9th Urban Mobility India Conference & Expo 2016
Planning Mobility for City's Sustainability

TOWARDS BETTER ACCESSIBILITY AND MOBILITY IN INDIAN CITIES

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Urban Transport Problems

- Congestion related delay and unreliability
- Crowding in public transport vehicles
- Pollution
- Noise
- Reduction of green space
- Visual intrusion
- Community severance
- Number, severity and risk of accidents
- Poor accessibility for those without a car and those with mobility impairments
- Disproportionate disadvantaging of particular social or geographic groups

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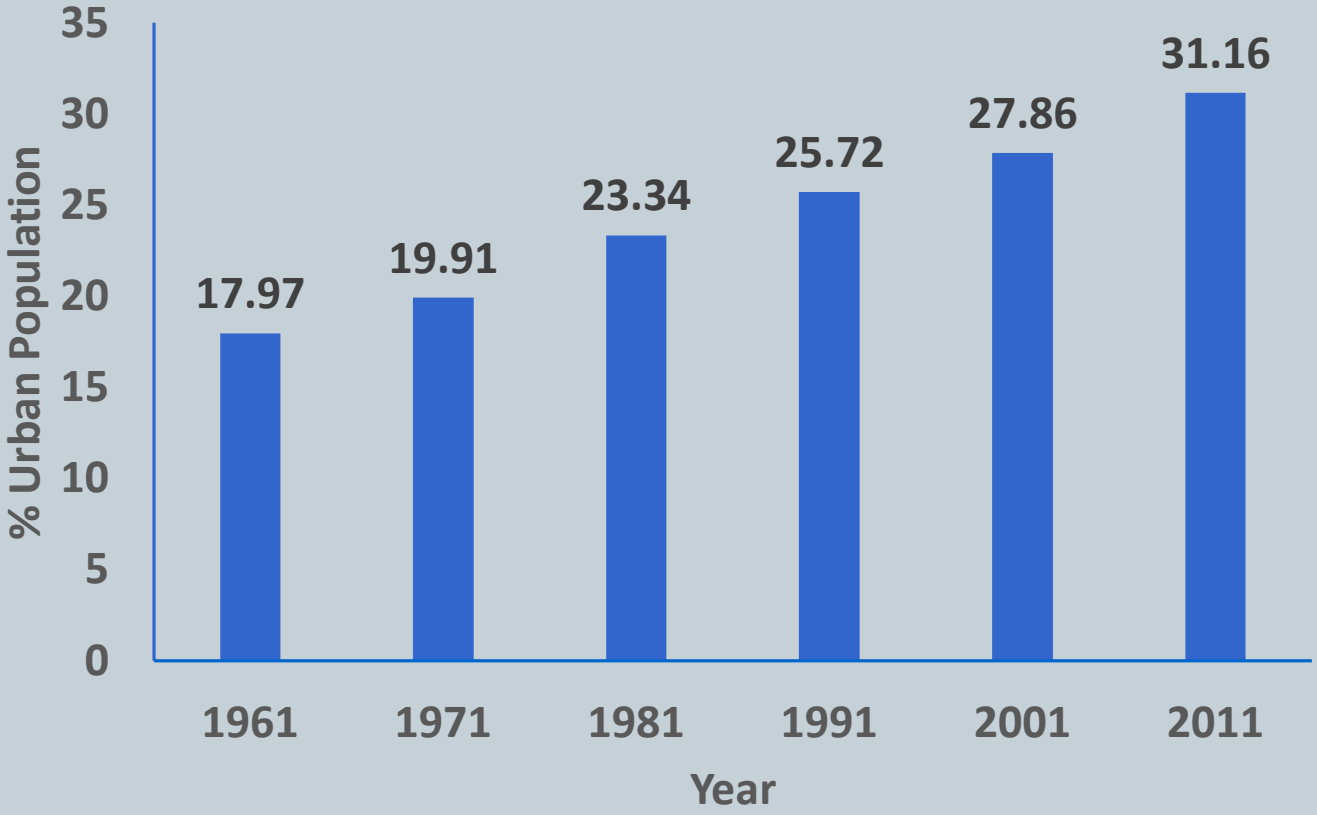
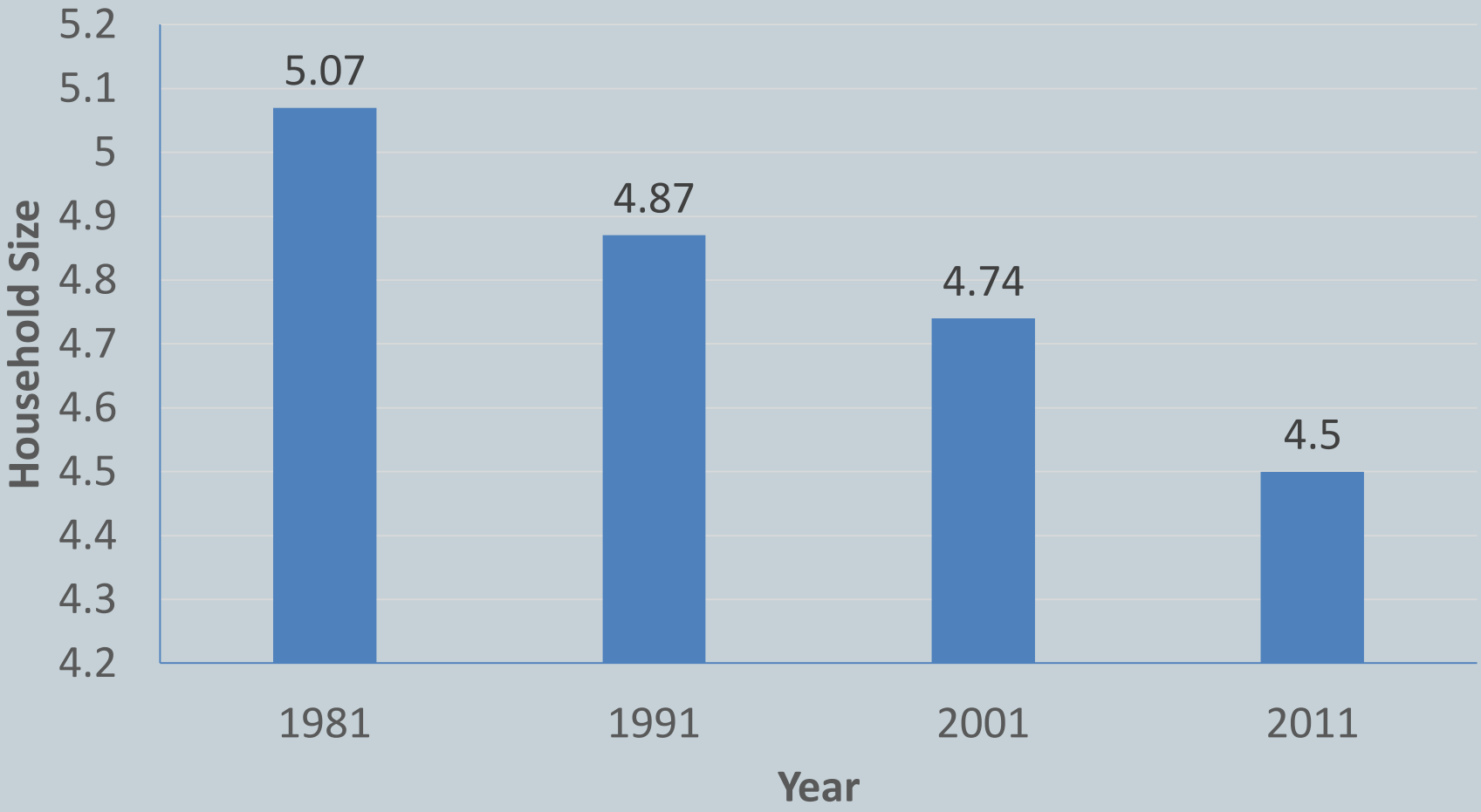
Planning Mobility for City's Sustainability

Urbanization in India

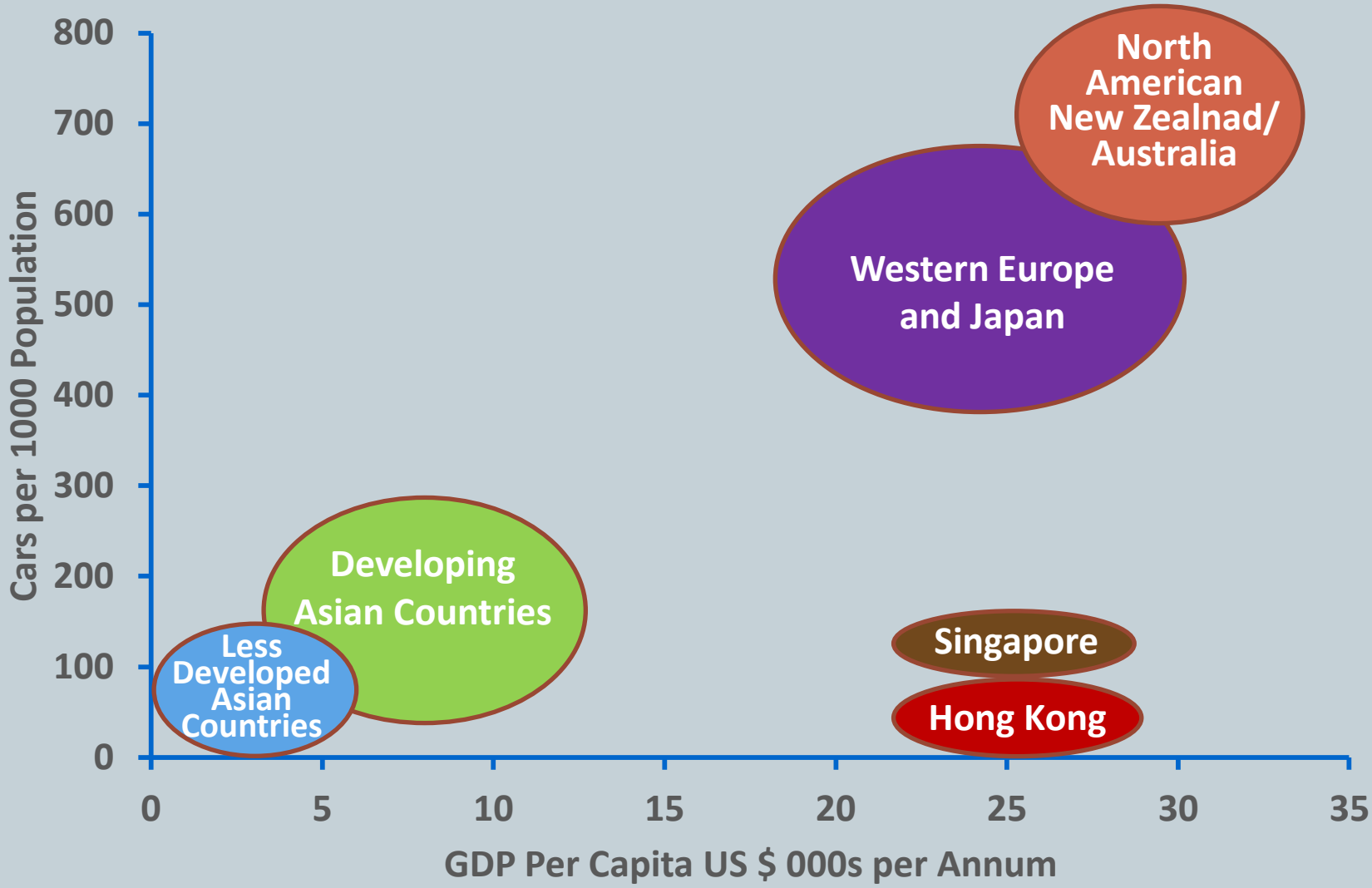


- India is one of the fastest urbanizing country in the world at the moment
- By 2050, it will be 51.7 % (Source: UN, World Urbanization Prospects 2011 Revision)

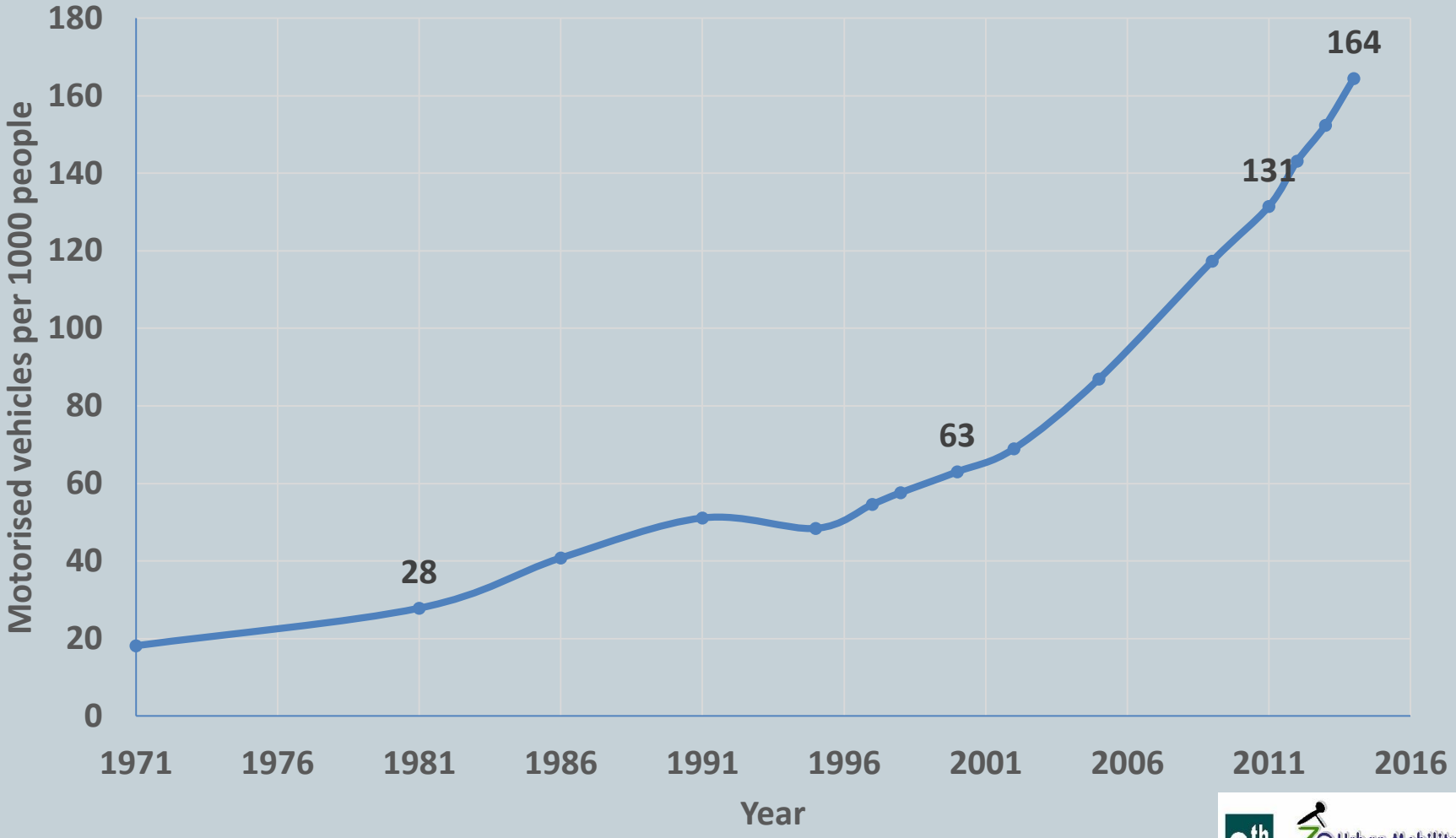
Trend of Household Size in Greater Mumbai



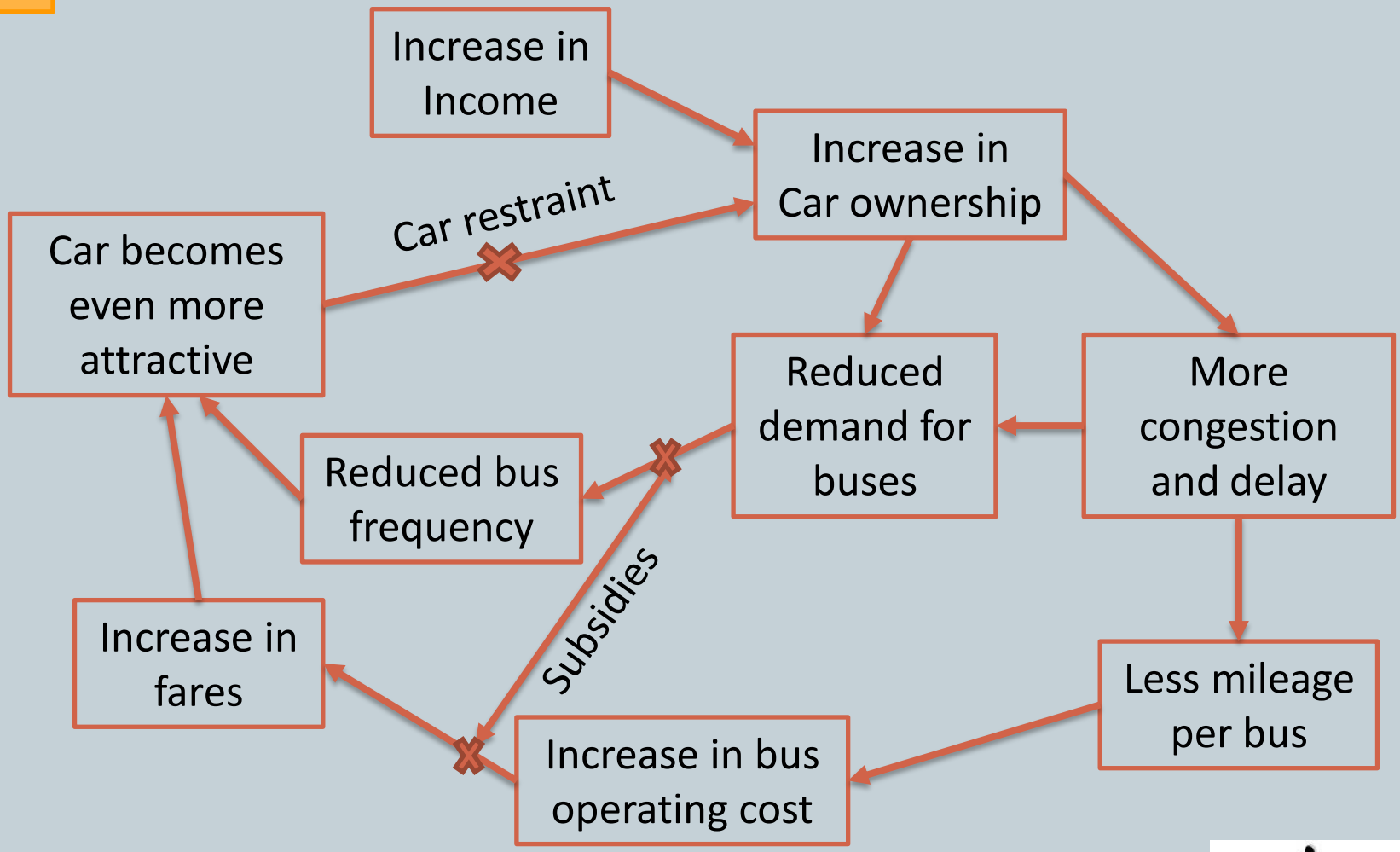
Car Ownership in Cities Worldwide



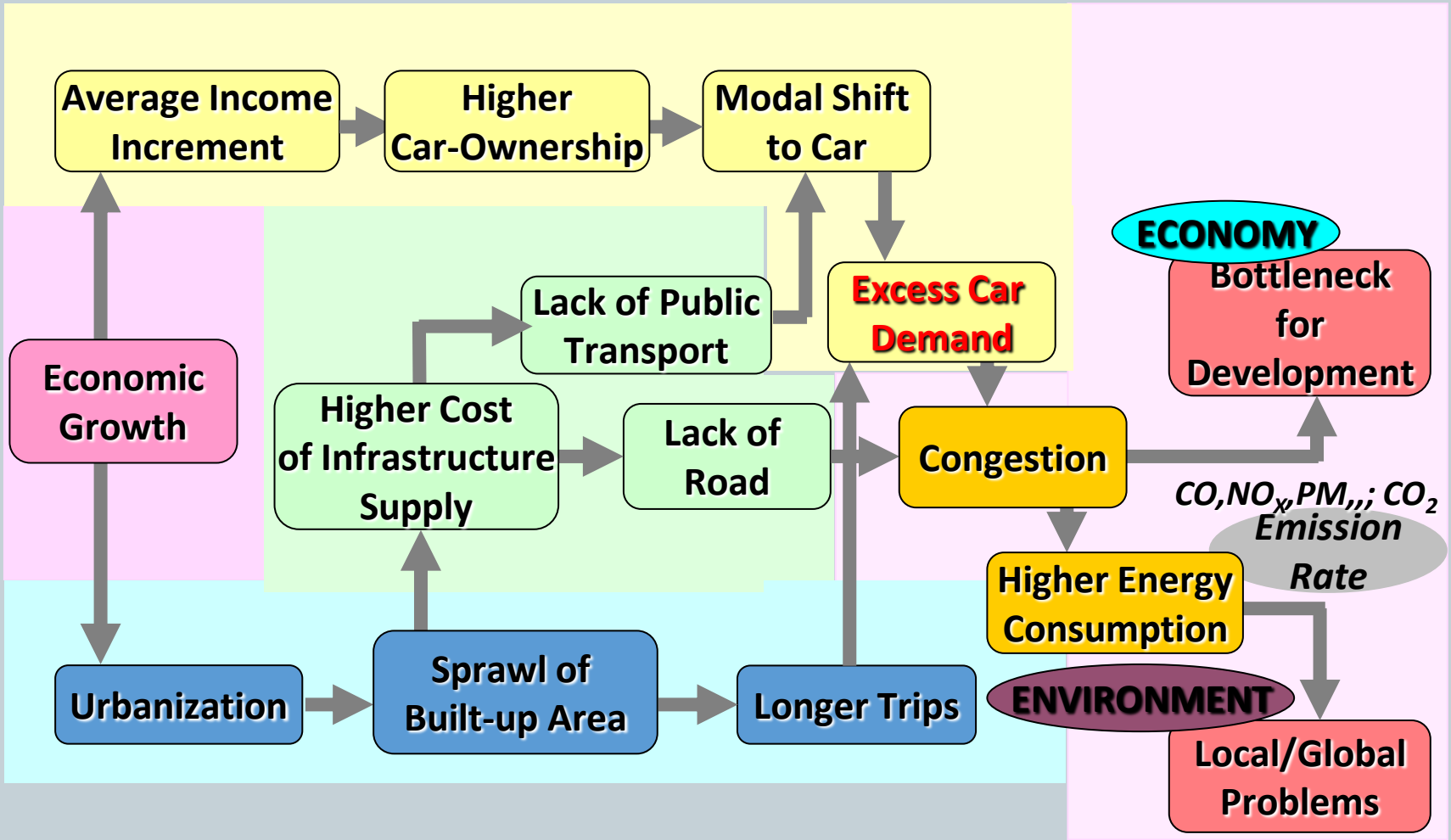
Growth of Motorised Personal Vehicles in Greater Mumbai



Car and Public Transport Vicious Circle

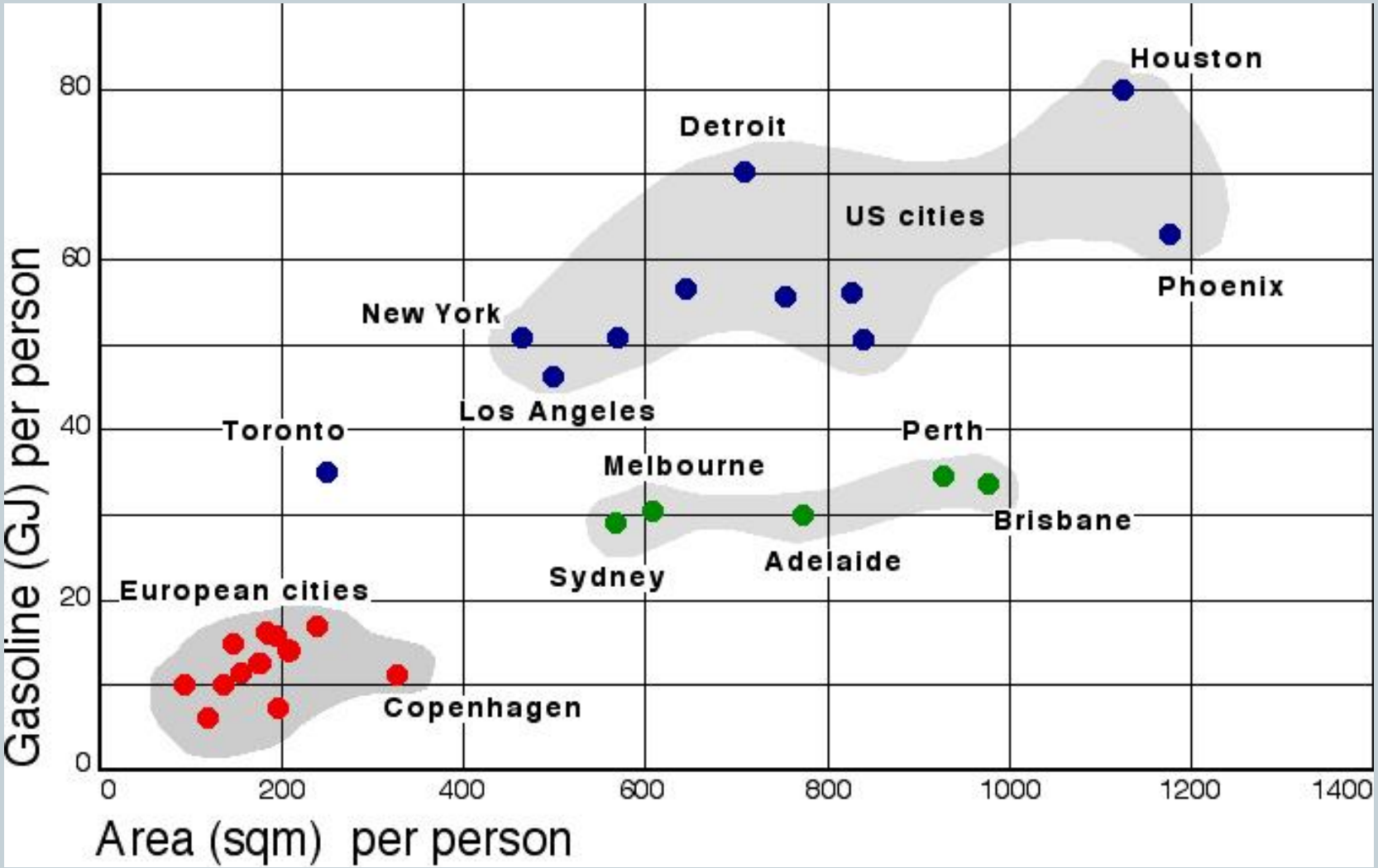


Effects of Improper Urbanisation and Motorisation



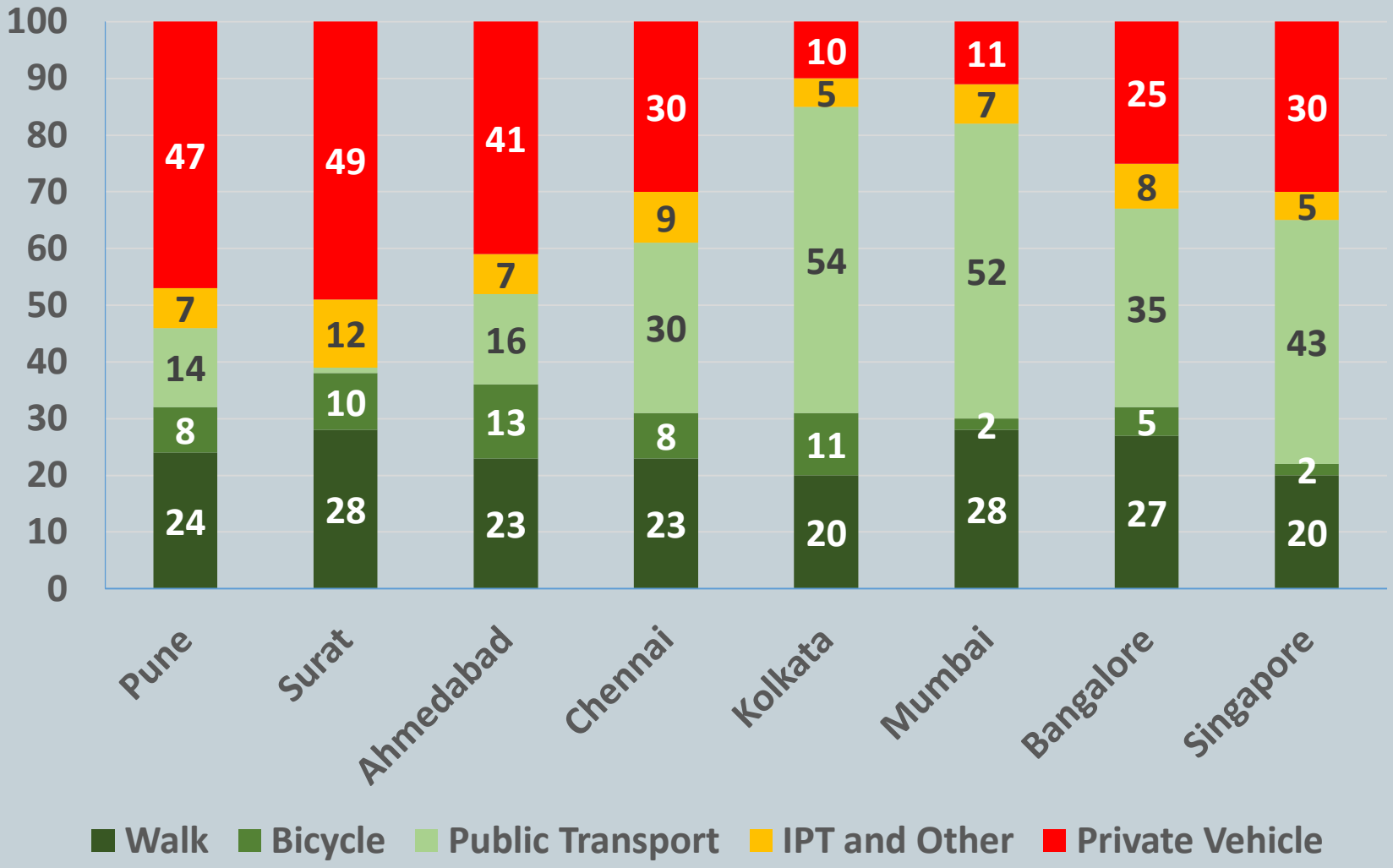
Courtesy: Yoshitsugu Hayashi, Nagoya University

Per Capita Gasoline Use

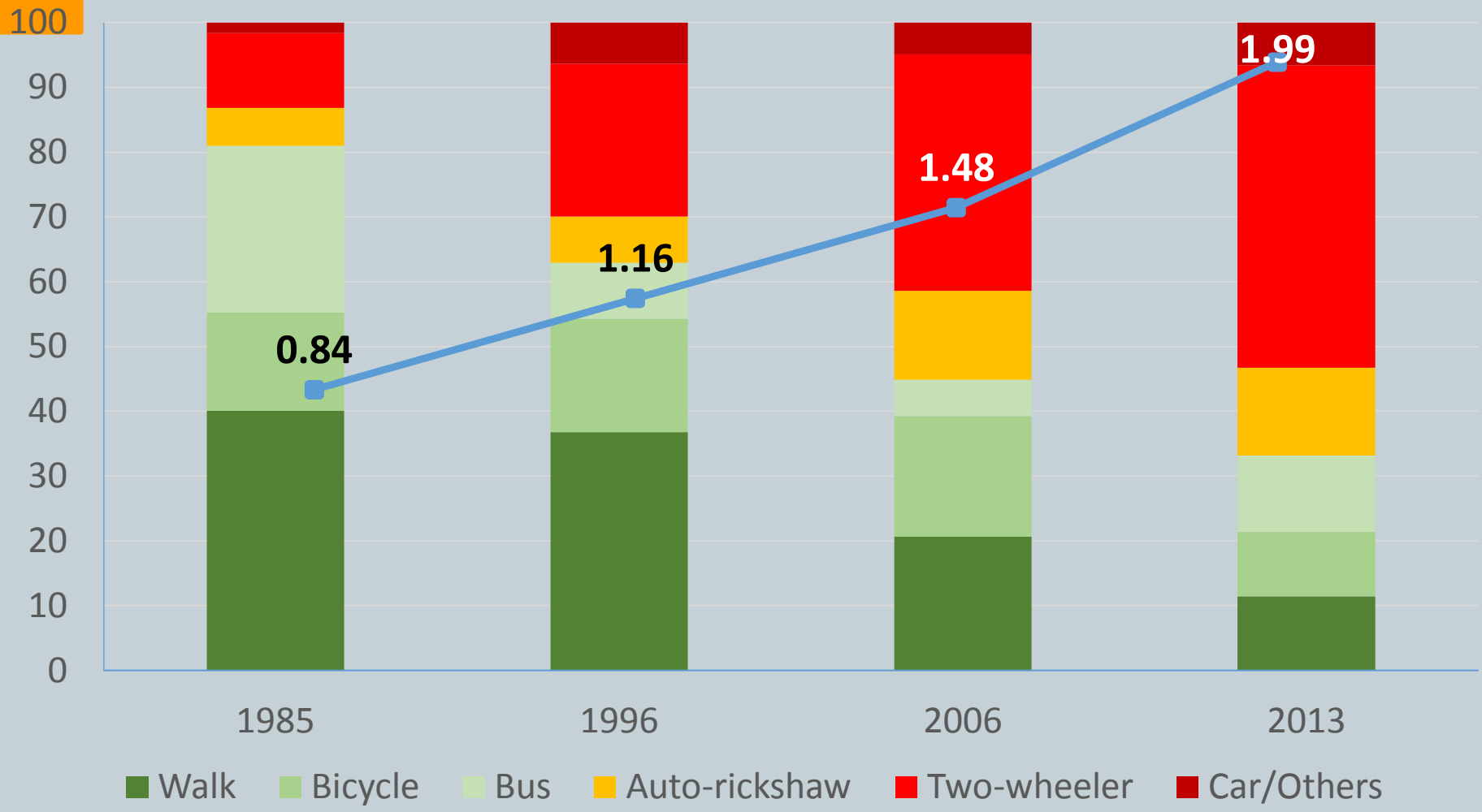


(Source: Wikipedia)

Modal Shares in Indian Cities



Diminishing Public Transport Share

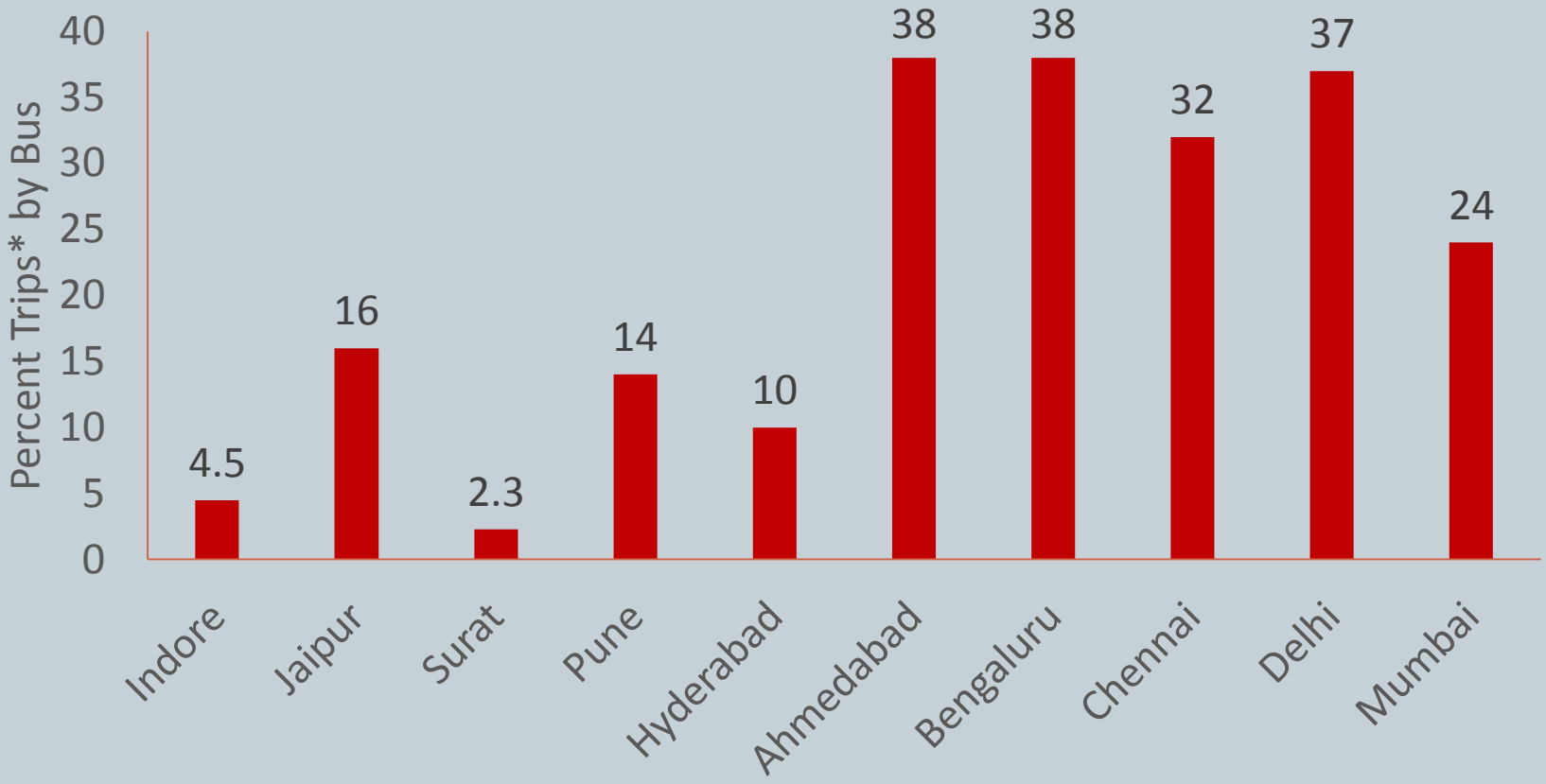


Modal shares of Vadodara from 1985 to 2013

Diminishing Public Transport Share

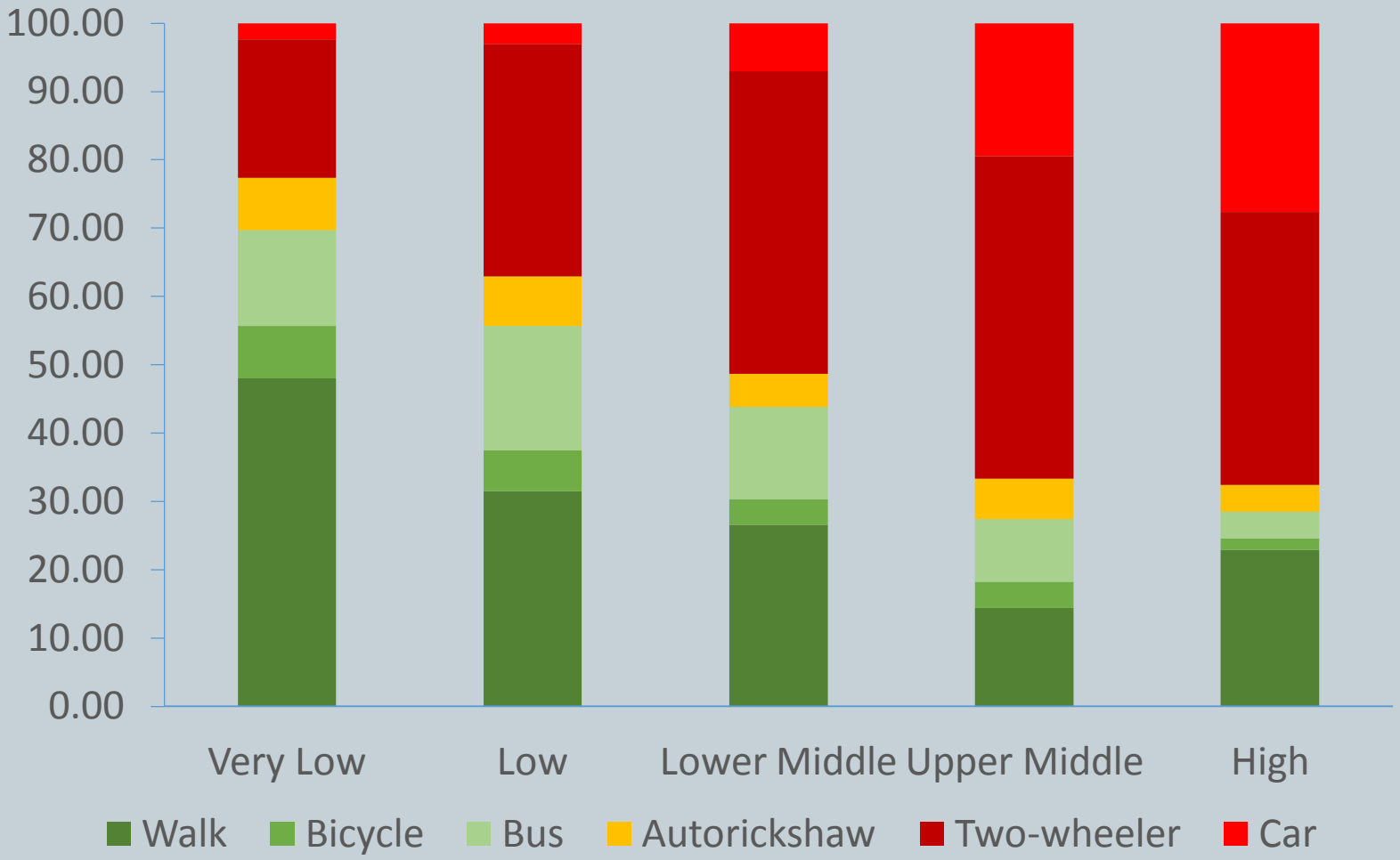
- The fleet size of 200 in 1985 in Vadodara declined to 85 in 2006
- Reasons:
  - Not providing door to door service, i.e., absence of last mile connectivity
  - Lack of information on bus schedules
  - Infrequent and not convenient
  - Discomfort inside vehicles
  - Perceived cost of travel by private vehicle is less than that by public transport
  - Overall poor area coverage, accessibility and quality of service
  - Public transport planning not integrated with the land use planning

Share of Trips by Bus in Indian Cities



*Excluding non-motorised trips. Data pertains to the period 2007 – 2011

Modal Split by Income Level

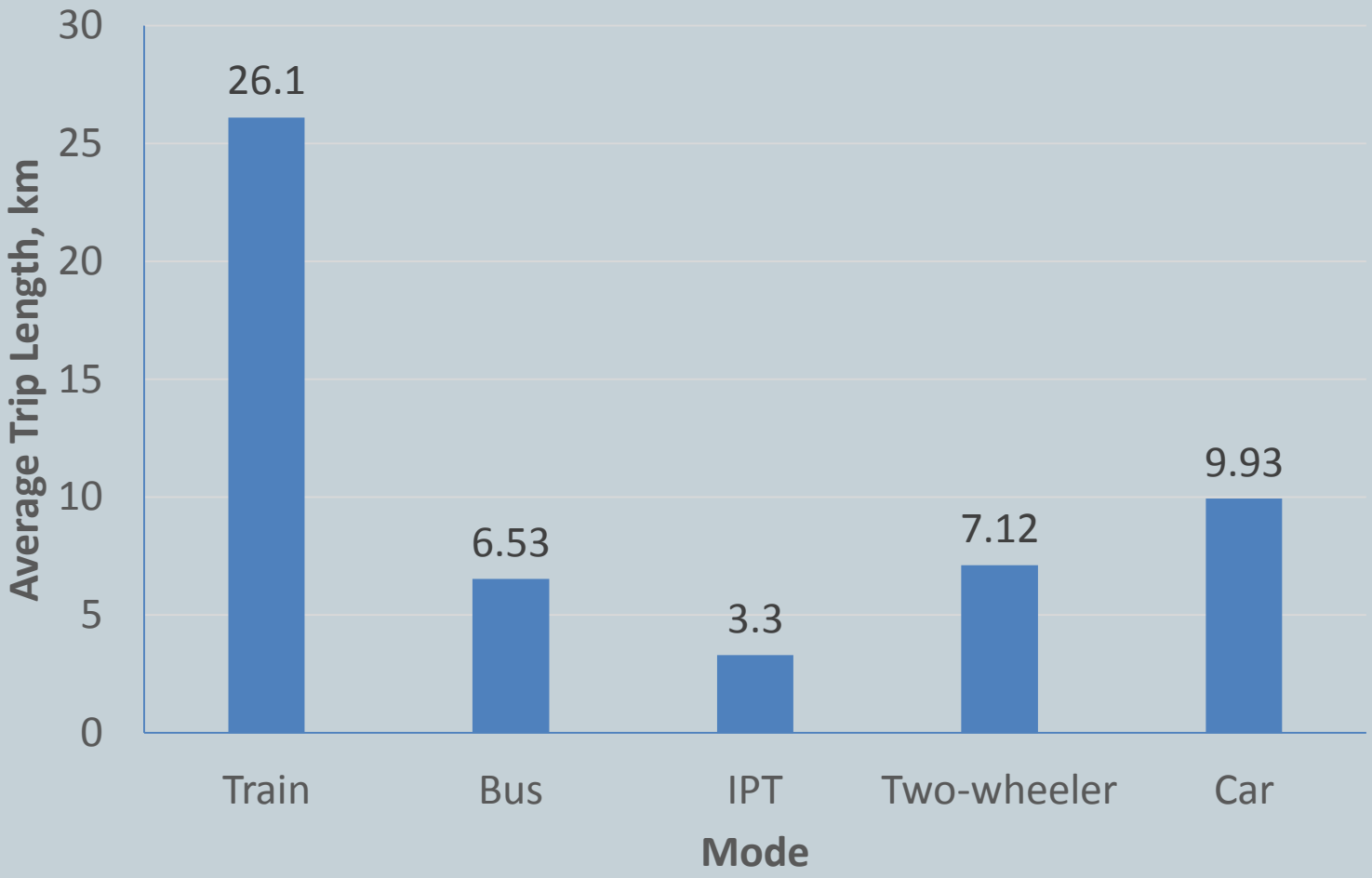


Source: Transportation Status Report by Citizens of Pune, 2012-13

Crowding inside PT Vehicles

Super dense crush load

Average Trip Length by Mode in Mumbai



Avoid-Shift-Improve Approach

Reduce or avoid the need for travel	Shift to more environmentally friendly modes	Improve the energy efficiency of transport modes and vehicle technology
• Integration of land use and transport • Mixed land use • TOD • Ride sharing	• Transport demand management • Shift to NMT • Shift to PT	• Shift to alternative fuels • Electric cars

Policy/Techno Instruments for ASI

CUTE Matrix		Strategy: Avoid Reduce traffic demand	Strategy: Shift Reduce emissions per unit Transported	Strategy: Improve Reduce emissions per kilometer
Instruments	Technology	Pedestrian Ort Dev't Bicycle Ort Dev't Transit Ort Dev't	Integrated Public Transport System (BRT+ParaTransit) Highly Competitive Railway	LEV, EV Alternative Energy Advanced Infra- Tech Logistic Efficiency
	Regulation	TDM Parking Regulation Compact/Mix Land Use	Bus/Tram Priorities Non-MT Smarter Modal Evolution	Emission Standard Top Runner Program Eco-Drive
	Information	ICT Telework Smart Choices for Workplace and Schools	Awareness Campaign	Knowledgebase ITS Labeling of Vehicle Performance
	Economic	Fuel Tax Road Pricing Car Charge / Fee Location Subsidy	Fuel Tax Road Pricing Car Charge / Fee	Fuel Tax LEV Preferential Tax

Generalised Cost of Travel as Equity Measure

Components of Generalised Cost

In vehicle travel time

- walking time
- Waiting time
- Transfer/interchange time
- Perceived cost of travel
- Cost incurred at the transport terminal
- Cost of Discomfort (e.g., crowding inside vehicle)

Suitable weights are used for converting each component into common unit i.e., either money (fare) or time (in vehicle travel time) units.

Typical Subjective Values of Generalised Cost Components

Income Group	Waiting Time (Rs/hr)	Travel Time (Rs/hr)	Discomfort (Rs/hr per unit shift in DC)
Middle	44.00	36.50	27.00
High	100.00	79.00	65.00
Low	22.50	20.00	1.90

How to address equity issue in Transportation Planning

- Net benefit to travelers in terms of reduction in generalised cost of travel can be used as an equity measure
- The net benefits to travelers of different socioeconomic groups can be worked out due to the implementation of any transportation improvement
  - Net benefits to travelers by income class
  - Net benefits to travelers by age group
  - Net benefits to travelers by Gender
  - Net benefits to travelers by disadvantaged group
- In order to facilitate shift to public transport from various socioeconomic groups, transport planners and operators must work to develop a differentiated supply for a differentiated public.

Accessibility as Equity Measure

- $AM_i^s = \sum_j E_j e^{-\beta C_{ij}}$
- Where, AM_i^s= Accessibility Measure for spatial unit i for socioeconomic group s
- E_j = opportunities, such as employment, education, etc. of spatial unit j
- c_{ij}^s= Generalised cost of travel between i and j for socioeconomic group s
- β = calibration parameter

National Transport Policy

- Integrating land use and transport planning
  - Sustainable Urban Mobility Plans
  - Transit Oriented Development
- Equitable Allocation of Road Space
  - Public transport
  - NMT
- Priority and use of Public Transport
  - Appropriate Technology
  - Last mile connectivity
  - Pricing
  - Financing
- Role of Para Transit
- Priority to Non-motorized Transport
- Use of Cleaner Technologies
- Parking
  - Pricing
  - Park and ride facilities
- Capacity Building
- Public Private Partnership
- Innovative Financing Mechanisms using land as a resource
  - Betterment levy on land owners
  - Commercial exploitation of land

Smart Cities Project

- Smart City
  - Focuses on sustainable and inclusive development
  - Is compact and having core infrastructure with a decent quality of life to its citizens
- Transport Sector
  - Creating walkable localities with mixed land use
  - Transport Infrastructure that provides efficient urban mobility and public transport
  - Tranits Oriented Development (TOD), public transport and last mile para-transit connectivity
  - Integrated multimodal transport
- Smart Solutions
- Mission for Rejuvenation and Urban Transformation stresses on Avoid, Shift Improve Policy

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THANK YOU