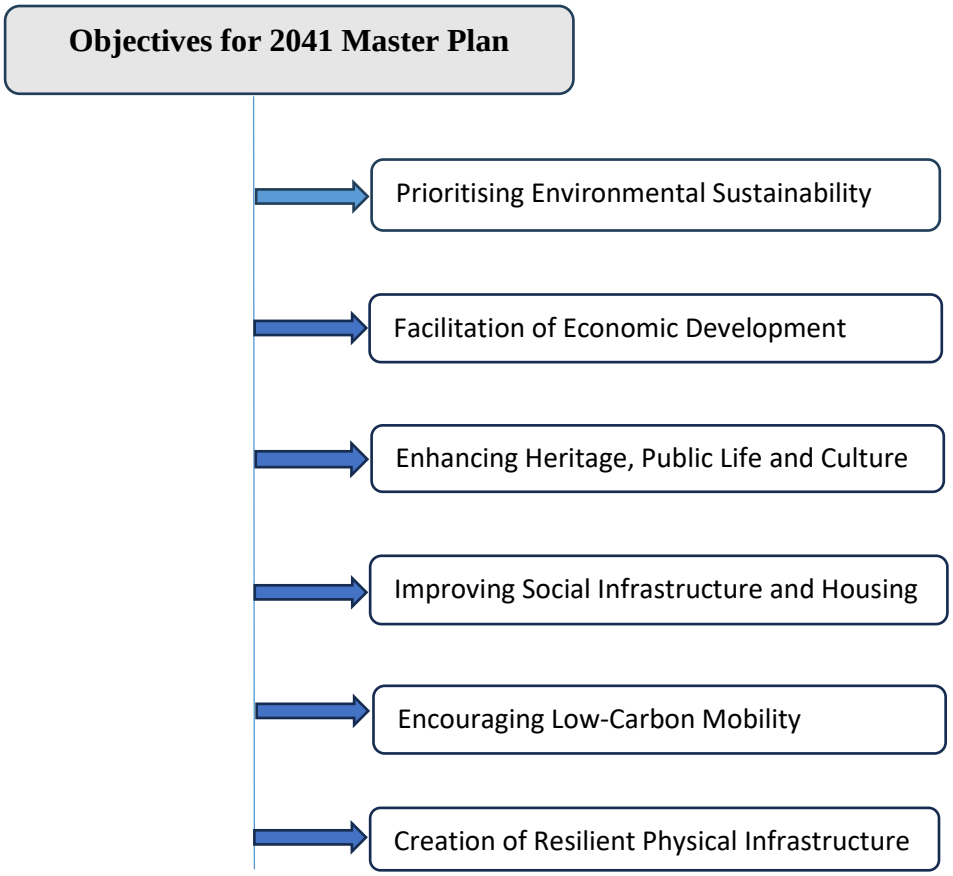

Figure 5: Objectives for 2041 Master Plan

Source: MPD, 2041

The environment section of the master plan deals with a rigorous approach to the green and blue environmental assets. The master plan denotes the rise of green cover in the city from 150 sq. km in 2001 to 300 sq. km in 2017. This can surely be denoted as one of the remarkable achievements of the 2021 Master Plan (DDA, 2021). The plan for 2021 has successfully helped cover almost 20 per cent of the city's area under green cover. The new plan for 2041 strives to further intensify the efforts of increasing green cover within the city limits. (DDA, 2021)

The plan also focuses on the creation of "The Green Development Area" to create a regional environmental buffer and promote low-density residential areas in urban villages. This development aims to foster city-level hubs for green living and recreation. With the existence of a green belt to create a regional environmental buffer, this plan highly encourages the production of food and other natural resources to meet the needs of the city. Furthermore, the belt can also act as a regional-level pollution sink and can be instrumental in tackling the pollution issue in the city (DDA, 2021). The essential components of the suggested framework include assessment based on data sharing and management, oversight and coordination of

multi-agency efforts and key performance indicators (KPIs) evaluation, a specialised monitoring unit, and support for project execution. (Aijaz, 2023). The proposed MPD-2041 suggests implementing a compulsory green rating for all new developments. Additional measures that can contribute to reducing CO2 emissions from buildings include policies that prioritise citizens, compliance with current building regulations, supportive initiatives, and regular inspections and audits (Aijaz, 2023). The MPD 2041 advises continuous oversight of construction sites and requires agencies to enforce dust management plans efficiently (DDA, 2024). The plan tries to link the heritage and ecological component of the city through a Cultural Resource Management Plan (CRMP), which could help the administration maintain the heritage and ecological resources.

The integration of the heritages with the green-blue assets aims to reinforce the historical and cultural connections between the city's natural and built environments, adding value to both heritage preservation and environmental sustainability (DDA, 2021). Furthermore, ash dykes of thermal power plants, landfills and unused waste landscapes like closed quarries will be transformed into 'green and blue features' for the city (Elets eGov, 2021). To foster the bond between people and nature, the plan promotes the creation of interactive zones that facilitate recreational, educational and cultural activities. This public engagement further tries to bring awareness amongst the community as a whole with respect to ecological conservation (DDA, 2021). To further stop the deterioration of the River Yamuna, the Master Plan of Delhi 2041 seeks to undergo a comprehensive rejuvenation programme.

The programme involves multiple agencies and includes components such as:

Table 2: Components of Yamuna Rejuvenation Plan – MPD 2041

Components	Description
Floodplain Protection	Establishing green buffers and restricting activities that could degrade the river's ecosystem
Ecosystem Restoration	It is also to undertake initiatives to restore the river's ecological health, by treating wastewater before discharge, cleaning the river bed and restoration of biodiversity along its banks
Public Awareness Campaigns	The initiative emphasises renewed efforts to engage the community in the conservation and restoration of the Yamuna River through targeted public awareness campaigns

The Aravalli ridge, frequently referred to as the "lungs" of Delhi, serves as a safeguarded ecological area that boasts a wealth of biodiversity and historical importance. Nevertheless, unauthorised building activities have taken place due to inadequate oversight. The draft MPD 2041 underscores the importance of bolstering biodiversity and safeguarding the ridge's ecosystem. Yet, there are growing worries regarding possible construction in Haryana, which could diminish this delicate region. Delhi could benefit from observing Goa's regional plan, which allocates eco-sensitive zones with different degrees of development constraints to protect its vulnerable ecosystem (Aijaz, 2023).

i. Governance Framework:

It bears a close resemblance to that of the Master Plan of 2021. The Municipal Corporation of Delhi also plays a crucial role in the execution of the plan, particularly within the New Delhi area. Various governmental organisations, including the Delhi Jal Board, Public Works Department, Delhi Pollution Control Committee, and National Capital Region Planning Board, are among those tasked with the implementation of the 2041 Master Plan (DDA, 2021).

ii. Financial Mechanisms:

The funding strategy envisioned in the Master Plan includes the creation of a dedicated "Green Fund." This fund serves as the main mechanism for the upkeep, enhancement, and expansion of Delhi's blue-green infrastructure. Furthermore, the plan aims to investigate additional innovative financing strategies such as public-private partnerships, community funding, and green bonds, among others. (DDA, 2021)

Despite the Plan holding a potential of generating $100 billion over the next two decades, thus increasing the Delhi's per capita income to Rs 4 lakh ((TIMESOFINDIA.COM, 2023), it still has a numerous barriers enlisted in the following section.

3. Barriers

The implementation of Delhi's Master Plan 2041 (MPD 2041) encounters numerous substantial obstacles. Despite advancements in environmental goals, Delhi ranks among the greenest cities in India, boasting over 18,000 parks, gardens, and seven biodiversity parks managed by the DDA; however, the city grapples with an uneven distribution of green cover. The city's blue

assets, which include more than 900 water bodies and the River Yamuna, are also confronted with their distinct challenges.

a. Technical Barrier

The initiative for Riverfront development, which traces its roots back to the 1962 Master Plan, has yet to fulfil its intended objectives. Issues such as encroachment, pollution, and the depletion of water resources have further diminished the river's area. Only 2% of the entire catchment area of the Yamuna River flows through the National Capital Territory (NCT), Delhi, yet this section collects 79% of the river's total pollution over a span of 48 kilometres, rendering it the most polluted part of the Yamuna River (Arora et al., 2023). Air quality continues to be a pressing issue, with 45% of pollution stemming from dust and 20% from vehicle emissions. These environmental concerns underscore the persistent struggle to secure cleaner air and water in the city. Furthermore, the plan fails to highlight the numerical targets and plans, and disaggregated actions with respect to the solid waste management, water and waste water chapters. This creates ambiguity in the minds of the policy readers and the sector is devoid of any concrete targets (Depinder Kapur & Depinder Kapur, 2021).

b. Institutional Barrier

Institutional fragmentation and lack of coordination present longstanding obstacles that have carried over from earlier master plans and continue to impact the current one. The disjointed governance framework results in overlapping responsibilities, which inhibits synchronised action. Such challenges are noticed in big metropolises where governments often work in silos (Pethe et al., 2011).

c. Financial Barrier

Furthermore, financial limitations present a significant challenge, as budget allocations frequently fail to meet the financial demands of large-scale project implementation. The financial problem is faced by most of the cities in India as very few cities have good finances to get credit ratings (Jha, 2023). Inaccurate estimations of population growth and resource requirements further complicate financial planning, adversely affecting the efficient distribution of funds. Moreover, the developmental strategies or master plans are seldom associated with the financial viability of the municipal government. The city officials do not create the master plan in accordance with budgetary constraints or priorities.

d. Policy Barrier

Another critical obstacle is posed by regulatory and policy limitations. Current land-use policies, outdated urban planning guidelines, and a rigid regulatory environment serve as impediments to the execution of MPD 2041.

e. Regulatory Barrier

Additionally, while the plan specifies various urban design standards, residential guidelines, and mobility objectives, it lacks clear phasing, funding strategies, and comprehensive institutional frameworks for implementation. Although the plan proposes numerous projects and initiatives through Area Action Plans, it does not provide clarity on the prerequisites and necessary steps for their realisation (Cities Forum, 2021). The enhancement of institutional capacity for such ambitious projects should have been explicitly addressed, considering the expectation that multiple organisations would manage different sectors.

f. Coordination Barrier

Moreover, there is a notable lack of alignment with the National Capital Region (NCR) development plan, even though Delhi plays a pivotal role in the region's economic, consumption, and waste generation dynamics. Another obstacle arises from the presence of banned industries immediately beyond the Master Plan boundary, resulting in the redirection of pollution and waste to adjacent areas, which may exacerbate the environmental impact (Cities Forum, 2021). While the MPD 2041's goal to establish monitoring frameworks and committees like the City Vitality Committee (CV-COM), Environmental Sustainability Committee (ES-COM) and Built Environment Committee (BE-COM) is a commendable initiative, the absence of a concrete strategy, established timelines, and clearly defined operational parameters poses a significant challenge (Cities Forum, 2021).

Although MPD 2041 is ambitious and aligns with sector-specific visions, the intricate nature of Delhi's institutional framework and governance system is likely to create resistance to realising the desired outcomes.

4. Recommendations

To effectively navigate challenges discussed in the aforementioned section in the implementation of the Delhi Master Plan 2041, there is a need for comprehensive and multifaceted strategy. Firstly, strengthening the institutional coordination is crucial. The

fragmented governance and the multiplicity of organisations in the governance framework needs to be addressed at the earliest. The present structure of Delhi could benefit from the creation of a unified Urban Planning Authority similar to that of the Singapore's Urban Redevelopment Authority (Tan, 2020). This will help in eliminating overlapping responsibilities and streamline the governance structure and bring synchronisation across the sectors involved in the master plan implementation (Ghosh et al., 2009). Additionally, fostering inter-agency collaboration through clear mandates for the proposed Area Action Plans could accelerate implementation (Gallent & Shaw, 2007). Polycentric governance is another feasible alternative which implies that multiple organisations interact with each other concurrently over several issues to influence the outcomes (Pethe et al., 2011; V Ostrom et al., 1961).

The technical challenges particularly concerning the Yamuna River and air quality need a stronger monitoring system in place. The case study of adoption of green infrastructure solutions such as Cheonggyecheon Stream Restoration in Seoul, South Korea, serves as a perfect lighthouse to the impending task of the River Yamuna Rejuvenation programme (Lee & Anderson, 2013). The Master Plan of 2041 (DDA, 2021) sheds light on the importance of Delhi's blue-green infrastructure and its network. This can be enhanced to further mitigate pollution levels. On the part of mobility, clean energy initiatives and electric vehicles adoption similar to Copenhagen's carbon-neutral initiatives (Kohl & Andersen, 2022) can be implemented. This could address the problem of vehicular pollution, which contributes significantly to Delhi's air quality issues.

On the financial front, innovative financing mechanisms need to be optimally utilised, such as land value capture, PPPs, and green bonds to meet budgetary constraints. This strategy has been successfully executed in New York City's High Line Park, where the development of surrounding properties facilitated the financing of public infrastructure projects (Loughran, 2014). It is further imperative to enhance financial planning by incorporation of accurate population growth projections to ensure that funding is judiciously allocated for essential public services (Park & LaFrombois, 2019). Furthermore, PPPs present significant opportunities in India. The Kelkar Committee Report of 2015 underscores the necessity of reassessing PPPs. The committee stresses the importance of reinforcing the three fundamental pillars of PPPs—Governance, Institutions, and Capacity. Additionally, the Committee advocates for a more expedited dispute resolution process to encourage greater involvement from private stakeholders. The report further emphasises the necessity of training government officials to manage PPP projects effectively (Kelkar Committee, 2015). These perspectives are

also supported by George Peterson in his book, *Big-city Politics, Governance, and Fiscal Constraints*. He highlights the need for enhanced participation from private entities in large-scale projects through the PPP framework. This approach would alleviate the pressures on local administration and significantly enhance infrastructure development and service delivery within the city (Peterson, 1994).

Regulatory reforms should prioritise the modernisation of land-use policies and the guidelines related to it, ensuring they are congruent with the contemporary needs of the fast-paced urbanisation. Cities such as Tokyo have effectively adopted flexible zoning regulations that accommodate mixed-use development (Zhang et al., 2024). This further facilitates efficient urban growth. In addition to the regulatory reforms, Delhi should also refine the strategies and establish clear funding pathways for large-scale projects.

Finally, the integration of the development of the National Capital Region (NCR) and its strategies should be in sync with Delhi's master plan. Enhancing collaboration within the NCR as exemplified by the metropolitan coordination practised by the Greater London Authority can assist in mitigating the pollution and also help balance the regional urbanisation in an effective manner (Green et al., 2020). The formulation of more stringent monitoring and evaluation frameworks, complete with established timelines and operational parameters, will further bolster transparency and accountability in the implementation of the ambitious objectives outlined in MPD 2041.

The lessons drawn from international examples can surely assist Delhi in surmounting the challenges and actualise the vision as encapsulated in the Master Plan of Delhi 2041.

5. Constructive Template for Planning

The landscape of planning in India is rife with a multitude of challenges. As highlighted previously, these obstacles necessitate deeper reflection and scrutiny, which can serve as viable solutions to the urban planning issues faced by cities throughout India. This segment presents a proactive framework for forthcoming planning endeavours in Indian urban areas.

- **Need for real-time and accurate data**: The examination of the previously mentioned master plans has revealed issues concerning data precision. The Master Plan of 2021 frequently faces criticism for inaccuracies in population forecasts. The anticipated

figure of 128 lakh fell short compared to the actual population growth of 137.8 lakh (Dewal, 2006). Therefore, moving forward, it is essential to have precise and timely data to guide decisions regarding population dynamics, resource availability, and financial needs along with their forecasts. Authorities must adopt a planning perspective that is more in tune with the real-world context. Steering clear of overly optimistic assumptions will keep them aligned with their stated goals. Master plans are fossilised plan intended for a duration of 20 years, offering little opportunity for midcourse adjustments. Furthermore, it would be beneficial for city planners and officials to consider adopting rolling plans rather than adhering to a fixed 20-year strategy. This approach would facilitate the re-evaluation of priorities and be more adaptable to the evolving dynamics present in urban environments.

- **Clear definition of targets and objectives**: It is crucial to establish realistic and attainable targets that are well articulated and effectively communicated. The priorities outlined in the initial sections of the plan document must be consistently reflected in the subsequent sections as well. This ensures that policymakers, authorities, and other relevant stakeholders can work towards a common goal. The Master Plan of 2021 underscores the inconsistency in establishing priorities (Green City) compared to the objectives (Delhi as a Global Metropolis) (Puri, 2012).
- **Stakeholder engagement and participation**: The master plans in today's time advocate for increased participation of all the relevant stakeholders and authorities. Public participation and understanding their needs and vision of the city help planners navigate the course of planning seamlessly. At the same time, demarcating boundaries for all the stakeholders and government departments helps in proper assigning of the roles and responsibilities, thereby bringing more accountability of the institutions involved in the planning, implementation and feedback process.
- **Phased prioritisation**: Creating a phased and clearly articulated roadmap for implementation by segmenting the objectives into short, medium, and long-term goals would facilitate better resource allocation and the establishment of milestones.
- **Capacity building**: It is vital to invest in enhancing institutional capacities through training initiatives. This will further enable the realisation of true potential at the grassroots level, thereby ensuring the effective management of urban infrastructure projects.

- **Sustainable financial planning**: Formulating budgets that align with actual resources while maintaining realistic expectations of future revenue sources will ultimately assist in setting and achieving objectives. Developing revenue models that balance immediate expenditures with future gains and specifying allocations for essential projects will help prevent overextension.
- **Evaluation framework for monitoring**: Establishing outcome-based and quantifiable targets for each objective/sector, such as water quality, water supply, wastewater treatment, improving public transport, and managing vehicular traffic, will facilitate periodic evaluations of progress. Furthermore, the plans ought to be formulated in a way that allows for the possibility of adjustments and mid-course evaluation along the way. This would facilitate the implementation of essential modifications, thereby enhancing the plan's ability to respond to the evolving requirements of the city. The Draft Plan of 2041 has been criticised for failing to specify targets in critical sectors, rendering the plan effectively aimless. Outcome-based reporting will further aid in comparing the executed plan with the original objectives over time. This approach will minimise deviations from the intended plan and keep projects on track. Implementing a system of transparent public reporting concerning expenditures, progress, and gaps will foster trust between citizens, authorities, and other relevant stakeholders.
- **Policy recommendations for future planning**: Master plans are the horizons of the actual and the future reality of the city. Therefore, each master plan ought to act as a foundation for subsequent ones, facilitating the city's development in a seamless, phased approach. The policy must be designed to offer a strategic outlook for the city along with a detailed action plan to bring that vision to life. Additionally, the action plan should be economically viable, incorporating an essential evaluation framework. This all-encompassing policy would further empower city officials to respond more effectively to the needs of the city.

6. Conclusion

Delhi's transformation, from its majestic Mughal era to a modern green urban centre, showcases its resilience and adaptability. The challenges faced by Delhi's master plans mirror those of other fast-growing Indian cities, with slow implementation of spatial planning strategies. A key issue is the tension between land development and environmental preservation, highlighting

the need for ecological perspectives in planning and a framework aligned with sustainability (Vali, 2021).

While these plans aim to make Delhi more sustainable, efficient, and inclusive, they reveal obstacles like institutional fragmentation, financial constraints, and regulatory issues (Cities Forum, 2021). Ecologically, they recognise Delhi's green and blue resources, such as the Yamuna River and biodiversity parks, but uneven green space distribution, water pollution, and air quality remain pressing concerns (DDA, 2021; Aijaz, 2023). Strong, actionable strategies, including clear timelines and sustainable financing, are necessary to safeguard Delhi's ecological heritage and enhance climate resilience (Nallathiga, 2016).

Though the plans address longstanding challenges, they have yet to significantly improve liveability (Puri, 2012). To achieve the vision of a sustainable city, effective governance, institutional coordination, and ecological integration at all planning stages are critical. This approach will help Delhi preserve its unique historical and modern identity while setting a benchmark for sustainable urban development.

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