Transport in Cities ❯

INDIA
INDICATORS

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Abstract ⊙

This study compares basic transport and air quality indicators for 12 Indian cities. These indicators are reported in city development plans, comprehensive mobility plans, comprehensive traffic and transport studies and detailed project reports submitted to the Ministry of Urban Development between 2005 and 2007. The list was created with an intention to include, metropolitan cities, cities with ongoing or future BRT projects. We divided the 12 cities into three categories, "metro" cities (Chennai, Mumbai, and Delhi), "millennium bloomers" (Ahmedabad, Bangalore and Pune) and "now exploding" (Bhopal, Indore, Jaipur, Mysore, Rajkot and Surat).

Some significant observations from the transport indicators are as follow:

1. All cities classified as "now exploding" will double in size by 2021.

2. Average travel distances for the metropolitan cities and Bangalore is over eight kilometers. For the rest of the cities it is currently at six kilometers or below.

3. At current median household levels in these cities the rate of growth for two wheelers has slowed down and rate of growth of cars is increasing rapidly.

Introduction ❯

India has underway an ambitious, globally unique attempt to renew its urban infrastructure and reform the political, institutional and financial relationships between national, state, and city levels of government that have impeded sustainable city development heretofore. The Jawaharlal Nehru National Urban Renewal Mission (Jn NURM) combines an offer of financial support for infrastructure projects, under a cost-sharing arrangement with the states and local governments, linked to a carefully structured governance model, that includes both central assistance and mandatory and optional reforms.

As per JnNURM regulations the Ministry of Urban Development (MoUD) requires cities to develop citywide development plans (CDP's), comprehensive mobility plans (CMP's) and detailed project reports (DPR's) to become eligible to receive finanical support.

This study was conceived with an aim to build a database of transport and air-quality indicators from the projects sent to MoUD for approval under JnNURM and to perform preliminary comparative analysis of these indicators. The report will also indicate possible gaps in data collection and analysis and address opportunities for sustainable urban transportation.

JnNURM and NUTP ❯

The JnNURM was launched in 2005 with a focus on efficiency of urban infrastructure and service delivery mechanisms, including community participation and accountability of urban local bodies (ULBs)/ parastatal agencies towards citizens.   The duration of the mission is seven years beginning from the year 2005-06 and it identifies a requirement of 1,20,536 crore (28 billion USD) of investment in urban infrastructure in 63 cities across the nation.   The ambitious program has two sub-missions: one focused on services for urban poor and the other focused on infrastructure development.   The latter is administered by Ministry of Urban Development (MoUD) and includes projects in water supply and sanitation, sewerage, solid waste management, road network, urban transport and redevelopment of old areas in the cities. The JnNURM window is open until 2011.

The National Urban Transport Policy (NUTP) was launched in mid-2006 by the MoUD. The NUTP was created to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities.   The underlying aim is to create a policy that would lead to building people centric urban transport instead of being focused on improving conditions for private motor vehicles.   To realize its objective it recommends: integrated land use and transport planning, equitable allocation of road space, priority to public transport, priority to non-motorized transport, discourage use of personal motor vehicles, coordinated planning and association with private sector.   After the launch of the NUTP a crucial decision was made for all urban transport projects to receive financial assistance under JnNURM to conform to the NUTP.   These reforms and the related National Urban Transport Policy (NUTP) guidelines provide an unprecedented pull from the center, motivating states and cities across India to attempt to design and implement BRT and other sustainable transport solutions, all at the same time.
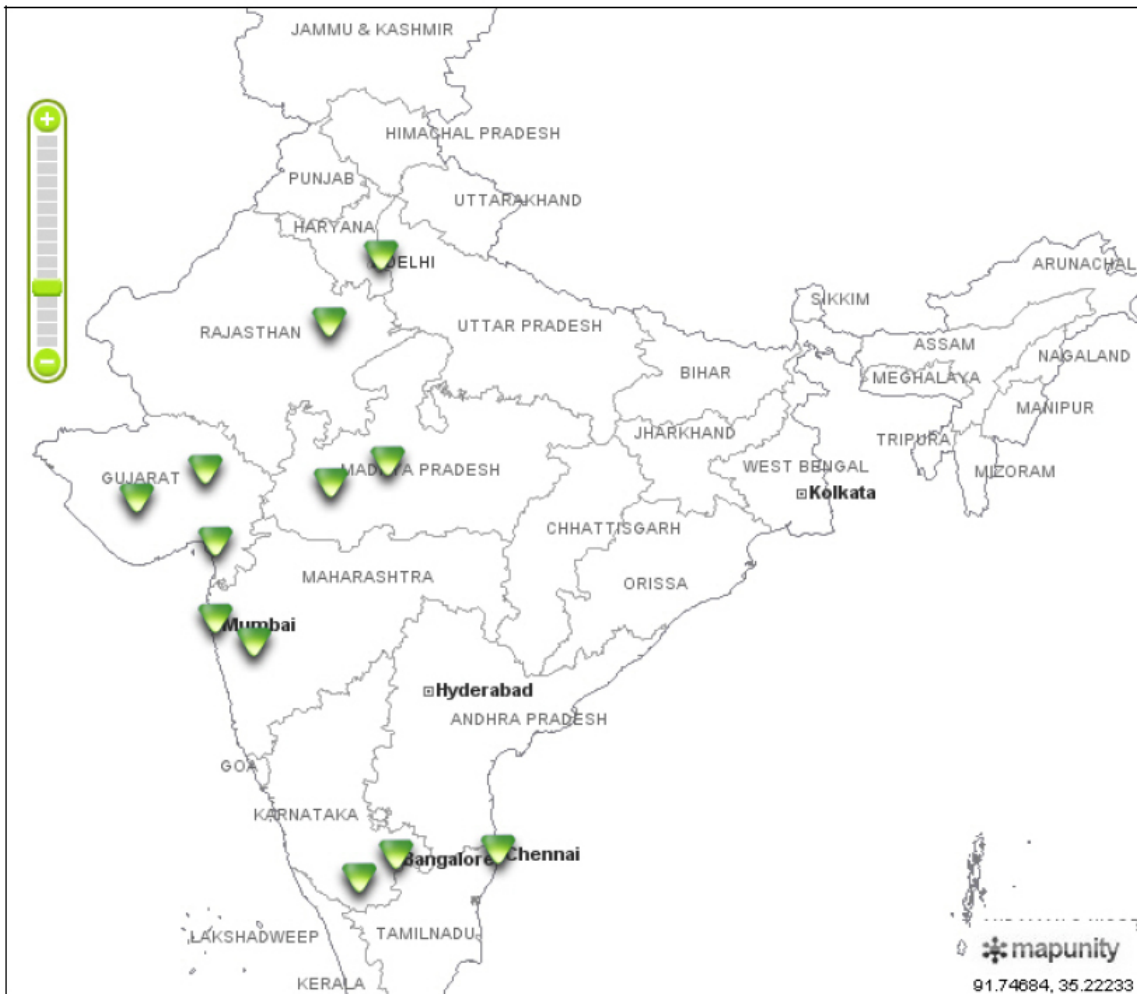
| City	State
Ahmedabad	Gujurat
Bangalore	Karnataka
Bhopal	Madhya pradesh
Chennai	Tami nadu
Delhi	Delhi
Indore	Madhya pradesh
Jaipur	Rajasthan
Mumbai	Maharashtra
Mysore	Karnataka
Pune	Maharashtra
Rajkot	Gujurat
Surat	Gujurat

CITY SELECTION

The city selection was done with an intention to include, metropolitan cities, cities with ongoing or future BRT projects. We divided the cities into three categories, metropolitan cities (Chennai, Mumbai, and Delhi), millenium bloomers (Ahmedabad, Bangalore and Pune) and now exploding (Bhopal, Indore, Jaipur, Mysore, Rajkot and Surat). Based on the available budget we were limited to 12 cities. We made a decision to leave out "metropolitan city" Kolkata and "millennium bloomer" Hyderabad to include more cities in the "now exploding" category. The map above shows the cities and the table lists them.
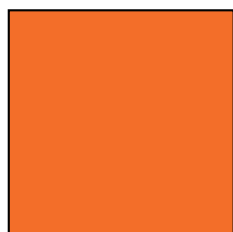
Legend
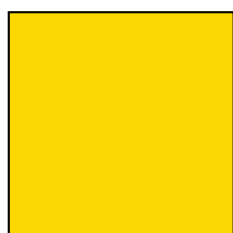
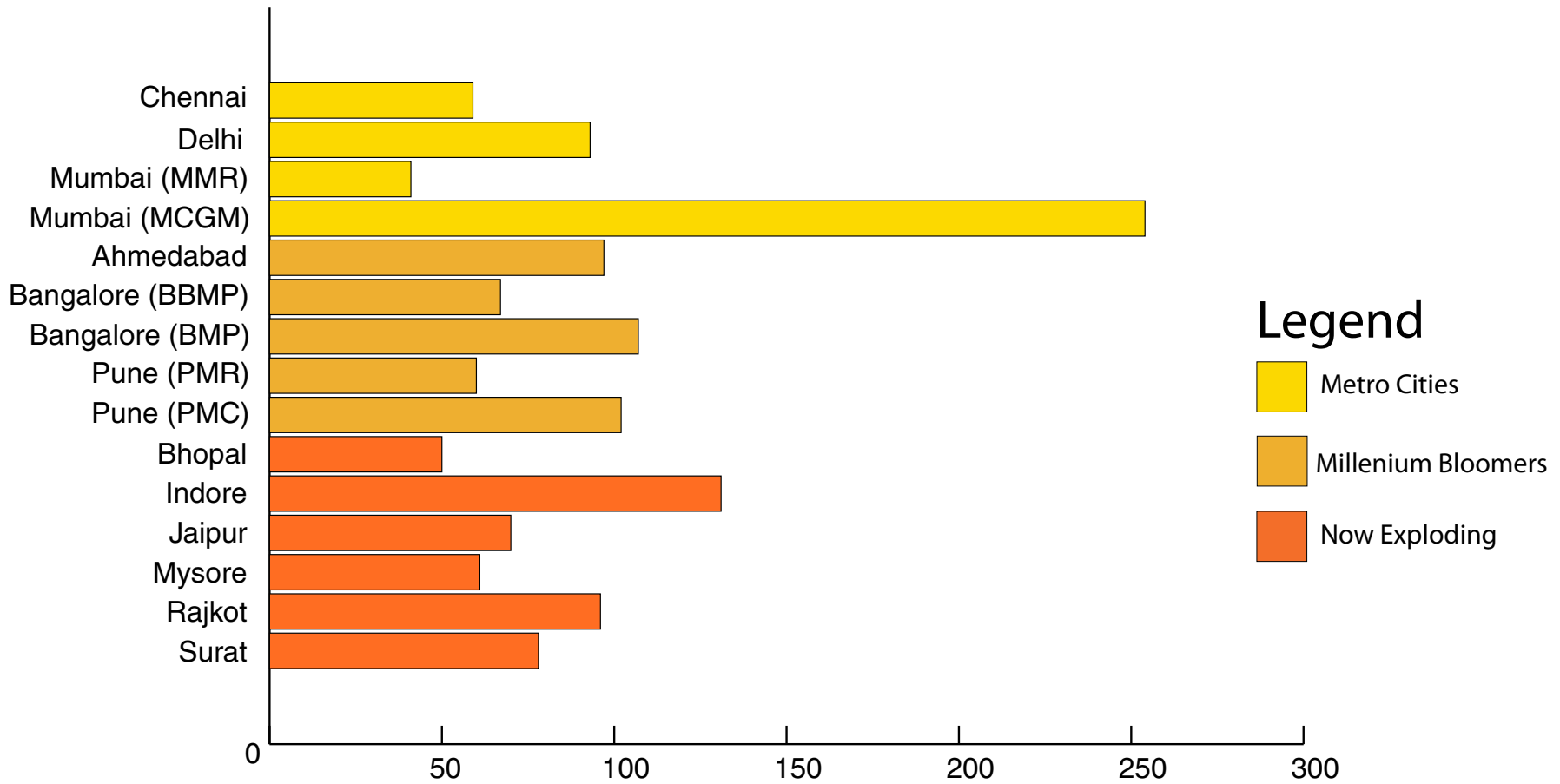▮ Metro Cities: Chennai, Delhi, and Mumbai
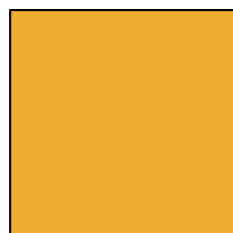
▮ Millenium Bloomers: Ahmedabad, Bangalore and Pune

▮ Now Exploding: Bhopal, Indore, Jaipur, Mysore, Rajkot and Surat

Density of Indian Cities

people per hectare

Legend

- ▮ Metro Cities
- ▮ Millenium Bloomers
- ▮ Now Exploding

Population Density

Population data is from the 2001 census. 2021 population projections used for analysis of growth trends are from comprehensive mobility plans submitted by cities. City limits are defined as per latest municipal jurisdiction boundaries. Three cities Mumbai, Pune and Bangalore show two values for density due a recent trend to annex adjoining villages into the municipal jurisdiction. This data was available only for 3 cities. This is done to allow planned comprehensive development.

Population Growth

2001 - 2021

Legend

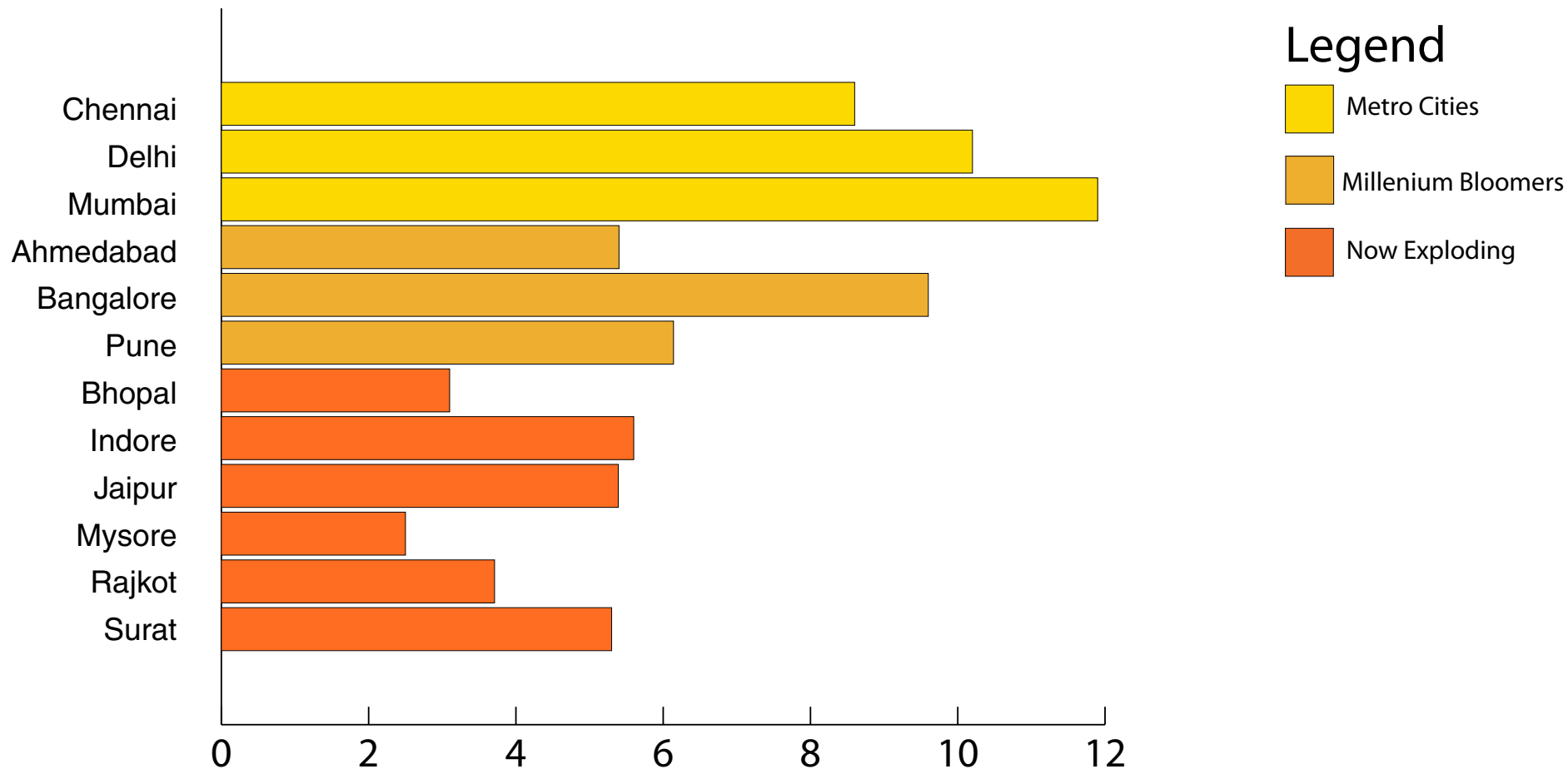- Metro Cities
- Millenium Bloomers
- Now Exploding
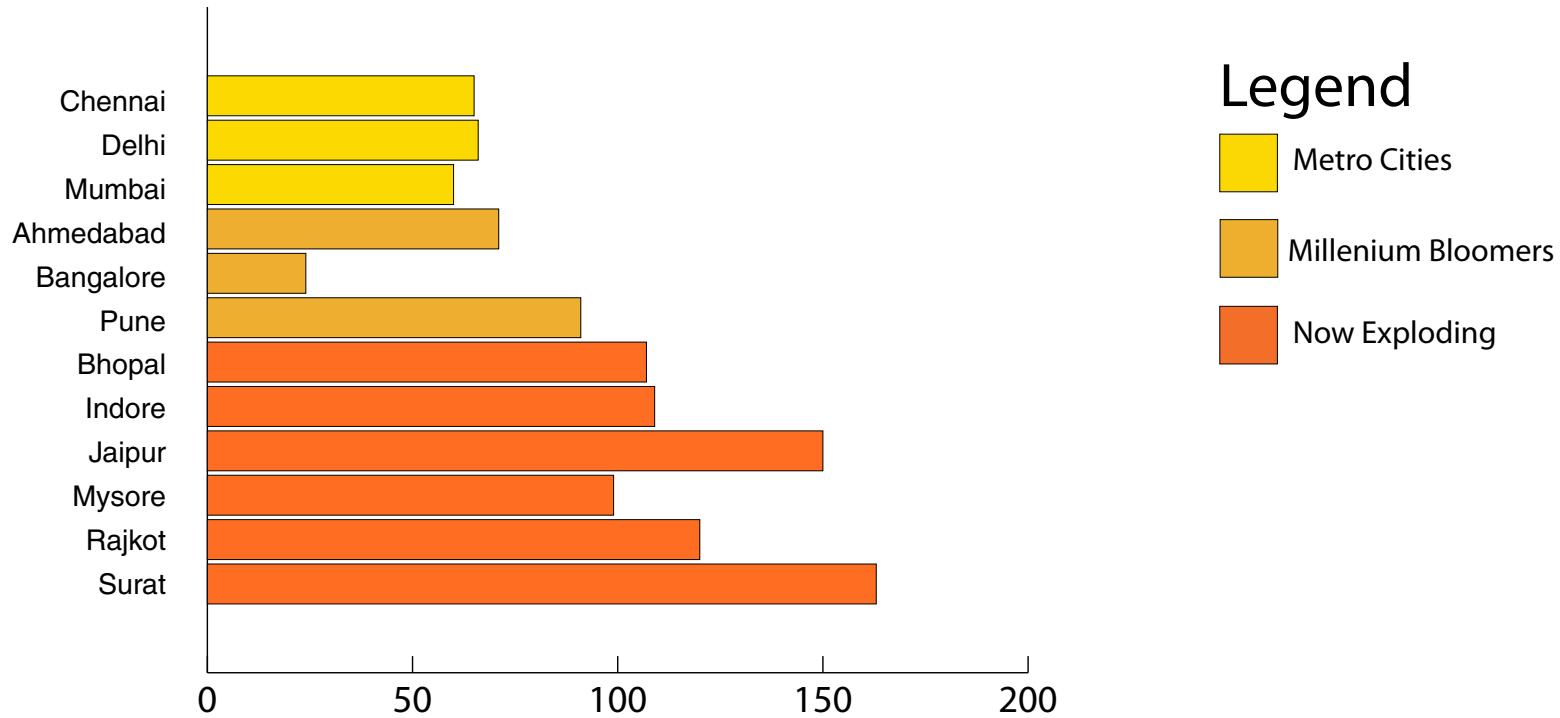
Population Growth

Bangalore is the only city projected to grow less than 50% in the next 20 years. All cities classified as now exploding are projected to double their population by 2021.

Average Trip Length

kilometers

Legend

- Metro Cities
- Millenium Bloomers
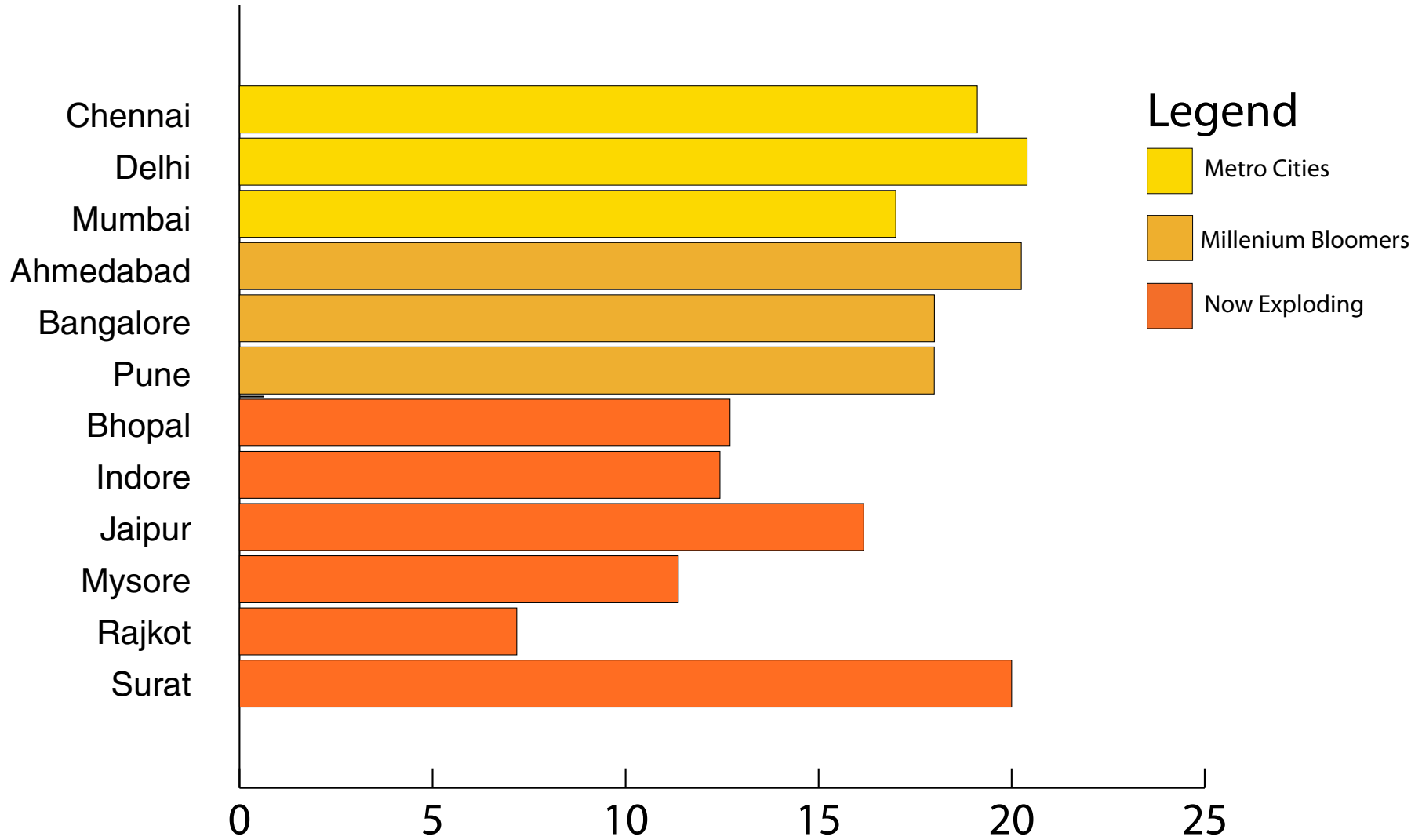- Now Exploding

Mobility

Average daily trip lengths for metro cities and Bangalore are over 8 km. All other cities are at 6 km or less. These cities will see an increase in trip lengths in the coming year. Based on literature from around the world shows an increase in per capita trip making and trip lengths with

1. Increasing income
2. Increased participation of women in the labor force
3. Industrial restructuring towards a service oriented economy.
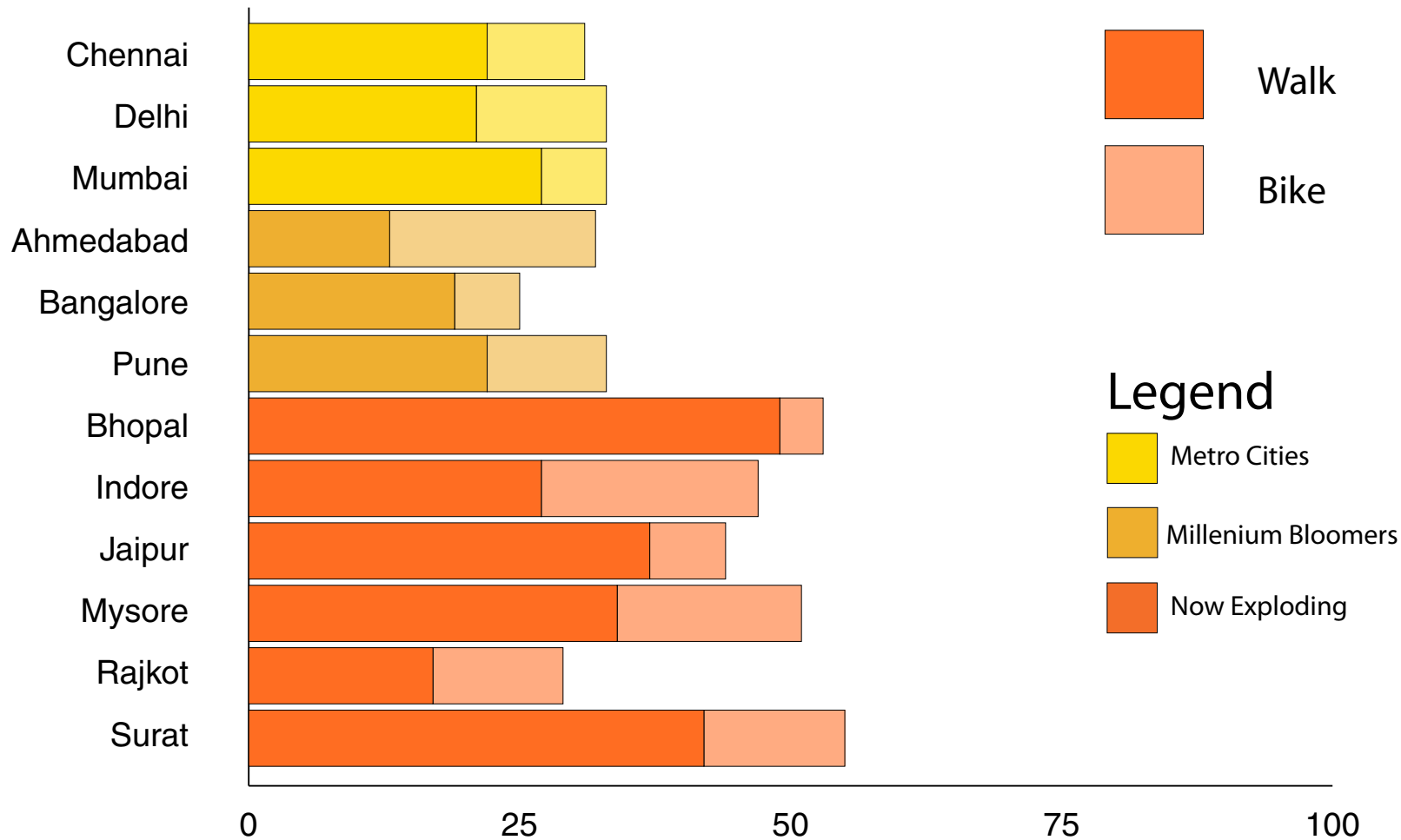
All cities are showing this trend.

Travel Speeds

kilometers per hour

Legend

- Metro Cities
- Millenium Bloomers
- Now Exploding

City	Speed
Chennai	19
Delhi	20
Mumbai	17
Ahmedabad	20
Bangalore	18
Pune	18
Bhopal	12.5
Indore	12
Jaipur	16
Mysore	11
Rajkot	7
Surat	20

Non-Motorized Transport Mode Share

Legend

- Walk
- Bike
- Metro Cities
- Millenium Bloomers
- Now Exploding

Non-motorized transport

All cities show an extremely high use of non-motorized transport. The data is from 2-3 years ago and some recent reports suggest these shares have decreased in this duration. Except for the 5.6 km busway in Delhi and 10 km exclusive bikeways in Pune there is no dedicated infrastructure for bicyclists in any of the cities. Wherever provided footpaths are not continuous and encroached upon. Indore is a good example for a city with no footpaths. Most cities in the "now exploding" category have no footpaths at all.

Public Transport & Intermediate Public Transport

modal share

Legend

- Metro Cities
- Millenium Bloomers
- Now Exploding

Public Transport

Informal Public Transport
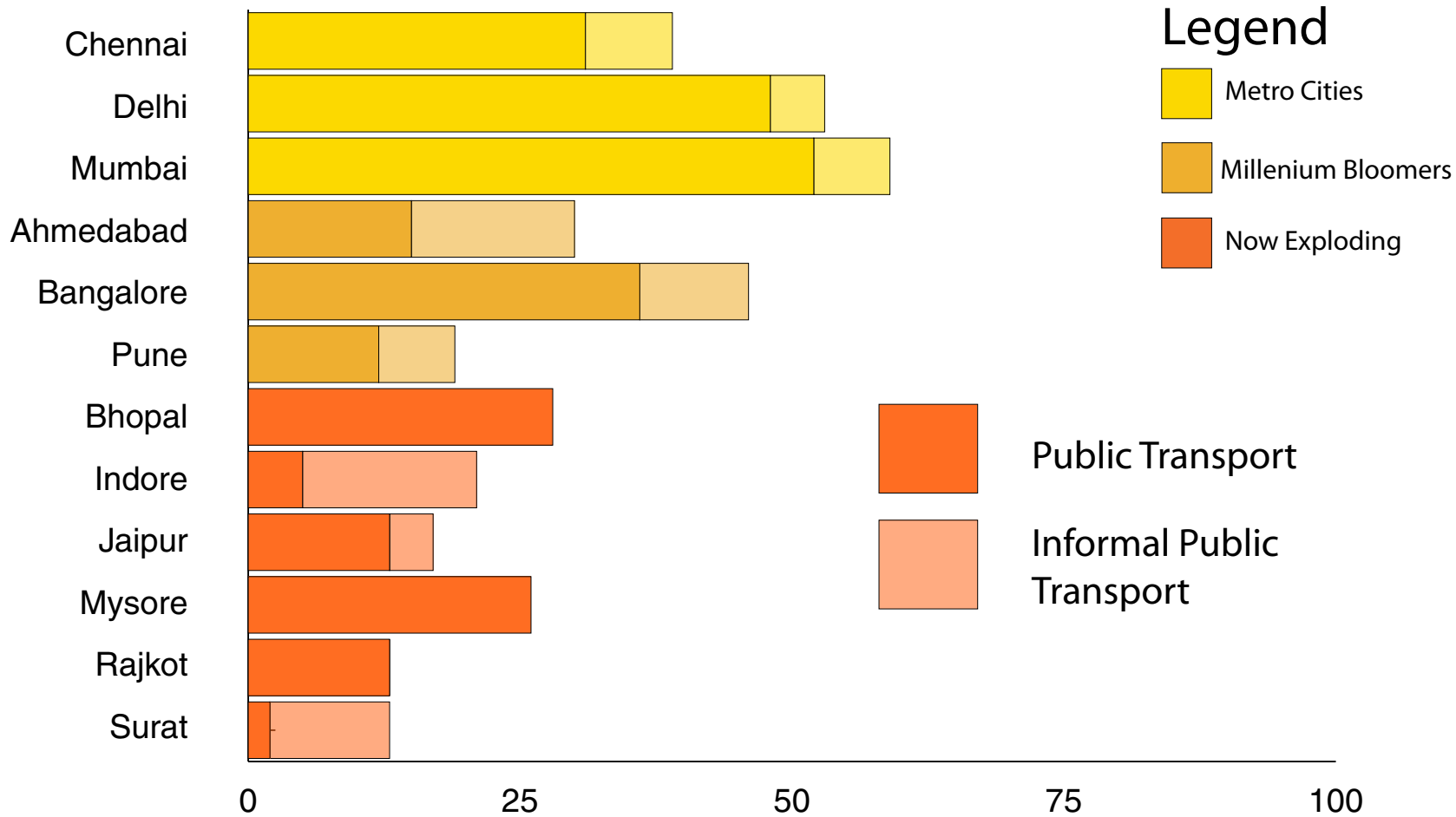
Public transport & intermediate public transport

Public transport and informal public transport are presented on the same indicator. In some cities it is very difficult to differentiate between the services. Buses operate under the state carriageway contracts, operations are irregular, unorganized and of poor quality. Informal public transport includes mini-buses, maruti vans, tempos and shared auto rickshaws (3, 4, 6 and 8 seater). Mumbai shows the highest share of public transport (pt) 52%. Mumbai and Chennai have heavy rail system and Delhi had Metro system. Bangalore is building a metro. Delhi inaugurated a 5.6 km BRT corridor in May of 2008. Ahmedabad, Pune, Jaipur, Indore, Surat, and Rajkot have approved BRT projects under JnNURM and are in implementation stage. Bhopal and Mysore have BRT projects in planning stage. It will de interesting to see how public transport mode shares react to these new public transport systems.
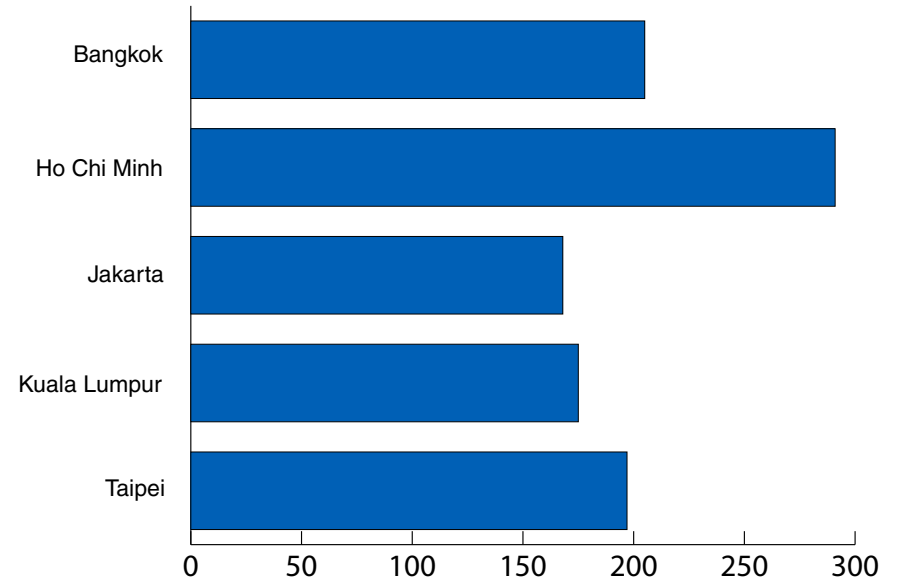
Two Wheeler Motorization 🔶

two-wheelers per 1000 population

Indian Cities
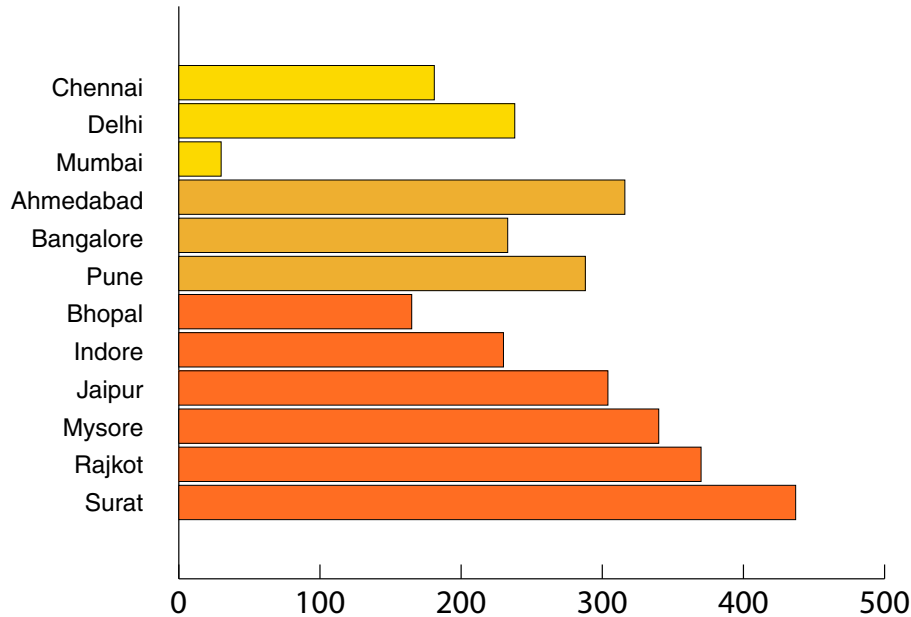
Other Asian Cities

Motorization

A regression of two-wheelers per 1000 population and median household income do not show good statistics for the given sample. Monthly median household incomes are in a range of 50 USD and 220 USD. At these levels two wheeler ownership and monthly household income level are not correlated.

11 of the 12 cities have higher motorization than the average for middle income Asian (MIA) cities. Indian cities have one of the highest two wheelers motorizations in the world. It will be interesting to see if it stabilizes at the current 300-400 per 1000 population mark or continue to grow. Literature from around the world suggests a trend to move from two wheelers to cars as income grows.

The Indian policy makers face a big dilemma, to provide facilities to improve travel conditions, to improve safety for two wheelers, to create more stringent emission standards or to not provide any enhanced infrastructure and hope that two wheelers stabilize at these levels, as new two wheeler users are about the same as the people moving from two wheeler to cars.


Median Household Income

and cars per 1000 population
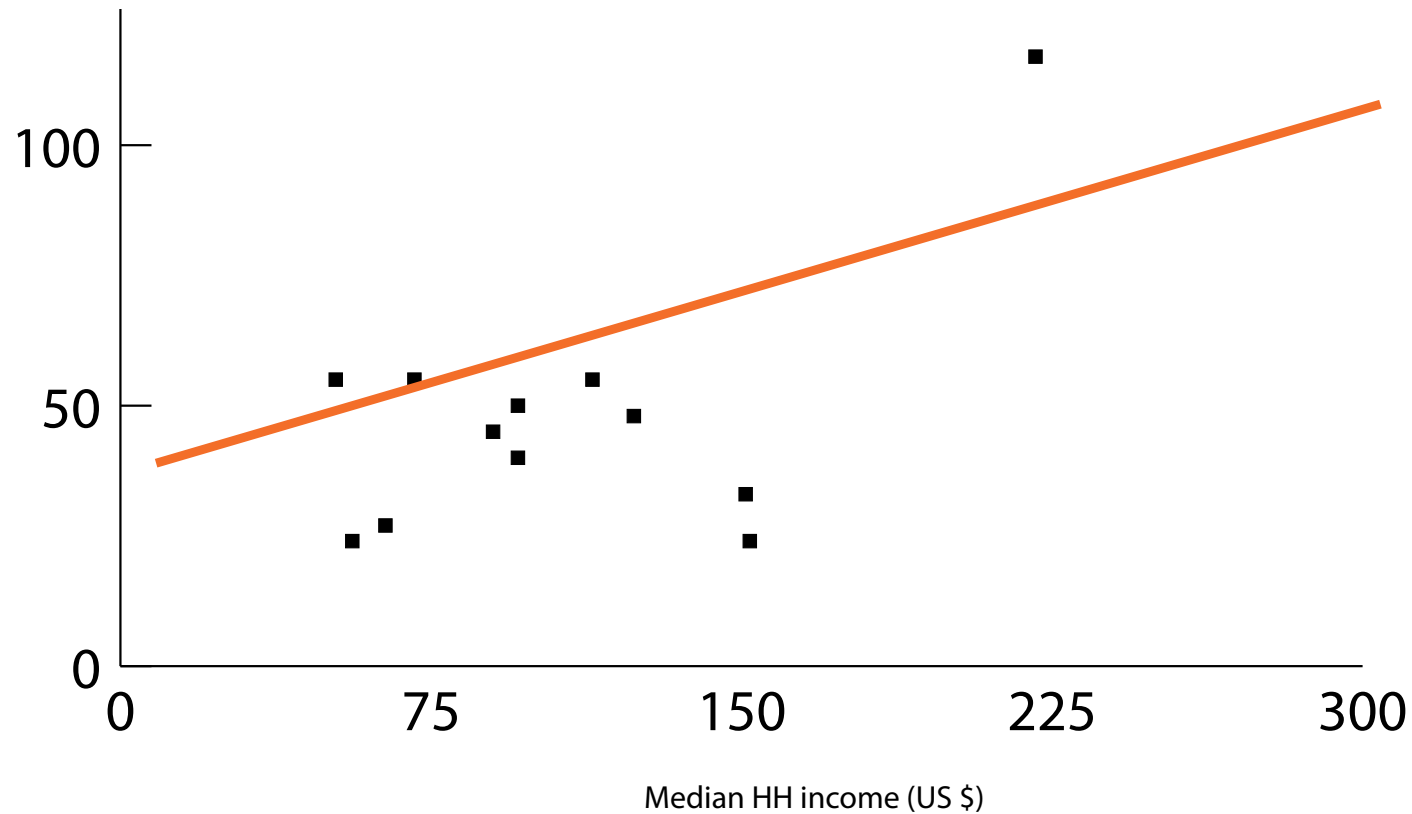
The regression shows a clear correlation between car ownership and monthly household income for the given sample. On the whole car ownership is likely to increase with an increase in income levels. All 12 cities are well below the average of 198 cars per 1000 population26 for middle income Asian cities. Most cities are closer to the average of 38 cars per 1000 population26 for low income Asian cities. Delhi is the only city with more than 100 cars per 1000 population.

CO2 Emissions

tons per capita per year
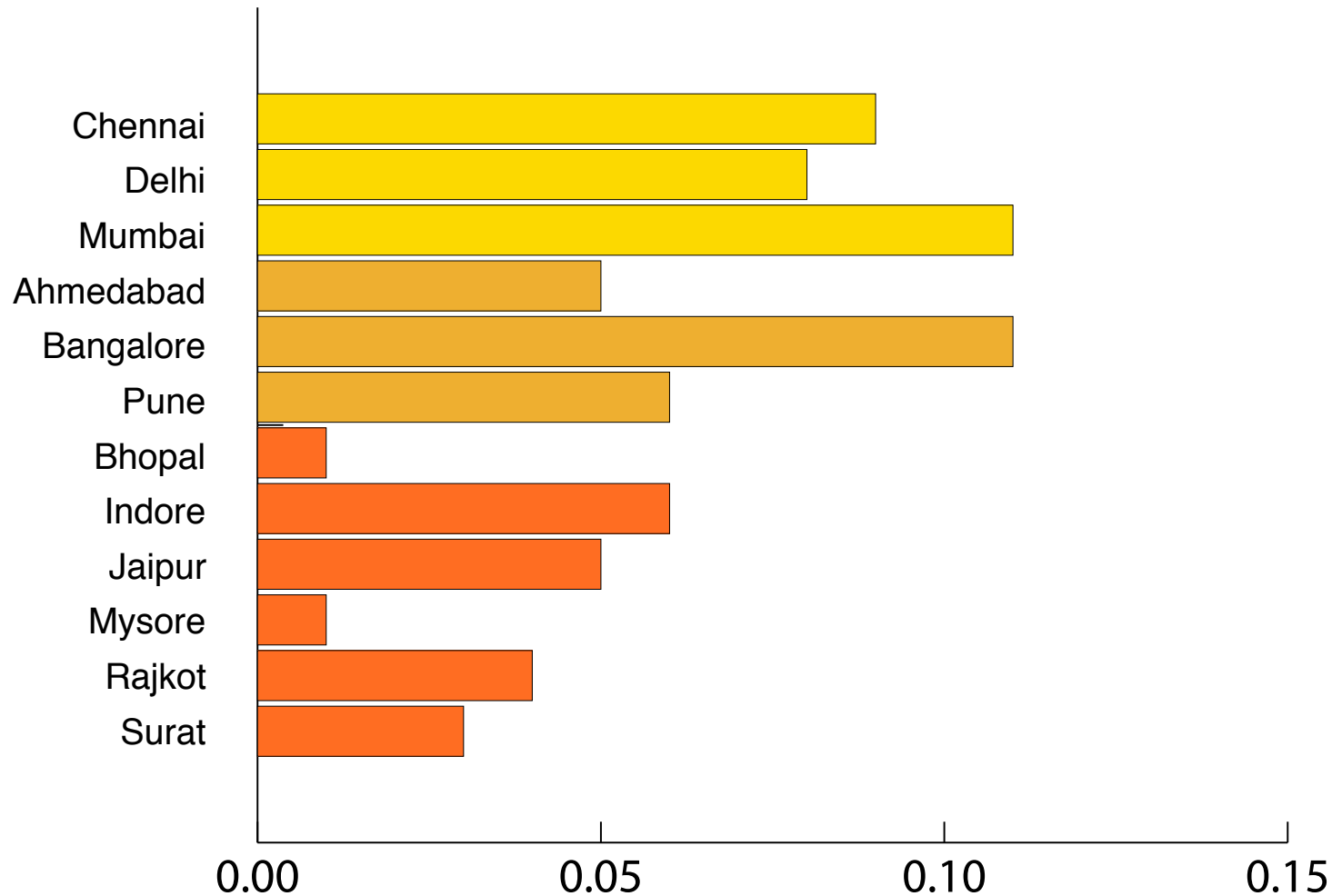
CO2 emissions per capita per year

This graph shows a comparison of annual co2 emissions from the transport sector in terms of ton per capita per year. The figures range from 0.01 ton co2 per capita per year for Mysore to 0.11 ton per capita per year for Mumbai. Mumbai despite a high public transport mode share shows more co2 emission due to longer trip lengths and higher share of cars versus two wheelers. Fuel use and co2 emissions are 3-4 times higher for cars in comparison with two-wheelers. We foresee a significant increase in emissions as people shift from non-motorized transport to two-wheelers and two wheelers to cars.

Conclusion ⊗

In all cities, incomes are growing rapidly; there is an increased participation of women in the labor force and industrial restructuring towards a service economy.   Literature from other countries in this stage of development shows an increase in travel and average travel distances.

Tokyo, Osaka, Hong Kong, Singapore and Seoul all share a history of curtailing motorization for a significant period at an early stage of motorization.   Much before it reached 150 vehicles per 1000 people.   In Hong Kong, Singapore and Seoul, high-quality mass transit systems were not yet in operation when private vehicle restraint began.   Slow motorization despite rapidly rising incomes allowed these cities a window of opportunity to invest in public transport and eventually provide substantial, high-quality public transport systems.   They were able to maintain bus-based public transport usage at a high level until mass transit became affordable and was built.   Public transport never became the mode of last resort or to be seen as only for the poor in these cities.

Indian cities are at this stage and are making investments to build mass transport systems.   If the goal is to have transportation systems and motorization levels of high income Asian (HIA) countries two things are essential:

1. Measures to curtail motorization
2. Measures to ensure high quality for the mass transport systems in planning and implementation stage.

Future Data Needs ⊙

This database is a representation of the transport situation in India around 2005. Very little archived data is available for cities outside the metros. Given the growth stage a lot of out cities are in an exercise of this scale should be conducted every 5 years. There is a need to collect data beyond what has been used in the paper to get more accurate estimates of energy consumption and social impacts.   The following additional data should be collected to enhance this research and for future research.

1. Data on trip lengths by mode and by trip purpose (work, shop, recreation, education and other)
2. Clearer understanding of supply of informal public transport systems and demand served by them.
3. Clearer understanding of travel patterns in the non-motorized segment.
4. Data to study travel characteristics of two or more worker household
5. Data to assess the increase in participation of women in the labor force

Acknowledgements ⦿

The Data

City	Population (2001 Census)	Modal Split for Travel, Percent of Trips				Vehicle Ownership	
		Public Transport	Private Transport	Bicycling & Walking	Average Trip Length km	Vehicles Per 1000	Passenger Cars Per 1000
Ahmedabad	4,500,000	30	38	32	5.4	371	55
Bangalore	8,625,000	36	39	25	9.6	283	50
Bhopal	1,433,000	28	19	53	3.1	189	24
Chennai	7,014,000	39	30	31	8.6	226	45
Delhi	13,840,000	48	19	33	10.2	355	117
Indore	1,759,000	16	37	47	5.6	257	27
Jaipur	2,032,000	17	39	44	5.4	359	55
Mumbai	17,702,000	52	15	33	11.9	54	24
Mysore	787,000	26	23	51	2.5	380	40
Pune	4,200,000	12	54	33	6.1	335	48
Rajkot	1,002,000	13	38	49	3.7	403	33
Surat	2,430,000	13	31	55	5.3	492	55

City	Population (2001 Census)	Modal Split for Travel, Percent of Trips				Vehicle Ownership	
		Public Transport	Private Transport	Bicycling & Walking	Average Trip Length km	Vehicles Per 1000	Passenger Cars Per 1000
London	6,679,699	40	45	14	7.5	356	288
Paris	10,661,937	54	18	28	8.3	383	338
New York	18,409,019	54	35	11	16.7	459	412

Full Text Available
http://www.embarq.org/sites/default/files/India-Transport-Indicators.pdf

Data Available
http://www.embarq.org/sites/default/files/12-Indian-Cities-Transport-Indicators-Database.xls