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Cities at the Forefront: Shaping Low-carbon Futures in India

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Abstract: India's cities are at the centre of the global climate and energy transition. They remain deeply dependent on fossil fuels as hubs of high consumption and emissions, yet simultaneously drive economic growth, industry, and employment. As India pursues its Net Zero commitments, the way its cities restructure energy use will shape national and global low-carbon trajectories. In this context, using examples from several large and medium-sized cities, this paper explores how cities of different sizes in India are creating different clean energy pathways and examines the political economy of the energy transition in cities. The article discusses the multifaceted nature of the transition, emphasizing the difficulties associated with evolving energy systems within urban environments. The paper also reflects on the issues and challenges, and discusses the adoption and participation of different sections of city dwellers in this transition.

Keywords: urban energy transition; low-carbon development; political economy; India.

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1. Introduction: Cities at the Energy Crossroads

Globally, cities are at the forefront of experiencing the impact of climate change, and the energy transition has attracted considerable attention as a key strategy to combat it. Cities are becoming more important due to their unique position in a decentralized government structure, and they play a crucial role in effectively delivering public services to communities through their local governments. This highlights the necessity for cities to take a more active role in energy governance by overseeing the transition of energy systems and engaging local stakeholders. Cities worldwide are taking the lead and charting their course to determine sustainable pathways for future generations, thereby enhancing the quality of life for city dwellers (Junghans and Kreft 2016; Khosla and Bhardwaj 2019a, 2019b). Several Indian cities are taking the lead in preparing their climate action plans and energy transition plans, which shows their intent to create a sustainable city through different energy transition and climate action initiatives.[1] For

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[1] Four of the biggest metropolises in India—Delhi, Bengaluru, Chennai, and Mumbai—and a few other mid-size and smaller cities—Ahmedabad, Vadodara, Pune, Nagpur, Bhopal, and Indore—have prepared their climate

India, it is a crucial moment because it faces the twin challenges of urban and energy transition simultaneously. India is experiencing a significant increase in urbanization, with projections indicating that 50% of its population will be urban by 2050 (NITI Aayog 2021). At the same time, the current debate on energy transition and climate action has also been high on the agendas of cities.

Urbanization has been a key driver in India's economic transformation. Indian cities contribute more than two-thirds to the country's GDP, and projections indicate that they will accommodate nearly 600 million people by 2036 (Kouamé 2024; MOHUA 2015). Cities like Bengaluru, Hyderabad, and Mumbai have become hubs for IT and financial services, while industrial corridors around Pune, Surat, and Ahmedabad have driven manufacturing growth. With this scale of growth, cities are becoming major energy and emission hotspots. Delhi, for instance, regularly ranks among the world's most polluted capitals due to heavy transport use and a coal-based power supply, while Mumbai's growing electricity demand is linked to commercial and residential cooling needs. These cities generate jobs and higher incomes, but this growth also leads to increased energy use in construction, transport, and industry. For example, rapid expansion of urban rapid transit systems (metro rails) in the Indian cities boosts connectivity and productivity, yet the construction itself is highly energy-intensive. Unless urban growth is steered towards low-carbon pathways—such as shifting freight to rail, enforcing green building codes, and electrifying transport—the same engines of growth will keep adding to India's carbon footprint (Ramachandra et al. 2015).[2]

Given that cities of all sizes are poised to grow and the urbanization trend is on an upward curve, intervention at the city level is necessary. As mentioned before, several cities have been trying to create a noticeable impact on reducing emissions through different energy transition interventions. Against this backdrop, this paper highlights some of these efforts by Indian cities of different sizes to create different energy transition pathways. The article also discusses the multifaceted nature of the transition, underscoring the complexity of evolving energy systems within different urban environments in India. In the later part of the paper, it also reflects on the challenges and discusses the emerging pathways and opportunities for urban energy transition in India.

2. The Urban Energy-Climate Nexus

The relationship between energy and climate in Indian cities is becoming more pronounced, as the country's rapid urbanization increases demand for infrastructure, housing, and transportation. Cities like Delhi, Mumbai, and Bengaluru, as well as mid-size and smaller cities like Surat, Indore, and Pune, are not only building more but are also dealing with increased water pumping, mobility, and cooling needs, which increase electricity use and emissions. Simultaneously, shifting

action plans, which chart the energy transition pathways for their respective cities.

[2] The major sectors contributing to total emissions in Delhi, Greater Mumbai, Kolkata, Chennai, Greater Bangalore, Hyderabad, and Ahmedabad are the transportation sector (contributing 32%, 17.4%, 13.3%, 19.5%, 43.5%, 56.86%, and 25%, respectively), the domestic sector (contributing 30.26%, 37.2%, 42.78%, 39%, 21.6%, 17.05%, and 27.9%, respectively) and the industrial sector (contributing 7.9%, 7.9%, 17.66%, 20.25%, 12.31%, 11.38%, and 22.41%, respectively).

climate patterns—characterized by an increase in extreme weather events, such as heat waves and floods—are placing increasing pressure on urban energy systems and infrastructure (Nhede 2017; Ram et al. 2022; Yazdani 2020). Such pressure places urban regions at the forefront of testing integrated energy transition solutions, such as energy-efficient buildings, rooftop solar, and public transportation electrification, which can reduce emissions while helping cities adapt to climate stress.

India's commitment to achieving Net Zero by 2070 positions its cities as essential to the change. The decisions taken today about housing, transportation, and infrastructure will lock in emissions for decades to come, since over half of the population is predicted to reside in urban areas by the middle of the century. Several major cities, such as Mumbai, Chennai, Ahmedabad, Bengaluru, Pune, Bhopal, and Indore[3], have commenced the development of city climate action plans, while Surat has been acknowledged for its proactive implementation of energy efficiency methods in municipal water supply and other city-wide services. Simultaneously, India's Smart Cities Mission, Solar City Mission, and other initiatives, such as the Energy Efficiency Financing Platform, are providing towns with the resources to address energy and climate issues (Arabindoo 2020; Bhardwaj et al. 2019; Garg and Barach 2021; Kandt 2012; Khan et al. 2018; Mehta 2020; MOHUA 2015). Achieving the Net Zero objective necessitates the expansion of initiatives, such as installing rooftop solar in public buildings like government offices, schools, health centers, and new housing developments; electrifying urban transportation fleets; and enhancing the sustainability of municipal services.

3. The Evolving Urban Energy Transition in India

India's urban energy transition is evolving, as cities are rapidly moving from centralized, fossil-fuel based urban systems toward cleaner, more distributed energy models. This transformation is driven by a mix of policy incentives, technological maturity (especially for the solar rooftops, electric transport, and energy efficiency programs across different sectors like buildings and industry), and urgent climate and public health concerns. The pathways of change are visible across three interlinked domains—the power sector, mobility/transport, and buildings/construction—and play out differently in each city depending on geography, political and governance capacity, and local priorities. For example, Delhi, Chennai, Bengaluru, Indore, Bhopal, and Surat illustrate how local context shapes priorities and interventions. These cities, which differ in size and climate vulnerability, also show increasing emphasis on the preparation of climate action plans, illustrating their intent and priorities for energy transition in different sectors (ETPI 2024a).[4]

First and foremost, efforts to achieve power sector transition can be seen in most of the above-mentioned Indian cities –grid decarbonization through renewable energy integration, grid-interactive demand

[3] Eighteen cities in nine states have prepared various types of action plans to enhance their climate action capabilities. For instance, the earlier action plans, known as city resilient action plans, primarily targeted extreme weather events. The newer action plans are more focused on net-zero efforts.

[4] Other cities, such as Surat, Pune, and Bhopal, are taking efforts in different directions. This section provides some examples of the efforts made by three big cities and one midsize city towards energy transition.

management, and innovations that link waste streams to energy. For instance, Delhi's recent solar policy (2023) aims to rapidly scale rooftop installations across both government and private buildings. It is hoping to get 25 percent of its total yearly electricity requirement through solar power by 2027, up from the existing 9 percent.[5] For the purpose of encouraging adoption, the government provides a capital subsidy and Generation-Based Incentives (GBI) for residential, commercial, and industrial consumers.[6] Other ground-breaking models such as community solar, peer-to-peer trading, and the hybrid Renewable Energy Service Company (RESCO) model are further improving accessibility by allowing those with unsuitable rooftops to use solar energy, exchange unused power in real time, and benefit from net metering. In addition, every state government complex with over 500 sq. m. of available rooftop space is required to install solar plants. To simplify the process, a single-window platform (Delhi Solar Cell) has been designated for directions and compliance. Furthermore, the Delhi Waste-to-Energy Policy also seeks to reduce landfill-bound waste and generate electricity to support the energy needs of the city. Other cities, such as Mumbai, Chennai, and Bengaluru, have also set mid-term[7] and long-term targets[8] for grid decarbonization through renewable integration. Additionally, cities are also focusing on energy efficiency and renewable energy integration in water supply, wastewater treatment, and industries, including micro, small, and medium enterprises, to reduce emissions in these sectors. For example, mid-size cities, including Bhopal, Indore, and Surat, and big cities like Delhi, Mumbai, and Bengaluru, have a medium-term target of implementing energy efficiency measures in the industrial sector. Other mid-sized cities, such as Indore, particularly illustrate an effective waste-to-energy pathway. At the city level, the large-scale processing of wet waste into bio-CNG reduces landfill methane and provides a locally produced, cleaner transport or cooking fuel. Indore's plants and operational model have been documented as a replicable city-level intervention that yields both emissions and public health benefits.[9] Furthermore, cities like Chennai have considered climate-resilient infrastructure while integrating climate risks into their planning to ensure that generation and distribution systems remain operable during extreme weather events.

A second visible effort towards energy transition in urban areas is found in the mobility or transport sector. The transport sector currently accounts for 18% of the country's total energy consumption (BEE 2022). Although this is lower than the global average, energy demand from the transport sector has increased drastically over the past three decades and is projected to grow in the future (ETPI 2024c). There have been several efforts to decarbonize transportation through public transit, electric vehicles (EVs), and the promotion of non-motorized transport services. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM), launched in 2005, marked a positive shift towards the prioritization of public transport. Further, the government has implemented several policies and

[5] This target is announced in the Delhi Solar Portal (Govt. of NCT of Delhi, n.d.).

[6] A capital subsidy of ₹2,000 per kW for domestic projects (with a limit of ₹10,000 per consumer) (Govt. of NCT of Delhi, n.d.).

[7] Mid-term targets are to be achieved by 2030. For example, Chennai and Mumbai both have a 2030 renewable energy (RE) target of 50%.

[8] Long-term targets are to be achieved by 2050. For example, Chennai and Mumbai both have a 2030 RE target of 100% and 90%, respectively.

[9] The city climate action plans of Mumbai, Chennai, Bengaluru, Bhopal, and Indore have been analysed.

schemes to accelerate the transition to cleaner fuels and vehicles. Among the most prominent is the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles in India (FAME) Scheme, launched in 2015. Currently in its second phase, the scheme aims to promote the adoption of private electric two- and four-wheelers, autorickshaws, and buses through a mix of financial and non-financial incentives. Building on its success, the central government has set an ambitious target of achieving a 30% market share for EVs by 2030 (NITI Aayog 2025). To complement the central initiative, more than 15 state governments have also introduced state-level EV policies offering additional incentives to accelerate EV adoption. In parallel, a national vehicle scrappage policy has been implemented to encourage users to replace old, inefficient vehicles with newer models running on cleaner fuels.

Almost all small and large cities in India have been electrifying their public fleets, incentivizing private EV uptake, and strengthening non-motorized transportation. For instance, Delhi has adopted one of the most ambitious EV strategies to simultaneously scale up electric buses to reduce pollution and fuel demand. Recent government actions show a concentrated drive to add thousands of e-buses to the city fleet and broaden EV adoption across vehicle categories through incentives like subsidizing road transport taxes for both four-wheelers and two-wheelers. To encourage more electric vehicles and create a support system for them in the city, the Delhi Development Authority (DDA) has amended the Unified Building By-Laws to mandate that 20% of all parking spaces in new buildings have EV charging stations. Similar to the power sector, Chennai's transport sector plan emphasizes climate-resilient public transportation infrastructure while promoting and incentivizing private vehicles (with a special focus on two- and three-wheelers). The city also plans to achieve 100% electrification of its transportation system by 2050. As mentioned earlier, Indore's mobility story is intertwined with its waste-to-fuel innovations—demonstrating a circular approach where municipal waste becomes a low-carbon transport fuel (ETPI 2024c; Nilofar Saifi and Jha 2023).[10]

A third visible effort towards energy transition is in the buildings and construction sector. The sector is making efforts to enhance efficiency, raise standards, and promote green certification for buildings. Following the national blueprint, several states have adopted the Energy Conservation Building Code (ECBC) for commercial buildings and the Eco Niwas Sahita (ENS) for residential buildings. The states are promoting Rooftop Solar Photovoltaic (RTSPV) systems and Solar Water Heaters (SWH) to offset fossil fuel use and meet energy requirements on site. Urban local bodies are proactively supporting this agenda by mandating the use of RTSPV and SWH systems in specific categories of buildings through building bylaws or development control regulations. Most of the bigger cities are proactively taking steps towards enhancing building efficiency and raising standards in comparison to smaller cities. For instance, in Delhi, RTS and SWH have been added to building efficiency programs. Bengaluru is actively promoting green and low-carbon buildings through the implementation of both passive and active design strategies. By 2030, the target is for 42% of new residential buildings and 48% of new commercial buildings to incorporate insulated walls and roofs, advanced window

[10]Author's analysis of the city climate action plans of these cities.

technology, and improved building service designs. Chennai is focusing on passive cooling, resilient envelope designs, and climate-sensitive building codes. Chennai's climate action plan suggests making buildings more resilient to climate impacts by adding better drainage near important facilities and using materials that can handle salty and humid conditions, which will help lower energy use for cooling. The city has set a target to achieve 100% building energy efficiency but has not explicitly stated the timeline for achieving it (ETPI 2024b).[11]

India's urban energy systems are in active flux. Climate resilience underpins and tempers the emphasis across all the aforementioned sectors. The cities, both big and small, discussed above demonstrate different but complementary pathways, reflecting a clear intent toward greening their energy use. These pathways are also supported by proactive policy uptake by municipal bodies, strong city leadership, and technical integration across urban services. However, numerous challenges remain, including significant implementation gaps. Among the most pressing are the lack of timely execution, limited institutional capacity, and financial constraints—issues that will be discussed in the following sections.

4. Political Economy of the Energy Transition in Cities

India's urban energy transition is shaped as much by politics and institutions as by technology. The urban energy transition in India is also not merely a techno-economic challenge. It is deeply political, involving multiple stakeholders[12] and their interests, institutional constraints, narratives, and financing dynamics (Kaladharan 2018). Across cities like Delhi, Chennai, Mumbai, and Indore, utilities, regulators, governments, industries, and citizens all play distinct yet interlinked roles. For instance, the utilities remain at the heart of energy delivery, but they are often outside the administrative control of city governments.[13] The city's plans for greening its power consumption will depend not only on the city government but also on the financial health of the distribution utilities and their exposure to political influence. In addition, there is also a tension between existing centralized energy planning by state-owned utilities and the growing emphasis on and popularity of decentralized, community-based energy systems.

Different levels of government promise cleaner and more reliable power, but electoral incentives, fiscal constraints, and bureaucratic fragmentation often constrain their actions. Political narratives pertaining to affordability, reliability, fairness, and development significantly impact the adoption or delay of policies. These dynamics generate institutional and governance challenges that slow decarbonization efforts. Coordination failures between departments and jurisdictions and inadequate municipal capacity lead to the uneven implementation of schemes such as solar cities, RTS, and smart grids (Gogoi et al. 2023). As

[11] Author's analysis of the city climate action plans of these cities.

[12] Governments, including state and local self-governments, power utilities, regulators, industries, and citizens, all play a crucial role in the energy delivery process.

[13] In Bengaluru, there is one distribution company that supplies power to the entire city, while other cities may have either multiple distribution companies or just one state-level distribution company providing power. For instance, Delhi has three distribution companies, supplying power to different parts of the city.

mentioned earlier, financing is a key challenge for utilities, as most of the power utilities in the country are heavily indebted and have large standing regulatory assets (Gogoi et al. 2023; Kaladharan 2018; Kaur and Chakraborty 2019; Kumar 2025). It is a challenge for these power utilities to invest in modern infrastructure given their growing indebtedness. Schemes such as the Revamped Distribution Sector Scheme (RDSS) and city-level initiatives, such as Indore's energy literacy program, attempt to fill this gap but remain partial solutions. For all cities, big and small, energy transition success will depend not just on technological solutions but on resolving political-institutional tensions, aligning stakeholder incentives, and crafting narratives and financing mechanisms that distribute costs and benefits in ways that are politically viable.

5. Challenges and Emerging Pathways in Urban Energy Transition

India's urban energy transition faces deep structural and institutional challenges that slow the shift away from fossil fuels. Most cities remain locked into long-established infrastructures built around fossil-fuel-based power, centralized grids, and energy-intensive transport systems. This path dependency reinforces fossil fuel dependence and limits the pace at which clean alternatives can achieve scale. Urban infrastructure—from outdated grids to vehicle fleets and housing settlements—requires large-scale retrofitting, yet investments are often delayed due to the limited financial capacity of state utilities and municipalities. Moreover, fragmented governance frameworks—where energy regulation, urban planning, and climate policy operate across municipal, state, and national levels—create overlaps and coordination failures (Khosla and Bhardwaj 2019b; Zérah and Das 2023). As a result, even progressive policy efforts such as Indore's waste-to-energy initiative or Pune's promotion of energy-efficient buildings often face implementation hurdles.

As mentioned earlier, resource constraints further exacerbate these challenges. The debt-laden distribution companies (DISCOMs) and fiscally stretched urban local bodies often lack the capital to decarbonize public service infrastructure. Several cities, though active in solar promotion, struggle to align energy initiatives with broader urban planning frameworks (Zérah and Das 2023). Climate vulnerabilities compound these pressures—Chennai faces recurrent floods, Delhi and Mumbai contend with severe air pollution, and heatwaves increasingly strain electricity systems in all these cities. These impacts divert attention and resources toward short-term, reactive measures rather than long-term decarbonization and adaptation infrastructure.

However, despite its challenges, the urban energy transition presents promising pathways and emerging opportunities. Technological innovation is reshaping the urban energy landscape, with cities beginning to adopt smart grids, advanced metering infrastructure, and digital systems for demand management and energy efficiency. Cities like Delhi are gradually piloting storage technologies, such as battery systems and hybrid renewable models, to support grid stability and enhance reliability. Multi-level policy initiatives are further accelerating this shift. National programs, like the Smart Cities Mission and the RDSS, are being complemented by state and municipal policies promoting RTS, waste-to-energy projects, street lighting programs, and electric mobility (Asaad et al. 2021; Bobbins et al. 2024). Cities such as

Chennai, Surat, Indore, and Pune have been planning and experimenting with decentralized energy models and climate-resilient infrastructure to strengthen disaster preparedness. Moreover, India's participation in global partnerships—such as the International Solar Alliance (ISA) and C40 Cities—enables knowledge exchange, financial support, and technology transfer from international urban energy transitions. These combined efforts point toward a future where Indian cities could evolve into laboratories of sustainable urbanization by incorporating resilience, digital innovation, and clean energy into their core development strategies.

6. Conclusion

There is no doubt that urban centers are at the forefront of India's energy transition. Urban governance is expected to play a significant role in the transition from a fossil-fuel-driven urban economy to a green economy. Cities such as Delhi, Mumbai, Chennai, and Indore, as well as several emerging urban centers, illustrate both the ambition and the friction that shape this journey towards transition. However, structural political-economic barriers, rather than technology and ambition, continue to constrain the urban energy transition in India. The political economy of the transition—defined by fragmented governance, regulatory capacity gaps, and the persistent pull of fossil-fuel lock-ins—continues to determine the pace and direction of change. Institutional arrangements continue to favor centralized utilities, opaque decision-making, and short-term political gains, while municipal governments are expected to deliver low-carbon futures without commensurate powers or financial resources. Clean energy pathways in this landscape run the risk of perpetuating existing inequalities unless urban governance prioritizes questions of authority, accountability, and distributive justice.

However, these risks also present several opportunities. Emerging innovations—decentralized renewables, smart grids, and resilience planning—offer important openings, but scaling them requires confronting the political interests that shape energy choices, not merely optimizing technical solutions. Delivering this vision will require cities to strengthen institutional coordination, empower local governments, and embed climate and energy planning into broader development priorities. As climate impacts intensify and energy demand surges, addressing these political economy constraints is no longer optional but foundational—because India's pathway to a sustainable, Net Zero future will ultimately be won or lost in its cities.

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References

Arabindoo, Pushpa. 2020. "Renewable Energy, Sustainability Paradox and the Post-Urban Question." *Urban Studies* 57(11):2319–36.

Asaad, M., F. Ahmad, M. S. Alam, and M. Sarfraz. 2021. "Smart Grid and Indian Experience: A Review." *Resources Policy* 74:101499.

Bhardwaj, A., F. de Lorenzo, and M.-H. Zérah. 2019. "New Powers: How India's Smart Cities Are Governing and Transitioning to Low-Carbon Energy." Working Paper, Centre for Policy Research, New Delhi.

Bobbins, K., F. Caprotti, J. de Groot, W. Pailman, M. Moorlach, H. Schloemann, A. Densmore, K. Finlay, E. Fischat, S. Siwali, and J. Links. 2024. "Smart and Disruptive Infrastructures: Re-Building Knowledge on the Informal City." *Urban Studies* 61(1):165–79.

Bureau of Energy Efficiency (BEE). 2022. *Impact of Energy Efficiency Measures*. New Delhi: Bureau of Energy Efficiency.

Energy Transition Preparedness in India (ETPI). 2024a. *Crosscutting Themes: A Study on Transition Preparedness in Ten Indian States (2020–2021)*. Sustainable Futures Collaborative, Prayas (Energy Group) and WRI India.

Energy Transition Preparedness in India (ETPI). 2024b. *The Buildings Sector: A Study on Transition Preparedness in Ten Indian States (2020–2021)*. WRI India, Prayas (Energy Group), Sustainable Futures Collaborative.

Energy Transition Preparedness in India (ETPI). 2024c. *The Transport Sector: A Study on Transition Preparedness in Ten Indian States (2020–2021)*. WRI India, Prayas (Energy Group), Sustainable Futures Collaborative.

Garg, B., and R. Barach. 2021. "Collaborative Governance for Urban Sustainability: Implementing Solar Cities." *Asia Pacific Journal of Public Administration* 43(4):236–57.

Gogoi, E., R. Cordeiro, and D. P. Vyas. 2023. *Scoping Study for a Cities Climate Change Programme*. New Delhi: Shakti Sustainable Energy Foundation.

Government of NCT of Delhi. n.d. "About Delhi Solar Energy Policy 2023." Delhi Solar Portal. Retrieved October 14, 2025 (https://solar.delhi.gov.in/page/about-delhi-solar-energy-policy).

Jaspal, M., and J. Scott. 2025. *The State of the Global Energy Transition*. New Delhi: Observer Research Foundation.

Junghans, L., and S. Kreft. 2016. "Cities at the Centre of Climate Change: Seizing Opportunities towards Transformation." *Germanwatch*. Retrieved from https://www.germanwatch.org/en/blog/cities-centre-climate-change-seizing-opportunities-towards-transformation.

Kaladharan, M. 2018. "Wielding Power in the Capital: The Case of the Delhi Electricity Distribution Sector." Pp. 63-98 in *Mapping Power: The Political Economy of Electricity in India's States*, edited by N. K. Dubash, S. S. Kale, and R. Bharvirkar. Oxford: Oxford University Press.

Kandt, A. 2012. *Indian Solar Cities Programme: An Overview of Major Activities and Accomplishments*. Preprint. Golden, CO: National Renewable Energy Laboratory.

Kaur, A., and L. Chakraborty. 2019. "UDAY Power Debt in Retrospect and Prospects: Analyzing the Efficiency Parameters." Working Paper 12968, Levy Economics Institute of Bard College.

Khan, S., P. Taraporevala, and M.-H. Zérah. 2018. "Mission Impossible: Defining Indian Smart Cities." *Economic & Political Weekly* 53(49).

Khosla, R., and A. Bhardwaj. 2019a. "Urban India and Climate Change." Pp. 459–76 in *India in a Warming World*, edited by N. K. Dubash. New Delhi: Oxford University Press.

Khosla, R., and A. Bhardwaj. 2019b. "Urbanization in the Time of Climate Change: Examining the Response of Indian Cities." *WIREs Climate Change* 10(1):e560.

Kouamé, A. T. 2024. "View: India Urbanisation Critical for Getting Developed Tag." *The Economic Times*, January 28. Retrieved from https://economictimes.indiatimes.com/news/economy/infrastructure/view-india-urbanisation-critical-for-getting-developed-tag/articleshow/107155247.cms.

Kumar, C. 2025. "ICRA Keeps Negative Outlook on State Discoms; Gross Debt Rises to ₹7.4 Lakh Cr." *Fortune India*, October 1. Retrieved from https://www.fortuneindia.com/economy/icra-maintains-negative-outlook-on-state-discoms-flags-elevated-regulatory-assets/126640.

Mehta, K. 2020. "A Snapshot of Solar City Programme in India." *The International Journal of Analytical and Experimental Modal Analysis* 12(8):2106–14.

Ministry of Housing and Urban Affairs (MOHUA). 2015. *Smart City: Mission Guidelines*. New Delhi: Ministry of Urban Development, Government of India.

Nhede, N. 2017. "Renewable Energy: How Cities Are Accelerating the Energy Transition." *Smart Energy International*. Retrieved from https://www.smart-energy.com/magazine-article/renewabe-energy-energy-transition/.

NITI Aayog. 2021. *Reforms in Urban Planning Capacity in India*. New Delhi: NITI Aayog, Government of India.

NITI Aayog. 2025. *Unlocking a 200 Billion Opportunity: Electric Vehicles in India*. New Delhi: NITI Aayog, Government of India.

Ram, M., A. Gulagi, A. Aghahosseini, D. Bogdanov, and C. Breyer. 2022. "Energy Transition in Megacities towards 100% Renewable Energy: A Case for Delhi." *Renewable Energy* 195:578–89.

Ramachandra, T. V., B. H. Aithal, and K. Sreejith. 2015. "GHG Footprint of Major Cities in India." *Renewable and Sustainable Energy Reviews* 44:473–95.

Saifi, Nilofar, and B. Jha. 2023. "Solid Waste Management in Indore, Madhya Pradesh, India: Insights from a Survey of Literature." *International Society for the Study of Vernacular Settlements* 10(11):405–20.

Yazdani, H. 2020. "Here's How Cities Can Lead the Way in the Energy Transition." *World Economic Forum*. Retrieved from https://www.weforum.org/stories/2020/08/role-of-cities-in-the-energy-transition/.

Zérah, M.-H., and S. Das. 2023. "Solar Rooftop Systems and the Urban Transition: Shall the Twain Ever Meet? Interrogations from Rewari, India." *Journal of Urban Technology* 30(2):103–25.