



Clean Air and Sustainable Mobility: Agenda for Reform



Anumita Roychowdhury
Centre for Science and
Environment

Stakeholder Dialogue on
improving environmentally
sustainable transport in Sri
Lanka

Ministry of Environment, Sri
Lanka

Center for Science and
Environment, India

Colombo, December 10, 2013





Global Burden of disease: Shocking findings for South Asia...



December 2012:

Global Burden of Disease estimated by 450 scientists from 300 global organisations including WHO found -- Air pollution related deaths have increased by 300 per cent since 2000. About 65 per cent of these deaths occur in Asia.

Air pollution is among the top 10 killers in the world

Two-thirds of the death burden in developing Asia. South Asia most vulnerable.....

February 2013:

GBD findings for India: 620,000 premature deaths a year. More than 18 million healthy life years lost due to air pollution. Air pollution triggers stroke, cardiovascular and respiratory diseases, cancer.....

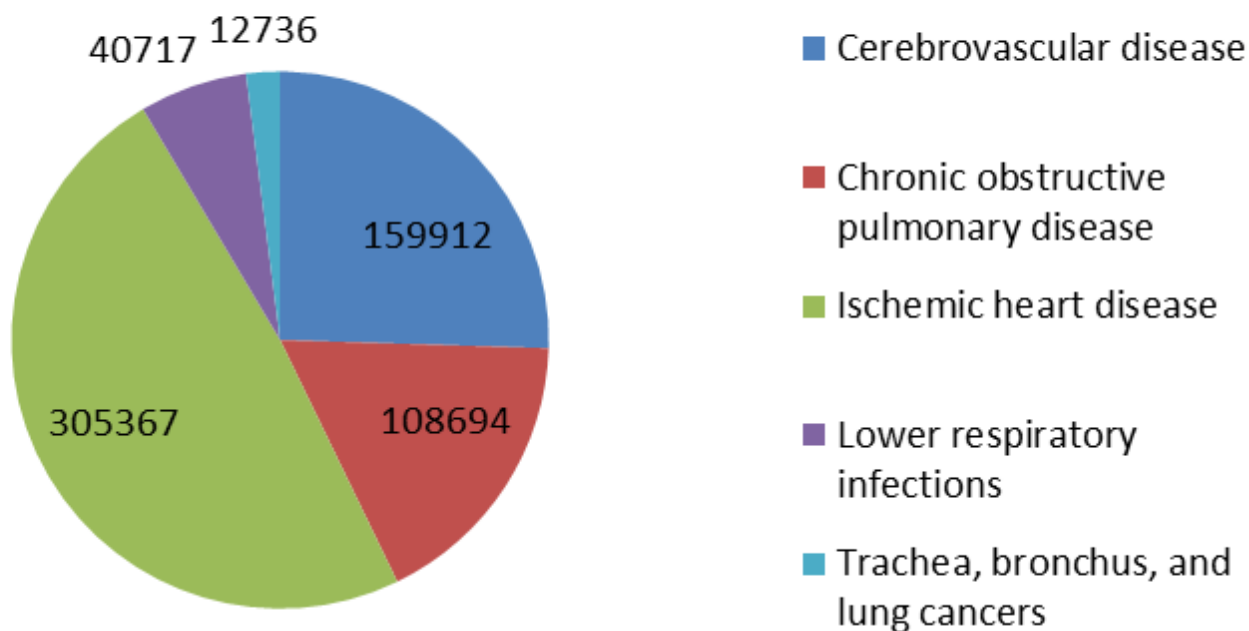
South Asia extremely vulnerable.....



The numbers.....



Deaths Attributable to Ambient Particulate Matter Pollution in India in 2010



SLOW MURDER



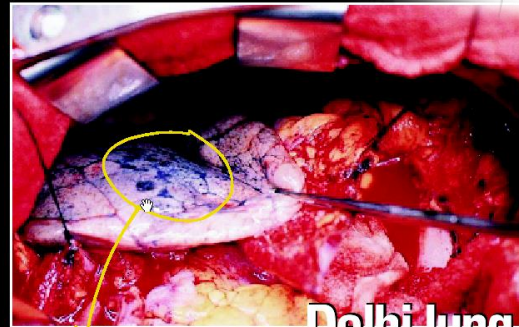
The deadly story of vehicular pollution in India

Centre for Science and Environment

Study directed by Anil Agarwal

Written by Anju Sharma and Anumita Roychowdhury

Himachal lung



Look at these black spots on the lung. The unfortunate owner lives in Delhi and has been breathing polluted air. Air full of carbon particles which accumulate in the lungs (black spots). What you can't see is a cocktail of gases and tiny particles, even smaller than carbon that get into our bodies. Actually, you are getting polluted.

Delhi lung
Capital punishment

Scary? But those cars are so sexy!

51,779 DEAD BY BREATHING
AIR POLLUTION TOLL RISES FROM 40,351 IN 1991-92
30% More Deaths In 1995! In Some Indian Cities Deaths Have Doubled
The Government Is In Control.

So It Thinks.
A DELUSION

One chemical
Pollution is killing more people in Indian cities

	Delhi	Mumbai	Kolkata	Chennai	Calcutta
1991-92	7,401	4,471	1,864	863	5,726
1995	9,858	7,023	3,038	1,291	10,647

Source: Central
Pollution Board
Giving pollution-related addresses and hospitalisation

	Delhi	Mumbai	Kolkata	Chennai	Calcutta
1991-92	38.6 lakh	26.6 lakh	8.03 lakh	4.6 lakh	29.3 lakh
1995	60.0 lakh	40.0 lakh	15.4 lakh	6.8 lakh	54.3 lakh

1991-92 figures are of World Bank
1995 figures are preliminary CSE

11 1995 figures are based on a CSE study. See full
Central Pollution Control Board air pollution data for
1995 - THE LATEST AVAILABLE - to an epidemiological
model developed by World Bank staffers to calculate
pollution-related health and mortality costs. (The World
Bank does not collect such data.)

YOU LINE UP FOR A TAILPIPE TEST
WHILE REAL CULPRITS GO SCOT-FREE

MINISTRY OF ENVIRONMENT AND FORESTS
No clear air quality reduction targets. No one knows when
our air will really become cleaner.

MINISTRY OF PETROLEUM AND NATURAL GAS
Monopoly producer of very, very dirty fuel.

MINISTRY OF SURFACE TRANSPORT
Does not even share with the public the data it collects
on the amount of new vehicles. If the license if the new
vehicles have really improved their standards? Not only this
it has no plans to deal with growing urban transport crisis.

MINISTRY OF INDUSTRIES
Soft on polluting industries.

MINISTRY OF FINANCE
Drying away from taxing the polluters.

MINISTRY OF HEALTH
Totally silent on health effects of air pollution.

AUTOMOBILE INDUSTRY
Trading health for mobility and profits.

POLLUTION CONTROL BOARDS
Nuclear can they control pollution? Not do they develop
effective control programmes.

POLYMERISING IS GENUINE.

For health's sake,

JOIN OUR BEFO

DONATE 1

Write to: Anil Agarwal, Centre
for Science and Environment
41, Tagore Park, New Delhi
110062. Tel: 496 7946, 496 1110, 496 1111.
Email: anil@cseindia.org



cough wheeze suffocate

it's time you
TAKE A STAND

PUT YOUR HEALTH ON THE POLITICAL AGENDA

3.30 pm • June 5, 1995 • Silver Oak, India Habitat Centre, Lodi Road, New Delhi 110003

People for Clean Air



CENTRE FOR SCIENCE AND ENVIRONMENT
2995 5124, 2995 6110, 2995 6399, 2995 6394

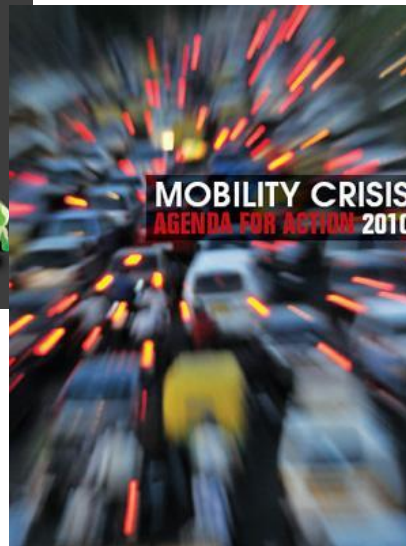
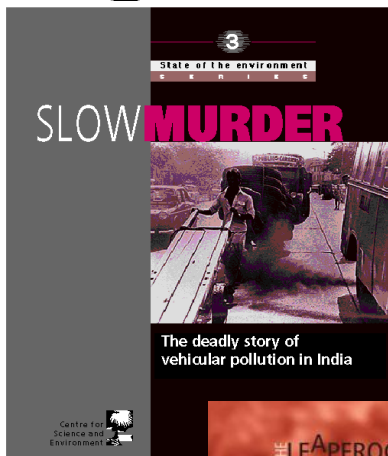
From its early stages, CSE's Right to Clean Air campaign used a variety of communication tools — such as this poster — to put out its message to the public. It built support

Roll down the window of your bullet-proof car, Mr Prime Minister
The security threat is not the gun. It's the air of Delhi

PEOPLES' CENTER ON CLEAN AIR
FOR AN IMMEDIATE IMPACT

OUR DEMANDS:
1. Immediate suspension of all new vehicle registrations in Delhi.
2. Immediate suspension of all new vehicle registrations in Delhi.
3. Immediate suspension of all new vehicle registrations in Delhi.
4. Immediate suspension of all new vehicle registrations in Delhi.
5. Immediate suspension of all new vehicle registrations in Delhi.

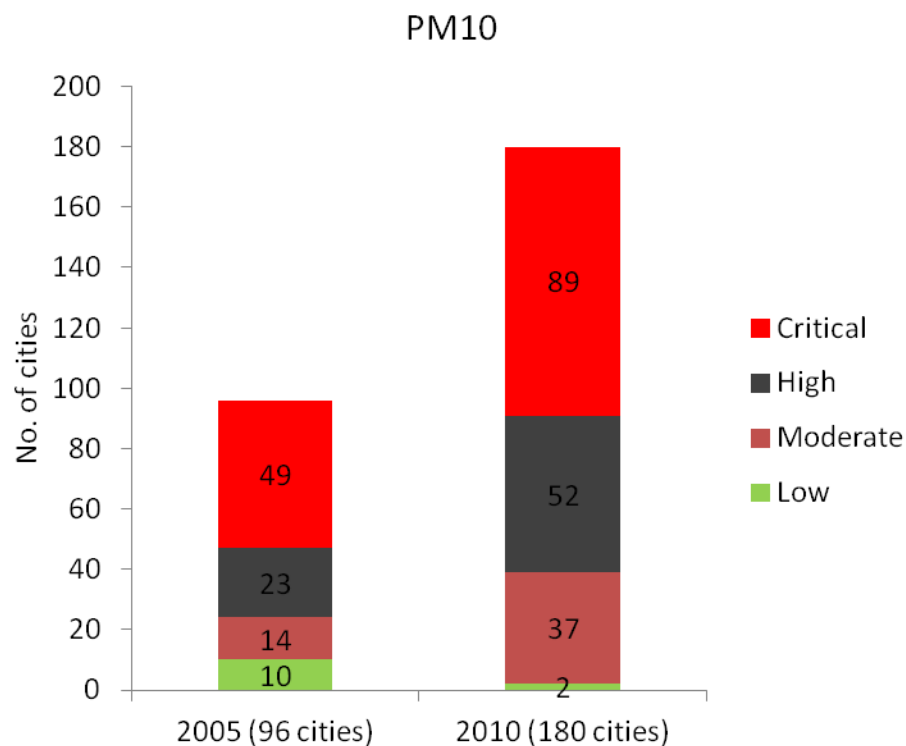




Building public understanding...



More Indian cities in grip of pollution

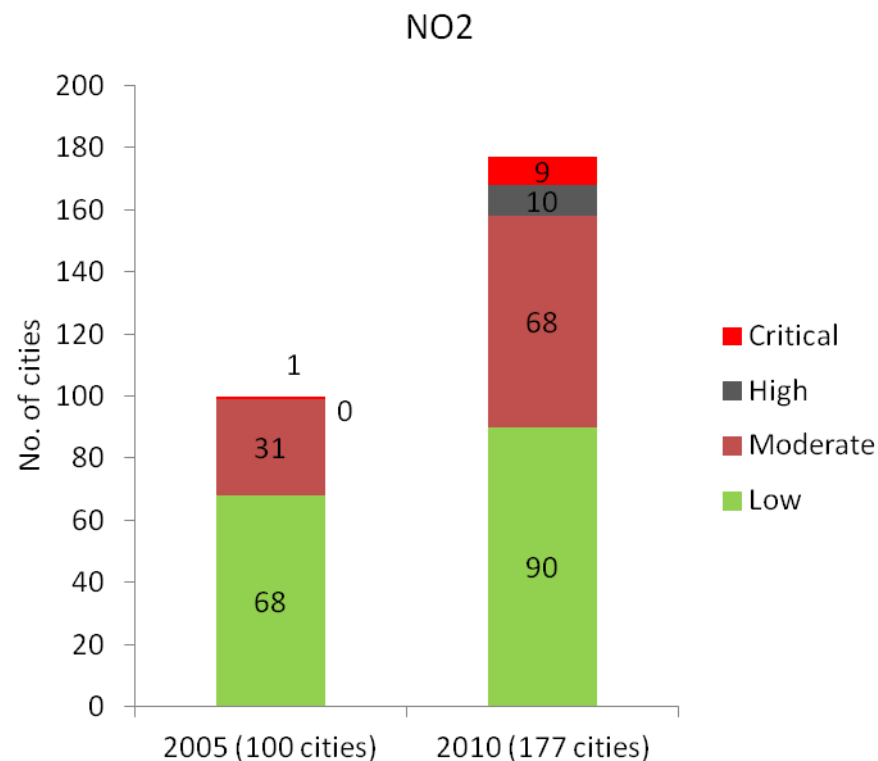


-- PM10 monitoring increased from 96 cities in 2005 to 180 cities in 2010.

-- Low polluted cities fallen from 10 to 2. --
Critically polluted cities (1.5 times the standards) increased from 49 to 89 cities.

-- 2005: 75% of cities exceeded the standard.

2010: -- 78% of cities



NO2 monitoring increased from 100 cities to 177 cities

2005: Only 1 city exceeded the standard. 2010: 19 cities

City enveloped in smog, Delhi this winter back to pre-CNG

- 'सांसें' पर स्मॉग की 'स्याह' परतें

Updated on: Thu, 15 Nov 2012 02:00 AM (IST)

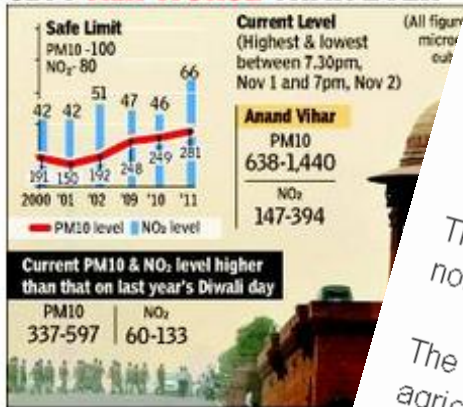
Gains Of Switch To Cleaner Fuel Frittered Away

Neha Lalchandani | TNN

New Delhi: Delhi's air pollution has reached alarming levels. For proof, just look out of the window. The grey-white 'haze' that has been covering the city since October 28, say experts, is actually smog that is linked to the rapid rise in

►High pollution, P 6

CITY AIR WORSE THAN EVER



Smog leaves Delhi gasping for breath

TNN | Nov 3, 2012, 01:33 AM IST

Smog delays Sheila Dikshit's flight to Punjab

Disadvantage Delhi: Smog here to stay

Darpan Singh, Hindustan Times
New Delhi, November 08, 2012



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email print

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The Centre for Science and Environment (CSE), in its latest report, has delivered a stark warning: The smog is here to stay. It has also warned that Delhi is in the grip of a multi-pollutant crisis. The matter is not the only thing holding up the city's development.

Delhi winter smog is not an act of God

During the first week of November, Delhi went under a thick blanket of smog. The breeze nearly stopped, and the skies turned grey and dank. Cool and calm weather led to fumes settling close to the ground. People held masks, scarves or handkerchiefs to their faces.

The resultant outcry in the smog-hit city had officials stubbornly insisting that this was nothing new and that it happened every winter. The new twist came when agricultural stubble burning in Punjab was blamed for the billowing haze.

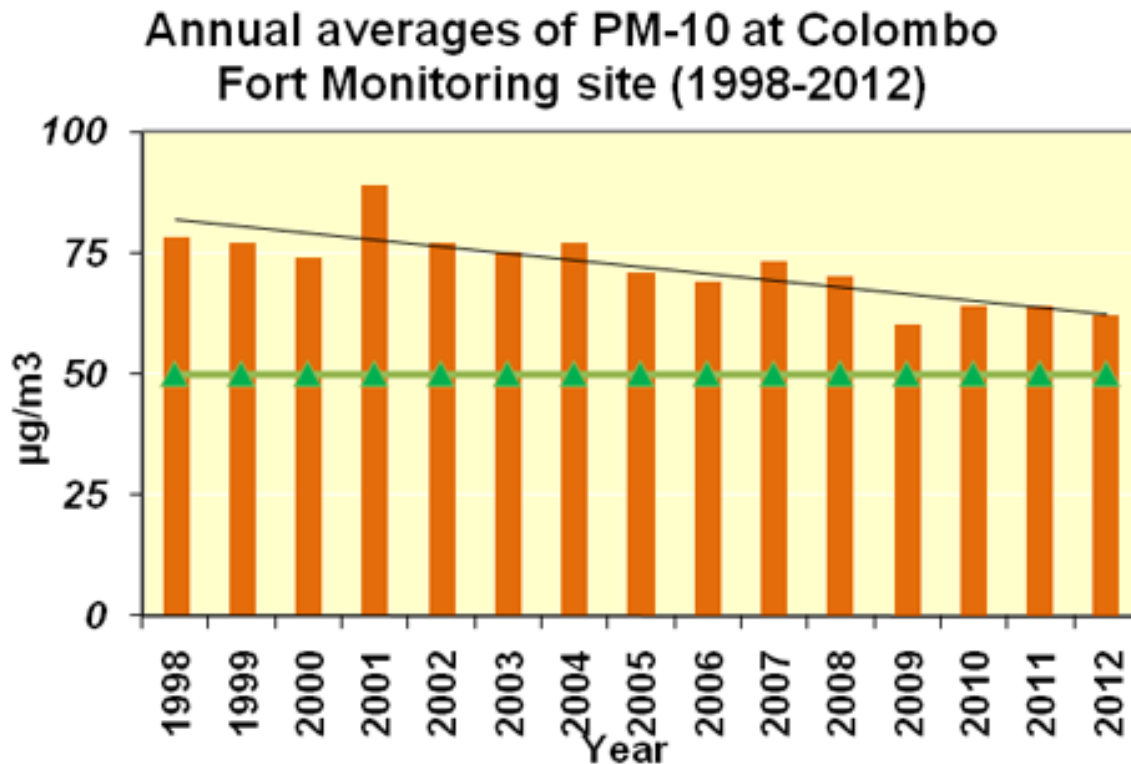
02:44AM IST

Punjab | NASA | flight | Flashpoint | Apex

File
Ludhiana trip by Delhi chief minister Sheila Dikshit in a chartered aircraft from a telecom industrialist family became the flashpoint of the ongoing row between Delhi and Punjab when the plane was delayed by nearly three hours.

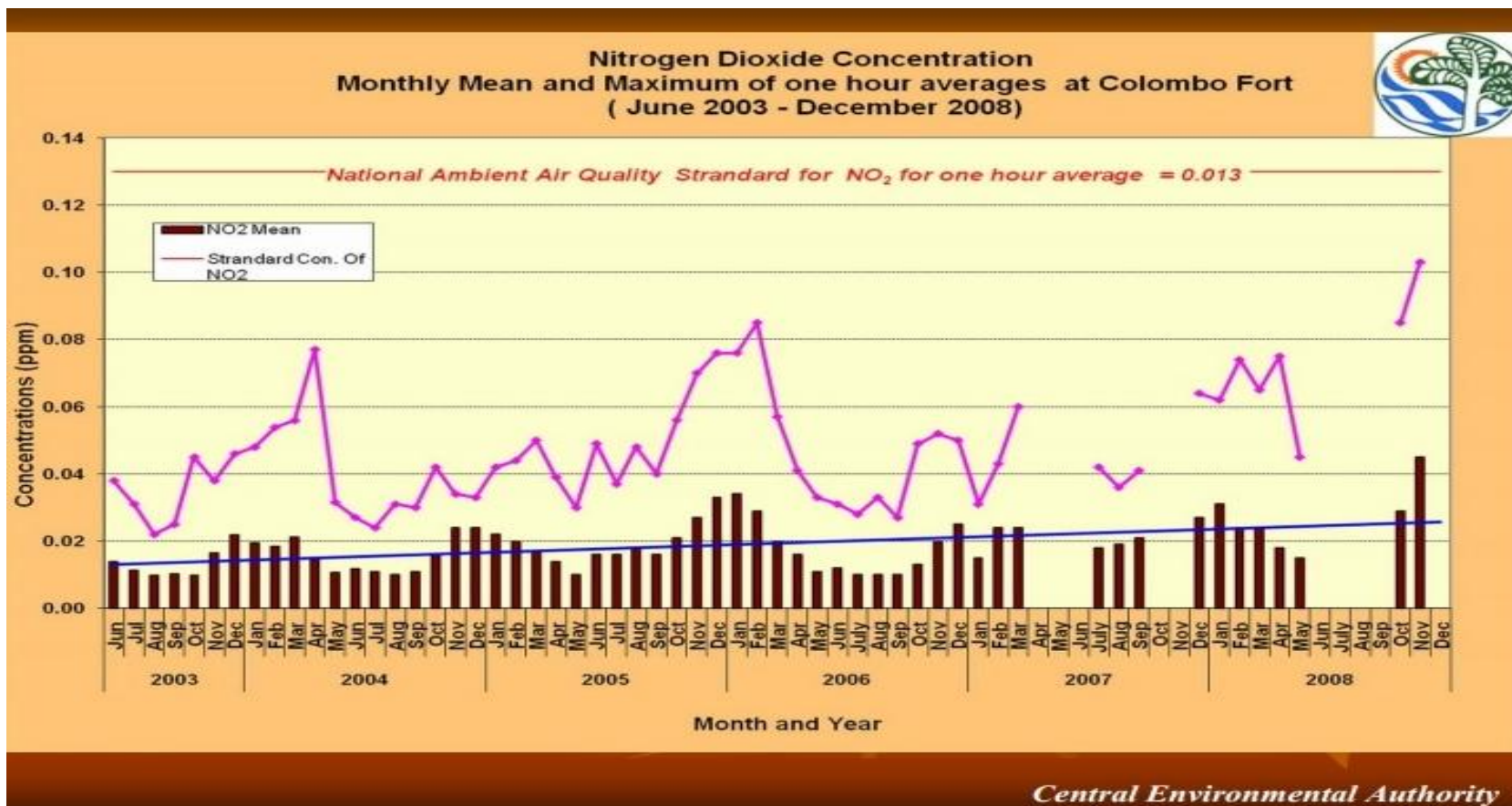
Air quality in Colombo

- **PM10:** Annual averages over the years have ranged within 60 to 82 $\mu\text{g}/\text{m}^3$ with a slight decreasing trend between 1998 to 2012.
- The levels have consistently exceeded WHO latest guideline value of 50 $\mu\text{g}/\text{m}^3$ for PM-10.
- Limited monitoring. Not enough data on other pollutants
- Mobile Air Quality Monitoring Station installed



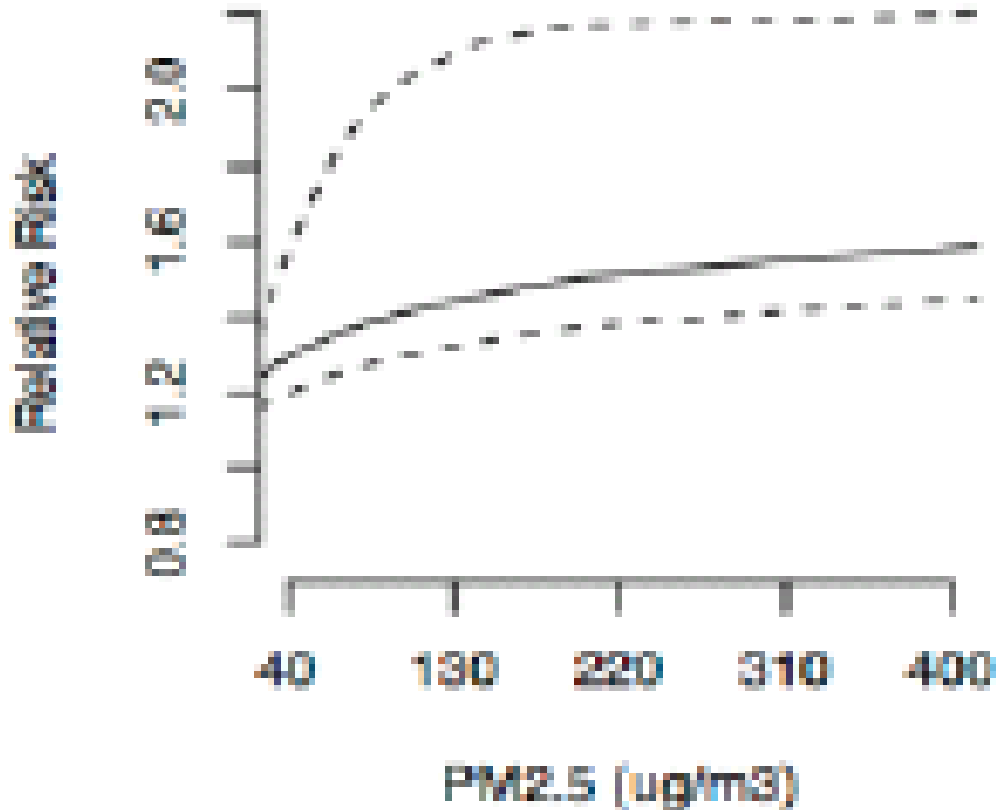
Colombo monthly levels indicates rising trend

- Monthly NO₂ concentration values, June 2003 to December 2008



Source: R.N.R.Jayarathne, *Air Quality issues in Sri Lanka*, Central Environmental Authority, Sri Lanka, presentation, http://www.cseindia.org/userfiles/air_quality_issues_srilanka.pdf

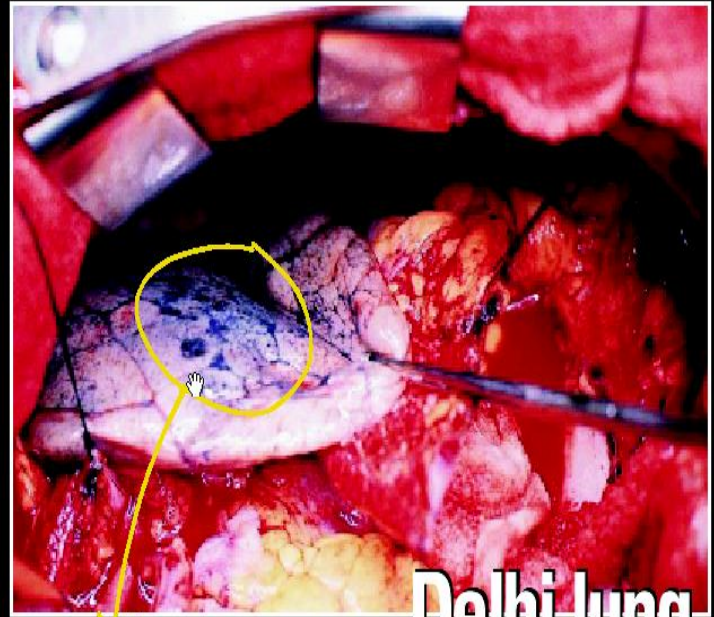
Sri Lanka has comparatively lower pollution levels than Northern cities of India.....But health impacts can be large. Most of the health effects occur at much lower levels. Need to meet tighter targets.



Integrated Exposure-Response function for Ischemic Heart Disease



What about our health?



Look at these black spots on the lung. The unfortunate owner lives in Delhi and has been breathing polluted air. Air full of carbon particles which accumulate in the lungs (black spots). What you can't see is a cocktail of gases and tiny particles, even smaller than carbon that get into our bodies.

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Mounting global health evidences.....



Scale of studies ---- Eg. the Arden Pope study (Journal of American Medical Association 2002) based on American Cancer Society data**16 years, about 500,000 people in 116 metropolitan areas** to arrive at **irrefutable findings**.

..... a mere increase of 10 microgramme per cum of PM2.5 can increase the risk of lung cancer by 8 per cent, cardiopulmonary deaths by 6 per cent, all deaths by 4 percent.

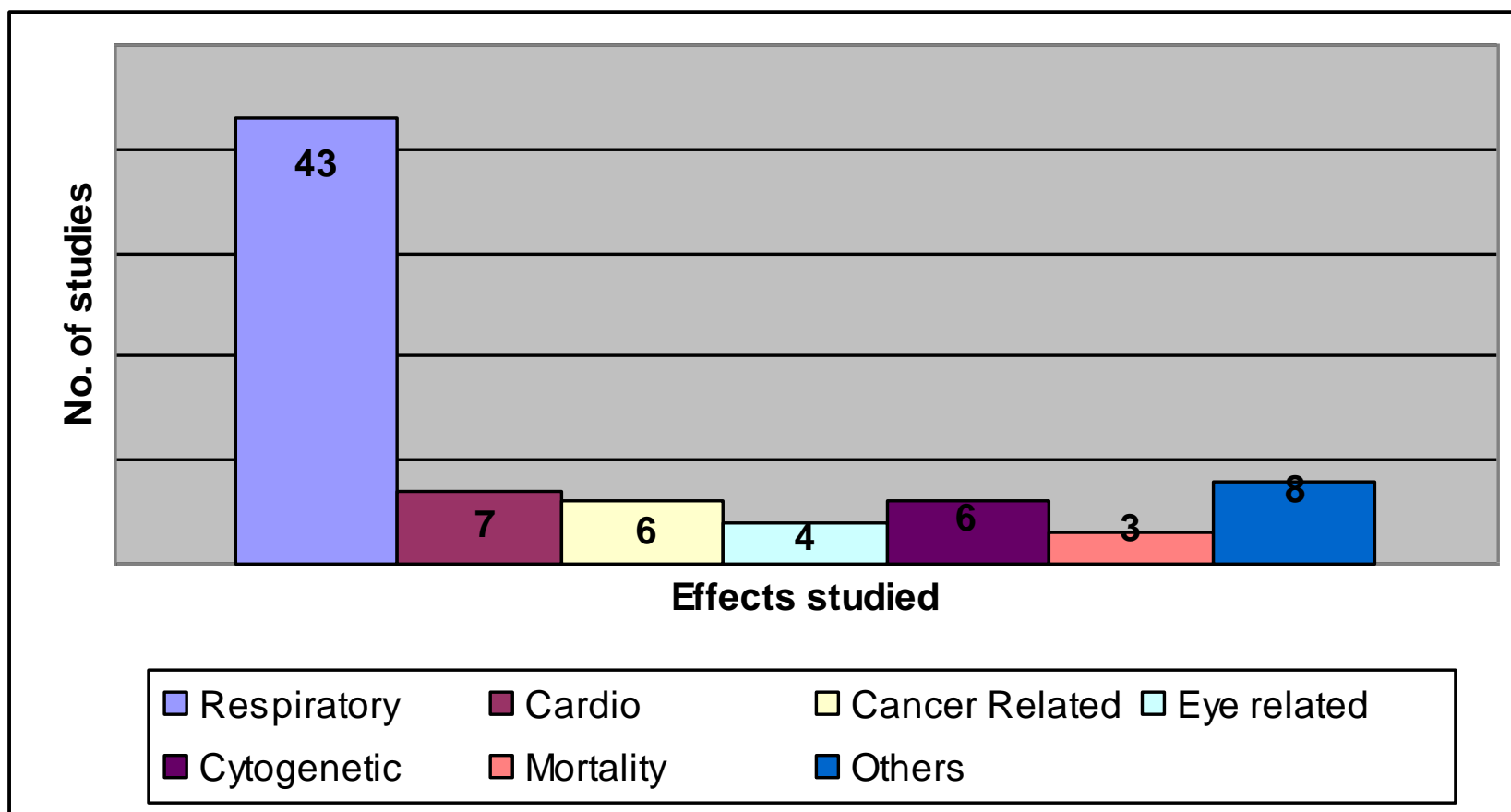
These findings are equally valid for India
Our lungs are same.....



Studies in India looking at a more diverse set of diseases....



Broadens from respiratory health symptoms to other health end points – cardiovascular, eye disorders, cellular changes, cancer, premature deaths....





Global studies

Looking beyond lungs



Diabetes: First large-scale population-based study links diabetes with air pollution. Increase in insulin resistance in lab test and an increase in markers of inflammation (which may contribute to insulin resistance) after particulate exposure.

Strong and consistent association between diabetes prevalence and PM2.5 concentrations. For every 10 $\mu\text{g}/\text{m}^3$ increase in PM2.5 exposure, there was a 1 percent increase in diabetes prevalence. Counties with highest versus the lowest levels of PM2.5 pollution had a more than 20% increase in diabetes, which remained after controlling for diabetes risk factors. (Diabetes Care 2011)

Heart:

Acute Effects of Fine Particulate Air Pollution on Cardiac Arrhythmia: Conclusion: PM2.5 exposure within approximately 60 min was associated with increased PVC counts in healthy individuals. (He F et al 2011 The APACR Study. Environ Health Perspect)

Blood pressure

Traffic-related Air Pollution and Blood Pressure in Elderly Subjects With Coronary Artery Disease: Found positive associations of systolic and diastolic BP with air pollutants. The strongest associations were with organic carbon, multiday average exposures, ect. (Delfino, Ralph J. et al 2010, Epidemiology, May 2010)

Effect on foetus: Studies have shown damaging impact of PAH on even fetus

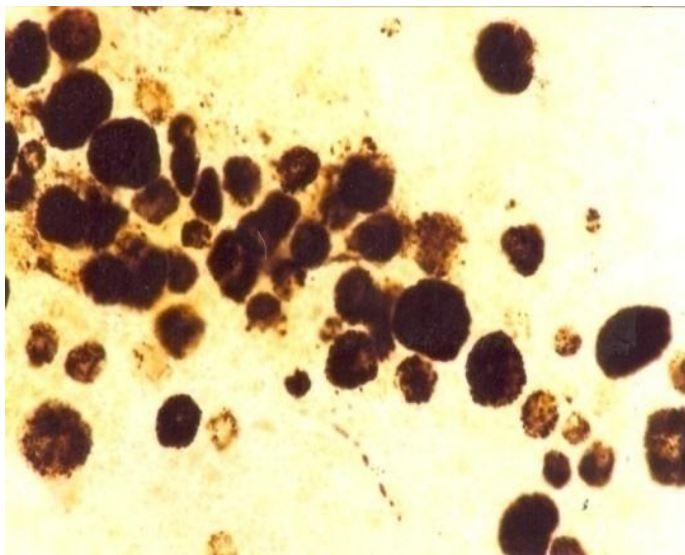


More evidences.....



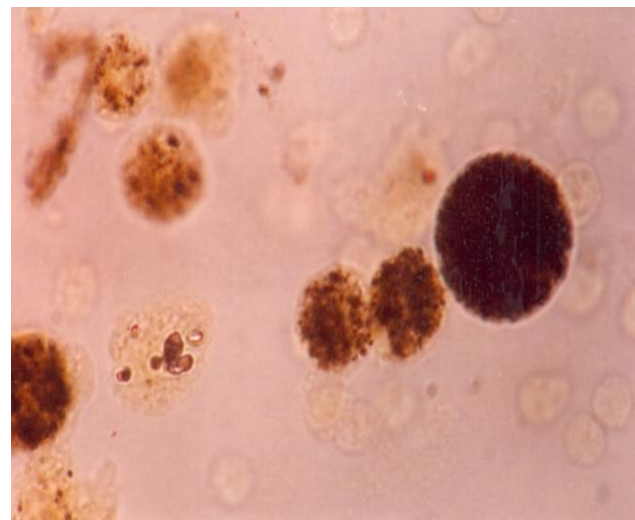
Alveolar macrophage - biomarker of air pollution

Control area:
Sundarbans



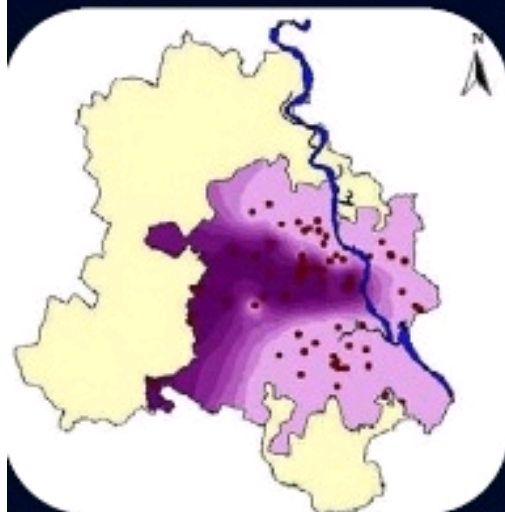
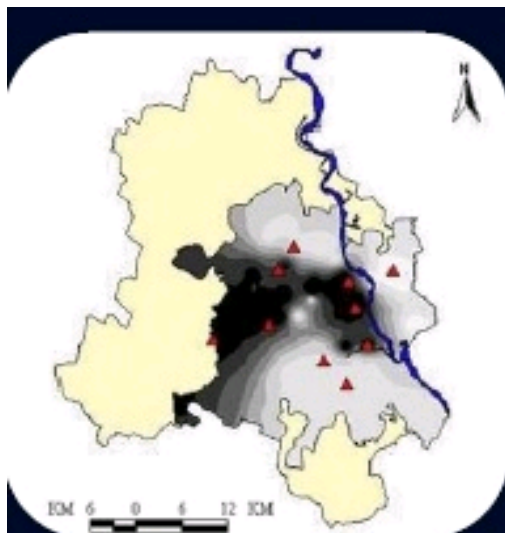
Exposed group; Kolkata taxi
driver
Increase in AM number

Larger AM – particle laden



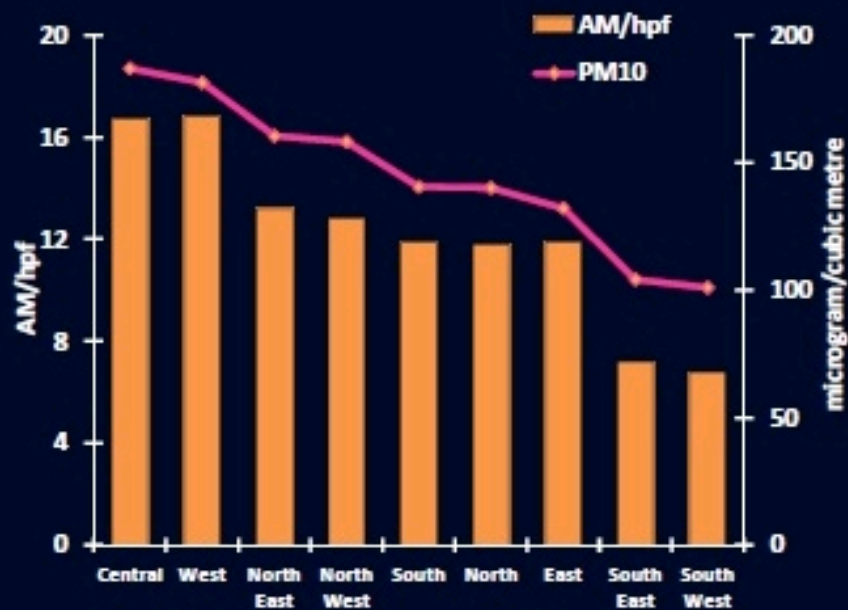


Co-relating health evidence with air pollution



PM₁₀ and AM count

AM count correlated positively with PM₁₀ level
($\rho=0.581$, $p<0.001$)





Emerging evidences in Colombo...



Collage of evidences

- Children from urban areas of Sri Lanka have poorer respiratory health status as compared to children from semi-urban areas. Poor outdoor air quality is one of the contributory factor.(2012)
- Children require more frequent medical visits than in the past. School absenteeism has become common especially among children.
- Senior citizens often experience difficulties in breathing, coughing and chest tightness. These illnesses become prominent during certain seasons when pollution accumulation takes place in Colombo.
- The application of WHO health impact assessment shows that nearly 20% of Asthma cases recorded at LRH could be attributed to PM10. 4% of total cases for hospital admissions for respiratory diseases and respiratory mortality in general could be attributed to PM10 pollution in Colombo (2005)
- Studies attribute Rs 22- 17 billion to health damage cost owing auto diesel emissions in Colombo. Diesel vehicles are responsible for 96%-89% of SO₂ and PM10 from the transportation sector (Sunil Chandrasiri 2006).



Delhi first generation reforms.....

Soft options are now all exhausted



Delhi has fought hard to get breathing space

On vehicles

- Introduced low sulphur fuels and petrol with 1 per cent benzene
- Mandated pre-mix petrol to two- and three-wheelers
- Moved from Euro I to Euro IV over the last decade
- Implemented largest ever CNG based public transport programme
- Capped the number of three-wheelers
- Phased out 15 year old commercial vehicles
- Strengthened vehicle inspection programme (PUC)
- Efforts made to divert transit traffic
- Set up independent fuel testing laboratories to check fuel adulteration

On industry

- Relocated polluting units
- Tighter controls on power plants. No new power plants.

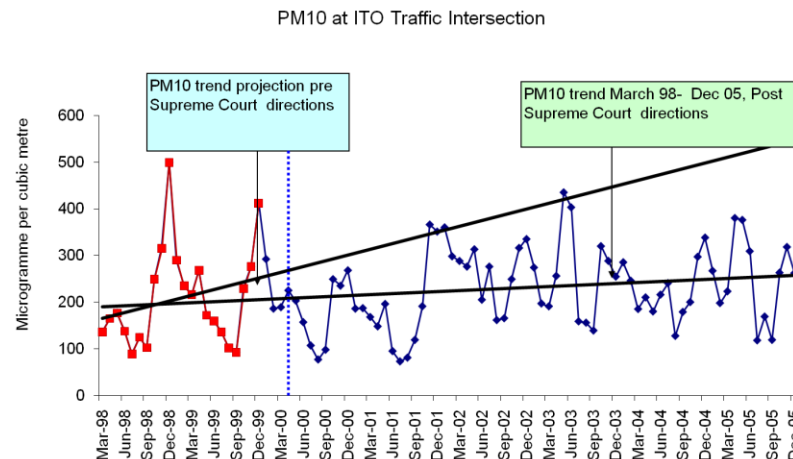
Air quality monitoring

- Adopted new ambient air quality standards
- Expanded air quality monitoring and reporting

Other sources

- Emissions standards for generator sets
- Ban on open burning of biomass

This now needs scale and stringent enforcement



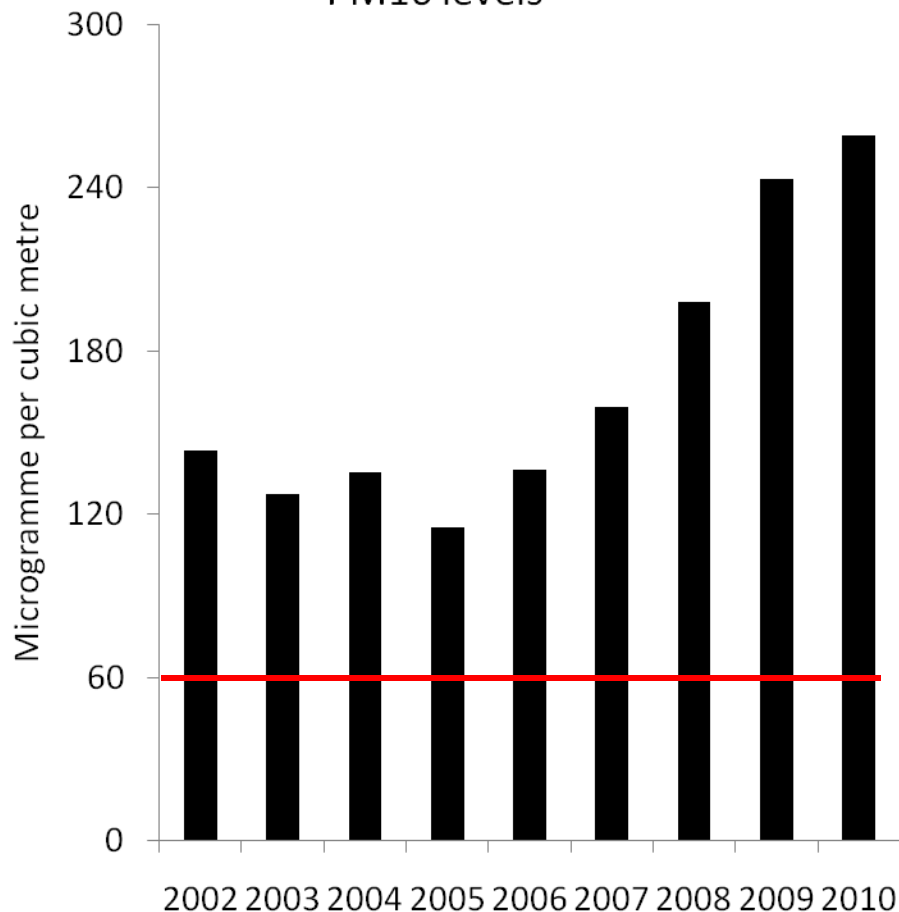


Pollution levels up: Delhi losing its gains



Both PM10 and NO2 levels show an increasing trend and exceed the safe levels. PM10 exceed the standard by nearly 4 times and NO2 by 1.3 times

PM10 levels



NO2 levels



Note:

-- Annual averages of residential areas, Charts are based on CPCB, MOEF data

-- Red lines denote National ambient air quality standards; PM10 at 60 microgramme per cubic metre; NO2 at 40 microgramme per cubic metre



First generation action in Colombo



- **Air quality regulations:**
- The National Policy on Urban Air Quality Management was adopted in 2000.
- Air quality standards for selected air pollutants enacted.
- Taking cognizance of WHO Air Quality Guidelines (2005), standards for PM10 and PM2.5 gazetted in 2008.
- **Fuel Quality regulations:**
- Leaded gasoline was phased out in June 2002.
- Low sulphur diesel was introduced in January 2003.
- Leaded petrol removed from the market in 2002
- Low sulphur diesel introduced in 2003 (500 ppm super diesel, and 2500 ppm regular diesel)
- Regular diesel will be 500 ppm in 2012, and super diesel will be 50 ppm in 2012
- **Import related regulations:**
- Import of Two Stroke Three-wheelers was banned in 2008.
- Importation of two stroke technology banned
- Low tax regime for hybrid vehicles from Jan 2011 (within 3 months 3,000 hybrid vehicles were imported);
- Review of policies for assembling of vehicles using old parts (Board of Investment (BOI) law, Sri Lanka)
- **Emissions testing:**
- Vehicular emission testing programme was initiated in 2008.
- Vehicle Emission Testing program commenced in Sept 2008 covering Colombo Metropolitan Region



National Air Quality Standards must be made legally enforceable



- **In India standards are notified under the Air Act. But no accountability. No punitive action on state governments if the ambient air quality standards are not met.**
- **Abatement plans are not designed to meet local mandatory air quality targets**
- **Emissions regulations are kept weaker for most of India.**
 - **In the US** the air quality standards are federally enforceable. EPA impose sanctions if states fail to meet the air quality targets -- such as cut highway funds.
 - Civil society can sue the state governments.
 - “Citizen Court Suits” allowed against EPA for failure to promulgate NAAQS, emissions standards or implement state implementation plans.
- **In India** the twelfth five year plan mandates the governments to set monitorable target of air quality -- achieve the standards of air quality in all major cities by 2017

Ensure enforcement of air quality standards, accountability and compliance.



Pollution comes from a variety of sources.....
Why are we specially worried about vehicles?



Vehicles are of special concern



- Vehicular emissions contribute to significant human exposure. **Pollution concentration in our breathe is 3-4 times higher** than the ambient air concentration.
- In densely-populated cities more than **50 – 60% of the population lives or works near roadside** where levels are much higher. This is **very serious in low income neighborhoods** located close to roads.
- **Poor have a higher prevalence of some underlying diseases** related to air pollution and proximity to roadways increases the potential health effects.
- In three cities World Bank review found **vehicles contributing an average 50% of the direct PM emissions and 70% of PM exposure**.
- **The WHO report of 2005:** Epidemiological evidences for the adverse health effects of exposure to transport related air pollution is increasing.
- **Public transport users, walkers and cyclists are the most exposed groups** – most of them are also poor.



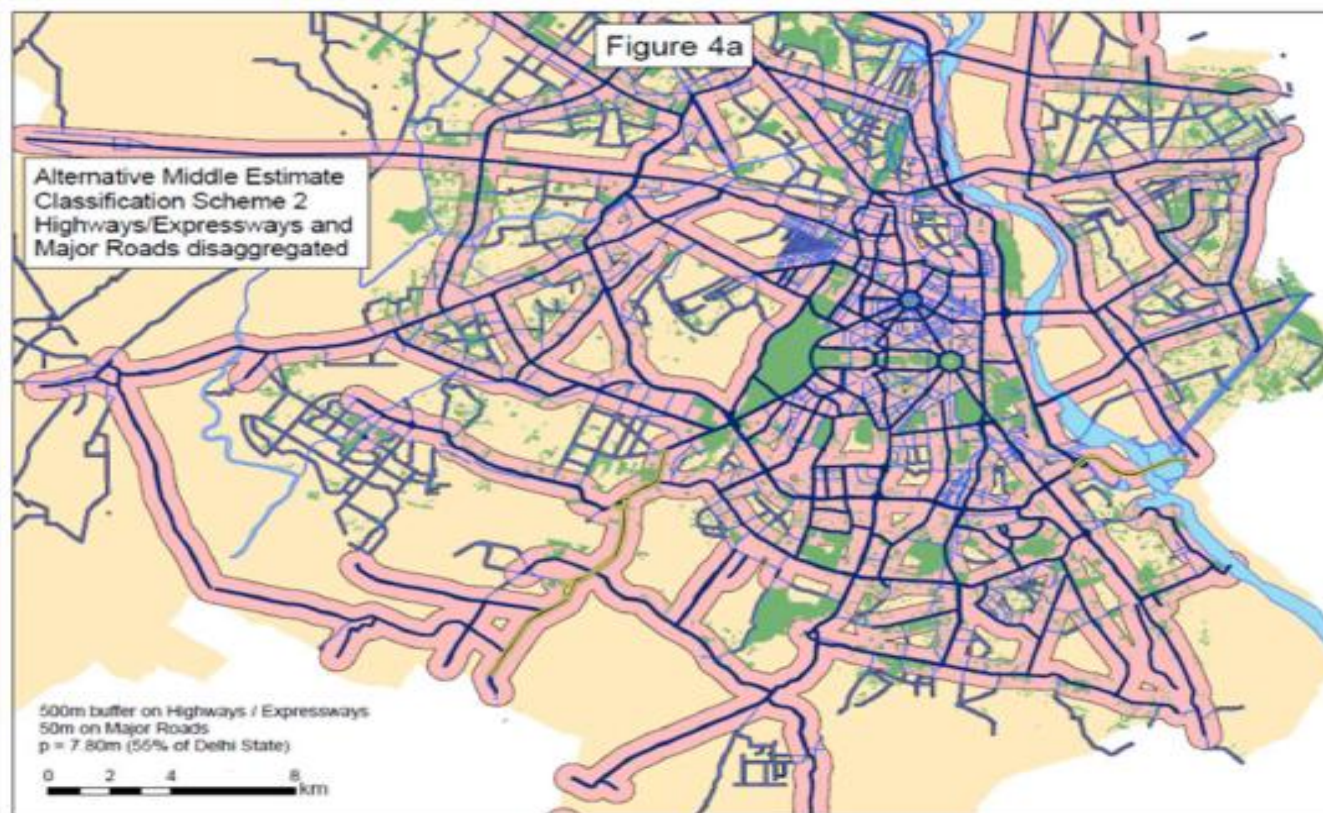


People living close to roads are most exposed to vehicular fume

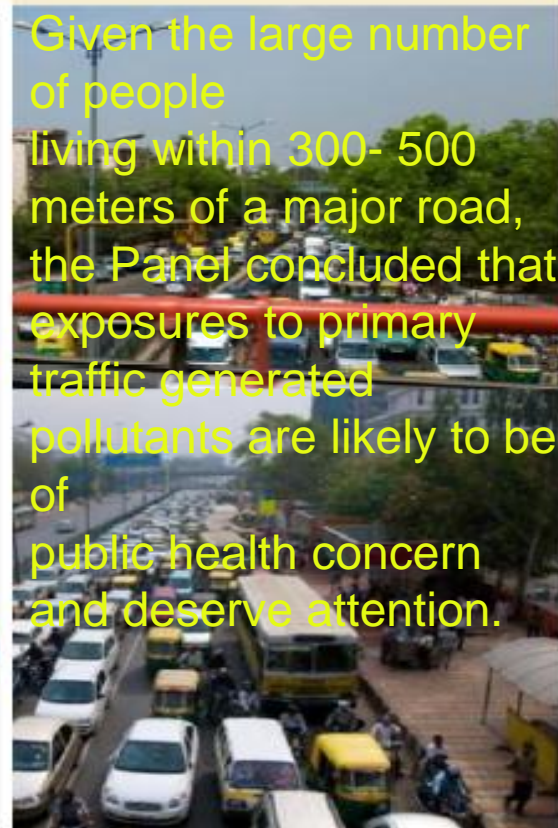
Evidence from Delhi....



The Traffic Impact Area in Delhi: New HEI Analysis: 55% of the Population within 500 meters of a Freeway; 50 meters of a Major Road



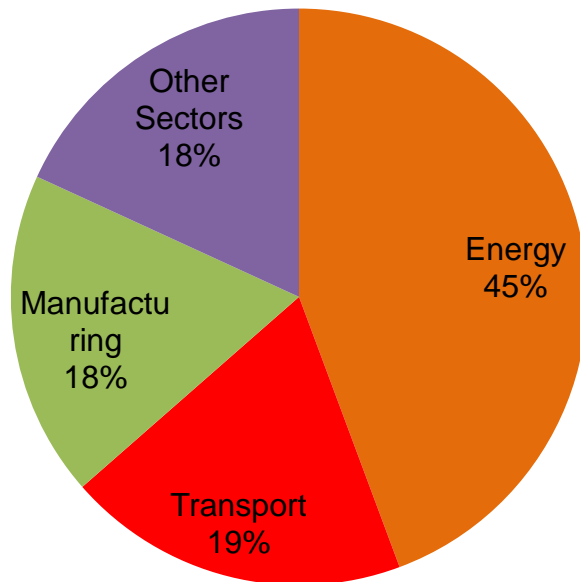
Given the large number of people living within 300- 500 meters of a major road, the Panel concluded that exposures to primary traffic generated pollutants are likely to be of public health concern and deserve attention.



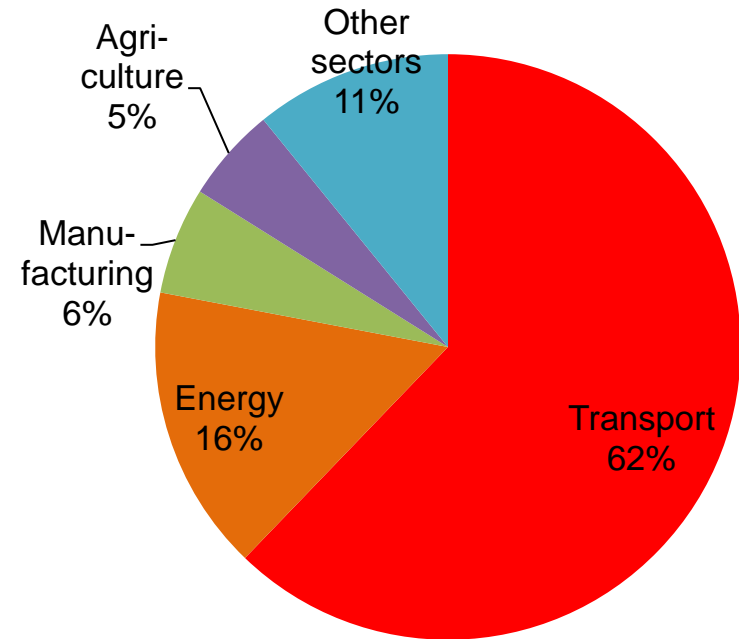
Sri Lanka: Contribution of different sources

- Transport sector's contribution to NO₂ is substantially higher – about 60%
- Transport sector's contribution to SO₂ is about 20%

Sectoral contribution to SO₂ levels

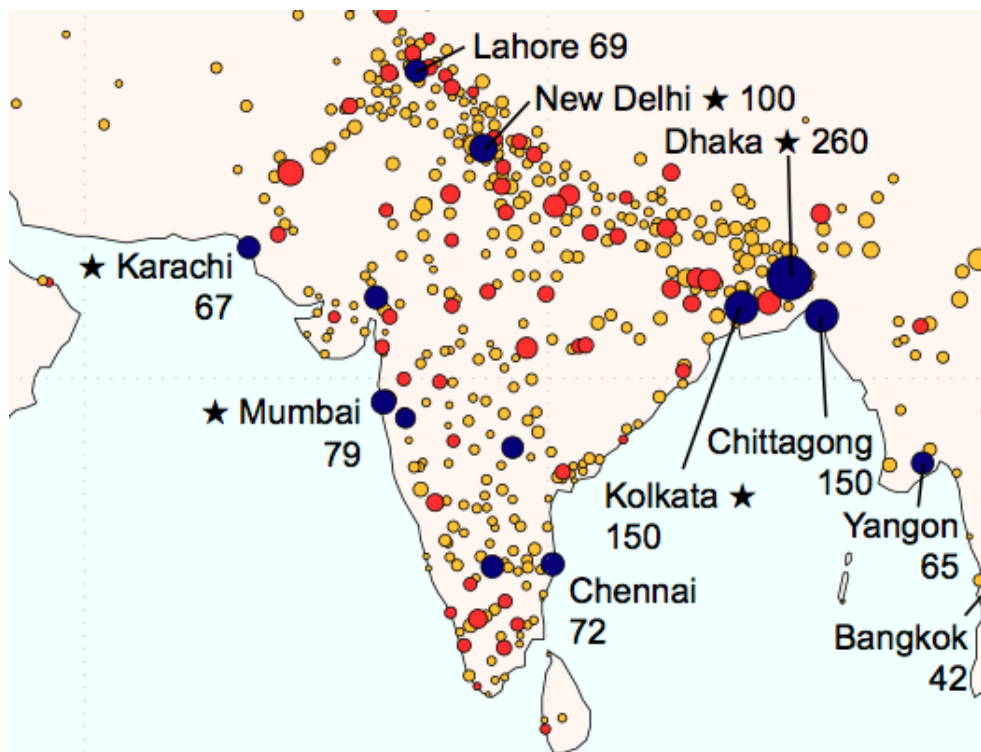


Sectoral contribution to NO_x levels





Exposure to Vehicle Emissions



Exposure (iF) is the population-weighted intake fraction, or the grams of vehicle pollution inhaled per grams of vehicle pollution emitted.

Location	Exposure (iF)*
United States	21
World	39
China	45
India	51
Hyderabad	63
Bangalore	68
Ahmedabad	69
Chennai	72
Mumbai	79
Delhi	100
Kolkata	150

Estimates from Apte, J. S., Bombrun, E., Marshall, J. D., & Nazaroff, W. W. (2012). Global Intraurban Intake Fractions for Primary Air Pollutants from Vehicles and Other Distributed Sources. *Environmental Science and Technology*, 46(6), 3415–3423.

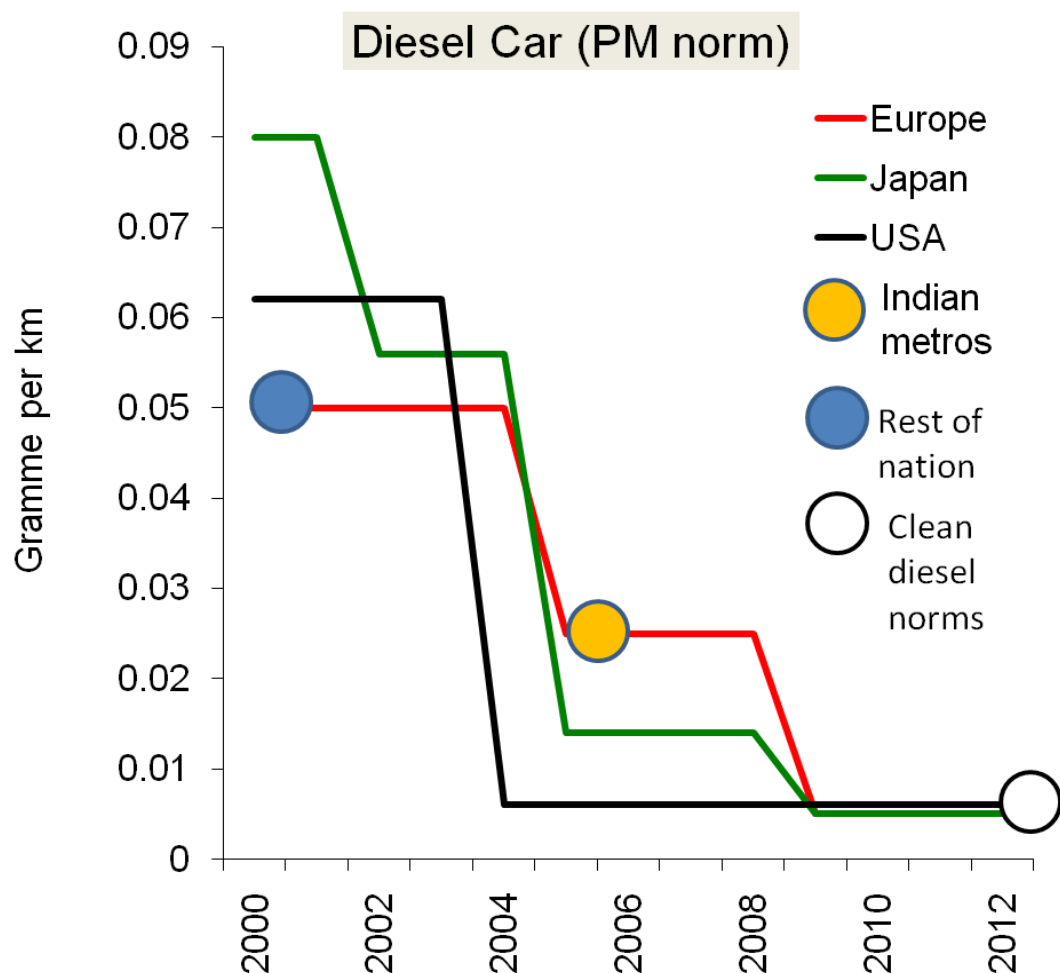


Technology leapfrog.....

-- Bharat Stage III 12 years behind Europe

-- Bharat stage IV seven years behind

Diesel car emission norm trajectory and India's position



During 12th plan refinery capacity will expand 1.6 times.

But this is not linked with stringent emissions standards roadmap.

There is no fiscal strategy



Fuel quality languishing in South Asia



Current and proposed Sulfur Levels in Diesel in South Asia

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
European Union										500	50(10) ^f												10
Japan ^b										500		50										10	
Hong Kong, China		500										50										10	
United States											500	15										10	
South Korea							500	430		100	30										15(10) ^f		
Singapore	3000										500											50	
Taipei, China	3000			500			350			100												50	
Thailand	2500			500																350			50
China (metros) ^g	5000					2000		500	350													50	
China (nationwide) ^{e,f}	5000					2000			2000 & 500												350		
India (metros)	5000				2500	500					350 ^h												50
India (nationwide)	5000				2500										500								350
Malaysia	5000	3000				500 ^c																	500 ^d
Philippines	5000					2000													500			50 ^g	
Sri Lanka	10000						5000 ^e	3000&500								500				50 ^g			
Vietnam	above 5000						2500										500						50
Indonesia	5000								3500														350
Cambodia						2000																1500	
Bangladesh																						5000	
Pakistan	10000																					7000 ^c	



Diesel: A special challenge



Delhi/India: In the new vehicle sales (cars & jeeps) diesels account for more than half

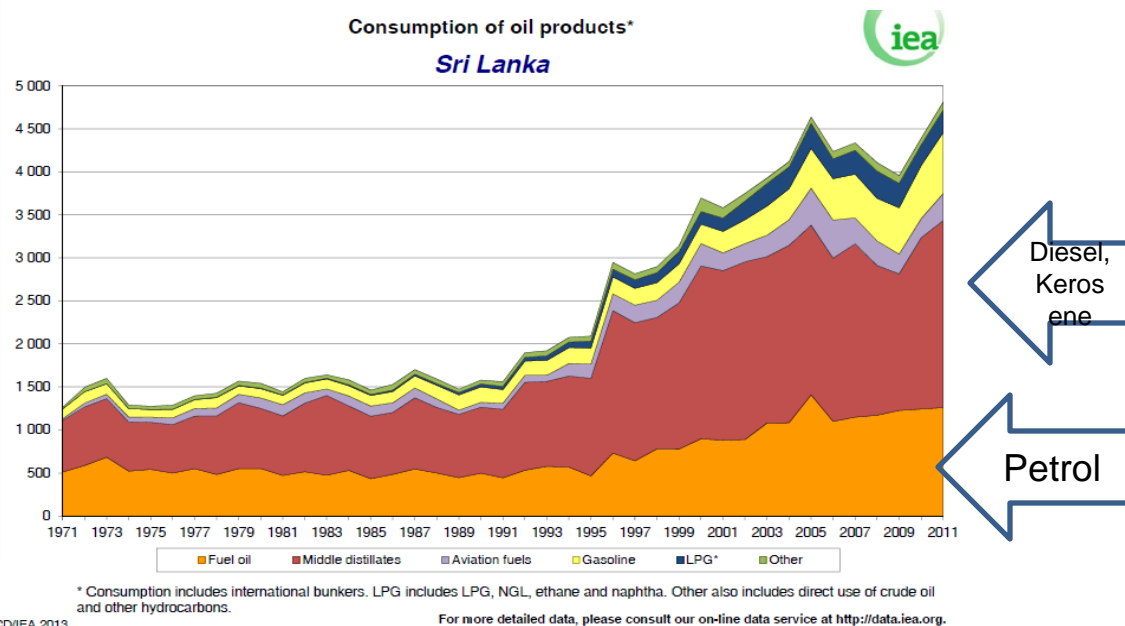
Colombo: Diesel vehicles are 45% of total fleet now.

Fuel price policy responsible for growing dieselisation: Transport sector uses 96% of diesel.

Taxes on diesel cars have increased but the cheaper fuel continue to remain an incentive

- Sri Lanka plans to achieve the Euro IV quality fuel with 50 ppm sulfur

In Sri Lanka, diesel consumption is high.... Sri Lanka imports 85% of its energy demand (oil and products).



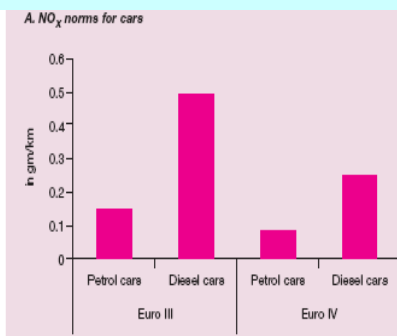


WHO has reclassified diesel emissions as class 1 carcinogen

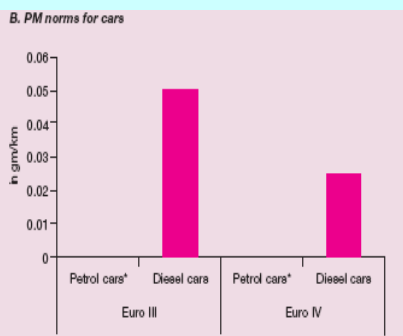


Diesel cars are legally allowed to emit three times more NO_x than petrol cars under the Euro norms

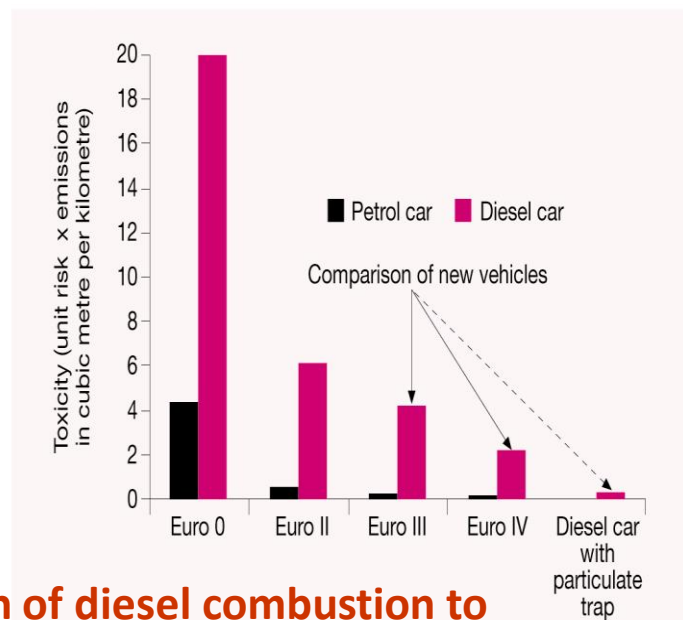
NO_x norms for cars



PM norms for cars



Toxicity of diesel emissions



Very high contribution of diesel combustion to PM_{2.5} in Indian cities





Diesel cars can also make South Asia more energy and climate insecure. How?



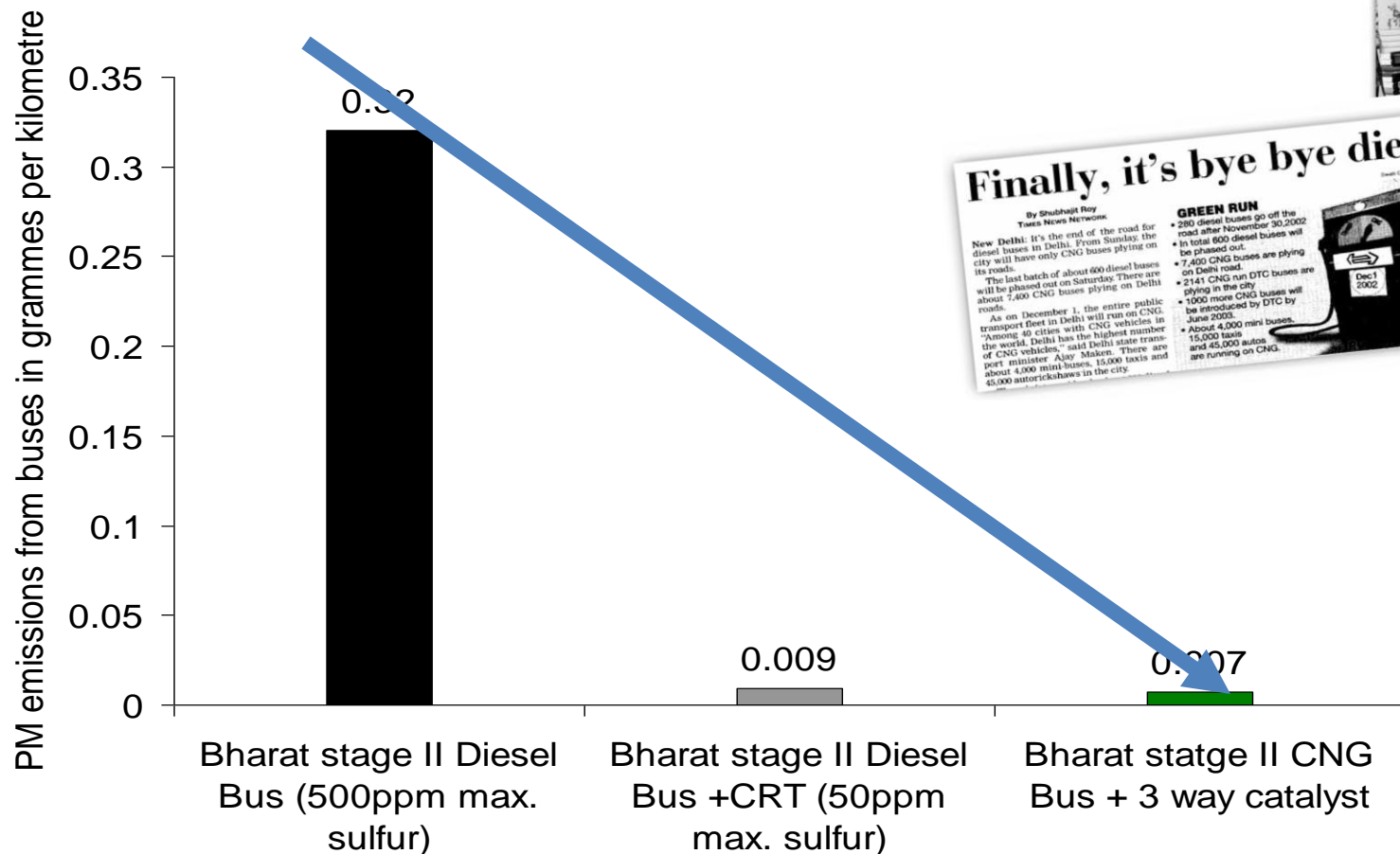
- Cheaper diesel fuel encourages bigger and more powerful cars. Eg, --
 - Due to higher gasoline prices 85% of the gasoline cars sold in India have less than 1200 cc engines
 - But 64 % of diesel cars are just under 1500 cc and the rest above.
- Diesel fuel has higher carbon content than petrol. If more diesel is burnt encouraged by its cheaper prices and more driving, more heat-trapping CO₂ will escape.
- Black carbon emissions from diesel vehicles are several times more heat trapping than CO₂ and this nullifies fuel efficiency gains.
- Europe has found that with increased demand for diesel energy consuming refining process will expand to increase the share of diesel from each unit of oil refined. CO₂ emissions from the upstream refining process will increase. This negates the benefit of shift from petrol to diesel cars.
- European Commission has calculated the difference in lifetime pollution costs of Euro IV compliant diesel car and petrol car. Total pollution cost of a Euro IV diesel car is 1195 Euros vis a vis 846 Euros for a petrol car. This nullifies the marginal greenhouse gas reduction benefit of diesel car and costs higher to the society.



CNG helped Delhi to leapfrog and fight poor quality diesel



Euro II diesel bus emits nearly 46 times higher PM than Euro II CNG bus in India.

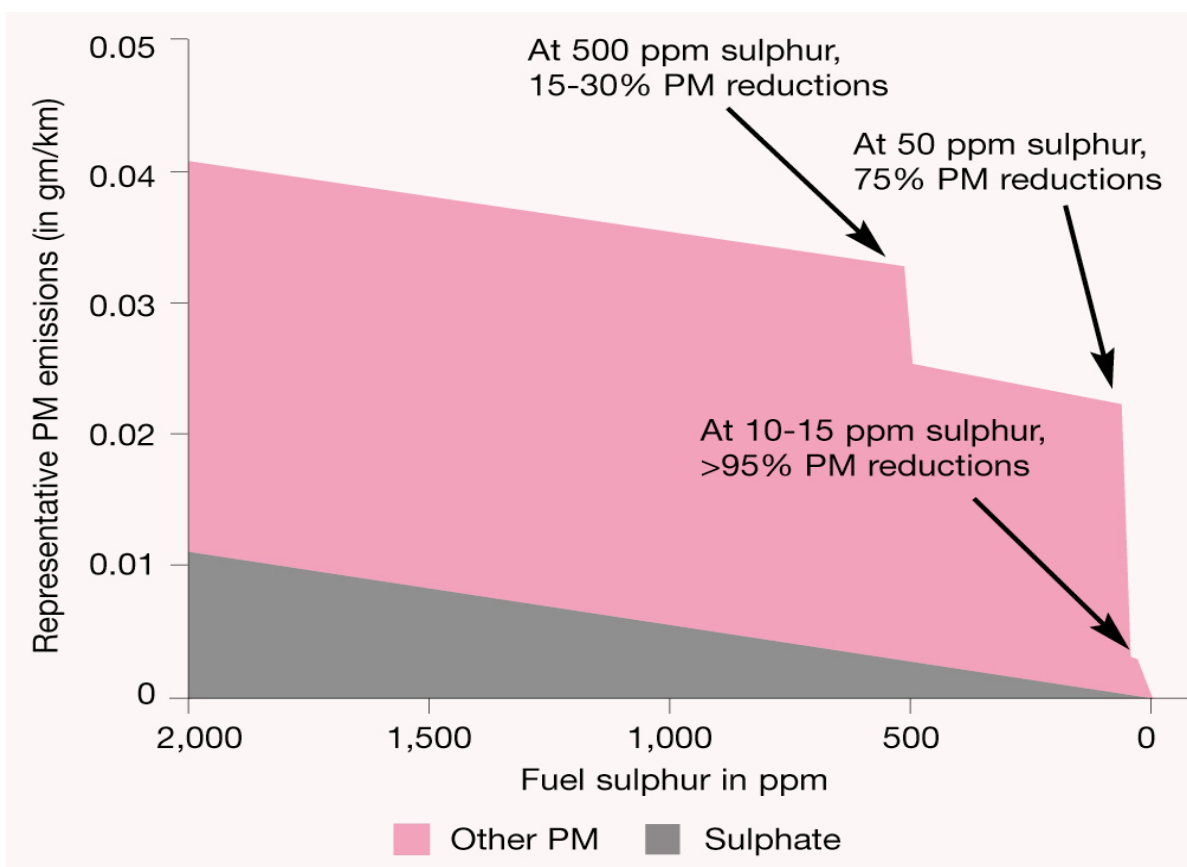




Need roadmap for clean diesel



Achieve near zero emissions....





Other governments are taking active fiscal measures

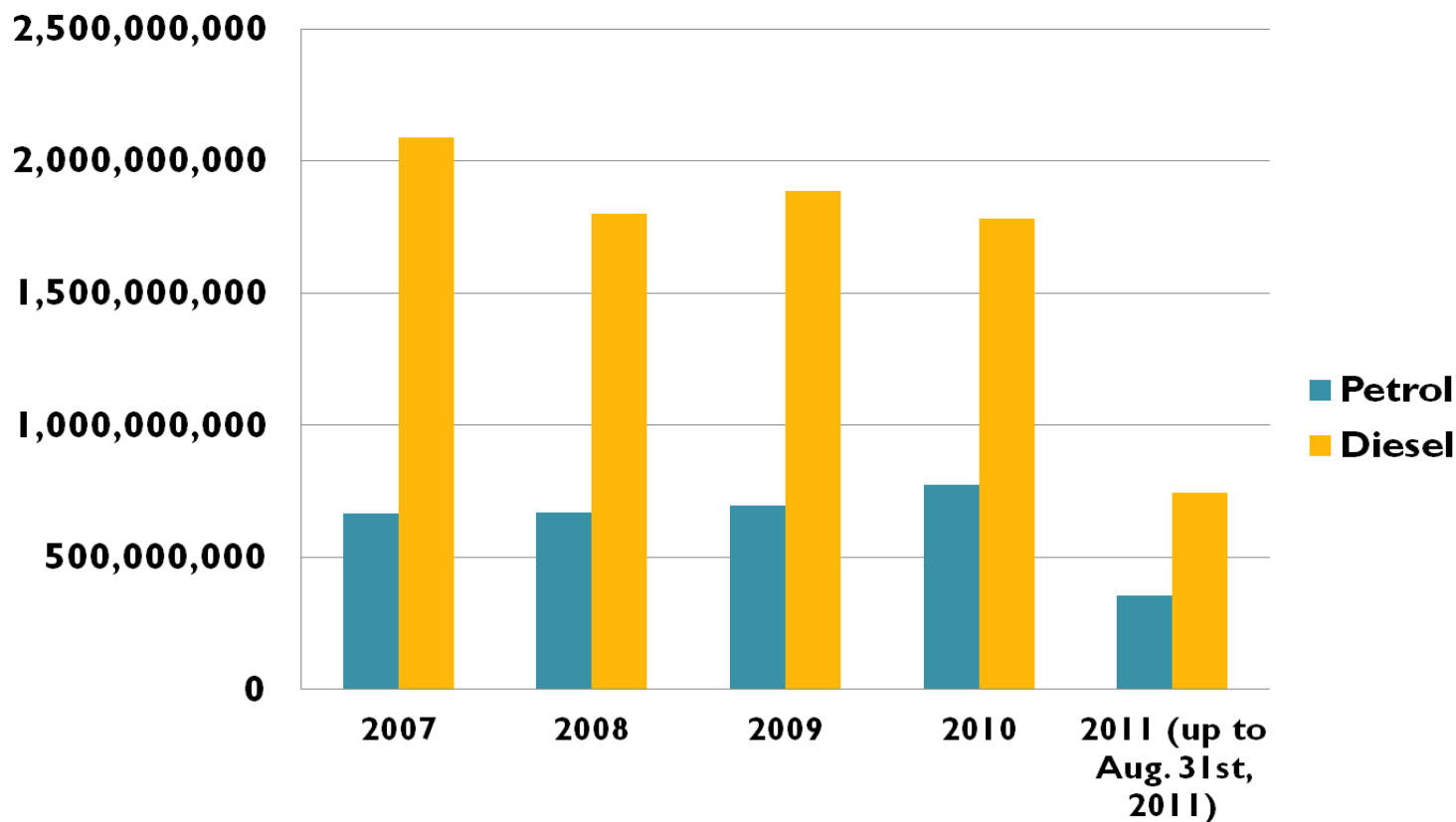


- Fiscal measures to discourage conventional diesel.
 - In **Brazil** diesel cars are actively discouraged because of the policy to keep taxes lower on diesel.
 - In **Denmark**, diesel cars are taxed higher to offset the lower prices of diesel fuel.
 - In **China**, taxes do not differentiate between petrol and diesel.
 - **European Commission** has calculated the difference in lifetime pollution costs of Euro IV compliant diesel car and petrol car. The total pollution cost of a Euro IV diesel car is 1195 Euros vis a vis 846 Euros for a petrol car. This nullifies the marginal greenhouse gas reduction benefit of diesel car and costs higher to the society.



Fuel taxation: Best practice Sri Lanka

Change of fuel consumption in Sri Lanka (in litres)



Source: Don S. Jayaweera 2011, Analysis on effectiveness of fiscal strategies introduced on Hybrid Vehicles and market response – Policy Reforms on Clean Air, Presentation at the conference organized by the Center for Science and Environment on clean air and sustainable mobility– September 28-29, 2011



Action on in-use vehicles.....



- **Move to upgrade in-use vehicle inspection in Delhi**
- System upgrades and norms revisions
- Lambda implemented
- Audits networking
- Specially designed inspection of CNG buses
- High volume centralised test centres for commercial vehicles
- Check malpractices
- Diesel vehicle testing needs upgradation

Colombo has also taken the lead in improving in-use emissions inspection regime





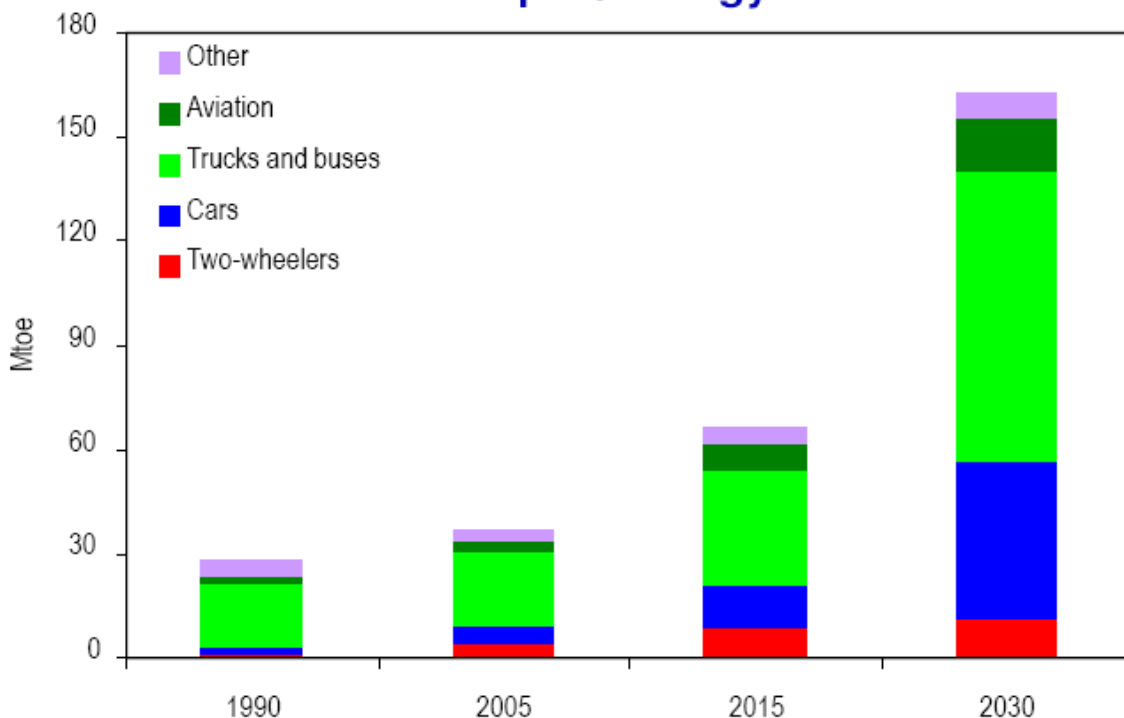
Vehicles make us more energy insecure....
Climate insecure..... Resolve efficiency vs
emissions trade-off



Cars, trucks and buses will drive the future oil demand.....

Trend in fuel consumption by different modes of transport in India

WEO2007 Reference Scenario: India's Transport Energy Demand



Transport demand – mostly oil – grows rapidly as car ownership increases in line with rising incomes

Transport energy demand has grown at 1.2 times the GDP growth rate.

Fuel consumption by vehicles in 2035 could be six times that of the 2005 level. (ADB)

Shift of freight from railways to trucks: Railway share only 26%

Vehicle mass, and size increasing
--- 6-10% increase in average mass,
-- 6% increase in engine size. This means increased guzzling.....

Fleet weight increase by 2% a year can lead to a cumulative loss of 6.5 mtoe between 2010 and 2020



Car centric growth encourage fuel guzzling

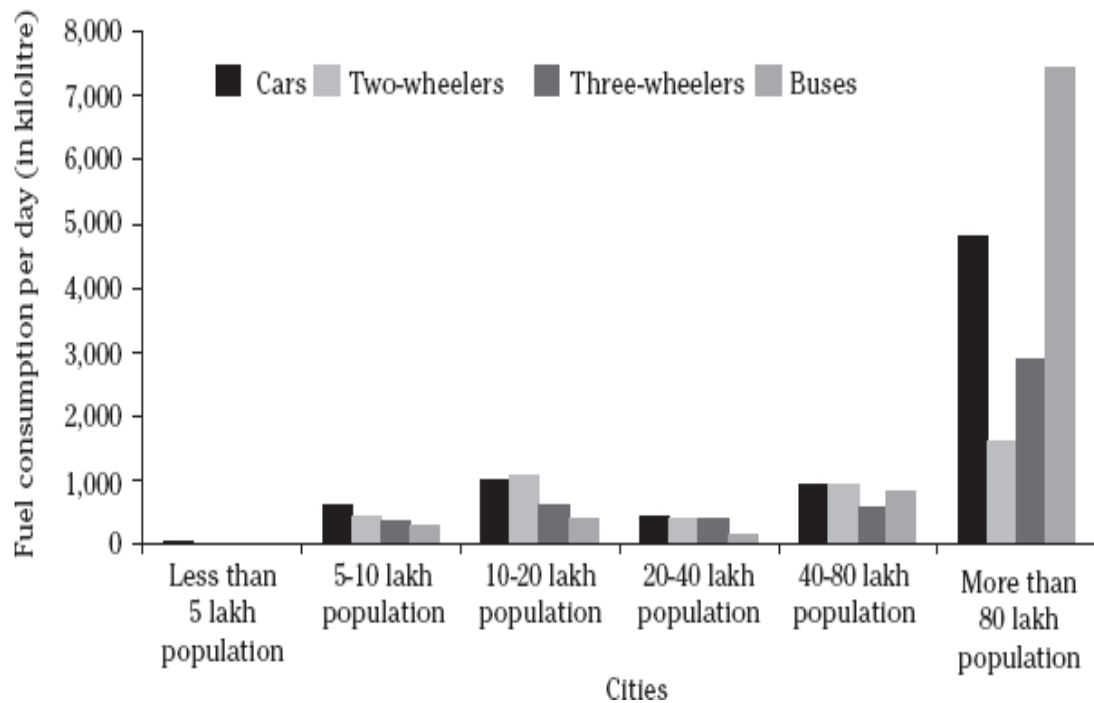


Very high fuel guzzling in the transport sector of big cities These also have high concentration of personal vehicles – cars and two-wheelers

Urban car travel consumes nearly twice as energy on average as average urban bus travel on a per passenger basis. By 2030-31 on an average Indians will travel thrice as many kilometers as they traveled during 2000-01.

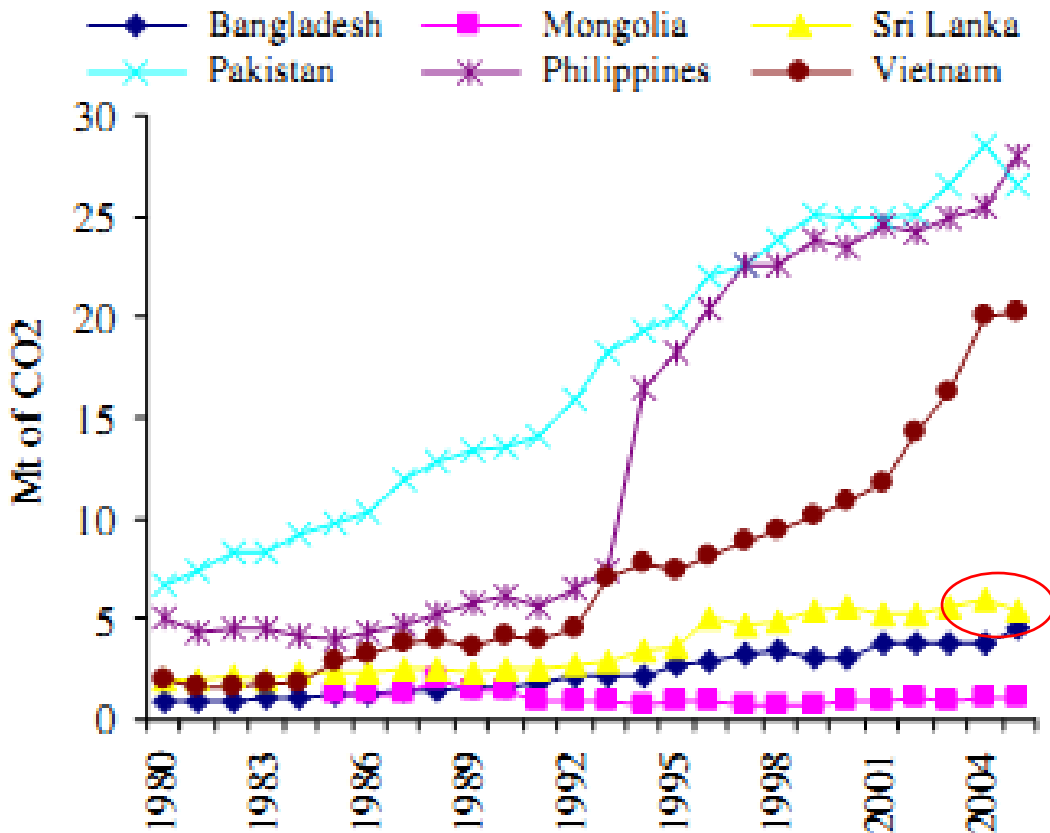
Personal vehicles can account for about 65 – 90% of the total carbon-dioxide emissions in transport sector

Fuel consumption per day in different classes of cities





Transport Sector impacts on CO2 emissions

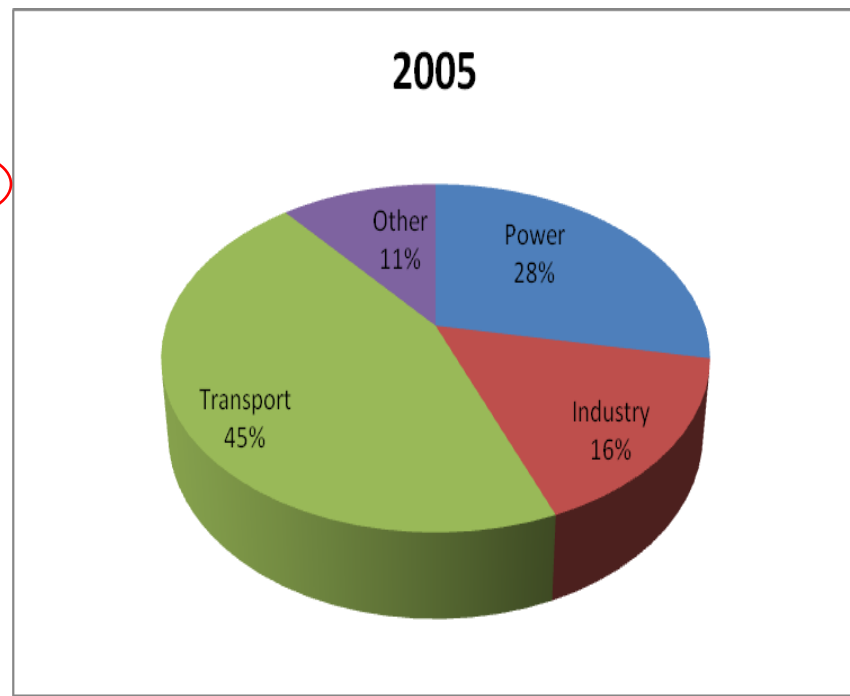


In Sri Lanka transport CO2 emissions dominate

Sri Lanka has a chance to be preventive.

Requires fuel efficiency standards for vehicles and other measures

Need fuel economy regulations and mobility management



Source: Govinda R. Timilsina, Ashish Shrestha, 2009, "Transport sector CO2 emissions growth in Asia: Underlying factors and policy options", Energy Policy 37



MOBILITY CRISIS



Cities are losing battle of car-bulge: **The rapid increase in vehicles is destroying all gains of air pollution and health**

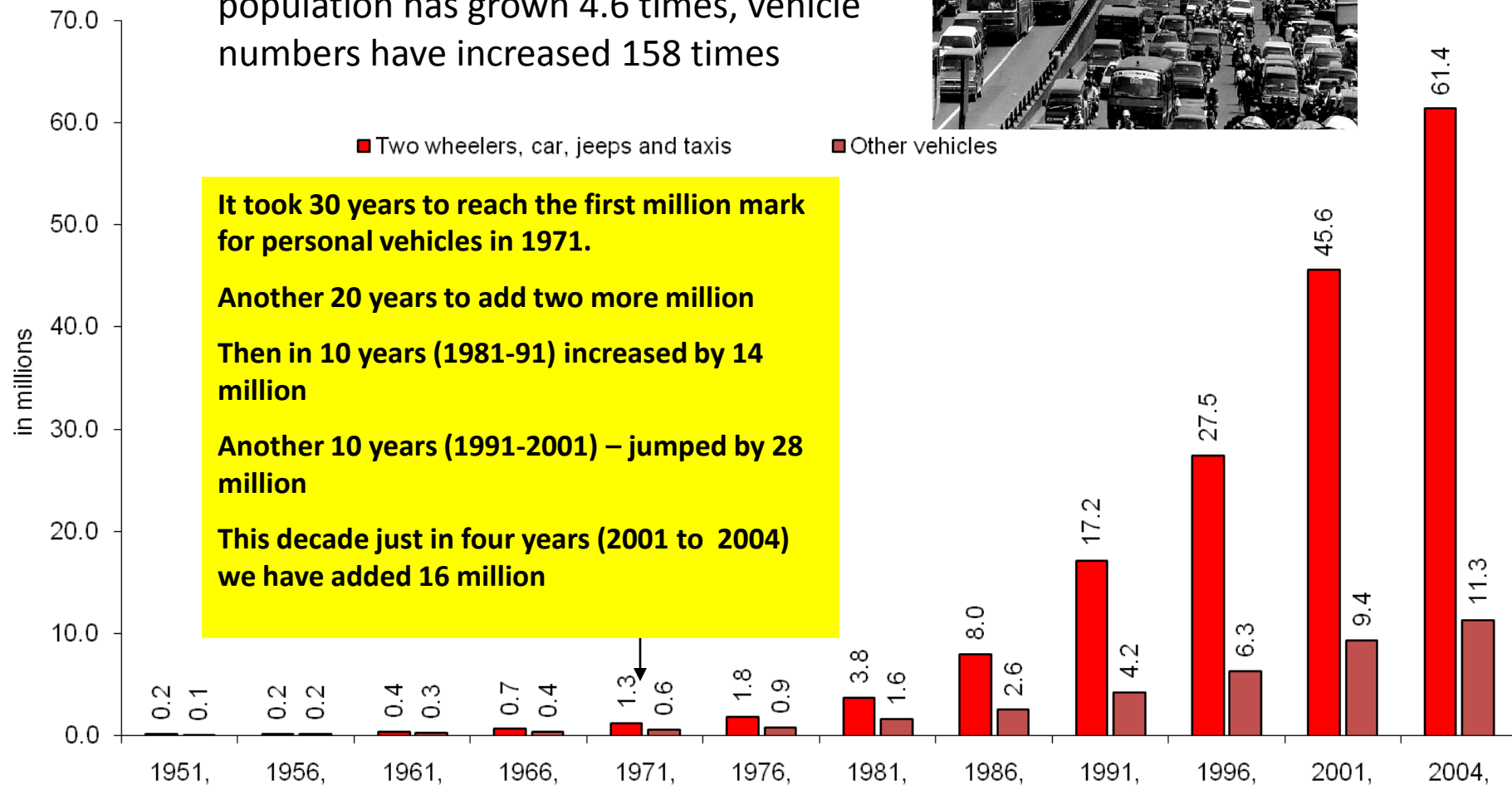




Explosive numbers in India



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

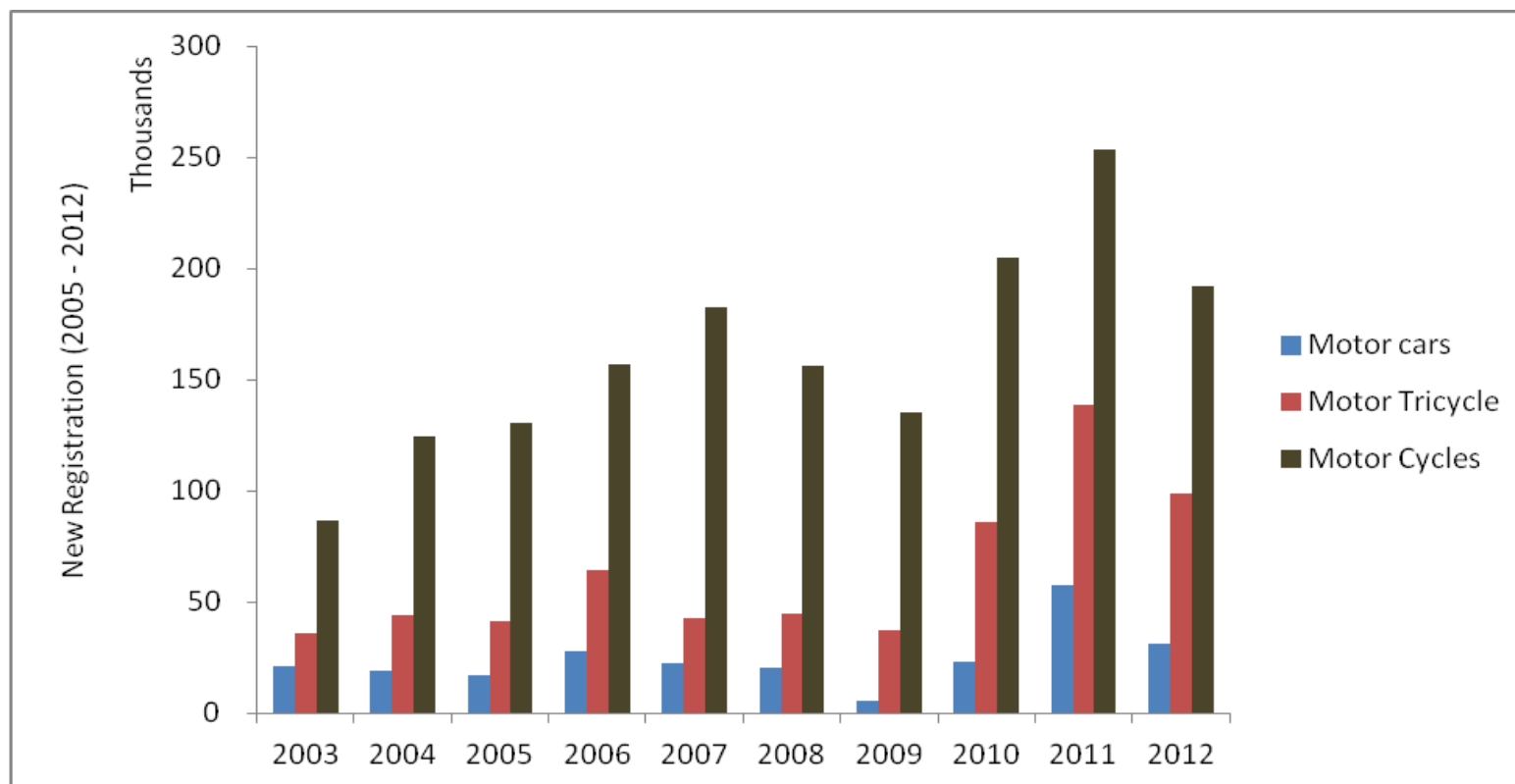




Personal vehicles will skew motorisation in Sri Lanka as well



Rapid motorization -- motor vehicle fleet has doubled in one decade (1991 to 2000) in Sri Lanka. The trend in recent years shows an even steeper growth



Source: Department of Motor Traffic, Colombo

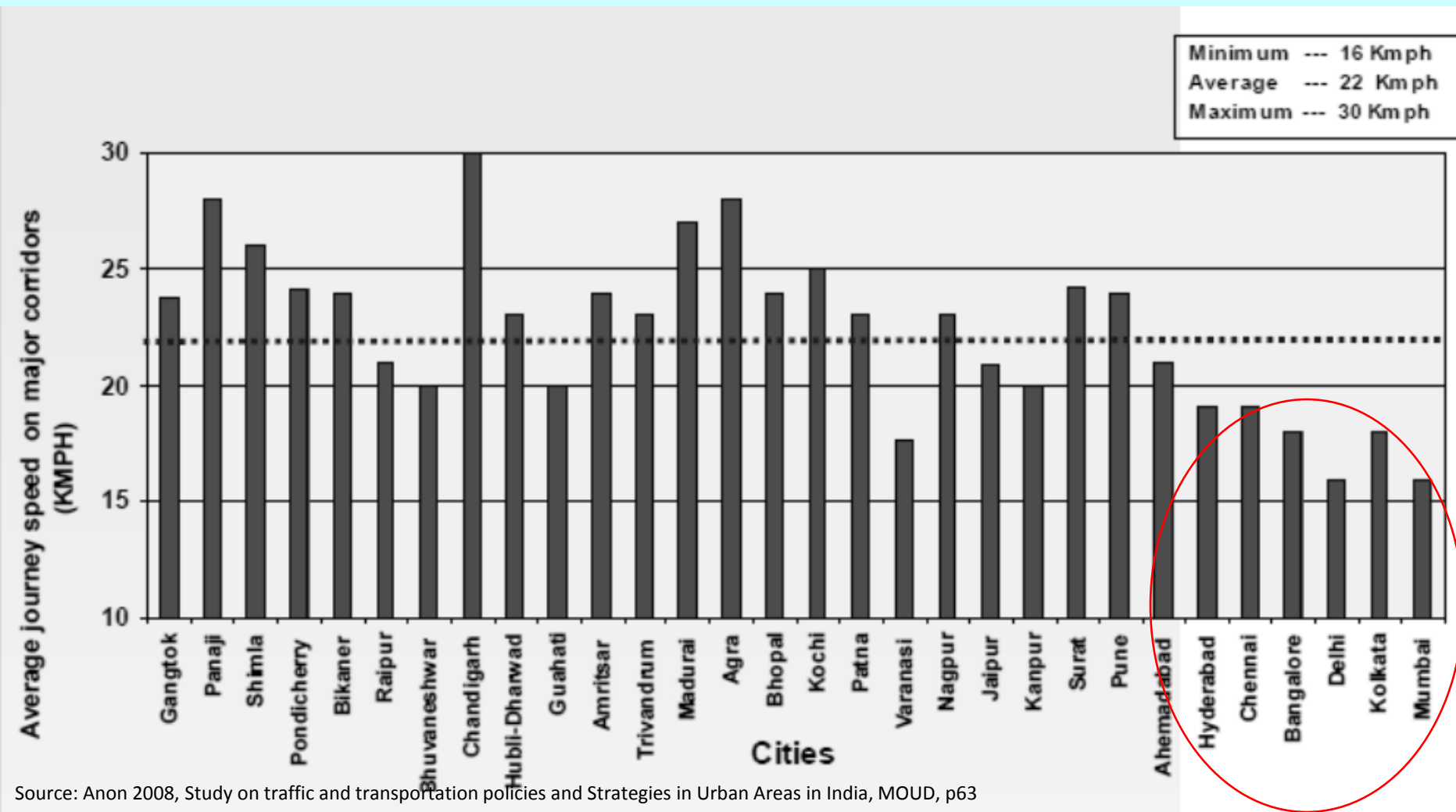


Indian cities are paralyzed

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

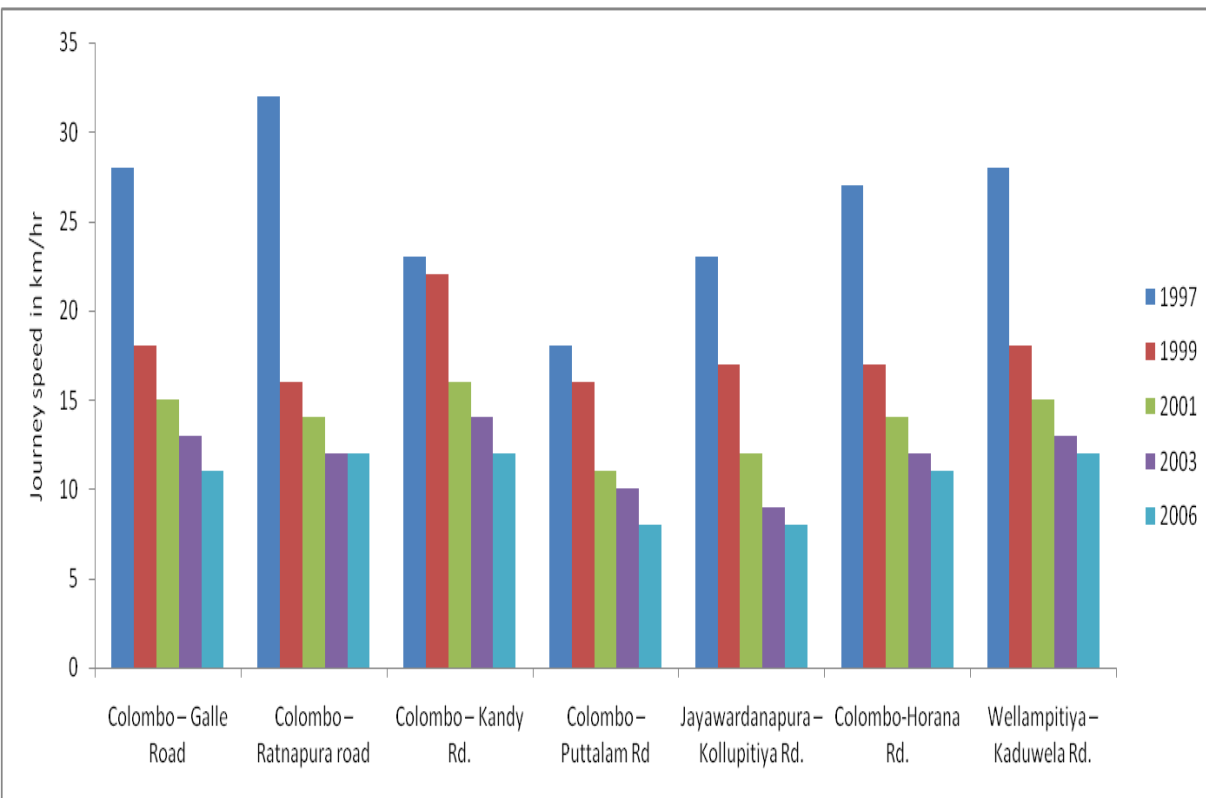




Peak hour traffic speed dips in Colombo



Car journey time survey results



- Sri Lanka incurs a massive financial and man-hour loss due to traffic congestion.
- In Greater Colombo this loss was estimated to be **as high as Rs 32 billion per annum in 2009.**
- **Cost of Lost Time in Public Transport:** estimated Rs 20 billion per annum (USD 174Mn)
- Sri Lanka is **losing 1.5% of the GDP due to traffic congestion.**
- Road safety compromised: Fatality: 1 in 50 deaths are due to road accidents
- Cost of Accidents: estimated Rs 30 billion per annum (USD 260Mn)



Colombo shaping transportation strategies...



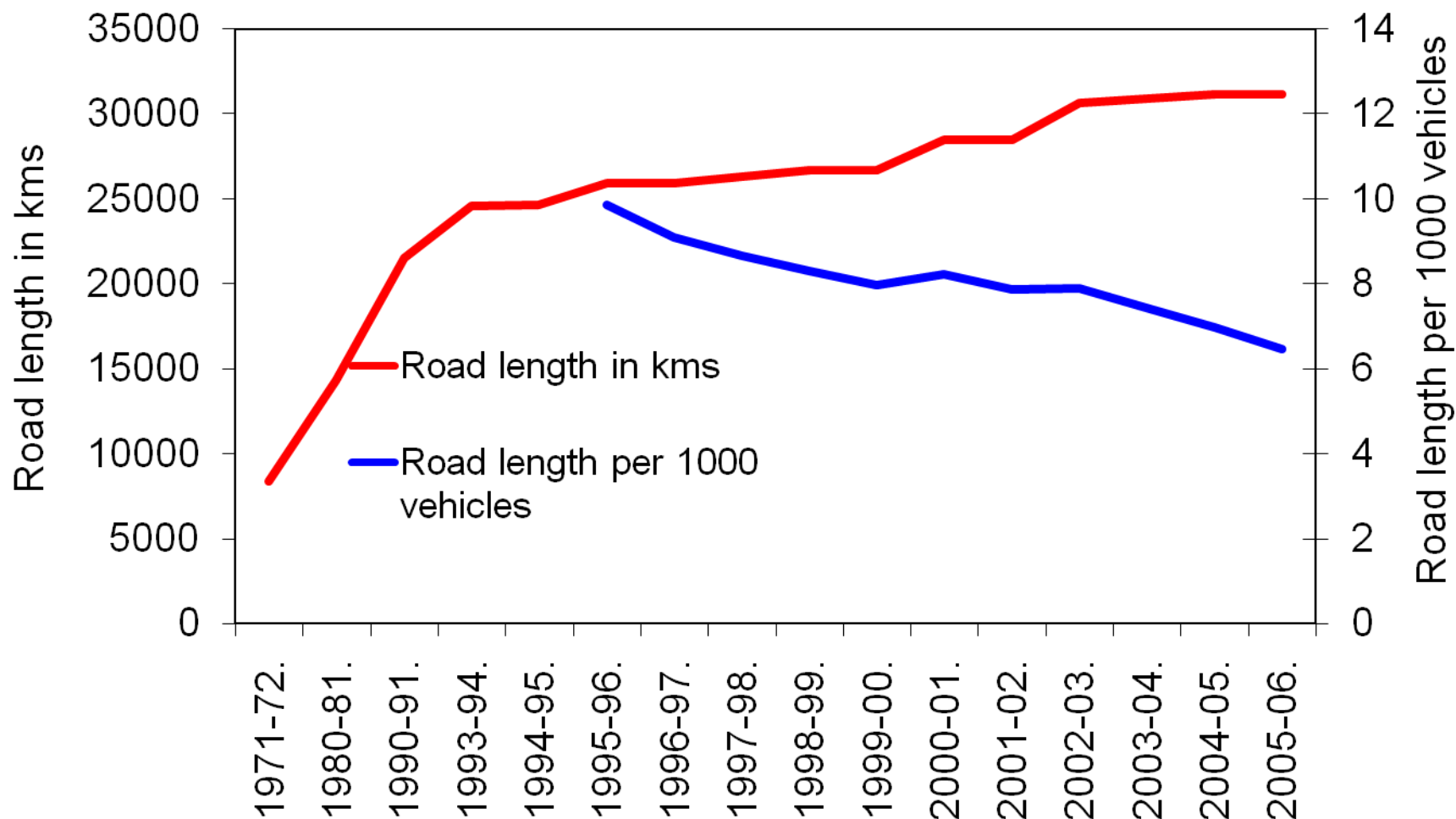
- 4 lane highway being constructed
- Flyovers being constructed (8 already done)
- In Western province, electric railway (metro) being constructed
- Transportation plans to 2020 include BRT system for Colombo and surrounding areas



Can building more roads help?
Delhi has failed to solve the problem of congestion by widening road network
..... We can never build enough roads

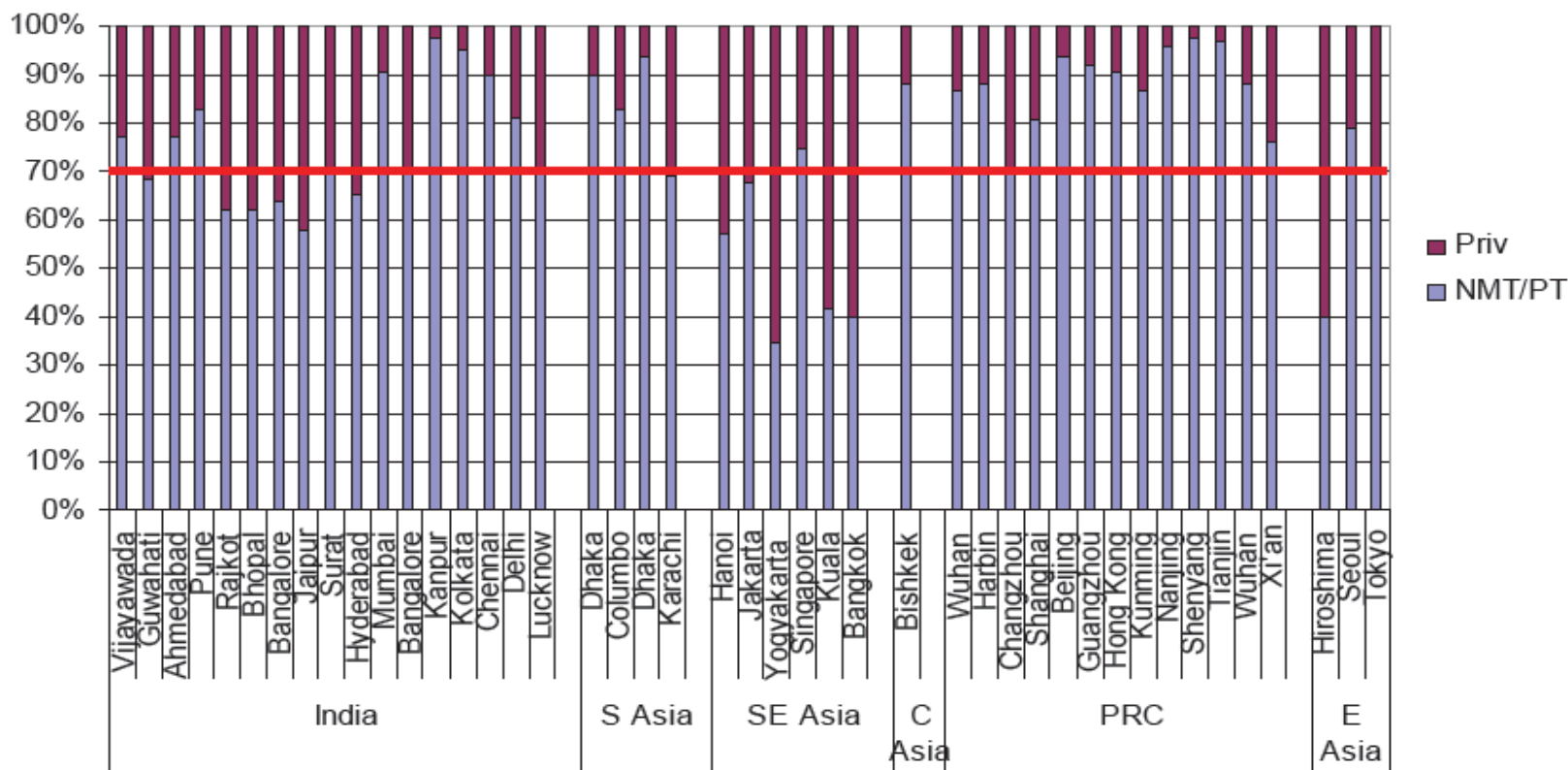


Delhi has built 66 flyovers. It has not helped....





Understand the advantage of South Asia



Source: Tim Chatterton 2010, Managing Transport Impacts in Asian Mega-Cities, University of the West of England, Bristol, UK, IUAPPA Regional Workshop, Tunis, North Africa

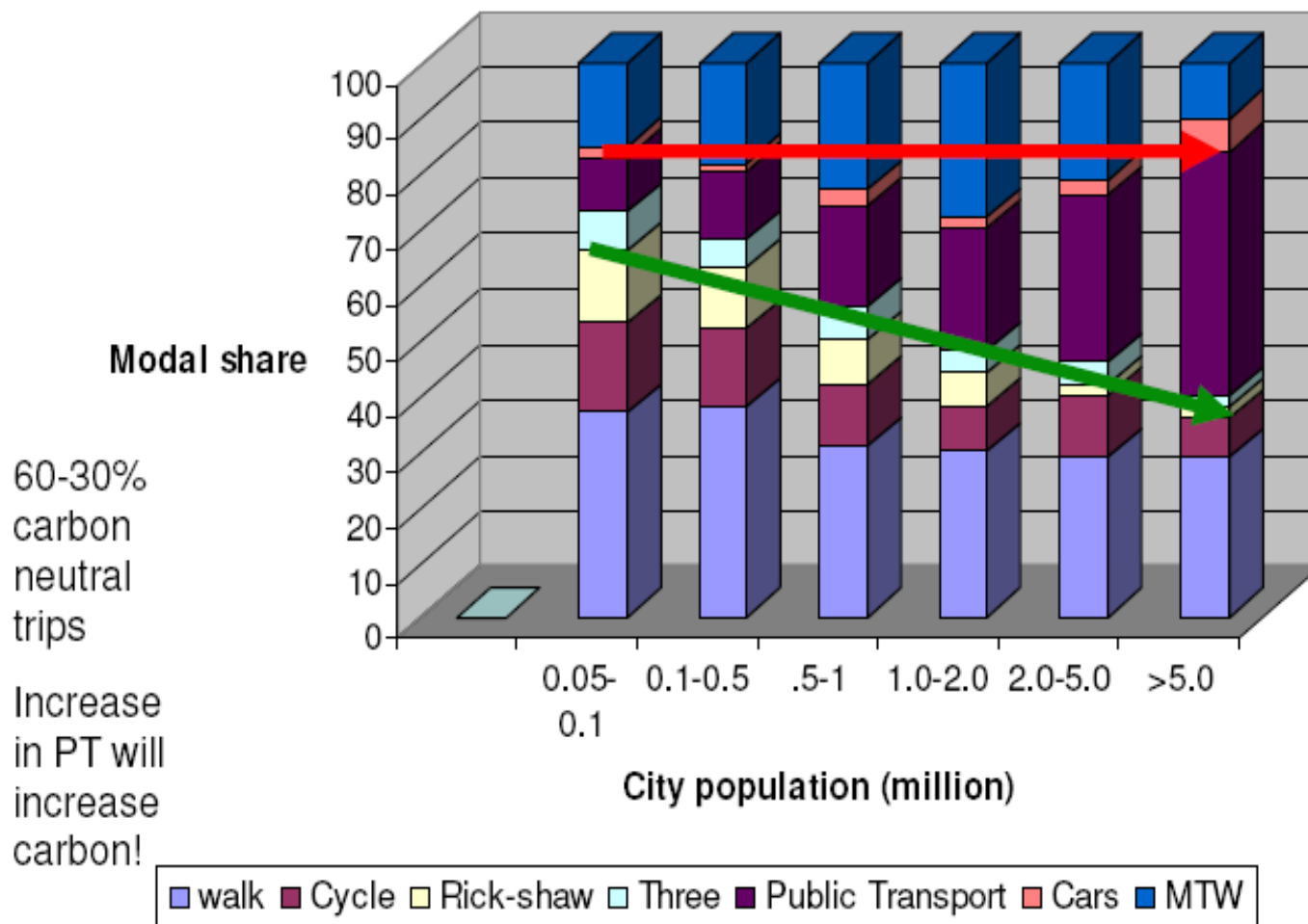


Strength of our cities....



Urban Mobility

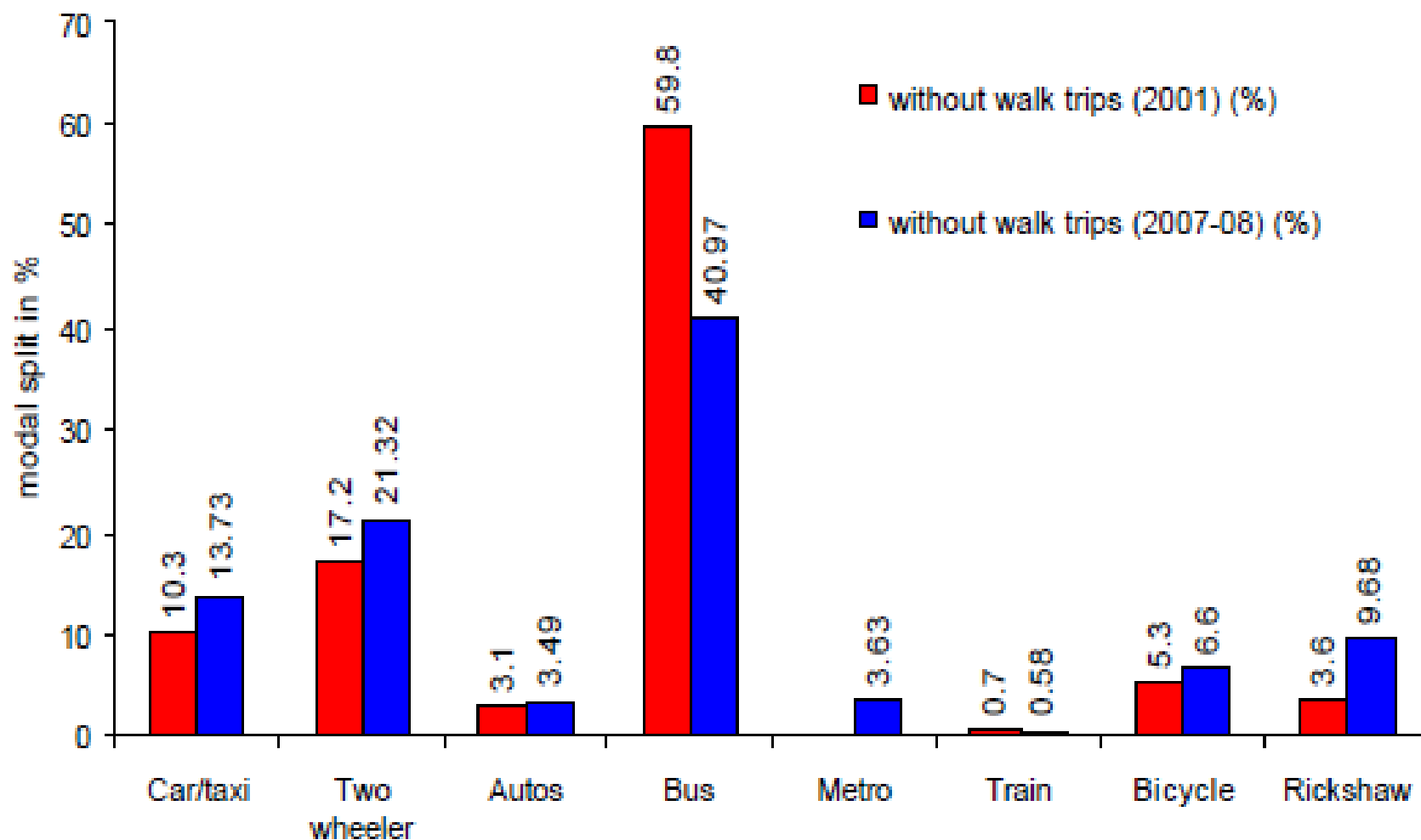
PT and NMV based, MTW majority personal vehicles





This slide has already begun in Delhi.....

Public transport losing ground





Challenges of rebuilding public transport

-- Delhi Master Plan has set the target of 80% public transport ridership by 2020.....



Buses: present and future



- Cities grow with walk; cycle and then instead of bus move to car
- Buses are critical as spine of city mobility -- **allow greater flexibility, geographical coverage, cost effectiveness, and space efficiency**
- Buses are fuel efficient – move people in most cost-effective way

Buses vs cars

- Over 2 million cars are sold each year
- Over 30,000 buses are sold each year
- Crisis of management of bus service
- Crisis because of neglect
- Crisis because we don't plan for buses, only cars

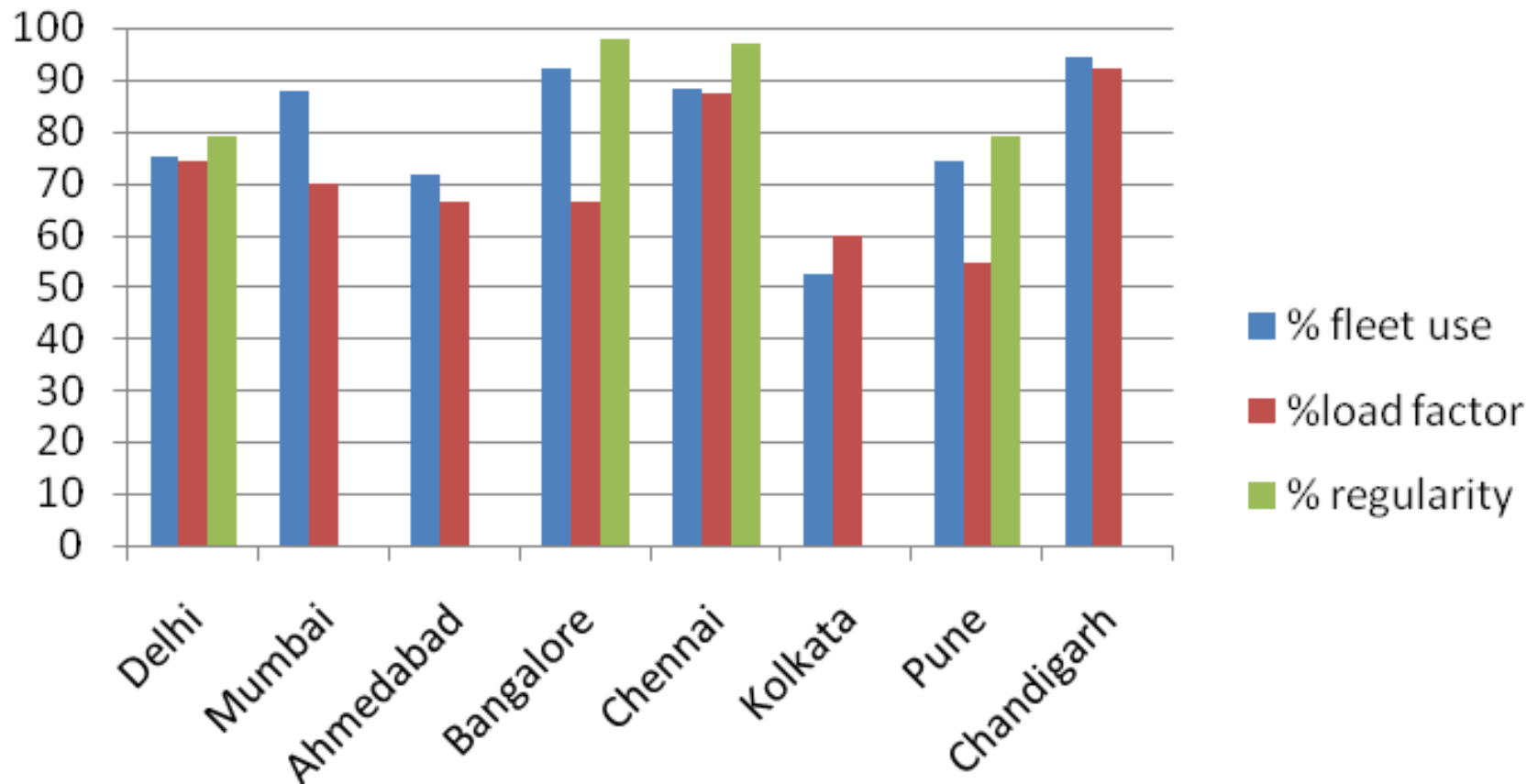


Bus transport can make a big difference... But....



- **COLOMBO:** A increase in bus share from 76% to 80% can save 104,720 tonnes of oil equivalent, or 3% of the fuel consumed in the baseline case. This means 5% reduction in total vehicles and freeing up of roadspace equivalent to removing 62,152 cars.
- This can also lead to 5% reduction in total vehicles (47,716), release road space (equivalent to removing 62,152 cars from the road).
- **BANGALORE:** An increase in bus share from **62% to 80%** saves equal to 21% of the fuel consumed in the base case. Leads to 23 per cent reduction in total vehicles and frees-up road space equivalent to taking off nearly 418,210 cars from roads. CO2 emissions can drop by 13 per cent. PM can drop by 29 per cent and NOx 6 per cent.
- **DHAKA:** An increase in bus share to 60% saves fuel equal to 15 per cent of the fuel consumed in the base case. Frees up road space equivalent to removing 78,718 cars from the roads. CO2 emissions drops by 9 per cent. PM can drop by 13 per cent and NOx less than 1 per cent.

**Travel demand is growing; but bus passenger down;
fleet utilization down; bus service more unreliable**



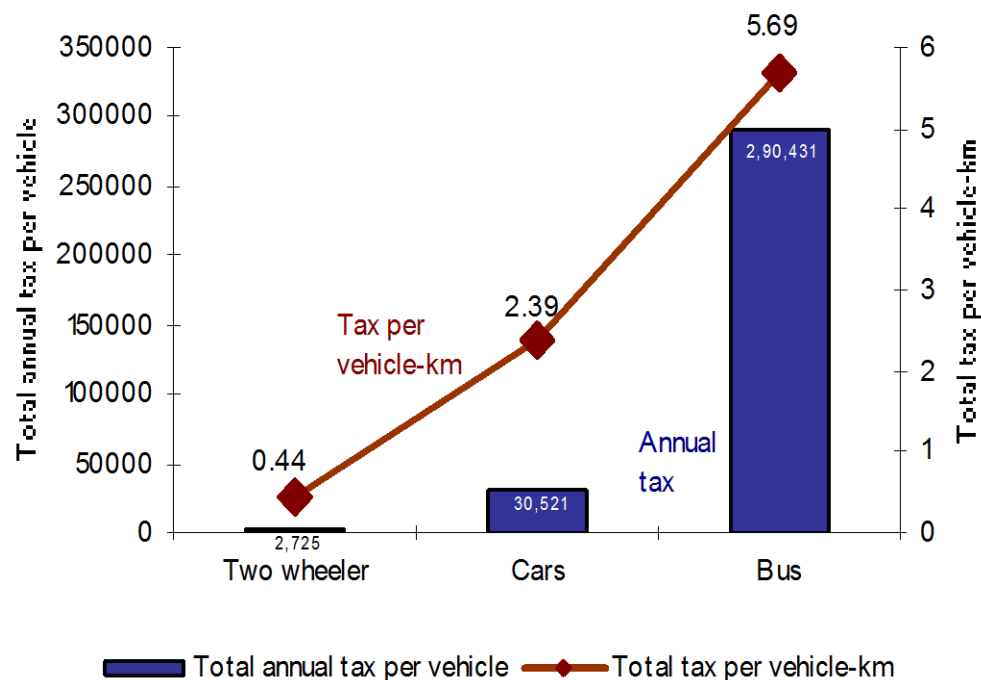
We tax our public transport more than cars...

Correct distortions...

Buses bear high tax burden than cars and two-wheelers. If lifetime tax is amortised then car pays roughly Rs 300 per year. But buses pay about Rs 13,000 per year – 43 times more than cars. **Thus, penalised for carrying more passengers**

If bus fares are raised, a substantial public transport ridership can be lost to two wheelers with running cost of just Re 1/km

For example -- Delhi with nearly the highest per capita income and car pays the lowest taxes.



In Delhi; metro pays less tax than bus

- **Metro gets wide range of tax exemption**
property tax, sales tax, capital gains tax, custom, excise, income tax etc.
- **But buses pay**
property tax, octroi, excise, entry tax, VAT, central excise, custom duty, excise duty on consumption, excise and VAT on spare parts, motor vehicle tax, advertisement tax
- **Metro needs bus; last mile connectivity**

Buses: Challenges and initiatives in Sri Lanka

- **Lack of integration:**
 - Sri Lanka Transport Board has not integrated its services with other modes of transport, such as rail.
 - Buses do not provide dedicated feeder-bus services to the railways.
- **Multiplicity of agencies:**
 - Several agencies – the Ministry of Transport (MOT), Provincial Ministries, Provincial Passenger Transport Authorities like National Transport Commission (NTC), Sri Lanka Railways (SLR), Sri Lanka Transport Board (SLTB), Department of Motor Traffic (DMT)
 - current institutional and governance constraints impede efficient delivery of public transport infrastructure and services.
- **Financial Hardships:**
 - SLR and SLTB –running into operational losses in millions of rupees in 2010
 - Huge Sri Lankan fuel bills to the tune of Rs. 1300 million remain unsettled

Source: P. Jayamanne, April 28 2011, *Issues and challenges of operating public transport in Sri Lanka*, presentation at Workshop on Air Quality and Environmentally Sustainable Transport, Ministry of Transport, Sri Lanka

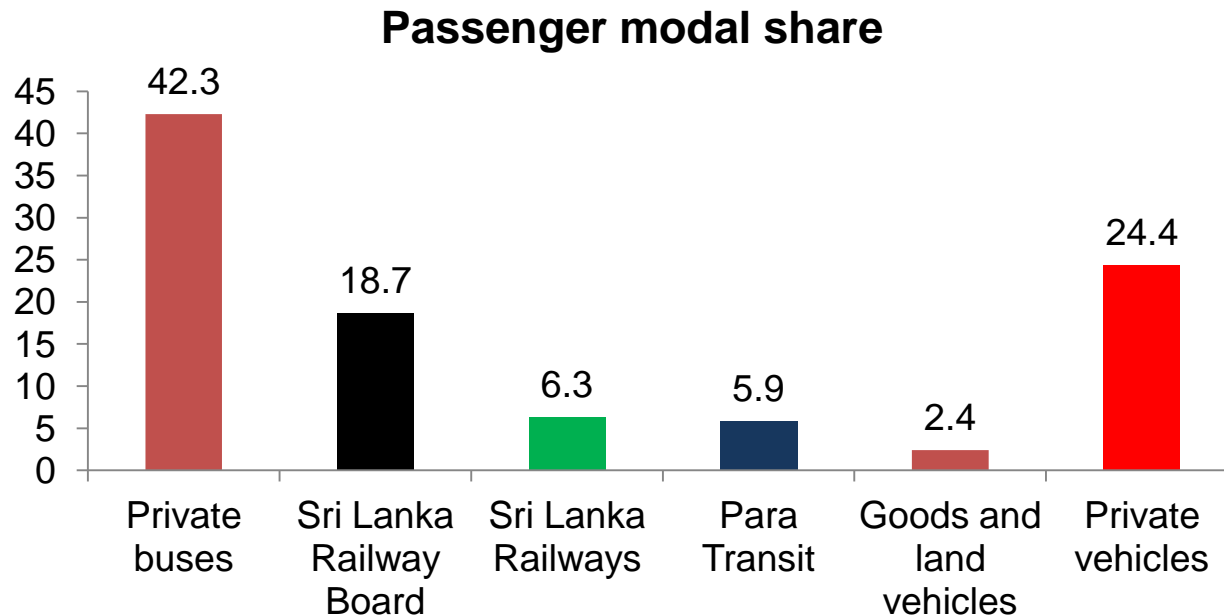
- **Public sector development initiatives under the ‘Mahinda Chinthanaldiri Dekkma’**
- Increase the number of school buses to 1500 – 688 buses have been introduced thus far
- Special ladies bus service for office staff
- “Gemi Seriya” bus service for rural areas
- Rail station modernisation

Source: Dhammika Perera, *Sustainable Transport Initiatives in Sri Lanka*, presentation,
http://www.cseindia.org/userfiles/sustainable_transport_initiatives_srilanka.pdf

Need for bus reforms

The challenge of balancing private and public sector

- in Sri Lanka private buses account for a massive 42%, while the Sri Lanka Transport Board (SLTB) buses account for the rest 18%

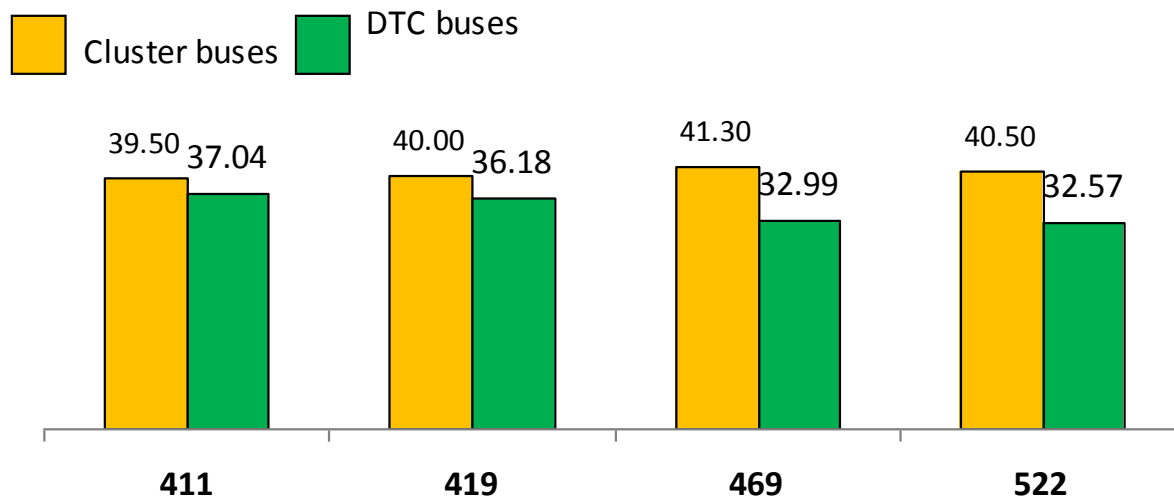


Delhi: Big transition started

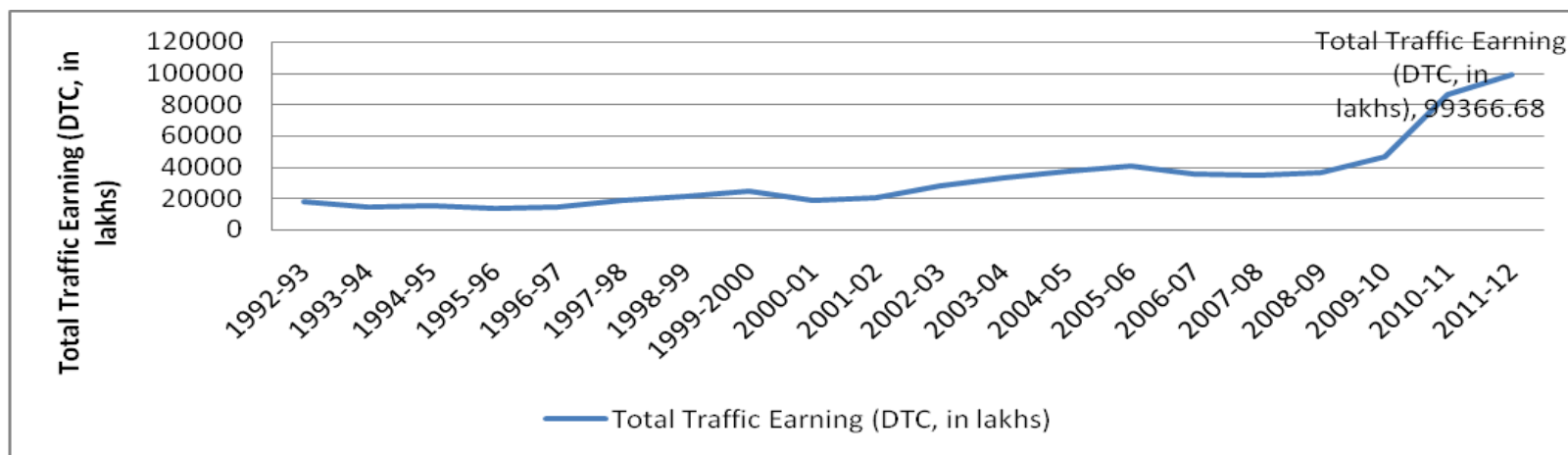
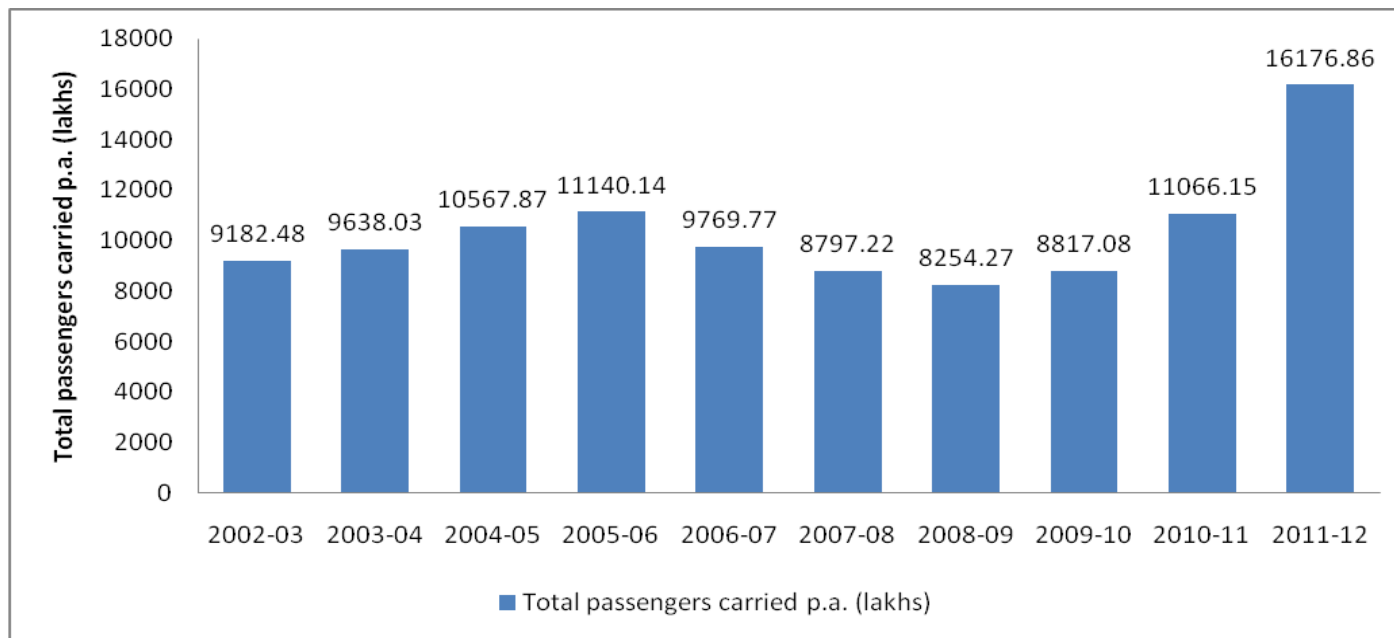


Delhi: restructures buses

- Divides routes of city into clusters; decides that 50:50 will be public and one private operator
- Based on performance guarantee



Delhi.. Evidence of transition: Passenger ridership and Earning





Need equity in the usage of road space

Reorganise the road space according to road users



Bus Rapid Transport in Delhi:

Right of the way segregated according to users --- bus users, walkers, cyclists and motorised vehicles.

Bus speed increased from 11km/h to 19km/h. Benefits nearly 60% of road users.

Delhi working on the next phase of the network. Nearly 400 km of BRT lanes sanctioned.....





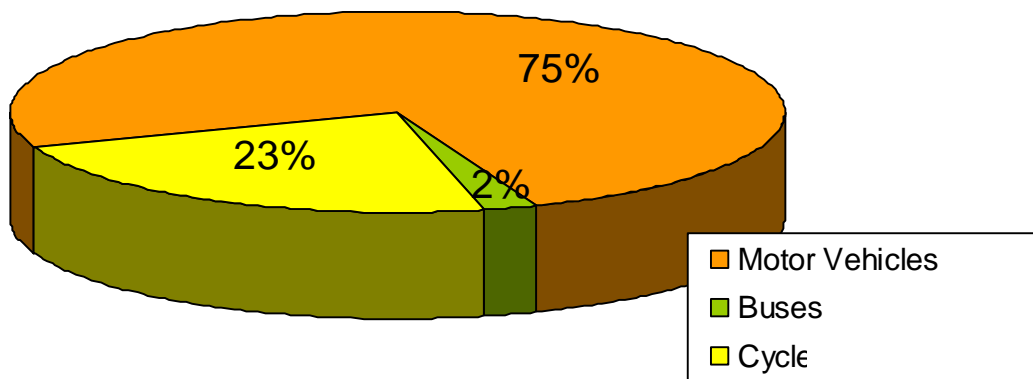
Who must get the priority – People or Vehicle? Plan for people. Not vehicles.



Understand the BRT corridor in Delhi....

- Buses are 2% of the fleet but carries 55% of the trips
- Cars and two-wheelers are 75% of the fleet but carry 33% of the trip.
- Important to take buses out of congestion

Distribution of Vehicles - By Mode



Chirag Delhi Junction

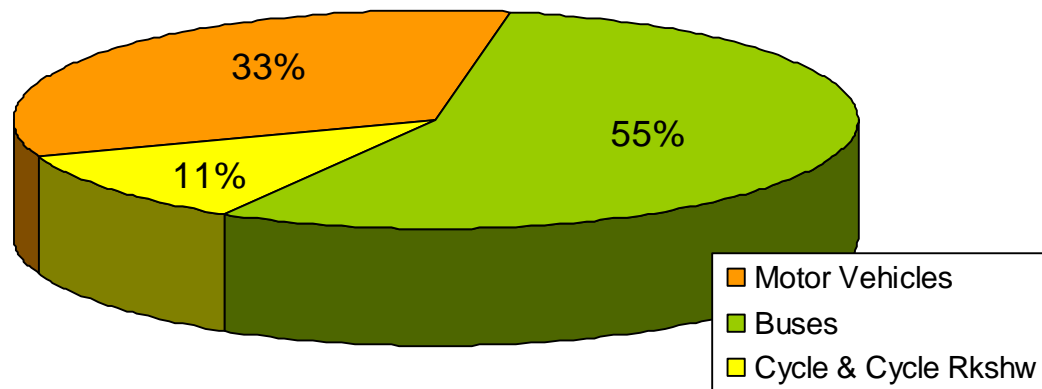
Morning Peak Hour

AK to MC

4,916 Vehicles

11,480 People

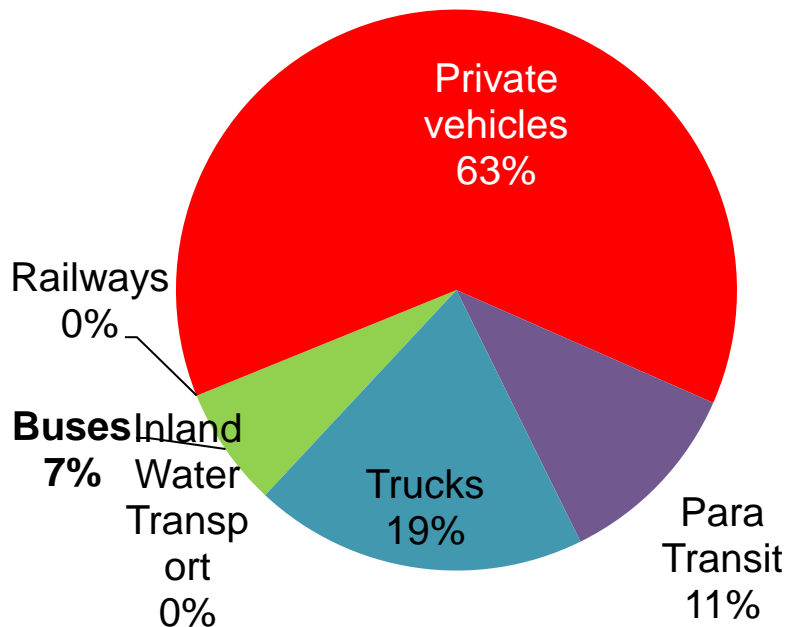
Distribution of People - By Mode



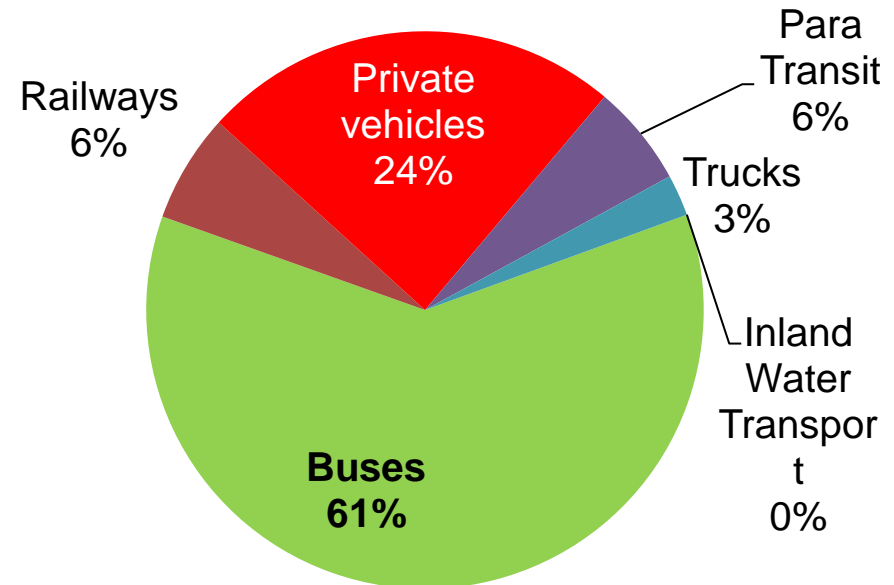
Colombo: Move people not vehicles

- While private vehicles constitute a massive 62.6% of vehicle no. share (51% by two-wheelers and 11% by the private cars), they transport only 24.4% of the total commuting population.
- Buses constitute only 7% of vehicle no. share but they cater to 61% of commuting share

Vehicle modal share, 2007



Passenger modal share, 2007

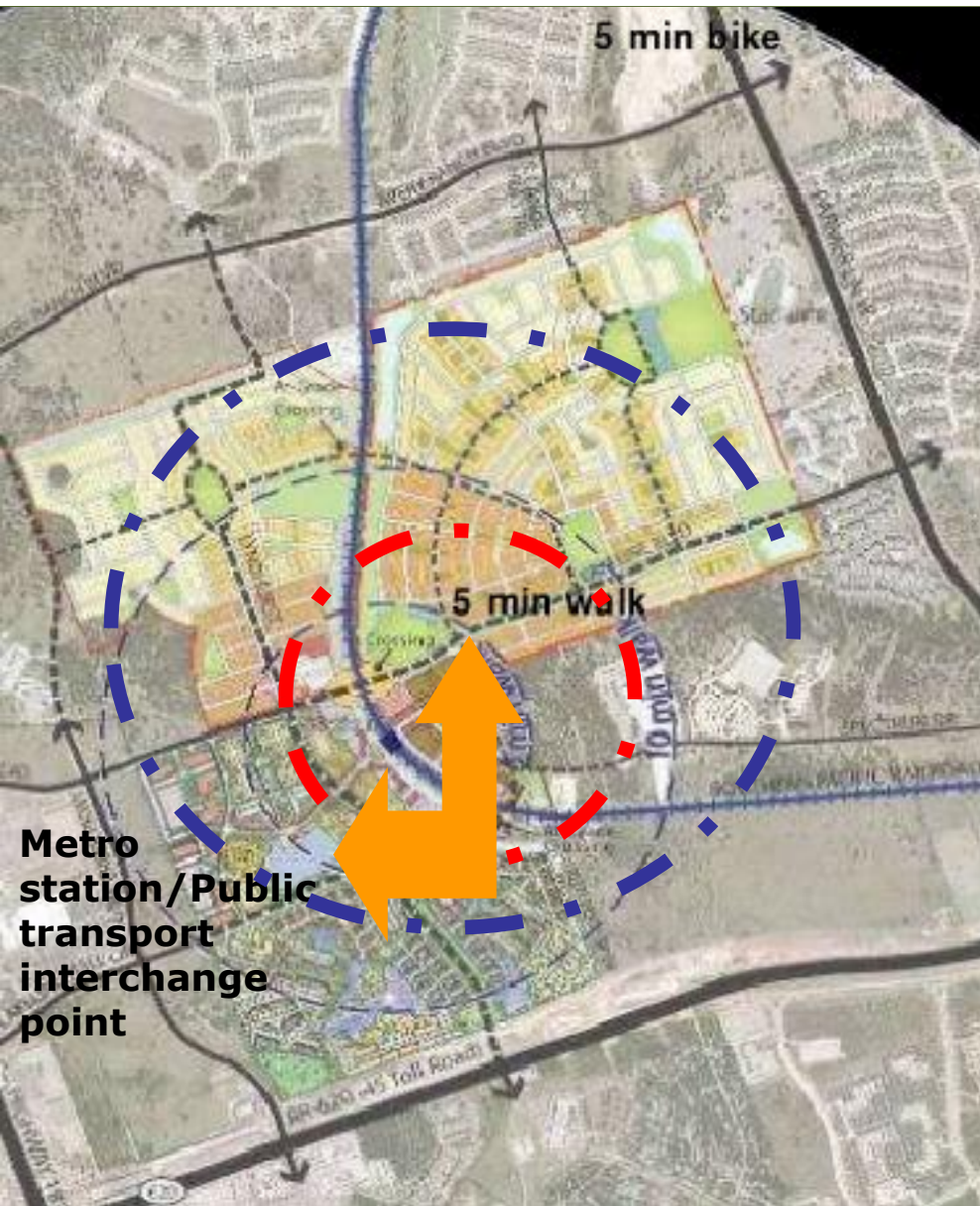




Integrate, integrate integrate.....

Delhi is developing guidelines for modal interchange location

Delhi-- UTTIPEC/DDA guidelines



Bus stop, cycle rental: within 50 meter level walk from station exit

Cycle and two wheeler parking : within 100 meter level walk from station exit

Auto rickshaw stand: within 150 meter level walk from station exit

Private car/taxi/auto rickshaw “drop off”: with barrier-free of exiting pedestrians and NMT

Pedestrian exits, bus-stops and Cycle-rickshaw stands must be closest to main pedestrian exits from station.

Car parking if provided, must be BEYOND 250 M distance of Station/ or PT interchange point

Pairing of Origin-Destination (O-D) Nodes: Provide cycle/ auto stands at nearby important destinations.

Signages at both end locations.

Private car parking only at Terminal Stations.

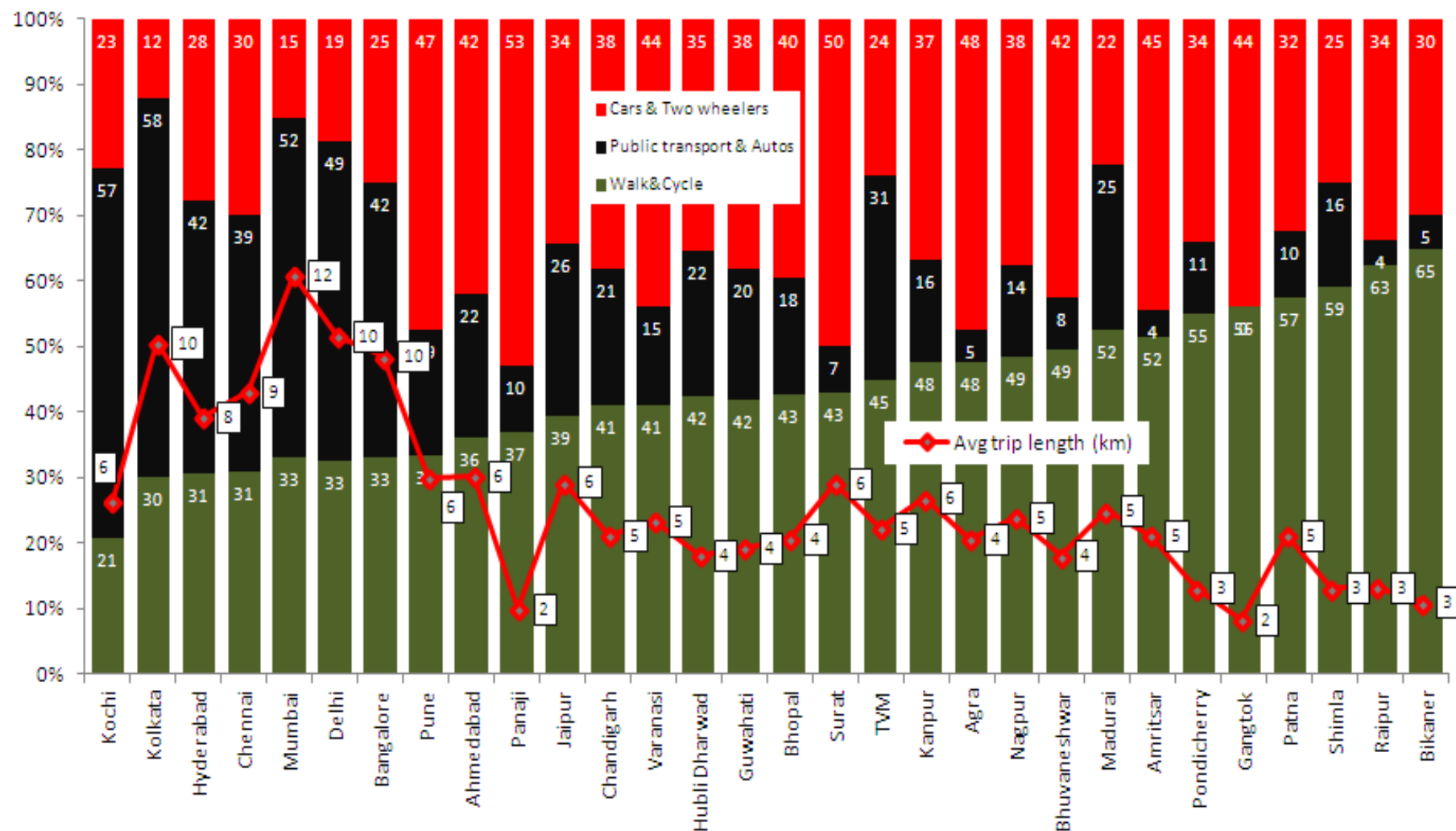
Discourage car parking at Stations within inner-city urbanized areas.



Public transport cannot work in isolation.....



Need compact cities to have shorter trip length, more walking and cycle share and less CO₂ emissions

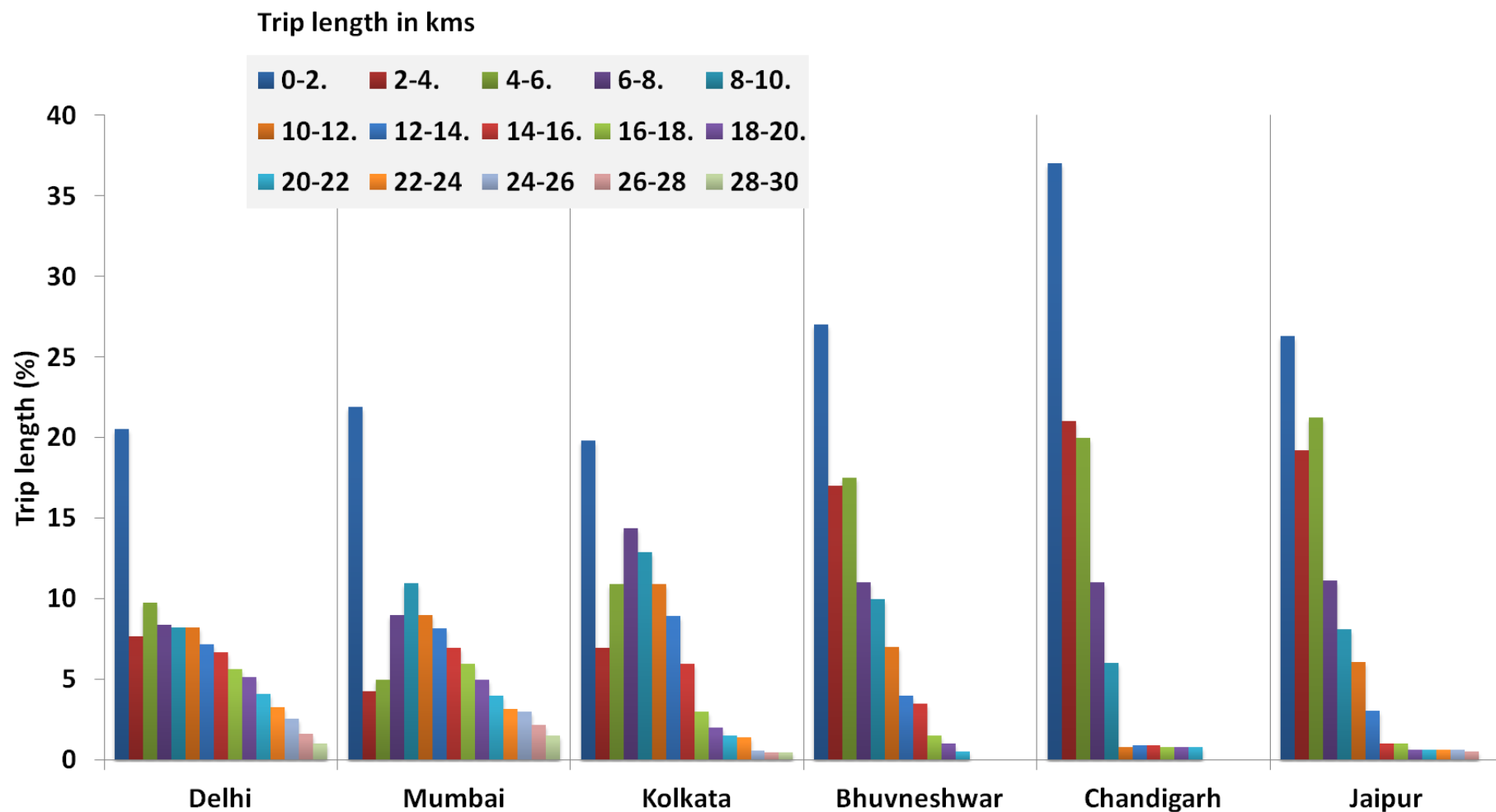


Source: Based on analysis of data provided in reports: 1) ICLEI-South Asia 2009 2) WSA/MOUD 2008



Sprawl effect

Bigger cities show more trips in higher distance range

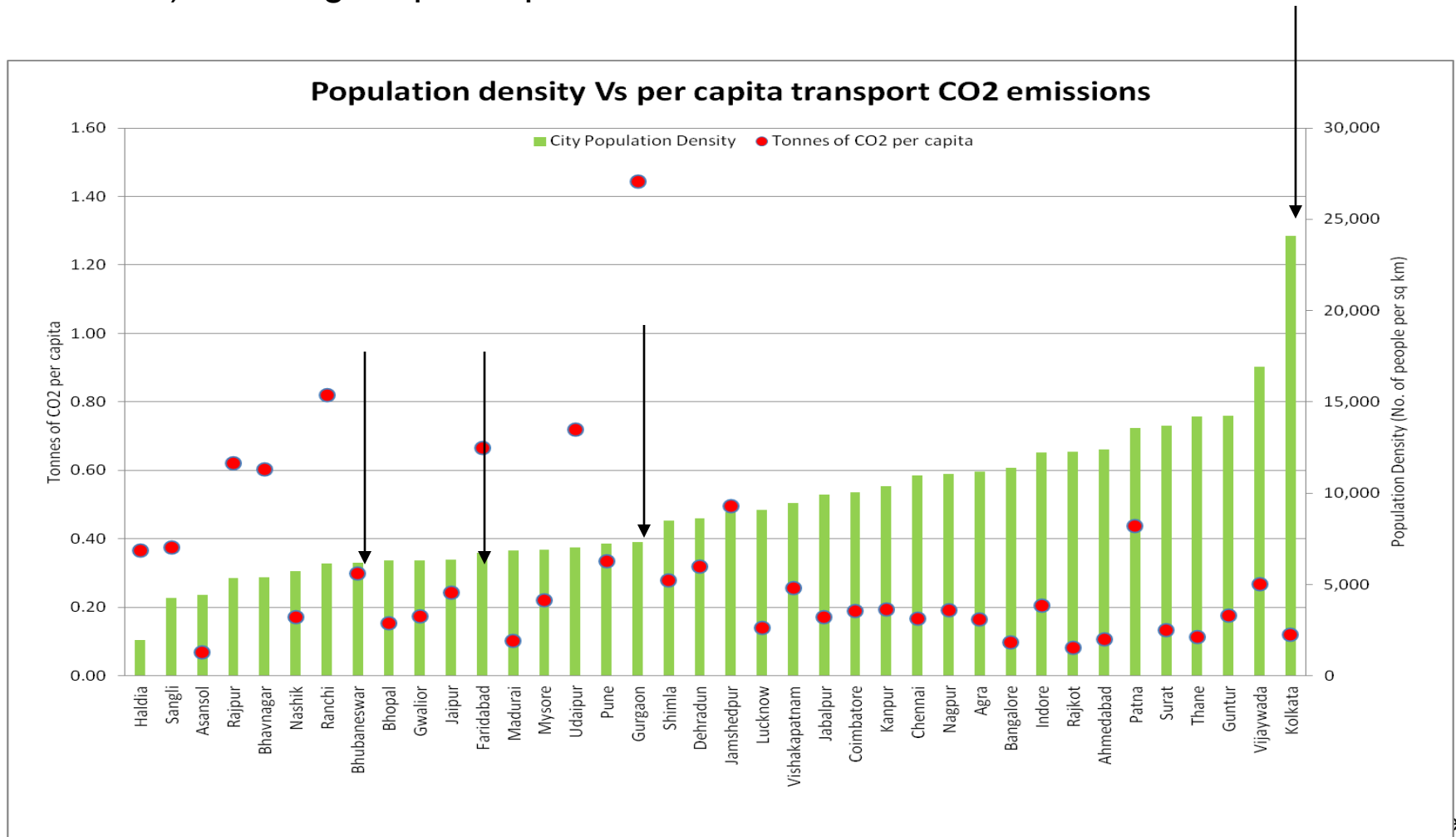




More dense the city, less CO2 emissions



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





Delhi: density control, signal free roads, foot over bridges work against public transport



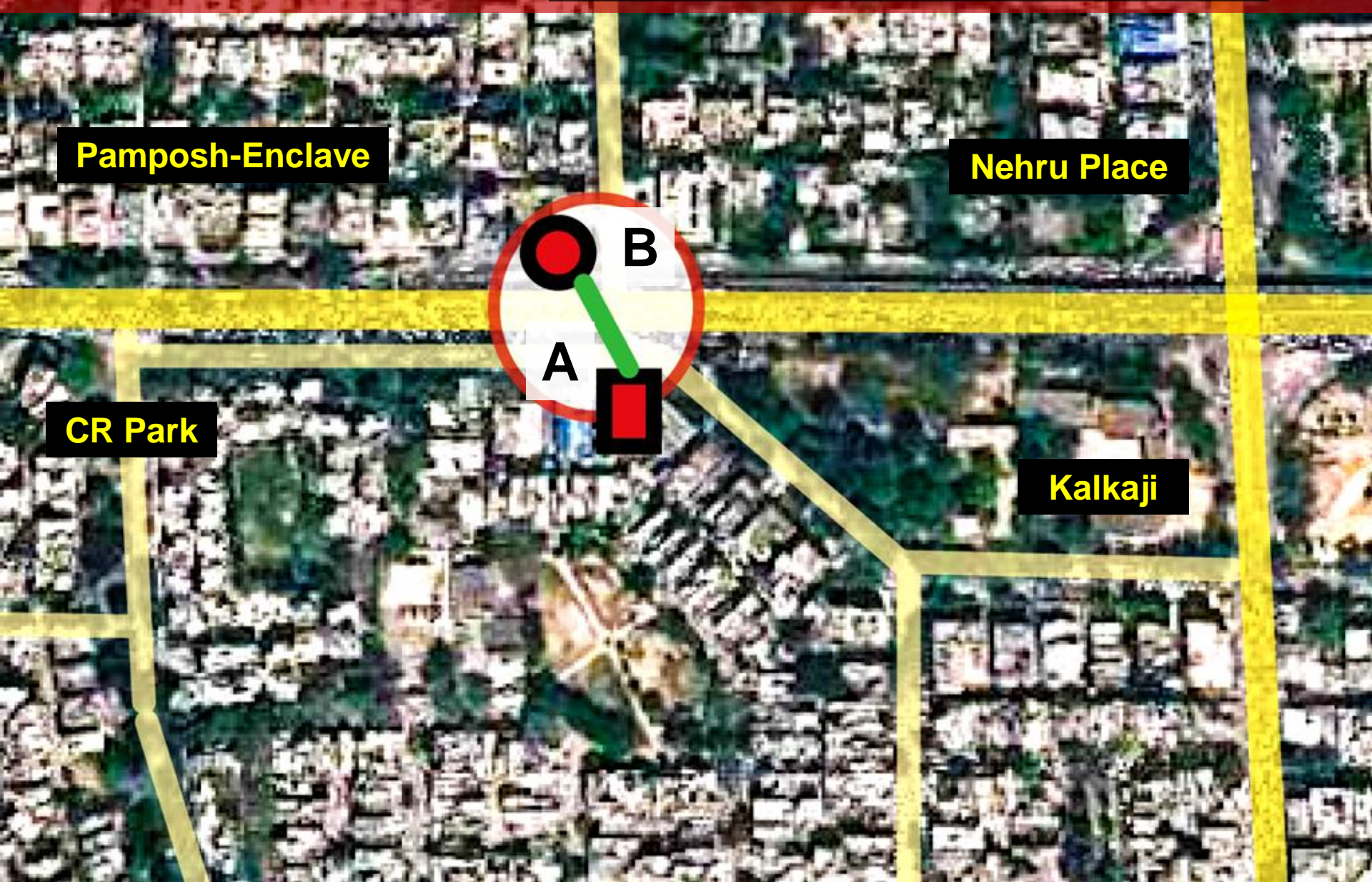
Engineering changes once made cannot be reversed easily... It permanently decides our travel choices



Case Study – Outer Ring Road (Nehru Place Flyover)

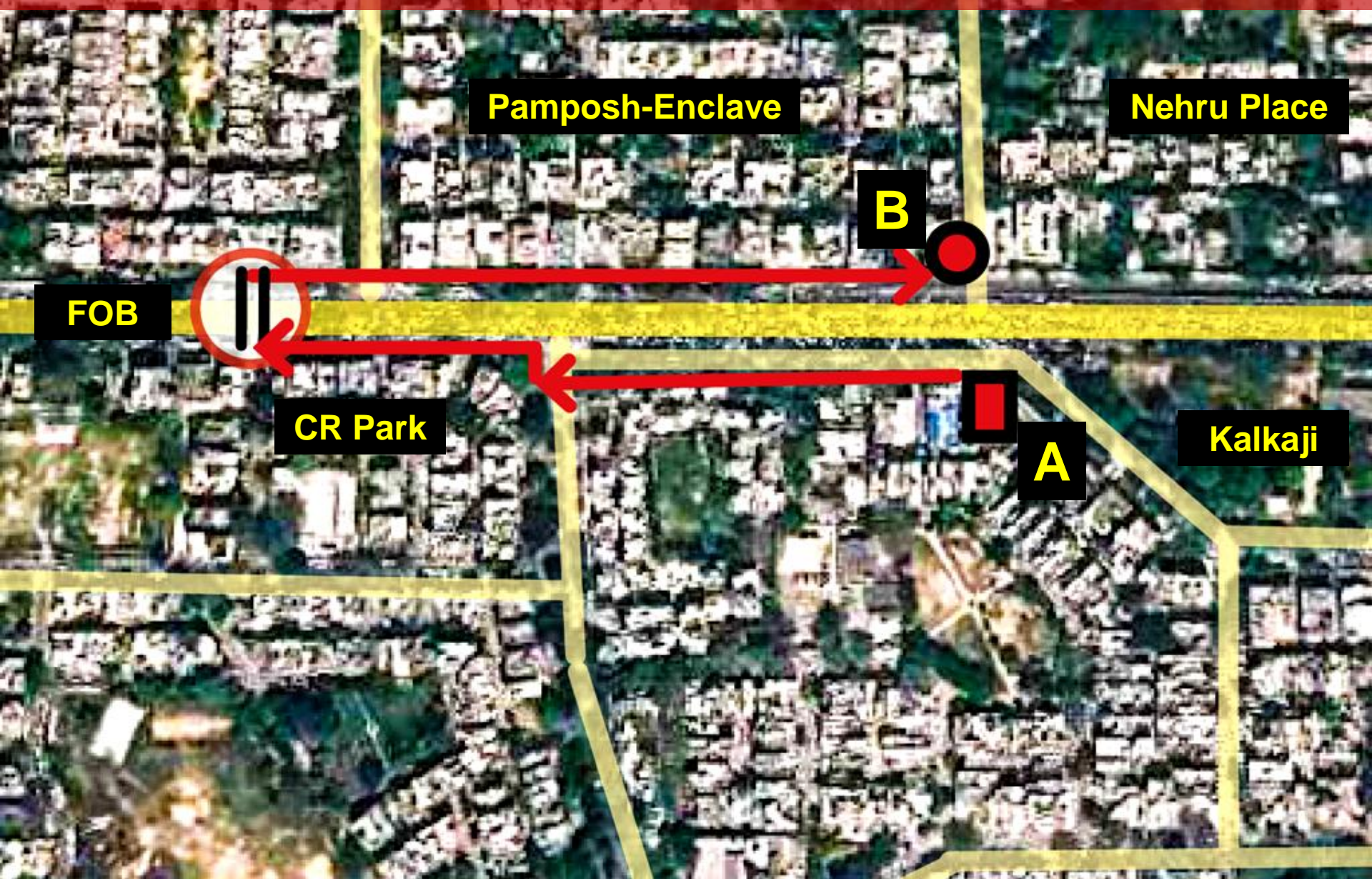
Travelling from A to B

Originally 30M across the road



Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B – Pedestrian Route 1 1000M via FOB





Policies promoting compact cities...



National Habitat Standards for transport

(Ministry of Urban Development, India)

- 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



Norms for compact city

National Habitat Standard Mission of the Ministry of Urban Development

Guidelines for compact mixed land use

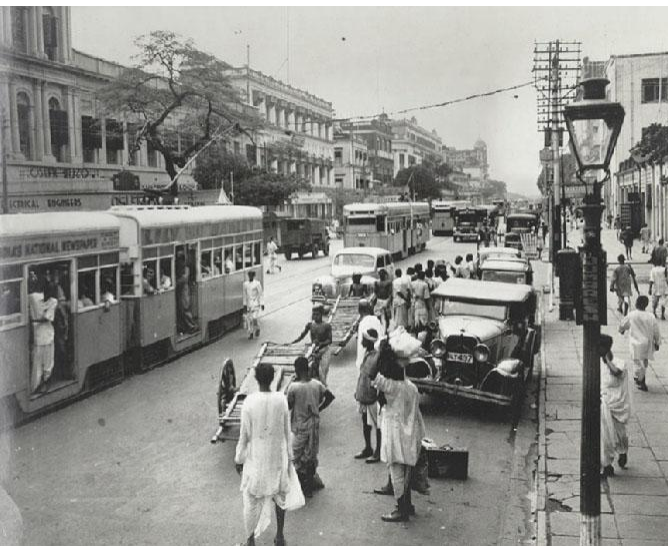
- **95% of residences should have daily needs** retail, parks, primary schools and recreational areas accessible **within 400m walking distance.**
- **95% residences should have access to employment and public and institutional services by public transport or bicycle or walk or combination of two or 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



We built walkable cities.....Most people in our cities walk to work



Substantial number of people in our cities walk to work.....

16-58% in our cities. In Delhi nearly half of education and even business trips are walk trips

Walking and urban poor.....A great part of urban people live in low income localities and slums. Many of them are too poor to even take a bus....

Disability and walking.....Survey in Delhi shows 58% of the disabled people find steps, ramps, difficult to negotiate; 45% of elderly find steps and ramps daunting; 20% find uneven, narrow sidewalks difficult. Engineering guidelines for disables are not implemented

Public transport can be successful only if our cities walkable:

Urbanity and life style.....Co-relation between active transportation (walking and cycling) and obesity.

China – 1.8kg weigh gain after and twice as likely to get obese for a Chinese who acquired a car.

King County – people weigh 7 pounds less on an average in walkable neighbourhoods



More Lessons from Delhi

Poor walking infrastructure in Delhi



Captive walker in poor neighbourhood (Govindpuri and Zaffrabad): Traffic and people on collision course.....

- Discontinuous, poorly paved footpaths, and not easily accessible
- Height and width of pavements violate norms
- Poor signages, no pedestrian refuge islands -- crosswalks are ordeal
- No kerbed ramps or blended crossings to access the crosswalk facilities
- Exposure to traffic very high.



Jay walking....asserting their right to cross where convenient
But car centric design does not allow safe, quick and shortest
crossing



Sai Chowk, Patparganj



Scindia House, CP

Seamless and signal free traffic is interrupting shortest direct route for pedestrians. This is inciting jay walking



Unusable infrastructure: Wasteful



Unusable infrastructure:
Wasteful
Guidelines of Indian Road
Congress are inadequate

Eg. In the absence of proper
guidelines on height of
pavements unacceptably
high pavements without
proper gradients are being
made.....





Retrofitting changes.....



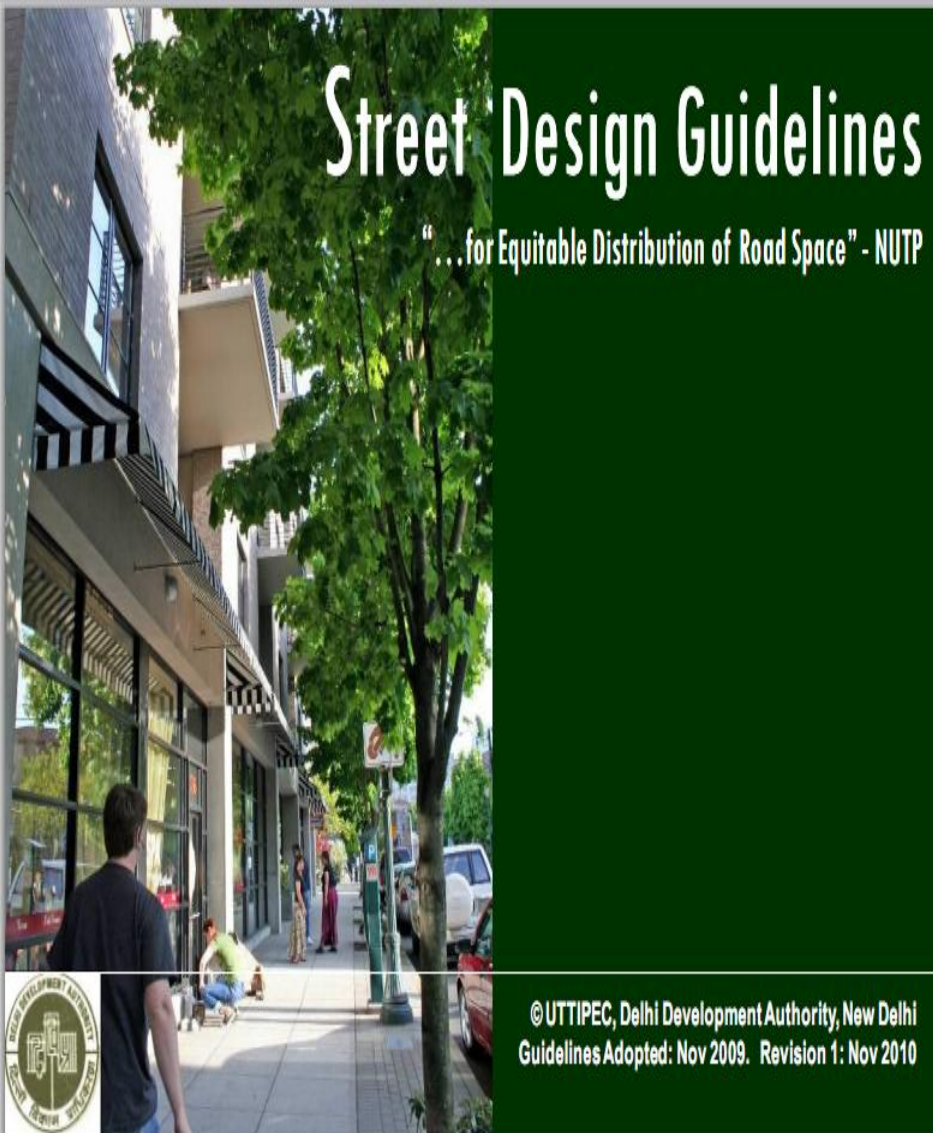
Connaught Place

- Sidewalks are now being rebuilt in Delhi



Source: CSE

Delhi: Opportunity to transform streets



Excerpts:

Initiate road design schemes for unwatched streets... to make safe urban areas

Get rid of walls and setbacks. Add street edge uses -- for road safety at night,

Add planned hawker zones.

Introduce planned mixed-use housing ...along road edges of major vulnerable roads.

Remove gates on public streets from gated colonies from vulnerable areas.

Nanded: small; walk and cycle town can make it work for the future



Dehradun: Pedestrianised the heart of the city....

Paltan Bazar the commercial hub in Dehradun: Four-wheelers and three-wheelers banned from 10 am to 9 pm.

Even shop keepers are not be allowed to bring their vehicles inside the Bazaar. After public protest two wheelers allowed



Matheran: India's only no vehicle town



Maharashtra protects its non-motorised legacy

Town of 5000 does not allow any vehicle to come inside.

No resident is allowed to own any vehicle.

Train and horses are the only access



Bicycles and cycle rickshaws – the ultimate zero emitters and feeders for multi-modal integration



Bicycles are personal feeders to public transport, cycle rickshaws are zero emissions intermediate transport. Momentous court order in Delhi recently to protect these vehicles.....

Enormous captive ridership of bicycles but declining in all Indian cities: 1980 - 2000: -- Bicycle ridership declined from 20% to 5% in Delhi; 45% to 35% in Nagpur; 33% to 18% in Indore; 3% to 16% in Ahmedabad.

Need well designed and safe NMT infrastructure under urban renewal missions programmes to induce NMT traffic

Bus-bike integration: Delhi experiment with BRT-rented bicycles as optional feeders

Need priority access to NMT. Eg. Delhi to implement bicycle master plan





Reinventing NMT

Punjab Eco cab Service: changes face of rickshaw

Fazilka Ecocab initiative by Graduates Welfare Association
– dial a rickshaw scheme – organises non motorised transport
Till date the service has been launched in 20 districts of Punjab



Eco cab service launched in Chandigarh



Dedicated rickshaw stand, Fazilka

Image Source: Fazilka ecocabs



Chandigarh: The car manic city making space for cycle rickshaws



- Eco-cab was launched in Chandigarh on June 25, 2013 with support from Municipal Corporation and Chandigarh administration.
- Municipal Corporation has designated 169 rickshaw stands in Chandigarh and request for additional 50 is being processed.



Image Source: Chandigarh ecocabs



Non-motorised transport initiatives in Sri Lanka



- **National policy recognition**
- Ensure that the planning and development of infrastructure facilities includes reasonable provision for NMT systems
- Assure that separate infrastructure facilities exist for pedestrians and non-motorized vehicles on selected urban roads and designated regional roads
- Improve awareness of safety aspects in the use of such vehicles and popularizing the use of safety equipments
- Provide a special scheme for financing the purchase of bicycles through the rural banking system
- Take steps for schools and offices to encourage the use of bicycles and for the provision of parking
- Develop park and ride facilities near railway stations and bus stops for bicycles
- **Public and civil society Initiatives:**
- The National Cyclist Forum (NCF): It was launched on March 12, 2010 by the Environment and Natural Resources Minister under the 'Haritha Lanka' project.
- Distribution of bicycles among school children: In 2010, about 2,000 cycles and more recently another 500 cycles were distributed
- Cyclone public campaign promoting bicycling, developed by Practical Action: organised public mega bicycle rally 2004 onwards. In cyclone 2012 was organised with an approximate participation of 5,000 bicyclists.



Colombo: does it naturally





Colombo: Ahead of others in the region: will it change as it grows?





Remove hidden subsidies to cars.....

What's going wrong? Parking

Wasteful use: 90 to 95 per cent of the time a car is parked

Insatiable demand for land:
Annual registration of cars generate demand for land bigger than 310 football fields in Delhi!

Inequitous use of land: A car is allotted 23-26 sq m for parking. Under low cost housing scheme only 18-25 sq m is allotted to very poor families.

Parking takes away walkspace from pedestrians, green areas



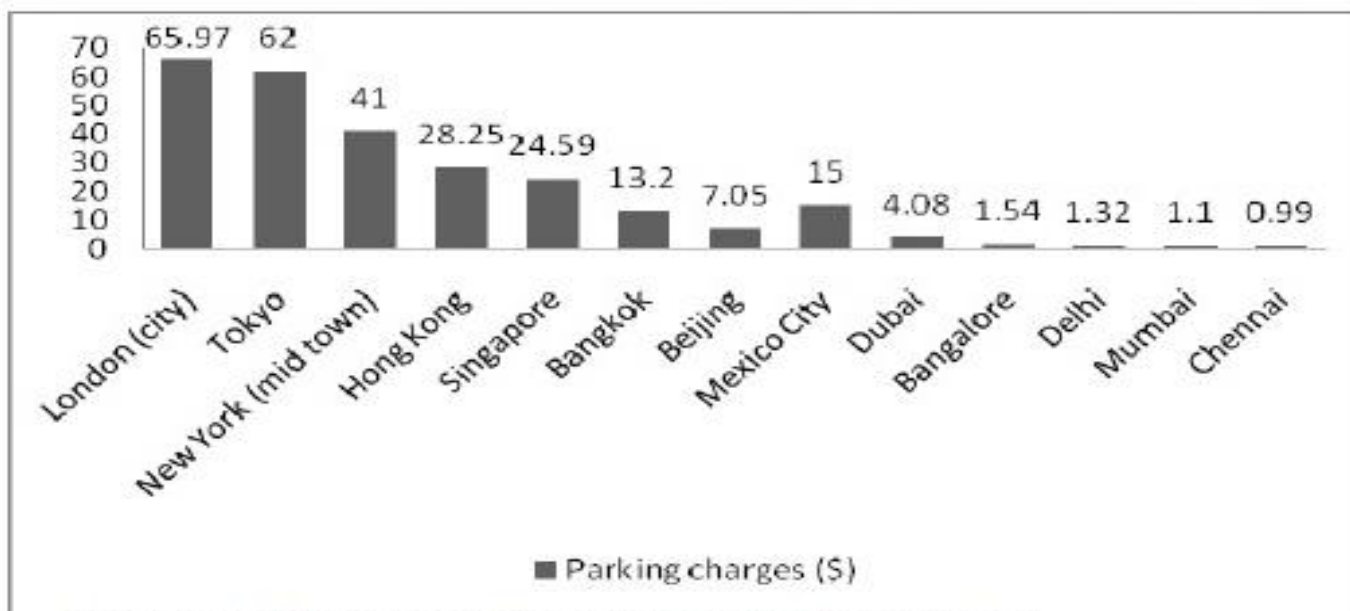
In most of the cities, on street parking occupies 40-60% of the major road lengths



Free or for pittance: Indian cities have lowest parking charges in the world



Comparison of daily rates in commercial business Districts in different cities



Source: Colliers International (2011) - CBD daily parking charges (in US \$)

If hidden subsidies are removed parking rates in multi level car parks will increase six times



Use parking policy to reduce demand for parking and cars. Influence commuter choice



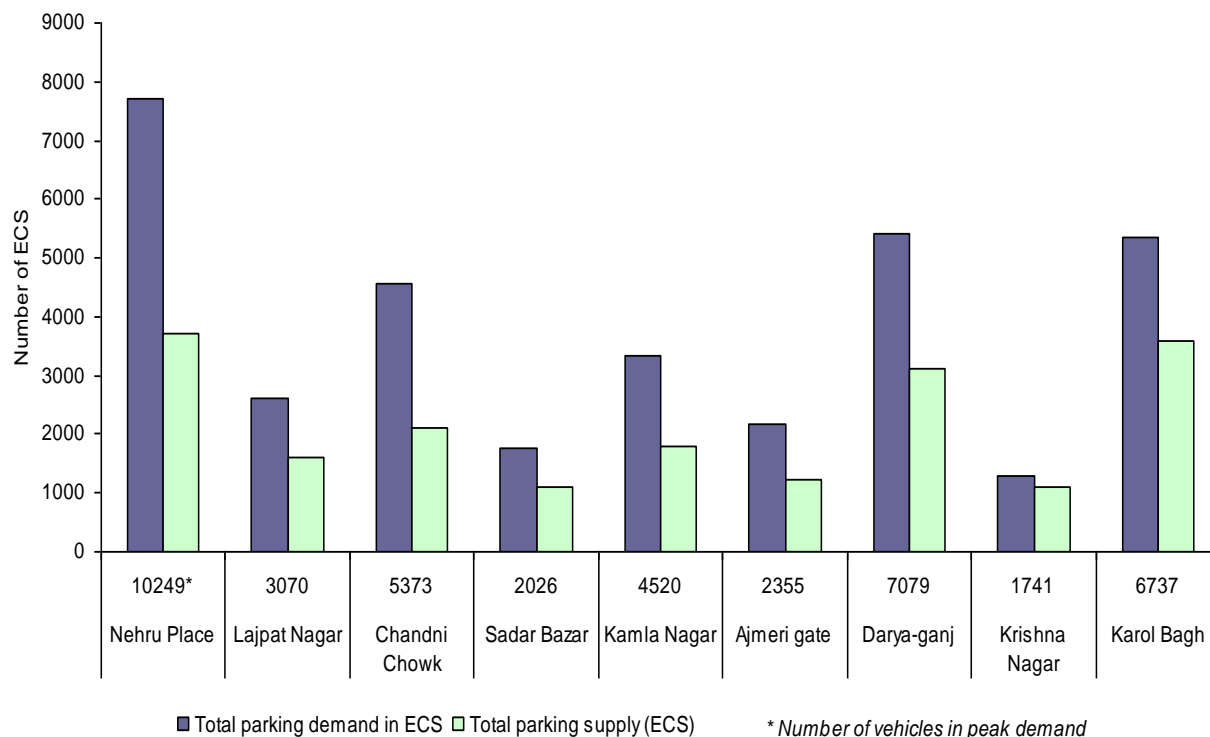
Should we keep supplying more parking? Is that the solution?

International experience shows just the opposite:

Tokyo has highest car ownership in Asia – 350 cars per 1000 people. But its parking standards in commercial areas is 0.5 parking slots per 100 sqm.

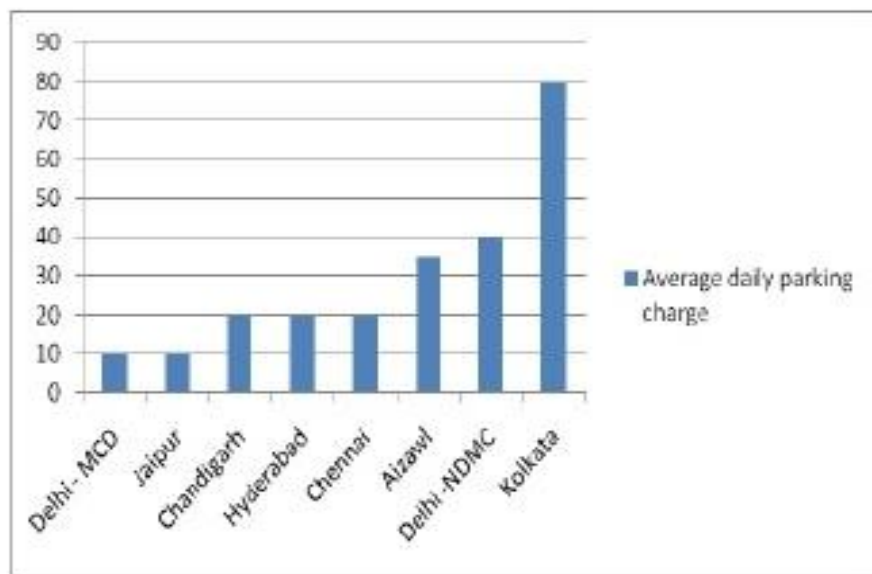
But Delhi with 84 cars per 1000 people provides 3 parking slots per 100 sqm.

Example from Delhi: Yawning gap between peak parking demand and supply and short fall





Kolkata – leads today in parking charges



Maximum restraint principles

Surface parking charges are highest in Kolkata – Rs 10 per hour

Only city with residential parking pricing policy: Personal vehicles pay night charges for on street parking in neighbourhood with narrow streets.

Those who cannot park on roads rent spaces to park cars. They pay in the range of about Rs. 1000-1200 per month.

This is similar to Tokyo model



Delhi: Protects green cover and parks from parking



A significant step has been taken in Delhi to prevent parking in green areas and in neighbourhood parks.

Following the intervention from EPCA the Delhi Master Plan 2021 has been amended to ensure that parks and playgrounds are not permitted to be utilized for parking purpose as it would destroy breathing space and playground for children



Gangtok: demands proof of parking before registration



Sikkim transport department notification makes it mandatory for buyers to produce an availability-of-parking-space certificate before registering vehicles

- The superintendent of police issues certificates after physical verification of the parking space
- This is followed by an inspection by motor vehicles inspector, who submits details to the transport department along with a rough map of the site
- In the hills, car owners often park along the road and walk to their houses, which may be located higher up or lower down
- Two car dealers received notices from the transport department directing them not to sell cars without first asking for the availability-of-parking-space certificate



Other countries are limiting and pricing parking supply



Portland, Oregon set an overall cap of 40,000 parking spaces downtown. This increased public transport usage from 20-25 per cent in the 1970s to 48 per cent in mid 1990s.

Seattle allows a maximum of one parking space per 100 square metres at downtown office

San Francisco limits parking to seven per cent of a downtown building's floor area

New York: Very high parking fees and limited parking supply lowers car ownership far below the average rates in other US cities.

Boston has frozen parking requirements at 10 per cent higher than the 1973 levels. This has helped Boston to meet the federal clean air standards.

Bogota has removed limit on the fees that private parking companies can charge. The revenue is dedicated to road maintenance and public transit improvement.

Shenzhen: Hike in parking fees during peak hours leads to 30% drop in the parking demand.

Tokyo: Enforcement against parking violations cuts congestion drastically . Private firms allowed to issue tickets for parking violations. This makes on-street parking expensive.

Bremen: No free parking in city centre. Parking charges higher than public transport cost.

Globally, customers agree to pay high parking charges if they get good shopping and pedestrian environment. This also improves business.



Parking policy: Guiding principles....



- Adopt flexible parking standards and review parking standards. Do not create oversupply. Account for improved public transport access and reduction in personal vehicle travel.
- Integrate parking design with multi-modal integration. Priority to NMT and public transport
- More stringent parking controls and enforcement in areas well served by public transport. Phase out on-street parking in targeted areas.
- Parking pricing -- Minimise free parking, restrict on-street parking, use variable parking rates, avoid fixed annual payment, price parity between surface and multi-level parking
- No parking on green spaces, pavement, NMT lanes, and service lanes. Non-negotiable.
- Need parking strategy for residential areas and mixed land use areas.
- Use parking revenue for other congestion reduction strategies and local amenities
- Stringent penalty on parking violations.
- Develop parking strategy for special localities like hospitals, railway station, cinemas, shopping malls, schools, high impact events etc
- Provide parking for public transport vehicles
- Need innovative parking strategies for residential areas for demand management

Policy opportunity: National Urban transport policy provides for parking as a restraint measure; JNNURM reform agenda; Supreme Court directives on parking and congestion.



Create your own transport fund
to meet the cost of
transition.....

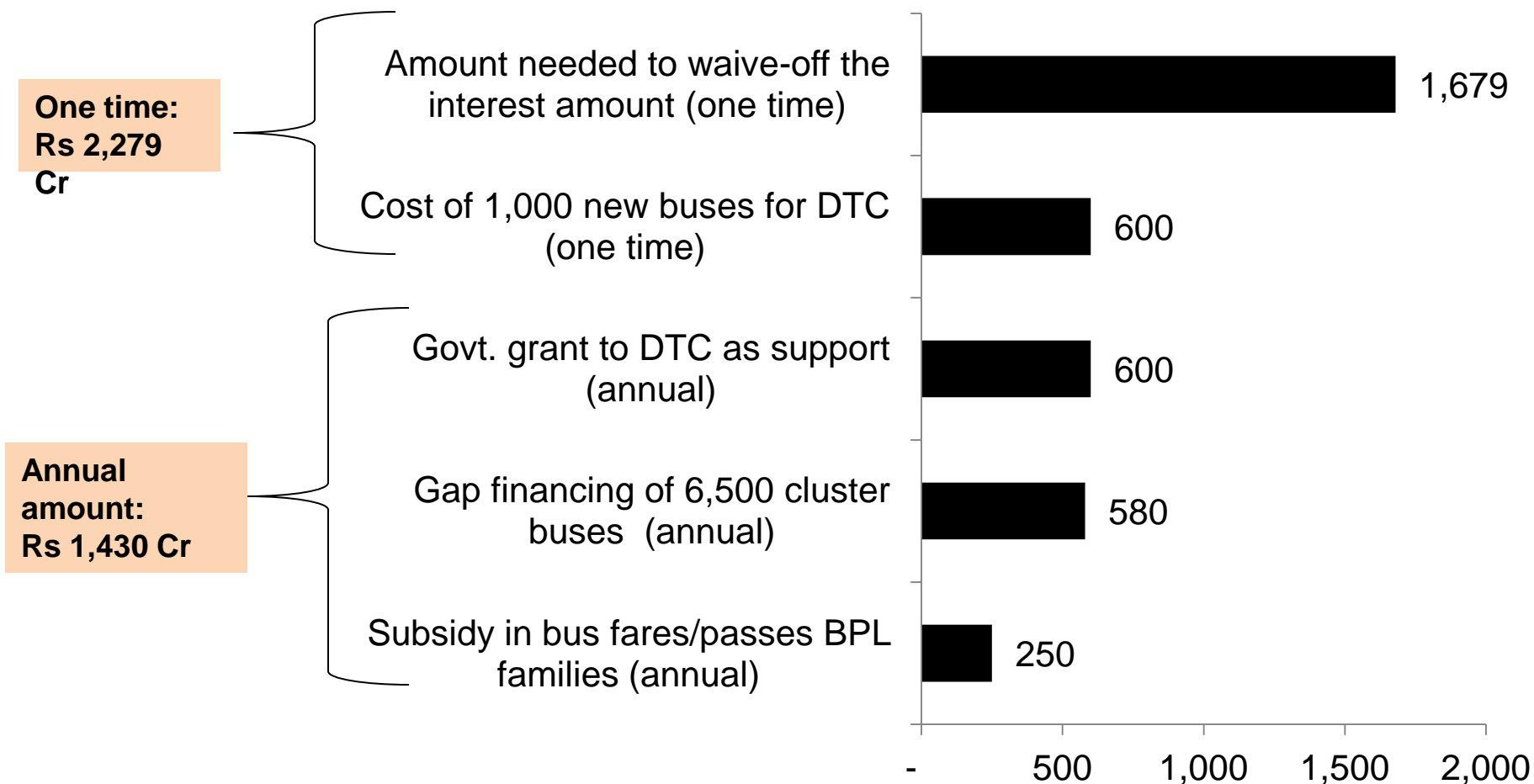




Public transport reforms presents a serious fiscal challenge.....



Delhi needs more than Rs 5000 crore for bus reforms..... Some examples. How will cities meet this fiscal challenge.....





India setting its reform agenda.....



JNNURM mandates dedicated urban transport fund

Identifies the following as the possible sources of funds that can act as a fiscal brake on car centric growth.....

- Waive off/reimburse all its taxes on urban buses and city bus service

- Need advertisement policy to tap newer source of revenues

- Need parking policy as a car restraint measure

- Additional cess on automotive fuels

- Additional registration fees on cars especially diesel cars and two-wheelers

- Annual renewal fee on driving license, vehicle registration

- Congestion tax



Urban Transport fund: Beginning of a good practice.....



Urban transport fund Proposed in 33 cities.....

- **Surat takes the lead:** Operational since 2011. Created through budgetary allocation. Its revenue components to include -- vehicle tax amounting to Rs 8 crore, pay and park charges of Rs. 2 crore and license fee for advertisement rights of all kinds amounting to Rs. 5 crore. There are plans to collect revenue from floating F.S.I. along the BRTS corridor.
- **Bangalore** has set up a dedicated urban transport fund through MRTS cess on petrol and diesel sold in Bangalore

Urban Transport Fund for Bengaluru and Mysore : Seeded with Rs. 10 crores and Rs. 5 crores from State Finance Corporation. Also a State Level Urban Transport Fund and sanctioned Rs. 10 crores..Fund through three sources to start with -- **Cess on Motor Vehicle Tax; Cess on taxes collected by Urban Local Bodies; annual amount of Rs. 20 crores would be sanctioned from SFC grants.**

- **Urban Transport Fund – Jaipur:** Initially -- financial assistance worth Rs. 10 crores from Rajasthan State Road Transport Corporation, Jaipur City Transport Services Ltd., Ajmer City Transport Services Ltd..... Revenue heads identified: These include revenue from an additional tax of 10% on the **onetime conventional Rajasthan State Motor Vehicle Tax, and of 5% on the other taxes; Revenue from green tax on old and new vehicles; Revenue from additional stamp duty; Donations/Contributions from the accumulated fund of the Rajasthan Government; CSR revenue from industries; Other sources to be identified.**



Potential of a piggy bank for buses in Delhi.....



S · N o.	Source of Revenue	Revenue (in crores)	Percentage share of revenue	Enhanced potential
1.	Sales of Bus Tickets	858.89	100	858.89
2.	Advertising on Bus Stops (Existing)	101.11	100	101.11
3.	Parking	280	25	70
4.	Additional advertising revenue potential (on Buses on rear windscreen, Plasma/LCD Advertising on Buses, JC Decaux Street Furniture advertising)	201.83	100	201.83
4.	Green Tax	36	25	9
5.	Commercial development in Bus Terminals on PPP Basis	104.27	100	104.27
7.	Air Ambience Fund	29	25	7.25
8.	FSI linked TDR along BRT Corridor	10	100	10
	Source: CSE estimates			



Similar models being worked out elsewhere.....



World Bank assessing similar approach in other cities...

Snap shot of example from WB presentation in UMI (OP Agarwal)

Potential revenue in billion units (Yet to be released study)

Fares – 35 billion units

Rent on property – 40

Parking -- 30

Station naming rights – 5

Betterment – 75

Fuel tax – 15

Vehicle registration – 2

Advertisement -- 3

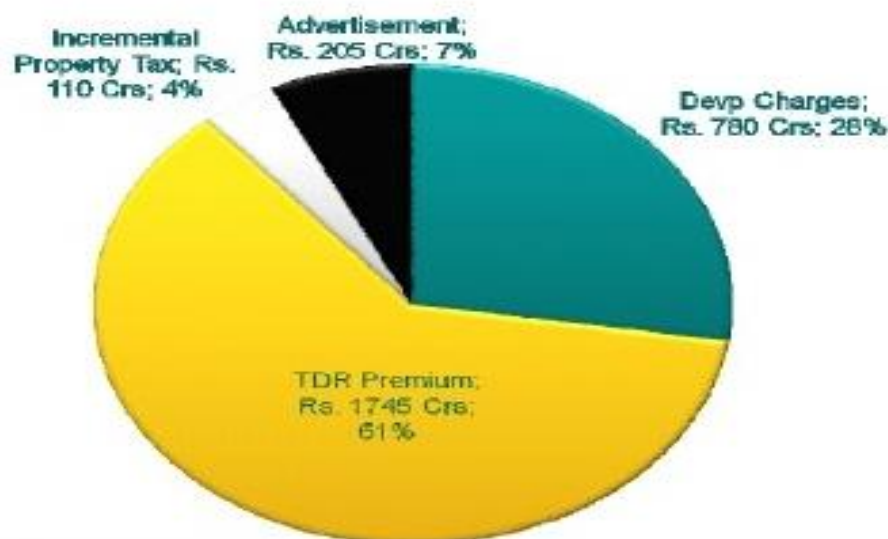
Generates a lot more than the target of meeting the O&M cost of 93 billion units



Pimpri Chinchwad: Innovative steps



PCMC allows densification along the BRT corridor
Advertisement revenue and incremental property tax are the key source
In 2012-13 revenue worth Rs 92 crore generated
This is used to construct and maintain BRT



Total income potential of BRT corridors



Looking at non-conventional sources.....

Land Value Capture: Generate revenue from land-use densification, through enhanced property taxes, betterment levies or purchase of land development rights etc along MRTs corridors.

Challenges -- uncertainty in valuing the increase in value because of transport intervention and separating other influences. .

Need clear policy to channelise revenue from land monetization, betterment levy, land value tax, enhanced property tax or grant of development rights.

Need regulatory safeguards.

Make density the focus. Higher floor Space index should not be indiscriminately used for revenue collection.

Ensure TOD principles are adopted for densification.

Enforce travel demand management principles including parking caps etc to ensure that people in the TOD zone is transit oriented.

High density offers the opportunity for average trip lengths to be short and increase public transport, walking and cycling.

Need inclusionary zoning regulations that will require that all new housing developments include a portion of units as affordable housing.

Zonal regulations and its stringent implementation should be made contingent to land based financing.

Densification through redevelopment/ infill of existing urban areas to be prioritized.



....Lessons from global cities



Hong Kong:

- Earns 3.5 billion from commercial exploitation
- Launched the one-year pilot Transport Support Scheme (TSS) in June 2007 --a series of measures to provide time-limited transport allowances to job-seekers and low-income employees living in remote districts. This replaced by the Work Incentive Transport Subsidy Scheme to help all low-income employees. Proving work incentive transport subsidy encourages the employees to use more public transport

Columbia: Impose betterment levy on the enhanced value

Copenhagen: National government handed over a 600 meter wide and 5 km long of underdeveloped stretch to the city to finance metro construction. After metro value of land increased. The city sold real estate at increased prices. This revenue contributed towards 45 per cent of cost of construction.



Global lessons



London:

Advertisement revenue: In 2005 Transport for London, the bus company in London, negotiated 10 year contract with advertisement company to advertise on bus shelter in London. This led to treble increase in revenue that goes to transport network improvement

Congestion tax: The revenue from congestion tax is invested in improvement in public transport network

Prudential borrowing mechanism in UK – Bus companies have the option of borrowing from the Public Works Loan Board at low interest rates. This has government support.

Land value taxation: London Jubilee Line – In 2005 estimated value of land with 1000 yards radius. The value of this land increased USD 18.8 billion. The land value tax can cover the cost of the project.

Mexico: One US cent per litre of fuel of surcharge to generate revenue for Environment Trust Funds

France: Bonus and penalty based on CO2 emissions of cars

Income tax on wage bill of employers to pay for public transport



Tax the dirty higher.....



Implement travel demand management measures to recover the cost of congestion and pollution, fuel usage and other externality associated with personal vehicles.

Example of global approaches:

US – Cars pay more taxes and also differentiates the tax according to engine size – fuel inefficient bigger cars pay more.

Singapore – Electronic road pricing and Vehicle quota system
Road tax differentiated by engine size, fuel type

Germany – Cars complying with older emissions standards pay more than the current standards.

China – **On purchase-** Excise, VAT, Tariff, Vehicle acquisition tax; **On ownership** – New car check out fee, License plate fee, Vehicle usage fee, **Vehicle use** – Insurance fee, Road maintenance fee, Consumption tax etc

London and Stockholm – Congestion pricing

Norway: Cordon pricing. Revenue ploughed back in public transport etc



**Our cities need upscaled transition
Avoid future emissions
Shift to sustainable modes of mobility**



Leapfrog technology

- Accelerate emissions standards roadmap
- Set fuel economy standards

Opportunity to provide scaled up alternatives

- Upgrade and upscale public transport and integration
- Infrastructure for walking and cycling

Reduce demand for travel and vehicle usage

- Integrate transportation with land-use planning
- Road pricing
- Tax rationalisation
- Parking policy and charges

Fund the transition: Need tax measures to allocate resources efficiently and raise revenue. Taxes on public transport is 2.6 times higher.

This needs support. Must not be allowed to fail..

Otherwise what???



Thank You...

