Designing cities for sustainable mobility

Chandni Chawk

Kolkata

Lutyen's Delhi ?

-- Centre for Science and Environment

Workshop Series on `Transport and Climate`
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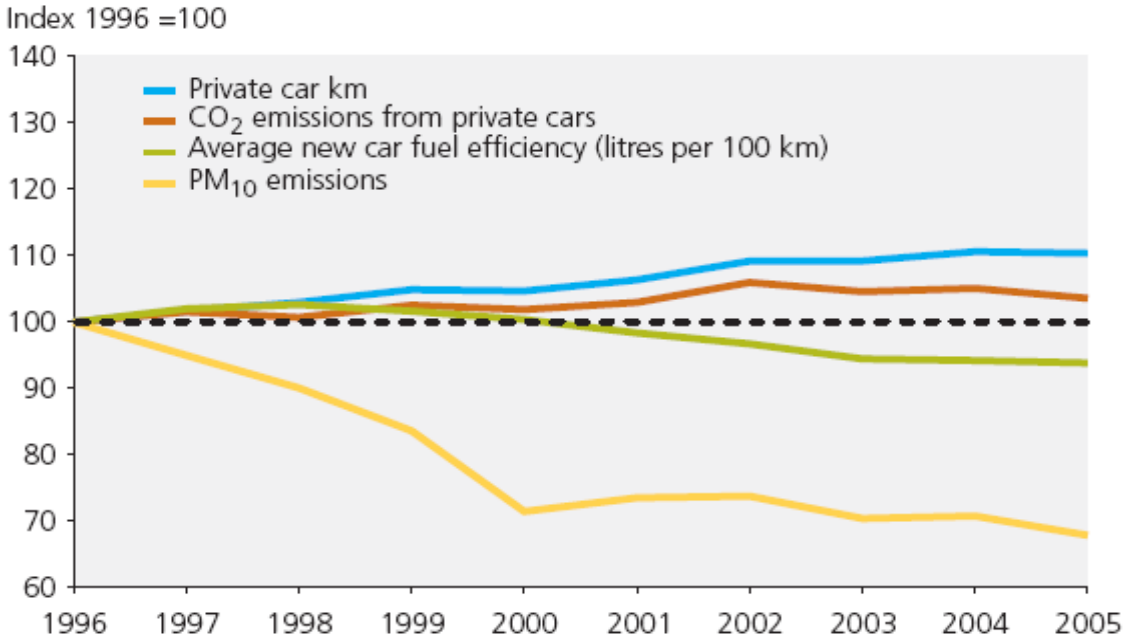
Only efficiency is not the answer
Lesson from other regions……..

UK distance driven, fuel use and emissions from private car transport: 1996-2005



Source: The environment in your pocket 2007, Department for Environment, Food and Rural Affairs. UK Govt.

•-- 1996 - 2005 fuel consumption of new cars in the UK decreased by 6% as a result of improvements in efficiency.

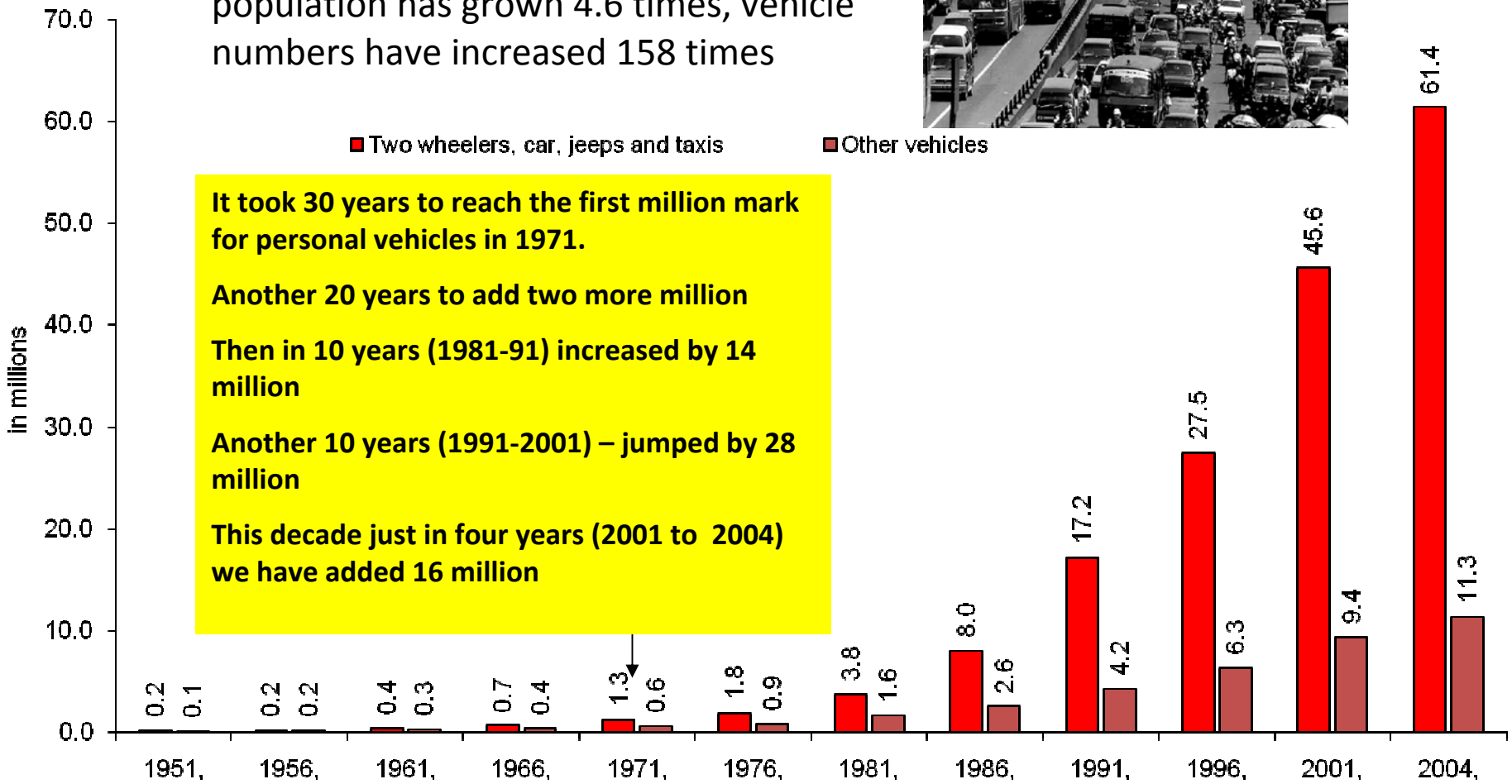
•-- But the emissions of CO2 from cars rose by 4% in the same period, mainly because of increasing distances travelled by car, which rose by 10%.

Mobility crisis in our cities…..

…… an increasing share of our daily trips are being made by cars that occupy more road space, carry fewer people, pollute more, guzzle more fuel. They edge out pedestrians, bicycles, cycle rickshaws and buses……..

Explosive numbers

Vehicle registration in India: India's urban population has grown 4.6 times, vehicle numbers have increased 158 times



It took 30 years to reach the first million mark for personal vehicles in 1971.

Another 20 years to add two more million

Then in 10 years (1981-91) increased by 14 million

Another 10 years (1991-2001) – jumped by 28 million

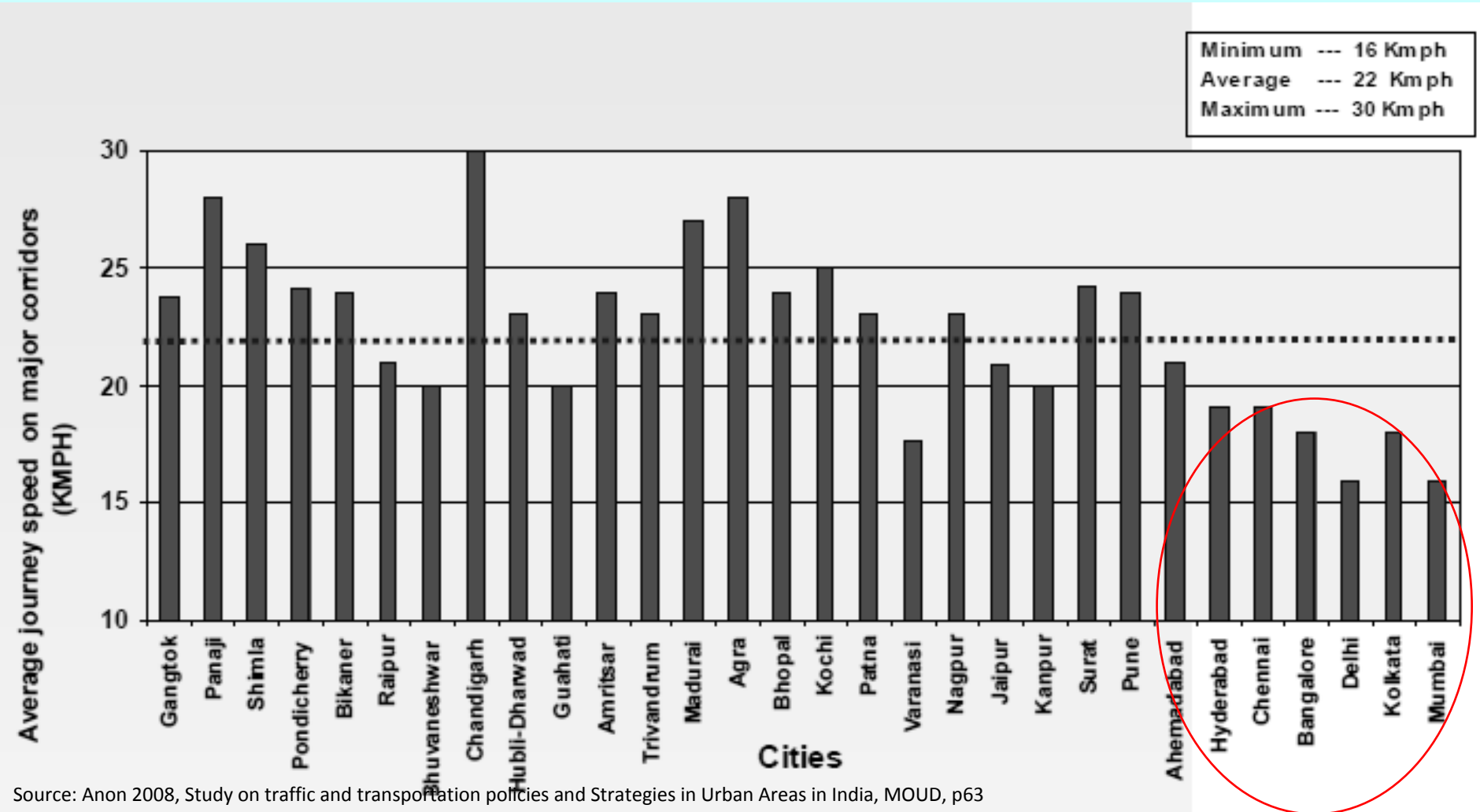
This decade just in four years (2001 to 2004) we have added 16 million

Source: Computed on the basis of MOSRTH motor vehicle registration data

Cities are Paralyzed

The Crawling Traffic

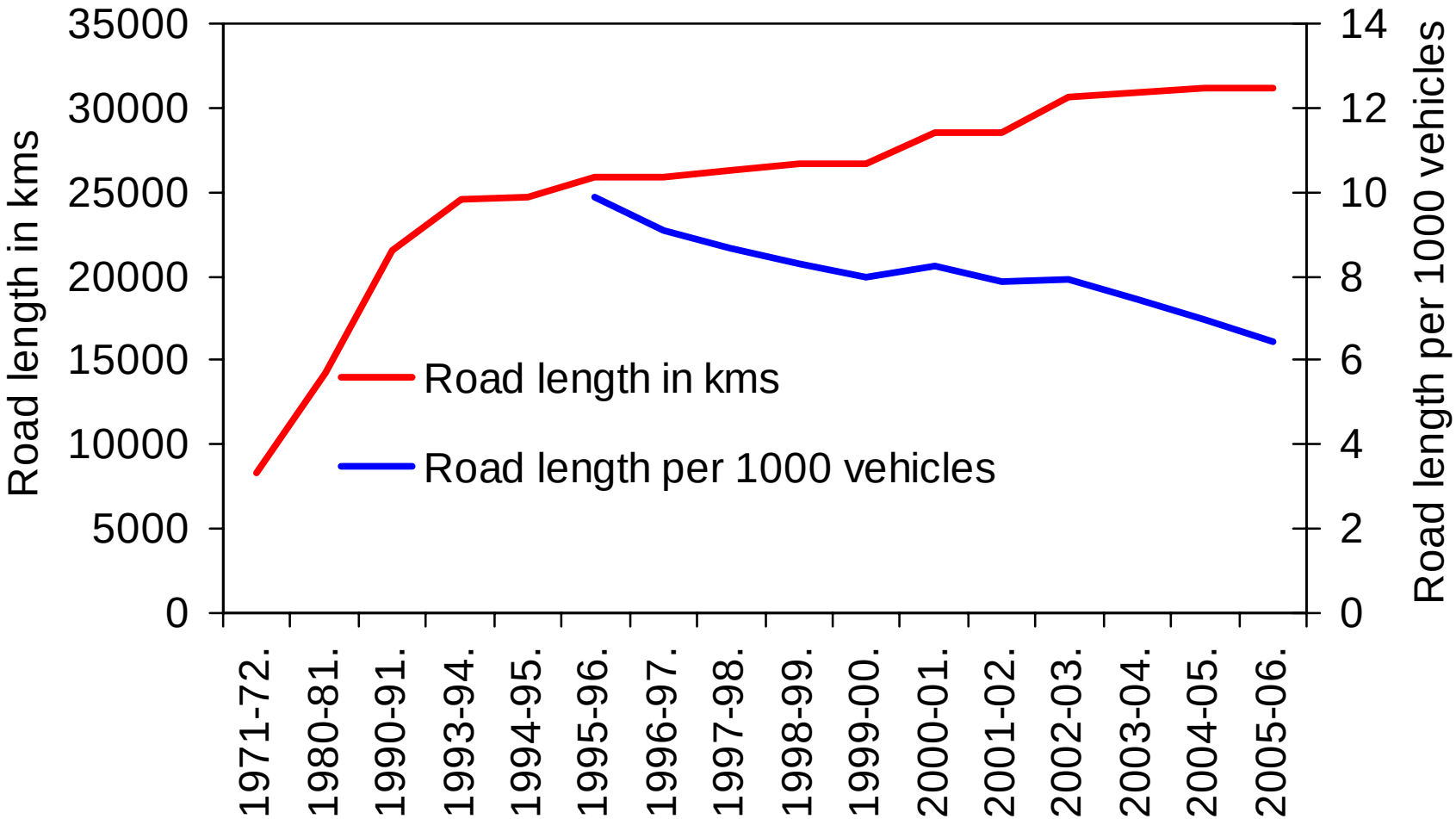
The average journey speed in Delhi (16 km/hr), Mumbai (16 km/hr) and Kolkata (18 km/hr): Abysmally poor compared to smaller cities



Source: Anon 2008, Study on traffic and transportation policies and Strategies in Urban Areas in India, MOUD, p63

Roads hitting dead end in Delhi

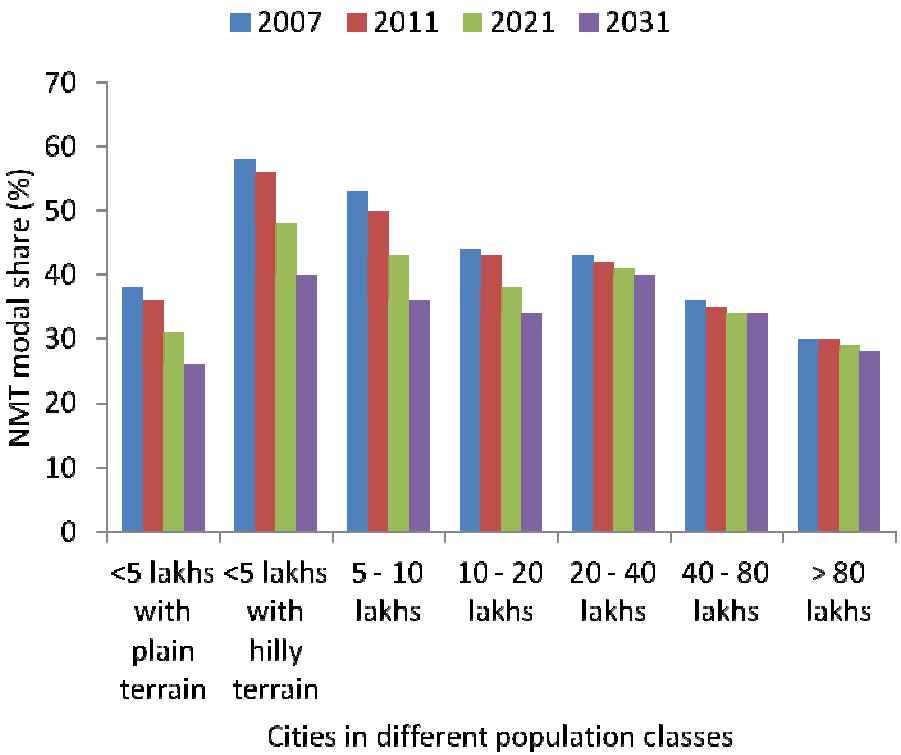
Roads expansion cannot keep pace with rising number of vehicles. Delhi has built 65 flyovers…….Yet congestion is getting worse by the day

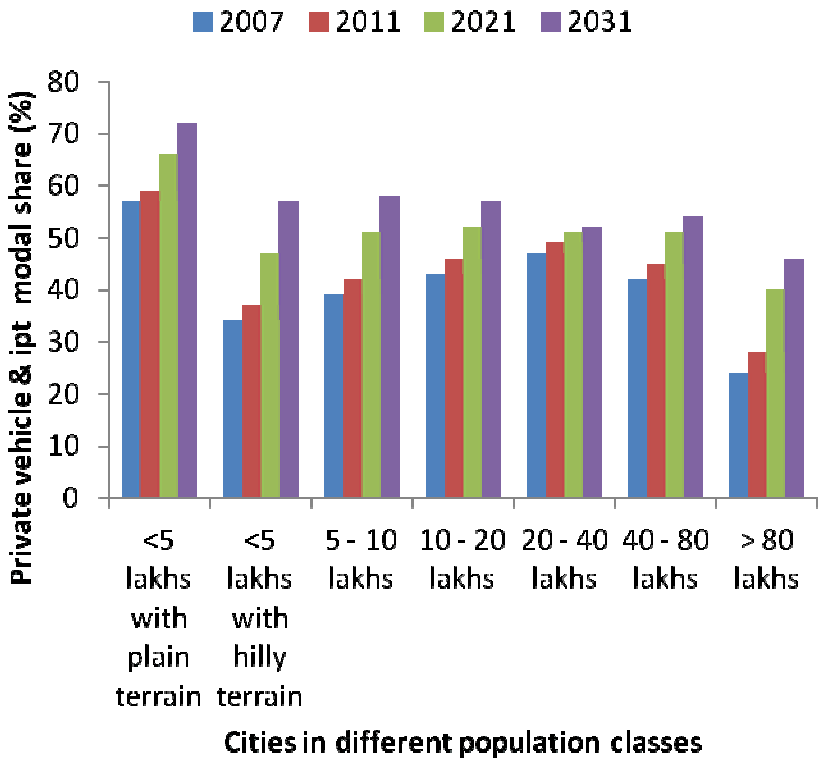


Source: On the basis of Economic Survey, Delhi Govt

Share of walk and cycle declining. Motorised transport gaining…….

Personal motorised travel to gain about 20% additional modal share in most city categories until 2031

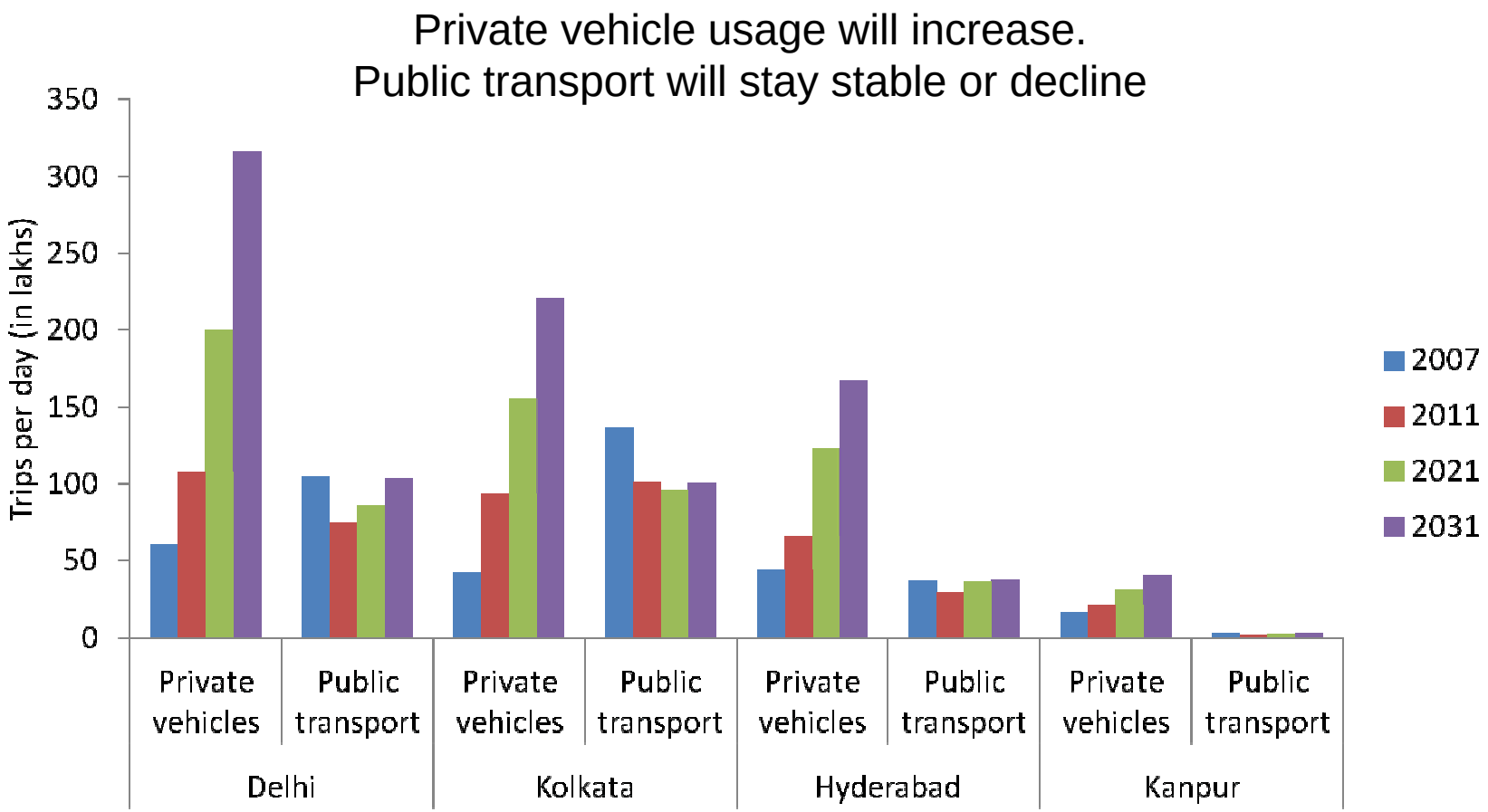




Source: CSE based on MOUD/WSA data 2008

Shadow of things to come

Modal share trend 2007-2031



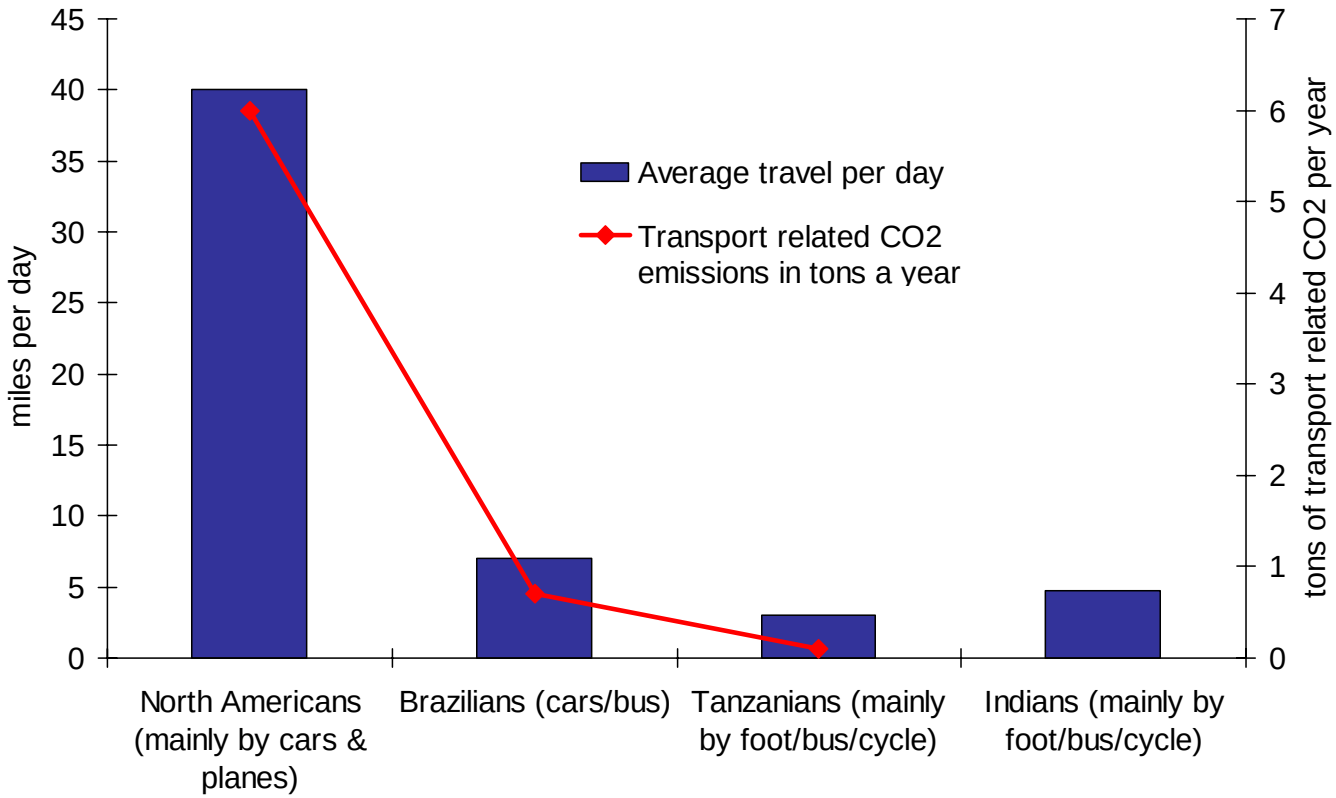
Source: Based on: MOUD 2008, Study on traffic and transportation policies and strategies in urban areas in India, Wilbur Smith Associates, Ministry of Urban Development, May

These are symptoms of the crisis

….. Need to go to the root of the problem

Travel locks up enormous carbon

Travel and CO2 emissions



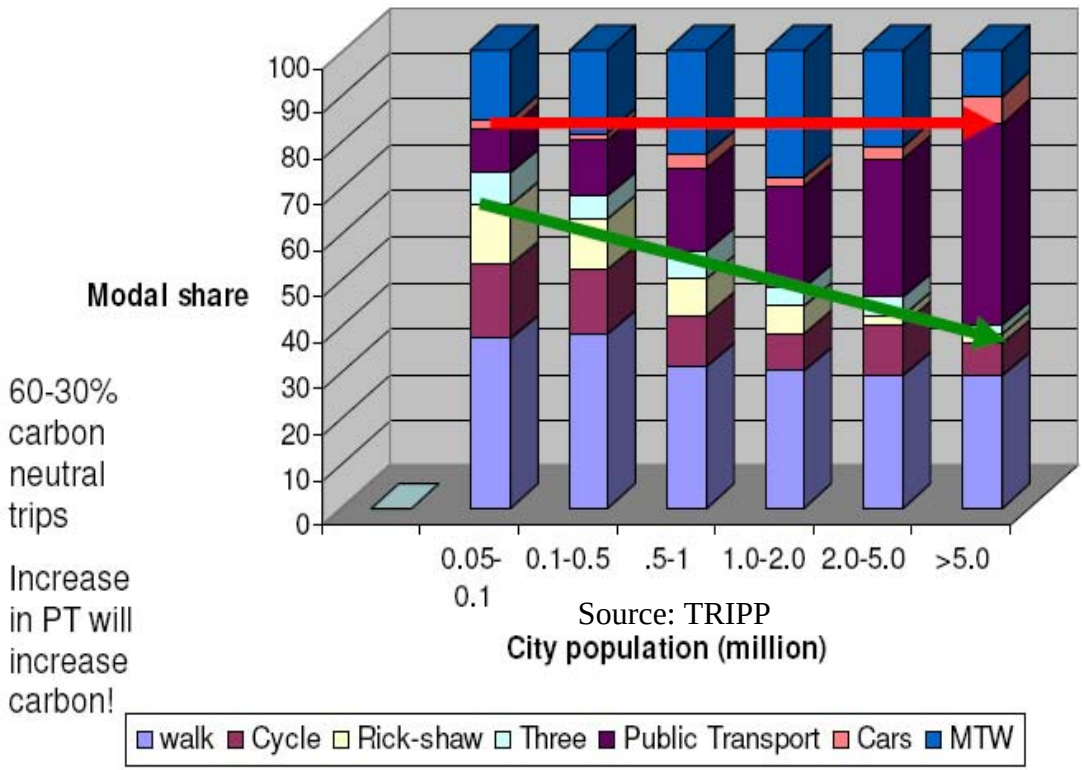
Source: unep

Our inherent strength…….

- We have built walkable cities: - 30-60% trips carbon neutral.

Urban Mobility

PT and NMV based, MTW majority personal vehicles



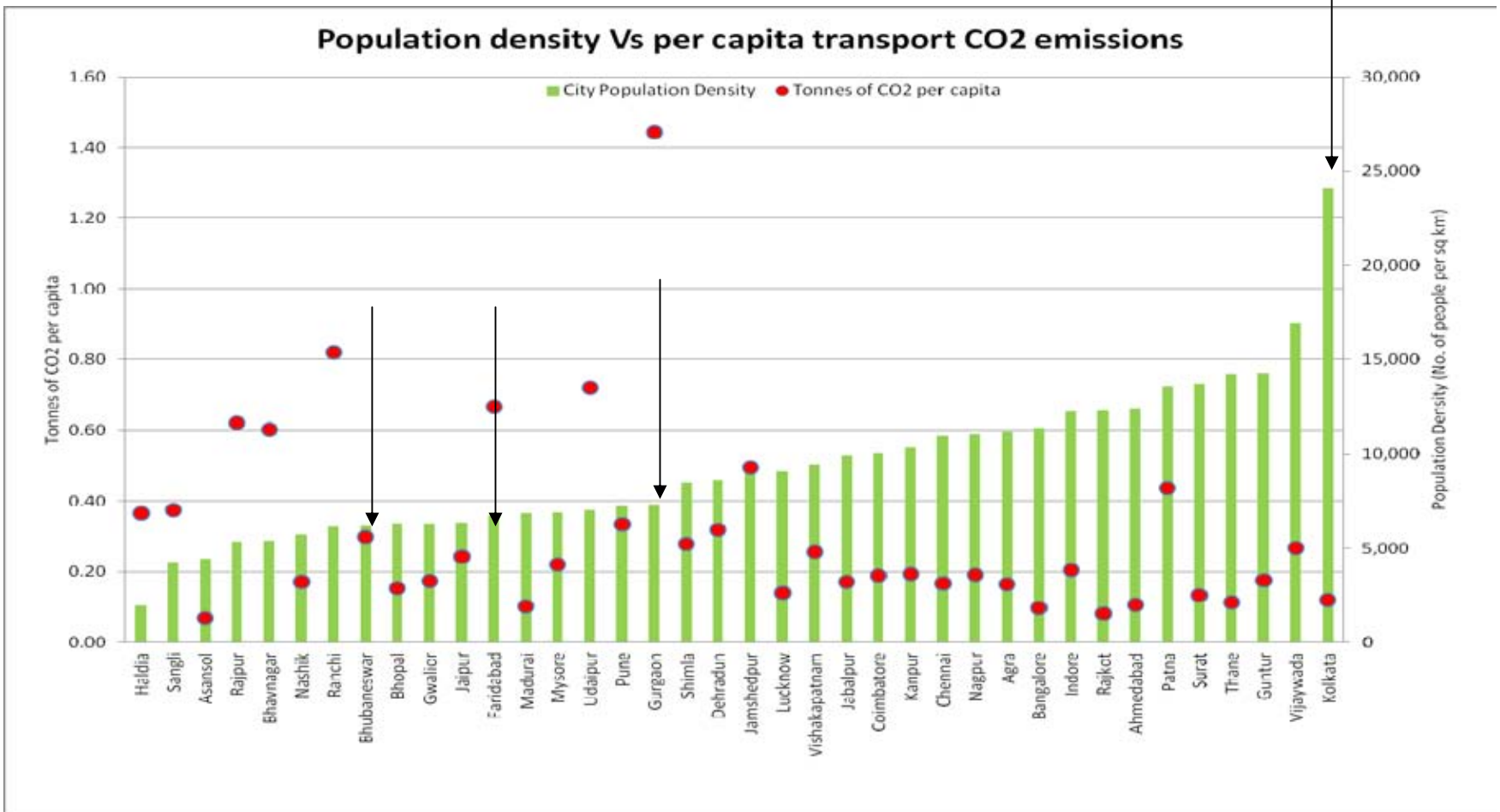
60-30% carbon neutral trips

Increase in PT will increase carbon!

Source: TRIPP

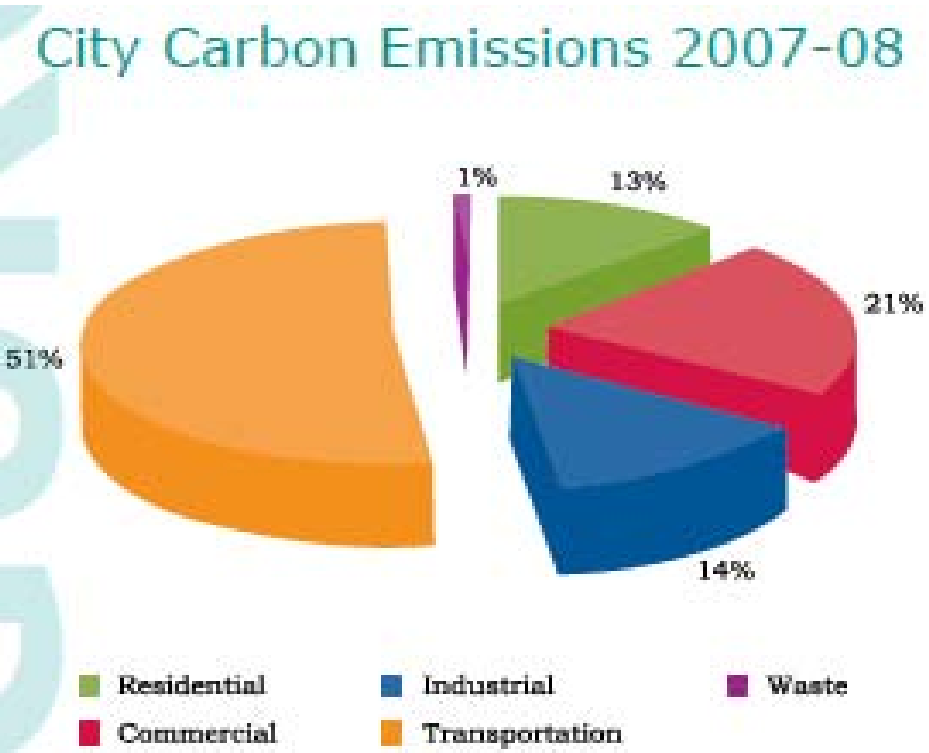
Pattern of per capita CO2 emissions, density and travel pattern…….
More dense the city, less CO2 emissions

- **Surprise:** Some smaller cities with lesser density, (eg Faridabad, Gurgaon, Patna etc) have higher per capital CO2 emissions

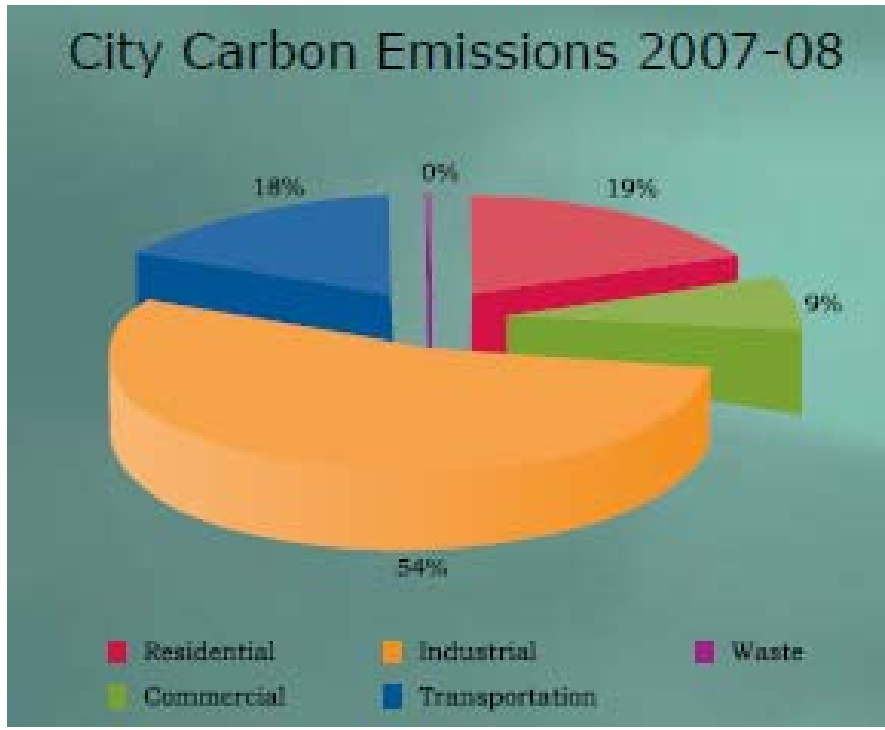


A mega city and a satellite town

Gurgaon

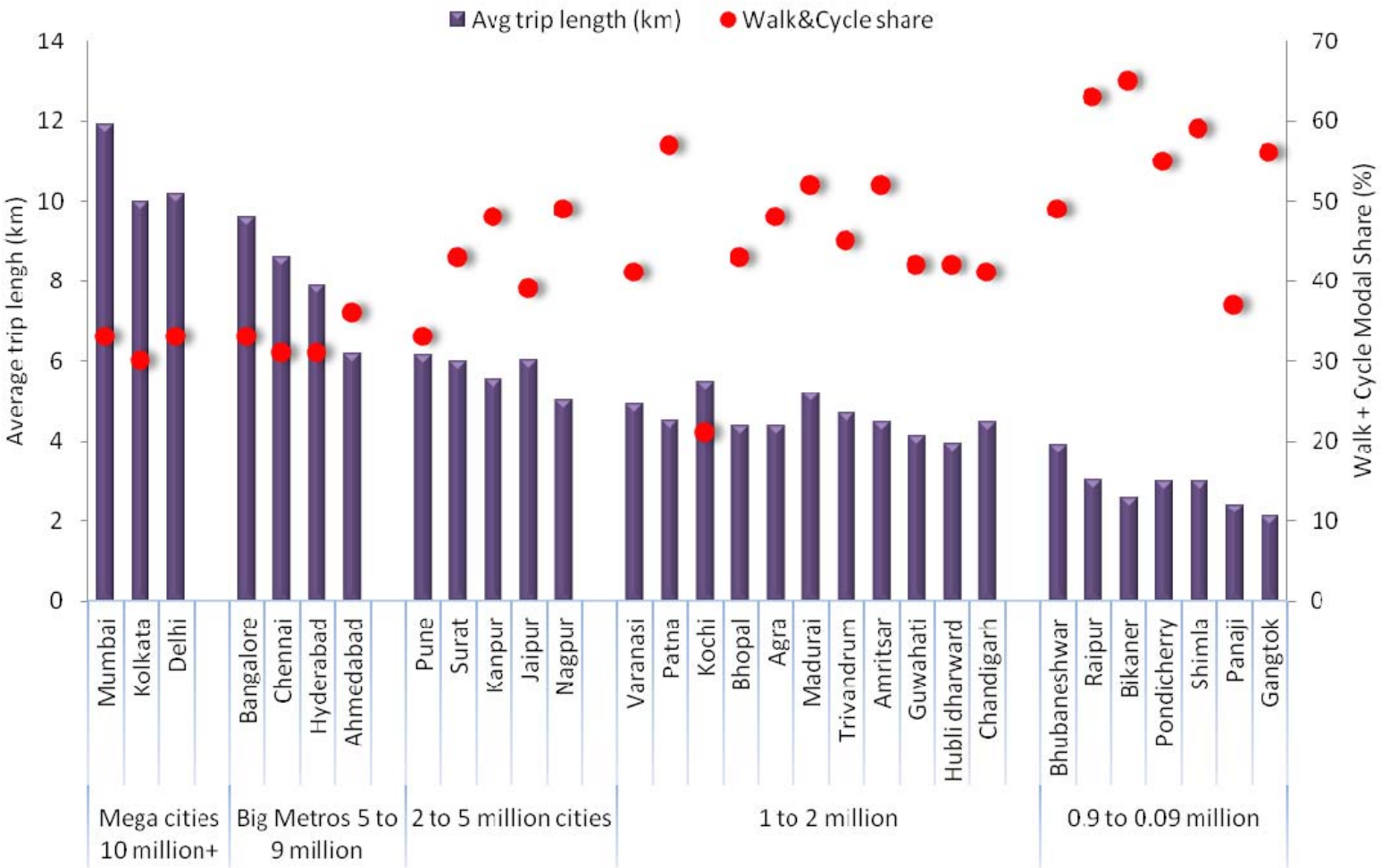


Kolkata:



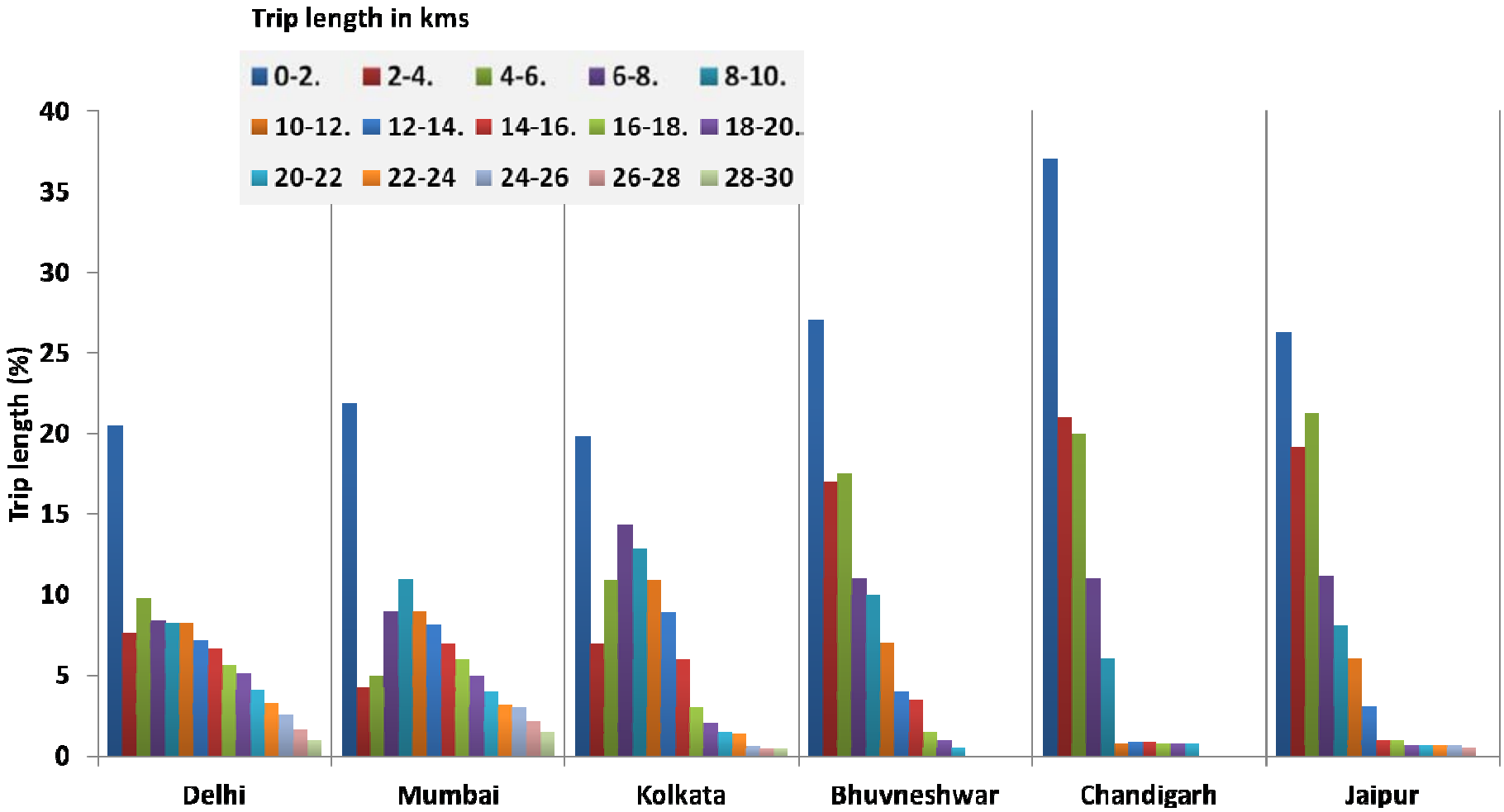
Source: ICLEI

Strong co-relation between trip length and share of walking and cycling



Source: Based on MOUD/WSA 2008

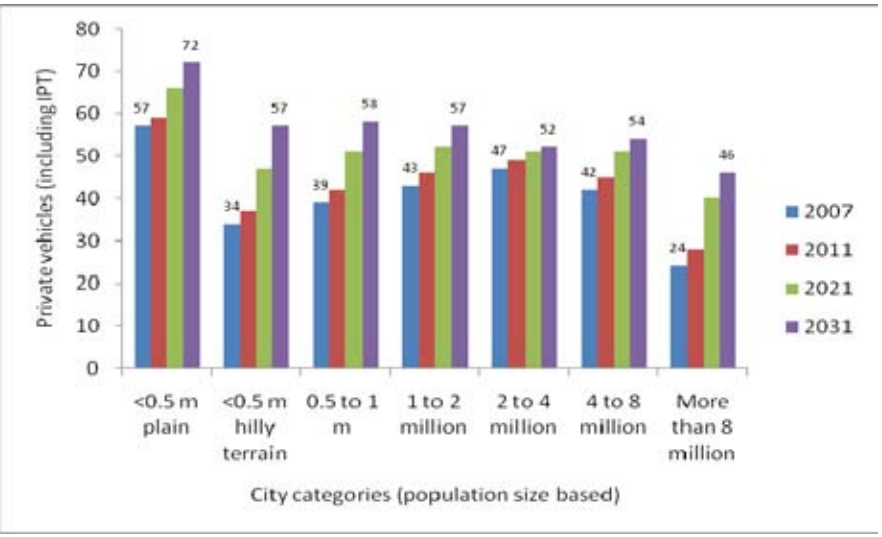
Sprawl effect
Bigger cities show more trips in higher distance range

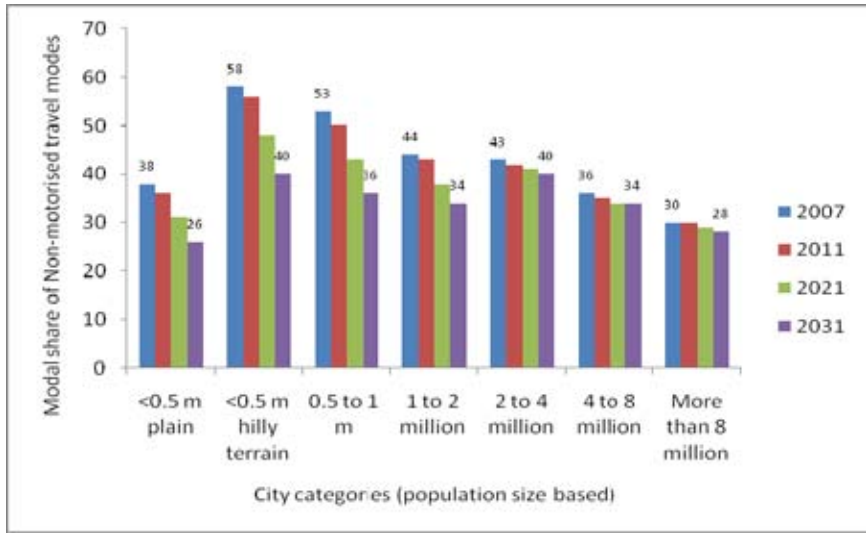


Source: Based on MOUD/WSA 2008 database

Emerging cities: Special challenge

•**WSA/MOUD forecast -- Cities with 0.5 million to 2 million population will have massive share of private vehicles in 2031 -- about 57% -- Mega cities will be at 46%.**

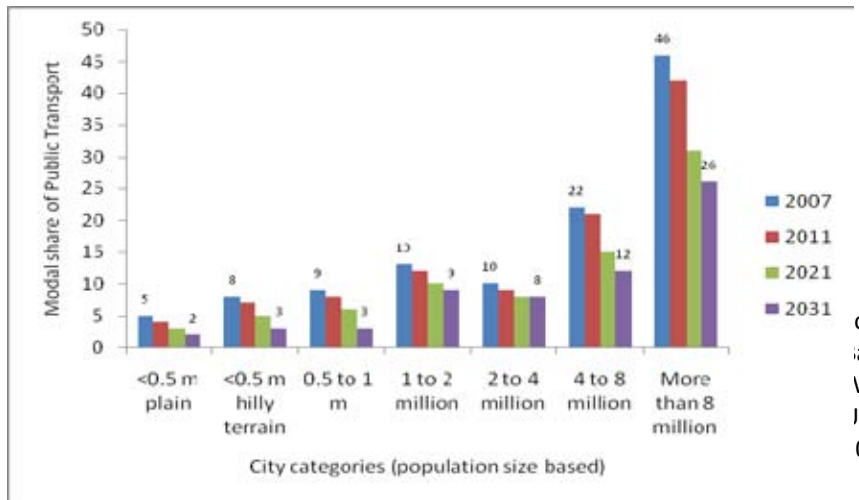




•Share of non motorised vehicles high but to decline more rapidly.

•Share of public transport will decline in all cities. But the share of formal public transport which is already low in smaller cities will slide further

•Private vehicles will grow very rapidly



ource:
ased on
VSA/MO
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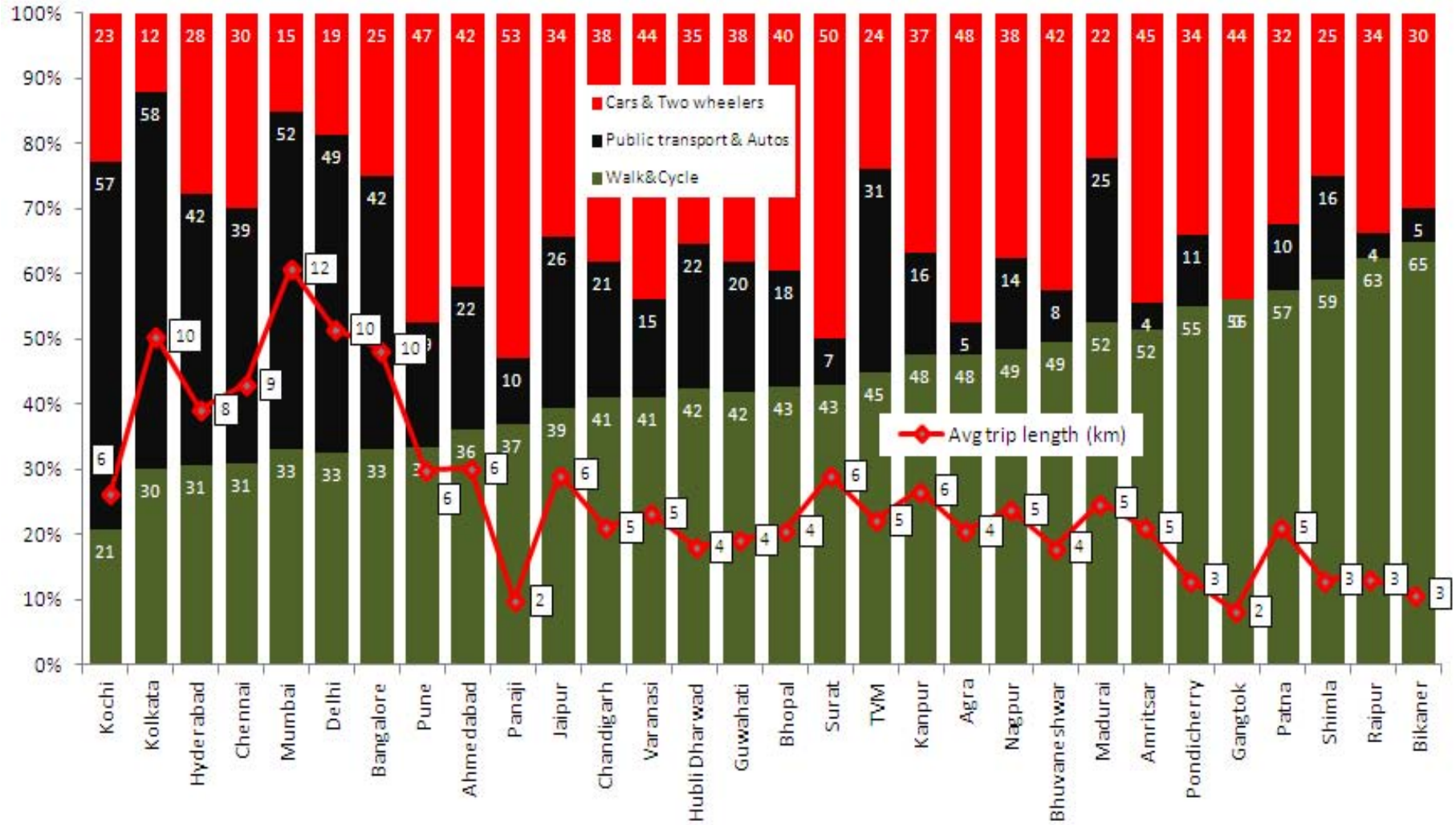
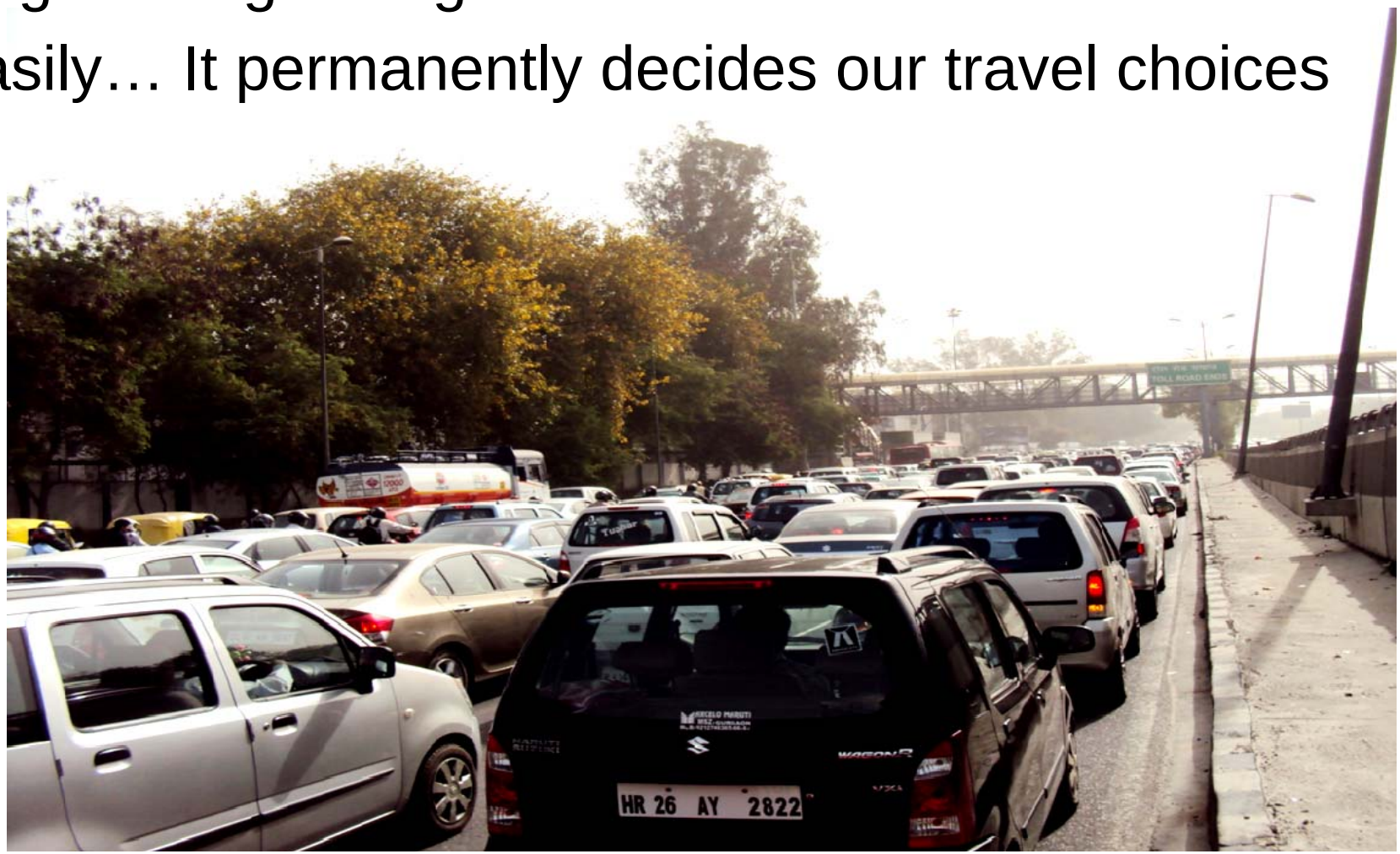
Compact cities have shorter trip length, more walking and cycle share and less CO2 emissions



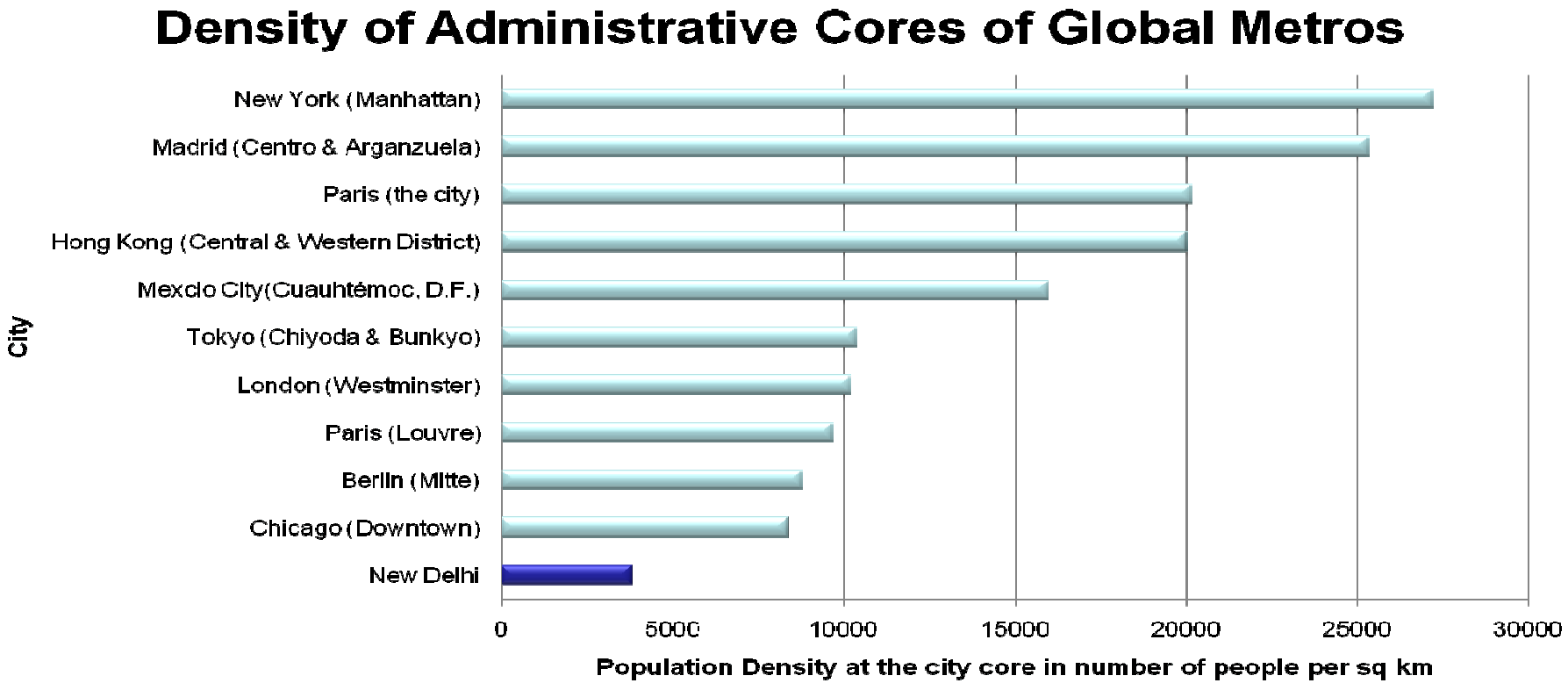
Source: Based on analysis of data provided in reports: 1) ICLEI-South Asia 2009 2) WSA/MOUD 2008

Delhi: Paradigm of density control, signal free roads, FOBs…….

Engineering changes once made cannot be reversed easily… It permanently decides our travel choices



Density control in Delhi has pushed people put of the city core



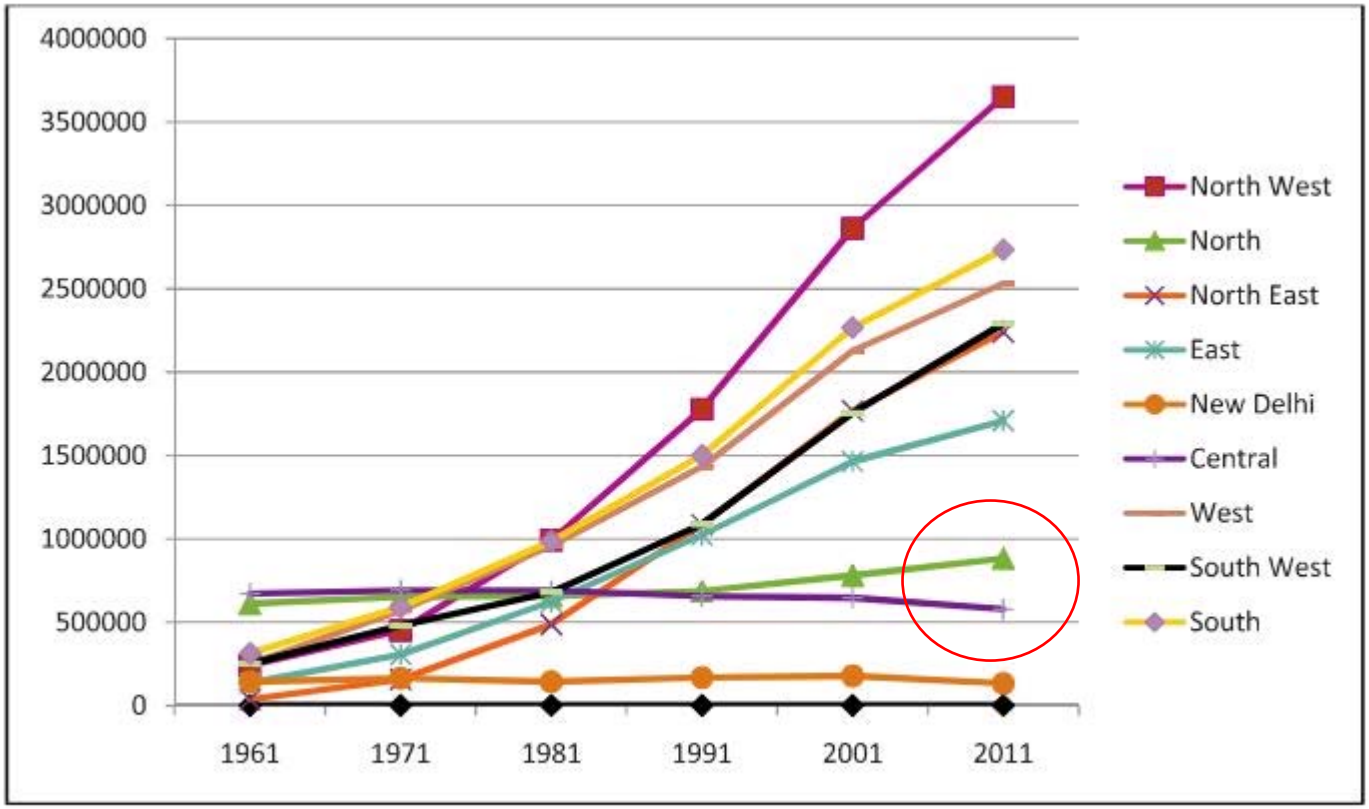
•Delhi has one of the most sparsely populated core in the world.

• New Delhi's density is more than six times lower than core administrative regions of New York and Madrid

• Even the heritage Louvre of Paris is 2.5 times densely populated than New Delhi

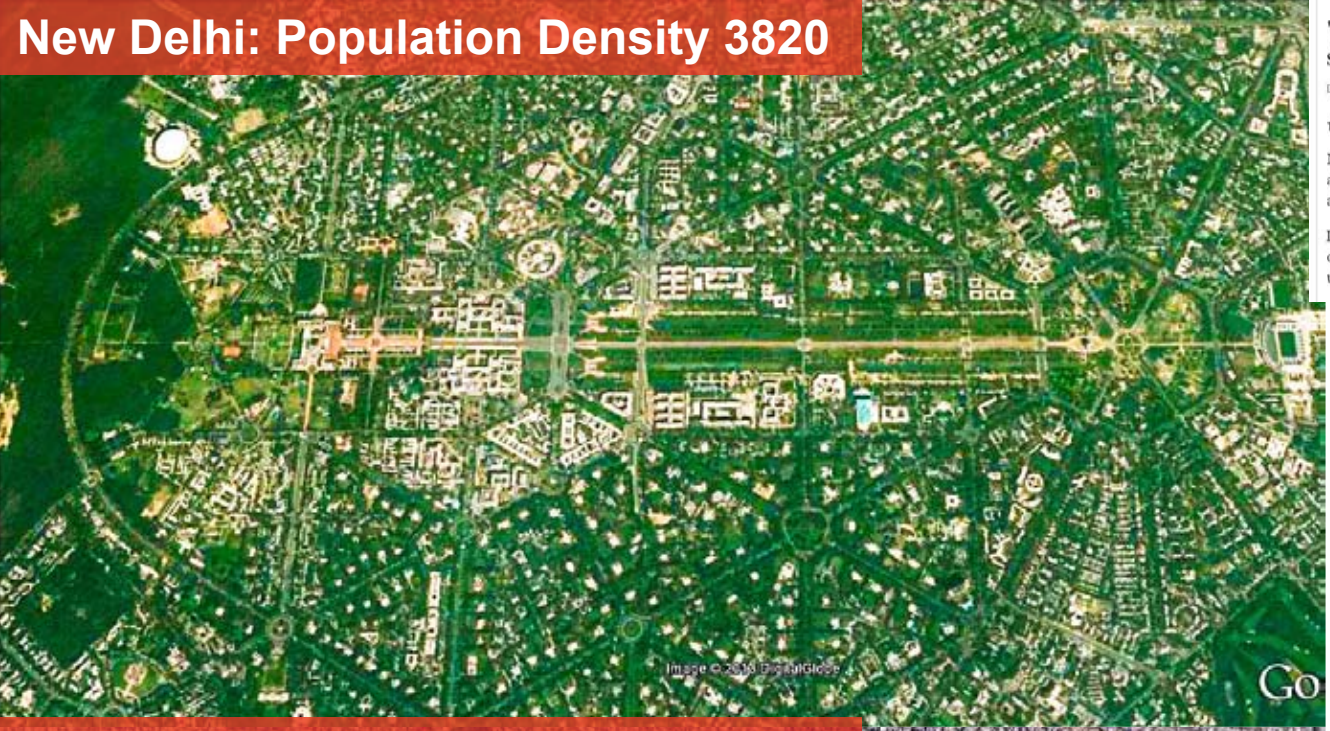
Source: Complied

Delhi: The core stagnates and declines

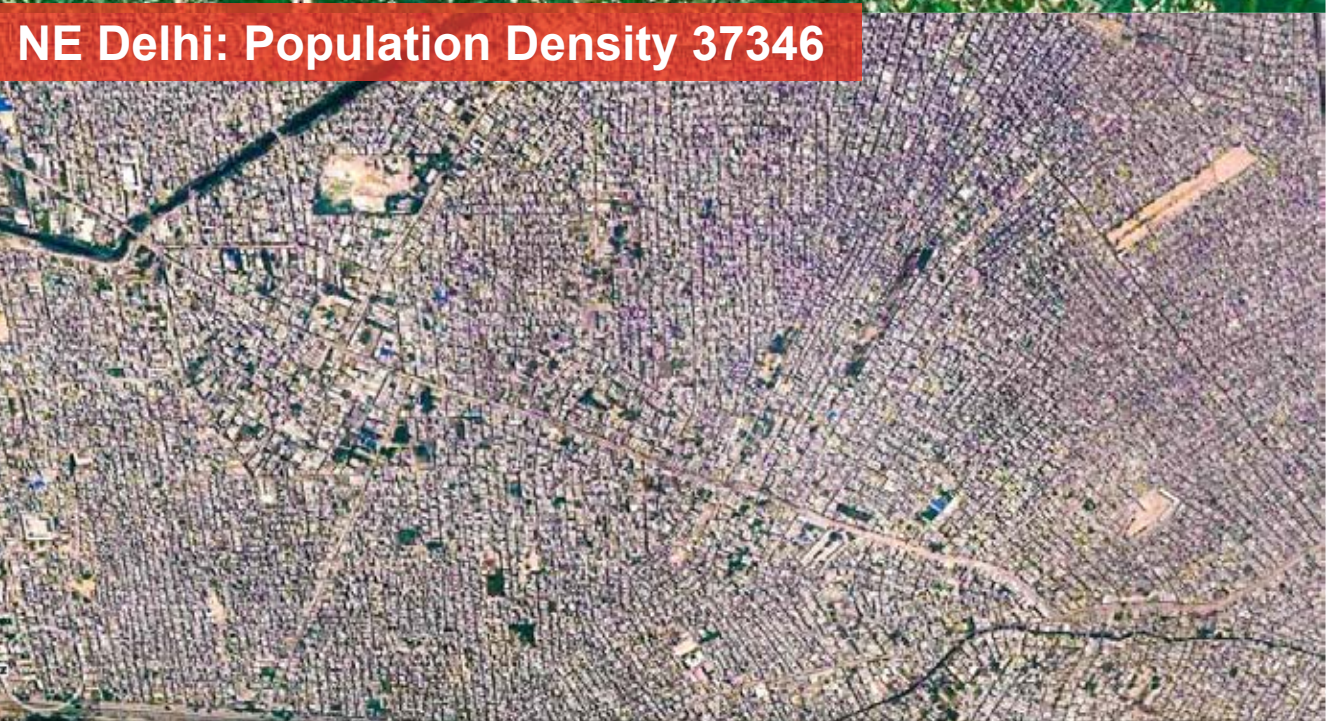


Graph 2: District wise population, from 1961 to 2011

New Delhi: Population Density 3820



NE Delhi: Population Density 37346



'Half of Delhi's population lives in slums'

Dhananjay Mahapatra, TNN Oct 4, 2012, 08.07AM IST

Tags: Supreme Court

NEW DELHI: Delhi may be one of the biggest metropolises in the world with a population of around 18 million, but nearly half its people live in slums and unauthorized colonies without any civic amenities.

In a note filed before the Supreme Court on management of municipal solid waste, the capital's civic bodies said, "About 49% of the total population of Delhi lives in slum areas, unauthorized colonies and about 860 jhuggi-jhonpri clusters with 4,20,000 jhuggies."

Only 1 per cent of Delhi's population live in Lutyen's Delhi.

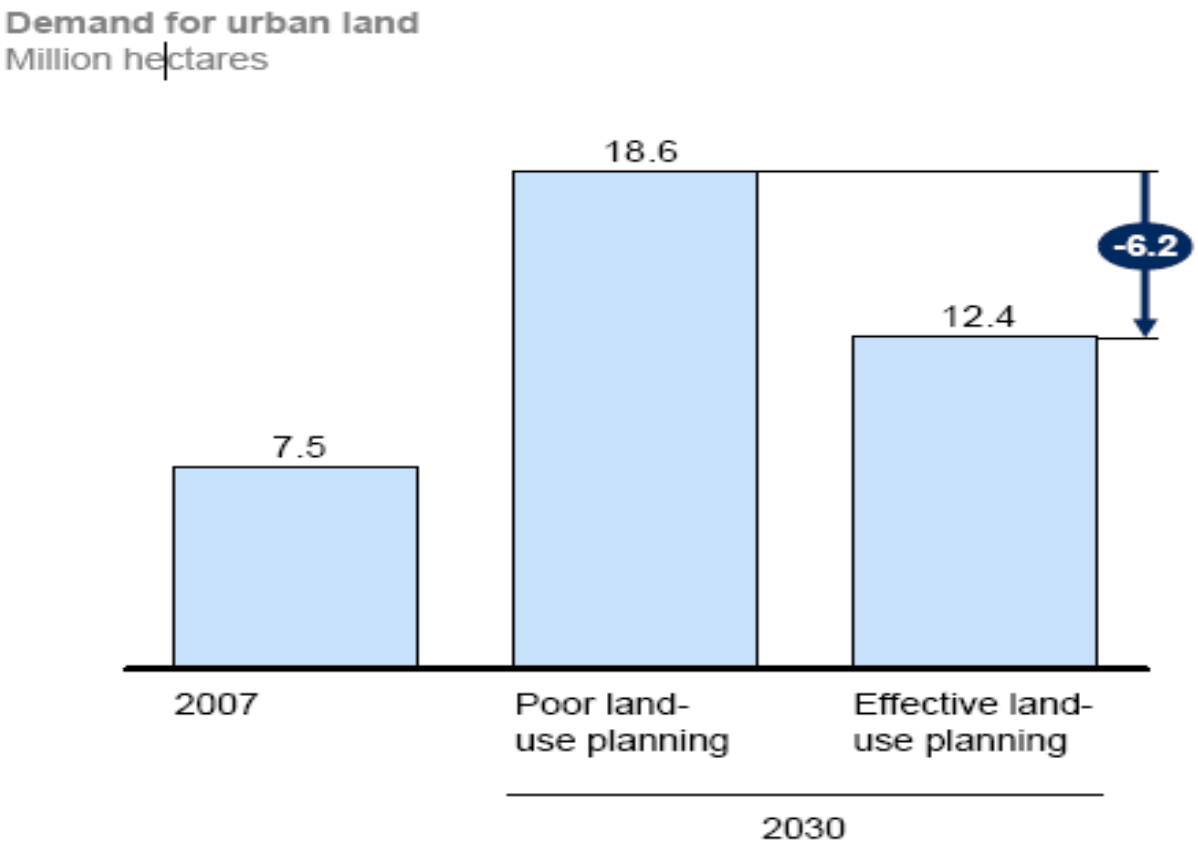
Most part of urban boom – housing and commercials have been pushed to the sides and periphery

Delhi has not maximised the use of land to provide for its teeming million – Delhi needs 70,000 houses a year to meet the housing deficit

Massive illegality: About 49% lives in slums, unauthorized colonies -- 860 jhuggi-jhonpris

Space affluence vs denser unliveable peripheries

Effective land use planning in CBD and transit corridors can potentially mitigate loss of land



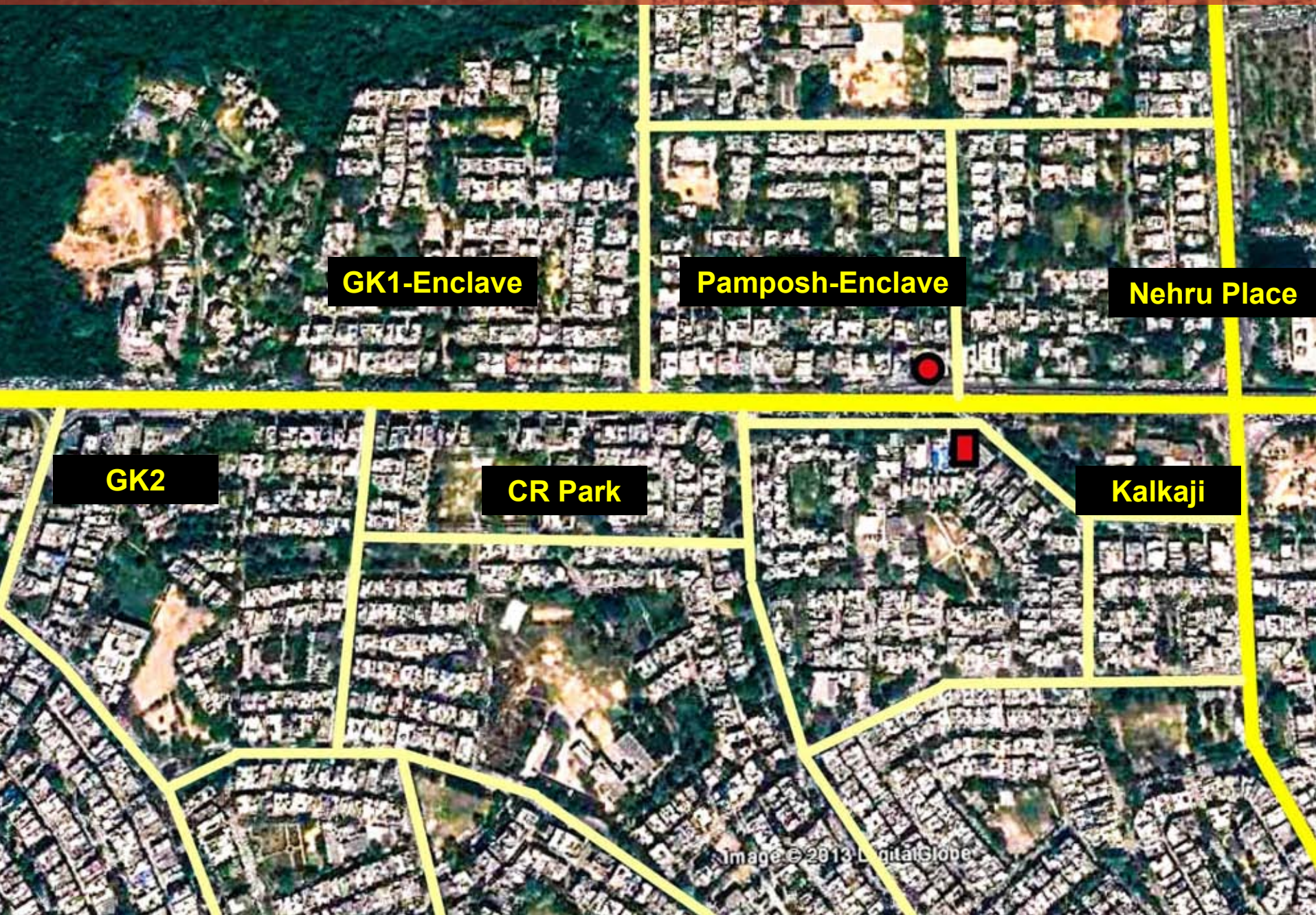
Source:2010, Mckinsey Global Institute

India could potentially save 6.2 million hectares of potentially arable land through effective planning for land use in the next 20 years

-- CSE trooped out in Delhi and NCR to check out how car centric infrastructure (*Delhi has built 66 flyovers and planning more*) and gated community approaches have increased travel distances and car dependency in the neighbourhoods and its impact on CO2 emissions….

-- Also impeded access to public transport nodes

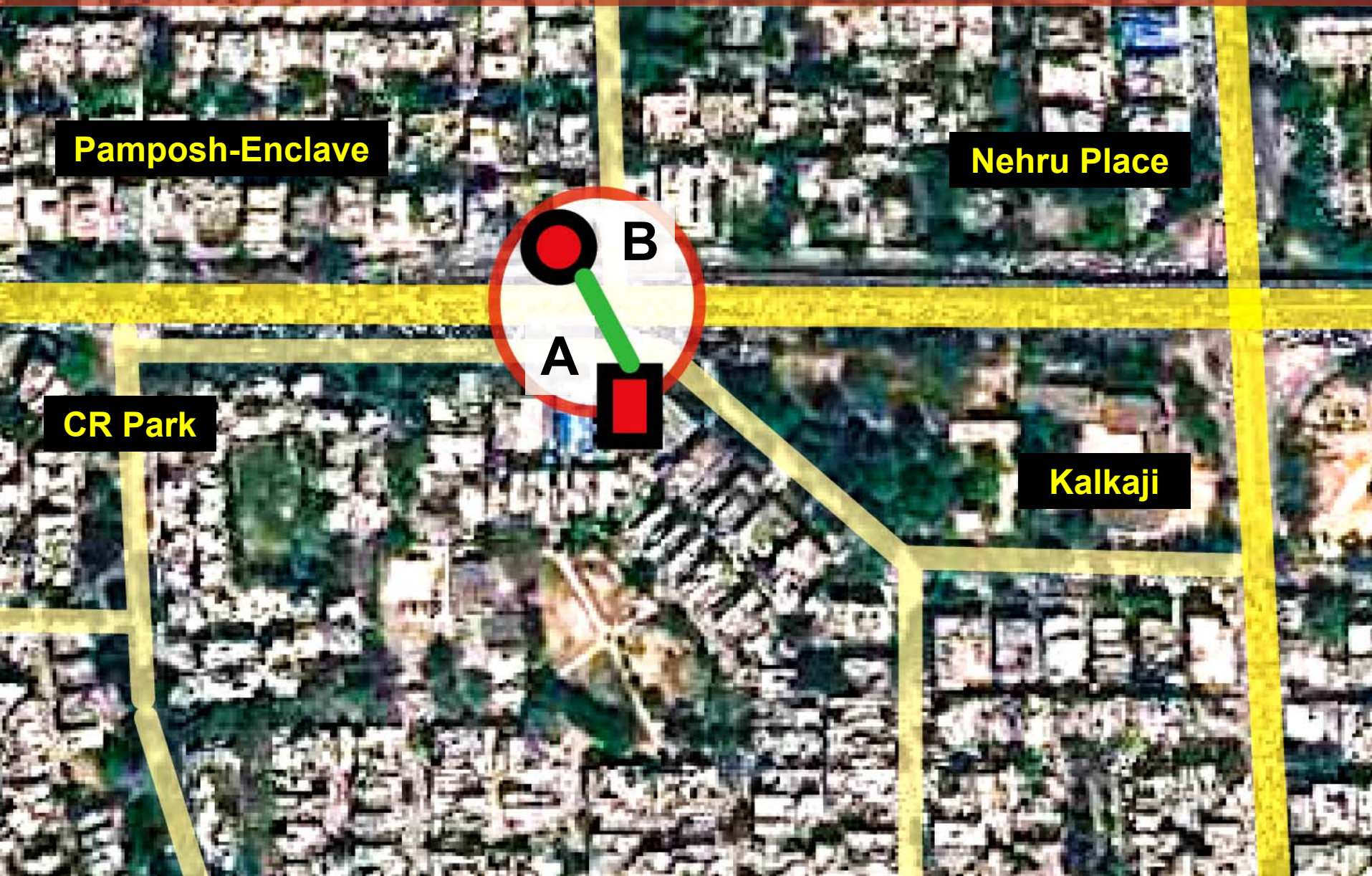
Case Study – Outer Ring Road (Nehru Place Flyover)



Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B

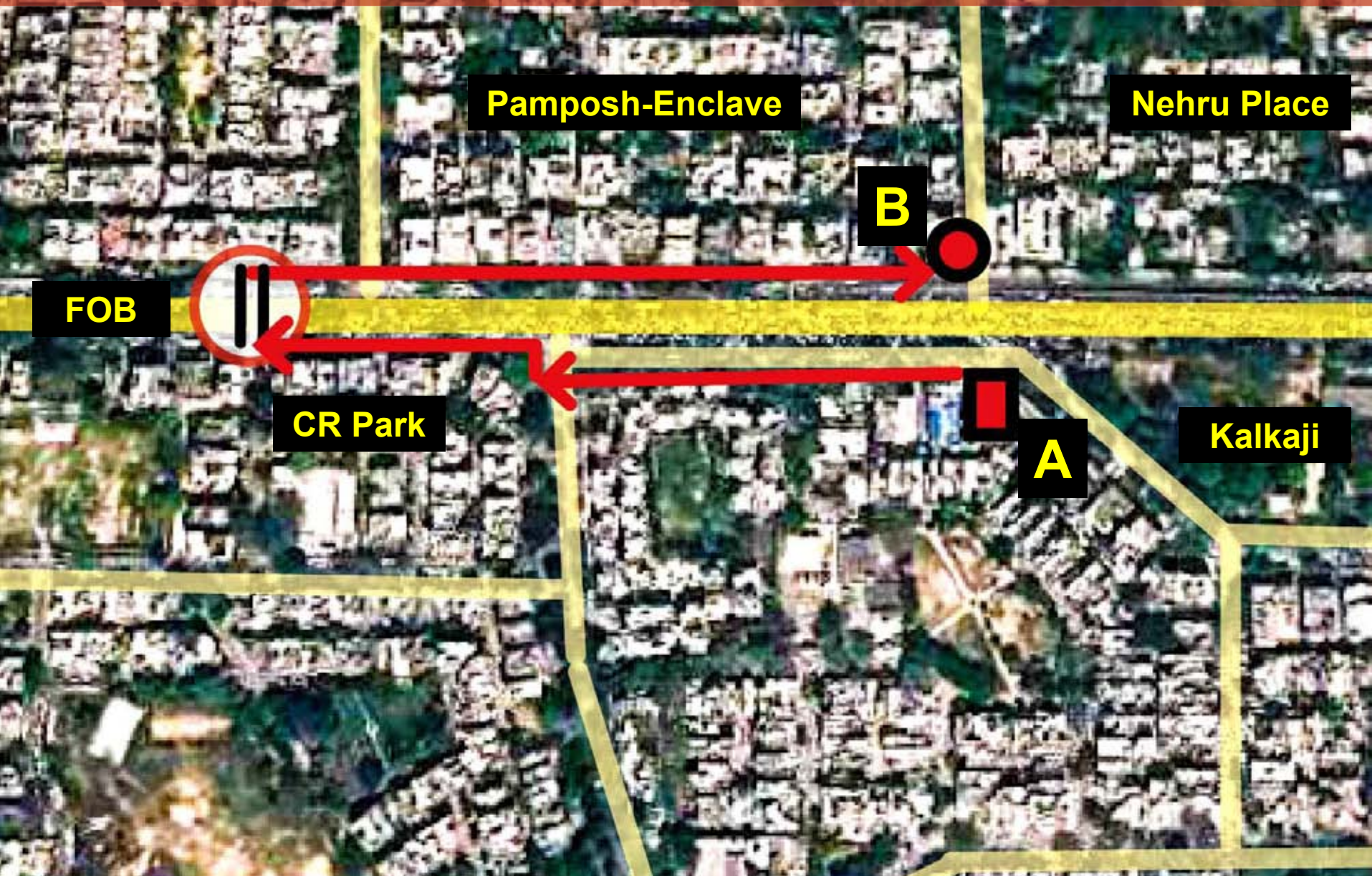
Originally 30M across the road



Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B – Pedestrian Route 1

1000M via FOB



Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B – Car Route 1

1.9 KM via GK2

Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B – Car Route 2

2.1 KM via Nehru Place

Case Study – Gurgaon Sector 28

Accessing Metro from ITC Laburnam Apts

- Only 3 exists to main road. Out of these 1 is private

Case Study – Gurgaon Sector 28

Accessing Metro from ITC Laburnam Apts

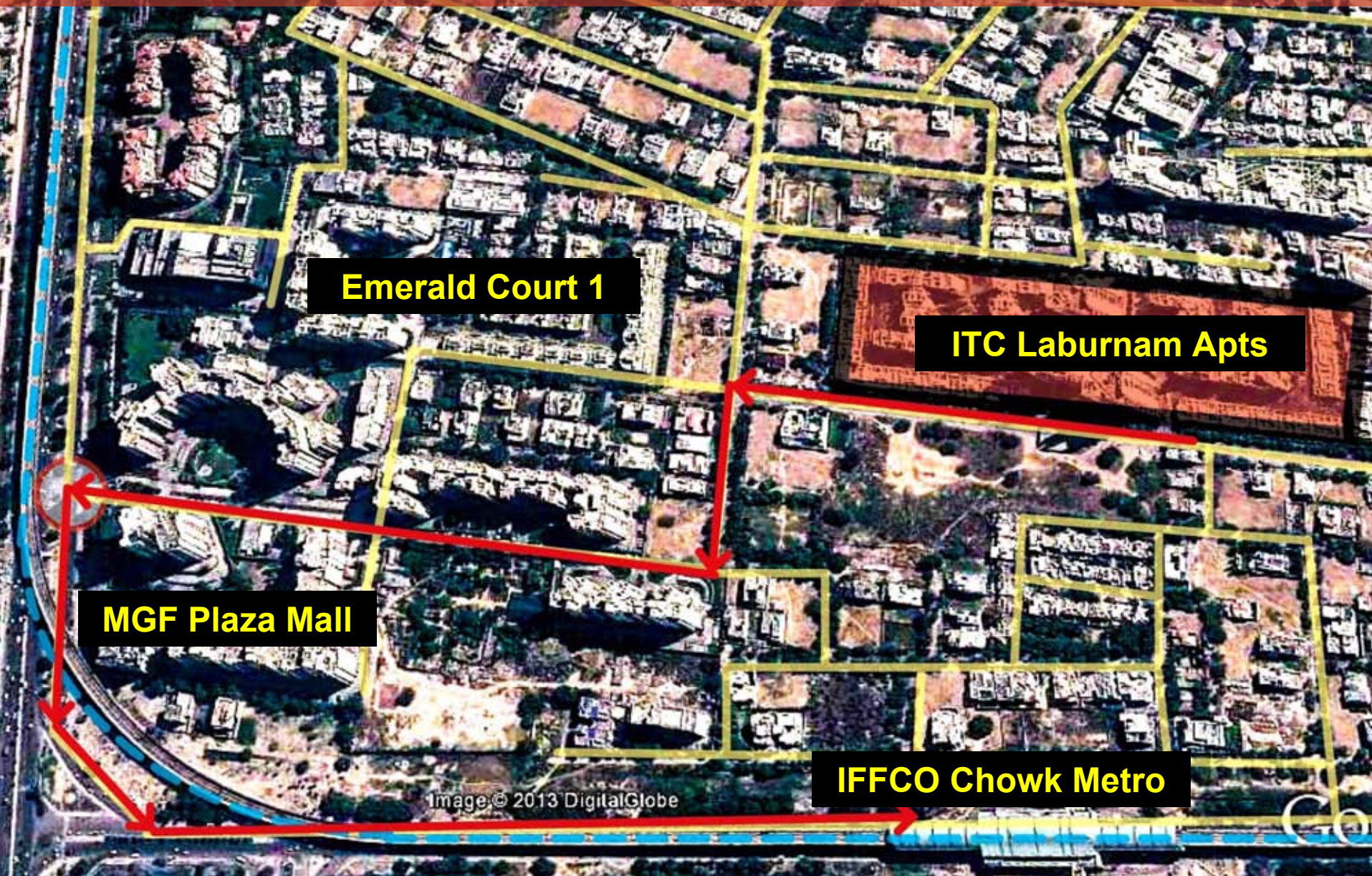
400M

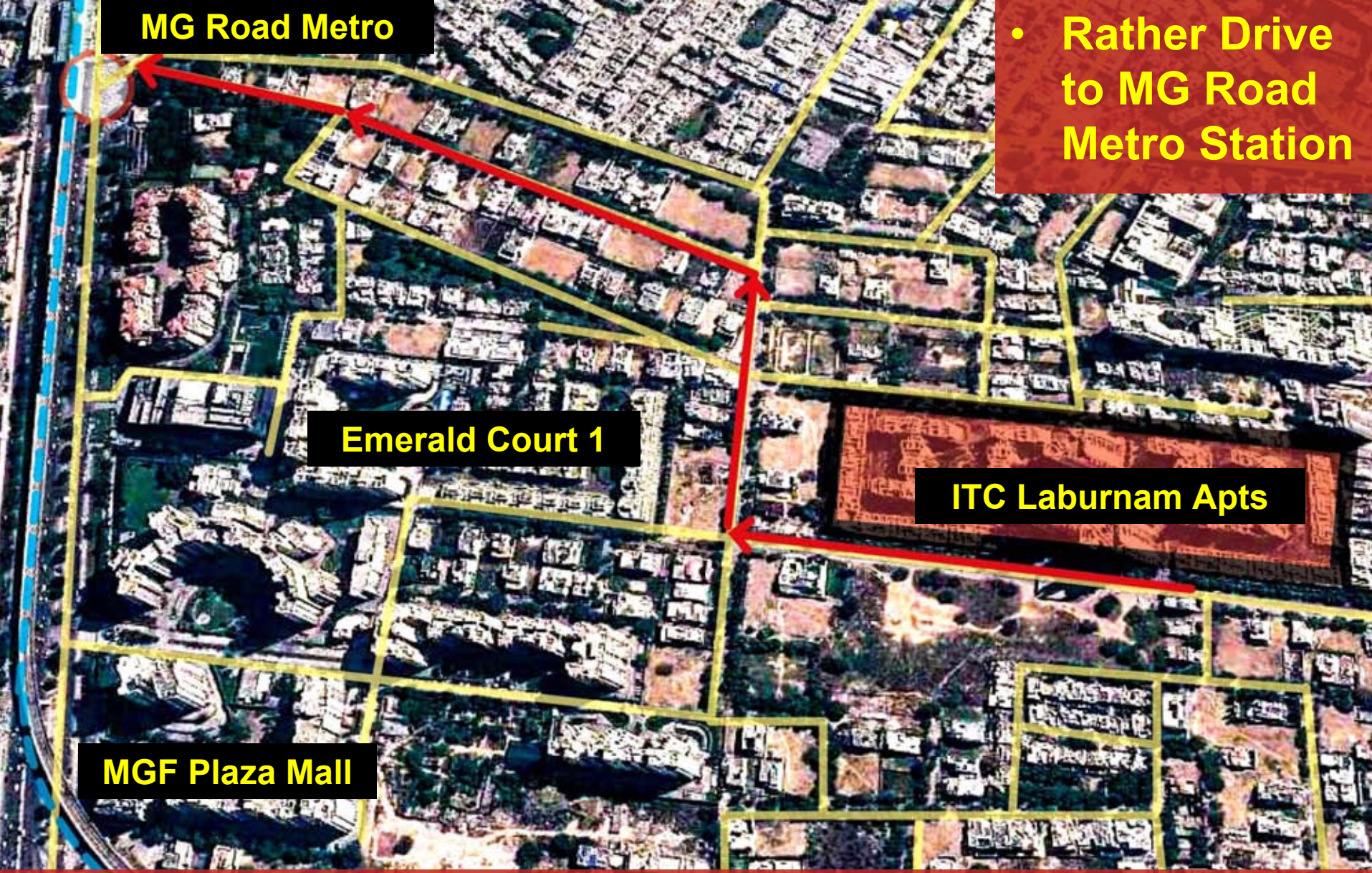
- **Shortest route not possible.**

Case Study – Gurgaon Sector 28

Accessing Metro from ITC Laburnam Apts

1800M





Accessing Metro from ITC Laburnam Apts

1400M

Case Study – Gurgaon Sector 28

Gated development at C Block, Sector 62, Noida

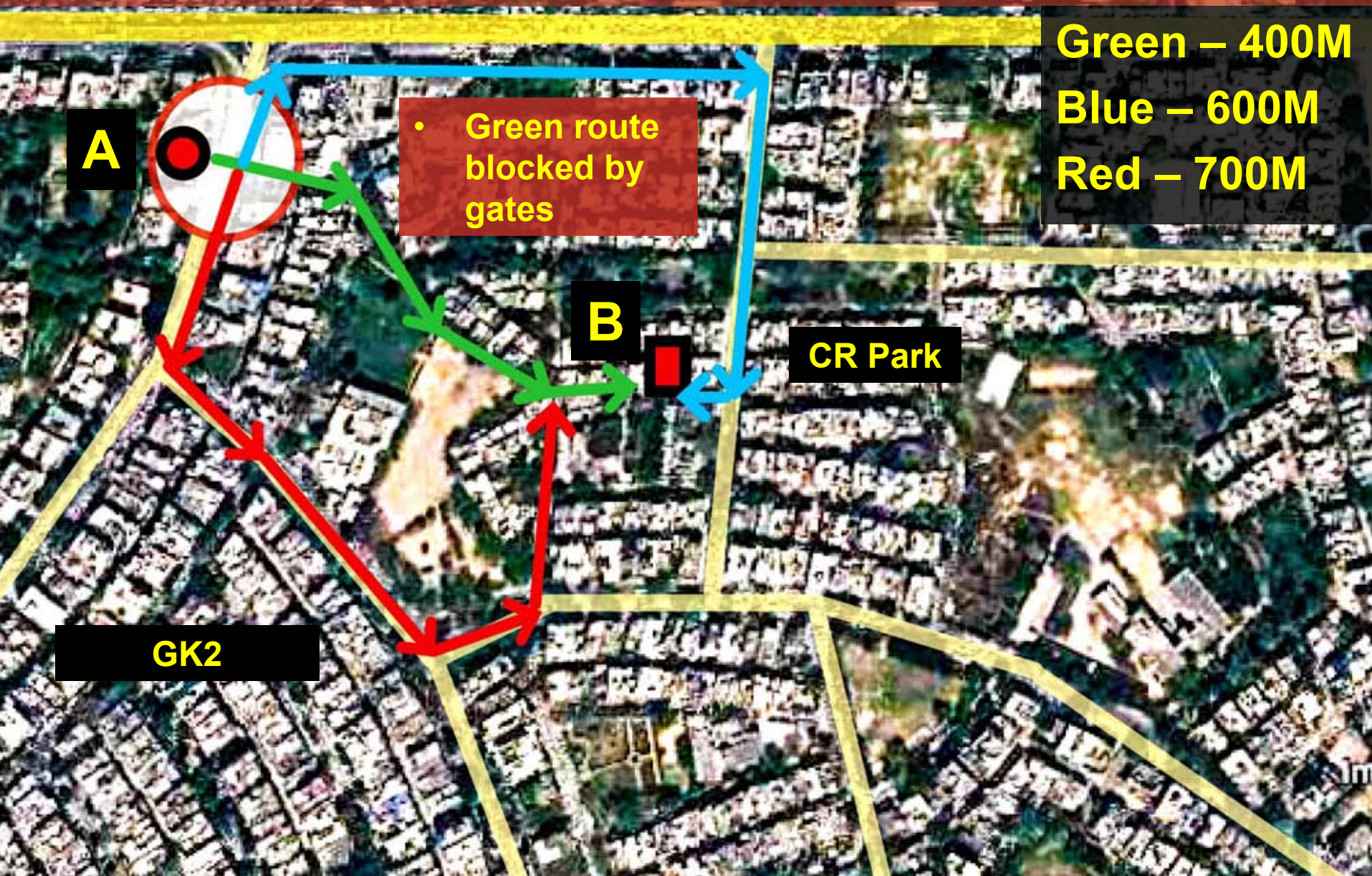
-- Direct distance from society block to market – 150 meters.
-- Gated development blocks this distance.
-- Motorised road is the only route that is 1 kilometres distance -- 20-25 minutes walk also impeded by parking
-- This transforms all zero emissions trips to energy intensive trips

- Residential
- Public
- Commercial
- Industrial
- Area covered by parking

Source: CSE

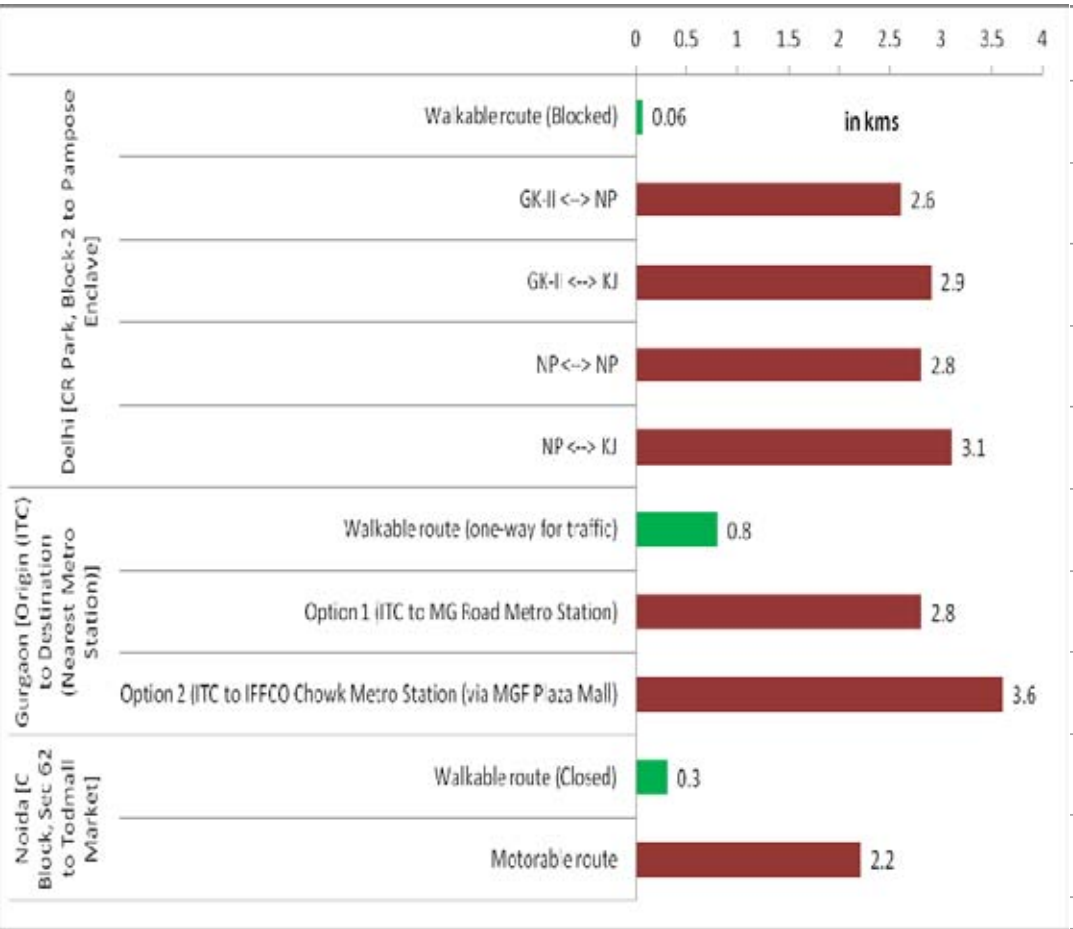
Case Study – Gated Mess (GK2 – CR Park)

Walking from A to B

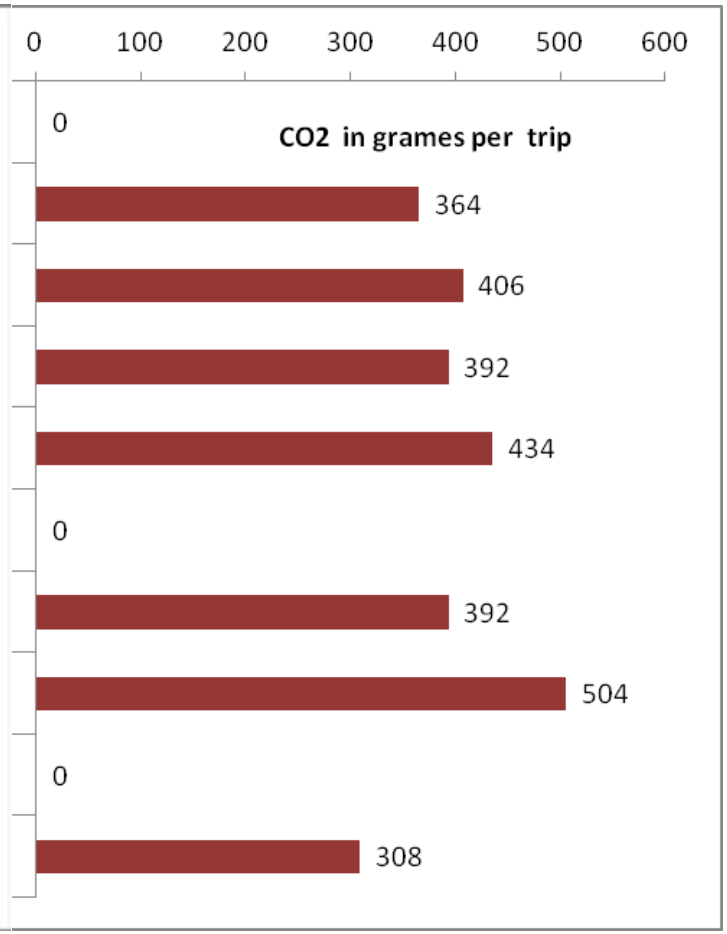


Travel and CO2 impact of signal free corridor

Travel distance



Travel CO2



Source: CSE Study

Transport CO2 emissions in Delhi poised to gallop

	Aggregate Transport CO2 Emissions	Transport CO2 Emissions Per Person (tCO2/ person)	CO2 Emissions Increase on 1990 (%)
2004 Delhi	6,146,651	0.4	97%
2010 Business as Usual (BAU)	8,268,298	0.5	165%
2030 Scenario 1: BAU	19,550,693	0.8	526%
2030 Scenario 2: Low Carbon Motor Vehicles (LCD)	17,069,668	0.7	447%
2030 Scenario 3: Active Transport (AT)	10,458,736	0.4	235%
2030 Scenario 4: Sustainable Transport (ST)*	9,327,207	0.4	199%

http://ncrpb.nic.in/latest_news/26Transport%20Department,%20Government%20of%20NCT%20Delhi.pdf

Delhi Master Plan has a target of 80% public transport share by 2020

If we ignore access, compactness, and travel distances…. investments in bus and metro will be a waste…..

Let us not repeat the mistakes…….
Kidwai Nagar redevelopment plan…

Low density can lead to sub optimal use of metro
Metro Corridor – Density disparity – The Yellow Line

- Chawri Bazar

- Race Course

- Green Park

Redistribute density
Delhi setting norms for high density requirements

Delhi framing Transit Oriented Development Policy (DDA/UTTIPEC)

Density minimums as per the table below:

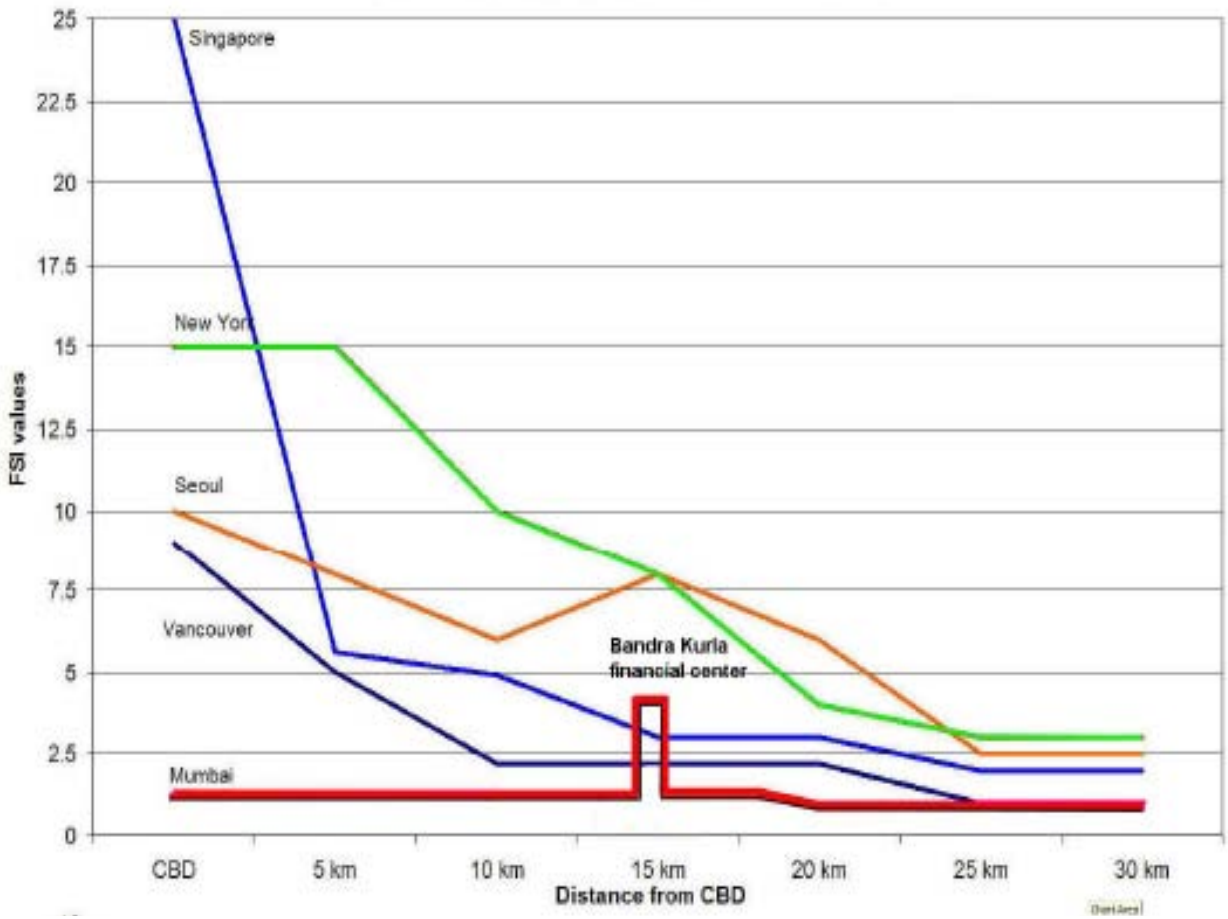
Gross FAR (site)	Minimum permissible density (with ±10% variation)	
	Residential dominated project (Residential FAR ≥ 50%)	**Predominantly non-residential** (Residential FAR ≤ 30%)
Below 1.0	Under-utilization of FAR (not permitted)	Under-utilization of FAR (not permitted)
1.1 - 2.0	200- 400 du/ha	100 - 200 du/ha
upto 3.0	400 - 600 du/ha	250 - 400 du/ha
3.1 - 4.0	600 - 800 du/ha	400 - 600 du/ha

*** Site level FAR shall be based on Approved TOD Influence Zone Plan.**

-- Mixed land-use norms: At least 30% residential and 20% Commercial & Institutional use of FAR is mandatory within the Influence Zone.

FSI variations with distance from CBD in commercial and residential areas in 5 cities

Variation of Maximum FSI in commercial areas



Source: Policy Note # 4 - New approaches to development control regulations and alternative spatial strategies for setting FSI values,

http://www.visionmumbai.org/images/projects/Document_DCR%20Options%2008x%20abscvk031313042241.pdf

Barcelona: High Density doesn't mean high rise

Considered one of the most beautiful city in the world, Barcelona has density ranging between 200 dwellings per hactare to 500 dwellings per hectare

Source: Mid-rise, high density. Until what extent does density matter? - Prof. Joaquim Sabaté

Design safe, active and livable cities……

Credit: SG Architects

Need active and safe streets

Not lonely roads cutting off walkers, cyclists, and public transport users

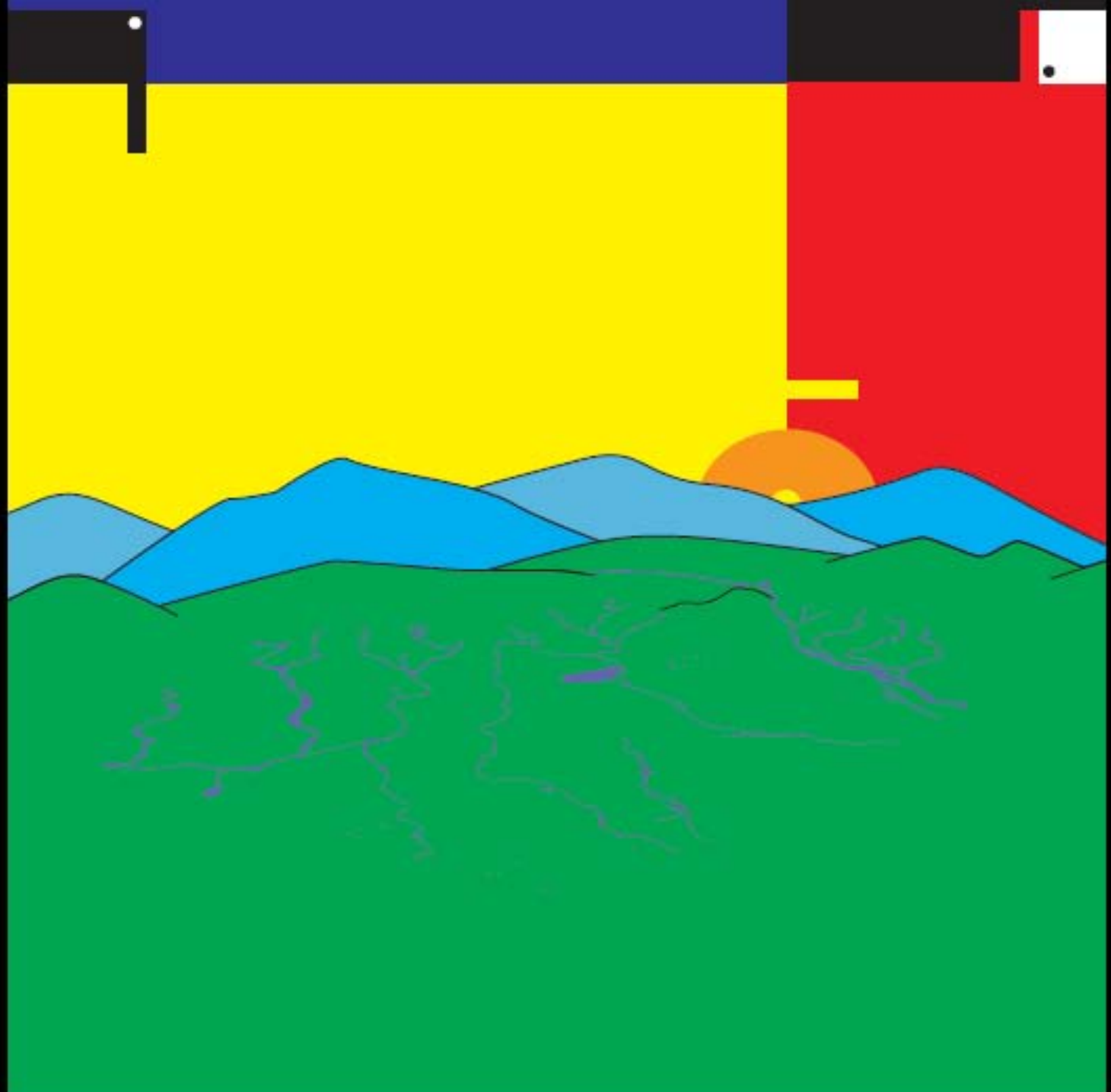
Remove high boundary walls, gates

Allow mixed land use zoning to optimise the use of valuable land along arterial roads

Need eye on the street: Shops and hawkers enhance safety

To ensure Safety of Pedestrians:

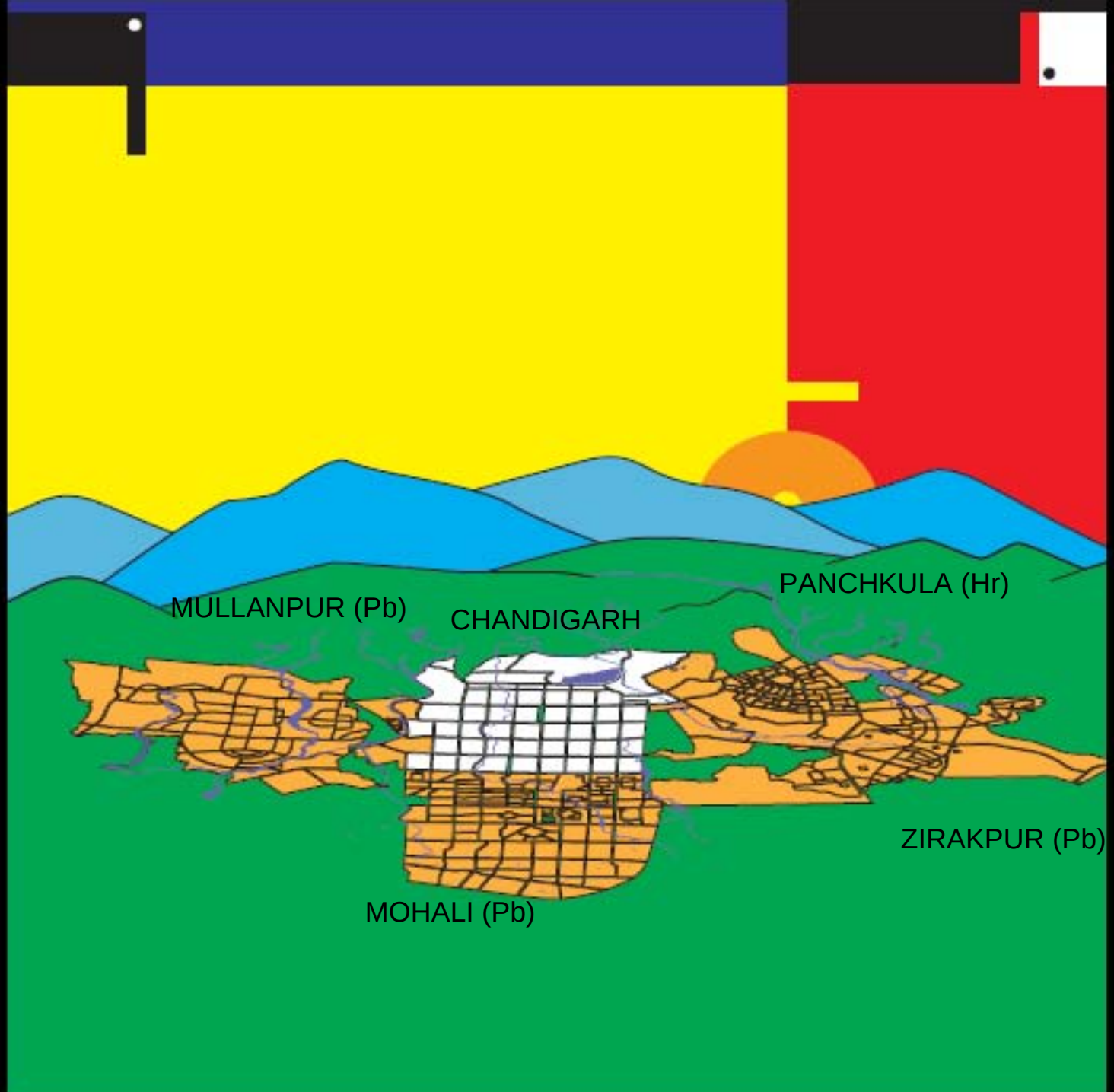
Chandigarh: Problem of affluence – Designed for cars……



CHANDIGARH


CHANDIGARH
MOHALI (Pb)


PANCHKULA (Hr)
CHANDIGARH
ZIRAKPUR (Pb)
MOHALI (Pb)

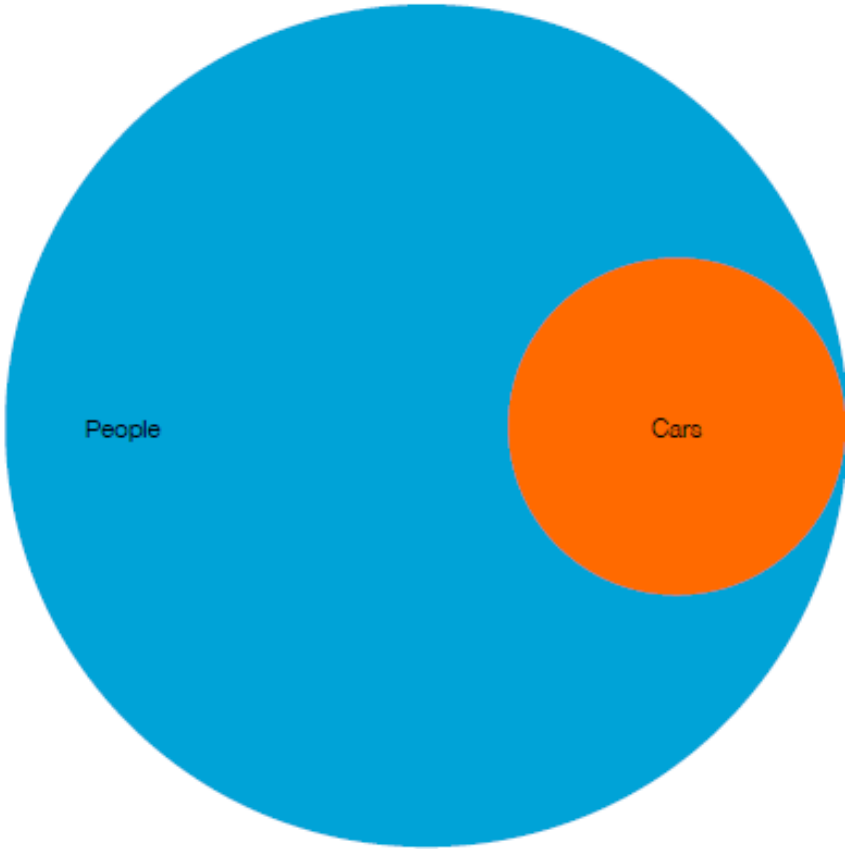

PANCHKULA (Hr)
MULLANPUR (Pb)
CHANDIGARH
ZIRAKPUR (Pb)
MOHALI (Pb)


PANCHKULA (Hr)
MULLANPUR (Pb)
ZIRAKPUR (Pb)
MOHALI (Pb)

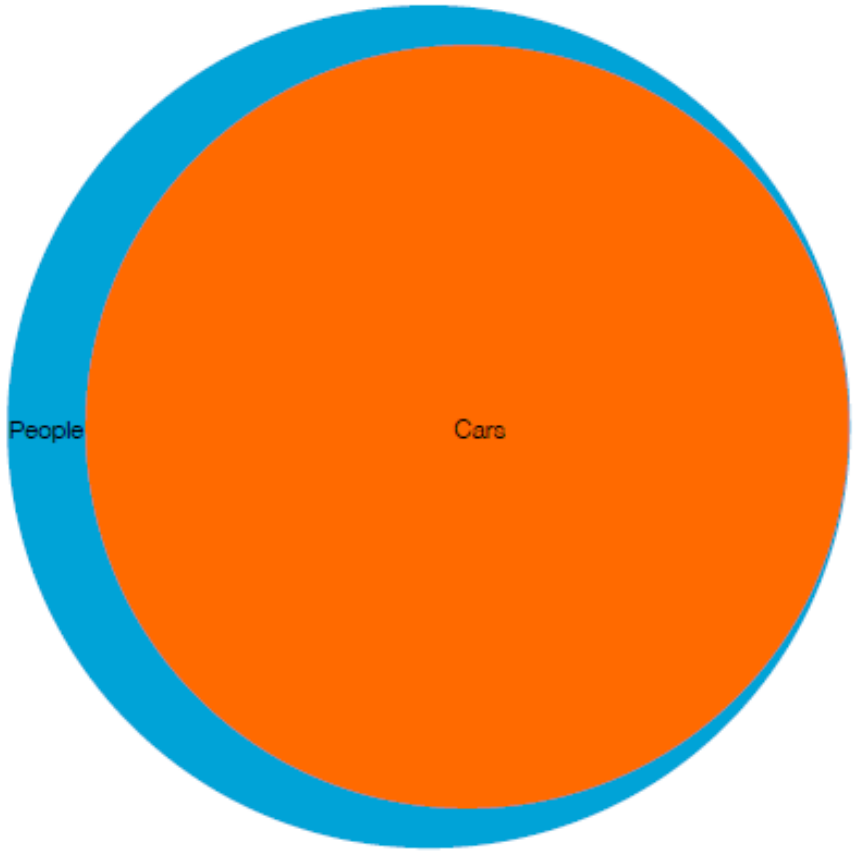

MULLANPUR (Pb)
CHANDIGARH
PANCHKULA (Hr)
ZIRAKPUR (Pb)
MOHALI (Pb)


LAND USE
Inner City Center
Commercial
+ Density
— Density

Impact of low density development and poor public transport planning



India 160 cars/1000 people

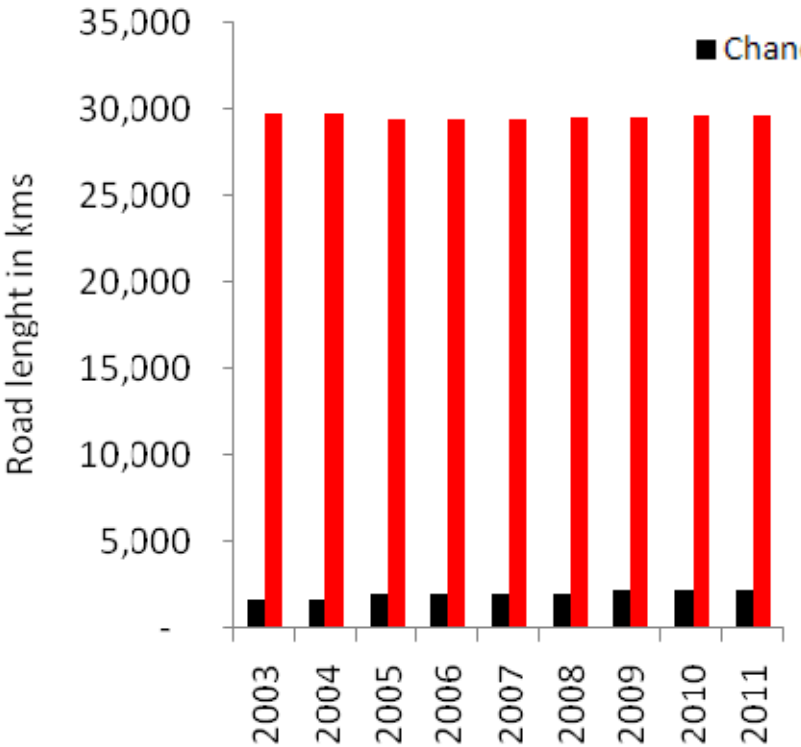


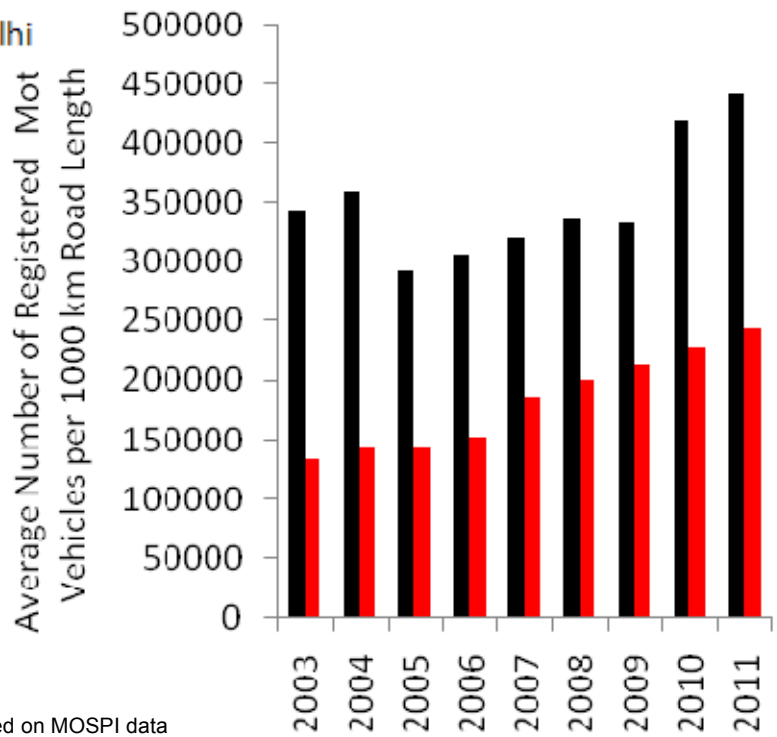
Chandigarh 820 cars/1000 people

Data Source: IP 2011

Chandigarh with less roads has higher vehicle density than Delhi

•Chandigarh has 441,284 vehicles per 1000 km of road length. Delhi has 243,783 vehicles per 1000 km of road length.

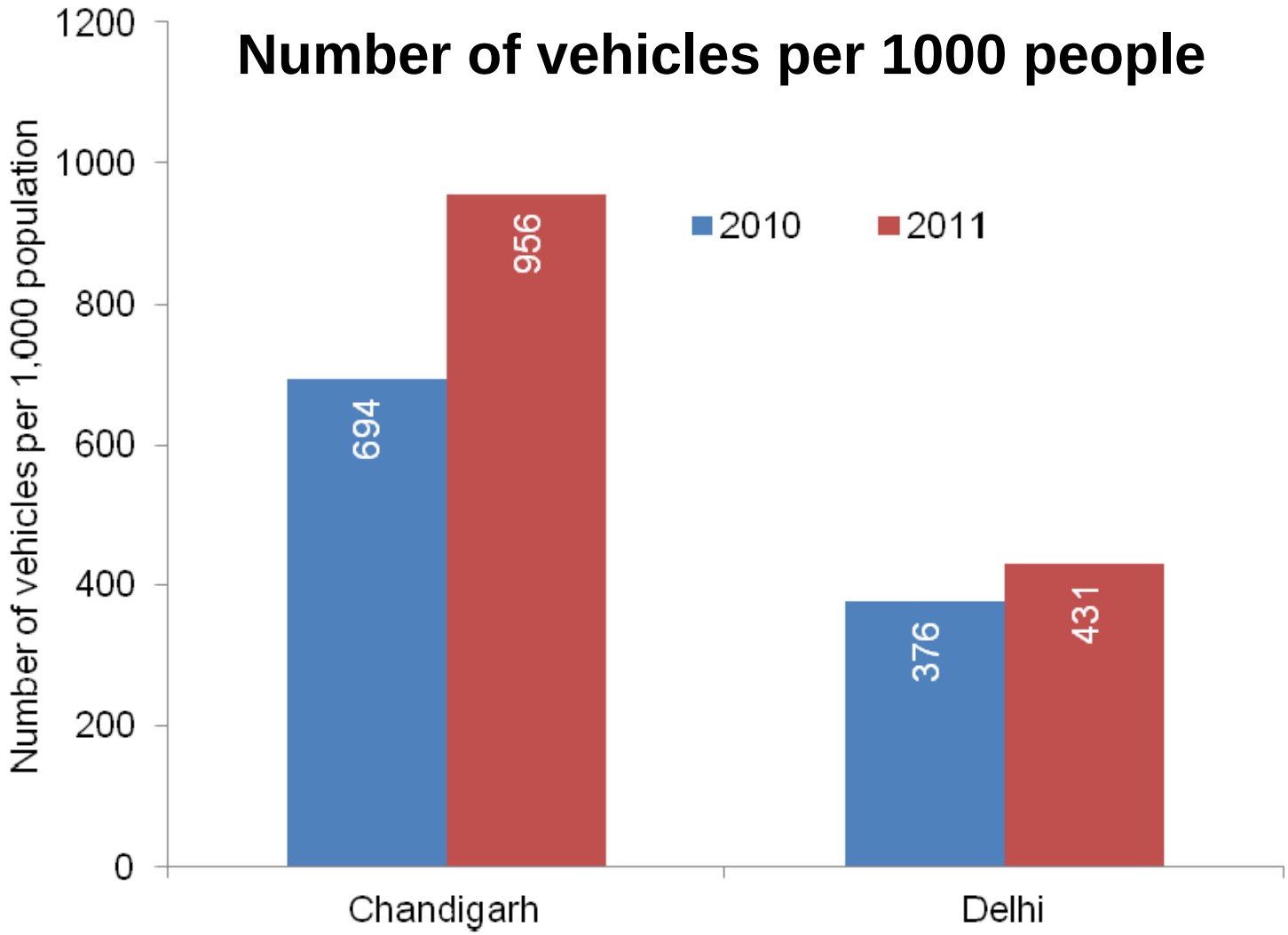




Source: Based on MOSPI data

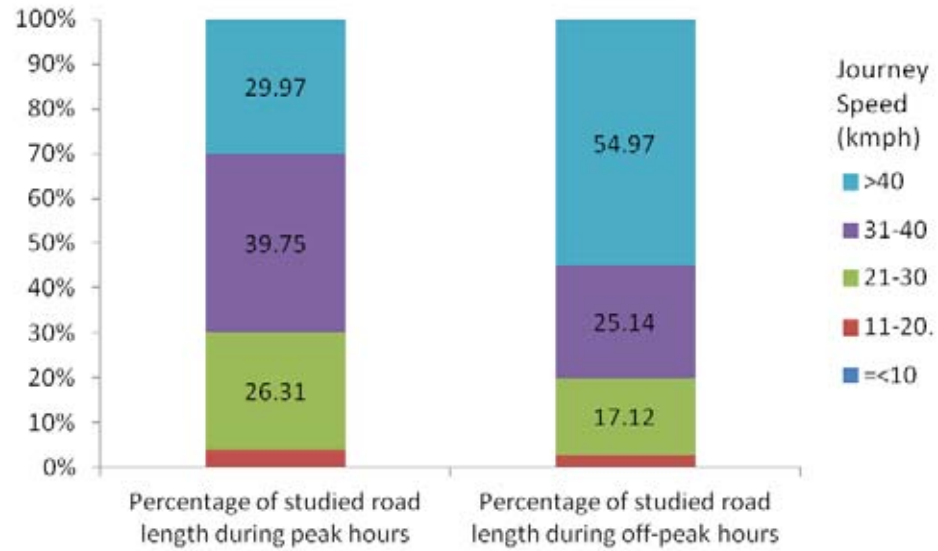
Chandigarh: Very high vehicle ownership

If two-wheelers and cars are included then Chandigarh has 878 personal vehicles/1000 people vs 362 personal vehicles /1000people in Delhi.

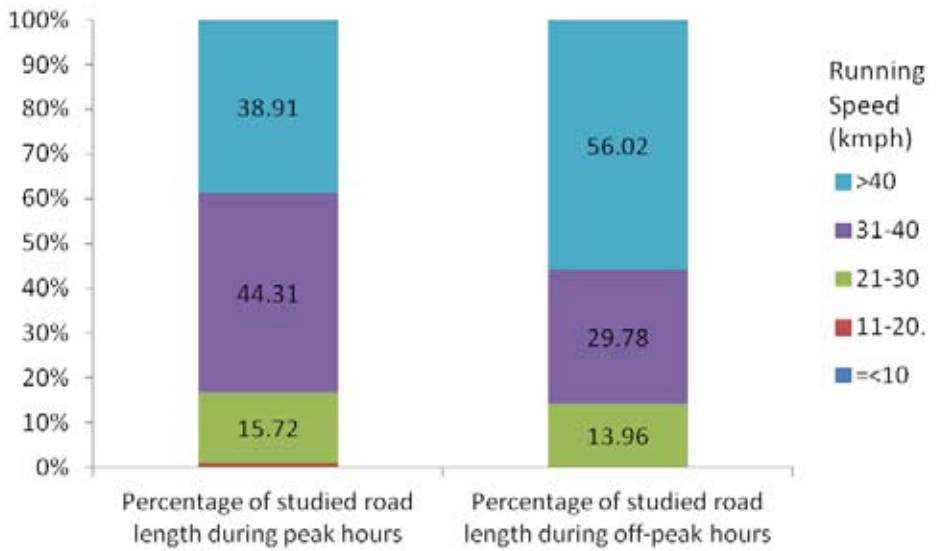


Auto city designed for speed. Compromise safety

Distribution of Peak/Off-Peak Hour Journey Speed



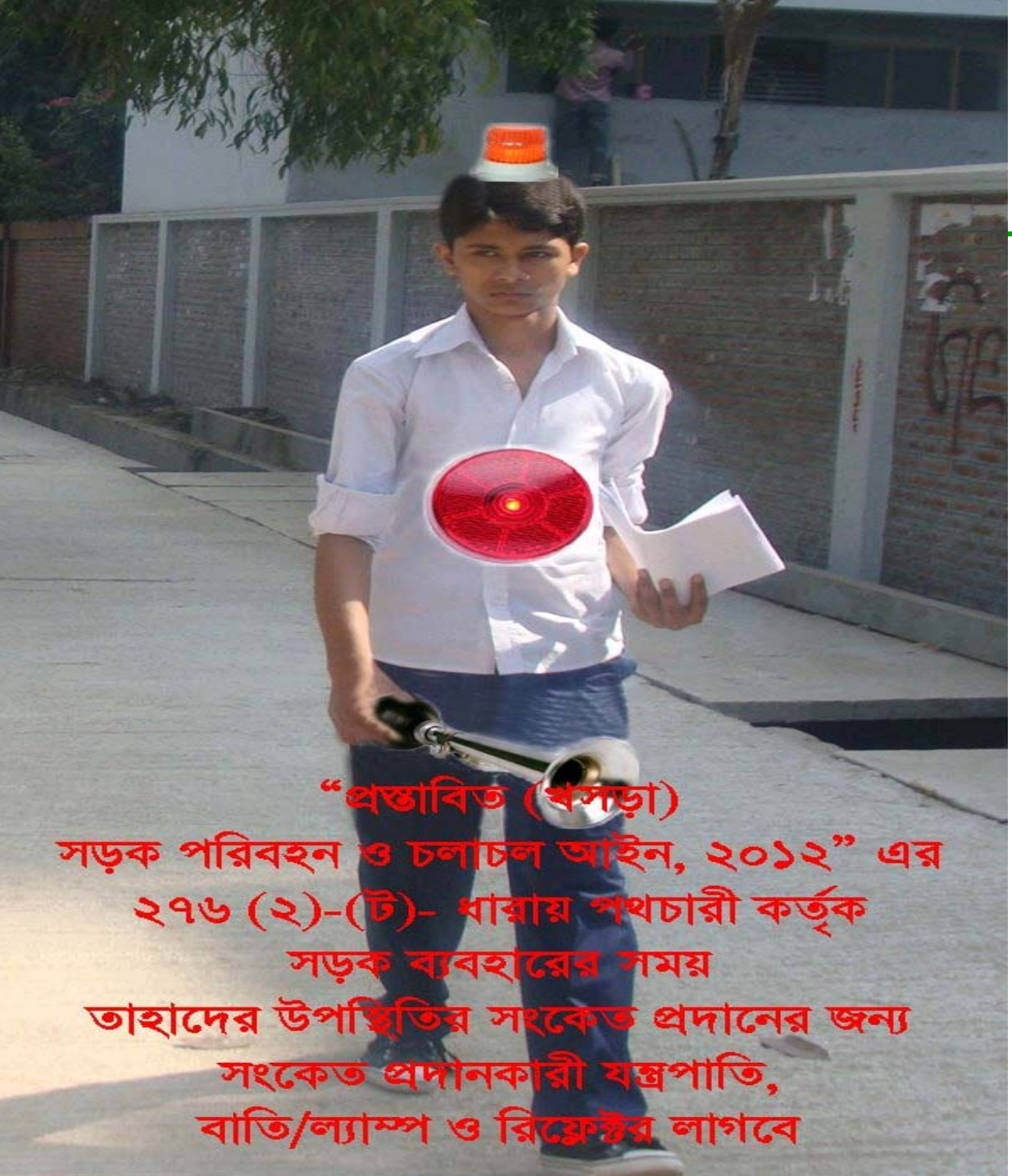
Distribution of Peak/Off-Peak Hour Running Speed



•**In absolute numbers the total number of road accidents is much higher in** Delhi (7260) than Chandigarh (456). But for comparable road length road accidents in Chandigarh are close to Delhi -- 201 road accidents per 1000 km of road length in Chandigarh vs and 245 in Delhi.

Poor walk access…. Chandigarh has footpaths and cycle paths. But not always usable…..

- Poor lighting conditions makes the track unsafe to walk or cycle in the evenings.
- No raised crossings on slip roads
- No safe crossing for NMT users
- Lack of traffic calming measures
- No pelican signals



Dhaka

Bangladesh Road Transport Regulations and Rules 2012 requires --- "**pedestrians to carry indicators including reflector, lamp etc…**"
People are complying to protest

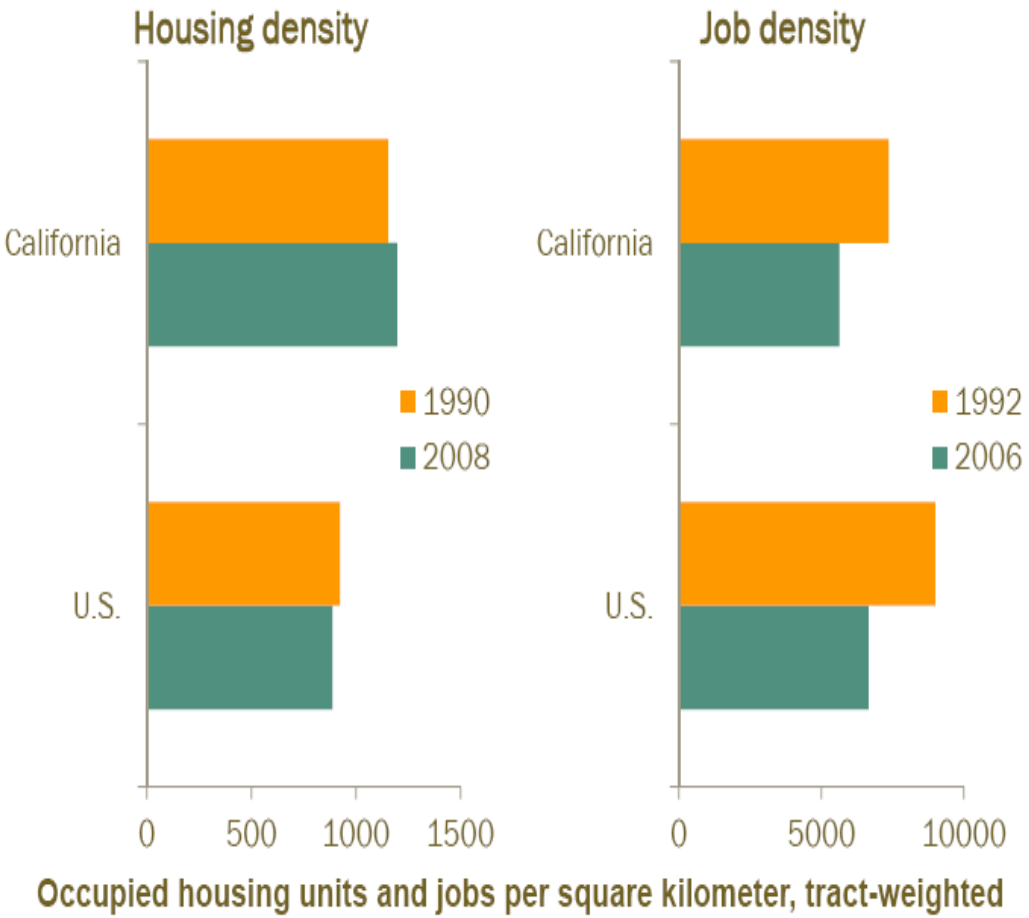
Moving away from strength….

Central Kolkata: Dense network of streets with excellent connectivity. The average block with public access streets under 1 hectare with block circumference of 400m or less.

New Town Kolkata

Even car manic California is reversing trends with policies and regulations……

California: The car paradigm….



-- Skewed workplace-housing density
-- Affects transportation behaviors

- Transit usage up modestly in all metros, but still very low (5.5% of all commutes)
- 75% drive alone to work
- Vehicles miles traveled per capita rose 3.5% in California between 1990 and 2008 – Nationally by 13.7%

Source: Kolko. J, Transit and Job Growth: Lessons for SB 375, Public Policy Institute of California

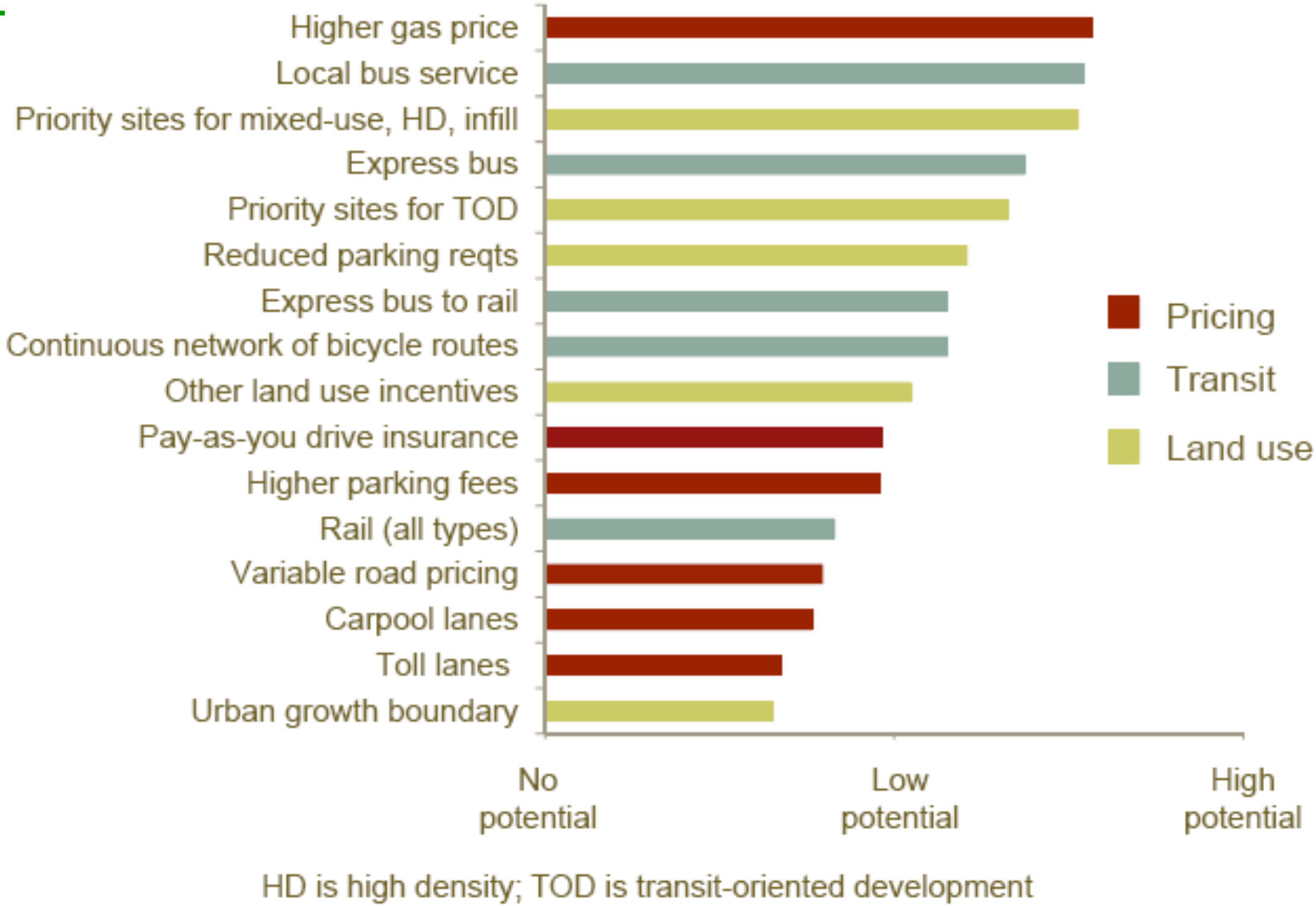
Corrective steps in California

- California has **enacted Sustainable Communities and Climate Protection Act (SB 375) since 2008**
- SB 375 aims to reduce per capita emissions by
  - about 7% by 2020
  - about 15% by 2035
- This requires each of California's 18 Metropolitan Planning Organizations to develop a regional strategy for reducing vehicle miles traveled to address climate change
- This requires integrated landuse and transportation plans, to focus development around transit
- **Cities who comply with SB 375's regional plans receive a larger share of transportation funds as well as regulatory streamlining for projects**

Targets

- **Increase Density-** Existing Density in a Station Area; Developable Land
- **Mix Land Uses-** Current Mix of Land Uses Community Amenities in a Station Area
- **Improve Walkability-** Block Size in a station Area; Mobility Barriers in a Station Area
- **Enhance Access to Job centers-** Regional Destinations, Proximity and Regional Transit Links to Existing Job Centers
- **High Quality Transit-** Housing + Transportation; affordability Index

California identifies strategies according to their Potential to reduce driving and emissions



Source: Kolko. J, Transit and Job Growth: Lessons for SB 375, Public Policy Institute of California

Evidence of change and reversal in Los Angeles

- **Lower Car Ownership**: 2/3rd households living near transit in LA own 1 or fewer cars, compared with 46% of the region.
- **More Transit Commutes:** Nearly 1/4th of commuters living near transit in LA take transit, walk, or bike, compared with just 8% of the region
- **More car free lifestyle:** 20 stations in the city are intense enough to potentially support car-free living
- **Many Connected Destinations:** Many regionally important job, entertainment/educational/institutional destinations linked on the transit system.
- **About 22% of the jobs in LA County are within walking distance of high quality, fixed-guideway transit**
- **Increase Residential Density:** Increasing the number of people who live in the half-mile radius around stations from 7,000 to 12,000 which equates to an increase in gross density of 3-5 units/acre–can reduce per-household vehicle miles traveled by 30%

Source: Center for Transit-Oriented Development (CTOD)

Whither our policy?

National Habitat Standards for transport

(Ministry of Urban Development)

- Area of residential blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 ha. In existing built-up areas, statutory planning for breaking up blocks, to provide publicly accessible pedestrian thoroughfare.
- No new development allowed until local street grid is put in place which subdivides land into blocks of no more than 2 Ha.
- Vehicle access network should be set on a grid with no side exceeding (C/C) 250m with additional public access pedestrian thoroughfares cutting through the block, where possible.
- No urban streets with one way undivided motor vehicle carriageway width of over 10m
- **N**umber of intersections of public pedestrian and cyclist network per square kilometre. Benchmark is at least 50 intersections per square km. Existence of statutory provision for creating public access through large blocks
- % of street with carriageway width for one way motor-vehicle traffic of over 10m

TOD policy in Delhi

Naya Raipur thinking its planning paradigm

Build compact city

……Devil is in detail

National Habitat Standard Mission of the Ministry of Urban Development

Guidelines for compact mixed land use

-- 95% of residences should have daily needs retail, parks, primary schools and recreational areas accessible **within 400m walking distance.**

-- 95% residences should have access to employment and public and institutional services by public transport or bicycle or walk or combination of two or more.

-- At least 85% of all streets to have mixed use development.

-- Need small block size with high density permeable streets etc

UTTIPEC guidelines

Hierarchy of Facilities	Accessibility Standard from each home/ work place.*
MRTS Station	Approx. 800 m or 10 min walk
Metro feeder/ HOV feeder Stop	Approx. 400 m or 5 min walk
Bus Stop	Approx. 400 m or 5 min walk
IPT/ auto-rickshaw Stand	Approx. 250 m or 3 min walk
Cycle Rickshaw Stand	Approx. 250 m or 3 min walk
Cycle Rental Stand	Approx. 250 m or 3 min walk
Shared private parking garage	Approx. 500 m or 6 min walk

Way forward

Need policy interventions at the central and state government levels to have public transport, walking and cycling oriented urban design. Devil is in detail

-- **Ensure dense and compact city design** to reduce travel distances and dependence on personal vehicles. Bring people and jobs closer to public transport systems.

-- **Improve walking, cycling and para transit access** to public transport nodes. Otherwise use of these systems will remain sub-optimal

-- Discourage car centric infrastructure (flyover, signal free roads, foot over bridges, etc) that obstruct and destroy movement patterns needed to promote walk, cycle and public transport

-- Design cities to enhance safety. Make streets active by design and get rid of lonely edges and fringes. Let the buildings have active frontage

-- Urban design interventions will require supportive car restraint policies

- Parking as a travel demand management measure
- Fiscal policies to influence travel choices
- Vehicle taxation policy, Congestion and road pricing etc
- Some global cities have enforced caps on car sales (Some of cities of China and Singapore) etc.

Towards livable cities……

Thank You