

**COALITION**  
**FOR URBAN**  
**TRANSITIONS**

# SEIZING INDIA'S URBAN OPPORTUNITY

**MOBILISING NATIONAL MISSIONS  
TO UNLEASH THE FULL POTENTIAL  
OF CLIMATE SMART CITIES**



## **About the Seizing the Urban Opportunity series**

This series, a collaborative effort by more than 36 organisations across five continents brought together by the Coalition for Urban Transitions, is being launched as a call to action ahead of COP26 in Glasgow. Our aim is to provide insights from six emerging economies demonstrating how fostering zero-carbon, resilient and inclusive cities can advance national economic priorities for shared prosperity for all. This report focuses on how to seize the urban opportunity in India.

The Coalition for Urban Transitions is a global initiative to support national governments in transforming cities to accelerate economic development and tackle dangerous climate change. Collectively, the contributors hope this report will provide the evidence and confidence that national governments need to submit more ambitious Nationally Determined Contributions in 2021 and to propel inclusive, zero-carbon cities to the heart of their COVID-19 economic recovery and development strategies.

## Disclaimer

The analysis, arguments and conclusions presented here are a synthesis of the diverse views of the authors, contributors and reviewers and is an 18-month research effort building on the Coalition's 2019 *Climate Emergency, Urban Opportunity* report. The Coalition takes responsibility for selecting the areas of research. It guarantees its authors and researchers freedom of inquiry, while soliciting and responding to the guidance of advisory panels and expert reviewers. Coalition partners, some as organisations and others as individuals, endorse the general thrust of the arguments, findings and recommendations made in this report, but the text does not necessarily reflect the personal views or official policies of any of the contributors or their members.

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## EXECUTIVE SUMMARY

India is urbanising very fast, with 34% of its people (461 million) living in urban areas as of 2018, and almost 53%, or 877 million, expected to by 2050. Providing decent housing, public services and job opportunities for so many people in such a short time, and doing so equitably and sustainably, is a daunting challenge.

India's cities are already economic powerhouses, contributing 63% of GDP in 2011 and a projected 75% by 2030. Between young people joining the labour force and migrants from rural areas, however, demand for work far outpaces urban job creation. The vast majority of Indian workers are either in the informal sector, or employed as contract or casual labour.

Housing development is another top priority, but more efficient land use is crucial. New analysis for the Coalition shows that India's urban footprint expanded by 9,822 km<sup>2</sup> between 2000 and 2014 – about 1.5 times the size of the Mumbai Metropolitan Region. Formal and informal housing construction has driven much of this growth. Updates to land use regulations and land market structures can help Indian cities meet housing needs while avoiding sprawl.

India also urgently needs to build climate resilience. Heat waves in several cities have created deadly conditions, and climate change is exacerbating what is already a daunting water crisis. Floods are another growing threat, causing an estimated US\$79.5 billion in damages across India between 1998 and 2017. Coastal cities are in particular peril.

Several major national programmes are helping India's cities become more resilient, sustainable and inclusive, including the Pradhan Mantri Awas Yojana (PMAY) Housing for All scheme, the Atal Mission for Rejuvenation and Transformation, and the Smart Cities Mission, harnessing technology to drive growth and improve city services. Though the results to date have been mixed, these “missions”, which involve large-scale investments and innovative projects, offer key entry points for urban transformation.

The ClimateSmart Cities Assessment Framework, launched in 2019, could be particularly valuable, allowing cities to assess their own vulnerabilities and potential for climate action on everything from energy, to green cover, to waste management. India's government has also pledged to mobilise US\$1.5–2 trillion in public and private finance through a National Infrastructure Pipeline, with thousands of projects.

New analysis for the Coalition shows adopting a bundle of proven low-carbon measures has the potential to reduce urban emissions from buildings, transport and waste in India by 89% in 2050, saving 1,784 Mt CO<sub>2</sub>-e relative to a baseline scenario.

Over half of the modelled abatement potential to 2050 (54%) is in cities with fewer than 1 million residents today, compared with 25% in cities of over 5 million. Across

sectors, nearly half the total potential depends on decarbonising electricity. In 2019, India generated 76% of its power supply from fossil fuels, mainly coal. India has pledged to increase the share of non-fossil installed capacity to 40% by 2030; as of February 2021, it was 24.5%.

Fully implementing the modelled measures would require US\$3.6 trillion in incremental investments to 2050, but analysis for the Coalition suggests they would more than pay for themselves in cost savings alone, and yield returns with a net present value of US\$1.6 trillion. They could also support 8.2 million new jobs in 2030.

India's COVID-19-related fiscal stimulus efforts to date have provided support for renewable energy and efficient technologies, but also bolstered high-carbon industries. Any further stimulus should prioritise sustainable, resilient and inclusive growth.

There are many additional ways for the national government to help unleash the power of compact, connected, clean and resilient cities. Four such opportunities are:

- **Align national infrastructure and urban development policies,** programmes and investments with the vision of ClimateSmart Cities.
- **Scale up energy efficiency initiatives** and incorporate clean energy and efficient technologies in housing and other urban programmes.
- **Support local governments** – especially small and mid-sized cities – to enable them to drive urban transformation.
- **Step up investments in sustainable transport,** prioritising the urban poor.



*Aerial view of Nahargarh Fort in Jaipur. Source: Shutterstock*

## INTRODUCTION

In India and around the world, national leaders face a triple challenge right now: ensuring a successful recovery from the devastation of COVID-19, pushing forward on their longer-term vision for equitable development, and addressing the enormous threats posed by climate change. The pandemic has wrought havoc on the global economy, with particularly severe impacts on the poor. It has also highlighted the urgency of building resilience to a wide range of shocks, especially the growing impacts of climate change.

Cities are at the centre of that triple challenge. As population hubs and economic engines, they will play a crucial role in the recovery and in countries' long-term economic vitality. Many have also been particularly hard-hit by the pandemic, however. So now, more than ever, national leadership is crucial to ensure cities can “bounce back” and fully realise their potential as engines of sustainable, inclusive growth. As outlined in the Coalition's 2019 flagship report, *Climate Emergency, Urban Opportunity*,<sup>1</sup> only national governments can mobilise resources at the scale needed, and they control or drive key policy realms: from energy, to transport, to social programmes.

Recognising that developing and emerging economies face particularly complex challenges, the Coalition is focusing on six key countries in the lead-up to COP26 in Glasgow: China, India, Indonesia, Brazil, Mexico and South Africa. Together, they produce about a third of global GDP<sup>2</sup> and 41% of CO<sub>2</sub> emissions from fossil fuel use.<sup>3</sup> They are also home to 42% of the world's urban population.<sup>4</sup> The extent to which these six major emerging economies can unleash the power of cities to catalyse sustainable, inclusive and resilient growth is therefore critical not only for their future trajectory, but for the whole planet.

This paper presents the results of policy analysis and modelling on India, delving deeper into findings summarised in the Coalition's new *Seizing the Urban Opportunity* report.<sup>5</sup> But first, for context, we outline our key findings across the six countries, and how they fit with the Coalition's previous work.

### **Powering the recovery and long-term sustainable growth through cities**

*Climate Emergency, Urban Opportunity* showed that a bundle of technically feasible low-carbon measures could cut emissions from buildings, transport, materials use and waste by almost 90% by 2050; support 87 million jobs in 2030 and 45 million jobs in 2050, and generate energy and material savings worth US\$23.9 trillion by 2050.<sup>6</sup> Compact, connected, clean and resilient cities have significant wider economic, social and environmental benefits as well. With deliberate attention to equity and inclusion, low-carbon measures can also help lift people out of poverty by improving their access to jobs, education and vital services. And by avoiding urban sprawl, countries



can protect agricultural land and natural ecosystems around cities, with benefits for food security and resilience.

The COVID-19 pandemic has mobilised historic levels of public spending in many countries, but only a fraction promotes sustainability or climate resilience, and very little focuses on cities.<sup>7</sup> Local leaders, meanwhile, have continued to raise their ambition: from embracing the concept of “15-minute cities” where people can get almost anything they need within a 15-minute walk or bike ride,<sup>8</sup> to joining the Cities Race to Zero, pledging to reach net-zero carbon emissions by mid-century or sooner.<sup>9</sup>

Aiming to inform and inspire national leaders in the lead-up to COP26, the Coalition set out to answer three questions: 1. How can national governments in these six key economies leverage cities to build shared prosperity while decarbonising and building resilience? 2. How can they make the most of the potential for compact, connected, clean and inclusive cities to drive the COVID-19 recovery? 3. How can insights from these six countries inform efforts by other national governments, development partners and financial institutions to support a shift towards low-carbon, inclusive and resilient cities?

Three themes emerge clearly from our analysis:

**1. A low-carbon urban transformation is within reach, with broad benefits.**

National governments can significantly accelerate decarbonisation by investing in compact, connected, clean and inclusive cities – and reap substantial economic, social and environmental benefits.

**2. Building resilience to climate change is as urgent as decarbonisation.** In all six countries, climate risks are immediate and severe, especially for the urban poor. Resilience-building is a multifaceted challenge: from embedding climate resilience in infrastructure and urban development, to adopting new technologies and practices to reduce climate risks, to addressing the socio-economic drivers of vulnerability in cities.

**3. There are many ways to foster low-carbon, resilient and inclusive cities.**

National governments have a wide range of options to choose from, including low-cost and immediate opportunities, and there are many synergies between decarbonisation, resilience-building, COVID recovery efforts, and development programmes.

The global report lays out an agenda for action for national and local leaders as well as for the broader development community, including financial institutions.

Transforming cities to become catalysts of sustainable, inclusive and resilient growth is a major undertaking, and it is likeliest to succeed if we all come together behind a shared vision. In the sections that follow, we delve into the challenges and opportunities for India in particular.



## THE PROMISE – AND CHALLENGES – OF INDIA’S CITIES

**India’s economy has grown dramatically, and cities have powered its transformation.** Since 1990, India’s economy has grown almost sixfold, to US\$9.16 trillion in 2019 in purchasing power parity terms – the third-largest in the world.<sup>10</sup> Cities contributed 63% of GDP in 2011, and that share is expected to rise to 75% by 2030.<sup>11</sup> An analysis of urban GDP growth to 2035 found all 10 of the world’s fastest-growing cities would be in India, with Surat, Agra and Bengaluru topping the list.<sup>12</sup> Seeking economic opportunities, millions have migrated from rural areas to cities. As recently as 1990, just over a quarter of Indians – 220 million – lived in urban areas, but by 2018, it was 34%, or 461 million.<sup>13</sup> By 2050, it is projected to reach 877 million, or almost 53%. Providing decent housing, public services and jobs for so many people in such a short time, and doing so equitably and sustainably, is a daunting challenge.

**Poverty and marginalisation make large swathes of the population deeply vulnerable.** India has made significant progress in reducing poverty, lifting more than 270 million people out of multidimensional measures of poverty between 2005 and 2015 alone, with the greatest gains in poorer states and marginalised communities.<sup>14</sup> But despite large improvements since the 1990s, 35% of urban residents still lived in slums as of 2018,<sup>15</sup> meaning they lacked basic services such as clean drinking water and sanitation, adequate space, protection from climatic elements, and/or secure tenure. Migrants from rural areas are particularly likely to live in informal settlements, in conditions that themselves perpetuate poverty<sup>16</sup> and with only precarious, low-paid employment.<sup>17</sup>

**COVID-19 hit the urban poor particularly hard and exposed urgent unmet needs.** When the pandemic hit, the poorest and most marginalised urban dwellers were particularly vulnerable, as the conditions in which they lived made it impossible to keep social distance or even to regularly wash hands.<sup>18</sup> The lockdown also left 44% of informal workers – the vast majority of Indian workers – unemployed,<sup>19</sup> and without social safety-net programmes to help.<sup>20</sup> The resulting economic distress led to the largest mass migration in India since the Partition in 1947,<sup>21</sup> though lack of rural jobs has since led many migrants to return to cities.<sup>22</sup> Nationwide, the number of people living on less than US\$2 per day grew by an estimated 75 million in 2020.<sup>23</sup> The government has launched new efforts to understand the needs of migrant workers and connect them to social security and welfare schemes, though there are questions about how effective those efforts will be.<sup>24</sup> It is also crucial to improve living conditions for the urban poor, especially for people in dense informal housing or slums, and address longstanding social, health and environmental challenges.<sup>25</sup>

**India needs to greatly accelerate job creation in its cities.** McKinsey estimates that India will need to absorb 90 million workers entering the labour force or moving from farm to non-farm sectors between 2018 and 2030.<sup>26</sup> Notably, 90.7% of Indian workers were informally employed as of 2017–2018.<sup>27</sup> This includes three-fifths of workers in the organised sector, as many jobs are contract or casual labour. Women’s

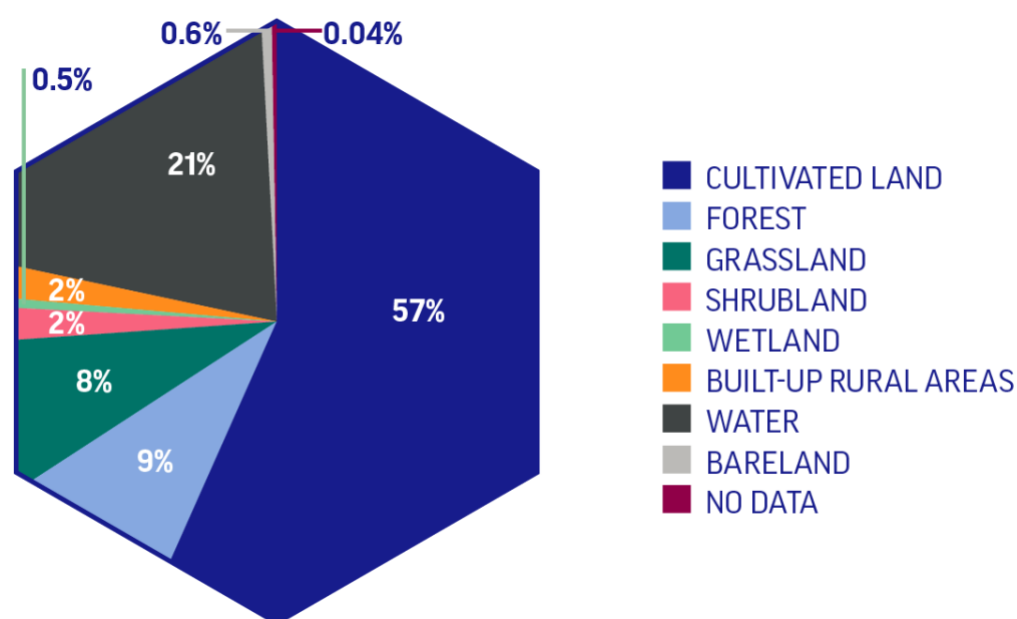
very low labour force participation – just 22.0% as of 2018–2019, and 18.4% for urban women,<sup>28</sup> and declining<sup>29</sup> – is another pressing concern, especially with growing urbanisation. Due to social constraints, many women may only be able to work outside the home if there are employment options close by, and that is likelier on farms than in cities.<sup>30</sup> Rural women tend to be less educated than rural men, which makes it harder to find jobs in urban economies that demand increasingly high levels of job skills and education<sup>31</sup> – or else pure physical strength.<sup>32</sup> Two other major factors, which are closely interconnected, are safety concerns and a lack of transportation infrastructure.<sup>33</sup> The resulting gender gap is enormous: male workers filled 83% of the almost 150 million new non-farm jobs created between 1991 and 2016. McKinsey estimates that even partly closing the female employment gap would require an additional 55 million non-farm jobs by 2030.<sup>34</sup>

**Building affordable, high-quality urban housing is another top priority.** One study found India's cities need to add 25 million affordable housing units by 2030<sup>35</sup> – which McKinsey estimated could create 30 million jobs by meeting that demand through home-building, mass transit, water infrastructure and property services.<sup>36</sup> The government's Pradhan Mantri Awas Yojana – Urban (PMAY-U) Housing for All mission, launched in 2015, has identified a need for 11.2 million new housing units by 2022. By the end of 2020, 10.9 million units had been approved and 4.1 million completed, with almost 3 million more under construction.<sup>37</sup> The scheme has also created an estimated 23 million jobs.<sup>38</sup> However, a recent study in Ahmedabad found many low-cost homes sat vacant.<sup>39</sup> The solutions recommended include working with local organisations to better meet community needs, fostering more mixed-use development and ensuring good public transport access.

**Careful land management is needed to stem urban sprawl.** About 460,000 of homes approved under PMAY-U to date involve redevelopment of existing slums, but the vast majority involve beneficiary-led construction or upgrades or subsidised larger projects.<sup>40</sup> All this requires land with good infrastructure and urban services, and so do commercial home-builders. Meeting that demand may require updating land use regulations and land market structures that now reduce the efficiency of land utilisation.<sup>41</sup> Most land is now privately held, in relatively small parcels, and this hinders planned urban expansion, which requires assembling land in larger parcels. Without better land management, continued urban growth unsupported by adequate public services and amenities could impose costs on Indian development of US\$330 billion to US\$1.8 trillion per year by 2050.<sup>42</sup> Overall, new analysis for the Coalition shows that India's urban footprint expanded by 9,822 km<sup>2</sup> between 2000 and 2014 – about 1.5 times the size of the Mumbai Metropolitan Region (Figure 1).<sup>43</sup> Most of that expansion was onto cultivated land (57%), creating potential risks for food security, and 21% was into built-up rural areas.<sup>44</sup> India has some of the most densely populated cities in the world.<sup>45</sup> As urban population expands and wealth grows, efficient land use and protection of natural infrastructure assets will be crucial to urban resilience

and food security, and to allow for agglomeration benefits to be captured to the fullest.

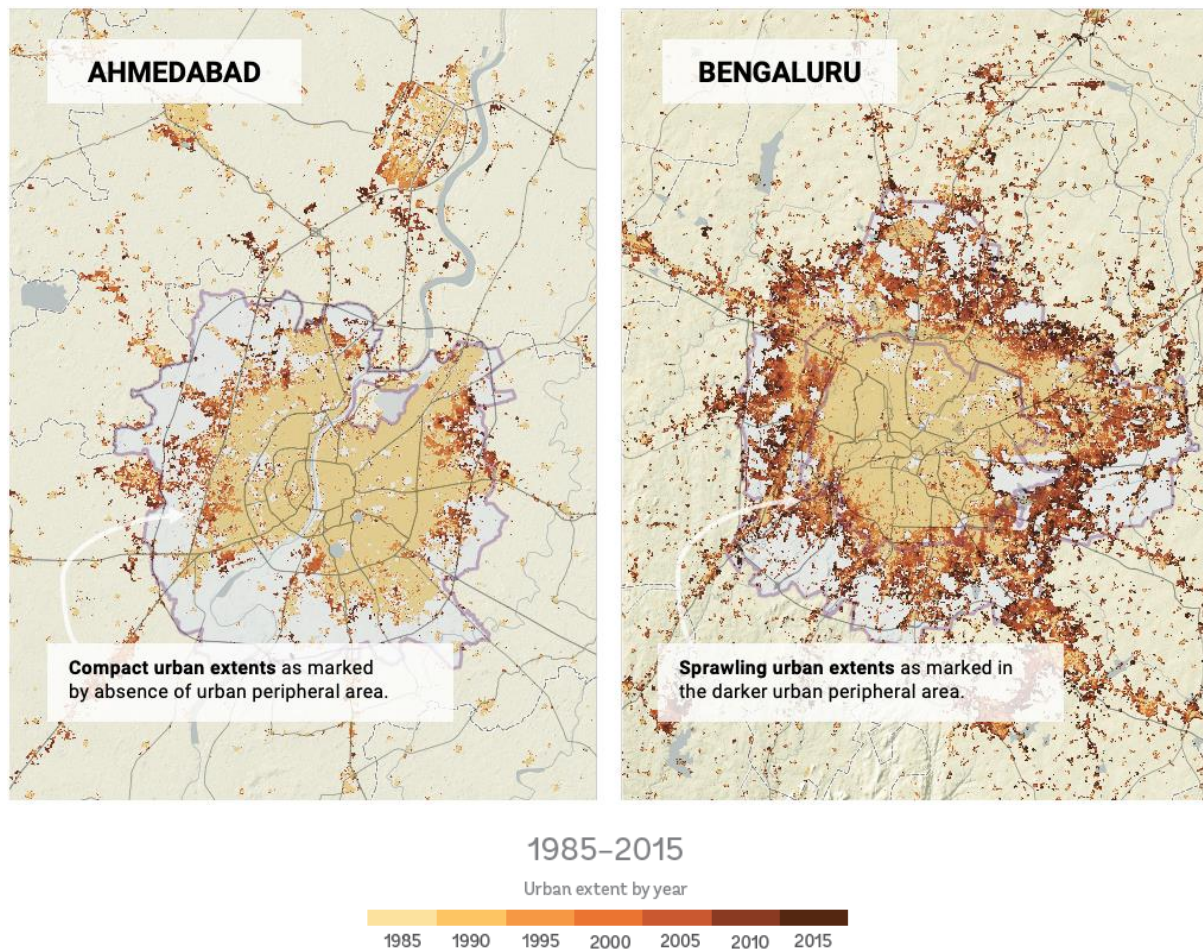
*Figure 1. Land converted to urban areas in India by type of land cover, 2000–2014*



*Source: Marron Institute of Urban Management, New York University, for the Coalition for Urban Transitions and the Food and Land Use Coalition. See [Annex 3](#) for full methodology.<sup>46</sup>*

**Effective planning has helped some Indian cities manage urban expansion and grow more strategically.** Though inefficient land use and urban sprawl are common problems, India has fared particularly badly and been slower than China, for example, in updating land use policies and practices to stem sprawl.<sup>47</sup> But some Indian cities are notable exceptions. Ahmedabad, for instance, retained its relatively compact urban extent from 1985 to 2015, even as its population more than doubled, while Bengaluru, where the population tripled in that period, spread widely into its periphery.<sup>48</sup> The peripheral growth that did occur in Ahmedabad was also much higher-density (Map 1).<sup>49</sup> It accomplished this through a land readjustment and pooling technique applied in Gujarat’s Town Planning Scheme<sup>50</sup> – one of several innovative approaches pioneered by Indian states in recent years.<sup>51</sup> Other cities can emulate and adapt these models to ensure more efficient urban land use and also capture more value from urban development.

*Map 1. Differences in urban expansion between two Indian cities: Bengaluru and Ahmedabad*



Source: Reproduced from Mehrotra et al., 2020.<sup>52</sup> Note: The white area denotes non-built-up space within city limits.

**India is investing heavily in improving public transport systems in cities,** including metro rail projects, feeder services and infrastructure to integrate other modes of transport with the metro. More than 700 km of metro rail lines were operational in 18 cities by the end of 2020, and over 1,000 km were under construction in 27 cities.<sup>53</sup> The government has also created lower-cost metro development programmes for mid-size cities, MetroLite and MetroNeo.<sup>54</sup> The government has invested almost Rs. 25,000 crore (about US\$3.4 billion) in metro projects in the last two fiscal years, and allocated almost Rs. 20,000 crore (about US\$2.6 billion) in the 2021–2022 budget.<sup>55</sup> Though metro projects are capital-intensive, the government has noted, they fuel economic growth and reduce traffic congestion, parking and traffic costs, total vehicle ownership costs and per capita road accidents.<sup>56</sup> These are major steps forward. However, it is crucial to also improve service for the large share of the population who still depend on buses, minibuses, rickshaws and other options.<sup>57</sup> The safety needs of women and girls in particular



require urgent attention, as their mobility is severely constrained by violence and harassment.<sup>58</sup> People with disabilities also need significantly better access to public transport, in line with the vision for universal accessibility in the revised National Urban Transport Policy, 2014.<sup>59</sup>

**India's cities are getting ever-more congested.** Though per capita car ownership in India remains low by global standards, the number of personal cars registered nationwide grew by a factor of 4.8 from 2001 to 2016, to 25.6 million.<sup>60</sup> The number of two-wheelers, meanwhile, grew by a factor of 4.4, to 169 million. The totals in both categories doubled from 2009 to 2016 alone. Rising personal vehicle ownership has huge costs due to air pollution (see below), congestion, and growing demand for land for wider roads and parking. In six cities – Mumbai, Delhi, Ahmedabad, Bengaluru, Chennai and Hyderabad – traffic is growing four times faster than the population.<sup>61</sup> A global traffic congestion index ranked Bengaluru first and Mumbai, Pune and New Delhi at Nos. 4, 5 and 8, respectively, among 416 major cities.<sup>62</sup> As in much of the world, COVID-19 reduced congestion in India in 2020, but the four cities still came in at No. 6, 2, 16 and 8, respectively, in the latest ranking.<sup>63</sup> The cost of congestion in Delhi alone has been estimated at US\$8.9 billion in 2013, projected to rise to US\$14.7 billion by 2030.<sup>64</sup> The large share of two-wheelers in India's vehicle fleet at least reduces fuel costs and provides better gender access.<sup>65</sup> However, by far the greatest opportunity for improving transport is to build on Indian cities' still-high share of trips that involve public transit and non-motorised transport (NMT) – 70% in New Delhi, for example.<sup>66</sup> Steps need to be taken to prioritise NMT, public and two-wheeler transport in road design, while improving safety for these commuters, as pedestrians, motorcyclists and bicyclists combined accounted for three-quarters of road traffic fatalities in India in 2017.<sup>67</sup>

**Indian cities have some of the world's highest levels of air pollution.** In 2016, more than 18 Indian cities had annual mean concentrations of fine particulate matter (PM<sub>2.5</sub>) of 100 µg/m<sup>3</sup> or higher, 10 times the level advised by the World Health Organization.<sup>68</sup> One in eight deaths in India in 2017 – 1.24 million altogether – were caused by illnesses linked to polluted air, such as lung disease, cardiovascular disease and diabetes.<sup>69</sup> Though indoor smoke is a major factor, more than half those deaths were linked to ambient pollution – and both have implications for the climate as well, as several pollutants, including black carbon (soot) and ozone.<sup>70</sup> Air pollution is also linked to large losses in labour income, estimated at US\$66 billion across South Asia in 2013.<sup>71</sup> Addressing this crisis requires interagency and interstate cooperation at the metropolitan agglomeration scale nested in the regional airshed.<sup>72</sup> In 2019, the Ministry of Environment, Forest and Climate Change launched the National Clean Air Programme, with a series of mitigation actions at airshed level. These interagency actions include regional and potentially some cross-national plans, technology solutions, sectoral interventions, and city-specific air quality management strategies that offer the promise of departing from previously failed efforts to meet National Ambient Air Quality Standards.<sup>73</sup>

**The Government of India has recognised the importance of cities in its vision for the future and has established a slew of national programmes.** Along with PMAY(U), key initiatives launched in the past decade include the Atal Mission for Rejuvenation and Urban Transformation, Heritage City Development and Augmentation Yojana (HRIDAY), the Smart Cities Mission, the Clean India Mission, and R-Urban Mission (see Table 1).<sup>74</sup> Between 2015 and 2019, Rs. 54,000 crore (about US\$7.4 billion) was invested in these schemes, and another Rs. 66,000 crore (about US\$9 billion) has been budgeted since. To complement these programmes, the government has launched an ambitious India Investment Grid, led by the Ministry of Finance and Corporate Affairs, aiming to mobilise US\$1.5 to 2 trillion in public and private investments to finance the National Infrastructure Pipeline through thousands of projects.<sup>75</sup>

*Table 1. Evolution of India's National Urban Development Programmes*

Year	Initiative	Goal
1992	The 74th Constitutional Amendment Act	Empowering municipalities functionally, financially and politically
2002	Urban Reform Incentive Fund (URIF)	Eliminating systemic weaknesses to strengthen municipal finance and functioning
2005	Jawaharlal Nehru National Urban Renewable Mission (JNNURM)	Eliminate structural and systemic weaknesses to create an investment climate and to improve local governance and finance
2007	National Urban Housing and Habitat Policy	Affordable housing for all with emphasis on vulnerable sections of society
2011	Rajiv Awas Yojana (RAY)	Working towards slum-free cities via property tilting and tenure security
2013	National Urban Livelihoods Missions	Reducing urban poverty by providing access to employment
2014	Swachh Bharat Abhiyaan (Clean India Mission)	Providing access to scientific sanitation and management of solid waste
2015	Development of 100 smart cities	Enhance the quality of urban life and provide a clean and suitable environment by employing smart solutions for the efficient use of available resources and infrastructure
2015	Atal Mission for Rejuvenation and Transformation of 500 cities with over 100,000 population (AMRUT)	Create infrastructure that has a direct link to the provision of better services to the people by applying reforms to improve service delivery and make municipal functioning transparent and accountable

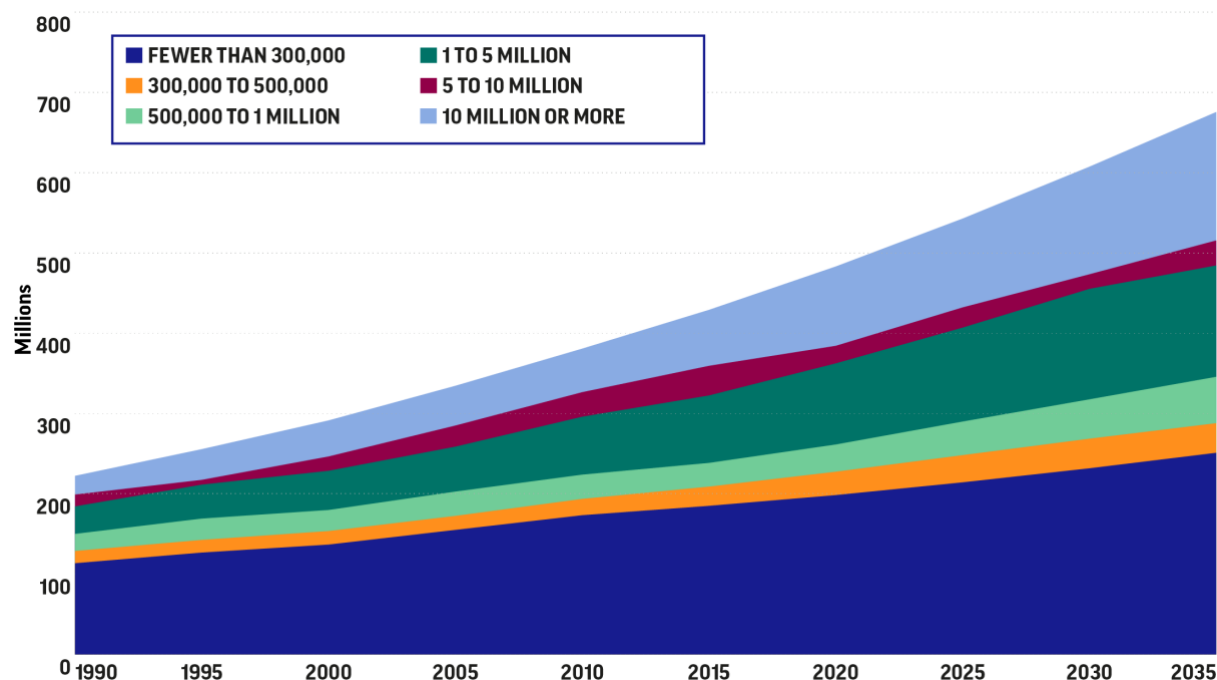
2015	Pradhan Mantri Awas Yojana (Housing for All)	Address the housing requirements of the urban poor including slum dwellers by promoting slum rehabilitation and affordable housing in partnership with the private sector and providing subsidies such as the credit linked subsidy and subsidy for beneficiary-led housing construction or enhancement
2015	Heritage City Development and Augmentation Yojana (HRIDAY)	Supporting core infrastructure aimed at revitalisation of areas close to heritage sites by focusing on water supply, sanitation, landscaping and tourist conveniences
2016	RURBAN Mission	Accelerating rural development and providing basic urban services
2019	National Infrastructure Pipeline (NIP)	Achieve economic growth and improve quality of life by promoting efficient investments in existing and new infrastructure in a variety of sectors, including transport, logistics, energy, water and sanitation and communication as well as social (e.g. health and education) and commercial (e.g. tourism) infrastructure
2019	National Capital Territory of Delhi (Recognition of Property Rights of Residents in Unauthorised Colonies) Act	Improve quality of life for residents of unauthorised communities by spurring redevelopment of these communities through the provision of more formal property ownership rights

Source: Knight Frank India, 2020.<sup>76</sup>

**More than half of India's urban population is in cities with fewer than 1 million people, which require stronger support to manage urban growth.** As of 2015, 56% of India's urban residents were in cities with populations under 1 million, including 43% in agglomerations under 300,000 (Figure 2).<sup>77</sup> By 2035, those shares are projected to be 51% and 37%, respectively. Small cities in India and globally tend to have particular difficulties ensuring high-density growth,<sup>78</sup> yet they also offer prime opportunities to shape urbanisation more efficiently to avoid the problems that larger cities may already be locked into. However, they need funding, capacity-building and flexibility to be able to fully participate in the urban missions and other programmes that support innovation and best practices. It is essential that projects under the missions be structured in such a way that they empower subnational governments and their agencies, without overly restrictive requirements.



*Figure 2. India's urban population by city size class, 1990–2035 (historical and projected)*



Source: Coalition for Urban Transitions analysis based on data from UN DESA, 2018. Data to 2015 are historical, 2020–2035 are projections.<sup>79</sup>

## Confronting climate change

**Climate change poses enormous threats to India that urgently require resilience-building.** Heat waves in several cities have created deadly conditions,<sup>80</sup> and a study of major cities found average summer temperatures in Mumbai, Kolkata and Delhi are already dangerously high and rising.<sup>81</sup> As cities sprawl and are increasingly paved over, urban heat island effects are becoming more pronounced – and exacerbating the impacts of climate change.<sup>82</sup> In Mumbai, for example, 94% of the land has been paved or built over since the 1970s, and the city lost 60% of its vegetation and 65% of its water bodies. The city's tree cover went from 35% to 13%.<sup>83</sup> Ahmedabad was a pioneer in developing a Heat Action Plan, in 2013 – the first in South Asia.<sup>84</sup> With guidance and support from the national government, more than 100 cities and districts have since developed Heat Action Plans,<sup>85</sup> including early warning systems, public cooling centres, cool roofs and new green infrastructure.

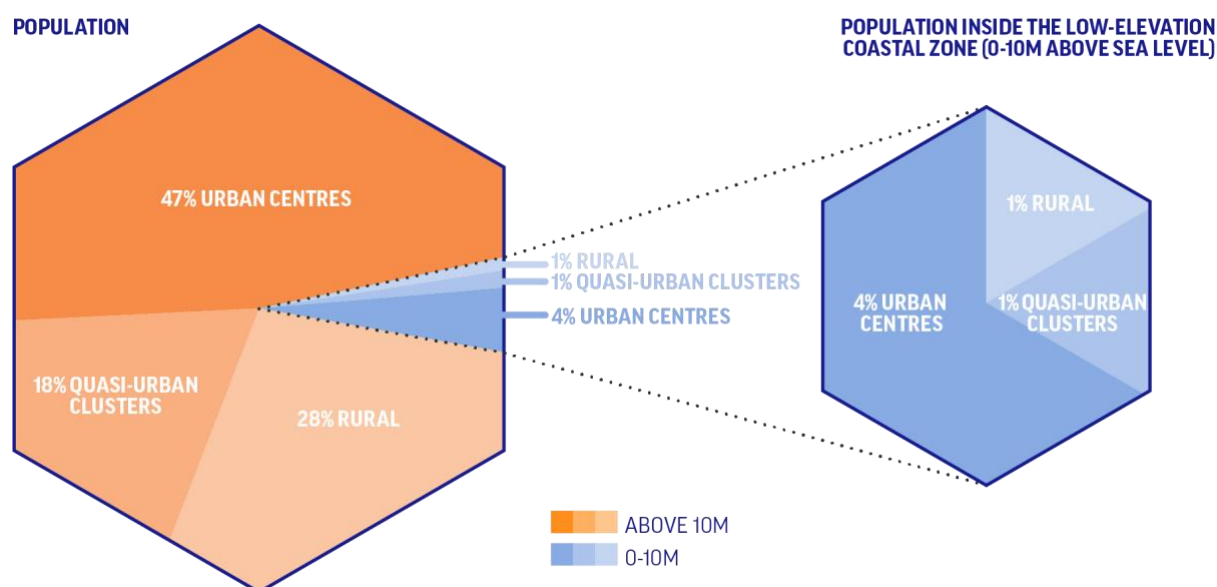
**India is also prioritising building energy efficiency through its Cooling Action Plan.** Launched in 2019, the national plan was developed by the Ministry of Environment, Forest, and Climate Change's Ozone cell. It aims to reduce cooling energy and refrigerant demand by 30% over the next 20 years.<sup>86</sup> The energy efficiency targets included for the sector are closely aligned with India's buildings sector interventions, as space cooling for buildings constitutes about 60% of total energy demand for cooling and is expected to grow 11-fold by 2038. Along with

targeting air conditioning efficiency and refrigerant use, the India Cooling Action Plan aims to promote energy-efficient building design, including cool roofs.<sup>87</sup>

**Climate change threatens to exacerbate India's daunting water crisis as well,**<sup>88</sup> with 354 million people projected to face severe water stress with even 1.5°C of warming, and 421 million with 2°C of warming.<sup>89</sup> Conditions are already dire: in 2019, amid a drought that affected about half of India, 330 million people faced water scarcity.<sup>90</sup> Below-average monsoons reduced water levels by a third in 91 major reservoirs. Rainfall in Chennai was 55% below average, and its reservoirs ran dry, causing the worst water crisis in 70 years. At the same time, flood threats are intensifying. Across India, floods caused an estimated US\$79.5 billion in damages between 1998 and 2017.<sup>91</sup>

**Sea-level rise and coastal storms also pose serious threats to India's urban populations.** As of 2015, modelling for the Coalition shows, an estimated 55.2 million people lived in urban coastal zones less than 10 metres above sea level (see Figure 3).<sup>92</sup> As sea levels rise and storm surges become more frequent and severe, being at such low elevation puts them in potential peril. Most of the urban zone of Kolkata, which is home to 15 million people, is at less than 10 metres above sea level. Kolkata already faces frequent flooding, and a 2019 study found that by 2050, much of the city could lie in the annual coastal flood risk zone.<sup>93</sup> Mumbai also faces major flood risks.<sup>94</sup> It is crucial to strengthen the resilience of coastal communities, perhaps as part of India's National Action Plan on Climate Change (NAPCC).

Figure 3. Share of India's population inside and outside the low-elevation coastal zone by settlement type, 2015



Source: CUNY Institute for Demographic Research, Institute for Development Studies and Center for International Earth Science Information Network, Columbia University, 2019. Note that the methodology used for this analysis differs from the UN population classifications cited earlier in this report. See [Annex 4](#) for full methodology.<sup>95</sup>

**Major national programmes are helping India's cities become more resilient, sustainable and inclusive.** The Smart Cities Mission, for example, launched in 2015, aims to harness technology to drive growth and improve resource management, urban mobility and a wide range of services.<sup>96</sup> The 100 participating cities have proposed more than 5,000 projects worth Rs. 205,018 crore (about US\$28 billion), funded through central, state and local funds, public-private partnerships and other sources.<sup>97</sup> Though progress was slow at first, 2,148 projects had been completed by the end of 2020, at a cost of more than Rs. 35,000 crore, including several that support sustainability, resilience and inclusion – from “smart” command and control centres in 53 cities, to 84 water projects and 47 solar projects. Several promising new initiatives were launched in 2020, all inspired by concerns and new ideas that arose during the COVID-19 pandemic, including the India Cycles 4 Change Challenge, to make cities safer for biking, the Streets for People Challenge, to create walking-friendly streets, and the Nurturing Neighbourhoods Challenge, to prepare cities to foster early childhood development.

**The ClimateSmart Cities Assessment Framework provides a powerful new tool for Indian cities seeking to adopt best practices in mitigation and adaptation.**<sup>98</sup> Launched in 2019 under the Smart Cities Mission, it builds on the work of the National Mission for Sustainable Habitat, which since 2008 has helped cities tackle climate risks and foster clean, inclusive and sustainable development. The new framework uses 28 indicators to assess cities' vulnerabilities and potential for climate

action on energy and green buildings, urban planning, green cover and biodiversity, mobility and air quality, water management and waste management. Almost 100 cities used the tool in the first phase. By applying this framework and leveraging the massive investments already being made in housing, transport and other urban infrastructure, India and its cities have a major opportunity to mainstream climate action – from transit-oriented development,<sup>99</sup> to mass deployment of rooftop solar PV, to resilient and energy- and water-efficient home-building.<sup>100</sup>

**The growing demand for shared mobility offers an opportunity for India to lead in innovating technology and business models in the electric mobility space.<sup>101</sup>**

The Ministry of Heavy Industries' Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) scheme aims to promote the manufacture of electric and hybrid vehicle technology, incentivising demand and improving charging infrastructure.<sup>102</sup> This presents an opportunity for India to innovate and lead in EV and hybrid technologies, particularly in niches relevant for Indian cities, such as two-wheelers and economy vehicles.<sup>103</sup> FAME India applies mainly to vehicles used for public transport or registered for commercial purposes, aiming to provide affordable and sustainable transportation options for the masses. The second three-year round of the scheme, FAME II, provides US\$1.3 billion in incentives for the purchase of EVs (including buses, rickshaws, cars and two-wheelers) and installation of charging infrastructure, particularly in cities.<sup>104</sup>

**Energy efficiency offers another major opportunity for savings and GHG reductions.** Efficiency improvements saved the equivalent of 15% of energy demand and avoided 300 Mt CO<sub>2</sub> of emissions in India between 2000 and 2018.<sup>105</sup> Through its Bureau of Energy Efficiency, the Ministry of Power has initiated energy efficiency initiatives in lighting, commercial buildings and appliances, as well as demand-side management in agriculture and industry. The National Mission for Enhanced Energy Efficiency (NMEE) is enabling project financing for and within cities through a Partial Risk Guarantee Fund for Energy Efficiency (up to 50% of the loan amount) and a Venture Capital Fund for Energy Efficiency, targeting financial institutions to promote domestic lending.<sup>106</sup> Of particular promise for cities is the work of the Super ESCO Energy Efficiency Services Limited (EESL), a joint venture between four utilities that functions under the Ministry of Power.<sup>107</sup> Since its establishment in 2009, it has helped India achieve an estimated 47 billion kWh in annual energy savings through the implementation of energy efficiency technologies and programmes, including streetlights, motors, buildings and decentralised solar.

**Renewable energy is growing rapidly in India.** In 2019, India generated 76% of its power supply from fossil fuels, mainly coal, but the share of solar and wind power in India's electricity mix more than doubled from 2015 to 2019, from 3.4 to 7.3%.<sup>108</sup> In its Nationally Determined Contribution (NDC), India has pledged to increase the non-fossil share of installed capacity (including nuclear, hydropower, waste and other sources) to 40% by 2030. Non-fossil installed capacity is growing rapidly, with 93 GW

of grid-connected power (24.5% of the total) and 1.3 GW of off-grid power (mainly solar photovoltaics) as of February 2021.<sup>109</sup> Prime Minister Modi has said he is confident that non-fossil capacity can reach 220 GW by 2022.<sup>110</sup> The government is also investing in Green Energy Corridors,<sup>111</sup> a major effort to integrate renewable energy into the grid and transmit it from eight renewable-rich states.

**Clean electricity is creating jobs.** Renewables are a growing source of jobs. As of 2019, about 833,000 workers in India were employed in renewable energy, with solar PV employment at a little over 200,000 jobs, over 50,000 jobs in wind employment, and nearly 370,000 in hydropower – or 19% of the world's total hydropower jobs.<sup>112</sup> Decentralised renewable energy (DRE) employment, though mainly in rural areas, not cities, is also rising, with companies directly employing as many workers as the traditional utility-scale power sector. Improved electricity access, in turn, is estimated to have created as many as 470,000 jobs in India in 2017–2018 through a wide range of applications.<sup>113</sup> It is important to note that clean energy jobs require training and upskilling, which requires large investments and, if all Indians are to benefit, a strong commitment to equity and inclusion. Good governance is also key, to mitigate unintended social or environmental impacts.<sup>114</sup>

**Achieving a vision of thriving, sustainable and resilient cities in India will require well-resourced, capable and accountable governments at all levels.** It is especially important to align institutional and fiscal capacities at the state and local levels. National and state governments have fiscal and institutional resources that are crucial for supporting local governments and for scaling up solutions. State governments control transport investments, energy infrastructure and utilities, and land policy and acquisition – which, as noted earlier, is critical for inclusive and sustainable urban land use. But local governments may actually be better positioned to conduct integrated housing and transport planning, ensure resident participation, and tailor green growth and climate adaptation projects to local needs. Large metro areas also need to connect with smaller, resource-poorer communities around them to coordinate growth and ensure shared prosperity.

**Significant governance reforms may be needed to facilitate urban transformation.** Today, a complex entanglement of national, state and local jurisdictions translates into fragmented governance of fast-growing urban areas, including large metropolitan agglomerations. The national government shapes the vision for urban land use through strategic plans and missions and controls economic and fiscal policies with significant, although sometimes indirect, effects on land and housing markets. Meanwhile, although the 74th Amendment recommends devolution of powers to Urban Local Bodies (ULBs) for urban planning, public utilities and infrastructure, they remain poorly funded in comparison to other global cities with similar population sizes.<sup>115</sup> City governments also continue to be largely disempowered, especially when it comes to land use planning and direct control over funds.<sup>116</sup> Metropolitan planning committees (MPCs), on the other hand, which could

play a key role in supporting multi-jurisdictional planning and coordination, have typically been ignored, bypassed or limited in their powers by their respective states.<sup>117</sup> It is clear that a new approach is needed to foster effective metropolitan-scale action.

## BOX 1: HOW WE BUILT OUR ANALYSIS

This report combines original climate and economic modelling, spatial analysis, policy research and analysis, and country-specific insights gathered by consulting iteratively with urban, energy and climate policy experts in China, India, Indonesia, Brazil, Mexico and South Africa.

First, the Stockholm Environment Institute (SEI) modelled the urban greenhouse gas abatement potential in six countries, using a bottom-up assessment of mitigation options in residential and commercial buildings, road transport, waste management, and materials for urban buildings and transport infrastructure.

The model covers CO<sub>2</sub> emissions from energy consumption, process emissions from the production of cement and aluminium used in urban infrastructure, and methane (CH<sub>4</sub>) emissions from landfills. It is important to note that emissions from industries within cities are not included. Thus, the urban share of emissions may appear smaller than in other studies. It is also important to note that this analysis was undertaken prior to the full impacts of COVID-19 being known. Hence, the baseline scenario, for example, does not factor in the potential economic impacts of COVID-19 on emissions pathways. Any planned future analysis will be adjusted to take this into account.

The baseline scenario reflects countries' commitments in their first round of Nationally Determined Contributions (NDCs) under the Paris Agreement, but not the latest updates. This means the abatement potential between 2020 and 2050 identified in the analysis is all additional to the first NDCs. For details on data sources, measure-specific assumptions and analytical steps, see [Annex 1](#).

Second, Vivid Economics modelled the incremental investments through 2050 – that is, investments beyond baseline levels – needed to realise the abatement potential identified by SEI, using existing technologies and practices, and accounting for learning that would reduce costs over time. They also modelled the cumulative returns on those investments through 2050. Across all countries, the estimates presented in this report are net returns (i.e. net present value, or the extent to which benefits exceed costs over the period to 2050), discounted at 3.5% per year, assuming a 2.5% annual increase in real energy prices from 2014 levels. That is the central scenario in the analysis; for a comparison of results with different assumptions, see Annex 2, Part 3. Note that the economic returns estimate only considers direct energy and material cost savings and is thus partial. The returns would be higher if factors such as time savings from avoided congestion, increased productivity, improved health and environmental quality, and avoided climate change impacts were taken into account.

Finally, the Vivid analysis estimates the direct, indirect and induced jobs (full-time equivalent) that the modelled measures could support in 2030 and 2050, taking into account technology-specific labour productivity factors and adjusted to reflect typical differences in labour productivity between OECD and non-OECD countries. The estimates are based on uniform labour productivity assumptions for the six countries and provide indicative job numbers. Further work should collect more country-specific



information to refine the results. The job numbers reflect an estimate of net jobs by comparing green investment with an equivalent investment in fossil fuel projects, while fully recognising the uncertainties in such counterfactuals. In all of these categories, we provide overall numbers as well as selected sector- and measure-specific estimates. For details on data sources and the full methodology, see [Annex 2](#).

The third modelling exercise that informed our analysis was by the Marron Institute of Urban Management at New York University, which examined the scale and composition of the conversion of land to urban purposes in each of the six countries in the period 2000–2014. The results show not only how much cities' collective footprint grew in that time, but also what they displaced: farmland, built-up rural areas, forests, grassland, etc. For a detailed methodology, see [Annex 3](#).

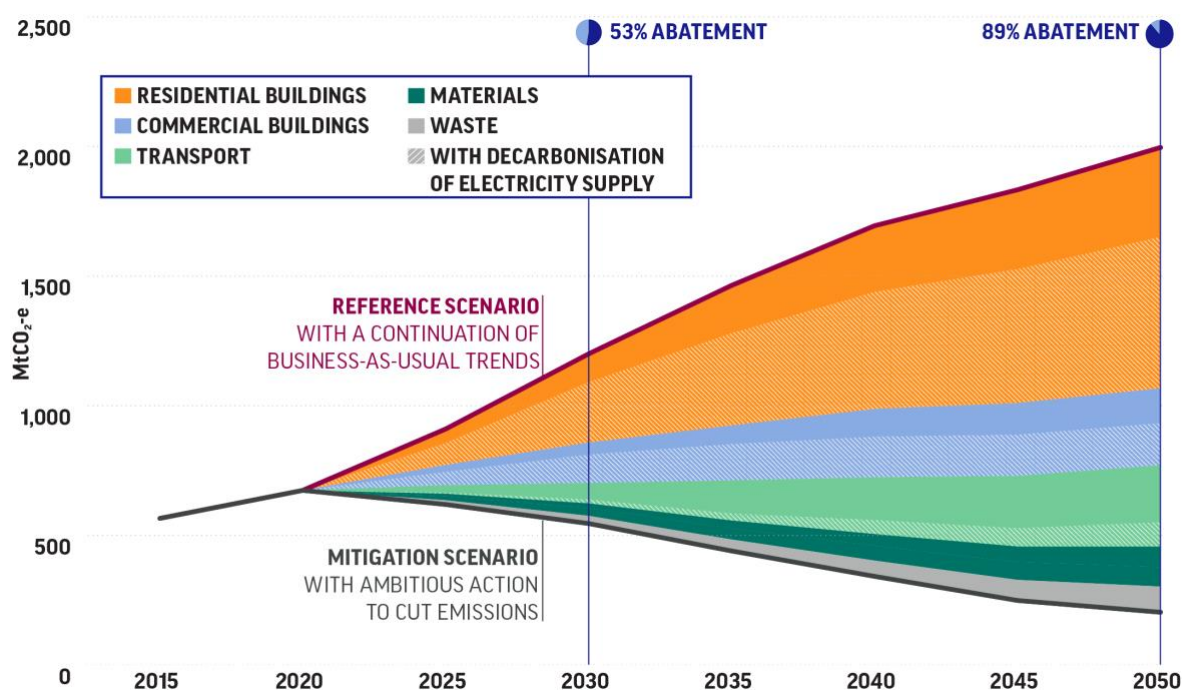
Finally, recognising that coastal populations are particularly exposed to climate change impacts, including sea-level rise, storm surges and other hazards, we drew on the work of the Institute for Demographic Research at City University of New York, the Center for International Earth Science Information Network at Columbia University, and the Institute of Development Studies to estimate the share of each country's population living in coastal zones at less than 10 metres above sea level, and the urban share of that population. While a detailed mapping of coastal climate risks in the six countries is beyond the scope of this report, this analysis provides some indication of the extent of the risk. For a detailed methodology, see [Annex 4](#).

The four modelling exercises inform analysis in this report as well as the Coalition's global synthesis report, based on detailed literature reviews (including policy documents, peer-reviewed studies, grey literature and media coverage) and close collaboration with experts in the six countries, with additional input from a wide range of Coalition partners. The resulting recommendations are meant as illustrative examples, and should not be seen as an exhaustive list of options for national policy-makers in each country.

## HOW URBAN ACTION CAN DRIVE DECARBONISATION AND ECONOMIC GROWTH

**India can raise its climate ambition, and cities hold substantial emission reduction potential.** By 2050, modelling for the Coalition suggests, implementing a bundle of existing low-carbon technologies and practices could reduce urban emissions from buildings, transport, waste and materials for infrastructure by 89% in 2050, saving 1,784 Mt CO<sub>2</sub>-e relative to a baseline scenario (Figure 4).<sup>118</sup> Residential buildings hold 52% of the cumulative abatement potential identified; commercial buildings, another 20%, and transport, 15%. Across sectors, the analysis shows, nearly half the total abatement potential depends on decarbonising electricity. And small and mid-size cities are key: 54% of the cumulative potential identified is in cities with fewer than 1 million residents today, compared with 25% in cities of over 5 million.

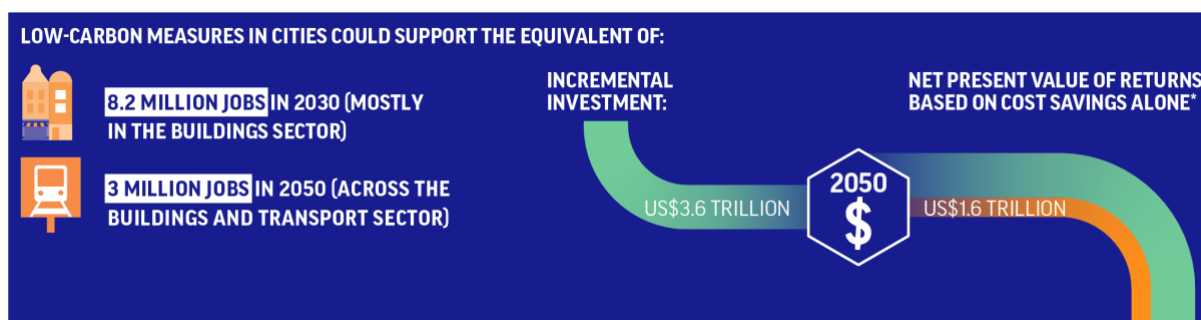
*Figure 4. GHG abatement potential in key urban sectors in India to 2050*



Source: Modelling by the Stockholm Environment Institute for the Coalition for Urban Transitions.<sup>119</sup>

**Investing in urban decarbonisation could bring significant economic benefits.** An economic analysis for the Coalition found that fully implementing the modelled measures would require US\$3.6 trillion in incremental investments to 2050 (Figure 5).<sup>120</sup> But they could more than pay for themselves through energy and material cost savings, yielding cumulative returns with a net present value of US\$1.6 trillion. Public transport offers particularly attractive economic returns: investing US\$79.1 billion by 2050 could bring returns with a net present value of US\$1.4 trillion. It would also reduce air pollution and traffic congestion – two urgent concerns for India – and, if designed to prioritise the needs of the poor, make cities more inclusive.<sup>121</sup>

Figure 5. The economics of selected low-carbon measures in Indian cities



Source: Modelling by Vivid Economics.<sup>122</sup> Note: These job and growth numbers are based on scenarios and are not forecasts of future outcomes. The job numbers in particular are subject to a high level of uncertainty, as explained in [Annex 2](#), and should be interpreted with caution.

### Urban decarbonisation measures offer significant job creation potential as well.

The economic analysis also provides indicative numbers of jobs that could be supported by the investments. It shows that the modelled measures could support 8.2 million new jobs in 2030 – including 6.6 million in residential building efficiency (new construction and retrofits) and 1.1 million in commercial building efficiency.

Promoting a shift to electric vehicles, meanwhile, could support about 250,000 jobs in 2030, the analysis suggests. This should be encouraging to policy-makers who already see EVs as a prime opportunity for India.

## UNLOCKING THE POTENTIAL OF INDIA'S CITIES

The COVID-19 pandemic has hit India hard, with more than 32 million confirmed cases by mid-August 2021 – the second-highest number worldwide, after the United States – and over 429,000 deaths.<sup>123</sup> As noted earlier, the social and economic impacts have also been substantial. India's GDP shrank by 8% in 2020,<sup>124</sup> though it is now projected to grow by 11.5% in 2021. Extreme poverty grew, while the middle class got smaller.<sup>125</sup> Fiscal stimulus packages totalling US\$325 billion as of February 2021 have helped revitalise the economy, but also bolstered high-carbon industries.<sup>126</sup> There have been green measures as well, however, including a US\$26.5 billion investment in biogas and cleaner fuels; a waiver on interstate transmission fees for renewable energy until December 2022; incentives for solar panel and LED technology manufacturing; and a pledge to have 25% of new vehicle registrations in Delhi be EVs by 2024. These are positive steps. It is crucial that further investments to revitalise the economy move away from fossil fuels and instead lay a foundation for a more sustainable future, especially in cities.

Going forward, four key opportunities for impact at the national level are:

**Align national infrastructure and urban development policies, programmes and investments with the vision of ClimateSmart Cities.** From the urban missions, to the National Infrastructure Pipeline, the Government of India's ambitious agenda has the potential to transform cities for the better, building resilience and accelerating decarbonisation while improving living conditions for all. A systematic approach will be crucial to making the most of these opportunities.

**Scale up energy efficiency initiatives and incorporate clean energy and efficient technologies in housing and other urban programmes.** Through its Bureau of Energy Efficiency, the Ministry of Power has launched initiatives on lighting, commercial buildings and appliances, as well as demand-side management in industry and municipalities. The National Mission for Enhanced Energy Efficiency (NMEE) has set up two funds to enable project financing for and within cities;<sup>127</sup> the market potential for these programmes is estimated at US\$10 billion.<sup>128</sup>

**Support local governments – especially small and mid-sized cities – to enable them to drive urban transformation.** Limited institutional capacity remains a key barrier to ambitious mitigation and adaptation action in many cities. It is crucial to align institutional and fiscal capacities across levels of government to ensure cities have the funds, technical know-how and institutional support they need. The national government has vital resources, for instance, while state governments control land policy and acquisition,<sup>129</sup> and local governments are best positioned to engage communities.



**Step up investments in sustainable transport, prioritising the urban poor.**

Though car ownership in Indian cities is rising,<sup>130</sup> a large share of trips still involve public or non-motorised transport – 70% in New Delhi, for example.<sup>131</sup> It is important to prioritise those commuters in road design and improve safety for them, as they now account for two-thirds of total road traffic fatalities.<sup>132</sup> It is also crucial to improve service for the vast swaths of the population who ride buses, minibuses and rickshaws.<sup>133</sup>



*Solar panel installation on roof of New Delhi metro station. Source: iStock*

## ENDNOTES

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<sup>1</sup> CUT, 2019, “Climate Emergency, Urban Opportunity.”

<sup>2</sup> Their collective share in 2019 was 31.7%, including 17.3% from China. Authors’ calculations based on World Bank GDP data (PPP, in current international \$). See <https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD>.

<sup>3</sup> Authors’ calculations based on 2018 data from the International Energy Agency (total CO<sub>2</sub> emissions): <https://www.iea.org/data-and-statistics>.

<sup>4</sup> Authors’ calculations based on 2018 data from UN DESA, 2018, “World Urbanization Prospects: The 2018 Revision.” China alone is home to 20% of the world’s urban residents, and India, to another 11%.

<sup>5</sup> CUT, 2021, “Seizing the Urban Opportunity: How National Governments Can Recover from COVID-19, Tackle the Climate Crisis, and Secure Shared Prosperity through Cities.”

<sup>6</sup> CUT, 2019, “Climate Emergency, Urban Opportunity.”

<sup>7</sup> Vivid Economics, 2021, “Greenness of Stimulus Index: An Assessment of COVID-19 Stimulus by G20 Countries and Other Major Economies in Relation to Climate Action and Biodiversity Goals (February 2021 Release).”

<sup>8</sup> C40 Cities, 2020, “How to Build Back Better with a 15-Minute City.”

<sup>9</sup> See <http://www.citiesracetozero.org> and the listing of cities in the Climate Ambition Alliance, at <https://climateaction.unfccc.int/views/cooperative-initiative-details.html?id=94>.

<sup>10</sup> See World Bank GDP data (PPP, constant 2017 international dollars): <https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.KD?locations=IN>.

<sup>11</sup> Government of India, 2015, “Smart Cities Mission Guidelines.”

<sup>12</sup> Oxford Economics, 2018, “Global Cities: The Future of the World’s Leading Urban Economies to 2035.”

<sup>13</sup> UN DESA, 2018, “World Urbanization Prospects: The 2018 Revision.”

<sup>14</sup> UNDP, 2019, *Human Development Report 2019 – Beyond Income, beyond Averages, beyond Today: Inequalities in Human Development in the 21st Century*. Poverty is broadly concentrated in populous and landlocked states such as Bihar, Jharkhand, Uttar Pradesh and Madhya Pradesh.

<sup>15</sup> See UN-Habitat data: <https://data.unhabitat.org/datasets/proportion-of-urban-population-living-in-slums-time-period-between-1990-and-2018>. It is important to note that UN-Habitat and the Indian government measure slum populations differently, with UN-Habitat focusing on household conditions, while official estimates are based on neighbourhoods. For a more detailed discussion of these differences and yet another, even higher estimate of urban slum populations, based on various measures of deprivation, see Patel, Shah, and Beauregard, 2020, “Measuring Multiple Housing Deprivations in Urban India Using Slum Severity Index,” *Habitat International*. UN-Habitat data show the share of urban residents in slums at 54.9% in 1990, declining to 29.4% in 2010 and 24% in 2014 before rising to 35.2% in 2016 and 35.2% in 2018. The data do not indicate a reason for the rise.

<sup>16</sup> MoHUA, 2015, “Slums in India: A Statistical Compendium 2015”; Rains, Krishna, and Wibbels, 2018, “Urbanisation and India’s Slum Continuum: Evidence on the Range of Policy Needs and Scope of Mobility.” The latter, a study of over 8,000 households in Bangalore, Jaipur and Patna, found 70% of slum residents had been born in a slum.

<sup>17</sup> V. Kumar, 2020, “Why India’s Migrant Workers Are Returning to the Cities They Fled during the Covid-19 Lockdown,” *Scroll.In*.

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- <sup>18</sup> Rinju, 2020, “COVID-19: How Do India’s Urban Informal Settlements Fight the Pandemic,” *DownToEarth* (blog).
- <sup>19</sup> World Bank, 2020, “Beaten or Broken? Informality and COVID-19.”
- <sup>20</sup> V. Kumar, 2020, “Why India’s Migrant Workers Are Returning to the Cities They Fled during the Covid-19 Lockdown,” *Scroll.In*.
- <sup>21</sup> Mukhra, Krishan, and Kanchan, 2020, “COVID-19 Sets off Mass Migration in India,” *Archives of Medical Research*.
- <sup>22</sup> V. Kumar, 2020, “Why India’s Migrant Workers Are Returning to the Cities They Fled during the Covid-19 Lockdown,” *Scroll.In*; N, 2020, “No Jobs in Villages, Bihar’s Migrants Are Returning to Cities,” *IndiaSpend*.
- <sup>23</sup> Kochhar, 2021, “In the Pandemic, India’s Middle Class Shrinks and Poverty Spreads While China Sees Smaller Changes,” *Pew Research Center FactTank* (blog).
- <sup>24</sup> Paliath, 2021, “A Year After Exodus, No Reliable Data Or Policy On Migrant Workers,” *IndiaSpend* (blog).
- <sup>25</sup> See, e.g., WEF, 2021, “Indian Cities in the Post Pandemic World”; Kidwai, 2020, “COVID Exposes Underinvestment in Cities. India Must Rethink Its Approach for an Inclusive Future,” *The Indian Express*; Ravindra, 2020, “A Post-COVID-19 Plan for Future of Our Cities,” *Deccan Herald*.
- <sup>26</sup> Sankhe et al., 2020, “India’s Turning Point: An Economic Agenda to Spur Growth and Jobs.”
- <sup>27</sup> Murthy Salapaka, 2019, “Measurement of Informal Economy – Indian Experience”, drawing on national government statistics.
- <sup>28</sup> MSPI, 2020, “Periodic Labour Force Survey (PLFS) – Annual Report [July, 2018 – June, 2019],” Ministry of Statistics & Programme Implementation.
- <sup>29</sup> IWWAGE, 2020, “Women’s Work Participation Continues to Decline: Evidence from the Periodic Labour Force Survey, 2017-18,” *Initiative for What Works to Advance Women and Girls in the Economy* (blog).
- <sup>30</sup> Sircar, 2019, “Female Labour Force Participation: Asking Better Questions,” *Centre for Policy Research – Policy Challenges 2019–2024* (blog); Sundari, 2020, “Structural Changes and Quality of Women’s Labour in India,” *The Indian Journal of Labour Economics*. Notably, however, Sundari also found urban women were far likelier than their rural counterparts to be employed in the tertiary sector, an important advantage as farm jobs decline. The share of overall employment in agriculture, which has a majority-female workforce, shrank from 63.3% in 1991 to 42.6% in 2019. See World Bank data: <https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=IN>.
- <sup>31</sup> Madgavkar et al., 2019, “The Future of Women at Work: Transitions in the Age of Automation.”
- <sup>32</sup> Notably, the latest government data show 72.6% of urban men who are illiterate are employed, but only 21.9% of illiterate urban women – though the gap only narrows among workers with more than a high school education. See MSPI, 2020, “Periodic Labour Force Survey (PLFS) – Annual Report [July, 2018 – June, 2019],” Ministry of Statistics & Programme Implementation.
- <sup>33</sup> Li, 2019, “Falling Female Labor Force Participation in China and India,” *Pacific Exchange Blog, Federal Reserve Bank of San Francisco* (blog).
- <sup>34</sup> Sankhe et al., 2020, “India’s Turning Point: An Economic Agenda to Spur Growth and Jobs.”
- <sup>35</sup> Knight Frank, 2019, “Brick by Brick – Moving towards ‘Housing for All.’”
- <sup>36</sup> Sankhe et al., 2020, “India’s Turning Point: An Economic Agenda to Spur Growth and Jobs.”
- <sup>37</sup> MoHUA, 2021, “Annual Report 2020–21.”



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<sup>38</sup> Ibid. As of Dec. 31, 2020, PMAY(U) is estimated to have created 5.87 billion person-days of employment, which MoHUA translates into 5.9 million direct jobs and 15.4 million indirect jobs.

<sup>39</sup> Centre for Sustainability, 2020, “Paradox of Vacant Houses in India: Ahmedabad City.” There was a high vacancy rate overall, but it was higher in government housing. Notably, three years into Housing for All, it was reported that 164,000 units built under previous schemes were still vacant, mainly due to delays in allocating them. See Chandran, 2018, “Thousands of Low-Cost Homes Empty in India despite Urban Shortage,” *Reuters*.

<sup>40</sup> MoHUA, 2021, “Annual Report 2020–21.”

<sup>41</sup> Mahadevia, Mahendra, and Pai, 2018, “Ahmedabad: Town Planning Schemes for Equitable Development—Glass Half Full or Half Empty?”

<sup>42</sup> Tewari and Godfrey, 2016, “Better Cities, Better Growth: India’s Urban Opportunity”; Shaban, Kourtiti, and Nijkamp, 2020, “India’s Urban System: Sustainability and Imbalanced Growth of Cities,” *Sustainability*.

<sup>43</sup> Analysis by the Marron Institute of Urban Management, New York University. See Annex 3 for a detailed methodology.

<sup>44</sup> For a comparative analysis of how cities in India and other countries have expanded in recent decades, see Güneralp et al., 2020, “Trends in Urban Land Expansion, Density, and Land Transitions from 1970 to 2010: A Global Synthesis,” *Environmental Research Letters*.

<sup>45</sup> Kolb, 2019, “The Most Densely Populated Cities the World: Mumbai, India Tops List,” *24/7 Wall Street*.

<sup>46</sup> Analysis for the Coalition by the Marron Institute of Urban Management, New York University. See Annex 3 for a full description of the data sources, approach and limitations: <https://urbantransitions.global/urban-opportunity/seizing-the-urban-opportunity/annexes/>.

<sup>47</sup> Güneralp et al., 2020, “Trends in Urban Land Expansion, Density, and Land Transitions from 1970 to 2010: A Global Synthesis,” *Environmental Research Letters*.

<sup>48</sup> Population growth estimates are from the World Population Review website, which uses data from UN DESA, 2018, “World Urbanization Prospects: The 2018 Revision.” See Bengaluru estimates: <https://worldpopulationreview.com/world-cities/bangalore-population> and Ahmedabad estimates: <https://worldpopulationreview.com/world-cities/ahmedabad-population>.

<sup>49</sup> Bharti and Mehrotra, 2020, “Metropolitan Ahmedabad: Scaling Up with Contiguous Replication of Town Planning Schemes.”

<sup>50</sup> Sanyal and Deuskar, 2012, “Town Planning Schemes as a Hybrid Land Readjustment Process in Ahmedabad, India: A Better Way to Grow?,” in *Value Capture and Land Policies: Proceedings of the 2011 Land Policy Conference*; Mahadevia, Mahendra, and Pai, 2018, “Ahmedabad: Town Planning Schemes for Equitable Development—Glass Half Full or Half Empty?”

<sup>51</sup> Mathews et al., 2018, “State-Led Alternative Mechanisms to Acquire, Plan, and Service Land For Urbanisation in India.”

<sup>52</sup> Mehrotra et al., 2020, *Greater than Parts: A Metropolitan Opportunity (Vol. 1): Executive Summary and Synthesis Report*.

<sup>53</sup> MoHUA, 2021, “Annual Report 2020–21.”

<sup>54</sup> MetroLite and MetroNeo are meant for Tier 2 cities, the next size class after India’s top eight (metropolitan) cities, with populations from about 500,000 to several million. The latest list is at <https://www.mod.gov.in/dod/sites/default/files/hra.pdf>.

<sup>55</sup> Government of India, 2021, “Expenditure Profile 2021–2022.” Spending in fiscal 2019–2020 was Rs. 18,162 crore. The revised estimate for fiscal 2020–2021, which reflects sharp cuts across a wide range of government programmes, is Rs. 6,4836 crore.

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- <sup>56</sup> See Section 10 of MoHUA, 2021, “Annual Report 2020–21.”
- <sup>57</sup> Errampalli, Patil, and Prasad, 2020, “Evaluation of Integration between Public Transportation Modes by Developing Sustainability Index for Indian Cities,” *Case Studies on Transport Policy*; M. Kumar et al., 2016, “Informal Public Transport Modes in India: A Case Study of Five City Regions,” *IATSS Research*; Shah and Adhvaryu, 2016, “Public Transport Accessibility Levels for Ahmedabad, India,” *Journal of Public Transportation*.
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- <sup>108</sup> See IEA “Electricity Generation by Source” data, <https://www.iea.org/countries/india>.
- <sup>109</sup> See Ministry of New and Renewable Energy data: <https://mnre.gov.in/the-ministry/physical-progress> and Ministry of Power “Power sector at a glance” data: <https://powermin.gov.in/en/content/power-sector-glance-all-india>. The latter shows total installed capacity at the end of February 2021 was 379.1 GW.
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- <sup>119</sup> This analysis estimates global urban GHG abatement potential using a bottom-up assessment of mitigation options in urban buildings, transportation, infrastructure construction and waste management. For a detailed methodology, including assumptions and data sources, see Annex 1: <https://urbantransitions.global/urban-opportunity/seizing-the-urban-opportunity/annexes/>.
- <sup>120</sup> Modelling for the Coalition by Vivid Economics. See Annex 2 for a detailed methodology: <https://urbantransitions.global/urban-opportunity/seizing-the-urban-opportunity/annexes/>.
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The Coalition partners listed endorse the general thrust of the arguments, findings and recommendations made in this report.\*

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