WRI INDIA

CONFERENCE PROCEEDINGS

Implementing Low-Emission Zones for Cleaner Air in India

A SUMMARY OF EXPERT PERSPECTIVES

August 07, 2024 | New Delhi, India | Compiled by: Kanika Gounder, Kaustubh Chuke, Kaustubh Gosavi, Sree Kumar Kumaraswamy, Chaitanya Kanuri

BACKGROUND

Air pollution is a global health emergency, being the fourth deadliest cause of mortality, and it severely impacts all age groups, especially the young. The transportation sector is a significant contributor to air pollution in Indian cities and is the third highest emitting sector of greenhouse gases (GHGs). In India, road transport contributes 90 percent (Kumar et al. 2022) to the total carbon emissions from the transport sector. Transport also contributes to nearly a third of the particulate matter (PM) 2.5 pollution in Indian cities (Nair 2021). In 2019, air pollution caused 1.2 million deaths in India, making it the fifth leading cause of death (Health Effects Institute. 2019. State of Global Air 2019). Concerted efforts to combat rising air pollution have become increasingly critical, necessitating innovative and impactful solutions.

WRI India hosted a roundtable discussion on "Implementing Low Emission Zones for Cleaner Air in India" on August, 7th, 2024, to discuss regulatory and technical challenges, learnings from early adopter cities, and strategies for scaling low emission zones (LEZs) in the Indian context.

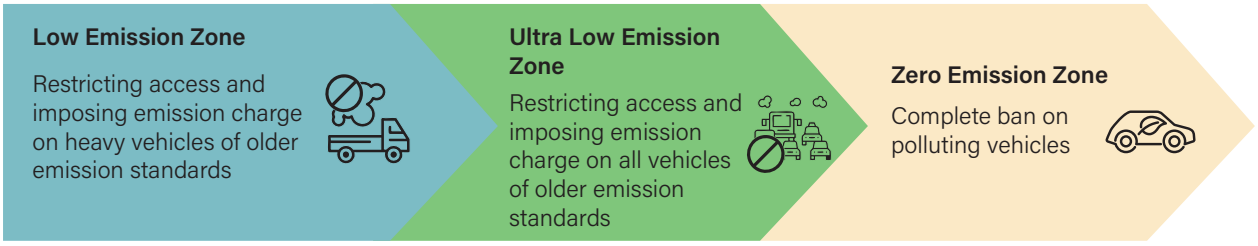
India has committed to ambitious goals to combat air pollution and achieve net-zero emissions by 2070. To achieve this, some of the initiatives proposed by the government include the National Clean Air Programme (NCAP), fuel standard evolution, and e-mobility promotion with central and state-level electric vehicles (EV) policies. In addition to these broader initiatives, focusing on urban hotspots and addressing specific sources of air pollution is crucial. Local urban air quality can be improved through targeted measures to reduce vehicular emissions in highly polluted urban areas. In such areas, LEZs, also known as healthy air zones and clean air zones, can be introduced as an effective measure. LEZs restrict the movement of high-polluting vehicles or impose an emission fee for their entry. In addition to LEZs, more stringent categories, such as ultra-low emission zones (ULEZs) and zero emission zones (ZEZs) have been adopted globally.

CONTENTS

These conference proceedings reflect the presentations and discussions of participants and do not necessarily represent the views of WRI India or other participating institutions.

ULEZs impose stricter limits, allowing only low or zero-emission vehicles. ZEZs permit only those without tailpipe emissions, such as electric or fuel-cell vehicles, and promote non-motorized transport (NMT) and zero-emission public transport.

FIGURE 1 | Types of cleaner air zones



Source: Compiled by WRI India

Supporting measures in LEZs play a crucial role in amplifying emission reduction efforts, delivering multiple benefits across air quality, climate, and urban mobility. By promoting non-NMT and public transport modes, LEZs reduce dependency on private vehicles, thereby decreasing vehicular emissions and congestion. These measures improve air quality directly, mitigating health risks associated with exposure to pollution, particularly for vulnerable groups like women, children, the elderly, and those belonging to economically weaker sections. LEZs also contribute to climate goals by incentivizing the adoption of EVs, providing scrappage incentives to phase out older, high-polluting vehicles, and accelerating the transition to cleaner transportation modes. Additionally, regulating parking within LEZs supports more efficient land use and encourages a shift toward sustainable mobility solutions, enhancing overall urban accessibility and livability.

Case studies from cities like London, Bali, Jakarta, and Beijing, highlight success stories and advocate for LEZs as an effective solution to curb urban air pollution. However, despite the global success of LEZs, their implementation remains limited in Indian cities. While, ZEZs that completely prohibit internal combustion engine (ICE) vehicles have been introduced in a few tourist areas, including the Taj Mahal in Agra, the Statue of Unity in Kevadia, and the ecologically sensitive hill station of Matheran, cities facing challenges with poor air quality index (AQI) are yet to adopt LEZs as a part of their strategic plans toward cleaner air.

The implementation process for LEZs involves collaboration between central and state-level authorities, pollution control boards, transport departments, and municipal corporations, with effective enforcement by the traffic police. The literature identifies various primary legal pathways for implementing LEZs and ZEZs in India (Dhole et al. 2023) highlighted as follows:

TABLE 1 | Legal pathways for implementing LEZs in india

LEVEL	AUTHORITY	LEGAL PROVISIONS	EXAMPLE
Central	Ministry of Environment, Forest, and Climate Change (MoEFCC)	Section 3 & 5 of the Environment Protection Act, 1986	Matheran Eco-sensitive Zone, Taj Trapezium Zone
Central/ State	MoEFCC, Central Pollution Control Board (CPCB), state pollution control boards (SPCBs)	Sections 16-18 of the Air (Prevention and Control of Pollution) Act, 1981	National Clean Air Programme (NCAP)
State	SPCB	Section 19 of the Air (Prevention and Control of Pollution) Act, 1981	Delhi's restriction on trucks and diesel vehicles
State/ Local	State governments, city governments	Section 115 of the Central Motor Vehicle Act, 1988	Delhi's odd-even vehicle rule
Local	Municipal corporations, state governments	Sections 208, 456, 457 of the Maharashtra Municipal Corporation Act, 1949	Restrictions on vehicles in Pune, Mumbai

Source: Secondary research by WRI India.

However, the successful implementation of LEZs in India would require consideration of several other factors, including the presence of alternative transport routes, sociopolitical support, and demographic impact. It is also crucial to ensure that LEZ restrictions do not disproportionately impact vulnerable communities, particularly women, children, and the elderly.

ABOUT THE WORKSHOP

To discuss the above-mentioned gaps, identify additional barriers and ideate solutions, the closed-door roundtable discussion was conducted over two sessions. First, on "Early Mover Cities: Learnings and Challenges", where the participants discussed the regulatory frameworks, the economic and social impact, and the technical and infrastructural requirements of LEZs. The second session was on "Scaling LEZs: Implementation in the Indian Context" where stakeholder collaboration, phased implementation, monitoring, evaluation, and public awareness were discussed.

The participants included representatives from the state and local governments, academia, think tanks, policy researchers, and related stakeholders. The topics of discussion included an exploration of LEZs, strategies adopted globally, their impact on air quality, and assessing opportunities and challenges in implementing LEZs in the Indian context.

FIGURE 2 | Participants discussing LEZ implementation strategies at the roundtable

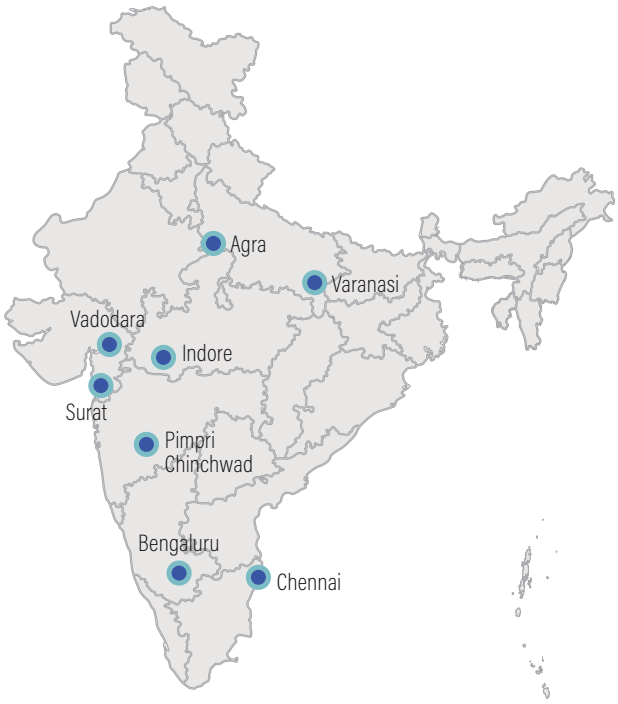
Photo Credit: WRI India.

INITIATIVES BY CITIES

Representatives from eight cities—Chennai, Bengaluru, Surat, Indore, Agra, Pimpri Chinchwad, Vadodara, and Varanasi—attended the roundtable discussion. Each representative shared a range of initiatives that their city has undertaken to reduce pollution and congestion in the city.

City officials shared diverse strategies to reduce emissions, showcasing innovative initiatives tailored to local contexts. Bengaluru demonstrated the success of pedestrian zones such as those in Church Street, in enhancing public awareness about the benefits of clean air. Surat focused on electrifying goods vehicles in its textile market to cut emissions. Agra highlighted the Taj Trapezium Zone's significant achievement of reducing pollution around the Taj Mahal. In Pimpri Chinchwad, the graded response action plan (GRAP) was cited as a key measure to combat high particulate matter levels through enhanced public transport and non-motorized transport infrastructure. Chennai showcased its efforts to create vehicle-free zones and

FIGURE 3 | City-level participation at the roundtable



Source: Compiled by WRI India.

expand EV infrastructure, while Varanasi prioritized restricting diesel vehicles in sensitive areas such as the Kashi Vishwanath corridor. Vadodara emphasized transitioning its municipal fleet to electric, including buses and waste collection vehicles, while Indore explored integrating cycling into its public transport system and planned further expansions. These examples collectively underline the importance of targeted, locally relevant approaches to reducing urban emissions while promoting sustainable mobility. Overall, the diverse approaches across different cities reflect each city's adaptation to its unique challenges, demonstrating a growing commitment to sustainable urban development and the reduction of pollution through a mix of technology, infrastructure, and policy interventions. They also highlight the necessity of tailoring LEZs to the local context. For example, Varanasi's geography makes metro rail impractical, leading to the exploration of water taxis and ropeways as alternatives. Other cities are leveraging electric buses, enhancing non-motorized transport options, and focusing on cleaner fuels. Localized solutions that account for each city's unique geographical, social, and economic characteristics will be key to the successful implementation of LEZs in India. By focusing on the specific needs and challenges of each city, India can develop flexible frameworks that ensure both effective pollution reduction and long-term sustainability.

TABLE 2 | Initiatives discussed by officials to reduce vehicular emissions in their cities

	VEHICLE RESTRICTION ZONES	PROMOTION OF EVS/ CLEANER FUEL	DEVELOPMENT OF MASS TRANSIT SYSTEMS	IMPROVEMENT IN NMT INFRASTRUCTURE	OTHER LOW-EMISSION/ MOBILITY INITIATIVES
Chennai	▪ 1.5 km long pedestrian plaza in Pondy Bazaar ▪ Car-free Sundays and "Happy Streets"	▪ Procurement of 1,500 e-buses ▪ Over 1,500 EVs used for solid waste management	Metro-rail expansion from 45 to 118 km	100 km of footpaths developed, with an additional 11 km planned	▪ Reduced traffic and pollution by moving the Koyambedu bus stand outside the city ▪ Parking policy to manage high-traffic areas ▪ Intelligent Transport System (ITS) with real-time data for 600 bus stops and 165 junctions to reduce congestion

	VEHICLE RESTRICTION ZONES	PROMOTION OF EVS/ CLEANER FUEL	DEVELOPMENT OF MASS TRANSIT SYSTEMS	IMPROVEMENT IN NMT INFRASTRUCTURE	OTHER LOW-EMISSION/ MOBILITY INITIATIVES
Bengaluru	▪ Pedestrian and vehicle-free zone on a stretch of Church Street ▪ Initially vehicles were restricted from 10 am to 5 pm	Advocating EV usage			Spreading awareness about climate change
Surat		▪ 50% buses operating in textile market area are e-buses ▪ In talks with industrial associations to increase the number of EVs used by shop owners and for goods transport	▪ Metro rail to come up in 1.5 years in the main market ▪ New stations being built to enhance public transportation services	Existing bicycle sharing system to reduce vehicular dependence Plans to start an electric bicycle sharing system on a pilot project	Plans to develop LEZ in the central market area
Indore		▪ Transitioned from diesel to Compressed Natural Gas (CNG) buses ▪ Procured 200 e-buses with plans to transition the entire fleet to cleaner fuel ▪ Proposal to introduce an integrated smart urban mobility plan ▪ Proposal to implement 100% UPI and digital ticketing system		▪ 2,000 bicycles integrated into the public transport (PT) system, with plans to expand to 10,000 bicycles	Implementing advanced mobility systems to improve public mobility and connectivity

	VEHICLE RESTRICTION ZONES	PROMOTION OF EVS/ CLEANER FUEL	DEVELOPMENT OF MASS TRANSIT SYSTEMS	IMPROVEMENT IN NMT INFRASTRUCTURE	OTHER LOW-EMISSION/ MOBILITY INITIATIVES
Agra		▪ Implemented Taj Trapezium Zone (TTZ) allowing only EVs in a 2 km radius, and exploring further expansion ▪ Heavy vehicles are not allowed during the day and older vehicles are restricted	Industries relocated or shifted to natural gas in the TTZ area, to reduce pollution	Metro rail is under construction	▪ Impounding vehicles older than 10-15 years using automatic number plate recognition (ANPR) cameras ▪ Augmenting capacity of road network to mitigate traffic congestion on high demand corridors
Pimpri Chinchwad		Plans to introduce e-bikes for public bike share system through eZpedal, a private service provider	Bus rapid transit system (BRTS) and metro corridors implemented to reduce private vehicle use	Development of NMT infrastructure for cyclists and pedestrians after COVID-19	▪ Graded response action plan (GRAP) implemented after stakeholder discussion ▪ Exploring the introduction of an environment protection fee on the use of ICE vehicles
Vadodara		▪ Transitioning from diesel to CNG buses ▪ 100 e-buses in the process of procurement under PM-eBus Sewa program ▪ 25 charging stations for e-2wheelers/ e-4wheelers installed, with an additional 50 planned ▪ Proposal to transition 20-30% door-to-door waste collection to EVs			Use of water sprinklers and specialized trucks to reduce dust and pollutants at construction sites

Varanasi	Proposal to restrict diesel vehicles in key areas like the Kashi Vishwanath corridor.	▪ Proposal to procure 2,000 e-buses to add to the current bus fleet ▪ Future vision to restrict diesel buses within the city and transform it into a green zone	Provision of bicycles and e-bikes on a rental basis through a public private partnership (PPP) model in restricted zones.	▪ Developing hubs to prevent buses and heavy vehicles from entering central areas, preserving cultural heritage ▪ Proposed a ropeway project to address congestion, given the impracticality of metro rail in narrow streets of the city ▪ Exploring water taxis for connecting the city's three rivers and reducing road traffic

Despite the commitment shown by Indian cities to reduce transport emissions, they face several significant challenges in implementing LEZs effectively. **While various initiatives, such as promoting EVs and creating pedestrian zones, are underway, these measures do not always target the most polluting vehicles, which contribute disproportionately to poor air quality and pose severe health risks to all residents.** A lack of broad public awareness about the urgency of reducing transport emissions and further actions that can be taken hinders progress. Additionally, limited access to clear, real-world data on major polluters limits cities' ability to target interventions effectively. Understanding the socioeconomic impacts of LEZs remains a gap as well, meaning that cities may overlook opportunities to mitigate adverse effects on vulnerable populations and avoid potential resistance from affected transport users. Furthermore, the involvement of multiple agencies creates complexities in ensuring accountability and implementing coordinated LEZ solutions. Addressing these challenges through clearer regulations, public awareness campaigns, and a unified approach across agencies will be essential for the effective advancement of LEZs in India.

Claudia López, the former mayor of Bogotá, an urban development expert known for pioneering sustainable transport solutions and advocating for LEZs, emphasized that while cities' initiatives toward electric mobility and LEZs are commendable, they face significant challenges. She highlighted that managing transport emissions is not just a technical issue for cities to solve but fundamentally a health problem affecting the lives of children. López underscored the importance of not only electrifying transport but also encouraging the use of public transportation, to avoid worsening congestion and pollution. In addition, she stressed the need for equitable space allocation in cities, advocating for green infrastructure and increased public transport accessibility, which she believes should occupy at least 30 percent of urban space. López also highlighted that **air pollution poses a health emergency, urging leaders to accelerate policy decisions and demonstrate urgency.** She further cautioned against prioritizing private vehicle traffic, underscoring the importance of changing public perceptions and behaviors to support sustainable urban development and ensure a fair distribution of public space.

In addition, representatives from civil society organizations, think tanks and academic institutions emphasized the need for an integrated approach that combines technological solutions with active community engagement to ensure the long-term success of LEZ initiatives. Technological advancements, such as real-time emissions monitoring, remote sensing, and enhanced use of existing systems like pollution under control (PUC) certificates, were highlighted as critical tools for improving LEZ enforcement and accountability. Also, public health messaging emerged as a key element, with an emphasis on framing air pollution as a gradual but serious health hazard, to garner public and political support. Participants recognized that engaging youth and local communities would be vital for fostering a sense of ownership and ensuring that the LEZ initiatives are not only implemented effectively but also sustained over time. The discussion also underscored the importance of political collaboration to advance legislation supporting

LEZs. Demonstrating the economic benefits of these zones, such as reinvesting revenues from LEZs into public infrastructure and services was seen as essential to securing widespread backing from policymakers as well as the public. These strategies collectively aim to integrate technology, health priorities, and economic incentives into a unified framework for LEZ implementation.

DISCUSSION OUTCOMES: KEY LESSONS AND TAKEAWAYS

Policy alignment and political engagement

Integrating urban planning with transport and environmental strategies is essential to manage urban population growth and rising vehicle numbers while protecting air quality. **Although legal provisions under acts like the Motor Vehicles Act, 1988, Air (Prevention and Control of Pollution) Act, 1981, and Environment (Protection) Act, 1986, can facilitate LEZ implementation, they often remain underutilized due to a lack of clarity on the impacts and benefits of LEZs.** Delhi's advanced measures in enforcing cleaner technology and phasing out outdated vehicles can serve as a model to expand LEZ frameworks nationwide, supported by existing strategies such as the national and city climate action plans (CAPs) and GRAPs. Sustained political engagement is critical for institutionalizing LEZs and ensuring their long-term success. This engagement can be fostered by clearly demonstrating the likely impacts of LEZs, crafting a compelling narrative on their tangible health and environmental benefits, and offering strategic policy options. High-level political and bureaucratic support has shown how direct involvement of key decision-makers can strengthen LEZ implementation efforts across cities.

Customizing LEZ solutions to local contexts

Indian cities have unique contexts and needs, and a one-size-fits-all approach to LEZs, one that is borrowed from global best practices, is not viable. There is a need for sector-specific LEZ strategies which should be customized for each region. For example, **in industrial cities like Gorakhpur and Kanpur, where heavy-duty vehicles (HDVs) are significant contributors to pollution, older HDVs need to be phased out to reduce pollution in high-impact areas.** Additionally, the balance between preserving cultural heritage and enhancing environmental conditions in cities like Varanasi was discussed. Initiatives such as water taxis would help maintain the local identity while addressing pollution.

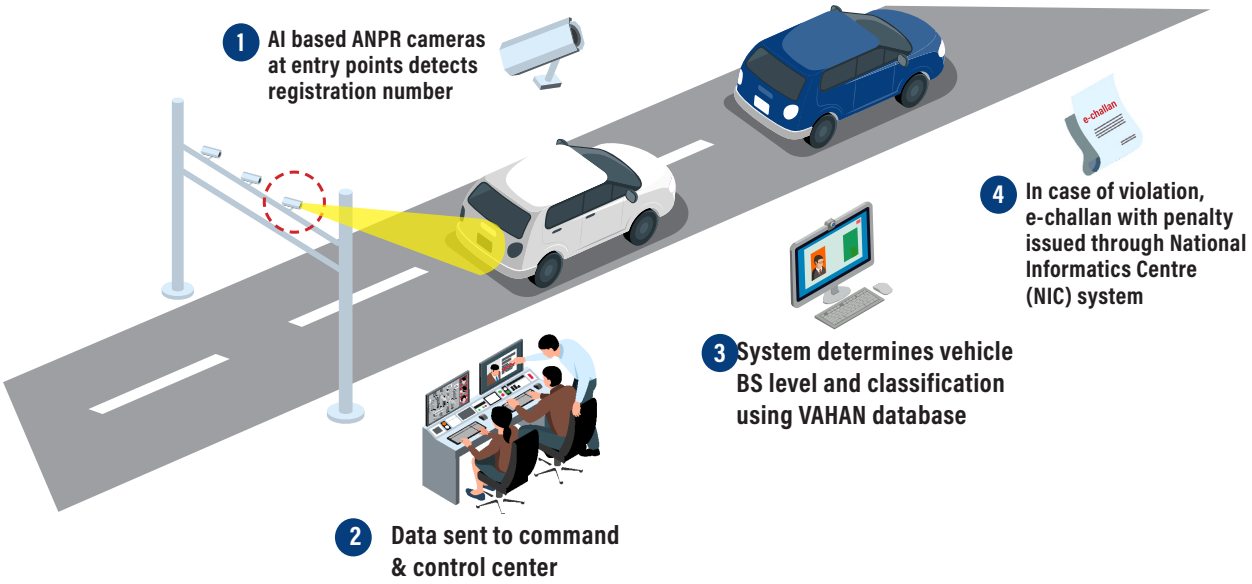
While LEZs primarily target vehicular emissions, stakeholders emphasized that addressing other key sources of air pollution is essential for achieving meaningful results. **In Indian cities, construction dust, road dust, industrial emissions, and diesel generators are also significant contributors to poor air quality.** To enhance the effectiveness of LEZs, these sectors also need focused interventions. For instance, construction sites should adhere to strict dust control measures, such as water sprinkling and barriers (as discussed in Vadodara), while industrial emissions and diesel generator usage must be reduced by transitioning to cleaner fuels and enforcing stricter standards. Effective waste management, including EVs for waste collection (as explored in Chennai and Vadodara) and reducing open burning, also play a critical role in improving air quality. Expanding the scope of LEZs to cover broader airsheds over time, and targeting emissions from multiple sectors ensures a comprehensive, contextualized approach that enhances the overall impact of LEZ implementation.

The role of reliable data in implementing LEZs

Reliable data is the backbone of any successful LEZ implementation, providing the foundation for informed decision-making and effective policy design. **Accurate, real-time data collection allows cities to monitor emission levels, identify pollution hotspots, and track the effectiveness of LEZ measures over time.** As discussed in the roundtable, comprehensive data systems such as automatic number plate recognition

(ANPR) cameras and remote sensing technologies are crucial for ensuring compliance and providing detailed emissions reports. Furthermore, these transport emissions could be correlated with ambient air pollution concentration measured through air quality monitoring sensors.

FIGURE 3 | Automatic number plate recognition (ANPR) system architecture



Source: Compiled by WRI India.

However, merely collecting data is not enough; **transparency and public access to this data are equally important for building trust and fostering continuous public engagement.** Participants emphasized the need for open, integrated datasets that allow for regular assessment and provide the flexibility to make evidence-based adjustments as needed, ensuring LEZ policies remain effective and responsive to changing urban conditions. Data on the most polluting vehicles, including their characteristics and purposes, can help set clear emission reduction targets, while post-implementation monitoring allows for assessing the effectiveness of LEZ measures. Additionally, transparent data on emissions reductions, health impacts, and economic benefits of LEZs is also critical for communicating their value to both policymakers and citizens, encouraging continued support and engagement.

In India, gaps in data reporting, such as the lack of detailed information from PUC certificates, hinder the identification of high-emission vehicles, known as "super emitters." Addressing these gaps through more robust, integrated data collection systems will allow cities to target interventions more effectively, improve public health, and make a stronger case for the long-term sustainability of LEZs. Ultimately, by ensuring that data collection is reliable, accessible, and transparent, cities can enhance the credibility of LEZ initiatives and drive greater public and political support for cleaner air.

Transition to cleaner fleets

Cleaner vehicle fleets, particularly EVs with zero tailpipe emissions, have the potential to improve the air quality significantly, as observed in Bogotá. Examples like the pedestrian-only streets in Bengaluru and Chennai, and Surat's e-bike sharing systems, were cited as progressive steps toward reducing emissions and improving air quality. The discussion also underlined the importance of retrofitting existing vehicles and transitioning to cleaner fleets, as a critical ancillary policy for effective LEZ implementation.

Citing secondary studies from London's LEZ and ULEZ strategies, suggesting an increase in trips on sustainable modes (NMT and PT)—from 53 percent in 2003 to 64 percent in 2023 (C40 Knowledge Hub 2024), participants highlighted that transitioning to cleaner fleets also enhances the effectiveness of LEZs. Participants discussed initiatives like Indore's green corridor and the transition to CNG and electric buses as examples of how cities can adopt greener public transport options. Their local government's goal of transitioning the entire public transport fleets to green energy by 2030 demonstrates the potential for cities to lead in sustainable urban mobility.

Promoting mass transit systems was identified as a critical strategy for reducing urban emissions. Expanding metro corridors and introducing bus rapid transit systems (BRTS) in cities like Pimpri Chinchwad and Surat were cited as key steps toward improving urban air quality and creating a sustainable urban mobility ecosystem. These investments can address the growing demand for efficient public transportation while making substantial progress toward their air quality goals.

Assessing the economic and community impact

Participants discussed the economic implications of air pollution in India, with an emphasis on the significant financial losses incurred due to poor air quality. There is a need to develop strategies that build a positive business case around LEZs, where revenues from implementation—such as the environment protection charge in Pimpri Chinchwad—can be reinvested into infrastructure improvements, benefiting local economies and businesses. Additionally, predicting and understanding the socioeconomic impact of LEZs on people and businesses is essential to inform decision-making and design effective mitigation measures, ensuring LEZ policies support economic and community resilience.

Beyond the impact on the local economy, the participants emphasized the vulnerability of specific community groups, such as pedestrians, hawkers, and shopkeepers, who are directly exposed to harmful emissions in high-traffic areas. Targeting these areas, especially around schools and hospitals, they recommended immediate infrastructure improvements, along with the integration of green spaces, to enhance urban air quality.

The participants recommended a gradual, empathetic approach to LEZ implementation, including incentives for compliance, to ensure public buy-in and mitigate potential economic hardships.

Community engagement and public buy-in

The discussion emphasized the importance of community engagement and appropriate framing of the solution for facilitating greater acceptance of LEZs. **Involving citizens, especially those most affected by pollution, would support in the development of widely accepted solutions.** Public engagement campaigns would also educate citizens about the health risks associated with pollution, leveraging the increased public health consciousness after COVID-19.

As discussed for Pimpri Chinchwad, ensuring continuous dialogue with stakeholders, the traffic police, local regional transport offices (RTOs), and local businesses, would help build momentum for implementing LEZs. In addition, open consultation with residents can strengthen public support. While there have been dialogues between the government and the public on reducing transport emissions, public participation, specifically in building consensus for LEZ implementation is still uncommon. The notable approaches of Pimpri Chinchwad and Bhubaneswar in this regard were discussed as valuable models for other cities. The participants also pointed out that reframing LEZs as clean air zones, with an emphasis on health benefits, led to more positive responses from stakeholders. Nomenclature matters when introducing these initiatives to the public; framing the conversation around improving quality of life would encourage greater support.

The roundtable also advocated for involving communities and youth in the design and execution of LEZ policies, fostering a sense of ownership and responsibility toward environmental issues. Education and engagement programs were deemed essential for building broad-based support for LEZ measures, with suggestions to incorporate environmental education in school curriculums and organize community

workshops to raise awareness about the benefits of cleaner air. **There is potential for youth-led initiatives to drive public support for LEZ implementation, ensuring sustained momentum for air quality improvements.**

In summary, implementing low-emission zones in Indian cities requires a multi-sectoral, locally tailored approach. Identifying pollution hotspots, like it was done in Bhubaneswar and Pimpri Chinchwad, and collaborating with municipal authorities, traffic management, and pollution control boards are key to integrating LEZs into broader air quality plans. Public support through community engagement, detailed emissions inventories, and targeted vehicle restrictions (such as high-polluting vehicle charges) is vital for the successful implementation of LEZs. Economic incentives such as reinvesting LEZ revenues into public infrastructure, and expanding reliable public transport systems further bolster these efforts. Indian cities also face unique challenges requiring phased LEZ expansion, as planned for Pune and Pimpri Chinchwad by 2026. Transparent data collection, strong political leadership, and continuous community involvement are critical for the long-term success and sustainability of LEZs.

NEXT STEPS AND ENTRY POINTS FOR ACTION

To advance the discussion on LEZs, the participants identified the following steps for effective on-ground implementation:

- Emphasize the health risks that pollutants from vehicles pose, particularly to vulnerable populations such as children and the elderly, to strengthen public awareness and garner support for LEZ policies.
- Introduce dynamic emission testing for PUC certification by measuring emissions during vehicle operation rather than idling, to provide a more accurate assessment and to align with global best practices.
- Develop targeted measures to assess the impact of LEZs across various population groups exposed to air pollution, with a focus on vulnerable groups who are most affected by pollution.
- Establish a phased LEZ implementation plan detailing the short-term and long-term strategies that ensure effective enforcement and adaptation over time.
- Form a dedicated task force to facilitate regular inter-departmental coordination, ensuring streamlined decision-making and effective implementation.
- Align LEZ strategies with existing legal frameworks such as the Air (Prevention and Control of Pollution) Act, 1981, the Environment Protection Act, 1986, and the Motor Vehicles Act, 1988, to ensure regulatory support and compliance.
- Recognize the challenge of addressing air quality in cities and test targeted vehicle restrictions in specific areas or timeframes to assess reduction in air pollution. This test-learn-scale approach can help gauge improvements in air quality and its impact on citizens' convenience and livelihoods.
- Assess and quantify the socioeconomic impacts of LEZs on vulnerable populations and design strategies to mitigate potential adverse effects while scaling up.
- Tailor LEZ solutions to the specific urban, social, and environmental contexts of Indian cities, ensuring that strategies are locally relevant and practical.
- Ensure supporting infrastructure, such as cleaner vehicle fleets, enhanced NMT networks, and robust mass transit systems, is in place to reduce emissions and promote sustainable mobility.
- Invest in real-time monitoring systems and infrastructure like ANPR cameras to ensure data-driven compliance and transparent enforcement of LEZs.
- Launch public awareness campaigns and actively involve youth and other community stakeholders in the design and execution of LEZ policies to foster long-term public engagement.
- Establish a dedicated forum for continued collaboration and knowledge exchange between cities to cultivate collective learning across regions.

The roundtable discussions highlighted the complexity and diversity of challenges faced by Indian cities in implementing LEZs. However, the exchange of ideas and experiences also showcased the potential for cities to act, and significantly improve urban air quality and public health. The recommendations and insights generated from the roundtable will serve as a foundation for developing tailored LEZ strategies that align with the unique needs of each city. Moving forward, it will be essential to continue fostering collaboration, engaging communities, and integrating innovative solutions to ensure the successful implementation and sustainability of LEZs across India.

PARTICIPANTS

Representatives from the Government

Arvind Kumar Nautiyal, Member Secretary, Commission for Air Quality Management in National Capital Region and Adjoining Areas

Ashish Tiwari, Secretary, Department of Environment, Forest & Climate Change, Uttar Pradesh

Bapusaheb Kerba Gaikwad, Executive Engineer, Pimpri Chinchwad Municipal Corporation

Chaudhari M N, Executive Engineer (BRTS), Surat Municipal Corporation

Dharmesh Rana, Executive Engineer, Vadodara Municipal Corporation

Gaurav Verma, Managing Director, Varanasi City Transport Services Limited

Katta Ravi Teja (IAS), Regional Deputy Commissioner (North), Greater Chennai Corporation

Pankaj Bhushan, Environment Engineer, Nagar Nigam Agra

Preeti Gehlot (IAS), Special Commissioner, Bruhat Bengaluru Mahanagara Palike (BBMP)

Sandeep Trivedi, Manager – Operations, AICTSL, Indore Municipal Corporation

International representation

Claudia López, former Mayor of Bogotá, Advisor to WRI and Harvard 2024 Advanced Leadership Initiative (ALI) Fellow

Felipe Ramirez Buitrago, Director, World Resources Institute

Representatives from academia, think tanks and civil society organizations

Anindita Ghosh, Senior Researcher, International Association of Public Transport (UITP)

Anju Goel, Associate Director, The Energy and Resources Institute (TERI)

Arindam Roy, Climate Science Advisor, Clean Air Fund

Gitakrishnan Ramadurai, Professor, Department of Civil Engineering, IIT Madras

Harish Phuleria, Associate Professor, Air and Noise Exposure Research Group (ANERG), IIT Bombay

Moorthy Nair, Associate Researcher, International Council on Clean Transportation (ICCT)

Mukesh Khare, Professor, Department of Civil Engineering, IIT Delhi

Nandini Shandilya, Senior Officer, ICLEI

Parin Visariya, Deputy Manager, Institute for Transportation and Development Policy (ITDP)

Prasanth Narayanan, Senior Manager, C40 Cities

Sonal Jain, Urban and Regional Development Advisor, GIZ

Vivek Vaidyanathan, Program Manager, Artha Global

Representatives from WRI India

Chaitanya Kanuri, Program Associate Director – Electric Mobility, WRI India

Kanika Gounder, Senior Program Associate – Electric Mobility, WRI India

Kaustubh Chuke, Senior Program Manager – Transport, WRI India

Kaustubh Gosavi, Senior Program Manager – Electric Mobility, WRI India

Prakash Doraiswamy, Program Director – Air Quality, WRI India

Sree Kumar Kumaraswamy, Program Director – Transport, WRI India

REFERENCES

C40 Knowledge Hub. 2024. "How Road Pricing Is Transforming London". April 2024 . https://www.c40knowledgehub.org/s/article/How-road-pricing-is-transforming-London-and-what-your-city-can-learn?language=en_US. Accessed on September 30, 2024.

Dhole, A., S. Wappelhorst, and A. Bhatt. 2023. "Improving air quality in cities through transport-focused low- and zero-emission zones: Legal pathways and opportunities for India". ICCT India. https://theicct.org/wp-content/uploads/2023/06/Legal-pathways-LEZ-and-ZEZ_final.pdf. Accessed on September 30, 2024.

Health Effects Institute. 2019. State of Global Air 2019. Special Report. Boston, MA: Health Effects Institute. "State of Global Air". https://www.stateofglobalair.org/sites/default/files/soga_2019_report.pdf. Accessed on September 30, 2024.

Kumar, M., Z. Shao, C. Braun, and A. Bandivadekar. 2022. "Decarbonizing India's Road Transport: A Meta-Analysis of Road Transport Emissions Models". Washington, DC. https://theicct.org/wp-content/uploads/2022/05/Meta-study-India-transport_final.pdf. Accessed on September 30, 2024.

Nair, M. 2021. "Vehicular Emissions in India". December 8. https://www.ceew.in/cef/masterclass/explains/vehicular-emissions-in-india.

ACKNOWLEDGMENTS

We would like to extend our gratitude to all the experts who participated in the discussions and shared their valuable inputs for implementing low-emission zones in cities. We would also like to thank all those who helped shape this document.

We would like to thank Prakash Doraiswamy, Director – Air Quality, WRI India, for his inputs during the discussions. We also thank Pravin Cherukuthota, Senior Program Associate, Electric Mobility, WRI India, for his contribution to the research work for the background presentation during the discussions.

We thank our rapporteurs, Garima Agrawal, Prayash Giria, Trinayani Sen, Komal Daal, Nitisha Singh and Yash Singh. We would like to especially thank Ankita Saxena, Nitisha Singh, Ankita Rajeshwari, Mrinalini Kaushik, and other colleagues from the communications team for their tremendous support in organizing the roundtable discussion.

We thank Open Philanthropy, Bloomberg Philanthropies and Clean Air Fund for their support in organising this event.

FOR MORE INFORMATION

Kanika Gounder, Senior Program Associate - Electric Mobility, WRI India
Contact: kanika.gounder@wri.org

Kaustubh Chuke, Senior Program Manager - Clean Air, WRI India
Contact: Kaustubh.Chuke@wri.org

Kaustubh Gosavi, Senior Program Manager - Electric Mobility, WRI India
Contact: kaustubh.gosavi@wri.org

Sree Kumar Kumaraswamy, Program Director - Clean Air Action, WRI India
Contact: sreekumar.kumaraswamy@wri.org

Chaitanya Kanuri, Program Associate Director - Electric Mobility, WRI India
Contact: chaitanya.kanuri@wri.org

ABOUT WRI INDIA

WRI India, an independent charity legally registered as the India Resources Trust, provides objective information and practical proposals to foster environmentally sound and socially equitable development. Our work focuses on building sustainable and livable cities and working towards a low carbon economy. Through research, analysis, and recommendations, WRI India puts ideas into action to build transformative solutions to protect the earth, promote livelihoods, and enhance human well-being. We are inspired by and associated with World Resources Institute (WRI), a global research organization. Know more: www.wri-india.org

WRI INDIA

LGF, AADI, 2 BALBIR SAXENA
MARG, HAUZ KHAS,
NEW DELHI 110016, INDIA
+91 11 40550776
WWW.WRI-INDIA.ORG