iihs™
INDIAN INSTITUTE FOR
HUMAN SETTLEMENTS

Urban India 2015 : Evidence

iihs™

INDIAN INSTITUTE FOR
HUMAN SETTLEMENTS

Urban India 2015: Evidence

CREDITS

EDITOR: Aromar Revi

LEAD AUTHORS: Arindam Jana, Teja Malladi

CONTRIBUTING AUTHORS: Geetika Anand, Shriya Anand, Amir Bazaz, Gautam Bhan, Mohan Raju JS, Jyothi Koduganti, Vishnu MJ, Pooja Rao, Neha Sami, Sonal Shah

IMAGES:
Cover Image - Mumbai: Neha Sami, IIHS
Demographic Dynamics - Bengaluru: Zohrab Reys Gamat, IIHS
Urban Economy - Sholapur: Shriya Anand, IIHS
Poverty, Inequality and Exclusion: Shriya Anand, IIHS
Housing - Bengaluru: Neha Sami, IIHS
Urban Water Supply and Sanitation - Katihar(Bihar): Geetika Anand, IIHS
Urban Transportation - Jaipur: Vikrant M S, IIHS
Energy - Ahmedabad: Neha Sami, IIHS

ACKNOWLEDGEMENTS: Madhav Pai, Abhijit Lokre

DESIGN AND LAYOUT: Arindam Jana, Teja Malladi, Vikrant MS

TABLE OF CONTENTS

Introduction

Urban India 2015: Evidence

There is a growing acknowledgement of the need to effectively manage India's urban transition to achieve sustainable and inclusive development. The contemporary political and policy discourse places increasing emphasis on cities and urban regions as sites for intervention, investment, and employment generation. This is articulated through various national missions and programmes such as the AMRUT, Make in India, Skill India, Housing for All, Smart Cities and Swachh Bharat missions, which are anticipated to help define the contemporary urban policy and implementation frame.

Multiple state governments and Urban Local Bodies (ULBs) are simultaneously working on policy and implementation initiatives that are relevant to their development contexts, priorities and constraints. As India's governance frame embraces a greater role for state governments and ULBs via a process of cooperative and sometimes competitive federalism, local and regional implementation is where the innovation and transformational potential will lie.

Given the diversity and complexity of India, there is a need to assess how national dynamics, political economy, and policies will be influenced by regional and local contexts. In particular, the challenge that Indian policymakers face is to move from policy to implementation in a variegated and shifting landscape of urbanisation. The Urban India 2015: Evidence book is a step towards providing a robust empirical basis for such discussions.

Building on the foundation created by IIHS in its 2011 publication titled Urban India 2011: Evidence, this publication brings together evidence on the current state of India's urban settlements across six key sectors: economic development, urban poverty and inequality, housing, urban water supply and sanitation, transport, and energy. It attempts to provide an empirical base for conversations around the formulation, implementation and impact of urban programmes by bringing together analysis, information, and visualisations that challenge and nuance the dominant narrative of Indian urbanisation.

This analysis is based on a unique geo-coded database created at IIHS, which contains spatial locations of all 0.6 million urban and rural settlements over 2001 and 2011. Mapping this database along with various Census variables allows us to gain in-depth insights about national and regional development trends at a settlement level, shifting the discourse significantly from states and districts as units of analysis. It also draws upon the most recent available data from the Census of India, the National Sample Survey Organisation, the Central Statistical Organisation, as well as policy documents, committee reports and other secondary sources.

The opening section of this book looks closely at the standard narrative of Indian urbanisation: its top-heavy nature, the potential demographic dividend that could be the base of an employment and growth transition, and the potential impacts on economic and social inequalities.

Our analysis unsettles this narrative. One: it demonstrates the emergence of high density population clusters around established urban centres accompanied by a massive increase in people living in settlements with between 5,000 and 20,000 people. This points to a "grey" population that remains classified as rural but is increasingly urban in character as well as deeply connected to established urban spaces and their economic and social development.

Two: improvements in socio-demographic variables like sex ratios and workforce participation show persistent regional differentiation despite overall improvements. This indicates the need for regionally disaggregated approaches to managing urbanisation rather than sweeping national imaginations and public policy interventions.

Three: we juxtapose the hypothesised benefits of our demographic dividend against the reality of inadequate education, skill development and low workforce participation rates. This suggests that we may not only lose the benefits of our young population but also that our urban areas may be accumulating serious social, economic and political risk through a concentration of unemployed, semi-educated youth in inadequately governed environments.

The discussion then shifts to an in-depth examination of a set of key sectors: Urban economy, poverty, housing, transport, urban water supply and

Urban India 2015: Evidence

sanitation, and energy. While the analyses have been organised into thematic sections, the purpose of this book is to also allow readers to make connections and inter-linkages across these sectors.

The growth of India's urban economy significantly accelerated following liberalisation in 1991, driven largely by the services sector. This has been accompanied by concerns about the employment intensity of growth, with job creation massively lagging the increase in new entrants to the urban labour force. The largest increase in employment during the past decade has come from the construction sector, which has largely created poor quality jobs without providing security. This national narrative masks significant regional economic variation, within which the urban transition is taking place.

The poverty chapter questions the current measurement frame, and asks what are the necessary bundles of assets, goods and services that urban residents need to live a dignified life in Indian cities. In spite of a rapid decline in consumption-based poverty, we find significant variation between the status of different socio-economic groups, pointing to deepening urban inequality and a replication of rural exclusion. Disaggregated analyses by rural areas, large cities and other urban settlements, underlines the fact that vulnerability and deprivation are often concentrated in smaller urban centres and in particular locations in larger cities and metropolitan regions. While arguing for a broader notion of the term poverty, we offer alternative notions such as the Proxy Wealth Index and Quality of Housing Index, based on ownership of assets as well as access to infrastructure and services across the six largest Indian cities.

'Affordable Housing' has become a common term within policy circles ranging. It is the subject of central policies like 'Housing for All by 2022' as well as a priority sector for banking. It is referred to frequently in descriptions of an emerging and untapped housing market but also figures prominently within civil society activism around housing rights. Yet, little clarity exists on what 'affordable' housing for urban India really is and how it should feature as an object of public policy. The housing chapter argues that this lack of clarity allows policy perceptions of 'affordability' to be disconnected from the actual existing demand for low-income urban households who face the brunt of housing shortage, inadequacy and poverty.

The next chapter examines the urban water supply and sanitation sector. Nearly40 per cent of urban households do not have access to treated tap water and around 13 per cent still defecate in the open. Of more concern is the fact that almost 88 per cent of waste is unsafely let into the environment leading to health hazards and pollution. Our analysis in this chapter looks at the state of delivery of urban water and sanitation services in India in the broader context of available resources both at the national and local levels.

The transport chapter marks the absence of a comprehensive or conclusive empirical picture of mobility in Indian cities. Within what we know, it marks a particular cusp where walking, bicycling and public transport remain the dominant ways of moving about Indian cities. This is changing rapidly due to increasing sprawl, declining densities and increasing trip lengths, the rapid growth of two-wheeler and car sales and consequent massive congestion, an epidemic of road accidents, and large cities that have amongst the worst air quality in the world. It argues for a more rigorous debate on the relationship between mobility, inclusion, public health and the environment, and the relationship between planning, economic development, mobility infrastructure choices and the dynamics of future travel demand.

The concluding chapter examines the urban energy sector, focusing particularly on residential energy use. It maps the energy and carbon emissions profile of the country. The analysis shows that income and population growth are the major drivers of energy use and carbon emissions in India. In addition, over 2006-10, energy intensity improvements have slackened along with an increasing carbonisation of the energy system. Going forward, providing universal energy access, addressing energy security concerns amidst complex geopolitics, wide scale and supply-linked power sector reform and aligning domestic policy with the globally agreed climate change agenda will be the key elements of sustainable energy and climate policy.

CHAPTER 6

URBAN TRANSPORTATION

Introduction

Urban population growth in the last two decades has been accompanied by sprawl, congestion and degradation of public health due to disjointed planning, and inadequate quality public transport systems and non-motorised transport infrastructure. Mobility in urban India is at a cusp—with a medium to high increase in per capita trip rates and travel distances, but decreasing non-motorised shares and sharply dropping public transport trips. Simultaneously, 42 per cent of urban households continue to own at least one bicycle. The urban monthly household transport expenditure for the bottom two deciles has stubbornly remained around 2 per cent over 1999-2012. The trajectory and growth of India's urban transport and mobility sectors will be determined by policy decisions and investments in the next 15 years.

While JnNURM has channelled investments in transport systems for some of India's largest cities, their level and quality needs to be more responsive to safety, health, affordability and environmental concerns. More attention needs to be focused on the mobility needs of people, not only in rhetoric but through tangible goals, policies and projects. However, as the National Transportation and Development Policy of 2014 pointed out, a comprehensive or conclusive picture of an urban transport baseline is still elusive. The data for each city varies significantly across studies depending on methodology, type, and location of surveys. Non-motorised transport tends to be under-reported, whereas gender and income disaggregated dimensions of urban travel are generally absent.

Even with lower vehicle ownership (per 1,000 persons), the negative externalities of increased motorisation are apparent. In 2010, road traffic accidents emerged as the tenth major cause of deaths, predominantly affecting the 25-65 year age group. Pedestrians, two-wheelers and bicyclists are the most vulnerable constituting between 60-90 per cent of the deaths. In addition, with more than 50 per cent of transport-related investments going to roads, issues of poor pedestrian and bicycle infrastructure, road design enabling high vehicular speeds, unsafe vehicle design, lack of enforcement, and undercounting and lack of expertise dealing with road safety will need to be urgently addressed.

Similarly, around 0.62 million premature deaths occur annually due to air pollution related diseases. While the conversion to Compressed Natural Gas (CNG) yielded environmental benefits, Particulate Matter (PM) 10 and PM 2.5 have increased post 2007-08. Suspended PM10 and nitrogen dioxide levels are high in 42 million-plus cities and critical in 8. The next round of reforms needs to move from improving fuel and car technologies to purposefully shifting people towards public and non-motorised transport, and reduce reliance on and increase regulation of motorised travel.

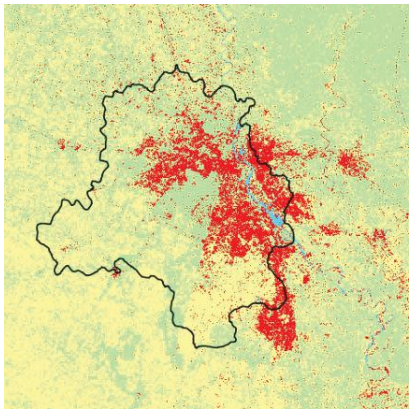
Currently, 96 Indian cities have organised and regulated public transport systems. City buses are the back bone of India's urban transport system, but face increasing challenges in obtaining land for parking and maintenance, declining fleet sizes, cost recovery, dedicated and quality infrastructure, and efficient route planning and operations.

Bus Rapid Transit Systems (BRTS) are now operational in 8 cities with a network length of 188 km serving 0.4 million persons daily. However, they have faced challenges in expanding their network after initial operations. Metro rail systems are operational in 7 cities with a network length of 274 km serving 3.5 million persons daily. A comparison of both systems reveals that the cost per Km of the Metro in Delhi and Jaipur is 23 times that of their respective BRTS. While Metros have been planned for 40,000-50,000 passengers per direction but the observed peaks are only a third to a quarter of this capacity. Moving forward the efficacy of transit systems vis-à-vis travel demand will need to be critically evaluated along with life cycle costs for operation, maintenance and environmental impact.

Over the last decade, 4 trillion rupees were channelled to urban transport, of which 52 per cent was spent in road infrastructure. An additional 1 trillion rupees were invested in Metro rail systems. According to the Working Group on Urban Transport, an annual investment of 800 billion rupees over the next 15 years (2015-2030) will be required to enable sustainable transport in India. However, urban transport is induced by and closely linked with urban growth policies. Planning responses which enhance and emerge from the dense, mixed use contexts of Indian cities will be critical to reduce, regulate or avoid motorised travel. Finally, the need for a systems approach supported by a dedicated transport fund and coordinated institutional structures is underscored.

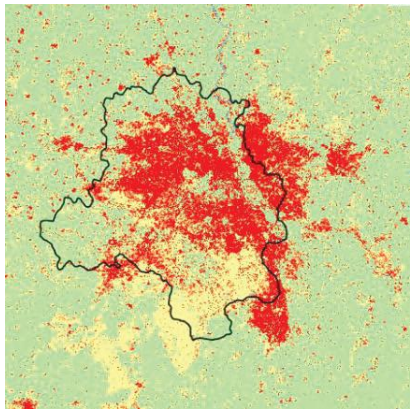
Urban Growth and Travel | Delhi | 1992 - 2011

1992



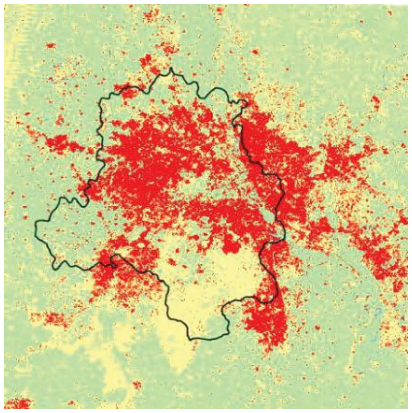
Population: 8.7 million
Built up area : 521 km^2
Density: 167 persons per hectare

2000



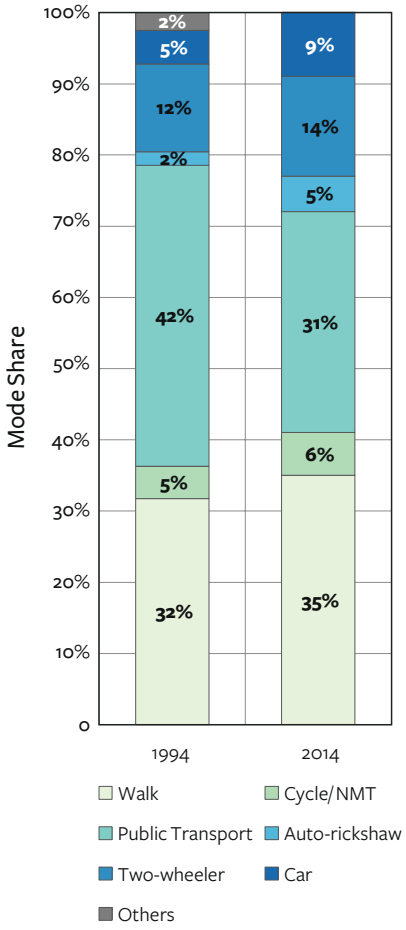
Population: 13.7 million
Built up area: 978 km^2
Density: 140 persons per hectare

2011



Population: 16.3 million
Built up area: 1108 km^2
Density: 147 persons per hectare

Trends in Modal Split, Delhi

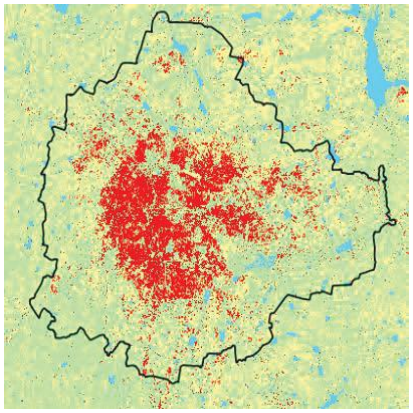


Delhi's physical footprint doubled over 1992-2011, while its people density reduced by 14 per cent. During this time, public transport modal shares reduced to 31 per cent, even after the Metro commenced operations in 2002. Four-wheeler modal shares doubled and pedestrian modal shares marginally increased, while their fatalities increased from 42 per cent to 55 per cent of the total road accident deaths. It was observed that 40 per cent of Delhi's roads did not have a pedestrian refuge, and motor vehicle mobility was prioritised through foot over bridges and subways.

Source: Tiwari, 2003; Tiwari and Jain, 2013; HPC, 2014; Sudhira, 2011;

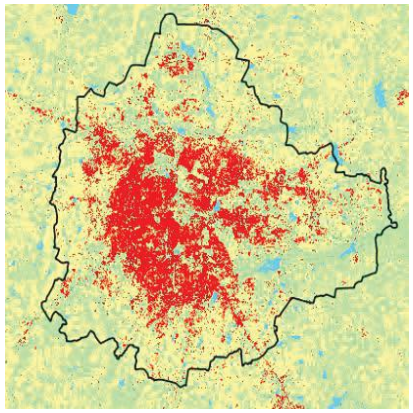
Urban Growth and Travel | Bengaluru | 1992 - 2009

1992



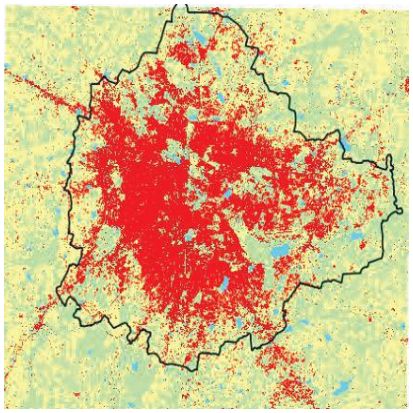
Population: 3.4 million
Built up area : 162 km^2
Density: 210 persons per hectare

2001



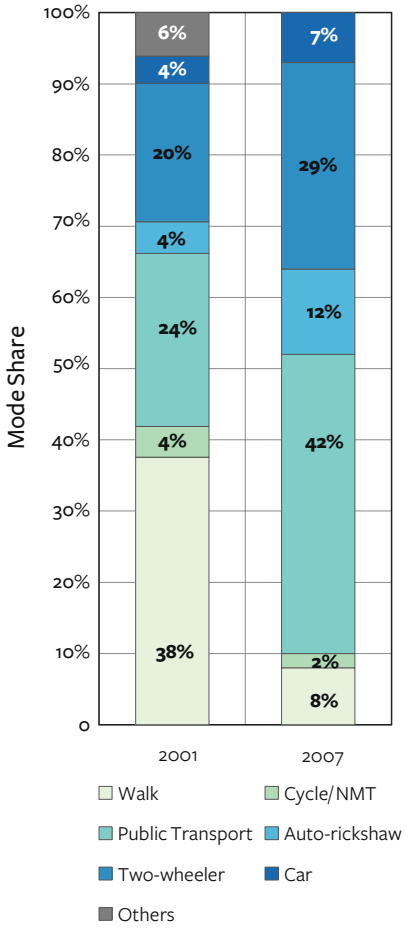
Population: 5.7 million
Built up area: 195 km^2
Density: 292 persons per hectare
Trip distance: 7.1 Km

2009



Population: 8.2 million
Built up area: 389 km^2
Density: 219 persons per hectare
Trip distance: 10.5 Km

Trends in Modal Split, Bengaluru

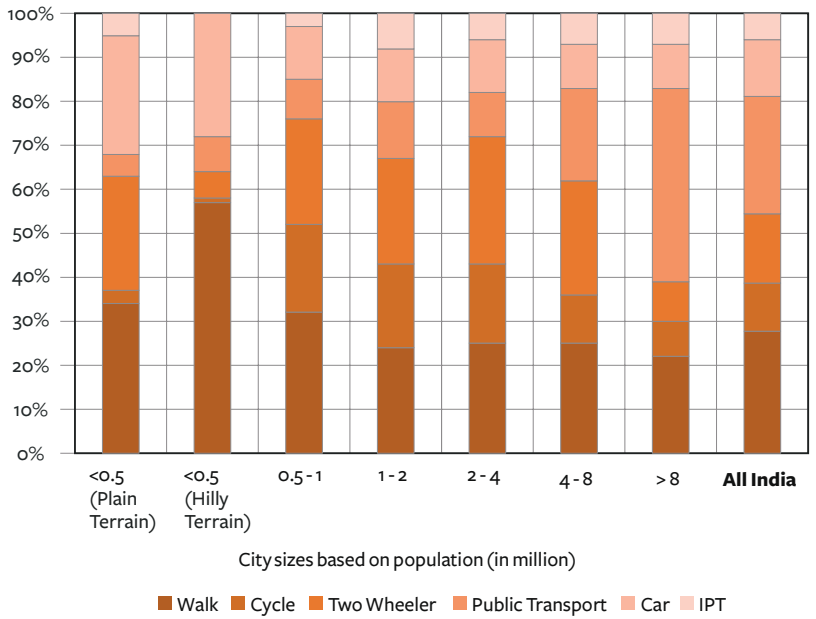


Over 2001-09, Bengaluru's physical footprint increased by 194 km^2, whereas people density reduced by 34 per cent. Trip distances increased from 7.1 km in 2001 to 10.5 km in 2007. The walking modal shares sharply reduced from 42 per cent to 10 per cent and pedestrian fatalities increased from 37 per cent to 44 per cent. However, Bengaluru's public transport modal shares almost doubled due to expansion and improvement of Bangalore Metropolitan Transport Corporation's (BMTC) services.

Source: RITES, 2007; Mahendra and Chanchani, 2014; Gota and Mutalik, 2007; WSA, 2008; Tiwari and Jain, 2013 ; Sudhira, 2011

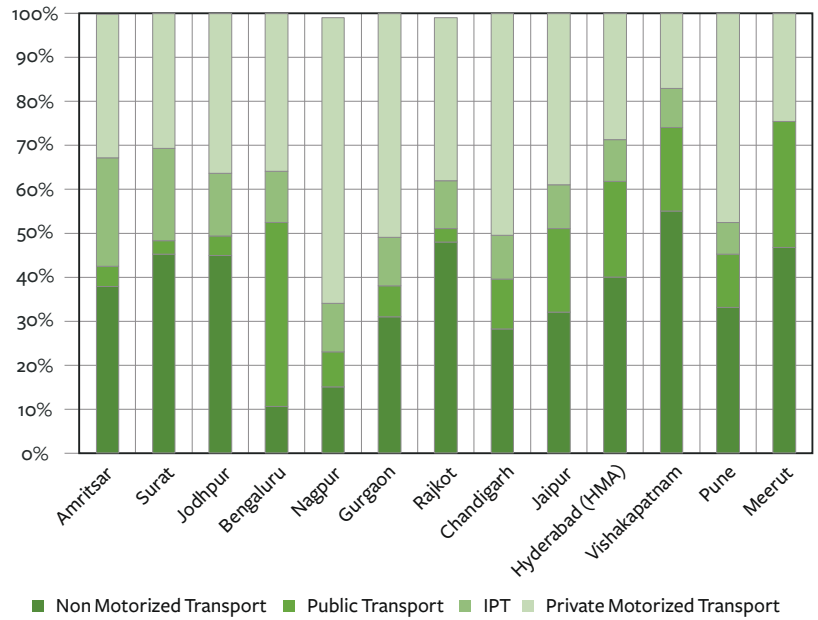
Modal Splits in Urban Areas

Modal Splits across City Sizes



Source: WSA, 2008

Modal Splits in Select Cities



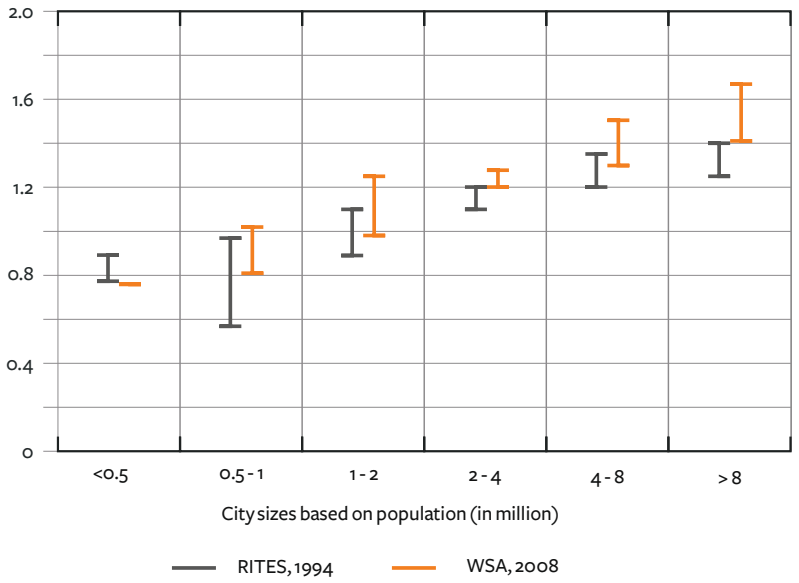
Source: Comprehensive Mobility Plans and Traffic and Transportation Studies (various years)

According to a national level study commissioned in 2008 by the Ministry of Urban Development, more than half the trips in cities above 0.5 million and 75 per cent of the trips in the metros were by non-motorised and public transport. In comparison, private motorised modes constituted between 19-41 per cent of trips.

City specific studies broadly follow national trends with some important differences. Data from 13 cities reveal that public and non-motorised transport modal shares account for between 25 to 75 per cent of all trips. Even though close to half the trips in Pune, Chandigarh and Gurgaon are by private motorised modes, a quarter to a third of the trips are by non-motorised transport. Bengaluru has the highest public transport modal share (42 per cent) followed by Chennai (31 per cent) and Meerut (29 per cent). In Amritsar, Surat and Jodhpur, intermediate para-transport filled the role of public transport services.

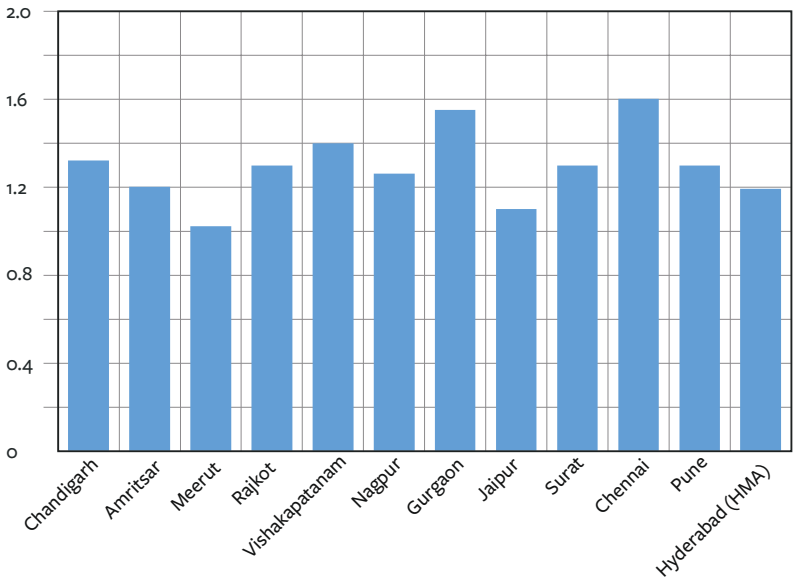
Per Capita Trip Rates in Urban Areas

Comparison of Per Capita Trip Rate across City Sizes | 1994 and 2008



Source: WSA, 2008

Per Capita Trip Rate across Select Cities

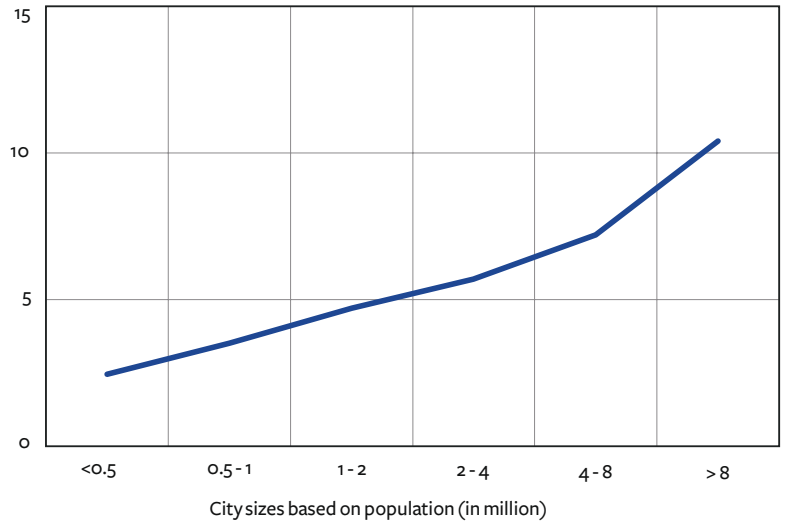


Source: Comprehensive Mobility Plans and Traffic and Transportation Studies (various years)

An analysis of travel patterns in 1994 and 2008 indicates that per capita trip rates have increased across all city sizes with a sharper increase in cities with populations greater than 8 million. The per capita trip rates for 14 cities varied from 1.02 (Meerut) to 1.6 (Chennai).

Trip Lengths in Urban Areas

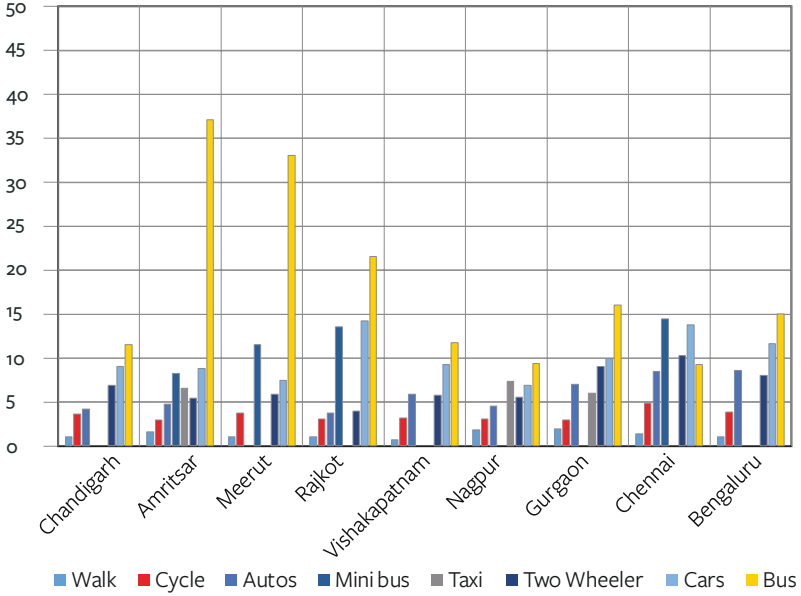
Trip Length across City Sizes (km) | 2008



Source: WSA, 2008; Tiwari, 2011

The average trip length in cities with populations of up to 2 million is less than 5km, making non-motorised transport a viable commuting option. However, even in cities like Mumbai and Hyderabad, 80 per cent of the trips are less than 10 km in length and 70 per cent of the trips are less than 5 km.

Average Trip Lengths by Mode (km)

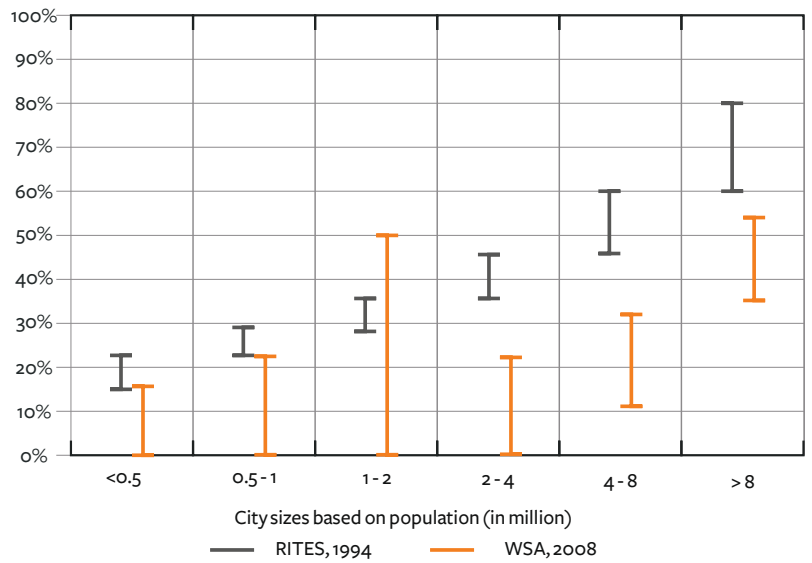


Source: Comprehensive Mobility Plans and Traffic and Transportation Studies (various years)

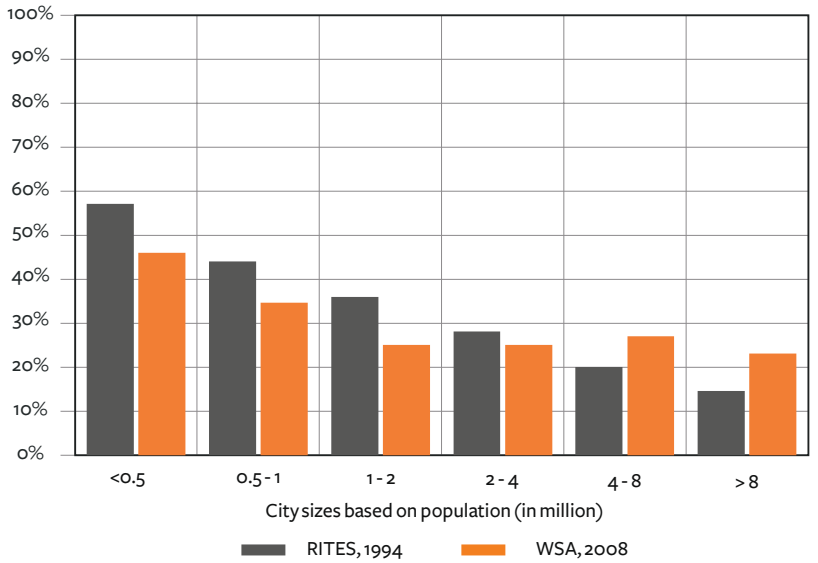
Trip lengths varied significantly across modes. The average trip lengths for walking and cycling is 1.3 and 3.5 km respectively, whereas those for auto-rickshaws and two-wheelers were 6 and 7 km. Cars, mini-buses and buses catered to longer travel distances of 10, 12 and 18 km respectively.

Public Transport Shares, Walk Shares and Journey Speed

Comparison of Public Transport Shares across City Sizes | 1994 and 2008



Comparison of Share of Walk Trips across City Sizes | 1994 and 2008

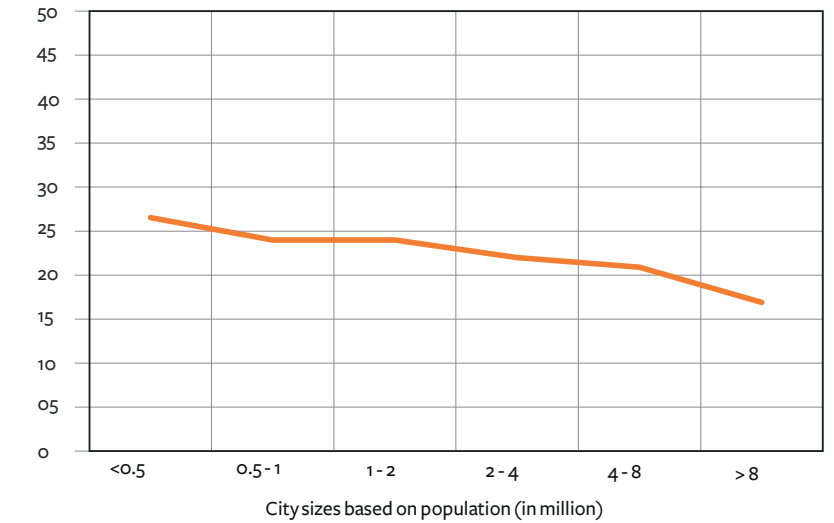


Public transport modal shares reduced in all cities over 1994-2008. The share of walk trips declined by 11 per cent in cities with populations of up to 2 million and increased by 7-10 per cent in cities with populations greater than 4 million.

The average journey speeds reduced with city size, from 24 kmph for cities with a population of 1-2 million to 17 kmph for cities with populations greater than 8 million.

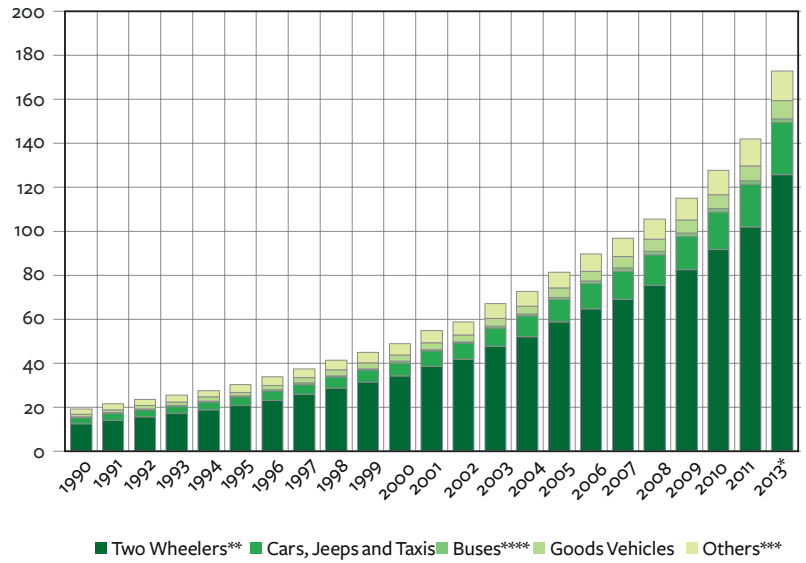
Source: WSA, 2008

Average Journey Speed (kmph) | 2008



Growth of Motorised Vehicles and Vehicle Ownership

Total Registered Motorised Vehicles (in millions) | 1990 - 2013



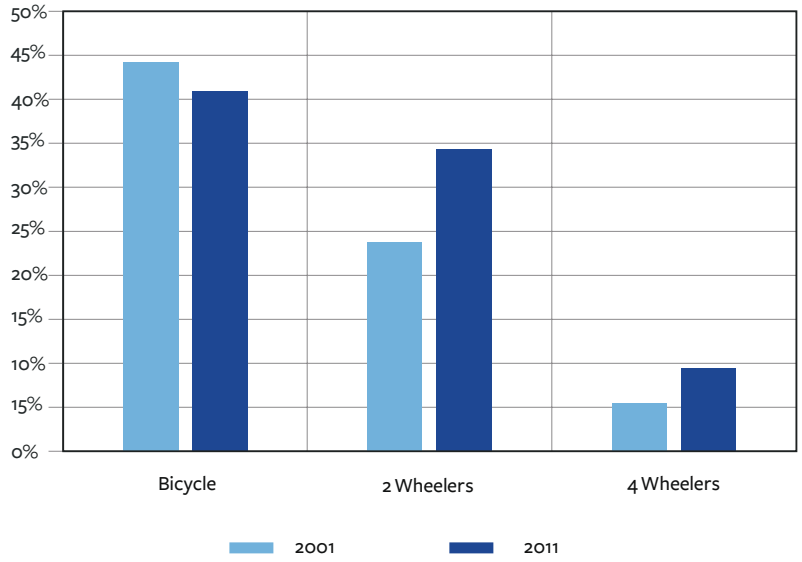
Source: MoRTH, 2013; Indiastat, 2013

Nationally, the number of private motorised two-wheelers increased nine times from 14 million (66 per cent) in 1991 to 126 million (73 per cent) in 2013. The share of buses reduced from 1.5 per cent in 1993 to 1 per cent in 2013, even though absolute numbers increased from 0.3 million to 1.7 million.

Amongst million-plus cities during 2002-2012, Pune recorded the highest compounded annual growth rate of 13 per cent followed by Kochi (12 per cent), Coimbatore (12 per cent), Madurai (11 per cent), Chennai (10.8 per cent), Kanpur (10.7 per cent) and Hyderabad (10.6 per cent).

NOTE:
* Provisional
** Two-wheelers include auto-rickshaws for the years 1963 and 1968.
*** Others include tractors, trailers, three wheelers, LMV and other miscellaneous vehicles
**** Buses Includes Omni buses since 2001.

Percentage of Urban Households with Private Vehicle Ownership | 2001 and 2011

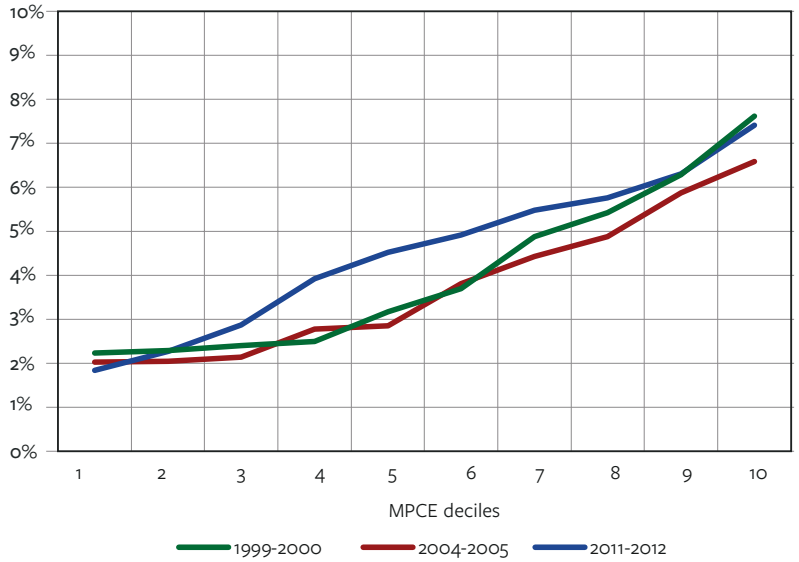


Source: Census of India, 2001 and 2011

Over 2001-2011, the share of households across India owning two-wheelers increased from 24 per cent (13 million) to 34 per cent (27 million). The number of households owning bicycles increased from 25 million to 33 million, even as their share reduced by 3 per cent. However, an overwhelming 41 per cent of urban households in India own at least one bicycle.

Household Expenditure on Conveyance

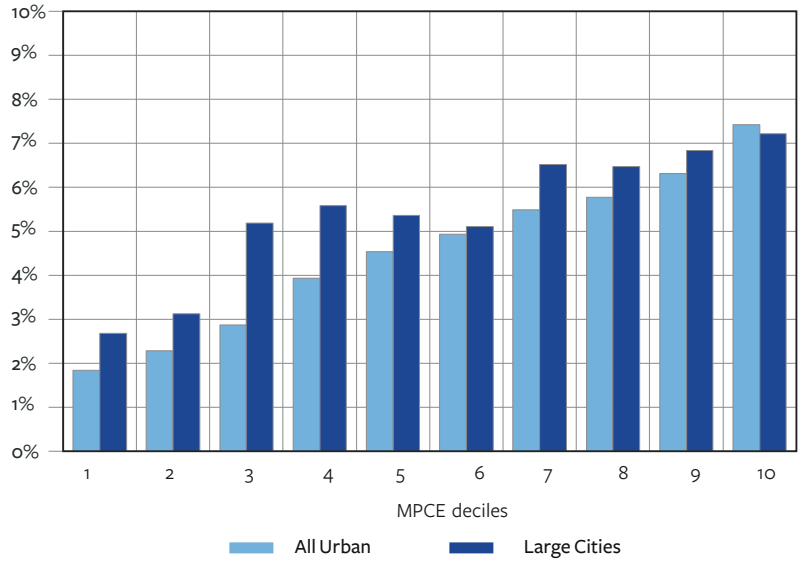
Urban India | Share of Median Monthly Household Travel Expenditure 1999-2012



Source: NSSO 55th, 61st, and 68th Rounds

From 1999-2012, the monthly household travel expenditure stayed around 2 per cent for the bottom two decile classes. However, travel expenditure for the fourth to seventh deciles increased by 2.5 to 3 times over 2004-11.

Urban India and Large Cities | Share of Median Monthly Household Travel Expenditure | 2011-2012

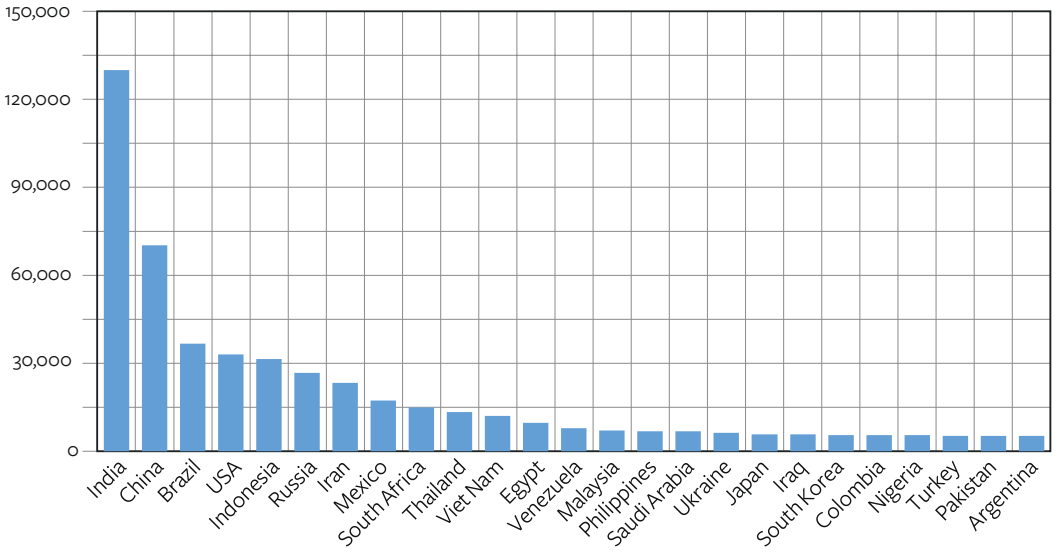


Source: NSSO 68h Round

In 2011, the monthly household travel expenditure in large cities was 1.2-2.5 times of that for all of urban India.

Road Safety in India

25 Countries with the Highest Number of Road Traffic Fatalities | 2010

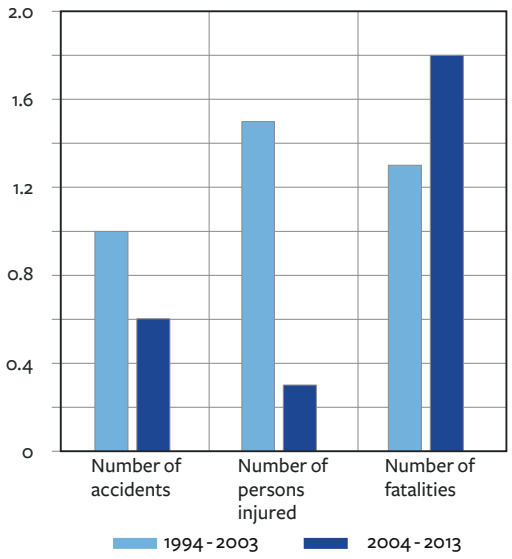


Source: World Health Organization, 2013

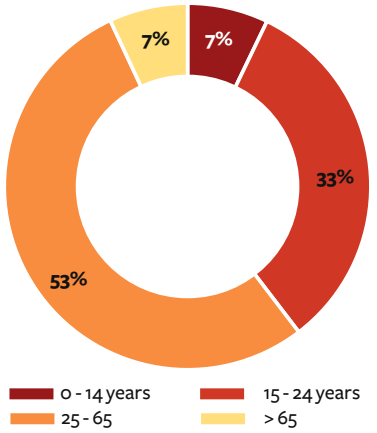
According to the World Health Organization, India reported the highest number of road fatalities (0.13 million) amongst 182 countries in 2010. It was the tenth leading cause of deaths in India. One-third of all accidental deaths were road fatalities. In 2013, India reported 0.49 million road accidents, 0.49 million injuries and 0.14 million road traffic deaths. This accounts for 1 road accident per minute and 1 road accident death every 4 minutes.

While the number of road accidents and injuries has decreased over 2004-2013, the number of fatalities has increased. The majority of the victims came from younger population groups with 40 per cent in the 0-24 age group and 53 per cent from the 25-65 age group.

Compounded Annual Growth of Accidents, Persons Injured and Fatalities | 1994-2003, 2004-2013



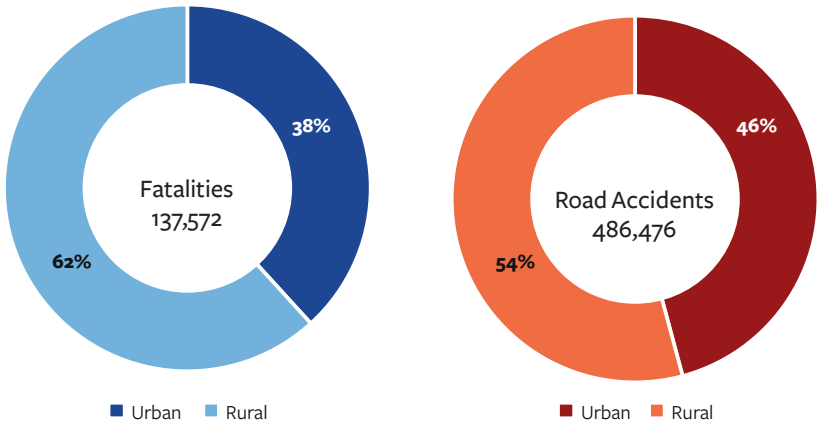
Age Profile of Accident Victims | 2013



Source: MoRTH, 2014

Road Safety in Urban Areas

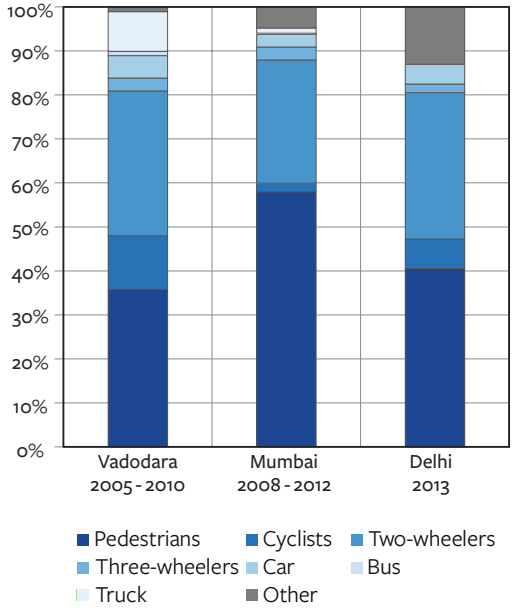
Urban and Rural Share of Road Accidents and Fatalities | 2013



Source: MoRTH, 2014

Urban areas contributed to 46 per cent of total accidents and 38 per cent of total fatalities.

Fatality by Road Users in Select Cities

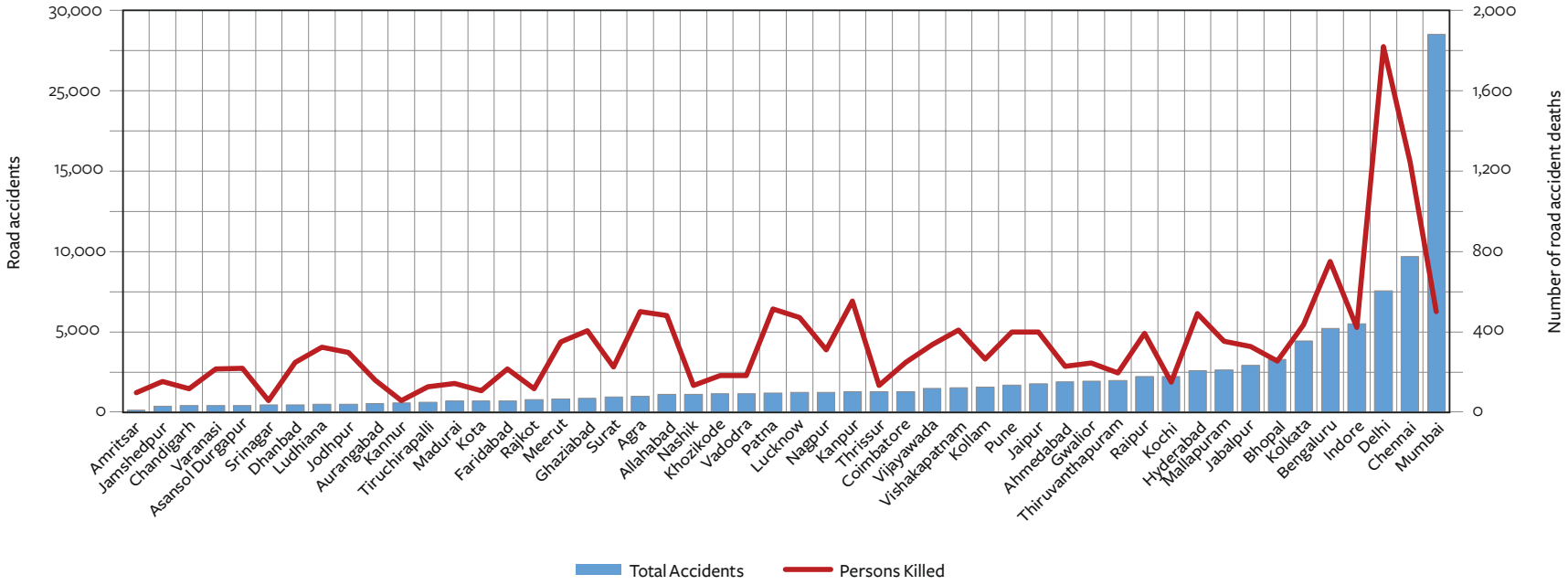


Source: Geetam Tiwari (2013) for Vadodara;
MoRTH (2013) for Delhi and EMBARQ India (2013) for Mumbai

In urban areas, pedestrians, bicyclists and two-wheelers constituted 60-90 per cent of road accident fatalities.

Road Safety in Million Plus Cities

Total Road Accidents and Number of People killed in 50 Million-plus Cities | 2013



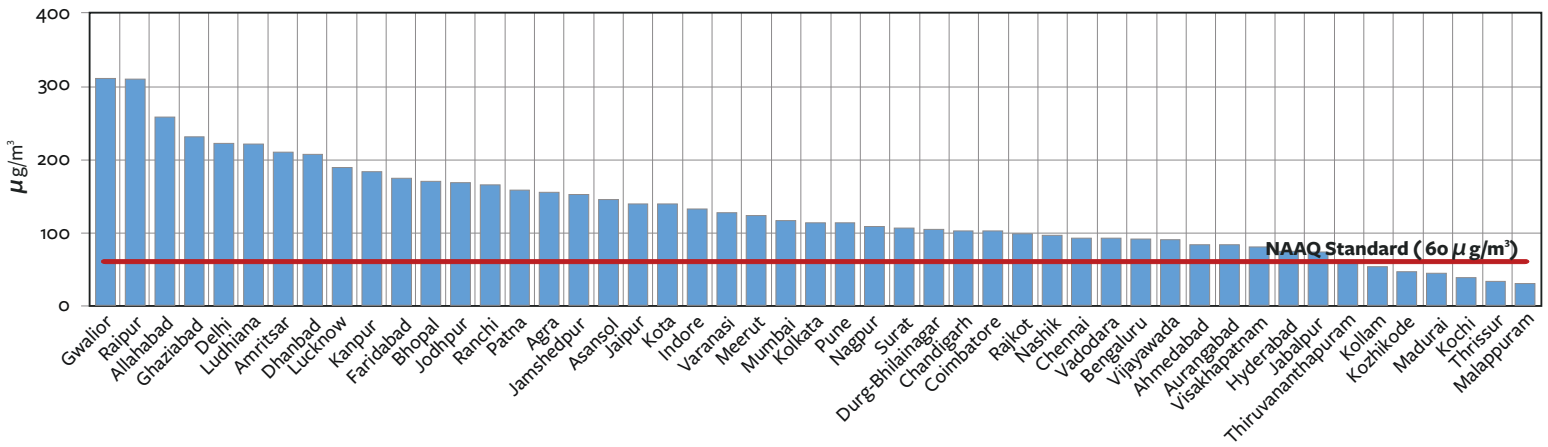
Source: MoRTH, 2013

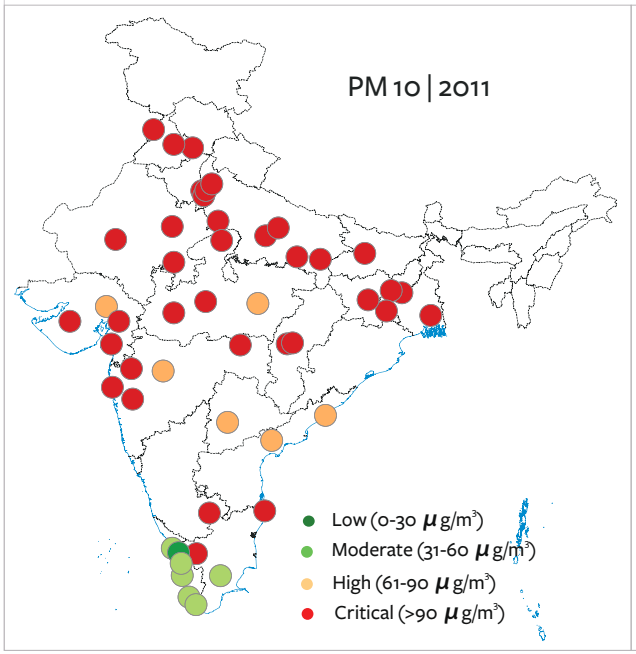
In 2013, 50 cities with populations of over a million contributed to half (0.1 million) of total urban road accidents and 32 per cent (17,000) of urban road accident deaths.

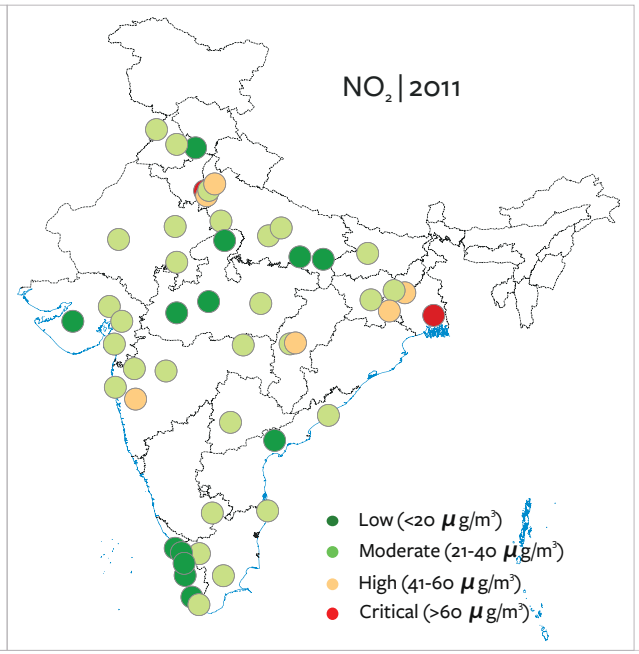
Six cities — Mumbai, Chennai, Delhi, Indore, Bengaluru and Kolkata — contributed to 25 per cent (56,000) of all urban road accidents in 2013. Delhi had the highest number of urban road fatalities (1,820) followed by Chennai (1,247).

Air Pollution in Million Plus Cities

Levels of Suspended Particulate Matter (PM10) in Million-plus Cities, 2011

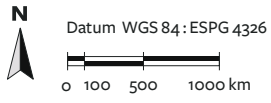




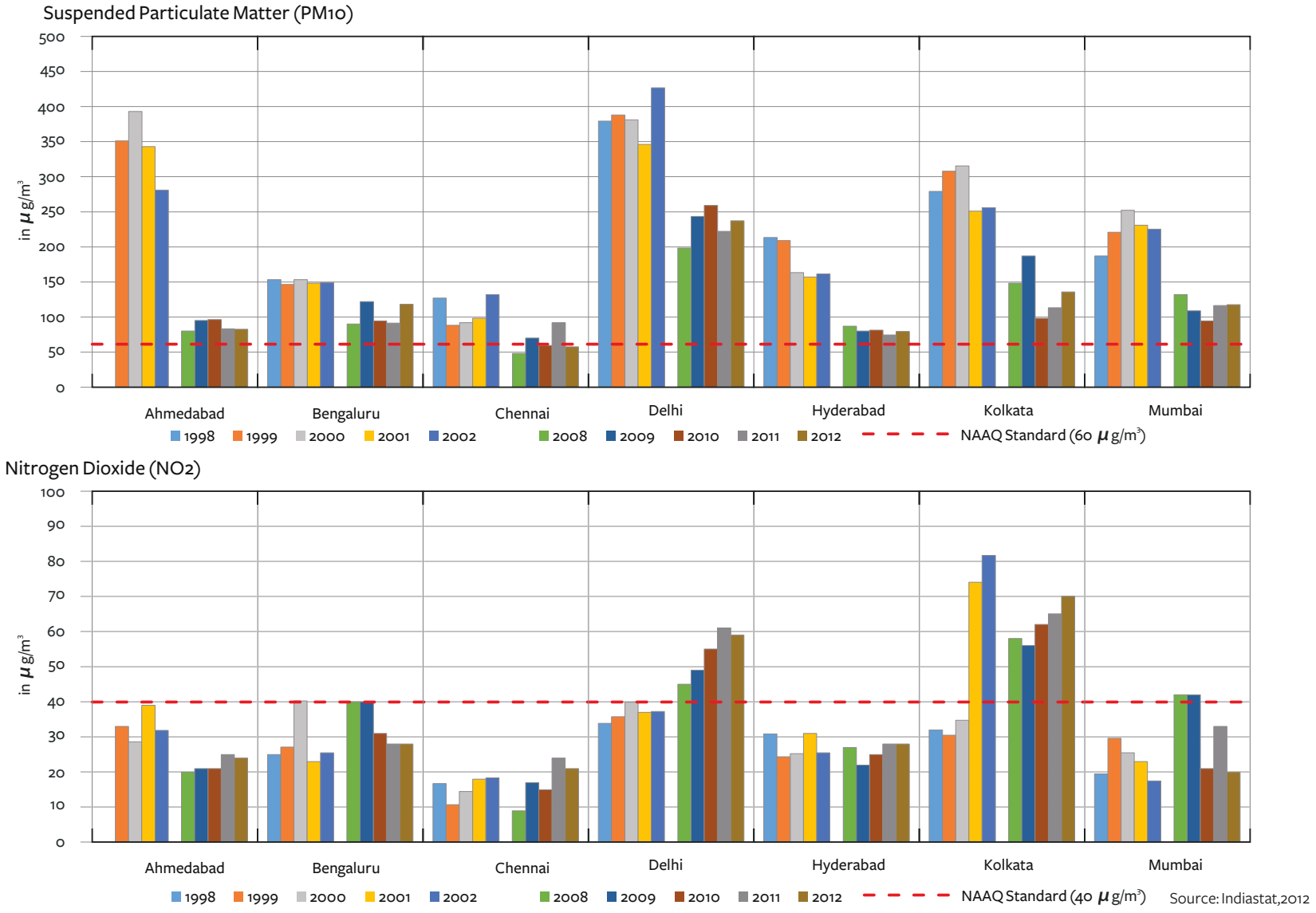


The Global Burden of Disease (2013) Report ranked outdoor air pollution as the fifth leading cause of death in India. Around 0.62 million premature deaths occur annually due to air pollution related diseases. Suspended particulate matter was at high and critical limits across 42 million-plus cities. Nitrogen dioxide was at high and critical levels in 8 cities.

Source: Indiastat 2011; CPCB ,2011



Air Pollution in Metros



Source: Indiastat,2012

Though PM10 has reduced from 1998-2002 levels, it began to increase from 2008 onwards and reached critical levels in the metros. Nitrogen dioxide remains within low and moderate limits across the metros, except for Delhi and Kolkata.

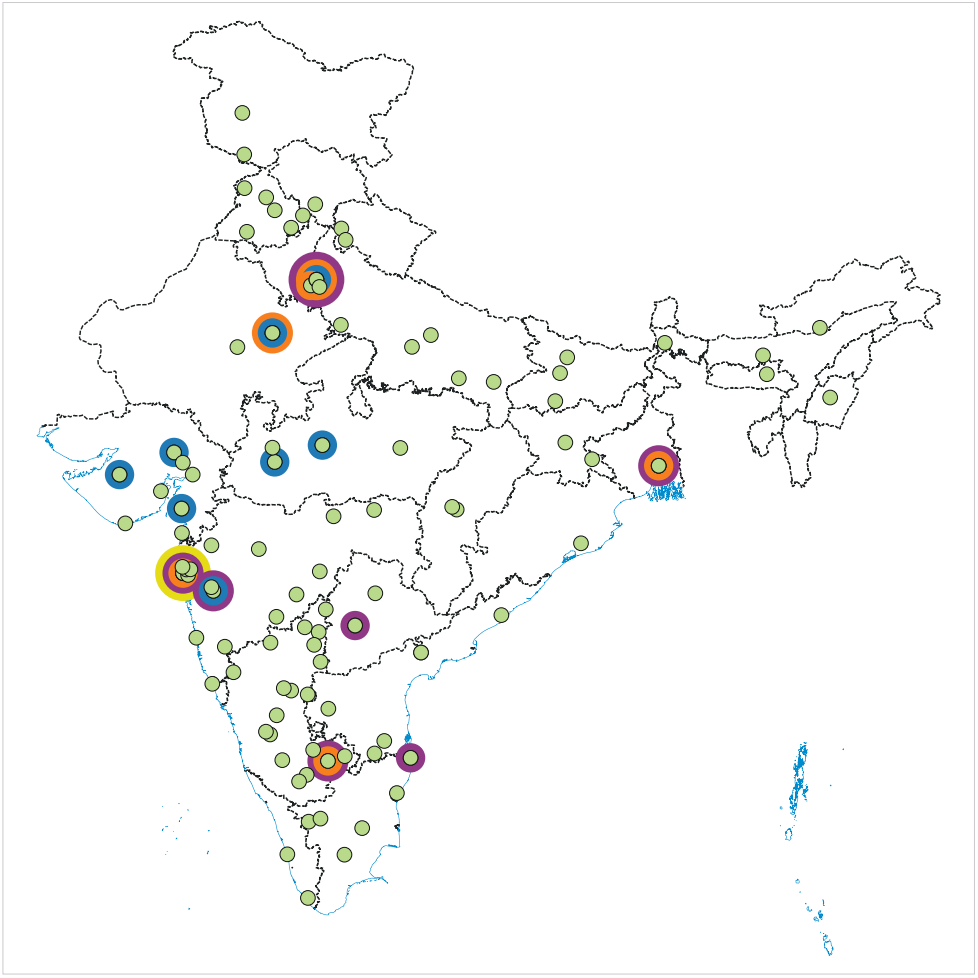
Public Transport Systems

Public Transport System	Cities
Bus	97
BRTS	9
Metro Rail	6
Commuter Rail	7
Monorail	1

Only 97 urban settlements have some form of an organised public transport service.

Operational Bus Rapid Transport: 188 km
Daily Ridership: 0.4 million

Operational metro rail: 274 km
Daily Ridership: 3.5 million



Comparison of City Bus Services

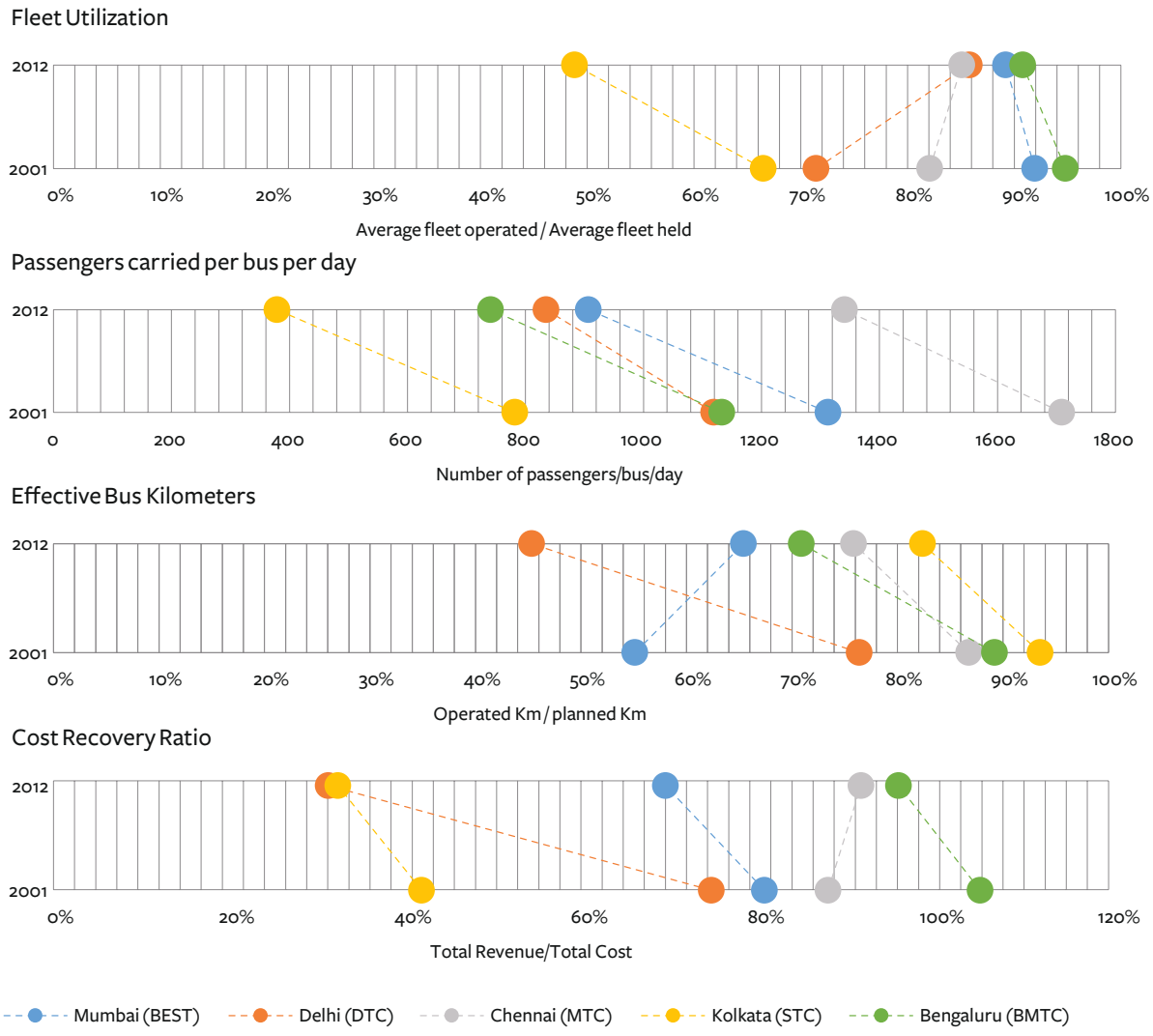
This set of visuals demonstrates the performance of city bus services in 5 Indian metros: Kolkata, Delhi, Chennai, Bengaluru, and Mumbai.

Kolkata's fleet utilisation has been low and has drastically decreased over 2000-12. DTC and Metro TC have improved their fleet utilisation to 85 per cent in 2012-13, while BEST and BMTC range close to 90 per cent fleet utilisation.

In all bus agencies, passengers/bus/day have dropped from 2000-01 to 2012-13. Chennai has a very high passengers/bus/day ridership indicating overcrowding.

Over the last twelve years, effective bus kms have reduced for all the city bus agencies. In 2012-13, Delhi TC was the least (45 per cent), while Kolkata STC was the highest (82 per cent).

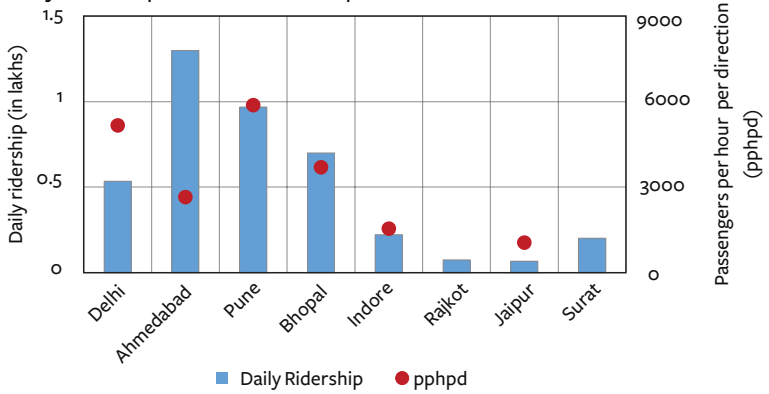
Until 2011-12, Bengaluru's BMTC was consistently recovering all its costs from fare and non-fare box revenues. Delhi's DTC and Kolkata's STC have more than 70 per cent of their costs subsidised by state budgetary support.



Source: Indiastat, 2014

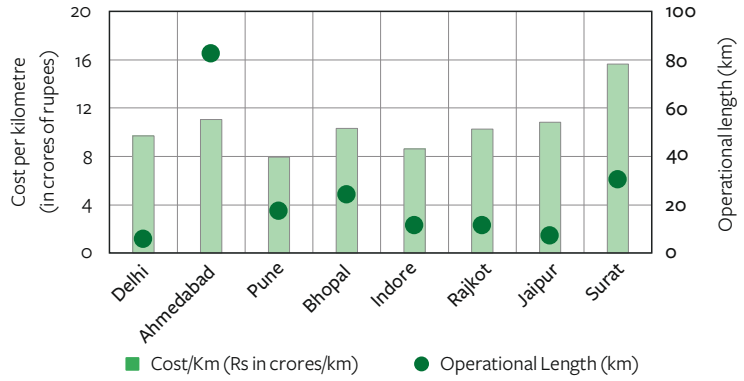
Bus Rapid Transit Systems

Daily Ridership and Peak Ridership of BRTS



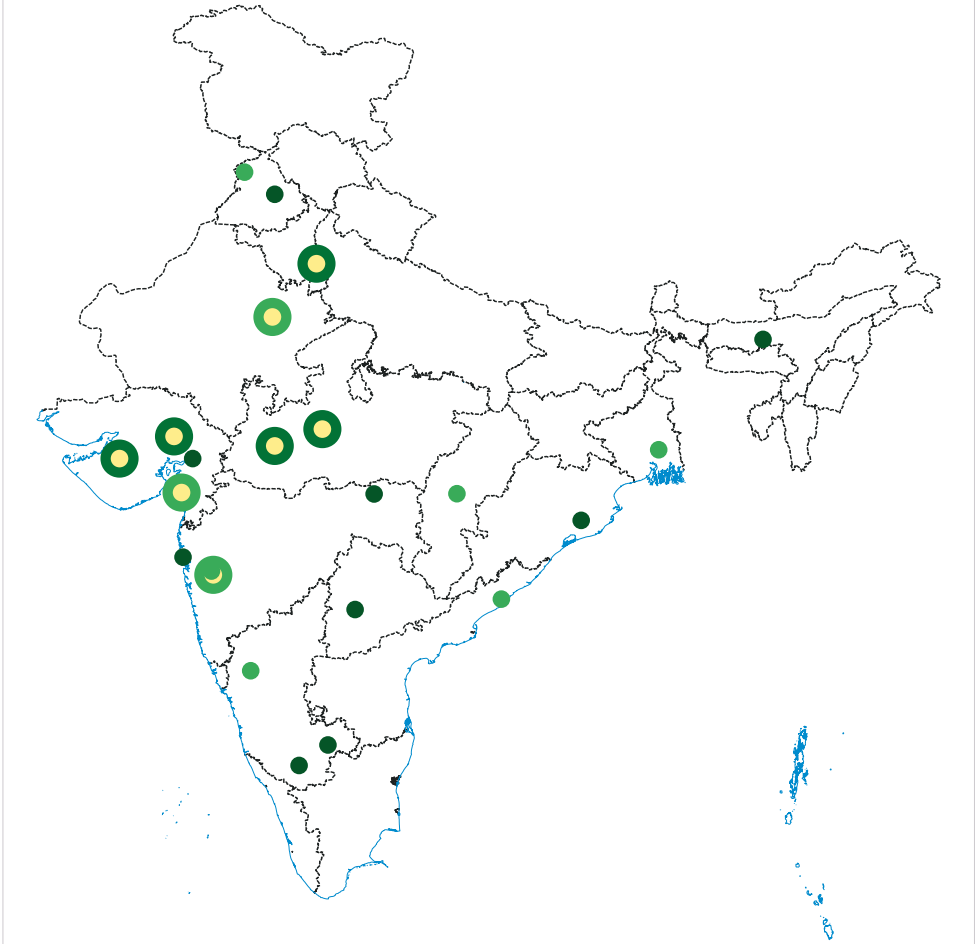
Source: BRT Centre of Excellence, 2015; Mahadevia, Joshi and Datey, 2012; Tiwari and Jain, 2010

Operational Length and Cost per Kilometre of BRTS



Source(s) : BRT Centre of Excellence, 2015; IUT, 2012; Tiwari and Jain, 2010

BRT corridors are currently operational in 8 cities, under construction in 5 and in different stages of planning in 9 cities. Ahmedabad has a daily ridership of 1.3 lakh with 2600 pphpd (2013). The Delhi BRT system has 5,500 pphpd with a daily ridership of 53,500 (2013), indicating unidirectional peak hour travel. Surat BRT spent the highest—Rs.15.7 crore/km followed by Delhi (Rs.14 crore/km).

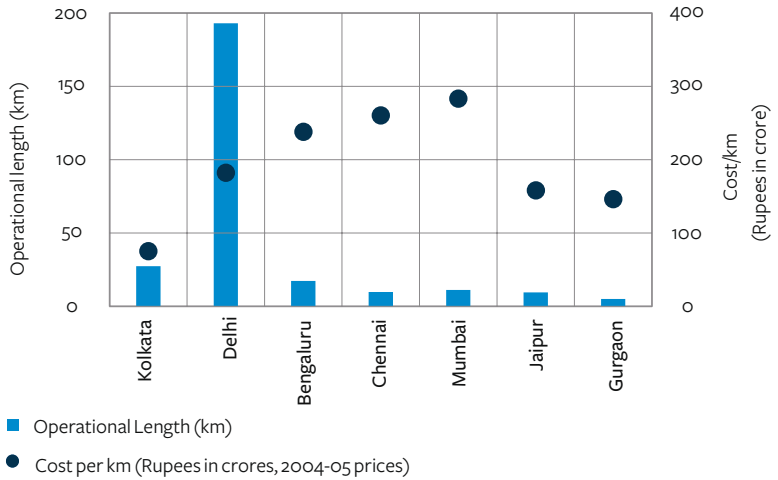


Source: BRT data; Swamy 2014

Note: Peak Persons per Hour per Direction (PPHPD) data not available for Rajkot and Surat.

Metro Rail Systems

Operational Length and Per Kilometre Approved Cost of Metro Rail Systems

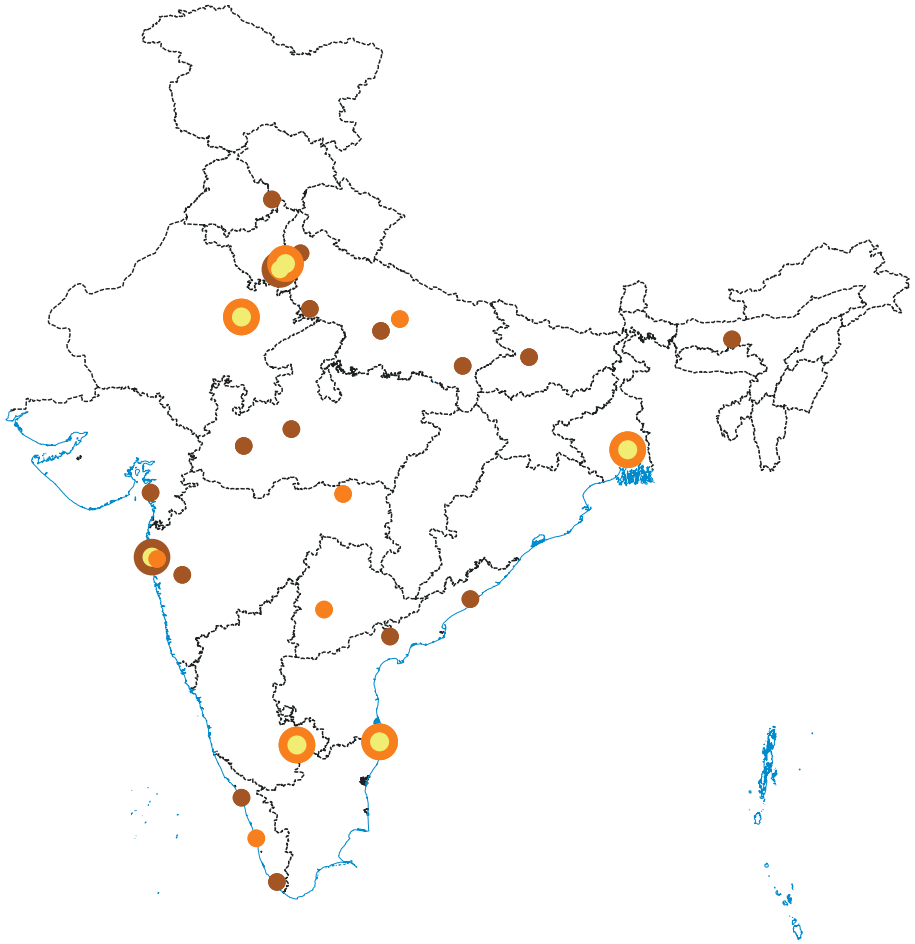


Source: UNEP, MoUD, 2014; Singh, 2002; MRTS Websites

Note: The costs indicate approved cost for Delhi, Bengaluru, Chennai, Mumbai and Jaipur metro systems and construction cost for Kolkata and Gurgaon metro systems.

7 metro rail systems are operational, with 5 under construction and 16 additional cities planning for it. Currently, the network is 274 km long with expansion plans for 1,034 km. Delhi and Kolkata have the largest networks with corresponding ridership.

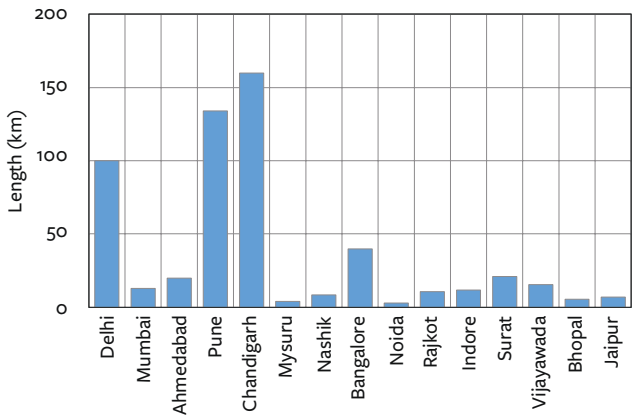
Note: The planned phases include proposed metro rail systems for which Detailed Project Reports have been prepared or are under preparation.



Source: BRT data; Swamy 2014

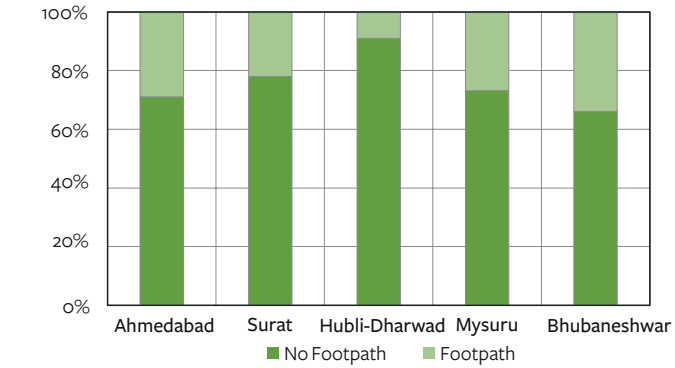
Non-Motorised Transport

Cycle Track/Lane Length in Select Cities | 2014



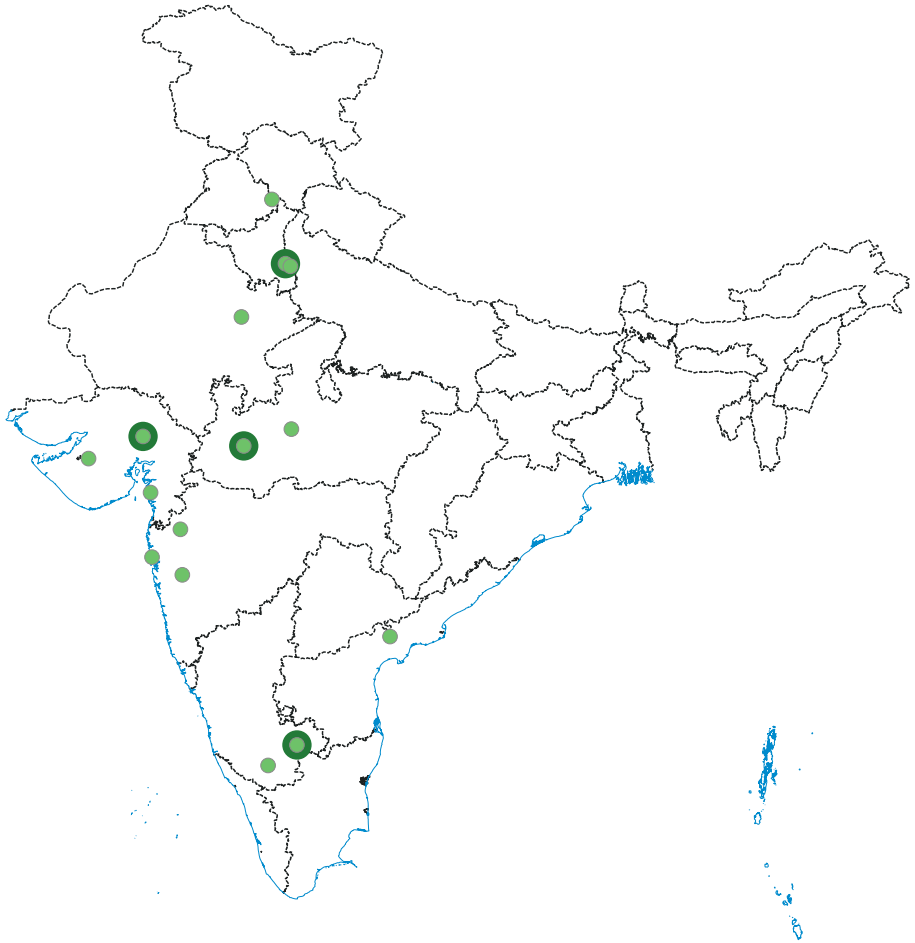
Source: TERI, 2014; University of Virginia, 2014

Presence of Footpaths in Select Cities | 2013



Source: CEPT, 2013

Cycling infrastructure exists in 15 cities with a total network length of 554 km. However, the quality of cycling infrastructure has been critiqued for obstructions, encroachment by on–street parking, unsafe crossings and uneven surfaces. There are 6 bicycle renting systems in 4 cities with 263 cycles and 40 stations. An assessment of pedestrian infrastructure in Ahmedabad, Surat, Hubli-Dharwad, Mysuru and Bhubaneshwar indicates that more than 60 per cent of the roads have no footpaths.



LEGEND

Cycle Tracks/Lanes

Bicycle Renting Systems

N

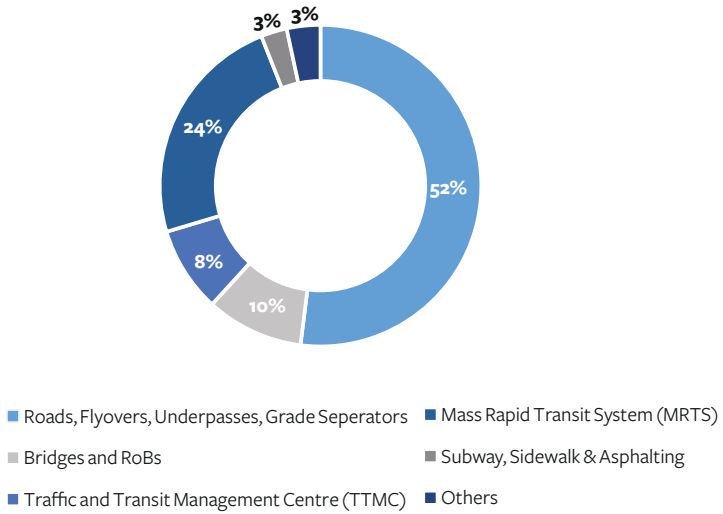
Datum WGS 84 : ESPG 4326

0 100 250 500 km

Source: Kost, 2014; Cycle Sharing India (as of 2015), TERI, 2014, TRIPPD

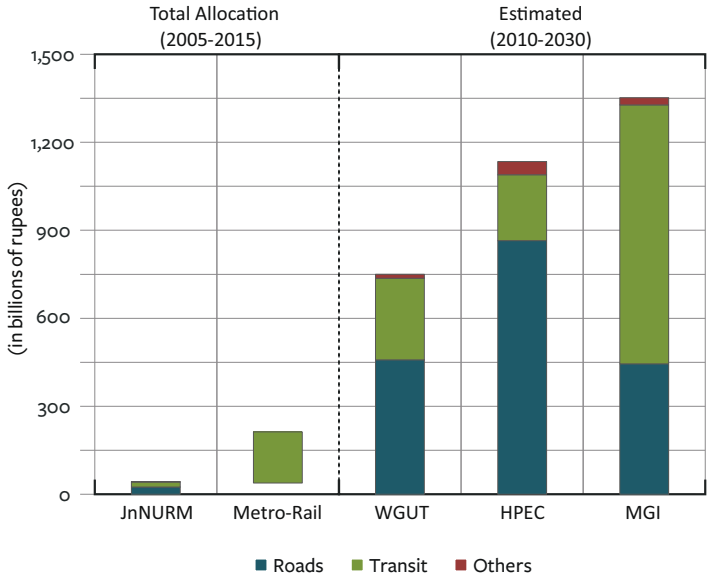
Public Investments in Urban Transport

JnNURM's Expenditure on Completed Transport Projects as of 2014



Source: JnNURM, 2014

Annual Allocated and Estimated Expenditure for Urban Transportation



Source: JnNURM, 2014; NTDPC, 2014; MoUD2014

Note: MGI: McKinsey Global Institute; HPEC: High-Power Expert Committee, Government of India; WGUT: Working Group on Urban Transport, National Transport and Development Policy Committee. The annual investment for JnNURM has arrived after dividing the actual total cost by 10 years.

Urban transport constituted 35 per cent (79) of all completed JnNURM infrastructure projects and 27 per cent (0.4 trillion rupees) of expenditure. Roads, flyovers, grade separators and underpasses constituted 52 per cent of the total transport expenditure.

The total investments in JnNURM projects and Metro rail systems* over 2005-2015 amounted to 2 trillion Rupees. The Working Group on Urban Transport estimates 15 trillion Rupees over 2010-2030. Thus, annual investments of 0.92 trillion Rupees would be required over 2015-2030. AMRUT's total investment 2015-2020 is 0.5 trillion Rupees.