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PRODUCTIVITY PROMOTION

FOCUS : DELHI - TRANSFORMING TO A WORLD CLASS CAPITAL

PRODUCTIVITY ....
THE SHORTEST ROUTE TO HOLISTIC EXCELLENCE
EMPLOY IT IN EVERY POSSIBLE MANNER
IN YOUR ORGANIZATION

"Productivity…your ladder to organizational success"

"Productivity…the science of resource optimization"

"Productivity…the Mantra for employee stress elimination"

JOURNAL OF DELHI PRODUCTIVITY COUNCIL

ABOUT DPC

DELHI PRODUCTIVITY COUNCIL (DPC) is an autonomous productivity organization established in 1959 by the National Productivity Council and the Delhi Administration, Govt. of N.C.T. of Delhi for spreading the message of productivity. DPC is a tripartite in its constitution with equal representation on its Governing Body from Government, Employers Organizations, Trade Unions, Educational & Research Institutions, Associations and Experts.

OUR MISSION

The mission of the Delhi Productivity Council (DPC) is to boost socio-economic development of National Capital Region through enhancing productivity leading to improved living standards and quality of life for the people.

OUR VISION

To be a leading Productivity Council in the country with a Vision of strengthening competitiveness, harmonizing environmental protection with increasing productivity and maintaining social fairness/justice

ACTIVITIES

- Residential & Non-residential Training Programmes /Seminars
- Consultancy Assignments
- In-company Training Programmes
- Higher Education Programmes
- Publications

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सत्यमेव जयते

REKHA GUPTA
Chief Minister, Delhi

MESSAGE

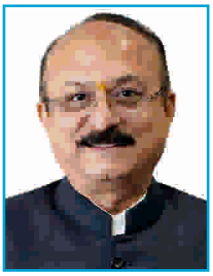
As India marches with confidence toward becoming the world's third-largest economy and realising the vision of Viksit Bharat @2047, it is imperative that our national capital emerges as a truly world-class city that is efficient, inclusive, sustainable, and future-ready.

Delhi stands at a defining moment in its civilisational journey. From its ancient roots as Indraprastha to its role as the nerve centre of modern India, the city has always reflected the aspirations of the nation. Today, in the Amrit Kaal, we are reimagining Delhi through the lens of Sabka Saath, Sabka Vikas, Sabka Vishwas our Sabka Prayas.

Our focus is on transformational governance; with modern infrastructure, seamless urban mobility, digital-first public services, clean energy, river rejuvenation, and resilient urban ecosystems. Productivity, innovation, and technology are being harnessed not as ends in themselves, but as tools for citizen-centric growth and enhanced quality of life.

This edition of *Productivity Promotion* is a timely and thoughtful contribution. By bringing together policymakers, experts, and practitioners, it reflects the collaborative spirit needed to build a capital that sets global benchmarks in governance and sustainability.

I am confident that these ideas will inspire collective action and reinforce Delhi's journey toward becoming a proud symbol of a New India that is strong, efficient, and compassionate.



सत्यमेव जयते

ASHISH SOOD
MINISTER OF HOME, POWER, URBAN DEVELOPMENT, EDUCATION,
HIGHER EDUCATION, TRAINING & TECHNICAL EDUCATION
GOVT. OF NATIONAL CAPITAL TERRITORY OF DELHI

MESSAGE

As Delhi moves decisively towards becoming the capital of a Viksit Bharat, our education and skill ecosystems must function as engines of efficiency, innovation, and value creation in a fast-evolving, technology-driven world.

In the Amrit Kaal, productivity is no longer measured only in economic output. It encompasses human capital development, innovation capacity, ethical leadership, institutional efficiency, and lifelong learning. With this understanding, Delhi is reorienting its education and skilling framework to seamlessly integrate learning with earning and knowledge with application.

From strengthening foundational learning and teacher capacity to expanding skilling, digital literacy, and research-led higher education, our approach is productivity-centric, inclusive, and future-ready. Productivity-driven education empowers citizens to contribute meaningfully to nation-building, enhances competitiveness, and advances social justice by creating equal opportunities for all.

The fourth volume of Productivity Promotion thoughtfully contributes towards that education. It brings together critical themes such as urban sustainability, healthcare, environment, waste management, and future skills. These are the areas where productivity gains directly translate into improved quality of life. It reinforces the principle that cities become truly world-class when their people are skilled, efficient, and prepared for the future.

I commend the Delhi Productivity Council for its sustained efforts in spreading the message of productivity. May this publication inspire policymakers, institutions, and stakeholders to collectively build a productive, resilient, and values-driven Delhi.

ashish

Ashish Sood
Patron
Delhi Productivity Council

MESSAGE

The city established 5000 years ago, during the age of the Mahabharat by the Pandavas, known as Indraprastha, has witnessed many ups & downs during the eras of the Rajputs, Delhi Sultanate, Mughals and the British. The capital of India was shifted from Calcutta (now Kolkata) to Delhi in 1931. Delhi became a Union Territory on 1st November 1956.

At present, India is passing through its 'Amrit-kaal' 2022-2047. We all aspire for the capital of 'Viksit Bharat' to be a “World class city”. To achieve this, we must overcome many challenges like chaotic traffic, pollution, growing slums, hills of garbage, polluted Yamuna, infrastructure development issues, and many more.

Delhi Productivity Council, for the purpose of drawing attention of the Union Government, Delhi Government, all Civic Agencies, Government Organisations, Policymakers, Bureaucrats and the citizens of Delhi to this important objective, has planned to bring out this issue of our Productivity Promotion Journal on the topic- "Delhi - Transforming to a World class Capital.

I am sure this issue will boost an awareness among all the concerned directly or indirectly.

Sampat Toshniwal
President
Delhi Productivity Council

From the Editor's desk

As India races to become the third largest economy of the world before 2030 and achieve a Developed Country status by 2047, it is imperative that it's Capital Delhi is transformed into a World class city.

It gives me immense pleasure to share the DPC "Productivity Promotion" Journal for the July–December 2025 issue on the theme "Delhi – Transforming to a World-Class Capital." This edition highlights the ongoing efforts, visionary projects, and innovative initiatives that are reshaping Delhi into a city that embodies excellence in governance, infrastructure, sustainability and citizen well-being. It also identifies the challenges that lie ahead and possible means to overcome them.

Over the past few years, Delhi has undergone remarkable transformation across multiple dimensions—urban mobility, digital governance, environmental sustainability, and social inclusivity. From state-of-the-art metro connectivity to the expansion of green spaces and adoption of smart city technologies, the capital continues to demonstrate how productivity and innovation can go hand in hand with people-centric development.

This issue brings together insightful articles from policymakers, urban planners, and industry experts who have been instrumental in driving this transformation. Their experiences and perspectives shed light on how strategic planning, citizen engagement, and technological advancements are shaping Delhi's journey toward becoming a truly world-class metropolis.

We hope this edition will inspire readers to reflect on the role of productivity and innovation in urban development. We extend our sincere appreciation to all contributors and readers for their continued support and engagement with the "Productivity Promotion" Journal.

Regards

(Ajay Kashyap)
Editor

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The Editor invites contributions containing original ideas on how best to promote productivity to be sent to Director, DPC Institute of Management, Plot No. 2, Sector-9, Dwarka, New Delhi-110077

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Delhi is the soul of India.

Jawaharlal Nehru

I asked my soul: What is Delhi? She replied: The world is the body and Delhi its life.

Mirza Asadullah Khan Ghalib

Delhi is a land of stories, where every monument has a tale to tell.

William Dalrymple

Delhi is the city of life, the city of love, and the city of monuments.

Rana Safvi

Delhi is a place where ancient history and modern life live seamlessly together.

Shashi Tharoor

Delhi is a city that has been built and destroyed seven times, but every time it rises from the ashes, stronger and more beautiful than ever before.

Anonymous

Delhi is a city that has always been the center of power in India.

Pavan Varma

Delhi is the cultural and political heart of India.

Salman Khurshid

If you are tired of Delhi, you are tired of life.

Anonymous

When I was a child I used to think of Delhi as the middle of the earth.

Ruskin Bond

Delhi is a city of dreams, where a little hope is enough to begin.

Khushwant Singh

Monuments teach the art of patience; Delhi teaches the art of endurance.

Anonymous

DELHI – THE CITY OF THE FUTURE

Dr. Nivedita Haran, IAS (Retd.)
Former Additional Chief Secretary
(Power & Renewable Energy)

ABSTRACT:

A developed country must have a world-class capital. But a world-class capital surely cannot have major areas under flood waters every monsoon when offices are perforce shut, runways swimming underwater and leave aside schools & colleges even the national Parliament has to declare a rainy day! Imagine the untold misery for the common citizens, the loss to the public exchequer and the harm to the national economy.

The situation during the winter months is equally worrisome when Delhi's environment and AQI level hovers around 'very poor', sometimes tilting towards 'dangerous' and 'poisonous'. Compared to other global capitals what is it that makes Delhi so susceptible to dipping temperatures that the air quality turns so bad? Delhi is not a full-fledged state for a reason: being the country's capital, it has to maintain the level of infrastructure, wide motorable roads, pleasant ambience, with aesthetic beauty to make it stand out with stable law and order. Yet, Delhi seems to have fallen into an unfathomable abyss, roads lack maintenance, road shoulders encroached, the open lakes and water bodies a cesspool of filth, solid waste dumped along roadsides and homeless squatting under flyovers. After the departure of the earlier elected government that was mired in corruption and nepotism with weak administration, the new government has come in with a lot of hope and faith from the citizens. Delhi needs a strong and able administration with the will to govern and tackle the capital's problems, it is indeed doable but requires commitment and discipline, perseverance and delivery. It is with the hope and anticipation that the present government will listen and act that this article is being written. The primary problems faced by the capital will be the subject of scrutiny in this article with suggestions for improvement to follow.

DELHI: THE ROAD TO BECOMING A WORLD-CLASS CAPITAL

The capital of India was shifted from Calcutta (since renamed Kolkata) to Delhi in the early 1900s by the European colonisers due to its more centralised location within the sub-continent and its closer access to the Himalayan hill-stations. Over the years it built itself into India's political focus

and was the destination for migrants from other regions of the country and even refugees from across the border post-partition. Delhi boasts a long and rich historical legacy, as Indraprastha finds mention in the Mahabharata too. Having faced the brunt of invaders and colonisers alike Delhi's wealth was looted and the city rebuilt at least seven times. This has given the city its resilience, its distinct economy, and a rainbow culture with the never-say-die attitude of its denizens. Yet, despite its immense potential, Delhi still grapples with chronic urban problems that hold it back from achieving the stature of a truly world-class capital. To reach that level, the city must address several deep-rooted challenges—ranging from pollution and congestion to governance and inequality.

Given its unusually fast growth in population the concept of the National Capital Region was mooted in the 80's to provide a holistic expansion of the city while embracing within it the adjoining areas of UP, Haryana and Rajasthan. The idea was to decentralise the congested central areas of Old Delhi, allow New Delhi to retain its Lutyentsian planning concepts of green avenues, low-rise construction with the CBD restricted to Connaught Place and the Central Secretariat offices around the Rashtrapati Bhawan and India Gate. In this attempt at decentralising Delhi, Noida proved to be a moderate success with a number of institutions and business centres finding roots there, Gurugram was a let down as last few years' experience has shown: it has some of the major MNC offices located there and yet it lacks the basic infrastructure by way of good roads, housing for all strata and reliable civic services. In contrast, Greater Noida has proved to be a bigger success: well-laid out roads, large green patches, tree-lined avenues and surprisingly free from urban water-logging. Of course, Greater Noida could go the Gurugram way if not handled now with alacrity.

1. Air Pollution: A Crisis in the Skies

Perhaps the most visible and alarming issue Delhi faces is its severe air pollution. Every winter, smog envelopes the city, pushing air quality to hazardous levels. Vehicular emissions, construction dust, industrial pollutants, and seasonal crop burning in neighboring states all contribute to the crisis. Delhi NCR is said to be implementing various dust alleviation strategies, including enhanced construction site regulations like water sprinkling and covering all building materials lying in the open to prevent it from floating around, deploying mechanical sweepers and mist spraying systems and using dust suppressants. Yet, the results are not visible.

Dust is also generated during road repairs and adequate control measures are necessary thereon too. The mismanagement of solid waste and the solid waste sites is an equally serious issue. Despite court directions the humungous waste dumping yards are a bane for a city: it is pathetic to find waste, household, commercial and industrial, all mixed up and all dumped at these sites generating many hillocks over the years. It is even more pathetic to find

ragpickers, sometimes even children, working through the waste in search for anything of recyclable value.

To move forward, Delhi needs stricter emission control policies, a rapid transition to clean energy and even better public transport network, and regional cooperation with surrounding states to manage agricultural practices. Without clean air, quality of life and global competitiveness both suffer.

2. Urban Congestion and Transport

Delhi's roads are choking. Despite an extensive metro network, the city struggles with traffic jams, inadequate last-mile connectivity, and rising vehicle ownership. Delhi got its first metro network in the 1990's. Thanks to a team of dedicated technocrats who through their sheer professionalism showed how with the will to succeed even a project that demanded extensive land acquisition, resettlement of scores of families and construction activity through some of the most congested parts of the city, the Metro project could be a success. Delhi Metro set an example for many other urban centres in the country. A "world-class" capital demands integrated transport planning—combining metro, buses, cycling lanes, and pedestrian-friendly infrastructure. Expanding electric vehicle adoption, creating smart traffic management systems, and redesigning urban spaces for walkability can dramatically improve mobility and livability.

3. Waste Management and Urban Cleanliness

A city of over 20 million generates mountains of waste daily. Landfills like Ghazipur have turned into towering hazards. Every modern urban centre follows an organised system of waste management. For Delhi to truly modernize, it must overhaul its waste segregation, recycling, and disposal systems. Encouraging citizen participation, strict enforcement of waste regulations, and investment in waste-to-energy plants can transform Delhi into a cleaner, greener city. To begin with the city needs to have strong bye-laws to manage its solid waste, be it domestic waste to commercial and industrial waste to the infectious hospital waste. Covid-19 experience has taught us how crucial it is to keep people safe from infections. Next, the laws need to be enforced. Delhi is divided into 3 municipal corporations and all three are weak in implementing its laws and in performing its routine duties. In cleaning of roads and pavements, maintaining the kerbs and dividers and taking good care of the roundabouts the New Delhi area where Lutyens Delhi falls performs better; the other areas are woefully inadequate in doing this work. Also, the activities of the municipal corporations need modernising.

The sweeping of roads often makes dust particles fly that are a cause of smog in the atmosphere. There needs to be a more practical method to clean the city roads to ensure while the roads and pavements get cleaned, the process does not raise the pollution levels.

4. Water Scarcity and Urban Infrastructure

Delhi's water demand far exceeds its supply, leading to recurring shortages and unequal distribution. Moreover, the city's infrastructure often buckles under monsoon rains, flooding streets and damaging roads. A world-class capital cannot function without sustainable water management, rainwater harvesting, recycling of wastewater, and resilient drainage systems. Unfortunately, many of the existing water bodies have been encroached upon, filled up and converted into building sites. To begin with all the remaining water bodies need to be inventorised, digitally surveyed and protected. The same goes for the river bed, river banks and flood plains. Yamuna River has been the lifeline of the city and the reason for its survival. Yet, the river has been misused and ill-treated for much too long. Now is the time to protect the river banks to allow the river to have flowing water all year round. Without impacting the health and growth of the flora and fauna the banks need to be protected through embankments that are a combination of live and concrete interventions. For, there is need to allow water seepage along the banks to ensure water table does not deplete. The release of domestic, commercial and industrial effluents into the river needs to stop forthwith as that is the primary reason for the river to die. It also creates the sighting of chemical foam in the water causing health hazards as it makes the water unpotable. The unrestricted, indiscriminate mining of river sand is another reason behind the Yamuna losing its health. It also creates whirlpools in the river beds that are dangerous for unsuspecting swimmers.

5. Governance and Coordination

One of Delhi's unique challenges lies in its fragmented governance structure. Power is divided amongst the Delhi government, the Municipal Corporations, and the Central Government, leading to bureaucratic overlap and policy paralysis. Streamlining governance, ensuring clear accountability, and promoting cooperative federalism are vital to efficient urban management. Law & Order and Land Matters are subjects that are reserved for the central government, Law and Order being with the Home Ministry and Land with the Ministry of Urban Affairs. Having worked as Director (Delhi Division) and Joint Secretary (Lands) in the Ministry of Urban Affairs. the author has had years of experience in land-related issues of Delhi some of which are: land planning, acquisition of land for public projects, land assignment again for projects that serve public interest and others. The DDA acts as the arm of the Ministry in performing many of these activities. But the lack of coordination between DDA and the Govt. of NCT of Delhi often leads to an absence of holistic view of the overall scenario. The present elected Govt.of Delhi needs to work towards by-passing such lack of coordination.

6. Housing, Inequality, and Urban Inclusion

Behind Delhi's glittering malls and offices lie vast informal settlements where millions live without proper sanitation or housing security. Bridging this divide is essential. Affordable

housing schemes, regularization of informal colonies, and inclusive urban planning can ensure that growth benefits all citizens, not just the elite. There is urgent need to come up with a policy for setting up of colonies. Instead of the government reacting after the unauthorised colonies have come up, the guidelines should lay down how and under what conditions colonies can be set up. After all, as the population grows the need for affordable housing will also increase. Instead of an ostrich-like attitude both the Central and Delhi government need to anticipate such needs and control them from the very beginning.

7. **Cultural Heritage and Urban Identity**

Delhi's historical and cultural richness is both a treasure and a responsibility. Rapid urbanization has often come at the cost of heritage conservation. To become a truly global capital, Delhi must protect and integrate its heritage sites into modern urban life—making them hubs of tourism, education, and civic pride. Delhi gets a sizable number of tourists every year. The touristic sites need to be professionally managed.

THE WAY FORWARD:

If Delhi is to transform itself into a world class capital certain strong measures are unavoidable. The question is: can Delhi and Delhiites live up to the challenge.

Becoming a world-class capital is not just about tall glass and concrete towers or flyovers—it is about creating a city that offers clean air too. Delhi's location is such that over the winter months the heavy colder air presses down over it from the surrounding foothills that gets aggravated by the emission of dust from households, roads, vehicular traffic and commercial and industrial establishment. It requires strict directions with even stricter enforcement wherein all dusty footpaths and road kerbs should be kept covered or planted with grass or environment-friendly weed. Sweeping of roads during the winter months should stop as that creates agitated dust particles that float in the air and cause smog. Waste needs to be cleared from roads by picking them up using pitchforks or rakes. Vacuuming is permissible provided the dust is not agitated and gets sucked in. In the long term all open dusty areas along roadsides are to be paved using locally sourced bricks or tiles. In this regard the traditional brick laying on pavements is best in terms of being more eco-friendly as it allows seepage of water into the ground and is also safer to walk on without being slippery.

The recently formed government is fortunate to have come in with tremendous goodwill. But it also comes in with a lot of expectations. The structure of administration in the national capital needs to be responsive, and has to learn to deliver with alacrity. Any attitude that displays indifference, or passing the buck should not be tolerated. A political leadership in a democracy like ours is as good as its administration. There is need to enforce strict accountability at every level. The delivery of the civic bodies is crucial in this regard. Delhi has an aware citizenry who are willing to contribute their bit, they need to be asked. The political executive may often find this

difficult as many are first-time ministers and get carried away by the pomp and grandeur of their position. It needs to be remembered that this is an opportunity that will never return: to make Delhi a world-class capital is a challenge that cannot and should not fail. For, all other states will be watching with keenness and learning from Delhi. And even more important, the world is watching: together we need to make Delhi a global capital that we can all be proud of. With its talent, history, and energy, Delhi has all the ingredients to rise as a global city. The task ahead is to shape those elements into a model of 21st-century urban excellence.

ABOUT THE AUTHOR:

Dr. Nivedita Haran is a retired IAS Officer (1980). Among the posts she held are : District Collector (Pathanamthitta) and (Trivandrum); Joint Secretary, Ministry of Urban Development, Govt. of India; Additional Chief Secretary (Revenue); Additional Chief Secretary (Power & Renewable Energy); and Additional Chief Secretary (Home); She holds a PhD in Sociology from IIT, Delhi.

INTERESTING FACTS

- Delhi has been the capital of seven different kingdoms and has a rich historical lineage reflected in its monuments, streets, and urban layout.
- Delhi is unique in blending ancient bazaars, Mughal architecture, and colonial buildings with modern skyscrapers and metro lines, creating a living urban identity.
- Air pollution kills more people annually than smoking, malaria, and car accidents combined. It is one of the top global killers—yet often ignored because it's invisible.
- Urban traffic congestion costs countries billions of dollars every year due to wasted fuel, lost work hours, and slower goods movement.
- Overlapping responsibilities among Delhi government, Municipal Corporations, Delhi Development Authority (DDA), and Central agencies often lead to delays in projects and policy implementation.
- Delhi is implementing e-governance, online grievance redressal, and integrated city dashboards to improve coordination and transparency.
- The city's daily water demand is around 1,290 million gallons, but supply is only about 1,000 million gallons, leaving a shortfall of 290 million gallons per day.
- In 2024, Delhi extracted 100.77% of its annual groundwater, meaning more water was withdrawn than naturally recharged.

ट्रैफिक–जाम से त्रस्त दिल्ली (कारण, प्रभाव और निवारण)

lEir rk"kuhoky
अध्यक्ष, दिल्ली उत्पादकता परिषद

ट्रैफिक–जाम दिल्ली के जनजीवन का एक स्थाई अंग बन गया है और आज कोई भी दिल्लीवासी इसके प्रभाव से अछूता नहीं रहा है। इस समस्या से त्रस्त दिल्लीवासियों के मुँह से आजकल प्रायः यह सुनने को मिलता है कि, "अब दिल्ली रहने योग्य नहीं रही।"

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1. वाहनों की अत्यधिक संख्याः

अधिकृत ट्रांसपोर्ट आंकड़ों के अनुसार वर्ष 2023 के अंत तक दोपहिया वाहनों और निजी कारों सहित दिल्ली में पंजीकृत वाहनों की संख्या 1.40 करोड़ से अधिक थी। ETauto.com के अनुसार वर्ष 2024 में कुल 7,09,024 वाहनों का पंजीकरण हुआ। वर्ष 2025 में यह संख्या इससे भी अधिक होगी। इस समय यह संख्या निश्चय ही 1.50 करोड़ के पार है जो देश के अन्य तीनों महानगरों (मुंबई, कोलकाता और चेन्नई) के वाहनों के सम्मिलित योग से भी अधिक है। इससे हम दिल्ली में उपलब्ध सड़क–तंत्र (Road – Network) पर वाहनों के अत्यधिक भार का अनुमान सहज ही लगा सकते हैं।

2. पार्किंग सुविधाओं की अत्यधिक कमीः

आश्चर्यजनक तथ्य है कि दिल्ली में जितने अधिक वाहन है उतना ही सार्वजनिक पार्किंग सुविधाओं का नितांत अभाव है। अधिकांश आवासीय क्षेत्रों में प्लॉट छोटे होने के कारण घरों में पार्किंग का स्थान प्रायः नहीं के समान है। दिल्ली की सभी कॉलोनियों में घरों के बाहर पंक्तिबद्ध खड़ी गाड़ियों का दृश्य एक आम बात है। पार्किंग के कारण लोगों में विवाद होना समाज में आम दृश्य है। लोग सड़कों के किनारे और गलियों में अवैध ढंग से गाड़ियां पार्क करने को विवश है जिसके परिणाम स्वरुप ट्रैफिक जाम बढ़ता हैं। अनेक स्थानों पर अनाधिकृत पार्किंग स्थल भी बने हुए हैं।

3. अपर्याप्त ट्रैफिक नियंत्रणः

जुलाई 2022 में दिल्ली में ट्रैफिक कर्मियों की संख्या 6000 थी जो इस समय अनुमानित 7000 होगी। यदि हम यह मान लें कि कुल वाहनों का 50% अर्थात् लगभग 75 लाख वाहन एक समय पर दिल्ली की सड़कों पर चलते हैं और उन्हें नियंत्रित करने के लिए कुल ट्रैफिक कर्मियों का 50% अर्थात् मात्र लगभग 3500 ट्रैफिक कर्मी एक समय पर ड्यूटी पर तैनात रहते हैं तो ट्रैफिक नियंत्रण की अपर्याप्तता का हम एक सहज अनुमान लगा सकते हैं। आधुनिक और पूर्णतया स्वचालित ट्रैफिक नियंत्रण तकनीक का विस्तार अभी तक संपूर्ण दिल्ली में नहीं हो सका है।

4. फुटपाथों पर अतिक्रमणः

दिल्ली के अधिकांश फुटपाथ दृष्टि से ओझल हो चुके हैं। उन पर दुकानदारों, अवैध पार्किंग ठेकेदारों और रेहडी पटरी वालों आदि ने स्थाई रूप से कब्जा कर लिया है। इसके परिणाम स्वरुप पैदल यात्री असुरक्षित ढंग से मुख्य सड़कों पर चलने को विवश है। इसके कारण वाहनों की औसत गति धीमी होती है।

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1. वाहनों की धीमी औसत गतिः

उपरोक्त चारों कारणों के परिणाम स्वरुप ट्रैफिक–जाम होते हैं और वाहनों की औसत गति धीमी रहती है। दिल्ली के व्यस्त बाजारों में दिनभर वाहन प्रायः रेंगते हुए दिखाई देते हैं। पर्व–त्योहारों के अवसर पर तो स्थिति और भी विकट हो जाती है। Tomtom.com ट्रैफिक इंडेक्स के अनुसार दिल्ली में मुख्य मार्गों पर वाहनों की औसत गति व्यावहारिक रूप से 20 से 30 किलोमीटर प्रति घंटा रहती है जिससे वाहनों का उत्सर्जन (Emission) बढ़ता है।

2. प्रदूषण एक गंभीर स्वास्थ्य समस्याः

गत अनेक वर्षों से दिल्ली देश के सर्वाधिक प्रदूषित शहर के रूप में कुख्यात हो चुका है। प्रदूषण पूरे वर्ष समान रूप से बना रहता है लेकिन प्रतिवर्ष सर्दियों में स्थिति गंभीर हो जाती है और इसका सबसे प्रमुख कारण वाहनों का उत्सर्जन (Automobile Emission) है। एक उल्लेखनीय तथ्य यह है कि वाहनों के उत्सर्जन की मात्रा वर्ष–पर्यंत एक समान रहती है लेकिन वर्ष में लगभग दस माह वह ऊपर उठकर वायुमंडल (Atmosphere) में विलीन हो जाता है इसलिए हमें इसका अधिक अनुभव नहीं होता है। लेकिन वर्ष के लगभग दो माह (प्रायः मध्य नवंबर से मध्य जनवरी तक) प्राकृतिक कारणों से जब हवा की गति अत्यंत धीमी होकर स्थिर (Stagnant) हो जाती है तब यह उत्सर्जन वायुमंडल में प्रवेश नहीं कर सकता और धरती के समीप वातावरण (Environment) में एक सघन आवरण बना लेता है। इसके परिणाम स्वरुप दिल्ली का वायु गुणवत्ता सूचकांक (AQI) और वातावरण में सूक्ष्म कणिका पदार्थ (PM 2.5) खतरनाक स्तर को पार कर जाते हैं।

सरकारें, प्रशासन, नीतिकार और सभी राजनीतिक दल इस सच्चाई को समझते हैं लेकिन इसका कोई स्थाई उपाय उनके पास नहीं है अतः विवश होकर इसका दोष पराली, उद्योगों और भवन–निर्माण कार्यों के मत्थे मढ़ते हुए सीलिंग, प्रतिबन्ध, चालान, ऑड–ईवन और जल–छिड़काव जैसे फौरी और अप्रभावी कदम उठाकर अपने कर्तव्य की इतिश्री कर लेते हैं। सर्दी कम होने पर हवा की गति स्वतः ही बढ़ जाती है और दिल्लीवासी अगले वर्ष तक सब कुछ भूल जाते हैं।

उल्लेखनीय है कि दिल्ली के प्रदूषण में पराली का योगदान नगण्य है, लगभग सभी बड़े उद्योग दिल्ली से बाहर हो चुके हैं, प्रदूषणकारी उद्योग दिल्ली में प्रतिबंधित है और भवन–निर्माण कार्य पूरे वर्ष समान रूप से चलते हैं। निष्कर्षतः वायु प्रदूषण का सर्वप्रमुख कारण है, अत्यधिक वाहनों का उत्सर्जन।

3. सड़क दुर्घटनाओं में वृद्धिः

राष्ट्रीय अपराध रिकॉर्ड ब्यूरो (NCRB) के आंकड़ों के अनुसार देश के अन्य महानगरों की तुलना में दिल्ली में सड़क दुर्घटनाओं की संख्या अधिक होती है। समाचार पत्रों में प्रतिदिन इनकी खबरें छपती है। दुर्घटनाओं के दो प्रमुख कारण है, लोगों में अपने गंतव्य पर पहुंचने की शीघ्रता के कारण सड़कों पर बिगड़ता लेन–अनुशासन (Lane Discipline) और मुख्य मार्गों पर आने वाले अचानक अवरोध (Sudden Bottlenecks).

4. उत्पादकता में कमीः

वाहनों की औसत धीमी गति, ट्रैफिक–जाम और सड़क–रोष (Road Rage) की बढ़ती घटनाओं के कारण दिल्ली के सभी कार्यशील लोगों (Working People) को अपेक्षाकृत अधिक समय तक ट्रैफिक में रहना पड़ता है। समय के अपव्यय और उससे उपजे तनाव का सीधा प्रभाव उनकी उत्पादकता पर पड़ता है लेकिन इस अप्रत्यक्ष भारी हानि का आकलन कोई नहीं कर सकता।

D;kg lek/kku\

इस बहुआयामी (Multidimensional) और विषम चुनौती का कोई एकांगी (One Sided) समाधान संभव नहीं है। इस पर समग्र दृष्टि (Holistic Approach) से विचार करने की आवश्यकता है। मैं इस हेतु त्रिस्तरीय सुझाव प्रस्तुत करता हूँ।

1. अल्पकालिक समाधान (अवधि 1 से 2 वर्ष):

1.1 अतिक्रमण मुक्त फुटपाथ : यदि दिल्ली के 100% फुटपाथ और सड़के एक समयबद्ध अभियान द्वारा स्थाई रूप से अतिक्रमण–मुक्त हो जाए तो इसके आश्चर्यजनक परिणाम होंगे। इससे पैदल यात्री असुरक्षित ढंग से सड़कों पर चलने को विवश नहीं होंगे, परिणाम स्वरुप वाहनों की औसत गति में बहुत सुधार होगा, उत्सर्जन और ट्रैफिक–जाम घटेंगे। दिल्ली में यह अभियान शासन–प्रशासन की पूर्णतः भेदभाव रहित दृढ़ इच्छा शक्ति से ही सम्भव हो सकता है।

1.2 ट्रैफिक नियंत्रण प्रणाली में सुधार : पूर्ण स्वचालित ATCS (Adaptive Traffic Control System) प्रणाली का विस्तार संपूर्ण दिल्ली में यथाशीघ्र हो जिससे ट्रैफिक कर्मियों पर निर्भरता घटे।

1.3 गंतव्य तक ट्रैफिक सुविधा (Last Mile connectivity) : प्रमुख मेट्रो स्टेशनों से निकटवर्ती बाजारों और रिहायशी क्षेत्रों तक सुविधाजनक और अधिक फेरों (High Frequency) वाली छोटी इलेक्ट्रिक फीडर बसों का प्रचलन बढे जिससे लोग निजी वाहनों का उपयोग करने को हतोत्साहित हो।

2. **मध्यमकालीन समाधान (अवधि 3 से 5 वर्ष)** :

2.1 **पार्किंग सुविधाओं का विस्तार** : बहुस्तरीय (Multilevel) पार्किंग का पूरी दिल्ली में तेजी से विस्तार होना बहुत आवश्यक है। इससे अवैध पार्किंग समाप्त होगी और लोगों में 'Park and Ride' की आदत बढ़ने से सार्वजनिक यातायात का उपयोग बढ़ेगा।

2.2 **ई–वाहन नीति** : दिल्ली अपने घोषित ई–वाहन लक्ष्यों से बहुत पीछे है। ई–वाहनों पर आकर्षक छूटें जैसे करो में कमी, निशुल्क पार्किंग आदि घोषित हो। साथ ही, चार्जिंग स्टेशनों का तेजी से विस्तार हो।

2.3 **निर्धारित साइकिल ट्रैक्स (Designated Cycle Tracks)** : दिल्ली के मुख्य मार्गो पर यथा सम्भव साइकिल कोरिडोर का निर्माण हो। यह वाहनों की औसत गति बढाने और दुर्धटनाओं को रोकने में अत्यधिक सहायक होगा।

2.4 **वाहन संख्या प्रबंधन नीति (Vehicle Population Policy)** : दिल्ली में ऐसी नीति बनकर लागू हो जिसमे वाहनों की संख्या नियंत्रित हो और नागरिकों को इस अभियान में शामिल होने को प्रोत्साहित किया जाए।

3. **दीर्घकालीन समाधान (अवधि 6 से 10 वर्ष)** :

3.1 **मेट्रो सेवा का विस्तार** : राष्ट्रीय राजधानी क्षेत्र (NCR) के सभी दूरस्थ स्थानों (Distant Suburbs) तक मेट्रो सेवा का तेजी से विस्तार हो, जिससे वहां से आने–जाने वाले निजी वाहनों की संख्या घटे।

3.2 **थोक मण्डियों (Wholesale Business Hubs) का स्थानान्तरण** : दिल्ली की प्रमुख थोक मण्डियों को बाहरी दिल्ली में स्थानान्तरित करने की योजनाएँ बने और बाहरी क्षेत्रों में नए आवासीय केंद्र (Satellite Townships) विकसित हो।

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यदि दृढ इच्छा शक्ति और समग्र सोच के साथ समयबद्ध प्रयास हो तो दिल्ली की ट्रैफिक चुनौती को एक सुन्दर अवसर में रूपांतरित किया जा सकता है और विकसित भारत की राजधानी दिल्ली, एक विश्व–स्तरीय शहर बन सकता है।

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श्री सम्पत तोषनीवाल एक अनुभवी उद्यमी एवं सामाजिक कार्यकर्ता हैं। वे राजस्थान सरकार में भूतपूर्व लोक सेवक, लघु उद्योग भारती (दिल्ली प्रदेश) के अध्यक्ष तथा राष्ट्रीय MSME बोर्ड के सदस्य के रूप में उल्लेखनीय सेवाएँ दे चुके हैं।

वर्तमान में वे दिल्ली उत्पादकता परिषद के अध्यक्ष हैं तथा अनेक सामाजिक एवं उद्योग–समर्थक संगठनों से सक्रिय रूप से जुड़े हुए हैं। वे स्वतंत्र, सरल तथा स्पष्ट विचारों के लिए जाने जाते हैं।

दिल्ली ट्रैफिक जाम

हैरान कर देने वाले तथ्य

- दिल्ली अक्सर दुनिया के टॉप ट्रैफिक कंजेशन वाले शहरों की सूची में शामिल होती है। पीक ऑवर्स में औसतन 30–45% अतिरिक्त समय सड़क पर लग सकता है।

- अगर रोज ऑफिस जाने में 1 घंटा ट्रैफिक में फंसते हैं, तो साल भर में यह लगभग 15–20 दिन सड़क पर ही गुजर जाते हैं!

- एक छोटी–सी बारिश भी दिल्ली में जाम महोत्सव में बदल जाती है। पानी भराव + गड्ढे = घंटों का जाम।

- दिल्ली की सड़कों पर किसी भी वक्त 1 करोड़ से ज़्यादा वाहन दौड़ते हैं, इसलिए थोड़ी–सी रुकावट भी बड़ा जाम बना देती है।

- दिल्ली का ट्रैफिक इतना अनियमित है कि लोग जाम में फंसकर मोबाइल गेम, रील, ऑफिस कॉल–यहाँ तक की पूरी वीडियो मीटिंग भी कर डालते हैं!

- दिल्ली पुलिस को हर दिन लाखों ट्रैफिक उल्लंघन रिकॉर्ड करने पड़ते हैं– ओवरस्पीडिंग, गलत पार्किंग, रेड लाइट जंपिंग सबसे ऊपर।

DESIGN INCLUSIVE CITIES - A ROADMAP FOR DELHI TO BECOME DISABILITY FRIENDLY BY 2030

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ABSTRACT:

Delhi's aspiration to become a world-class capital must rest on the foundation of inclusivity, where empowerment and dignity of persons with disabilities (PwDs) are prioritised within the urban landscape. This article presents a comprehensive, data-driven roadmap to make Delhi disability-friendly by 2030, leveraging policy reforms, infrastructural innovation, and lifelong support schemes. Drawing from three decades of leadership in disability advocacy, finance, and government, it spotlights pioneering interventions — early intervention, scholarships, health insurance, shelter homes, and legal guardianship-tested across India for real impact. The article offers strategic recommendations synthesising global best practices and ground experience, urging policymakers and stakeholders to ensure PwDs are not left behind in Delhi's story of progress.

INTRODUCTION:

Delhi pulsates with ambition, history, and diversity. As India's capital strives for global city status, the urgent question remains: **Is Delhi accessible and welcoming for all — especially for its 3.5 lakh citizens with disabilities?** According to the Census of India (2011), over 2.2% of Delhi's population lives with disability, demanding urban environments that support independent living, provide equal opportunity, and ensure full participation.

My leadership roles — Joint Secretary & CEO of the National Trust and CMD of NHFDC — provided a front-row seat to PwD challenges and the potential for transforming policy into practice. This article is a blueprint for cities to become disability-friendly: grounded in data, lived realities, and successful interventions.

THE BARRIERS — DELHI'S DISABILITY LANDSCAPE:

Despite progressive laws, Delhi's infrastructure, public services, and policies often fall short of true accessibility:

- **Physical Infrastructure Gaps:** Ramps, elevators, tactile guides, adapted transport, and signage are missing or poorly implemented at stations, hospitals, schools, and public spaces (Ministry of Social Justice & Empowerment, 2019 audit).
- **Transport Hassles:** Wheelchair users face difficulty in stations and buses; last-mile solutions lag far behind global standards.
- **Healthcare & Education Access:** District-level disparities, few inclusive classrooms, limited affordable therapies, and weak follow-up services persist.
- **Social Barriers:** Stigma, lack of disability awareness, and fragmented care systems limit social and economic inclusion.
- **Legal & Policy Challenges:** Even the Rights of Persons with Disabilities Act (RPWD), 2016 is unevenly implemented, with few accountability mechanisms and low grassroots penetration.

FROM EARLY STAGE SUPPORT TO LIFELONG INCLUSION - PIONEERING SCHEMES:

Drawing on my tenure in the National Trust, several ground-breaking schemes were implemented to address the full life cycle of disability challenges. These serve as potential models for Delhi's transformation:

1. **Early Intervention Scheme :** At the critical age when parents first discover their child's intellectual or developmental disability, the scheme provides parental training, financial aid, and support via accredited NGOs. Early engagement fosters acceptance, emotional resilience, and helps families navigate special education and therapeutic pathways.
2. **Gyanprabha Scholarship:** Designed to ensure no child with disability is denied education or skills. Scholarships apply to all fields — academic, vocational, or special skills — empowering children to chart individual paths.
3. **Niramaya Health Scheme:** Compulsory government-supported health insurance for PwDs. This dramatically increased access to therapies, interventions, and emergency care, removing the financial barrier that often halts progress for such families.
4. **Temporary Shelter Homes:** Created short-term, supportive accommodations for children/young adults with disabilities — providing relief for families during emergencies, transitions, or when parents need temporary support.
5. **Gharonda:** Permanent Shelter Solutions: Developed lifelong homes with specialised care for adults with disabilities who need long-term residential support after the passing of parents/guardians — ensuring dignity and stability.

6. **Professional Caregiver Teams:** Built a cadre of trained personnel to provide high-quality care, both in institutions and community settings. Addressed chronic staff shortages and improved service quality.
7. **Legal Heirship & Guardianship Scheme:** Launched an innovative legal protection model ensuring continuity of care, property management, and rights of protection after parents' demise — reducing vulnerabilities to exploitation and abandonment.

ROADMAP FOR DELHI: RECOMMENDATIONS & STRATEGIES:

A) Embed Universal Design in Urban Planning: All new public buildings, transport infrastructure, parks, and amenities must be designed for accessibility from the outset. Regular audits for retrofitting old infrastructure (ramps, lifts, signage, tactile floors, audio-visual information) should be mandated.

B) Reform Public Transport — Making Delhi Mobility Truly Inclusive: An accessible and inclusive public transport system is crucial for enabling persons with disabilities (PwDs) to participate fully in urban life. Reforming Delhi's vast and complex mobility ecosystem requires multi-pronged strategies embracing all modes-from Metro, buses, and local trains, to para-transit, taxis, and private vehicles. Here is a comprehensive elaboration integrating both your suggestions and best global practices:

1. **Delhi Metro — Universal Accessibility Upgrades:**
   - **Expand Wheelchair-Accessible Gates & Elevators:** All stations should retrofit or upgrade entrances, exits, platform access points, and concourses to seamlessly accommodate wheelchairs and mobility aids.
   - **Tactile & Audible Display Boards:** Install clear, multi-language audio announcements and high-contrast display boards for visual and hearing-impaired passengers.
   - **Internal Navigation:** Tactile paving should help users navigate between entry, platforms, and exits. Help desks must offer real-time assistance for PwDs.
2. **DTC Buses & NCR Inter-City Transport:**
   - **Increase Low-Floor, Ramp-Equipped Fleet:** Mandate that all new buses — city and inter-state — feature ramped or kneeling entrances, dedicated disability seating, and stop signals at accessible height.
   - **Last-Mile Para-transit Links:** Expand para-transit options like accessible E-rickshaws, micro-vans, and cycle taxis customised for wheelchairs and visually impaired users.

- **Mandatory Accessibility for NCR-Entry Buses:** All intercity/state-run buses entering Delhi must comply with Delhi's accessibility codes, reflecting its status as a model capital.

3. **Northern Railways' EMU (Local Trains) Inclusion:**
   - **Accessible Compartments & Platforms:** Reserve dedicated compartments and create accessible boarding points for EMU local trains. Platforms must have ramps, tactile cues, and real-time display of train schedules.
   - **Priority Boarding for PwDs:** Supervise staff to allow safe, priority boarding and disembarking for persons with disabilities during peak hours.
4. **Taxis, E-Rickshaws, & Voluntary Private Vehicles: "FREE RIDE FOR PwD" Initiative:**
   - **Awareness Sticker Campaign:** Encourage private vehicle owners, taxis, and e-rickshaw operators to participate in a "FREE RIDE FOR PwD" sticker campaign. This voluntary action signals a readiness to support and transport persons with disability at no cost, fostering community involvement and spreading awareness.
   - **Training Volunteers:** Organise citywide workshops training drivers to assist PwDs with boarding/disembarking, communication, and respectful support.
   - **Regulatory Support:** Delhi Transport Authority to provide incentives (tax breaks, recognition) for private and commercial drivers who consistently offer such voluntary free rides or discounts.
5. **Pan-Sector Staff Training & Certification:**
   - **Disability Etiquette & Emergency Assistance:** Make disability sensitivity training mandatory for all transport staff-including Metro, bus, taxi, rail, and para-transit workers. Certification can be linked to annual performance evaluation.
   - **Emergency Protocols:** Equip all public vehicles with emergency kits and provide helplines for real-time assistance.
6. **Accessible Travel Technology:**
   - **Unified Journey Planner App:** Develop a mobile application allowing PwDs to map fully accessible routes combining Metro, rail, buses, taxis, and e-rickshaws. Features should include real-time disruption alerts, accessible station locator, fare concessions, and a help request button.
   - **Online Booking Concessions:** Implement priority online booking and digital concessions for PwDs across all ticketing platforms.

7. **Inclusive Policy & Monitoring:**
    - **Regular Audits:** Conduct quarterly accessibility audits of all modes; invite feedback from PwDs and disability organisations.
    - **Public Reporting & Transparency:** Share audit results, improvement measures, and incident reports on official city portals to build trust.
    - **Collaboration with NGOs:** Partner with disability organisations for direct input, outreach, and ongoing training.
8. **Additional Recommendations :**
    - **Implement "Buddy" Programmes:** Pair public volunteers with PwDs for assisted travel during major exam days, festivals, or events.
    - **Mobile Clinics:** Offer mobile services (health, legal, social work) at transport hubs to aid PwDs during journeys.

SUMMARY:

By combining infrastructure upgradation, community campaigns, policy mandates, digital innovation, and inter-agency cooperation, Delhi can set a gold standard for disability-friendly public transport. The "FREE RIDE FOR PwD" stickers, mandatory staff training, accessible intercity buses, and upgraded Metro and rail systems will spark both awareness and systemic change-making travel dignified, safe, and empowering for every person with disability.

C) Digital & Social Inclusion:

- Ensure all Delhi Government e-services are accessible: websites, apps, public kiosks.
- Launch an "Accessible Delhi" mobile app for navigation and emergency support for PwDs.

D) Education & Employment:

- Support inclusive classrooms; train teachers across MCD and Delhi State Schools in disability pedagogy.
- Partner with private sector for skills development, internships, and jobs for PwDs-using NHFDC best practices as replicable models.

E) Healthcare & Community Support:

- Distribute NIRAMAYA subscriptions through Delhi hospitals and urban clinics.
- Geo-tag and publicize temporary and permanent shelter homes; create helpline support for care and emergencies.

F) Guardianship and Legal Support

Strengthen the legal heirship mechanism; facilitate legal aid and advocacy for protecting property, rights, and health access.

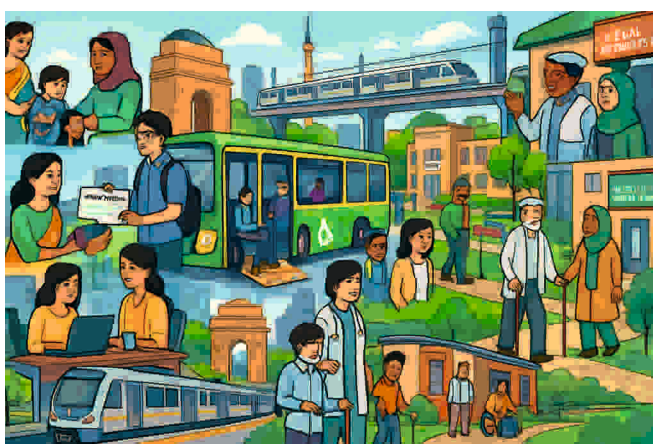
G) Awareness Campaigns & Civil Society Engagement

- Organise citywide workshops and media drives, in collaboration with NGOs and Disabled Persons Organisations.
- Celebrate International Disability Day with Delhi-centric policy exhibitions and interactive events.

CASE STUDIES – WHAT WORKS DURING MY TENURE:

- **Early Intervention** Enrolments increased by 30% across pilot districts in Delhi (2013- 2015).
- **NIRAMAYA Health Insurance** raised coverage from 8,000 to 75,000 beneficiaries in Delhi NCR.
- **Gharonda Shelter Model —** now cited by other states — ensured lifelong support for hundreds of adults.
- **Guardianship reforms** received national legal appreciation (Indian Express, 2022). International best practice: Singapore, Tokyo, and Barcelona have showcased "smart infrastructure audits" and public feedback platforms directly linked to city-building-Delhi can adapt these learnings.

FUTURE VISION FOR DELHI:



By 2030, Delhi can redefine itself as a beacon of disability inclusion if these proven models are adapted, scaled, and rigorously monitored. Disability-friendly cities are not only more humane, but they also unlock full creative and economic potential for all.

CONCLUSION:

1. **Ending Stigma: Supporting Parents and Early Intervention**

   A major barrier to early diagnosis and support is social stigma. Many parents, especially from under-informed or conservative backgrounds, hide developmental delays in children out of fear or shame. Rather than approaching child development centers or therapists, they sometimes fall prey to superstitions, unscientific practices, or social isolation, further hampering the child's growth.

   Delhi Government must, therefore, launch continuous awareness campaigns, especially through Anganwadis, maternity hospitals, schools, and media, to encourage early intervention, counselling, and diagnosis without stigma. Parental support groups and trained frontline workers should be made accessible at the ward level.

2. **Creating a Socially Inclusive and Rights-Based Ecosystem for PwDs in Delhi**

   While physical accessibility is a foundational aspect of inclusion, true inclusivity must be rooted in empathy, awareness, and accountability. Delhi, being the capital of India, must lead by example — not only through infrastructural upgrades but also through a transformation in public consciousness and governance systems.

3. **Priorities for PwDs: Beyond Policies to Public Awareness**

   Although several rules and guidelines exist to offer priority to Persons with Disabilities (PwDs) in public spaces-such as reserved seating, accessible entries, and priority boarding in transport like Delhi Metro — their implementation remains inconsistent. The issue is not just of regulation, but of public behavior and civic culture.

   All citizens must understand that PwDs may be born with disabilities or may acquire them through accidents, illness, or due to age-related conditions. Ageing itself is a phase of physical and sometimes mental impairment. Therefore, inclusion is not charity — it is an investment in a future that includes everyone. This calls for mass sensitization, so people stop staring, isolating, or treating PwDs as "different." Respect, not pity, should define interactions.

4. **Inclusive Education: Shaping Values from a Young Age**

   Inclusion must begin at school. Rather than creating isolated "special" schools, mainstream education must adopt inclusive models that allow children with and without disabilities to study together, learn from each other, and grow as equals. Curricula should include disability awareness from primary levels-teaching students how to assist, interact with, and respect PwDs in their day-to-day life.

   Such early exposure helps foster a generation that naturally internalizes diversity, rather than being indifferent or awkward in its presence. Moreover, children must be taught that disability

is not a limitation, but a variation of human experience.

5. Institutional Reforms: Accountability in Every System

Inclusion must be enforced systemically. A transformative step would be to mandate the following:

5.1 All government inspection reports-whether of schools, hospitals, transport hubs, or offices-should have a mandatory column:

"Status of accessibility and inclusion for PwDs (staff and visitors)".

This will embed inclusion as a governance norm, not a token gesture, and gradually transform public institutions into auto-mode inclusive ecosystems.

5.2 Annual Performance Appraisal Reports (APARs) for all Delhi government officers should include a specific section:

"What initiatives have you undertaken to empower or facilitate inclusion of PwDs in your role during the year?"

6. Enforceable Priority & Public Campaigns

6.1 At every public facility-government offices, transport hubs, hospitals, courts, Malls, Theatres, Hospitals, Banks,Transportations, and all places to make accessible, tourist sites — enforceable priority must be granted to PwDs, not just on paper, but through trained staff, public signages, and grievance mechanisms. This must be backed by multi-format campaigns (TV, Radio, Digital, Street Plays) to make disability awareness a part of daily civic identity.

6.2 Delhi can and must become a model for inclusive governance that other Indian states can replicate. It is not just about urban design — it's about reimagining society with dignity, equity, and empathy at its core.

6.3 Delhi's journey toward world-class status will be incomplete unless it is world-class in care, accessibility, and dignity for every citizen. Proven schemes — early intervention, scholarships, health access, shelter homes, legal protection — offer Delhi a roadmap to comprehensive inclusion. Urban planners, government, civil society, and business must unite, building on lessons from NGOs, State's welfare policies at the center 'the National Trust' and 'NHFDC', to ensure Delhi sets a new gold standard for cities across India and the world.

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ABOUT THE AUTHOR:

Ajay Kumar Lal is an acclaimed senior Civil Servant (IRAS-84Batch), Policy Maker, and Executive with over 30 years at the vanguard of disability empowerment, public finance, and social justice in India. As Joint Secretary & CEO, National Trust, (For Intellectual disabilities) he spearheaded national schemes for PwDs including Early Intervention, Gyanprabha scholarships (Education), NIRAMAYA health insurance, shelter homes (For temporary stay), and Gharonda (For Adults' lifelong stay) and when parents won't be there for their protection, legally bound guardianship reform under District Magistrates of each district of Indian states have started. As CMD, NHFDC, he pioneered direct financial and professional empowerment for thousands of PwDs. Widely decorated for innovation and efficiency — including the International Human Rights Organisation Award and entries in the Guinness World Records — Mr. Lal's legacy includes ground-breaking arbitration, social work, and infrastructure transformation. After superannuation as Principal Financial Adviser & CAO and Addl.Secty.to GOI, he acted as 'State Selection committee member board of the WCD' (Department of Women & Child Development, Govt.of NCT,Delhi) and at present, he is appointed as IEM/CVC.

LEARNING ABOUT FROM HISTORY

1. Disability Is More Common Than You Think

- 1 in every 6 people worldwide lives with a disability.
- India has over **2.68 crore** persons with disabilities (PwDs).
- In Delhi, 5 in every 100 homes have at least one PwD.
- Disabilities may be **by birth, age, accident, or illness.**

2. Government Support Schemes

Level	Scheme	What It Offers
India: depwd.gov.in	ADIP	Free assistive aids (wheelchairs, hearing aids)
	SIPDA	Funds to make public spaces accessible
	DDRS	Grants to NGOs for education & rehab
Delhi: delhi.gov.in	Disability Pension	₹2,500/month for eligible PwDs
	Sugamya Sahayak	Free assistive devices for mobility/hearing

3. Financial Relief for Empowerment

- ₹1.25 lakh tax rebate for parents of children with disabilities.
- **Train & flight fare discounts**, free bus travel (e.g., in Delhi).
- **Lower GST** on adapted cars for PwDs.
- **Job & education quotas**, loans for business/housing (NHFDC).

4. Champions of Change: Achievers with Disabilities

- **Dr. Syed Sallauddin Pasha -** Founded “Miracle on Wheels”, a wheelchair dance co.
- **Malvika Iyer -** Model & speaker; lost both hands, now a global disability rights voice.
- **Apoorv Om -** Deaf artist using digital media to spread awareness.
- **Murlikant Petkar -** India’s first Paralympic gold medallist.
- **K. Y. Venkatesh -** Para-athlete, Padma Shri awardee.
- **Anchal Bhateja -** First visually impaired woman to argue in Supreme Court.
- **Sudha Chandran -** Actress and dancer with a prosthetic leg.
- **Gopi Krishnan Varma -** First Indian lead actor with Down syndrome.

DELHI'S FIGHT AGAINST POLLUTION

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ABSTRACT:

Delhi, India's capital, faces one of the most severe air pollution crises, driven by vehicular emissions, industrial discharge, construction dust, stubble burning, and poor waste management. Seasonal weather patterns increase the problem, especially in winter, posing grave health risks. The city has responded with multi-pronged strategies, including the Graded Response Action Plan, National Clean Air Program, environmental compensation charges, and aggressive promotion of electric vehicles. Technological measures such as smog towers, anti-smog guns, real-time monitoring, and artificial rain complement policy actions. Community engagement, through initiatives like the Green Delhi App, Bhagidari movement, and school-based awareness programs, has strengthened public participation. Achievements include a 34% drop in PM2.5 levels (2016-2022), fewer severe pollution days, higher adoption of EVs, and improved summer air quality. However, challenges remain in inter-state coordination, infrastructure gaps, and behavioural resistance. Sustained, holistic approaches-combining strict enforcement, green infrastructure, and citizen involvement-are essential to ensure long-term improvement. Delhi's experience could serve as a replicable model for other urban centres battling pollution.

Keywords: Air pollution, Construction, Discharge, Emission, Infrastructure, Stubble

INTRODUCTION:

Delhi is an important metropolitan city of India, for it is the capital of the country. As much as it is the capital of India, it is also a thickly populated state, with the majority being a floating population. People from various states of India co-exist here. Therefore, it is also turning out to be a hub of culture, custom, governance, and economic activities. But on the other hand, it is also becoming famous for being one of the most polluted cities in the world. Over the years, the pollution level has gone up alarmingly to the extent where sickness related to pollution has increased and hospitals are engaged in addressing such issues more than before. The air quality of Delhi is deteriorating, and as a result, it is becoming a severe risk for human health.

The environmental issues occur due to factors like emissions from over 12 million registered vehicles, discharge from various industries, uncontrolled construction dust, and burning of agricultural residue from the surrounding states. Especially during the winter season, it is on the rise due to poor wind quality and high-rise buildings. Thus, it is turning out to be a matter of concern and crisis. The health condition is challenged, and the environment is becoming unliveable. The result is that breathing fresh air has become a rare commodity. Lungs are damaged, and quality of life is lowered drastically. So it is called for having multi-pronged and sustained interventions.

Through this article, an effort is made to understand Delhi's fight against pollution through policy measures, technological innovations, public participation, challenges, and the path ahead.

THE DEGREE OF POLLUTION CRISIS

The pollution in Delhi can't be just pinned down to one issue; rather, it is multifaceted. The Air Quality Index (AQI), is always in an alarming situation. It is due to various factors like;

- Emissions from Vehicles
- Pollution from Industry
- Dust from continuous Constructions
- Burning of debris and Biomass
- Poorly managed Waste
- Poor pattern of weather, like inversion of temperature and low wind)

The elderly and the children are the most vulnerable group. Those with any already existing respiratory problems are also likely victims of the same. Consistently, it has been noticed for the last two years in Delhi, particularly areas like Anand Vihar, Jahangirpuri, and Mandrika. Herein, the AQI was identified to be between 400 – 500. It is alarming.

MAJOR CAUSES OF AIR POLLUTION:

Here we have a look at various causes for having such acute air pollution in Delhi:

a. Emissions from Vehicles

Delhi has over 11 million registered vehicles. The pollution from there remains a major contributor. Though there is Bharat Stage VI (refers to a set of vehicle emission standards implemented) in place, still, due to the outdated public transport system along with fuel and engine norms, congestion etc., continue to aggravate the problem.

b. Pollution from Industry

Delhi NCR has a number of industries. Many of these are located in Faridabad, Noida, and Gurugram. They release a huge amount of sulphur dioxide, nitrogen oxides, and PM 2.5. Many of the units also use dirty fuels like coal and furnace oil.

c. Dust from continuous Constructions & Demolitions

Due to the development that is taking place, there is so much structuring and restricting of infrastructure taking place in Delhi NCR. This in itself adds to the increase in dust. Many times, dust control measures are not put in place, and so it becomes a serious contributor to dust pollution. Over and above this, when storage of construction materials is in the open air, and lack of green fencing, it adds to worsening the situation.

d. Burning of agricultural debris

Particularly in October and November, we have a serious problem from the neighbouring states of Delhi, like Punjab, Haryana, and Uttar Pradesh, where, after the harvest the seasonal stubble is burned. The smoke from the same moves towards Delhi, and due to the high-rise buildings, it does not move beyond Delhi, and all remain in the atmosphere, and the living conditions deteriorate. Though there are rules and regulations with regard to all these and alternatives like bio-composers are in place, still, issues continue to persist.

e. Poorly managed Waste

In areas that lie on the peripheries and in unauthorised colonies, it is noticed that garbage, leaves, plastic, etc., are burned in the open. Landfills like Ghazipur emit methane and other gases, largely contributing to pollution and greenhouse gas emissions.

GOVERNMENT STRATEGIES AND POLICY INTERVENTIONS:

Here we shall look at some of the government strategies and policy interventions made to reduce or bring the pollution level under control.

a. Environmental Compensation Charges

It is a fine imposed on the environmental damagers. It is monetary in nature and is operating under the polluter-pays principle. Charges for the same are calculated based on the nature and the scale of environmental damage, the type of violation caused, and the location of the violation. The types of violations include plastic waste, biomedical waste, and groundwater extraction. The honourable Supreme Court instructed the green cess (tax) to be imposed on those activities (Commercial vehicles entering Delhi and diesel vehicles older than 10 years to be deregistered) or products that harm the environment. This mandate is with the Delhi Pollution Control Committee (DPCC). They may issue show-cause notices, payments, and legal recovery of unpaid amounts.

b. Seasonal Plans by the Delhi Government

The Government of Delhi plans various activities to maintain the environment of Delhi based on the seasons. For winter last year, what was done was to include 15 focused areas, which are prominent and mobilised over 30 government departments. Some of the other seasonal plans include:

- Water sprinkling and Mechanised sweeping
- Anti-smog guns and Smog towers
- Enforcing a dust control system at construction sites
- Promotion of electric vehicles

c. Graded Response Action Plan (GRAP)

The Graded Response Action Plan is a plan that is executed in Delhi NCR to fight air pollution, especially during cold months when the air quality goes bad. It calls for specific action, particularly when the Air Quality Index becomes bad. This plan is to see that no further deterioration of air quality takes place. Therefore, certain measures like a ban on vehicles (old diesel vehicles, BS-III petrol and BS-IV diesel vehicles), odd-even schemes for public vehicles to be on the road, a ban on construction and demolition activities, closure of polluting industries, and an increase in public transport. This plan was first implemented in 2017 and modified in 2023.

d. National Clean Air Program (NCAP)

The National Clean Air Program (NCAP) is a pollution control initiative launched in 2019. The main purpose of this initiative was to reduce the concentration of coarse and fine particulate matter in the atmosphere by at least 20% by 2024. To achieve this main aim, there were efforts made to expand the national air quality monitoring network, build capacity for air pollution management, and bring public awareness about the hazards of air pollution. It also had other ideas like having a feasible plan to prevent, manage, and control air pollution. So the efforts will be to see:

- There is a proper air quality monitoring system
- The emission inventories are maintained
- There must be a customised action plan for each of the cities
- Build up the capacity at the local level for the urban bodies

PUBLIC TRANSPORT AND ELECTRIC VEHICLES

The Electric mobility, particularly in the transport system of Delhi, has made all the effort to do this and is emerging as the leader in the same field. The Government of Delhi is very proactive in this

area, and various EV policies and initiatives are taken to reduce vehicular pollution and to make Delhi a global leader in EV adoption.

Some of the key aspects include:

a. Electric bus fleet expansion

The Government of Delhi, particularly with the Delhi Transport Corporation (DTC), has so far brought in 7205 electric buses. There is an effort to add 150 to 200 electric buses every year, as was done in 2022. So, it is easily noticed that there is an effort made to actively expand the electric bus fleet in Delhi NCR. This effort also has another intention to reduce pollution. As per the reports of Autocar Professional, by 2025, Delhi wants to have 80% of its buses electrified. As per the DD News, it is stated that by 2027, 100% of buses must be electric in Delhi.

b. EV Policy in Delhi

The EV Policy of Delhi is considered to be the most progressive one globally. As per this policy, which started in 2020 and extended up to 2026, it states that 25% of all new vehicles sold by 2024 must be electric vehicles, and 50% of the new public transport vehicles, including buses, must be electric by 2024. Therefore, various incentives were proposed to this end, like purchase incentives, scrapping incentives, interest subsidies on loans, waiver of road taxes and registration fees, and support for setting up charging infrastructure.

c. Development of Infrastructure

Delhi is making every effort to ensure that the infrastructure network is ready and friendly at every three kilometres for electric vehicles. For that, there are efforts to get public charging stations, battery swapping stations, and require all new homes and workplaces to be EV-ready. The government is also ensuring electrifying bus depots.

d. Addressing challenges

To get the infrastructure ready and conducive for Electric vehicles is a challenge, as it requires a high investment. Breakdown and overheating are some of the issues that need to be sorted out. Then only the efficiency and reliability of such vehicles can be ensured.

TECHNOLOGICAL INTERVENTIONS

Delhi is making several technological interventions to boost electric vehicles (EVs) and public transport. They include:

a. Smog Towers

In Connaught Place and Anand Vihar, two pilot smog towers were installed. Using HEPA

stands (High Efficiency Particulate Air – a type of air filter that can remove a high percentage of airborne particles, including dust, pollen, mould, bacteria, and other harmful particles), efforts are made to improve air quality.

b. Water Sprinkling and Anti-smog Guns

During the peak months, large vehicles equipped with mounted cannons spray atomised water droplets in high-pollution zones to reduce dust.

c. Usage of Real-time Monitoring and Drones

Over 40 and more continuous ambient air quality monitoring stations and drone-based surveillance to enforce pollution control is enforced by the Delhi Pollution Control Committee (DPCC).

d. Artificial Rain and Cloud Seeding

Though it is expensive Delhi government has made an effort to go for artificial rain and cloud seeding in 2024. It temporarily reduces pollution levels. This technique works mainly depending on moisture conditions.

e. Public Charging Points

Delhi has considerably increased in public charging points to 2452 in 2022 and battery swapping stations to 234 to support the growing Electric Vehicle fleet.

f. Single-Window Process

With subsidies on offer for encouraging adoption, a unique single-window process has been established to streamline the installation and maintenance of charging points at private and semi-public locations.

g. Special Tariffs for Electrical Vehicles

To make charging more affordable and accessible, Delhi has introduced special Electric Vehicle tariffs, and provisions are made to have separate EV Meters.

h. Partnership between Private and Public Sectors

While the Government is providing land and infrastructure, the private sectors manage charging stations.

COMMUNITY PARTICIPATION AND PUBLIC ENGAGEMENT

Community participation and public engagement are essential for the successful implementation of Delhi's Electric Vehicle policy. So the Government of Delhi has actively involved citizens through awareness campaigns, public contests, and social media outreach to promote adoption and address concerns about charging, range, and maintenance. This movement is made with

the purpose of building trust, encouraging participation, and ensuring that the transition to EVs is inclusive and beneficial for all.

a. Green Delhi App

It is a mobile app. It allows citizens to report about open burning, dust violations, and garbage dumping. These real-time tracking and grievance redressal mechanisms have improved accountability.

b. Bhagidari Movement

It is a movement where people's partnership is essential. It is an initiative by the Delhi Government to promote broad-based civic participation in local governance. The goal of the government in this process is to create greater transparency and accountability in administration to improve the quality, efficiency, and delivery of public services. It was revived in 2023, and it encourages various forums like Residential Welfare Associations, Students, NGOs, and local Governments to raise awareness and enforce norms.

c. School Programs and Tree Plantation Drives

Every effort is made in Educational Institutions to have Environmental Clubs through which awareness complains are made through a plantation drive. In 2024, around 25 lakh saplings were planted across Delhi. Through these clubs promotion of environmental studies is encouraged. Efforts like Van Mahotsav and Plant a Tree campaigns are gaining momentum.

d. Social Media Engagement

Social media turns out to be a forum through which the government directly reaches out to the citizens and addresses their concerns. Here, the success stories of electric vehicle users are shared. This, in turn, builds trust and encourages others to follow the same.

e. Workshops and Schools Programs

Intending to educate the citizens about the long-term benefits of electric vehicles, the government is organising timely workshops and school programs. Matters like the reduction in daily expenses and the great positive impact on health are also discussed.

SEWAGE MANAGEMENT AND SOLID WASTE

In order to effectively control pollution in Delhi NCR, effective sewage and solid waste management are necessary. Therefore, there is a need to improve sewage treatment facilities, manage landfill sites, and promote waste reduction and recycle initiatives. Along with this, we also need to strictly follow environmental regulations and public awareness campaigns.

a. Sewage Management

To manage sewage effectively, certain measures must be followed. They are;

i. **Improve the Sewage Treatment Plants' Capacity**

Despite having several Sewage Treatment Plants in Delhi, it has been identified that their capacity is inadequate to handle the volume of sewage that is generated.

ii. **Poor Efficiency in Treatment**

Many times major part of the sewage is not treated, and that moves into river water, and the end result is that the water bodies are still dirty.

Solutions: It is a necessity today to expand the Sewage Treatment Plants' capacity, improve treatment efficiency, and promote decentralised wastewater treatment solutions. There is also a need, therefore, to involve the community in this process. Educate the residents about the proper wastewater disposal and promote responsible water usage.

b. Solid Waste Management

To manage solid waste, we follow the following steps;

i. **Ever-growing issues from Landfill**

Most of the leachate contamination and air pollution are due to the overflow from landfills.

ii. **Segregation of Waste**

To manage the landfill issues better, (Households and businesses), waste segregation could be done from the source itself.

GAPS AND CHALLENGES

Here, we identify various gaps and challenges that still exist to make Delhi a liveable city. They are the following:

a. Coordination between States

Friction in the political area and a lack of federal mechanisms to manage sewage effectively, certain measures must be followed such as pollution from neighbouring states due to stubble burning.

b. Judicial Vs Administrative Constraints

Many times, local government gets into a fix where, after being ruled by the court, they find it difficult to carry it out. This leads to an implementation vacuum and unnecessary pressure. Due to the situation, courts often demand urgent measures like bans or artificial rain without logistical feasibility.

c. Urban Planning Deficiencies

The pollution load increases with unregulated urban sprawl, informal settlements, and inadequate infrastructure planning.

d. Behavioural and Economic Obstacles

As usual, when there is a new effort made to get things going, there is always resistance from various quarters, like stakeholders who are transport unions, industrialists, and farmers. Lack of awareness among the general public and the cost of getting the infrastructure fit and ready to reduce pollution have become a matter of concern.

IMPACT AND ACHIEVEMENTS

In spite of having many odds, Delhi has still improved; this section analyses them.

a. PM2.5 levels dropped by 34% between 2016 and 2022 (Central Pollution Control Board [CPCB] data)

PM2.5 particles are tiny pollutants that penetrate deep into the lungs and bloodstream, posing serious health risks. In 2016, Delhi's PM2.5 levels were among the world's highest, exceeding safe limits by over ten times. Between 2016 and 2022, levels fell 34%, according to CPCB data, due to measures like the Graded Response Action Plan (GRAP), BS-VI fuel rollout, phasing out older diesel vehicles, and expanding public transport with electric buses and metro lines. Industrial relocation, cleaner fuel mandates, and seasonal dust-control measures also contributed. While levels remain above WHO limits, the steady decline shows coordinated action can yield significant air quality gains.

b. Number of severe pollution days reduced from 26 (2016) to 6 (2022)

A "severe" pollution day occurs when AQI exceeds 400, posing health risks for all residents. In 2016, Delhi recorded 26 such days, mostly during post-Diwali and winter stubble-burning periods. By 2022, this dropped to just six days, thanks to better forecasting, timely interventions, and emergency measures like construction bans, school closures, and traffic restrictions. Partial cooperation with neighbouring states reduced crop residue burning, while stricter penalties discouraged open burning locally. Public awareness campaigns also helped curb worsening activities. This decline shows that coordinated, rapid action can control extreme pollution events, though sustained vigilance is needed to preserve these gains.

c. AQI in summer months has improved, with more "moderate" days

In past years, Delhi's summer months often recorded "poor" AQI due to dust storms, industry, and traffic. Recently, more days have been "moderate" (AQI 51–100), aided by mechanised road sweeping, water-sprinkling, and stricter dust-control norms at construction sites. Coal-fired power plant closures and a shift to cleaner fuels have lowered emissions, while expanded green cover helps trap dust. Public transport upgrades, including electric buses and metro expansion, have further reduced traffic pollution. CPCB data shows fewer summer days now exceed AQI 200 than five years ago. These gains offer seasonal relief and a model for improving winter air quality.

d. EVs now constitute 14% of all new vehicle registrations in Delhi

Vehicular emissions are a major cause of Delhi's air pollution, largely from petrol and diesel vehicles. The 2020 Delhi EV Policy accelerated the shift to electric mobility through subsidies, tax exemptions, and registration fee waivers. Expansion of public and private charging infrastructure reduced range anxiety, while fleet operators, ride-hailing services, and delivery companies adopted EVs. Public transport also benefited, with electric buses replacing diesel fleets. By 2022, 14% of new vehicle registrations were electric-the highest among major Indian cities. This shift reduces emissions, noise, and fossil fuel dependence, positioning Delhi to exceed its 2024 EV adoption targets.

e. Over 5 lakh citizens have downloaded and used the Green Delhi App

The Green Delhi App enables citizens to report pollution violations directly to authorities by uploading geo-tagged photos and details of issues such as garbage burning, industrial smoke, or construction dust. With over 5 lakh downloads, the app reflects strong public participation, and thousands of cases have been addressed through this system. Real-time data helps authorities identify and act on pollution hotspots, bridging the gap between policy and enforcement. Residents feel empowered when their reports lead to visible action. As a technology-driven governance tool, its wider promotion and integration could make it central to Delhi's pollution-control strategy.

All these facts indicate that the persistent policy and civic efforts are slowly moving in the right direction.

THE WAY FORWARD

To effectively address air pollution in Delhi NCR, a multi-pronged approach is needed, encompassing strict emission controls, improved waste management, better crop residue management, and public awareness. This includes stricter enforcement of regulations, promotion of electric vehicles, and sustainable alternatives for waste disposal and agricultural practices.

Here's a more detailed breakdown:

a. Stricter Emission Controls:

- **Vehicular Emissions**

  Transitioning to electric and BS-VI vehicles, improving public transport, and implementing congestion charges are crucial steps.

- **Industrial Emissions**

  Relocating polluting industries away from Delhi, installing De-SOx and De-NOx systems at power plants, and ensuring petrol pumps have vapour recovery systems can significantly reduce emissions.

- **Construction and Demolition**

  Implementing measures like covering construction materials, using water sprays, and promoting on-site recycling of construction waste are essential.

b. Improved Waste Management

- **Minimising Waste Burning**

  Strict regulations and penalties for open waste burning, along with expanding waste segregation, recycling, and waste-to-energy initiatives, are vital.

- **Construction and Demolition Waste**

  Managing construction and demolition waste effectively by recycling it on-site or transporting it to authorised facilities, and preventing it from being dumped on public roads.

c. Crop Residue Management

- **Alternatives to Burning**

  Providing farmers with sustainable and cost-effective alternatives for crop residue management, such as Happy Seeders and subsidised Crop Residue Management (CRM) machines, is essential.

- **Preventing Burning**

  Strictly limiting biomass burning, including crop residue burning in neighbouring states, can reduce a major source of pollution.

d. Public Awareness and Participation

- **Promoting Sustainable Practices**

  Raising public awareness about the impact of air pollution and encouraging citizens to adopt sustainable practices like reducing vehicle use, avoiding waste burning, and conserving energy is crucial.

- **Citizen Engagement**

  Involving citizens in air quality monitoring and feedback mechanisms can foster a sense of ownership and responsibility.

5. OTHER KEY ACTIONS

- **Afforestation**

  A massive focus on afforestation and developing green spaces can help absorb pollutants.

- **Infrastructure Development**

  Expanding public transport networks, including metro and bus services, can reduce reliance on private vehicles.

- **Monitoring and Enforcement**

  Increasing the number of AQI monitoring stations and empowering authorities to take swift action based on hyperlocal data can improve the effectiveness of pollution control measures.

By implementing these measures, Delhi NCR can make significant strides in combating air pollution and ensuring a healthier environment for its residents.

CONCLUSION:

The fight against pollution is not something that can end with an immediate deadline. Instead, it is a lifelong process and never-ending effort. The last decades certainly indicate improvement in pollution control, where the government and citizens came together to put certain control in this process. Technology has progressed, and innovations have come in. But the challenge remaining ahead is to see that the structure is in place to support the system. Therefore, we need a united, sustained, and holistic approach. It must go beyond the administrative boundaries and must become part and parcel of urban governance. Every effort is made to clear the pollution in Delhi, and if it becomes a success, obviously, the same could be replicated in other cities of the country, and Delhi could become the benchmark for the rest.

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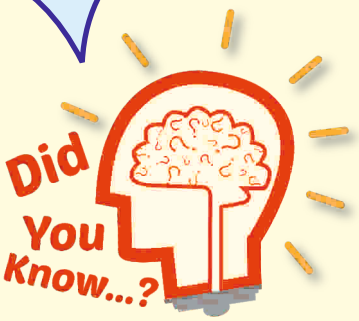
Prof. (Dr.) Sajan M. George, currently the Chairman of Don Bosco Institute of Technology (DBIT), Delhi, has 28 years of experience as an educator. To his credit he has six Masters Degrees and four Bachelor's Degrees. He possesses a wide range of technical and soft skills certified and recognised by reputed organisations such as Youth Reach, Tech Mahindra Foundation, and the British Council of India, etc. He has published four books, holds a patent titled" A study on customer attitude and satisfaction towards online shopping", has numerous articles published in reputed journals indexed by Web of Science, Scopus, and UGC-CARE. He has been recognised with 24 prestigious awards, including the recent ERDA Excellence Award 2024 for Academic Leadership, a testament to his visionary leadership and impactful contributions to education. An inspiring teacher at heart, he has taught a diverse range of subjects in the field of Management, mentoring thousands of students over the years. Known for his dedication, humility, and integrity, Prof. Sajan M. George is also an active contributor to various academic forums, seminars, and conferences.



1 Dr. Haagen-Smit, known by many as the "father" of air pollution control, was a graduate of the University of Utrecht and a biochemistry professor at the California Institute of Technology in Pasadena for 16 years before beginning his air pollution research in 1948.

2 The air pollution is so severe that it has begun to physically alter the city's historical heritage. The iconic red sandstone of the Red Fort is gradually turning black due to a buildup of pollutants, a startling visual indicator of the crisis.

3 According to the World Health Organisation (WHO), Delhi is the fourth most polluted city in the world in terms of suspended particulate matter (SPM).

4 One of the most telling facts about the source of pollution came during the COVID-19 lockdown in 2020. With all human activity significantly reduced, Delhi's air quality improved dramatically, with cleaner air and skies becoming clearly visible.

5 99% of people breathe air that exceeds World Health Organization's guideline limits.

6 Evidence from Greece shows that the problems of polluted air outdoors were being documented at least 2400 years ago. The book Airs, waters and places attributed to Hippocrates (ca 400 BC) suggested all sorts of illness as being related to the quality of air

STRATEGIES NEEDED TO TRANSFORM ITS HEALTHCARE LANDSCAPE TO MATCH GLOBAL STANDARDS

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ABSTRACT:

Delhi, the capital of India, stands as a dynamic and multifaceted megacity, embodying both the triumphs and tribulations of an emerging global metropolis. With a population exceeding 30 million and serving as a healthcare destination for millions more from neighboring states, Delhi's health ecosystem is among the most complex in the developing world. Despite major advancements in tertiary care and public health initiatives, the city faces enduring challenges such as infrastructure strain, workforce shortages, environmental health hazards, and the need for digital integration and governance reforms. This article explores comprehensive strategies to elevate Delhi's healthcare landscape to global standards. It emphasizes strengthening primary and preventive healthcare through new initiatives such as the Arogya Mandir program, digital transformation, integrated public-private partnerships, medical education reforms, and sustainability. Drawing lessons from global capitals such as London, Singapore, and Seoul, it calls for a holistic, citizen-centered, and technology-driven approach to make Delhi not only a capital of governance but a global capital of health, compassion, and human dignity.

INTRODUCTION:

Delhi, as India's capital, is more than a political center — it is the nerve center of the nation's socio-economic and cultural identity. Over the past few decades, Delhi has evolved from a historically rich urban settlement into one of the fastest-growing megacities in the world. Its healthcare system mirrors this growth — showcasing centers of excellence such as AIIMS, RML Hospital, Safdarjung Hospital, Lok Nayak Hospital, and GB Pant Hospital, while simultaneously grappling with challenges such as overcrowding, pollution-related illnesses, and health inequity between affluent and marginalized populations. The COVID-19 pandemic was a defining moment that exposed the fragility of urban healthcare infrastructure but also highlighted Delhi's

resilience, coordination, and capacity for rapid response. Going forward, transforming Delhi into a world-class capital demands not only better roads and cleaner air but also a healthcare system capable of delivering equitable, efficient, and sustainable care for all citizens.

THE CURRENT HEALTHCARE LANDSCAPE IN DELHI:

Delhi's healthcare architecture is a composite of public and private networks. The Government of NCT of Delhi (GNCTD) operates as a multi-tiered system comprising 41 government hospitals, 260 dispensaries, more than 1,100 Mohalla Clinics, and over 900 maternity and child welfare centers, complemented by premier tertiary care institutes like AIIMS, RML Hospital, Safdarjung Hospital,Lok Nayak Hospital, and GB Pant Institute of Postgraduate Medical Education and Research. The private healthcare sector also plays a pivotal role, offering advanced diagnostic and surgical services, though often at a cost inaccessible to economically weaker sections. This duality results in overcrowding of government hospitals, prolonged waiting times, and variable quality of care. Delhi's disease burden reflects both infectious and non-communicable diseases (NCDs) — dengue, tuberculosis, and air pollution-related respiratory disorders co-exist with diabetes, cardiovascular diseases, and mental health issues. According to the Delhi Statistical Handbook (2024), pollution-related illnesses account for nearly 18% of outpatient visits annually. While significant investments have been made under programs like the Mohalla Clinic initiative, gaps remain in referral systems, workforce distribution, and digital health integration. To achieve global parity, Delhi's health model must emphasize preventive, promotive, and participatory care, ensuring quality at every level.

Delhi today stands as a leading centre of medical excellence, offering a wide spectrum of high-quality healthcare services that attract not only patients from across the country but also from abroad. The city's hospitals — both government and private — are equipped with state-of-the-art infrastructure, advanced diagnostic and therapeutic technologies, and a pool of highly skilled specialists trained in premier national and international institutions. Patients from neighbouring states and foreign nations are drawn to Delhi because they receive world-class care at a fraction of the cost compared to developed countries. The affordability of healthcare here, combined with efficiency, promptness, and personalized attention, has established Delhi as a trusted medical destination.

What truly enhances Delhi's healthcare appeal is the blend of clinical expertise and compassion , where even the most complex procedures are carried out with precision and empathy. However, to sustain and elevate this standing, it is crucial to retain our well-trained doctors and healthcare professionals by providing them with improved working conditions, adequate resources, and modern infrastructure. With continued investment in quality, research, and human resources, Delhi and India can not only match but surpass many global healthcare systems, positioning themselves as leaders in accessible, affordable, and advanced medical care.

GLOBAL BENCHMARKS: LEARNING FROM LEADING CAPITALS:

Transforming Delhi into a world-class healthcare capital necessitates learning from successful global models. London (United Kingdom) operates under the National Health Service (NHS), emphasizing universal access, digital records, and evidence-based public health. Its community general practitioner (GP) model ensures that 90% of health issues are managed at the primary level, reducing tertiary overload. Singapore represents an integrated model combining public efficiency and private participation. The Healthier SG initiative focuses on lifestyle modification, preventive screenings, and personalized health plans linked to digital health IDs. Seoul (South Korea) showcases smart healthcare through telemedicine, big data analytics, and AI-based disease surveillance. The city's digital health infrastructure enables real-time tracking of outbreaks and emergency resource allocation. For Delhi, these models offer key lessons: build a strong primary care backbone, invest in digital health ecosystems, encourage research and innovation, and ensure policy coherence across institutions.

STRATEGIES FOR TRANSFORMING DELHI'S HEALTHCARE:

1. Primary healthcare is the foundation of a resilient health system. Delhi's Mohalla Clinics have successfully brought care closer to communities; however, expanding their scope and quality is essential. The recently launched Arogya Mandir initiative represents a major leap forward. Conceptualized as comprehensive wellness centers, Arogya Mandirs integrate preventive, curative, and diagnostic services under one roof. Unlike Mohalla Clinics focused on basic care, Arogya Mandirs offer multi-specialty OPD services, teleconsultation facilities, and yoga and wellness zones. Each Arogya Mandir is envisioned as a "Mini Health Hub" catering to urban clusters of 50,000–70,000 people, equipped with digital record systems and health education kiosks. The initiative aligns with the Ayushman Bharat Health and Wellness Centre philosophy but customized for Delhi's urban density. If scaled effectively, Arogya Mandirs can drastically reduce tertiary overload, enhance early disease detection, and improve patient satisfaction — becoming a cornerstone of Delhi's preventive care revolution.

2 **Infrastructure Modernization and Green Hospitals:** Delhi's tertiary hospitals, such as Lok Nayak, GTB, and Deen Dayal Upadhyay, cater to millions annually but face aging infrastructure. Transitioning to world-class standards requires large-scale modernization with patient-centric design, renewable energy adoption, and infection-control architecture. Green healthcare infrastructure — using solar energy, rainwater harvesting, waste recycling, and energy-efficient ventilation — should be institutionalized. The Delhi government's pilot project on solar rooftops at Lok Nayak Hospital is a commendable step, aligning with global sustainability benchmarks. Public-private partnerships (PPP) can

accelerate infrastructure upgrades through models like Build-Operate-Transfer (BOT) or Joint Modernization Schemes, ensuring accountability and efficiency.

3. **Digital Health Transformation:** Digitalization is the bridge between capacity and quality. Delhi can lead India's digital health revolution by expanding the Health Information Management System (HIMS) already introduced in select hospitals. Key measures include: unified Digital Health IDs for all citizens under the Ayushman Bharat Digital Mission (ABDM); AI-driven dashboards for monitoring disease trends and emergency resource deployment; telemedicine platforms integrated across Mohalla Clinics, Arogya Mandirs, and tertiary centers; and real-time linkage between hospital data, pharmacies, and laboratories. A Digital Health Command Centre at the city level can coordinate surveillance, logistics, and analytics, transforming decision-making from reactive to predictive.
4. **Human Resource Development and Medical Education:** Quality healthcare depends on trained manpower. Delhi must adopt a strategic human resource plan focusing on expanding postgraduate and paramedical training capacities; incentivizing rural and underserved area postings; introducing continuous medical education (CME) in digital and emergency medicine; and encouraging collaboration with global institutions for faculty exchange, simulation-based training, and joint research.
5. **Research, Innovation, and Public Health Laboratories:** Delhi's tertiary hospitals must evolve into research-intensive institutions. Collaborative platforms involving AIIMS, ILBS, and Delhi University can focus on local health priorities — pollution, mental health, childhood obesity, and vector-borne diseases. Strengthening public health laboratories with genomic sequencing and biosurveillance will help Delhi anticipate epidemics rather than react to them. Incentivizing start-ups in medical devices, AI diagnostics, and telehealth through incubation hubs can place Delhi at the forefront of health innovation.
6. **Governance and Accountability Reforms:** A world-class healthcare system demands transparent governance. Delhi can establish a Unified Health Authority (UHA) to coordinate across the Directorate of Health Services, medical colleges, and hospitals, ensuring uniform quality benchmarks. Periodic hospital accreditation under NABH standards, public dashboards of hospital performance, and citizen feedback mechanisms will enhance trust and accountability.

INTEGRATION WITH URBAN DEVELOPMENT AND SMART CITY GOALS:

Health outcomes are intertwined with the urban environment. Delhi's healthcare transformation must be synchronized with urban planning, pollution control, waste management, and public transport policies. Smart city technologies can integrate air quality data, epidemic alerts, and ambulance tracking into a unified public health dashboard. Development of Healthy Corridors —

green, walkable areas with fitness infrastructure — will promote preventive health behaviors. Cross-sectoral collaboration between the Delhi Development Authority (DDA), Municipal Corporation of Delhi (MCD), and Health Department is crucial to achieve this integration.

PUBLIC PARTICIPATION AND HEALTH LITERACY:

Citizen engagement is the soul of sustainable healthcare. Delhi can emulate the Healthier SG model by promoting citizen health pledges, school health clubs, and RWA-led wellness campaigns. Health literacy initiatives through social media, community radio, and school curricula will empower individuals to make informed decisions. Programs on nutrition, anti-tobacco drives, pollution awareness, and mental wellness can transform Delhi's public health culture.

ROADMAP TO 2035: VISION FOR A WORLD-CLASS HEALTH CAPITAL:

By 2035, Delhi should aspire to achieve universal health coverage, 100% digital interoperability across hospitals, NABH accreditation for all government hospitals, net-zero carbon emissions in healthcare, and a Global Centre for Urban Health and Innovation. These goals align with the Sustainable Development Goals (SDG 3) and India's Vision@2047.

CONCLUSION:

Transforming Delhi into a world-class capital begins with ensuring the health and dignity of its citizens. Healthcare is not merely an infrastructure goal — it is a moral and developmental imperative. By embracing the Arogya Mandir vision, digital innovation, sustainable design, and inclusive governance, Delhi can emerge as a global model for urban healthcare transformation. The road ahead demands unity of purpose — between government, professionals, and the people — to make Delhi not only the administrative capital of India but the health capital of humanity.

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Did You Know?

1 Delhi treats not just its 30+ million residents, but also patients from across North India and neighbouring countries, making it one of Asia's largest cross-border healthcare zones.

2 Delhi's top tertiary hospitals – AIIMS, Safdarjung and private hospitals like Apollo and Fortis – attract over half a million medical tourists annually, both domestic and international.

3 Several hospitals, like AIIMS and Sir Ganga Ram Hospital have adopted Solar power systems and zero liquid discharge plants, reucing their environmental footprint.

4 AIIMS Delhi ranks among the top 10 hospitals in Asia for specialized care, according to multiple international surveys.

5 AIIMS performed India's first completely robotic renal transplant and 3D laparoscopic surgery.

6 Delhi's Apollo Hospital has treated patients from over 140 countries.

7 The "10 Hafte 10 Baje 10 Minute" dengue awareness campaign received international praise for reducing vector-borne diseases.

8 The government spends over 14% of its annual budget on healthcare — among the highest in India.

WASTE MANAGEMENT AND ITS FUTURE VERSION OF ZERO WASTE DELHI BY 2030

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ABSTRACT:

Waste is one of the major urban challenges faced globally today, and the severity of the challenge is further exacerbated by rapid urbanisation, growing populations and increasing per capita waste generation. As one of the largest urban agglomerations in the world, Delhi collects 11,352 t of waste every day. Without adequate segregation, most of this waste is sent to dumpsites and waste-to-energy plants, often associated with significant capital costs and environmental externalities. This paper review in detail current **waste management** system and legal framework implemented by government to address this issue under **"Delhi zero waste management 2030"**. Our results revealed that in the wake of vicious cycle to virtuous cycle, the "circular economy" is an economic model where materials and value circulate and added value is created by services and smart operations. With due effect, the Solid Waste Management (SWM) sector has developed from the minimal control of emissions towards a resource recovery sector while still being constrained by strict emissions guidelines. This kind of change can be seen in the expansion in Waste to Energy (WtE) capacities, improved recycling rates and increased gas recovery from landfills. Major initiative has been taken by Delhi Govt. to make more **"Zero Waste Colonies"** involving Resident Welfare Associations (RWA) and local communities under the concept of **"Harit Mitra"** and **"Sahbhagita"** in Delhi.

WASTE MANAGEMENT AND ITS FUTURE VERSION OF ZERO WASTE DELHI BY 2030:

Generically 'Solid Waste' is defined as unwanted or unusable solid materials that has been disposed or discarded after their primary use. These wastes are generated by human beings in different areas like residential, industries and commercials sector. Solid waste include all non-liquid wastes (example - garbage or rubbish). Significant health problems and a very unpleasant living environment is created by solid waste if not disposed of safely and properly. It can provide breeding sites for vermin and insects (example-rats) which increases the likelihood of transmission of diseases, and can attract snakes and pests. Unmanaged waste can also cause

pollution (pollute water sources and the surrounding environment). Human being is creating boundless mounds of garbage of countless variety.

In the era of industrialisation, for improving the standard of living, we are focusing more on production and consumption. This leads to production of wastes in different form which are causing serious threat to environmental problem like global warming, climate change etc. Persons with disabilities, children, pregnant women and old age groups are more prone to diseases due to high sensitivity to pollution. So, to control the spread of diseases and environmental degradation, we have to take some mitigation measures in action. Waste management refers to the systematic handling—including **collection, transport, processing, recycling, and disposal**—of solid, liquid, and hazardous waste to protect public health. For effective handling of wastes, initiation of governmental programmes like **Swachha Bharat Mission (SBM)** was launched in the year 2014 and enabled community participation in creating clean nation.

Delhi is the capital of India and is bordered by Haryana state with its three sides and one side with Uttar Pradesh. The **National Capital Territory of Delhi (NCTD)** covers an area of approximately **1484** sq.km. According to 2011 census, it ranked 2nd after Mumbai in population. Delhi city's population was over 11 million and whole NCR population was about 16.8 million. Delhi's urban area is spreading beyond its NCR boundary and includes neighbouring cities of Gurugram, Noida, Ghaziabad and Faridabad which are known as **Central National Capital Region (CNCR)**. In Delhi city, waste management involves a combination of two services — public and private, which include complex, network of private workers who make their living by collection and selling the recyclable items from waste. These sectors may have informal arrangement in the form of contract with municipal bodies or with the community like Resident Welfare Association (RWA) or with the NGO's who are providing service to schools, hotels, hospitals or city malls to provide specific services. Some organizations which include informal sector might work in the forms of union, cooperative, or an association. In Delhi, many organisations work for handling and management of solid waste production. These organisations include urban local bodies, other governmental organisations, and some non-governmental organisations. All of these organisations play a vital role to manage different types of wastes production in its best possible ways to make environment favourable for living. Every organisation has specific function and area in which it works.

SOURCES: https://thewire.in/wp-content/
Figure 1: Authorities working for SWM with their specific geographical areas

There are concerned five urban local bodies managing solid waste management in Delhi which are represented in **Fig.2. Municipal Corporation of Delhi (MCD)** which was restructured into three bodies **(North, South and East)** and is responsible for majority of the city's Solid waste management. **New Delhi Municipal Corporation (NDMC)** and **Delhi Cantonment Board (DCB)** are two other local urban bodies which are also responsible for MSW management in their respective jurisdiction in Delhi. Private operators work in collaboration with the government and provide infrastructure and technical expertise to collect Municipal Solid Waste (MSW) at the block or ward level to waste-to-energy plants or to landfills. They also work with informal scrap dealers for recycling in mainstream.

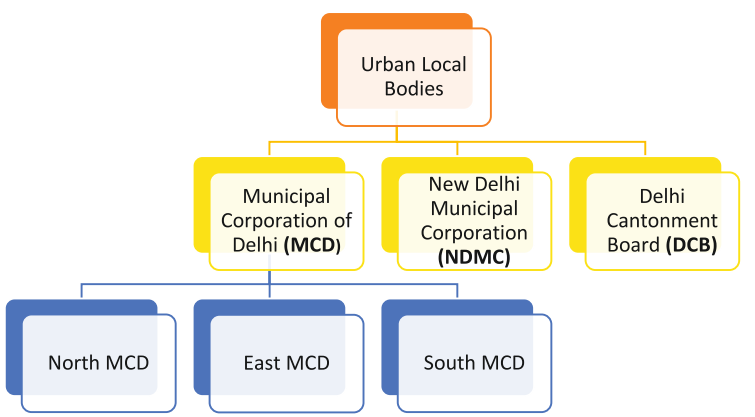

Figure 2: Urban local bodies responsible for MSW management in Delhi region

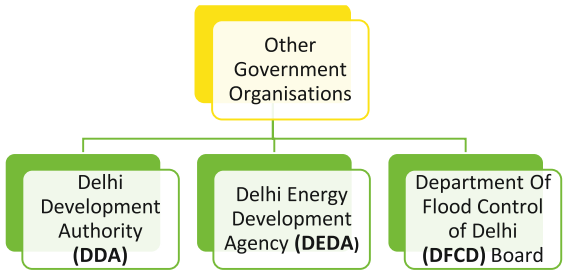

Figure 3: Other government organisations responsible for MSW management in Delhi region

Following are some other bodies which are also responsible for Municipal Solid Waste **(MSW)** in Delhi region **(Fig.3)**. Delhi Development Authority **(DDA)** works for sitting and allotment of land for sites of sanitary landfill and other sites that produces wastes as per the requirement. Delhi Energy Development Agency **(DEDA)** works on projects for solid waste utilization which aims at biogas for energy generation. Department of Flood Control of Delhi **(DFCD)** works for supplying soil which is used as landfill cover.

Current solid waste treatment strategies are approached towards utilizing and recovering the materials present in the discarded wastes in the largest extent as a resource and minimising the amount of solid waste which needs to be landfilled. For treatment of solid waste, different methods are used **(Composting, Incineration, Gasification, Compaction and Pyrolysis)**, the proper choice depends on the methods which are based upon re-use characteristics, available land area and cost of disposal. When we are reviewing the governmental plans working on solid waste management in Delhi-NCR in light of the challenges and prospects for future management, an indirect constitutional support like **Articles 48-A and 51A(g)** have been identified which directs both the state and citizens to protect and improve the environment. In 1992, the 11th and 12th Schedule of the Constitutional amendment (73rd and 74th) Act, empowers urban local bodies in sanitation and waste management. The Indian judiciary has actively enforced SWM laws and developed principles like **"Polluter Pay"** and **"Public Trust Doctrine"** in environmental cases and also developed a legal and policy framework under these legal foundations which are listed below **(Table 1)**.

Table 1: Key Waste Management Laws in India and Delhi

Act/Rule	Applicability	Key Features	Delhi-Specific Implementation
Environment Protection Act, 1986	National	Framework for all rules	Delhi Pollution Control Committee (DPCC) as enforcement body
SWM Rules, 2016	National & Delhi	Segregation, citizen responsibility, penalties	Solid waste monitoring Committee (SWMC), third-party audits
Construction & Demolition (C&D) Waste Management Rules, 2016	National & Delhi	Mandates recycling of construction waste	Tender clauses for recycled products
Hazardous Waste Management Rules	National & Delhi	Regulates hazardous industrial waste	DPCC oversight
Plastic Waste Management Rules, 2016	National & Delhi	Ban on single-use plastic, extended producer resp.	Local bans and initiatives
Bio-Medical Waste Management Rules	National & Delhi	Hospital, clinical waste management	Hospital compliance checked by DPCC
E-Waste Management Rules, 2016	National & Delhi	Recycling of electronics and appliances	Authorized recyclers in Delhi
Waste (Disposal & Management) Bill, 2023	Awaiting Implementation	Regional clusters, legal reforms & enhanced penalties	Expected to be adopted

In the last ten years, three major challenges have been identified in Urban Solid Waste Management in Delhi and respective authorities are monitoring these very strictly. They are as follows:

SWM Implementation in Delhi

- Enforced under the SWM Rules, 2016 following National Green Tribunal (NGT) orders for compliance.
- SWMC (Solid Waste Monitoring Committee), headed by Delhi's LG, oversees facility setup, remediation of legacy waste, and third-party audits.
- Stringent targets measure on legacy waste reduction and land reclamation.

C&D Waste Initiatives

- Delhi mandates use of recycled products made from C&D waste in all government contracts.
- New decentralised processing facilities are being set up to bridge the capacity gap and foster urban recycling.

National Action Plan and Urban Missions

- The Swachh Bharat Mission (Urban and Rural) acts as a key force in driving awareness and compliance for Solid Waste Management.

  National Action Plan for Municipal Solid Waste Management and similar state-level policies target reduction of waste generation and promote segregation. Delhi's waste management is governed by region-specific bye-laws, orders, and amendments. These complement national rules to address Delhi's unique urban waste challenges. Recent Delhi-Specific five key Regulations are discussed below:

- **Solid Waste Management Bye-laws of Local Bodies (2023)**

  Each municipal agency (MCD, NDMC, Cantonment Board) issues its own solid waste bye-laws under the Solid Waste Management Rules, 2016, published officially. These cover segregation, storage, user charges, and penalties for non-compliance.

  Source: DPCC official portal, NDMC Gazette Notification.

- **Plastic Waste Management Bye-Laws, (2024)**

  Delhi's updated bye-laws ban single-use plastics, outline Extended Producer Responsibility, and define enforcement measures.

  Source: Municipal Corporation of Delhi official documents.

- **DPCC Orders and Waste Management Protocols**

  The Delhi Pollution Control Committee (DPCC) enforces **hazardous, bio-medical, and e-waste directives based on Environment Protection Act 1986**, with regular updates on its official portal.

- **DPCC** posts official orders regarding collection, transportation, and treatment standards for all waste streams.
- **National Green Tribunal (NGT) and Supreme Court** regularly issue binding orders to Delhi's municipal bodies for **landfill remediation, segregation, and better urban management**. Official copies and status reports are published by DPCC.

Zero Waste" refers to designing and managing products and processes to reduce waste volume and toxicity, conserve resources, and to promote reuse and recycling. In Delhi, **zero waste colonies** (for example Navjivan Vihar at South Delhi) segregate garbage into wet, dry, sanitary, hazardous, and in e-waste form beside this composting and recycling items are managed locally. Other sustainability measures like Rainwater harvesting and water conservation practices are also followed to promote health and environmental wellbeing within the community. As of May 2025, Delhi has 633 certified zero waste colonies (593 colonies, RWAs, housing societies, and 40 institutes), collectively processing ~100 tonnes of compostable waste daily with ambitious plans to reach 200 more by 2027 with processing capacity approximately 100 tonnes of waste daily. In-situ segregation and full composting of wet waste or dry waste (by authorized recyclers) where incentive schemes like "Harit Mitra" and "Sahbhagita," also offer property tax rebates up to ₹1 lakh for compliant RWAs.

The Delhi 2030 vision document outlines integrated waste management, afforestation, and green education as pillars for sustainable urban development. In Delhi, the commitment to **zero waste by 2030** is supported by national acts, rigorous rules, and local innovations. To achieve Zero Waste Delhi by 2030, both India and Delhi have launched major policy initiatives, technological innovations, and behavioural change campaigns. Key national and local actions, with current data are discussed below.

a) Swachh Bharat Mission (Urban and Rural):

National flagship program is mainly driving waste segregation, decentralized composting, and waste-to-energy conversion. As of 2025, India processes over 15,000 metric tonnes of municipal waste per day through biogas and waste-to-energy plants.

b) Circular Economy Roadmap and EPR:

India mandates Extended Producer Responsibility (EPR) for plastics, electronics, and urging major manufacturers to take back and recycle their packaging and products. Delhi's State Action Plan on Climate Change (SAPCC,2024) majorly focus on air pollution control, plastic ban, decentralized waste processing, and increased recycling targets.

c) National Dialogue on Reducing Food Loss and Waste:

RESET 2025 initiative at Delhi focuses on halving per capita food waste per SDG 12.3, with India wasting 7.82 crore tonnes annually at the household level, roughly 55 kg per person. Delhi's initiatives focus on halving this by 2030.

d) G20 New Delhi Leaders' Declaration:

India, along with G20 partners, is committed to "substantially reduce waste generation by 2030" with enhanced circular economy and national action plans on plastics, C&D waste, and organics. Delhi mandates all government contracts which include the use of recycled C&D products, with requirements of at least 2–10% recycled material depending on project type. Delhi generates ~4,000–4,600 tonnes/day of C&D waste, which is now recycled in decentralised plants.

e) Celebration of International Day of Zero Waste and Mission LiFE:

India joined global coalitions for zero-waste policy mainstreaming, launching "Mission LiFE" (Lifestyle for Environment), emphasizing sustainable consumption and grassroots action. Projects such as ICLEI South Asia's "Moving Towards Zero Waste" conduct surveys, door-to-door drives, and educate citizens on segregating waste at source and award-winning localities like Arihant Nagar demonstrates public engagement.

f) Action oriented approach:

Public participation plays an important role in waste reduction and waste reuse is a primary function of the public at the stage of waste generation. Government authorities should inform people about the issue by organising seminars in authorized as well as unauthorized colonies of Delhi. The capitalistic and individualistic life style makes it harder to reduce solid waste production. Knowledge about the importance and benefits of sorting waste is one thing, and having knowledge on the recyclable waste material is another. People do realise that it is a good thing to sort solid waste so that not all of it is dumped together. Till now people know little about recyclable items and this in itself forms a barrier to waste sorting.

From the attitudes of the people, it is very clear that not all is lost. The future of sustainable solid waste management in the Delhi region is bright but only so if the potentials of the people to participate are positively tapped.

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Dr. Chirashree Ghosh is Professor in Dept. of Environmental Studies, Delhi University. She earned Ph.D degree in "Aquatic Ecotoxicology" from Visva Bharati University at Shantiniketan followed by a Post-doctoral Research at the University of Wageningen, The Netherlands, in the area of "Waste Management". In back home, initiated major research in the area of "Environment Pollution & Health". In the year 2003, she had joined as a faculty in University of Delhi at Department of Environmental Studies.

She had been Project Coordinator of a number of sponsored research projects; one of her major research contribution is preparation of **Carbon footprint map of Delhi**, which has been

presented at **Copenhagen Summit, 2009** by State Chief Secretary. She has been also collaborator of **National Air Quality Monitoring Program SAFAR** since common wealth game, 2010 and presently sharing data with CPCB and NGT as a national database. In the year 2011 where her work **"Water Foot Print Map"** presented as a case study from Asia pacific region by the international climate change work group and the meeting held at Johannesburg organized by IDRC, Canada. She is Convener of CAQM monitoring Committee & member of UTEIAA and UTEAC , Delhi Govt. Committee appointed by MOEF CC. Being a teacher and researcher she is trying to mobilize community on environmental issues and sensitizing them how their simple effective lifestyle changes can help them to attend better quality of health.

INTERESTING FACTS

1. Delhi generates around 11,000 tonnes of municipal solid waste (MSW) daily.
2. The Narela-Bawana plant is India's largest Waste-to-Energy (WTE) facility, processing over 2000 tonnes of waste per day and powering thousands of homes sustainably.
3. The goal is : No active landfill sites by 2030.
4. The Municipal Corporation of Delhi (MCD) has launched "zero waste colony" initiatives: for instance, 127 colonies have been declared as 'zero waste' zones (as of mid-2023) where waste is ideally handled at source and landfill contribution reduced.
5. Recycling hubs and material recovery facilities (MRFs) are being established to recover upto 90% of recyclable materials by 2030.
6. The Delhi Government is introducing digital waste tracking systems to monitor collection, segregation and disposal in real time.
7. Apps like "Blue Delhi" and "Swachhata" allow citizens to report waste issues and track resolution online.
8. Delhi recycles over 5000 tonnes of construction and demolition waste daily – turning debris into eco-friendly bricks, tiles, and road materials.
9. The "Compost Delhi, Grow Delhi" campaign promotes urban farming and community composting in residential colonies.
10. The Indian judiciary has actively enforced SWM laws and developed principles like "Polluter Pay" and "Public Trust Doctrine" in environmental cases and also developed a legal and policy framework under the legal foundations.

ENVIRONMENT AND SUSTAINABILITY: MANAGING GREENS AND OPEN SPACES:

Anil Kumar Goel
Former DGM, NTPC Ltd.

ABSTRACT:

The four pillars of sustainability are often used to advance business values and support profitability. However, environmental, economic, social, and human sustainability are fundamentally aimed at safeguarding future generations and enhancing the overall quality of life. Planting trees plays a vital role in protecting and restoring the environment.

To minimise waste and conserve resources, paper, plastic, glass, and aluminium should essentially be recycled.

Opting for biking, walking, or public transportation helps reduce emissions and promote healthier living environments.

SUSTAINABILITY AND THE SIGNIFICANCE OF GREEN AREAS AND SPACES IN ENVIRONMENTAL PROTECTION.

INTRODUCTION:

As the world faces the twin crises of climate change and biodiversity loss, sustainability has emerged as a guiding principle for creating a balanced and harmonious relationship between people and the planet. Central to this vision is the importance of green areas and spaces - such as urban parks, forests, gardens, wetlands, and green roofs. These natural and semi-natural environments are not only vital for protecting ecosystems but also provide significant social, psychological, and economic benefits.

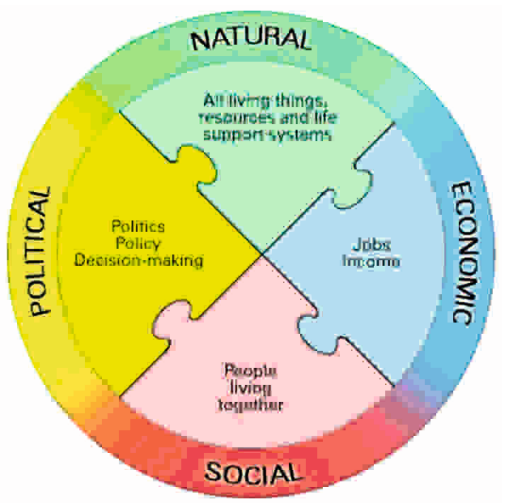
With rapid urbanisation, rising global temperatures, and worsening air and water quality, the need to protect, enhance, and expand green spaces is more urgent than ever.

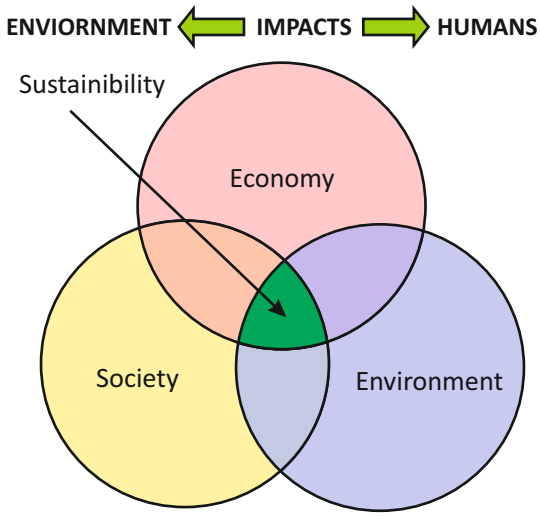
ENVIRONMENT:

The environment is the entire context of human life—the physical, chemical, and biological settings in which people live and interact. Thus, the home, air, water, food, neighbourhoods, workplace, and even climate constitute aspects of the human environment.

WHAT IS SUSTAINABILITY?

Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their needs/requirements.





THREE KEY PILLARS OF SUSTAINABILITY:

- **Environmental Sustainability:**

  Protecting natural resources and ecosystems.

- **Economic Sustainability:**

  Without adversely affecting the environment, promote long-term economic growth.

- **Social Sustainability:**

Ensuring fairness, justice, and well-being for all members of society. A sustainable society respects the planet's ecological limits. Green spaces directly support environmental sustainability while also improving quality of life, boosting mental well-being, and increasing economic value.

WHAT IS THE CIRCULAR ECONOMY?

While most companies still operate within a linear economy — produce, use, dispose — this approach is no longer sustainable. The circular economy offers a transformative alternative, addressing the root problems of over-production and over-consumption.

THREE CORE PRINCIPLES OF THE CIRCULAR ECONOMY:

- **ELIMINATE WASTE AND POLLUTION,**
- **KEEP PRODUCTS AND MATERIALS IN USE,**
- **REGENERATE NATURAL SYSTEMS.**

A key aspect of this model is considering the entire life cycle of products and services. In practice, this means creating designs that allow items to be re-used, re-manufactured, or re-cycled.

ENVIRONMENTAL SUSTAINABILITY REGULATIONS:

Environmental regulations are becoming increasingly ambitious, reshaping the way businesses operate. In Europe, the regulatory framework is evolving rapidly, with several key measures promoting environmental accountability.

CORPORATE SUSTAINABILITY REPORTING DIRECTIVE (CSRD):

This directive enhances transparency by requiring businesses to publish detailed reports on their environmental impacts and sustainability strategies, including their carbon footprint and the often-overlooked Scope 3 emissions (*).

This pivotal regulation enhances transparency by requiring businesses to provide detailed reports on their environmental impact and the strategies they employ. This includes companies disclosing their carbon footprint, including the crucial and often overlooked Scope 3 emissions:

(*) **Scope 1 emission:** Direct emissions that are owned or controlled by a company

Scope 2 emission: Indirect emissions that are a consequence of a company's activities but occur from sources not owned or controlled by it.

Scope 3 emission: All emissions not covered in scope 1 or 2, created by a company's value chain. (Example: When the company buys, uses and disposes of products from suppliers)

CORPORATE SUSTAINABILITY DUE DILIGENCE DIRECTIVE (CSDD):

This directive requires companies to conduct thorough due diligence throughout their supply chains to uphold robust human rights protections and maintain high environmental standards.

ECO DESIGN FOR SUSTAINABLE PRODUCTS REGULATION (ESPR):

This regulation sets minimum eco-design requirements and requires the development of Digital Product Passports to ensure compliance.

GREEN CLAIMS DIRECTIVE:

This directive addresses greenwashing by ensuring that environmental claims made by

businesses are supported with verifiable, science-based evidence. Its purpose is to protect consumers and enable them to make informed purchasing decisions. These regulations are mandatory, and failure to comply can result in reputational damage, fines, and loss of stakeholder trust. Companies must begin gathering relevant data and adapting their sustainability practices now to remain compliant and operational in the future.

SOME OF THE MOST SIGNIFICANT AND MOTIVATING BUSINESSES TO REDUCE THEIR ENVIRONMENTAL IMPACT:

BENEFITS OF ENVIRONMENTAL SUSTAINABILITY:

Reducing environmental impact brings numerous advantages for businesses, including:

Future-Proofing your Business:

Acting on sustainability today helps companies stay ahead of tightening environmental regulations and avoid potential supply chain disruptions. Integrating sustainable practices makes organisations more resilient and better prepared to handle future risks.

Cost-Saving Opportunities:

Implementing sustainable practices, such as reducing waste and improving energy efficiency, can help lower operational expenses. The greatest cost savings are often found within the value chain, particularly in areas like Scope 3 carbon emissions.

Employee Engagement:

Approximately 75% of Millennials seek purpose-driven careers, setting environmental goals, developing sustainability strategies, and demonstrating measurable progress can help attract and retain top talent.

Building Trust with Stakeholders:

Sustainability enhances trust among key stakeholders, including investors and consumers. Investors prefer companies with strong sustainability strategies, while consumer demand for environmentally friendly products continues to grow. More than 80% of consumers are willing to pay extra for eco-friendly options. By prioritising sustainability, companies can gain market share and strengthen relationships with both investors and customers.

Driving Innovation:

Understanding the full life cycle impact of a product opens the door to innovation. Businesses can develop new products, services, or business models that meet the rising demand for sustainable solutions, driving long-term growth.

ENVIRONMENTAL SUSTINABILITY CHALLENGES:

Achieving environmental sustainability comes with a range of challenges.

Some of the most significant obstacles businesses face:

Lack of Supply Chain Transparency:

Managing global supply chains is one of the greatest hurdles. Fully understanding their environmental footprint (without transparency), it becomes difficult to measure and improve sustainability performance.

Lack of Internal Buy-in:

Achieving sustainability goals requires strong internal buy-in, particularly from senior leadership. Without support at the top, securing the necessary resources and budget can be difficult.

High Costs of Sustainable Innovation:

Developing sustainable solutions often demands significant upfront investment in new technologies, materials, or processes. These costs can present a major challenge for small and medium-sized enterprises.

Navigating Constantly Changing Regulations:

Keeping pace with continually evolving sustainability regulations is both time-consuming and resource-intensive. However, non-compliance can result in fines, loss of stakeholder trust, and reputational harm. For this reason, staying up-to-date with regulatory developments is essential. Despite these challenges, prioritising environmental sustainability remains critical for maintaining competitiveness and ensuring long-term business resilience.

HOW TO STRENGTHEN ENVIRONMENTAL SUSTAINABILITY:

Enhance Supply Chain Transparency:

Most of a company's environmental impact occurs within its supply chain. You cannot manage what you cannot measure, so improving transparency and collecting accurate supply chain data is vital to reducing impact. Building strong relationships with suppliers is equally important for enhancing overall sustainability performance.

Prioritise Sustainable Product Design: By focusing on sustainability early in the design phase, companies can significantly reduce their total environmental impact. Around 80% of a product's environmental footprint is determined during the design stage. This makes sustainable product development a priority. Product design teams with the knowledge and tools to choose environmentally friendly materials and processes.

Conduct Life Cycle Assessments (LCAS) for your Product Portfolio: Performing LCAs across your product portfolio provides detailed insights into environmental footprints. This information enables informed, data-driven decision-making and serves as the foundation for sustainability strategies such as carbon reduction targets.

Foster a Culture that Champions Sustainability:

Gaining stakeholder buy-in-especially from senior leadership-is essential for securing the resources needed to create impact. Engage employees in shaping sustainability strategies and establish internal sustainability champions who can lead initiatives and inspire teams to take ownership of environmental goals.

Be Transparent in Communication:

Sustainability is an ongoing process, and being transparent about your sustainability efforts is essential for building stakeholder trust. Share regular impact reports and communicate openly about your progress — even when obstacles arise. Demonstrating honesty in both achievements and setbacks strengthens credibility and reflects a true commitment to positive change.

A Holistic Approach to Environmental Sustainability:

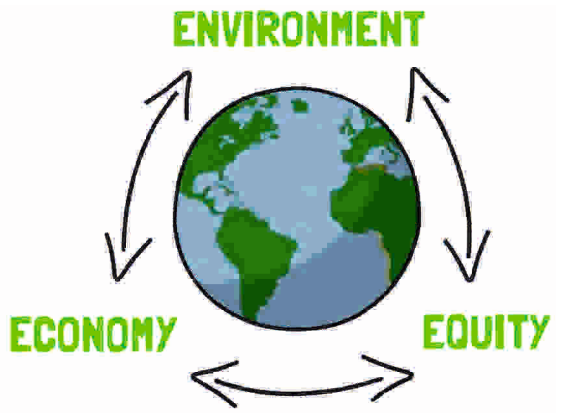
Taking a holistic approach is vital for accurately assessing and reducing a company's environmental footprint. Focusing on a single metric, such as carbon emissions, can lead to narrow thinking and unintended consequences. Many organisations face criticism for "Carbon Tunnel Vision," where they measure only the carbon emissions of their products without considering broader impacts such as biodiversity loss and waste generation.

In contrast, evaluating a product's footprint across multiple environmental indicators enables

businesses to make more informed and meaningful decisions. Life Cycle Assessments (LCAs) provide the in-depth data required for this perspective, offering insights into a product's environmental impact at every stage of its life. Leveraging LCAs helps companies build strong sustainability strategies and make evidence-based decisions that effectively minimise their overall impact.

ENVIRONMENT AND SUSTAINABILITY: A CALL FOR CONSCIOUS LIVING

The urgency for adopting sustainable practices has never been greater. Today, environmental sustainability stands as one of the most critical global challenges. Our planet faces mounting threats from climate change, but the issue extends far beyond that. It also involves tackling pollution, deforestation, biodiversity loss, resource depletion, and waste generation. These challenges are deeply interconnected, and addressing them collectively is vital for securing a liveable future. Environmental sustainability is not only a moral responsibility — it is also a sound business strategy. As Greta Thunberg reminded the world, we must act "like our house is on fire."



Urgent global action is necessary to prevent crossing irreversible tipping points.

WHAT IS ENVIRONMENTAL SUSTAINABILITY?

The widely recognised definition, provided by the Brundtland Commission, is:

"MEETING THE NEEDS OF THE PRESENT WITHOUT COMPROMISING THE ABILITY OF FUTURE GENERATIONS TO MEET THEIR OWN NEEDS."

WHY IS ENVIRONMENTAL SUSTAINABILITY IMPORTANT?

Environmental degradation directly impacts human health. The World Health Organisation reports that 24% of global deaths are linked to preventable environmental factors such as polluted air and contaminated water. Access to clean air, safe water, and toxin-free ecosystems is essential for human well-being.

MAJOR ENVIRONMENTAL CHALLENGES:

1. **Climate Change:** Human-driven greenhouse gas emissions are causing global temperatures to rise, leading to extreme weather, melting ice caps, rising sea levels, and disrupted ecosystems.
2. **Pollution:** Industrial activities are contaminating air, water, and soil. Plastic waste, chemical runoff, and toxic emissions pose significant risks to human and animal health.
3. **Deforestation:** Large-scale Forest clearing for agriculture, logging, and urban expansion results in habitat loss, species extinction, and higher atmospheric CO_2 levels.
4. **Bi-odiversity Loss:** Habitat destruction, pollution, climate change, and over-exploitation of resources are driving species extinction at alarming rates.

IMPORTANCE OF SUSTAINABILITY:

Sustainability ensures that present needs are met without jeopardising the ability of future generations to meet theirs. It protects the environment, supports economic stability, and enhances social well-being. Sustainable practices reduce costs, improve public health, and foster equity.

SUSTAINABLE PRACTICES FOR A BETTER FUTURE

- **Renewable Energy:** Transitioning to solar, wind, and hydropower reduces reliance on fossil fuels and cuts greenhouse gas emissions.
- **Sustainable Agriculture:** Organic farming, crop rotation, and water conservation maintain soil health and limit environmental harm.
- **Conservation Efforts:** Protecting natural habitats, reforesting degraded land, and supporting wildlife preservation safeguard biodiversity.
- **Waste Reduction:** Recycling, composting, and minimising single-use plastics reduce landfill waste and pollution.
- **Sustainable Transportation:** Public transit, electric vehicles, cycling, and walking significantly lower carbon emissions.

THE ROLE OF INDIVIDUALS AND COMMUNITIES:

Every person can contribute to environmental sustainability. Simple lifestyle changes-such as conserving energy, reducing meat consumption, and opting for eco-friendly products — can collectively have a substantial impact. Communities can amplify this by supporting local initiatives, advocating for green policies, and promoting environmental education.

BENEFITS OF GREEN AND OPEN SPACES:

1. **Climate Regulation:** Green spaces help cool cities, reducing the urban heat island effect.
2. **Air Quality Improvement:** Vegetation absorbs carbon dioxide and pollutants, improving public health.
3. **Biodiversty Conservation:** These areas provide habitats for various species, promoting ecological resilience.
4. **Recreation and Social Benefits:** Parks encourage physical activity, community interaction, and mental well-being.
5. **Economic Benefits:** Attractive green spaces can boost property values, support local businesses, and promote tourism.

CHALLENGES IN MANAGING GREEN AND OPEN SPACES:

- **Urbanisation:** Rapid development often reduces available green space.
- **Maintenance and Funding:** Upkeep requires ongoing financial and human resources.
- **Climate change:** Droughts, heatwaves, and storms can damage vegetation.
- **Community Engagement:** Involving residents in planning and upkeep is essential but resource-intensive.

STRATEGIES FOR MANAGING GREENS AND OPEN SPACES:

1. **Integrated Urban Planning:** Embed green areas into city design to ensure long-term preservation.
2. **Sustainable Design:** Use rain gardens, green roofs, and energy-efficient lighting.
3. **Community Involvement:** Encourage public participation to build a sense of ownership.
4. **Adaptive Management:** Plan for climate impacts with resilient landscaping.
5. **Partnerships and Funding:** Collaborate with businesses, NGOs, and government for financial and logistical support.

CONSTITUTION OF INDIA AND ENVIRONMENT:

- A fundamental "right to life" is guaranteed to all persons.
- 'No person shall be deprived of his life or personal liberty except according to procedure established by law.' (Article 21)

The scope of 'Right to Life' was expanded by the higher judiciary to include the -

'RIGHT TO A CLEAN AND POLLUTION-FREE ENVIRONMENT'.

DIRECTIVE PRINCIPLES OF THE STATE POLICY

The state shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country. (Article 48A)

FUNDAMENTAL DUTIES OF CITIZENS

To protect and improve the natural environment, including forests, lakes, rivers and wildlife, and to have compassion for living creatures. {Article 51 A (g)}

ENVIRONMENTAL (PROTECTION) ACT, 1986

The Environment (Protection) Act, 1986, was introduced as an umbrella legislation that provides a holistic framework for the protection and improvement of the environment.

In terms of responsibilities, the Act and the associated Rules require obtaining environmental clearances for specific types of new / expansion projects (addressed under Environmental Impact Assessment Notification, 1994) and for submitting an environmental statement to the State Pollution Control Board annually.

WASTE – DEFINITION AND CLASSIFICATION:

Waste is any material no longer needed by its owner or producer.

CLASSIFICATION:

- **Domestic waste,**
- **Industrial waste (e.g., Ash from Thermal Power Plants,**
- **E-waste(Electronic Waste),**
- **Construction debris,**
- **Agricultural waste,**
- **Food processing waste,**
- **Biomedical waste,**
- **Nuclear waste.**

UNDERSTANDING GREEN AREAS AND SPACES:

Green areas are lands covered wholly or partly by vegetation. Example: -

- Public parks
- Urban forests
- Botanical gardens
- Community gardens
- Wetlands and riparian zones
- Green roofs and walls
- Nature reserves and protected areas (Waste land) *

(*) A “wasteland” is an area of land that is barren, unproductive, desolate, and not being used to its full potential, often due to neglect or degradation. Specific types of wastelands are waterlogged or marshy lands, land affected by soil salinity, degraded forests and pastures and barren rocky or snow-covered areas.

WASTE LANDS ARE BROADLY CLASSIFIED INTO TWO MAIN TYPES:

(1) Culturable: land that can be made usable with treatment.

(2) Unculturable: land that is unproductive due to inherent problems like rocks or ice.

THE ECOLOGICAL IMPORTANCE OF GREEN SPACES:

(a) Air Quality Improvement: Plants absorb carbon dioxide and release oxygen through photosynthesis, while also filtering harmful pollutants like particulate matter, nitrogen dioxide, and sulphur dioxide. Urban trees can reduce air pollution by up to 30%, directly benefiting respiratory health.

(b) Climate Regulation: Green spaces act as carbon sinks and help combat the urban heat island effect by cooling the environment through shade and evapotranspiration.

(c) Water Management: By reducing runoff and enhancing groundwater recharge, green spaces help prevent flooding. Features such as rain gardens, bioswales, and permeable pavements contribute to sustainable stormwater management.

(d) Biodiversity Conservation: Parks, reserves, and native plantings create habitats for wildlife, support pollination, and contribute to ecological resilience.

SOCIAL AND HEALTH BENEFITS:

(a) Mental Health and Well-being: Access to green spaces has been linked to reduced stress, anxiety, and depression. Even brief exposure can improve mood and cognitive function.

(b) Physical Health: Green spaces encourage active lifestyles, helping to prevent obesity, cardiovascular disease, and diabetes, while also reducing noise and air pollution.

(c) Community and Social Cohesion: Shared green areas foster interaction, cultural exchange, and a sense of belonging.

(d) Education and Awareness: Parks, botanical gardens, and schoolyard green spaces serve as living classrooms for environmental learning.

ECONOMIC BENEFITS OF GREEN SPACES:

- **Increased Property Values:** Properties near parks often enjoy a 5-20% price premium.
- **Tourism and Recreation:** Urban parks & botanical gardens attract visitors and generate economic activity.
- **Cost Savings in Infrastructure:** Green infrastructure reduces the need for expensive stormwater and air quality systems, while green roofs lower building energy use.

GREEN SPACES AND URBAN SUSTAINABILITY:

(a) Role in Sustainable Urban Planning:

Incorporating green infrastructure — such as green belts, pocket parks, vertical gardens, and green corridors — into city planning improves environmental quality and liveability. Access should be equitable, ensuring disadvantaged areas are not left behind.

(b) Smart Cities and Green Spaces:

Smart technologies, such as GIS mapping, remote sensing, and IoT sensors, are increasingly used to monitor vegetation health, optimise irrigation, and track green cover.

CHALLENGES TO EXPANDING GREEN SPACES:

- ✓ Urban Sprawl: Expanding cities often reduce available green areas.
- ✓ Land Value Pressures: Commercial development may take priority over green space.
- ✓ Maintenance and Management: Lack of upkeep can lead to neglect.
- ✓ Environmental Degradation: Pollution, invasive species, and climate change damage ecosystems.
- ✓ Inequity in Distribution: Lower-income communities often have fewer and poorer-quality green spaces.

TECHNOLOGY AND INNOVATION IN GREEN SPACE DEVELOPMENT

- Drone-based tree planting is a method of reforestation utilising an unmanned aerial vehicle to plant trees and restore forests.

- AI-driven landscape planning: Produce lifelike 3D images of the Garden.
- Remote sensing for tree health: Monitoring of tree health by analysing spectral reflectance and structural data. Including detecting stress from pests, diseases, or drought, assessing growth and defoliation, and monitoring mortality and recovery after disturbances.
- Biophilic architecture: Green architecture focuses on energy efficiency, water conservation and responsible material use; biophilic design prioritises our psychological and physiological response to nature. In practice, the two approaches complement each other beautifully, creating spaces that are both eco-friendly and human-focused.
- Eco-friendly construction for parks and walkways: Eco-friendly Park construction involves using sustainable materials like recycled plastic and reclaimed wood, and integrating renewable energy sources such as solar panels for lighting facilities. Recycled materials should be used for the construction of walkways. These recycled materials reduce the waste and need for raw materials. This also reduces the cost.

FUTURE OF GREEN SPACES IN A CHANGING CLIMATE

As Climate change accelerates, Green Spaces must be:

Climate-resilient: Featuring native and drought-tolerant species. Climate resilient means - The capacity of systems, people, and ecosystems to cope with, adapt to, and recover from climate-related hazards and disruptions, such as extreme weather events.

- **Multi-functional:** Serving ecological, recreational, and infrastructural purposes.
- **Digitally Managed:** Using smart technology for upkeep.
- **Inclusive and Equitable:** Accessible to all.

HOW INDIVIDUALS CAN CONTRIBUTE

- Support or start community gardens.
- Volunteer for park clean-ups.
- Advocate for green-friendly policies.
- Educate others on the benefits of urban greenery.
- Plant trees or join reforestation projects. Policy makers should ensure that India's most common trees are planted, such as Sal, Babul and Neem. Banyan, Peepal, Mango, Ashoka, Beel and Teak.

CONCLUSION:

Green and open spaces are not just patches of greenery amidst concrete — they are lifelines for sustainable living and have an importance for ecological health and human well-being. As cities

continue to grow and the climate crisis intensifies, investing in and preserving green areas is no longer optional — it is imperative. These natural systems offer an incredible return on investment, from improving health to mitigating climate change.

Protecting the environment is both an ecological necessity and a moral duty. Sustainability balances human needs with the planet's well-being. By embracing sustainable practices, supporting strong environmental policies, and fostering environmental stewardship, we can create a resilient and equitable future.

The choice lies with us — live in harmony with nature today to ensure a thriving planet tomorrow. A sustainable future depends on how we design, maintain, and value our green spaces today.

Every tree planted, every park preserved, and every green initiative supported brings us a step closer to a healthier planet for generations to come.

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1. **Why are forests called the planet's lungs?**

   One mature tree can absorb up to 22 kilograms (48 pounds) of carbon dioxide (CO_2) per year and release enough oxygen for two people to breathe!

   The ocean produces over 50% of the oxygen we breathe. Tiny marine plants called phytoplankton play a massive role in regulating the planet's oxygen levels and absorbing carbon dioxide.

2. **If the world adopts agroecological farming (farming in harmony with nature), studies show we could sustainably feed the projected global population by 2050.**

   Sustainable agriculture can feed 10 billion people.

3. **Why are green spaces required in urban areas?**

   Access to greenery improves health-People living near green spaces are less likely to suffer from heart disease, obesity, or depression compared to those in concrete paved areas.

   Nature boosts happiness-Spending just 20 minutes in a park can significantly reduce stress hormones and improve mood, even if you don't exercise.

   Urban trees are natural air purifiers-A single large tree can remove up to 21 kilograms (46 pounds) of pollutants like dust, ozone, and nitrogen dioxide from the air each year.

   Green spaces keep cities cooler-Parks and urban forests can reduce local temperatures by up to 5°C, helping to counter the urban "heat island" effect.

   Green areas support biodiversity-Even small city parks can become mini wildlife sanctuaries, hosting pollinators, birds, and small mammals crucial for healthy ecosystems.

4. **Recycling just one aluminium can save enough energy to power a TV for 3 hours. Aluminium is 100% recyclable and can be reused endlessly without losing quality.**

5. **Renewable energy is now cheaper than fossil fuels-In many countries, solar and wind power cost less per kilowatt-hour than coal or natural gas, making clean energy not only eco-friendly but also economically smart.**

MASTER PLANS: STRATEGIC FRAMEWORKS FOR SUSTAINABLE DEVELOPMENT FOR DELHI WITH RESPECT TO PRESENT CHALLENGES

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ABSTRACT:

Master Plans are critical instruments in guiding the systematic development of regions, cities, and specific zones by laying out long-term strategic frameworks. These documents incorporate multidisciplinary elements such as land use, infrastructure, environment, transportation, housing, socio-economic development, and governance. As urbanization accelerates globally, the importance of integrated, flexible, and implementable Master Plans has grown manifold. Delhi, India's capital and one of the world's largest metropolitan regions, is at a critical juncture. The city faces critical urban challenges: severe traffic congestion, deteriorating air quality, water logging and a constant pressure to push population into NCR towns. Despite progressive Master Plans, these challenges persist due to fragmented governance, outdated infrastructure, and unplanned urban growth. The next Master Plan must reimagine Delhi as a self-sustaining metropolis that integrates transport reforms, air quality improvement strategies, urban redevelopment, and coordinated NCR regional planning. This paper explores the definition, components, methodologies, challenges, and case study of Master Plans of Delhi with a focus on their role in sustainable and inclusive development.

This policy brief presents a reform-driven vision for Delhi's Master Plan — one that addresses the intertwined issues of mobility, environment, housing, flood resilience, and regional redevelopment. It proposes a bold, optimistic strategy: reducing road congestion through Transit-Oriented Development (TOD) and integrated public transport; improving the Air Quality Index (AQI) with clean mobility, green infrastructure, and industrial emission control; retaining population within Delhi through vertical redevelopment and affordable housing; and regenerating NCR with coordinated regional governance and ecological buffers.

Additionally, it addresses the urgent need for a robust flood management system to mitigate urban flooding caused by heavy rains. The brief concludes with integrated recommendations that combine technical planning, institutional reforms, and participatory governance — positioning Delhi as a global model of sustainable urban transformation by 2041.

The currently operative Master Plan for Delhi (MPD) is the 2021 edition, which continues to guide urban development across the National Capital Territory. As per established planning norms, the horizon for each MPD spans 20 years, necessitating timely renewal to address evolving urban challenges. The proposed MPD-2041 is presently under review, with the Delhi Development Authority (DDA) inviting public feedback. In this context, I have submitted my recommendations for consideration, aiming to enrich the plan with forward-looking, inclusive, and sustainable perspectives.

INTRODUCTION:

1. Delhi at a Crossroads

Delhi's story is one of dynamic growth and persistent challenges. The capital now houses over 20 million people in its metropolitan area. Daily, it accommodates the highest vehicular density in India — over 12 million registered vehicles — resulting in some of the longest commute times globally. Air pollution levels frequently reach hazardous levels, and flooding has emerged as an increasingly serious threat during heavy rains.

Historically, Delhi's Master Plans have sought to regulate growth through zoning, transport planning, and infrastructure development. However, population growth, unplanned sprawl, inter-city migration, and climate pressures have outpaced planning efforts. Millions of people move daily between Delhi and NCR towns such as Gurgaon, Faridabad, Noida, and Ghaziabad for employment. This movement not only adds to congestion but also intensifies environmental stress and infrastructure demands.

The 2025 Master Plan for Delhi must address these interconnected issues with an integrated approach that looks beyond boundaries — addressing not only Delhi's core but also the wider NCR in a coordinated fashion.

2. Traffic Decongestion: A Systems Approach

Traffic congestion in Delhi is not simply a matter of too many vehicles. It is the outcome of decades of policy gaps: inadequate public transport coverage, inefficient last-mile connectivity, mixed traffic flows, and an absence of congestion pricing.

An effective approach to decongestion requires:

- **Transit-Oriented Development (TOD)**

  TOD zones — dense, mixed-use areas clustered around metro stations, Rapid Rail Transit corridors, and bus hubs — can reduce dependence on private vehicles. Delhi's Master Plan should mandate TOD for all future transport corridors, integrating residential, commercial, and institutional spaces within walkable distances.

- **Integrated Public Transport**

  Delhi must transform into a truly integrated mobility hub. This involves seamless coordination among metro, bus rapid transit (BRT), Rapid Rail Transit System (RRTS), and feeder e-rickshaw/micro-mobility services. Smart ticketing systems, real-time travel data, and integrated route planning will be essential.

- **Non-Motorized Transport (NMT)**

  Safe, shaded pedestrian walkways and dedicated cycling lanes will encourage short trips without vehicles. The Master Plan must ensure NMT corridors are part of all new developments and road upgrades.

- **Smart Traffic Management**

  AI-based traffic signal management, dynamic congestion pricing in core areas, and expanded park-and-ride facilities at metro and transit hubs can dramatically reduce peak congestion.

- **Freight Rationalization**

  Shifting freight movement to off-peak hours and establishing peripheral logistics hubs will improve both safety and traffic flow within the city.

3. Air Quality Improvement: From Reaction to Prevention

Delhi's air quality is among the most critical urban challenges. CPCB data shows that Delhi's average AQI over the last five years often exceeds 300 during winter months, well above safe levels. Vehicle emissions contribute over 40% to this pollution.

- **Clean Mobility Transition**

  Transitioning Delhi's public transport fleet to electric buses and e-rickshaws can drastically cut emissions. By 2035, Delhi should aim for an 80% electric fleet target. Incentives for electric vehicles (EVs) and expansion of charging infrastructure will accelerate adoption.

- **Green Urban Infrastructure**

  Expanding Delhi's green cover by at least 15% by 2041 — especially along ring roads and floodplains — will serve both air quality and urban heat reduction goals. A "Delhi Green Grid" should integrate urban forests, vertical gardens, and green rooftops.

  To bridge Delhi's green coverage gap, especially between areas like Lutyens Delhi (30%+) and dense zones like Karol Bagh or Chandni Chowk etc. This involves policy, design, community engagement, and innovative land use like creating.

Pocket Parks: Convert underutilized plots, dead-end streets, and leftover spaces into mini green zones.

Vertical Gardens: Encourage green walls on public buildings, metro stations, and commercial facades.

Rooftop Greening: Incentivize green roofs through tax rebates or FAR relaxations for retrofitted buildings.

Chandni Chowk & Karol Bagh: Use heritage-compatible landscaping—planters, shaded walkways, and native species that don't obstruct views or footfall.

Pedestrian Zones: Integrate green buffers and shaded seating in redesigned streetscapes.

There is need to take up community led initiatives like RWA's , schools and institutions should have mandatory requirement for green cover.

- **Building Emission Control**

  Mandatory green building codes, energy-efficient retrofits, and rooftop solar installations should be a requirement for new developments. This will reduce energy demand and emissions.

- **Dust and Waste Management**

  Mechanized street sweeping, dust control at construction sites, and efficient solid waste management must be embedded in the city's operations to curb particulate matter pollution.

  MPD-2041 should adopt a decentralized, circular, and data-driven approach to solid waste management, prioritizing segregation, local processing, and behavioural change. To ensure equitable and sustainable solid waste management the plan should prioritize decentralized processing, mandatory source segregation, and circular economy principles. Ward-level material recovery facilities and community composting hubs can reduce landfill dependence, while enforcing a three-bin system and digital tracking will improve compliance. Infrastructure for bio-CNG, composting, and plastic recovery should be scaled up, supported by zoning reforms and Extended Producer Responsibility. Integrating informal waste workers, promoting behavioural change through public engagement, and deploying real-time dashboards for monitoring will enhance efficiency.

- **Regional Air Quality Governance**

  Delhi's AQI is linked to pollution sources beyond its boundaries. NCR-wide coordination is essential to address stubble burning, industrial emissions, and vehicular pollution, with unified monitoring and regulation.

4. Population Retention and In-Situ Urban Regeneration

Delhi's population growth has traditionally spilled over into NCR towns. This outward migration fuels congestion and pollutes both Delhi and the periphery. The Master Plan must enable Delhi to absorb growth within its own limits through:

- **Vertical Redevelopment**

  Old, low-rise colonies must be redeveloped into high-density, mixed-use complexes. This will add housing stock without further urban sprawl. Redevelopment must also include modern infrastructure, community spaces, and transit integration.

- **Affordable Housing**

  The Master Plan should mandate a minimum of 20–25% affordable housing in all large-scale residential projects. This ensures inclusivity and minimizes the push factors driving migration to NCR.

  This policy is not merely a regulatory measure—it is a strategic intervention aimed at fostering inclusive urban growth, reducing socio-economic disparities, and curbing distress migration to the National Capital Region (NCR).

- **In-Situ Redevelopment of Unauthorized Colonies**

  Delhi has over 1700 unauthorized colonies, many of which lack basic services like water supply, sewage systems, paved roads, and fire safety infrastructure. These colonies emerged due to rapid urbanization, housing shortages, and informal land transactions. Despite their illegality, they are vibrant hubs of economic activity and shelter for low- and middle-income families. These areas should be regularized and upgraded through public-private partnerships, ensuring adequate infrastructure and living conditions while retaining communities. In-situ redevelopment refers to upgrading and formalizing existing settlements without displacing residents.

- **Decentralized Employment Hubs**

  The concept of decentralized employment hubs in Delhi is a vital urban strategy aimed at rebalancing the city's economic geography and alleviating the chronic burden of long commutes. Delhi's economic activity has historically been concentrated in central and southern zones—Connaught Place, Nehru Place, and Gurgaon—creating a lopsided urban structure where millions of residents from outer areas travel daily across long distances for work. This not only strains the city's transport infrastructure but also contributes to pollution, lost productivity, and diminished quality of life. By developing new commercial nodes in outer Delhi regions such as Dwarka, Rohini, Narela, and Bawana, the city can begin to disperse economic activity more equitably and foster localized growth.

These areas, each with distinct potential, are already earmarked for infrastructure upgrades and urban expansion. Dwarka, for instance, has emerged as a well-planned sub-city with proximity to the airport and metro connectivity, making it ripe for IT parks, business centres, and institutional campuses. Rohini, with its established residential base and access to metro corridors, can support retail, healthcare, and educational enterprises. Narela, once envisioned as Delhi's third mega sub-city, is undergoing a major infrastructure overhaul, including the proposed Rithala–Narela–Kundli metro corridor, which will dramatically improve connectivity and attract investment. Bawana, with its industrial estates managed by DSIIDC, offers a foundation for manufacturing and logistics hubs, especially for small and medium enterprises.

The decentralization of employment is not merely about spatial redistribution—it is about creating self-sustaining urban ecosystems. When jobs are located closer to where people live, it reduces travel time, lowers carbon emissions, and enhances work-life balance. It also stimulates local economies, as workers spend more on nearby services, housing, and amenities. Moreover, it encourages planned urbanization, as commercial development brings with it better roads, public transport, and civic infrastructure. Public-private partnerships will be crucial in this endeavour, enabling the government to leverage private capital and expertise while ensuring that development aligns with public interest.

In the long term, decentralized employment hubs will help Delhi evolve from a monocentric city into a polycentric metropolis—one where opportunity is not confined to a few enclaves but is distributed across a network of vibrant, connected nodes. This shift is essential not only for economic resilience but also for social equity, ensuring that all citizens, regardless of where they live, have access to dignified work and urban amenities. By investing in these outer zones, Delhi can unlock a new era of inclusive and sustainable growth.

- **Social Infrastructure**

  Delhi's current social infrastructure reveals stark disparities. While central and affluent areas benefit from well-equipped schools, tertiary hospitals, and recreational spaces, many peripheral and informal settlements remain underserved. According to the Delhi Master Plan 2021, the city faces a significant mismatch between the demand and supply of health and education facilities, exacerbated by uneven distribution and regional imbalances. Major hospitals are overburdened, not only due to local demand but also because of the influx of patients from neighbouring states, reflecting Delhi's role as a regional healthcare hub. Similarly, public schools in many resettlement colonies and slum clusters suffer from overcrowding, inadequate staffing, and poor maintenance, undermining the promise of universal education.

To address these challenges, redevelopment must be anchored in a holistic vision that integrates social infrastructure at every stage. For instance, new housing clusters—whether in in-situ redeveloped colonies or greenfield developments—should be accompanied by the planned provision of primary and secondary schools, anganwadis, polyclinics, and community centers. These facilities must be accessible, inclusive, and designed to serve diverse populations, including children, the elderly, and persons with disabilities. Moreover, the planning process should anticipate future demographic shifts, ensuring that infrastructure is scalable and resilient to population pressures.

Public-private partnerships can play a catalytic role in this domain as well. By incentivizing private investment in schools and healthcare facilities—through land grants, viability gap funding, or co-location with residential projects—the government can accelerate delivery while maintaining quality standards. However, this must be balanced with strong regulatory oversight to ensure affordability and equitable access, particularly for economically weaker sections.

Furthermore, the integration of digital infrastructure is increasingly vital. Smart classrooms, telemedicine facilities, and e-governance kiosks can bridge service gaps, especially in areas where physical infrastructure may take time to materialize. Equally important is the creation of safe public spaces—parks, libraries, sports complexes, and cultural centers—that foster community well-being and social cohesion.

Ultimately, the success of Delhi's redevelopment efforts will be measured not just by the number of housing units built or roads widened, but by the quality of life they enable. Social infrastructure is the connective tissue of urban life—it nurtures human capital, promotes equity, and sustains the city's long-term vitality. As Delhi charts its future, investing in schools, hospitals, and public amenities is not optional; it is the very essence of building a humane and inclusive metropolis.

5. Redevelopment of the NCR Region: Balancing the Core and Periphery

Delhi's growth cannot be separated from the NCR. The Master Plan must ensure integrated regional planning to avoid haphazard expansion:

- **Integrated Regional Planning**

  Delhi must coordinate with NCR towns to ensure balanced growth. NCR Planning Board should be empowered to oversee development and enforce cohesive policies across state boundaries.

- **Balanced Development**

  Encouraging specialized economic functions in NCR towns — manufacturing in Faridabad, IT in Noida, services in Gurgaon — can reduce commuter pressure on Delhi.

- **Regional Mobility**

  Expansion of RRTS and cross-border Metro lines will enable high-capacity intercity travel while reducing road congestion.

- **Environmental Coordination**

  Protecting Aravalli forests, Yamuna floodplains, and the NCR green belt is essential to preserve ecological balance and prevent merging of urban sprawl.

6. Flood Control and Stormwater Management

Delhi's vulnerability to flooding is growing due to climate change and encroachment on natural drainage systems. Heavy rains in recent years have caused severe urban flooding in low-lying areas such as Yamuna floodplains and parts of East and South Delhi.

The Master Plan must prioritize revamping Delhi's stormwater drainage network — expanding capacity, removing encroachments, and integrating with natural watercourses.

Restoring wetlands, lakes, and traditional water bodies can serve as buffers against floods while improving biodiversity and groundwater recharge.

- **Urban Permeability**

  Mandating permeable pavements, rainwater harvesting, and infiltration wells for all new developments will reduce runoff.

- **Flood Zoning and Risk Mapping**

  High-risk flood zones must be clearly demarcated, with construction restrictions and strengthened embankments. Smart flood monitoring systems must be deployed for early warnings and rapid response.

  Flood management in Delhi requires coordinated planning across NCR towns to prevent inflow of stormwater that overwhelms the city.

7. Integrated Policy Recommendations and Conclusion

Delhi's future hinges on its ability to move beyond fragmented, siloed planning and embrace a truly integrated, reform-driven approach to urban development. The city's Master Plan must evolve into a dynamic framework that recognizes the deep interconnections between mobility, air quality, housing, flood resilience, and regional coordination with the National Capital Region (NCR). Historically, Delhi's planning efforts have often treated these domains as separate challenges, resulting in piecemeal solutions that fail to address the systemic nature of urban issues. For example, transport upgrades have been implemented without corresponding improvements in air quality management or housing accessibility, while flood mitigation efforts have lacked coordination with land use and drainage planning.

An integrated policy vision would begin by aligning transport infrastructure with sustainable housing development, ensuring that new residential zones are well-connected to employment hubs and public transit. This reduces dependency on private vehicles, directly contributing to improved air quality and reduced congestion. Similarly, housing policies must be designed with environmental resilience in mind—incorporating flood-safe construction, green building norms, and inclusive zoning that accommodates diverse income groups. Air quality, a persistent challenge for Delhi, cannot be tackled in isolation; it demands coordinated action across sectors, including waste management, industrial regulation, and clean energy adoption, all of which must be embedded into the city's spatial and economic planning.

Flood resilience, too, must be mainstreamed into urban design. With climate change intensifying rainfall patterns and urban sprawl encroaching on natural drainage systems, Delhi needs a robust strategy that integrates blue-green infrastructure, permeable surfaces, and decentralized water management. These interventions must be synchronized with housing and mobility plans to avoid creating vulnerable pockets of development. Crucially, none of these efforts will succeed without seamless coordination with the broader NCR. Delhi's challenges—be it pollution, migration, or infrastructure stress—are regional in nature, and solutions must be co-created with neighbouring cities through shared governance frameworks, data exchange, and joint investment strategies.

- **Key recommendations include:**
  - Mandatory TOD zoning along all transport corridors.
  - Achieving at least 50% mode share in public transport by 2035.
  - Launching the "Delhi Green Urban Forest Program" to increase tree cover by 15% by 2041.
  - Creating at least four employment hubs in outer Delhi within a decade.
  - Enforcing redevelopment of unauthorized colonies under a time-bound PPP framework.
  - Introducing congestion pricing and freight rationalization by 2030.
  - Establishing a "Flood-Resilient Delhi Mission" with upgraded drainage and restored wetlands.
  - Institutionalizing a Unified Metropolitan Transport Authority (UMTA) for coordinated governance.

CONCLUSION:

Delhi stands at the threshold of transformation. The challenges of traffic congestion, pollution, flooding, and population pressures are serious, but solvable. A Master Plan that integrates vision with action — that fosters compact growth, sustainable mobility, environmental stewardship, and

coordinated regional planning — will allow Delhi to emerge as a global model of sustainable urban transformation. By embracing reform, Delhi can not only secure a liveable future for its residents but also inspire cities across India and beyond.

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1 Delhi was the first city in India to get a modern, legally enforceable Master Plan – the MPD 1962.

2 The MPD-1962 was developed by an Albert Mayer-led team and the Delhi Development Authority (DDA) and approved by the Central Government.

3 Delhi's plans reserved around 20% land as green, which is one reason it still has large parks, the ridge forest, and open recreational spaces.

4 Delhi's sub-cities (Dwarka, Rohini, Narela) exist because of Master Plans and were shaped by MPD-2001 to reduce pressure on Central Delhi.

5 MPD-2001 formally integrated a Mass Rapid Transit System (MRTS) which became the Delhi Metro.

6 Delhi is divided into 15 planning zones (A to P). Each zone has its own zoning regulations, density limits, and land-use maps.

7 MPD 2041 wants to make Delhi a "15-Minute City".

8 Delhi is the only Indian City with a continuous 60+ year Master Planning Tradition.

LEARNING TO EARNING: BRIDGING THE SKILLS GAP THROUGH SKILL DEVELOPMENT

Rahul Srivastava
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ABSTRACT:

Skill Development serves a mainstream driver of economic growth and societal advancement for any nation. In today's rapidly changing world, where Digitalization, Automation, and Climate action are re-shaping industries and employment patterns, the need for a skilled workforce has become more critical than ever. As technology transforms traditional jobs and creates new ones, workers must continuously upgrade their skills to remain relevant and productive. Moreover, as global economies transition toward sustainable practices and green technologies, skill development ensures that people are prepared for emerging sectors such as renewable energy, smart manufacturing, and digital services. By equipping individuals with the right technical, digital, and soft skills, nations can reduce unemployment, foster innovation, and build inclusive societies that are resilient to future disruptions.

KEYWORDS : Entrepreneurship, Vocational Studies, Employability, Skill Development, Education, Training, Lifeskills

INTRODUCTION:

Skill development refers to the process of enhancing an individual's capabilities, knowledge, and competencies to perform effectively in a job and meet the evolving demands of the workplace. It encompasses not only technical or vocational training but also the development of soft skills such as communication, problem-solving, adaptability, and teamwork. In a dynamic economic environment, where industries are constantly transforming due to technological innovation and globalization, skill development helps individuals stay relevant, productive, and employable. It also empowers workers to transition across roles, industries, or even create self-employment opportunities. For organizations and economies, a skilled workforce contributes to higher efficiency, innovation, and sustainable growth. Thus, skill development is not merely about employment—it is about empowerment, lifelong learning, and building a future-ready workforce.

The Ministry of Skill Development and Entrepreneurship (MSDE) is responsible for skill

development across the country and “Shri Narendra Modi, Hon’ble Prime Minister of India” mentioned at the world’s youth day that “Skill Development of the new generation is a national need and foundation of Aatmnirbhar Bharat”.

The key objective of skill development initiatives in India is to bridge the gap between the demand and supply of skilled manpower and create a workforce that meets industry and future market needs. This involves establishing a robust vocational and technical training framework that equips individuals with both foundational and advanced skills relevant to various sectors. Continuous skill upgradation is essential to help workers adapt to technological changes, automation, and new industry standards. Moreover, the focus is not limited to existing occupations but extends to developing new-age skills and fostering innovative thinking for jobs that are yet to emerge in the evolving economy. To realize this vision, the “Ministry of Skill Development and Entrepreneurship (MSDE) aim to implement training programs at scale, ensuring speed, quality, and global standards. Through initiatives like the Skill India Mission and Pradhan Mantri Kaushal Vikas Yojana (PMKVY), the government seeks to empower youth with employable skills, enhance productivity, and promote entrepreneurship. Ultimately, these efforts contribute to building a ‘Skilled India’—a nation where every individual has the opportunity to learn, grow, and contribute effectively to the country’s economic and social development.

SCHEMES AND SERVICES

The following schemes and services are driven by the MSDE for the better livelihood of the youth:

1. The Pradhan Mantri Kaushal Vikas Yojna.

PMKVY
प्रधानमंत्री कौशल विकास योजना
PMKVY 4.0
2022-2026

Based on the challenges faced in the earlier versions of PMKVY scheme, this upgraded version has been introduced to cater more effectively to the current ecosystem. This version is greatly enhanced, skilling the youth as per their abilities, aspirations and guiding them in choosing a right set of paths. The earlier versions highlighted issues such as mismatch between training and job opportunities, inadequate monitoring, and lack of focus on local and emerging skill demands. The scheme now emphasizes industry-linked training, digital and green economy skills, and regional need-based courses, ensuring that skilling is not just about certification but about creating sustainable livelihoods. Enhanced tracking mechanisms, stronger collaboration with industry partners, and integration with new-age technologies make this version more responsive and impactful.

2. Pradhan Mantri Kaushal Kendra (PMKK)

Pradhan Mantri Kaushal Kendra
Skill India
कौशल भारत – कुशल भारत

The PMKK are model training centers across the country equipped with necessary tools and infra to pertain industry-led on-demand dynamic courses, with at least one center envisioned in every district. These centers are designed to serve as benchmarks for high-quality skill training infrastructure and delivery under the national skill development framework.

Each PMKK is equipped with modern tools, machinery, classrooms, and digital infrastructure that simulate real workplace environments. This ensures that trainees gain hands-on, practical experience in their chosen trade, making them job-ready from day one. 812 PMKKs have been allocated so far across the country and 738 are functional.

3. Craftsmen Training Scheme (CTS)

कौशलं बलम्
Directorate General of Training

This scheme is ensuring skilled ready workforce for an industry that will foster faster country's growth. It ensures that young individuals are equipped not only with technical know-how but also with the practical skills needed to perform effectively in real-world work environments. Through a systematic and industry-aligned training process, the scheme aims to enhance both the quality and productivity of industrial output. Skilled manpower contributes directly to improved efficiency, reduced wastage, and higher innovation in production processes — leading to greater competitiveness of Indian industries in the global market.

Moreover, the initiative seeks to instill a technical and problem-solving mindset among the youth. By exposing them to modern tools, technologies, and professional work culture, the scheme nurtures a generation that is confident, employable, and ready to adapt to the changing dynamics of the job market. Ultimately, this approach strengthens the foundation of India's industrial ecosystem while empowering young citizens to secure meaningful livelihoods and contribute to the nation's economic growth.

4. Advanced Vocational Training Scheme (AVTS)

कौशलं बलम्

Directorate General of Training

The AVTS offers short-term modular courses, typically ranging from one to six weeks in duration, covering specialized skill areas relevant to various industrial sectors. These courses are designed to provide quick, focused skill enhancement and to keep the workforce updated with the latest techniques, tools, and technologies.

Since September 2007, over 3.5 lakh industrial workers and technicians have been benefited from the AVTS training programs conducted at NSTIs across the country. With financial assistance from the World Bank, training facilities at ATIs/NSTIs have been further strengthened and diversified, enabling the inclusion of new skill domains and advanced machinery to meet emerging industry trends.

In essence, AVTS continues to serve as a vital capacity-building initiative within India's skill ecosystem — enhancing workforce competence, promoting technological adaptability, and supporting industrial growth through a well-trained, future-ready workforce.

5. National Apprenticeship Promotion Scheme

The National Apprenticeship Promotion Scheme (NAPS-2) is a flagship initiative of the Ministry of Skill Development and Entrepreneurship (MSDE) aimed at promoting apprenticeship training across India. Building on the learnings from the first phase of the scheme, NAPS-2 focuses on creating a robust, demand-driven apprenticeship ecosystem that connects youth with real workplace training opportunities and industries with a skilled workforce. The first phase was launched in 2016 and amended for second phase NAPS-2 in 2023 for supporting industrial ecosystem.

Under the scheme, the Government of India provides partial stipend support to employers for apprentices engaged under the provisions of the Apprentices Act, 1961. This financial assistance helps reduce the cost burden on industries and encourages more establishments — especially MSMEs — to participate in apprenticeship training programs.

As of June 2025, over 8.5 lakh apprentices are receiving training under NAPS-2, with close to Two lakh women participants and a target of 13 lakh apprentices for the financial year.

6. Rozgar Mela

Rozgar Mela is a major cross-ministry employment initiative in India, designed to generate job opportunities in various government departments, ministries, and private companies. It is organized nationwide, bringing together employers and job seekers in events across dozens of locations, making it accessible to candidates from different regions and backgrounds.

During Rozgar Mela events, appointment letters for government jobs are distributed to selected candidates for roles in central ministries such as Railways, Health and Family Welfare, Posts, Financial Services, Home Affairs, Labor and Employment.

The initiative is well-supported by the National Skill Development Corporation (NSDC) under the Ministry of Skill Development & Entrepreneurship (MSDE), which also connects youth with opportunities in the private sector.

OUTCOME:

The government aims to achieve total employment-oriented skilling by 2025, where every trained youth is either employed, self-employed, or engaged in productive enterprise. To reach this goal, continuous efforts are being made as under:

- A recent Rozgar mela in October 2025 distributed over 51000 appointment letters.
- The Government portrays the initiative of giving youth a meaningful opportunity for an employment by way of Rozgar mela that aims to bridge the gap between skilled youth and available job opportunities, ensuring that training and education translate into real employment outcomes.
- Since its launch in 2015, under the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), more than 1.6 crore youth across India have been trained or oriented in industry-relevant skills. By creating this large and diverse pool of skilled youth, the scheme seeks to enhance employability, bridge the gap between education and industry requirements.
- The launch of Skill India Digital Hub (SIDH) under PMKVY 4.0 aims to better integration with education, skilling, employment and entrepreneurship services into one single digital platform.
- The programme under Indian Technical and Economic Cooperation (ITEC) driven by Ministry of Home Affairs (MHA) treaty of International Capacity Building for 200000 officials from 160+ countries have been trained.
- Continuous skill upgradation for Industrial work-force under Advanced Vocational Training Services (AVTS) - the scheme offers specialized, short-duration training modules ranging from one to six weeks, along with customized, industry-specific programs designed to meet the unique operational needs of different organizations. These focused training interventions enable industrial workers and technicians to stay aligned with the latest technologies,

machinery, production methods, and quality systems used in modern industry. As a result over 3.5 lakh workers and technicians have utilized the National Skill Training Institutes (NSTIs).

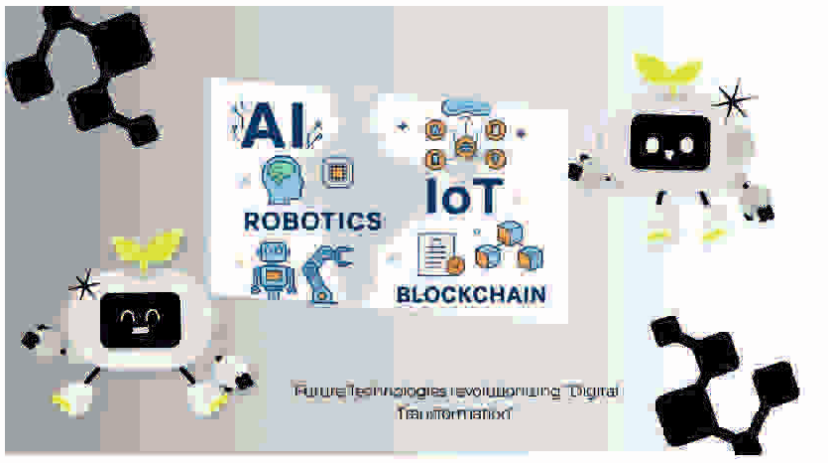
- Under PMKVY, since its inception in 2015 to December 2024, 1.6 crore people have been trained/oriented.

DATA (FROM VARIOUS SOURCES)

SCHEMES	PERIOD	TRAINED / ORIENTATION NUMBER	PLACED NUMBERS
PMKVY	2015-DECEMBER 2024	1.6 CRORES	2437000
NAPS	2016-OCTOBER 2024	3794000	2140000
DDU-GKY	INCEPTION MAY 2023	1451000	870000

Significance of future technologies like AI, Robotics, IoT and Blockchain in India

Artificial Intelligence, Internet of Things, Blockchain and Robotics are transforming skill development in India, equipping the workforce for future industries and digital economies. The Government has the aggressive planning and initiated the vision under the national policies, educational reforms and skilling. These technologies have changed the entire game worldwide and taking India also in storm by introducing AI in education and vocational training offers personalized better working ease-of-use environment. AI enabled tools are being used effectively in schools, colleges that creates instant skilled games, delivering meaningful feedback and audio/video reels and high-end graphics. Robotics training has been inducted in school curriculum like Atal Tinkering Labs, Robotics Automation courses etc. and ITI Vocational courses on Robotics hands-on shows Industry preparedness. IoT is revolutionizing key sectors like manufacturing, healthcare, logistics, agriculture with domain specific training and upskilling program on IoT for real-time data analytics and embedded systems are being introduced to bridge the gaps and creating new job opportunities for engineers and technicians.



Atal Tinkering Labs (ATLs)

The Atal Tinkering Labs (ATLs) initiative, under the Atal Innovation Mission (AIM) of NITI Aayog, has successfully established over 10,000 ATLs across the country. The program now aims to expand this network to 50,000 ATLs in its new phase beginning in 2025. In addition to expansion, AIM is focused on enhancing the performance and sustainability of the existing ATLs.

To support this objective, the ATL SARTHI program has been introduced. ATL SARTHI assists schools by monitoring the performance of labs through the ATL Dashboard and providing targeted support for improvement. Local authorities have been engaged to guide and strengthen the implementation of ATLs at the ground level.

Furthermore, more than 6,200 mentors have been onboarded to support students in their learning journey, offering technical guidance, project support, and innovation mentorship.

CURRENT STATUS

NSDC, NASSCOM, Skill India are running programs at larger scale and CBSE, NCERT have introduced in course curriculum. Even job demand is on high-time surge in sectors like cyber security, manufacturing, IT and Banks.

CHALLENGES

1. **Gimmickry and Public Relations**

   People argue that Rozgar Mela events are largely superficial, focusing on public relations rather than addressing the root cause of unemployment.

2. **Mismatch between Training and Industry needs**

   Rozgar Mela and other events does not solve fundamental issues like a mismatch between available skills and employers or industry demands.

3. **Low placement Conversions**

   Although large numbers are trained, placement rates remain inconsistent. Less than 15% figures are cause of concern.

4. **Monitoring and Outcome Tracking**

   - Tracking of actual employment outcomes after training is weak.
   - And real time labor market data is not integrated into course planning.

5. **Mobilization difficulties in rural areas**

   Seasonal occupation, Migration and Geographic spread affect participation. Women and differently-abled individuals face additional barriers.

   "Employers look for job-ready employees rather than trained technical ones. Future technologies evolves quickly and courses updates are sometimes finding tough to match up with the industry transformation. Small and medium enterprises (SMEs), which form the majority of India's industrial base, often find in-house training costly and time-consuming. They expect government institutions to train-ready workforce, while government expects industry participation—creating a coordination gap".

SUGGESTION

1. **Scholarship**

   The Ministry may consider introducing a dedicated scholarship scheme for aspiring entrepreneurs under PMEGP or others suitable programme. While several initiatives such as MSME Grant Schemes, Startup India Seed Fund, and various Incubation Schemes provide financial and developmental support, there is currently no direct scholarship mechanism

specifically aimed at nurturing potential entrepreneurs. Introducing such a provision could help identify and encourage entrepreneurial talent at an early stage.

2. Easy Loans

Government loan schemes such as PMEGP, MUDRA, Stand-Up India, and CGTMSE are designed to provide easy and collateral-free financial support to new and micro-entrepreneurs. These schemes are well-structured and subsidy/credit guarantee support is already in-place However, the actual disbursement of these loans sometimes faces challenges at the ground level:

- Bank Processing Delays or cautious lending behavior.
- Lack of awareness among applicants regarding documentation and project reports.
- Limited hand-holding support - Although government loan schemes are well-defined, ground-level support for beneficiaries remains limited. To ensure smoother implementation and timely loan disbursement, there is a need for strengthened handholding mechanisms. Establishing an external monitoring committee or designating a dedicated Single Point of Contact (SPOC) may fetch good results.

3. ITI Up-gradation

Under the Skill India Mission, significant efforts have been undertaken to modernize Industrial Training Institutes (ITIs). Through initiatives such as the Model ITI Programme and the STRIVE (Skills Strengthening for Industrial Value Enhancement) Scheme, approximately 500 ITIs have been upgraded to enhance training quality, industry relevance, and infrastructure capacity. Furthermore, as per the new policy direction announced in May 2025, an additional 1,000 Government ITIs are proposed to be upgraded over the next five years through a hub-and-spoke implementation model and under PM-SETU scheme Rs. 60000/- crores funds have been allocated.

However, India has more than 15,000 ITIs in total, of which nearly 78% are privately managed. This indicates that while progress has begun, a substantial portion of the ITI ecosystem still requires modernization. Continued investment, structured implementation support, and strong industry partnerships will be essential to ensure uniform quality standards and skill-readiness across the entire vocational training landscape.

CONCLUSION:

Skill development is not merely a training exercise; it is a strategic investment in India's human capital. By equipping youth with industry relevant, future-ready skills, the nation can bridge employment gaps, accelerate industrial growth, and enhance global competitiveness. While challenges remain in aligning training with industry needs, strengthening quality, and ensuring meaningful placements, continuous collaboration between government, industry, academia, Trainers and training partners will be crucial. With a focused, adaptive, and inclusive approach, India can transform its demographic dividend into a skilled, productive and innovation-driven workforce. Again, the meaningful part is dynamic centralized monitoring system that keeps an eye at every level with all stakeholders who involves in employment-generation, reskilling for the industrial growth.

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He is also the author of the management book "New Product Like a New Born Baby," which reflects his practical and people-centric perspective on innovation, product strategy, and organizational growth.

DID YOU KNOW?

1. Research shows that professionals who regularly upskill can earn 20-40% more than those who don't.
2. India's Skill India Mission (NSDC) aims to train over 400 million people, directly linking training to employment.
3. Skill gap is one of the biggest global challenges. According to the World Economic Forum (WEF), over 50% of employees will need reskilling by 2027 due to technological advancements and automation.
4. Yet, nearly 40% of employers report difficulty finding workers with the right skills.
5. Skills, not degrees, are becoming the new currency. Major companies like Google, IBM, and Meta now hire based on skills and certifications rather than formal degrees.
6. A report by Salesforce reveals that the digital skills gap could cost the global economy $11.5 trillion by 2028 if not addressed.
7. Countries that invest heavily in skill development (e.g., Germany's vocational model) enjoy lower unemployment rates and higher productivity.
8. Freelancing, gig work, and remote jobs reward multi-skilled professionals who combine digital, communication, and problem-solving skills.
9. By 2030, over 500 million jobs globally will require new skill sets that don't even exist today.

RE-SKILLING DELHI'S WORKFORCE FOR AN AI-POWERED ECONOMY

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ABSTRACT:

Artificial intelligence (AI) is transforming the global employment landscape by automating routine tasks, reshaping skill demands, and introducing new forms of work across sectors. In urban centres like Delhi, the impact is particularly profound due to the city's heavy reliance on services, informal employment, and knowledge-based professions. While AI offers opportunities for improved efficiency and innovation, it also poses significant risks of job displacement, especially for workers engaged in clerical, manual, or repetitive roles. Addressing these challenges requires a forward-looking approach to workforce development that prioritises both re-skilling and up-skilling to equip individuals with the skills needed to adapt and thrive in a technology-driven economy.

This study examines the evolving skill landscape in Delhi, identifying vulnerable job sectors, evaluating current re-skilling initiatives, and outlining strategic gaps in policy and implementation. Based on a qualitative review of secondary sources, the analysis underscores the urgent requirement for unified efforts among government agencies, private sector players, and educational institutions. Key recommendations include the formation of a city-level AI-Skills Task Force, promotion of micro-credentials, and integration of AI literacy in schools and vocational training. The findings stress the importance of inclusive skilling that reaches underserved communities and informal workers to ensure that technological progress supports equitable and sustainable growth.

Keywords: Artificial Intelligence, Re-skilling, Delhi Workforce, Digital Divide, Informal Employment, Skill Development

INTRODUCTION:

India is at the cusp of a technological transformation, driven largely by the rapid adoption of artificial intelligence (AI), automation, and digital platforms across diverse sectors. As AI begins to influence everything from healthcare diagnostics to urban planning and financial transactions, the Indian workforce is faced with an urgent need to adapt. This shift presents both an

unprecedented opportunity and a profound challenge, particularly in metropolitan regions where employment is concentrated in knowledge-intensive and service-oriented industries. The advancement of AI is transforming not only how work is performed but also the types of skills necessary to stay competitive and relevant in an increasingly digital economy (NASSCOM, 2020).

Delhi, as the national capital, occupies a unique position in this transformation. Home to a diverse array of workers — from bureaucrats and professionals to informal sector labourers — the city is simultaneously a political nerve centre, a hub for higher education, a centre for policy formulation, and a major node in India's service economy. The escalation of AI-driven technologies spanning industries such as governance, public health, retail, education, logistics, and finance in Delhi necessitates a parallel and immediate focus on re-skilling and up-skilling. While AI may streamline operations and improve productivity, it also compromises routine, manual, or repetitive occupations vulnerable to technological replacement (Chakravorti et al., 2022). In a city with high urban migration and a large informal workforce, the socio-economic consequences of this transition could be stark if proactive measures are not undertaken.

This situation underscores the core problem: Delhi's workforce must be rapidly equipped with new skills and competencies suited to an AI-powered future. The central objective is to identify the range to which AI will impact current job roles in Delhi, assess the preparedness of existing skilling initiatives, and explore how various stakeholders-governments, academic institutions, private enterprises, and civil society — can collaborate effectively to bridge the emerging skill gaps. This analysis is also essential to avoid exacerbating inequalities, especially among underrepresented groups such as women, youth, and migrant workers, who are frequently deprived of formal training.

To guide this examination, the following key questions are explored: (1) Which employment sectors in Delhi are most vulnerable to disruption by AI technologies? (2) What re-skilling programs currently exist, and where are the critical gaps? (3) How can a coordinated approach involving policy, academia, and industry drive inclusive and future-ready workforce development?

The discussion proceeds by first examining existing literature on AI's workforce impact, followed by an analysis of sector-specific trends in Delhi. Subsequently, it evaluates the effectiveness of ongoing skill development initiatives and proposes actionable recommendations to ensure Delhi's workforce can not merely endure but succeed in an AI-driven economy.

LITERATURE REVIEW:

The global integration of artificial intelligence (AI) into the economic fabric of nations has significantly altered the dynamics of labor markets. Countries worldwide are struggling to address the dual imperative of embracing technological innovation while ensuring their

workforces remain resilient and adaptable. The World Economic Forum (2020) forecasts suggest that by 2025, automation and AI could eliminate up to 85 million jobs globally, even as they give rise to 97 million new roles tailored to the requirements of emerging technologies. This structural transformation demands a recalibration of skill sets, where routine cognitive and manual tasks are increasingly automated, and new competencies such as data literacy, critical thinking, and adaptability become paramount (OECD, 2021).

India is no exception to these sweeping trends. As one of the fastest-growing digital economies, the country has actively promoted technology-enabled development through national programs such as Digital India, Skill India, and the National AI Strategy. These initiatives aim to foster inclusive digital growth, build AI capacity, and prepare the workforce for evolving job demands. The Skill India Mission, launched in 2015, seeks to provide market-relevant skills to youth across India, including through the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and other sector-specific training initiatives. Additionally, industry associations like NASSCOM have played a critical role in forecasting future skills and establishing digital learning platforms such as the FutureSkills Prime program, which focuses on AI, cybersecurity, cloud computing, and data analytics (NASSCOM, 2020).

Despite these national efforts, research on urban workforce re-skilling reveals several persistent challenges. A study by Mehrotra and Parida (2019) points to low levels of formal training, particularly among informal workers in cities, which reduces their employability in technology-driven sectors. Urban informal economies are cut off from institutional skilling resources, leading to a technological gap that unevenly impacts women, migrants, and lower-income groups. Moreover, the curriculum in many vocational programs remains outdated, disconnected from current market requirements, and lacking in practical, tech-driven applications (Bala et al., 2021). These gaps are particularly concerning in metropolitan areas such as Delhi, where employment is heavily service-oriented and increasingly susceptible to automation.

In order to gain deeper insight into how cities are addressing these challenges, it is useful to examine re-skilling models in comparable global contexts. In Singapore, the government launched the SkillsFuture initiative, which offers credits to citizens to pursue training in high-demand fields such as AI, robotics, and advanced manufacturing. The city-state's approach emphasises lifelong learning, employer partnerships, and a strong alignment between education and industry needs (Tan & Lim, 2019). In the United Kingdom, London's "Mayor's Digital Talent Programme" aims to close digital skill gaps by targeting underrepresented youth and creating pathways into tech roles through apprenticeships and employer-led training. Closer to home, Bengaluru — India’s IT capital-has seen public-private partnerships flourish, with firms collaborating with the government to establish coding academies, AI labs, and micro-certification programs aimed at transitioning traditional workers into tech-enabled roles (Rao & Bhatnagar, 2020).

However, there is a noticeable lack of scholarly work specifically addressing the re-skilling landscape in Delhi. While national-level studies provide valuable macro-level insights, they often overlook the region-specific dynamics of the capital city, such as its mixed economy, high in-migration rates, and significant informal sector employment. Limited empirical research has charted the effectiveness of local skill development centres or analysed the demographic spread of digital training participation in Delhi. Moreover, there is limited evaluation of how Delhi's education institutions, vocational programs, and digital infrastructure are preparing its diverse population for AI integration in the workplace.

This gap in research suggests an urgent need for a granular, context-specific understanding of Delhi's workforce re-skilling landscape. Without localised data and strategic insights, policy responses may remain fragmented and fail to serve the tailored requirements of the city's heterogeneous workforce.

METHODOLOGY:

This study adopts a qualitative, secondary data-based approach to explore the evolving skilling needs of Delhi's workforce in response to the growing adoption of Artificial Intelligence (AI) across various sectors. A qualitative framework was chosen to enable an in-depth, interpretive understanding of socio-economic patterns, policy interventions, and institutional responses relevant to workforce transformation. By relying on existing data sources, the analysis captures broader trends and insights that reflect the current status and challenges of re-skilling efforts in Delhi.

The primary sources of data include official government publications such as policy documents and strategic reports issued by the NITI Aayog, Ministry of Skill Development and Entrepreneurship (MSDE), and Delhi Skill and Entrepreneurship University (DSEU). In addition, data from the National Skill Development Corporation (NSDC), Census reports, and Labour Bureau surveys were used to understand employment trends, sectoral distributions, and demographic profiles within the Delhi National Capital Region (NCR). Academic literature and peer-reviewed journals supplemented these sources by providing context on urban skilling challenges, digital workforce transitions, and comparative frameworks. Reports by industry bodies like NASSCOM and global think tanks such as the World Economic Forum were likewise referenced to align the findings with international AI-related workforce developments.

The analysis follows a sector-wise impact assessment model, focusing on key industries within Delhi that are likely to be most affected by AI — such as retail, public administration, education, healthcare, and logistics. Each sector was analysed in terms of its susceptibility to automation and the corresponding level of skilling preparedness. A second layer of analysis assessed skilling readiness, looking at the availability and accessibility of training programs, digital literacy levels, and institutional support systems. This dual framework-sectoral impact and skilling

infrastructure — allows for a holistic understanding of the gap between existing workforce competencies and future job requirements.

However, the study is subject to certain limitations. The absence of primary data, such as interviews or field surveys, restricts the ability to capture real-time individual or institutional experiences. Furthermore, the dynamic nature of the policy environment, particularly in a fast-evolving field like AI, implies that inferences made from secondary sources may become quickly outdated. The fragmented nature of skill development reporting, with variations in definitions, scope, and data quality across sources, also poses a challenge to comparative analysis.

FINDINGS AND ANALYSIS:

AI Vulnerability Mapping of Delhi's Job Sectors

Delhi's employment landscape is characterised by a wide diversity of sectors, ranging from traditional government services to a growing digital and service economy. The rapid advancement of artificial intelligence (AI) technologies, particularly in automation, machine learning, and data analytics, is reconfiguring the nature of work in several of these domains. Although AI offers productivity and efficiency gains, it also poses displacement risks to certain categories of labor, especially those involving repetitive, clerical, and rule-based tasks (World Economic Forum, 2020).

In public administration, for instance, digitisation of records, automated grievance redressal systems, and chatbot-enabled citizen services are increasingly reducing the need for manual processing roles. Clerical workers engaged in data entry, file maintenance, and scheduling face an elevated risk of automation. In the education sector, AI-enabled digital assessment instruments, management systems for learning, and personalised learning platforms function are shifting the instructional paradigm. While this creates a demand for digitally skilled educators, it simultaneously reduces the need for traditional administrative staff.

Healthcare in Delhi is also undergoing AI-led transformation. Predictive diagnostics, automated report generation, and AI-assisted radiology tools are becoming prevalent in major hospitals and diagnostic centres. Support staff engaged in repetitive documentation or preliminary data collection face vulnerability, although new roles are emerging in telemedicine support, health informatics, and AI-assisted diagnostics (NITI Aayog, 2018).

The retail sector, especially within organised outlets and e-commerce platforms, is witnessing a decline in human cashiers, inventory clerks, and delivery scheduling personnel due to the deployment of automated billing, AI-based logistics, and customer analytics. Meanwhile, the manufacturing sector in the National Capital Region (NCR), though smaller than other metro areas, is also gradually adopting robotics and AI for quality control and assembly-line tasks, threatening jobs that depend on manual repetition and standardisation.

Furthermore, Delhi's economy is heavily reliant on services and informal gig work. From ride-hailing drivers and delivery workers to beauty professionals and domestic help, a substantial share of the workforce operates within app-based or semi-formal ecosystems. AI-driven platforms are increasingly optimising dispatch, service recommendations, and customer interaction. Although complete automation of such roles remains unlikely in the immediate future, workers in these sectors face algorithmic control and performance monitoring, leading to job instability and lower bargaining power (Chakravorti et al., 2022).

Overall, the roles most vulnerable to displacement include clerical staff, data entry operators, routine processing assistants, and administrative coordinators. Conversely, roles requiring emotional intelligence, physical dexterity, and contextual decision-making-such as caregiving, teaching, and urban fieldwork — face lower automation risk, though they too demand digital augmentation skills.

Existing Re-skilling Initiatives in Delhi

Recognising the need to prepare for an AI-influenced economy, various re-skilling efforts have emerged across Delhi, led by both public and private institutions. One of the most prominent initiatives is the Delhi Skill and Entrepreneurship University (DSEU), which was established to provide market-relevant training across sectors. DSEU offers diploma and degree programs in areas like data analytics, digital marketing, web development, and applied AI. These programs aim to bridge the gap between academic instruction and industry demands by incorporating hands-on training, internships, and collaborations with startups (DSEU, 2023).

The National Skill Development Corporation (NSDC) operates multiple training centres across the NCR, in partnership with private training partners. These centres provide short-term skilling in areas such as cybersecurity, artificial intelligence basics, and data handling. Programs like the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) have seen widespread implementation in Delhi, especially targeting youth and women in economically weaker sections (NSDC, 2021).

Private enterprises have additionally stepped in with digital learning platforms. Infosys Springboard, for instance, provides free courses in AI fundamentals, cloud computing, and soft skills through an open-access model. Google Career Certificates, in partnership with Coursera, offer flexible online certifications in IT support, data analytics, and UX design, aimed at entry - level learners. Although these initiatives show potential, their reach in low-income or non - english - speaking populations remains limited.

Moreover, numerous Delhi-based NGOs and community-based groups have undertaken grassroots skilling programs. These range from basic digital literacy courses to advanced technical workshops, particularly in underserved areas like North - East Delhi and unauthorised colonies. However, the lack of standardised assessment and certification often limits the employability outcomes of such programs.

Challenges in Re-skilling Implementation

Despite growing awareness and institutional activity, the implementation of effective re-skilling programs in Delhi faces several structural and systemic challenges.

First and foremost is the digital divide. Women, migrants, and economically underserved communities frequently face barriers to accessing smartphones, stable internet, or digital literacy-making them less likely to benefit from online learning platforms or AI training courses. According to the Internet and Mobile Association of India (IAMAI, 2021), Delhi still has significant digital access disparities based on gender and income, limiting inclusive skilling outcomes.

Second, awareness about AI's implications on jobs remains low at the grassroots level. Many workers, especially in informal sectors, remain unaware of how automation and AI could impact their roles, and therefore do not actively seek re-skilling opportunities. This disconnect between macro-level policy planning and local worker engagement presents a major bottleneck.

Third, there is a persistent mismatch between the training provided and actual industry requirements. Curriculum design in many training centres remains outdated, with limited exposure to real-world applications of AI and digital tools. Moreover, trainers themselves often lack updated technical knowledge or the ability to contextualise AI in domain-specific ways.

Budgetary constraints and fragmented policy execution further aggravate the problem. Multiple agencies — both central and state-level-operate in silos without adequate coordination, leading to overlaps in program delivery and inefficient resource utilisation. The absence of robust data on training outcomes, employability rates, or return on skilling investment hinders continuous improvement and targeted interventions.

Opportunities and Sector-Specific Recommendations

Despite the challenges, Delhi stands at a pivotal moment where focused interventions could transform its workforce into a digitally agile and AI-ready population.

One promising area is the expansion of IT-enabled services and AI ethics-related jobs. As more firms deploy AI in customer support, fraud detection, and content moderation, the demand is increasing for positions that oversee algorithmic fairness, data privacy compliance, and ethical governance. Training young professionals in these emerging fields can create high-impact, future-oriented job pathways.

Delhi's involvement in smart city initiatives provides another critical opportunity. AI is increasingly integrated into urban governance through urban traffic control and solid waste management systems, predictive policing, and public grievance portals. Training municipal staff and urban planners in digital tools, data interpretation, and AI integration could not only improve the provision of public services, but also generate new employment models within the public sector.

The education sector, particularly in public institutions, offers potential for up-skilling frontline

workers such as teachers and administrative staff. Incorporating AI tools into pedagogy requires basic understanding of learning analytics, digital platforms, and hybrid instruction design. Investing in educator training ensures that technological integration complements instead of substituting human instruction.

Lastly, the ecosystem for digital entrepreneurship and tech-enabled startups in Delhi is growing steadily. Co-working spaces, incubators, and venture capital firms are progressively supporting AI-driven business models in e-commerce, healthcare, and mobility. Empowering skilled youth with entrepreneurial training, startup capital access, and mentorship can catalyse grassroots innovation. Programs that target women and first-generation entrepreneurs from marginalised backgrounds could foster inclusive economic growth.

In conclusion, while the risks posed by AI to Delhi's labor market are substantial, so too are the opportunities for those equipped with the right skills. Sector-specific re-skilling, strategic policy support, and strong public-private collaboration will be critical for guaranteeing that the transition to an AI-powered economy is both inclusive and equitable.

POLICY RECOMMENDATIONS:

To equip Delhi's workforce for the rapidly evolving AI-driven economy, a multi-pronged and inclusive policy strategy is essential. This requires structural reforms, proactive governance, and a sustained commitment to lifelong learning. The recommendations outlined here focus on establishing institutional frameworks, strengthening industry–academia linkages, expanding digital skilling pathways, and creating incentives for organisations to invest in human capital development.

Establish a Delhi AI-Skills Task Force

A targeted intervention to coordinate all skilling efforts at the city level is urgently needed. The formation of a Delhi AI-Skills Task Force under the aegis of the Delhi government can serve this purpose. This body should act as a central node to convene stakeholders from academia, industry, civil society, and public sector institutions to assess skilling needs, monitor progress, and align initiatives with real-time labor market trends. It should also publish an annual AI Skills Report for Delhi, offering granular data on job trends, skill gaps, and participation by demographic groups (OECD, 2021).

Strengthen Industry–Academia Linkages through AI Centres

To make AI education meaningful and employment-oriented, the government should promote the establishment of AI Centres of Excellence in public and private colleges across Delhi. These centres should go beyond offering theoretical instruction by embedding real-world projects, hackathons, and industry-led mentorship into the curriculum. Partnerships between universities and technology firms can foster innovation ecosystems where students gain exposure to AI

applications in domains such as healthcare, logistics, education, and governance (NASSCOM, 2020). Additionally, embedding faculty development programs within these centres would ensure educators remain current with the evolving AI landscape.

Incentivise Re-skilling of Mid-Career Professionals

The digital economy's evolution is not only displacing entry-level jobs but also threatening the roles of mid-career professionals in roles that require legacy systems or non-digital workflows. To address this, fiscal and non-fiscal incentives should be provided to companies that invest in up-skilling or re-skilling existing employees, especially those in administrative, clerical, and customer-facing functions. Tax credits, matching grants, or performance-linked training subsidies can encourage firms to integrate continuous learning into their human resource strategies (World Bank, 2020). This would also reduce job redundancies and foster greater workforce stability.

Embed AI Literacy in School and Vocational Curricula

Preparing for an AI-powered future must begin early. Schools and vocational institutions should integrate AI literacy and adaptability into foundational curricula. This includes not just coding or technical skills, but also critical thinking, data interpretation, and ethical understanding of AI systems. For vocational training programs, modules on AI applications in logistics, retail, agriculture, and urban services should be developed, especially for students who are unlikely to enter formal higher education. A differentiated approach, using gamified content and vernacular media, can help reach marginalised learners and minimise dropout rates (UNESCO, 2022).

Promote Micro-Credentials and Modular Certifications

Given the diverse educational and employment backgrounds in Delhi, flexible learning options are crucial. Micro-credentials and modular online certifications offer a scalable way for individuals to acquire targeted, industry-relevant skills without committing to long-term degree programs. Government bodies can partner with platforms such as Coursera, SWAYAM, and Future Skills Prime to offer subsidised access to AI courses, and ensure recognition of these certifications by employers. Stackable credentials — where learners accumulate credits over time — can enhance career mobility and build a culture of continuous up-skilling (World Economic Forum, 2023).

In summary, an integrated policy approach that targets institutions, industries, educators, and learners is crucial for Delhi's success in an AI-led economic environment. By embedding AI readiness into education and workforce systems, enabling access to flexible learning, and catalysing public-private cooperation, Delhi can create a robust and inclusive talent pipeline capable of navigating technological disruption.

CONCLUSION:

The advancement of artificial intelligence is no longer a distant forecast but a present and accelerating force reshaping work, productivity, and economic models. For a dynamic and populous city like Delhi, the implications of this technological transformation are particularly significant. With its dense service sector, large informal workforce, and rapidly digitising governance systems, Delhi stands at a crossroads. Without timely and targeted re-skilling and up-skilling interventions, the city risks deepening existing inequalities and excluding vast segments of its workforce from future economic participation.

The urgency of re-skilling is not simply about job retention — it is about ensuring equitable growth, where technological change acts as a driving force behind empowerment rather than displacement. This calls for a proactive and collaborative approach involving government bodies, the private sector, educational institutions, and community-based organisations. Policy leadership must provide the framework, but the real impact will stem from shared ownership of the challenge and consistent alignment of skills development with real market demands (NITI Aayog, 2018; OECD, 2021).

Moreover, inclusivity must remain at the heart of Delhi's skilling strategy. Many residents in the city work in informal roles — street vendors, delivery personnel, domestic workers, and small-scale artisans — who often fall outside the purview of structured training ecosystems. Tailoring learning pathways that account for the constraints of time, language, and access is crucial. Mobile-based learning, local training centres, and modular certifications offer scalable and adaptive solutions. Special attention should likewise be paid to gender disparities and the demands of migrant communities, who frequently lack social and digital capital to transition into AI-relevant employment.

While current efforts have laid important groundwork, further research is vital to deepen understanding and strengthen impact. Subsequent research may investigate the intersection of AI and informal economies, examining how digital technologies are transforming gig work, micro-enterprises, and urban self-employment. Similarly, focused research on migrant worker skilling — considering mobility, documentation, and language barriers — can help build more inclusive and responsive training models.

In conclusion, re-skilling is not merely a policy choice but a socio-economic imperative for Delhi's sustainable future. By investing in human capital today, the city can create a workforce that not only survives but thrives in an AI-powered world.

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Dr. Bushra S. P. Singh is an academician, researcher, engineer, and currently serves as Assistant Professor of Management at GJIMT. She also holds the role of Associate Editor for the Gyan Management Journal. With a passion for research, she has authored over 30 scholarly papers published in reputed journals and edited volumes, and has been recognised with Best Paper Awards at Academic Conferences organised by Panjab University.

A trained expert in Structural Equation Modelling and advanced data analysis techniques, Dr. Singh brings a research-driven approach to her teaching and academic work. She has also served as a reviewer for journals published by Wiley. She holds a B.Tech in Biotechnology from Thapar University, an MBA in IT & Telecommunication from UIAMS, Panjab University (where she was awarded a Gold Medal), and a Ph.D. in Management as a UGC-Junior Research Fellow from University Business School, Panjab University

INTERESTING FACTS

1. AI Could Create More Jobs Than it Replaces:

According to the World Economic Forum (2020), while AI and automation may displace 85 million jobs globally by 2025, they are also expected to create 97 million new roles-mostly in data analysis, digital transformation, and human–machine collaboration.

2. Delhi Leads in Informal Employment:

Nearly 80% of Delhi's workforce operates in the informal sector, meaning most workers are outside structured skilling or digital training systems — a key challenge in building AI-readiness (Labour Bureau, 2021).

3. AI in Everyday Delhi Life:

From traffic lights that use predictive algorithms to reduce congestion, to AI-based health diagnostics in major hospitals, and chatbots handling public service queries, Delhi is already experiencing an AI revolution in governance and daily living.

4. A Skilling Gap That's Wider Than it Seems:

Despite hundreds of training centers under PMKVY and NSDC, only less than 5% of India's workforce has received any formal vocational training (MSDE, 2022). In Delhi, this gap is magnified by rapid urban migration and digital inequality.

5. Women Face a Double Disadvantage:

Studies reveal that women in Delhi are 30% less likely than men to have access to digital devices or online learning opportunities (IAMAI, 2021). Gender-sensitive skilling is essential to ensure equitable AI participation.

6. The 'AI-Skills Task Force' Vision:

Experts propose establishing a Delhi AI-Skills Task Force to coordinate all city-level skilling efforts, track job trends, and ensure every worker-from engineers to street vendors-can benefit from AI inclusion.

Join the Delhi Productivity Council
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If you are interested in productivity and would like to network with like-minded organizations and professionals, why not join the DELHI PRODUCTIVITY COUNCIL?

HIGHLIGHTS OF DELHI PRODUCTIVITY COUNCIL (DPC)

DPC is a not for profit autonomous organization established in 1959 by the National Productivity Council and the Delhi Administration, Govt. of N.C.T of Delhi for promoting productivity culture in India. DPC is tripartite in its constitution having equal representation from Government, Employers, Employee organizations and from technical and professional institutions on its Governing Body.

DPC is engaged in providing training and consultancy to wide variety of organizations in the areas of Productivity, Quality, Safety, Management effectiveness and Organizational effectiveness for almost six decades in India.

The Council offers 5 types of membership: Industrial Enterprises , Trade Unions, Institutional, Individual and Life Membership.

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7. Preference in publication of technical paper(s) written by your personnel in the DPC Journal.
8. Free Access to DPC IM Library in Dwarka campus during normal working hours.
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12. Free usage of one classroom complete with Projector & Screen at Dwarka campus up to eight hours per usage limited to twice in a year for organizing Workshops, Training Programmes, Tests, Counseling Sessions and Interviews. The usage can be made from 10.00 a.m. to 6.00 p.m. on weekends, holidays or based on availability during week days.
13. 50% discount on normal charges for utilizing DPC's Open Green Lawn in Dwarka campus for organizing Company Events/Exhibitions as per DPC policy for such usage. The usage can be made maximum twice in a year only on Sundays and holidays from 10.00 a.m. to 6.00 p.m.

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Contact us now at :

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