



# Clean Air and Sustainable Mobility: Agenda for Reform



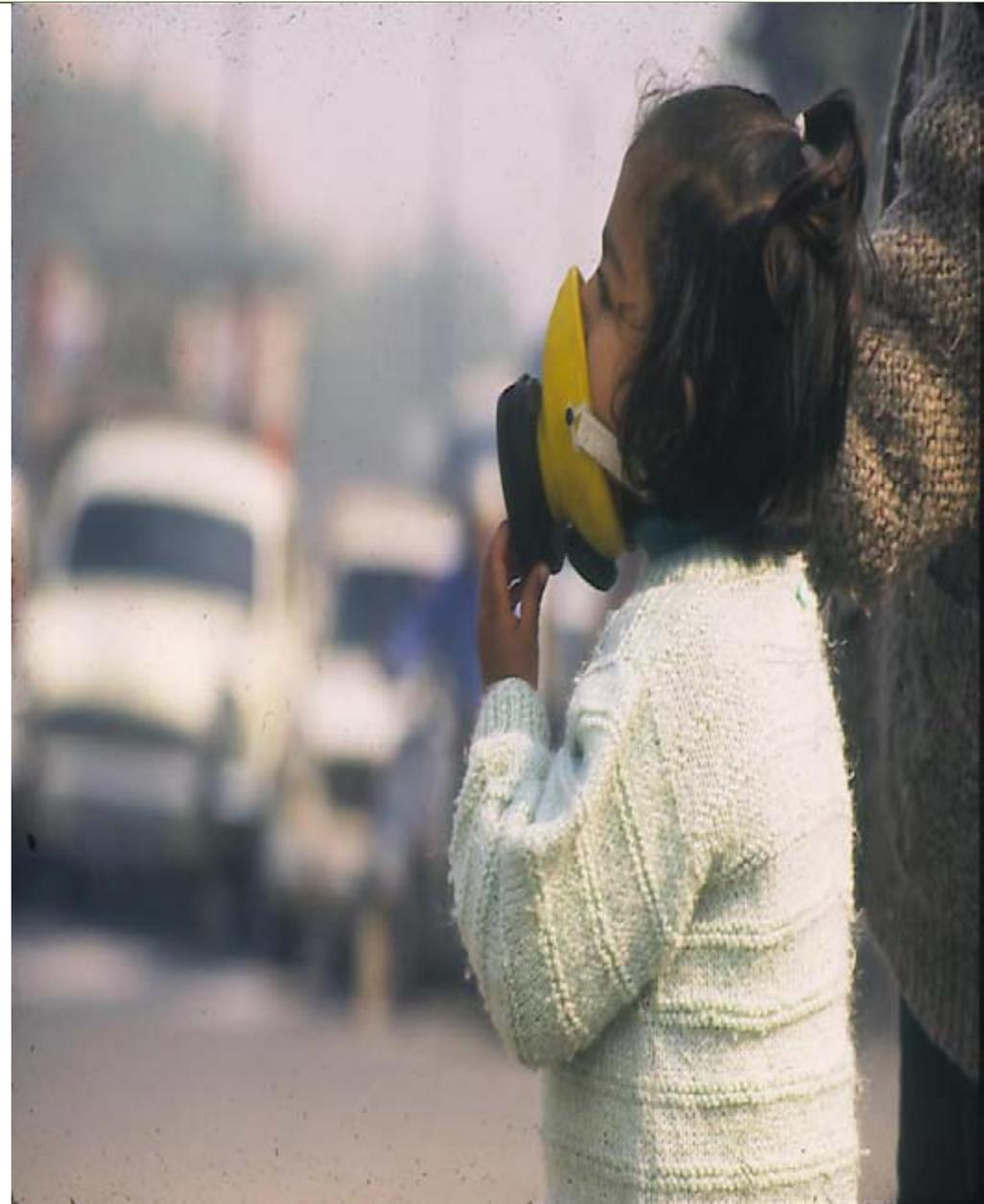
**Anumita Roychowdhury  
Priyanka Chandola  
Ruchita Bansal**

**Centre for Science and Environment**

***Stakeholder workshop on Air quality  
and transportation challenges***

***A joint initiative of  
Ministry of Physical Infrastructure  
and Transport, Government of Nepal  
and  
Centre for Science and Environment,  
India***

**Kathmandu, December 27, 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.....

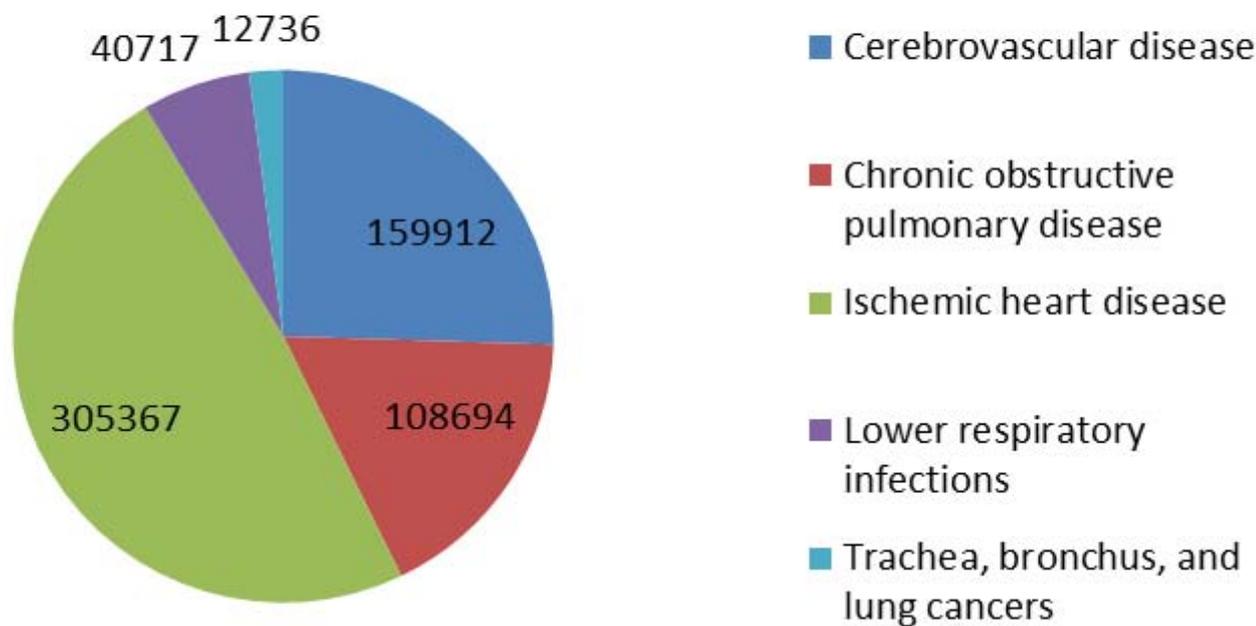
**South Asia extremely vulnerable.....**



# The numbers.....



## Deaths Attributable to Ambient Particulate Matter Pollution in India in 2010



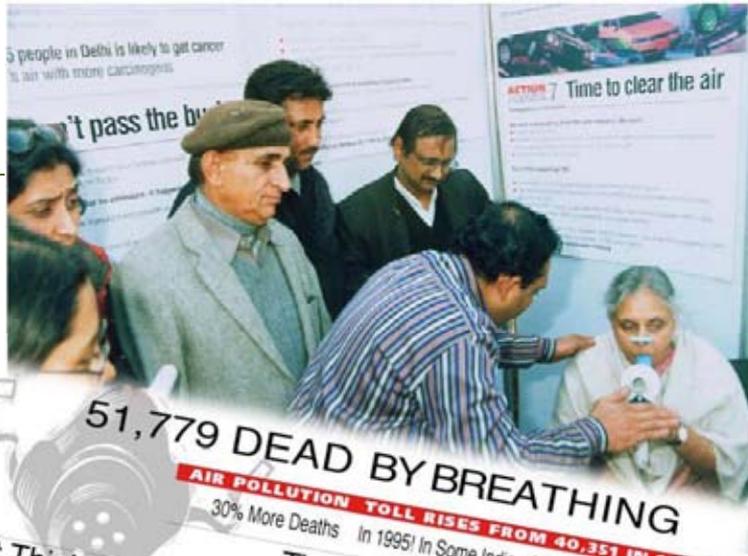
# SLOW MURDER



The deadly story of vehicular pollution in India

Study directed by Anil Agarwal  
Written by Anju Sharma  
and Anurita Kapoor/Chitra

Centre for Science and Environment



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

So It Thinks.

DELUSION

Year	Delhi	Jaipur	Chennai	Coimbatore
1991-92	40,351	4,471	1,562	50
1995	51,779	5,500	1,300	10,647

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

Ministry of Environment and Forests  
Ministry of Petroleum and Natural Gas  
Ministry of Justice Transport  
Ministry of Health  
Ministry of Finance  
Ministry of Urban Affairs  
Ministry of Transport  
Ministry of Power  
Ministry of Information and Public Relations  
Ministry of Labour  
Ministry of Education  
Ministry of Science and Technology  
Ministry of Agriculture  
Ministry of Industry  
Ministry of Defence  
Ministry of Home Affairs  
Ministry of External Affairs  
Ministry of Railways  
Ministry of Shipping  
Ministry of Airports  
Ministry of Civil Aviation  
Ministry of Tourism  
Ministry of Culture  
Ministry of Sports  
Ministry of Youth Affairs and Sports  
Ministry of Women and Child Development  
Ministry of Social Justice and Empowerment  
Ministry of Panchayati Raj  
Ministry of Information and Public Relations  
Ministry of Labour  
Ministry of Education  
Ministry of Science and Technology  
Ministry of Agriculture  
Ministry of Industry  
Ministry of Defence  
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Ministry of Civil Aviation  
Ministry of Tourism  
Ministry of Culture  
Ministry of Sports  
Ministry of Youth Affairs and Sports  
Ministry of Women and Child Development  
Ministry of Social Justice and Empowerment  
Ministry of Panchayati Raj

## ONE MORE YEAR OF SLOW MURDER

Centre for Science and Environment (CSE) is a public interest organisation engaged in research and lobbying for and communicating the urgency of sustainable development. CSE's campaign against air pollution began in November 1, 1986 with a public meeting, an exhibition and the release of a leaflet exposing an smoggy secret: Slow Murder: The deadly story of vehicular pollution. Since then, we have focussed on gathering information to better nail the culprits of pollution. For interested people and institutions to appreciate...

For health's sake,

JOIN OUR BEFORE DONATE

Centre for Science and Environment  
11002, Okhla Industrial Estate, Delhi-110024  
Phone: 011-26101234  
Fax: 011-26101235  
E-mail: cse@csce.org

# cough wheeze suffocate

It's time you TAKE A STAND

PUT YOUR HEALTH ON THE POLITICAL AGENDA

3.00 pm • June 3, 1995 • Silver Deck, India Habitat Centre, Lodi Road, New Delhi 110003

People for Clean Air

CENTRE FOR SCIENCE AND ENVIRONMENT  
2995 5124, 2995 6110, 2995 6395, 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

## Himachal lung



## Delhi-lung

Capital punishment

Look at those 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.

Scary? But those cars are so sexy!

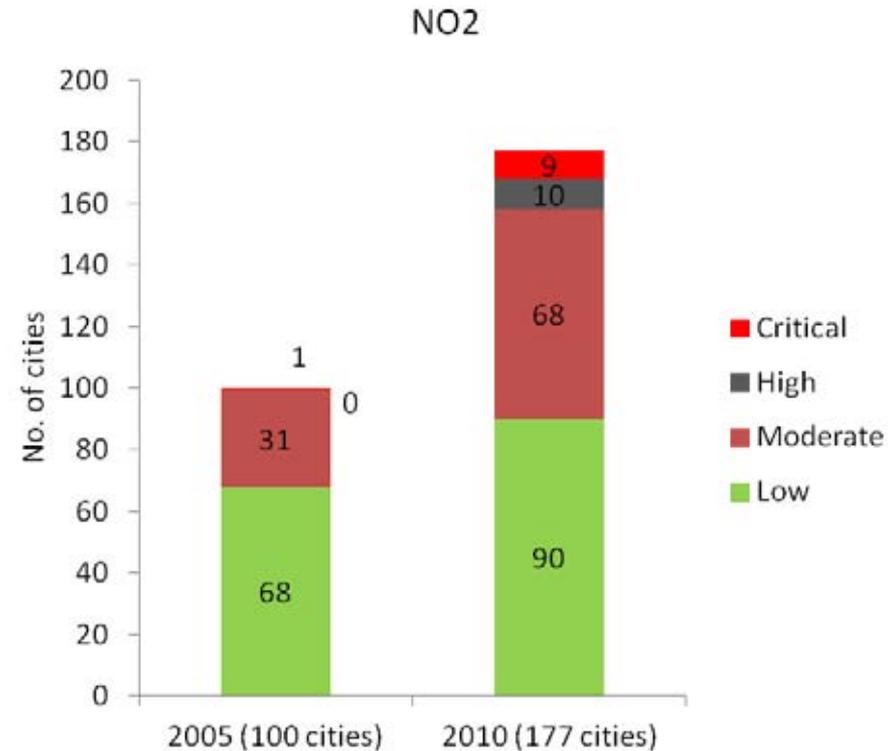
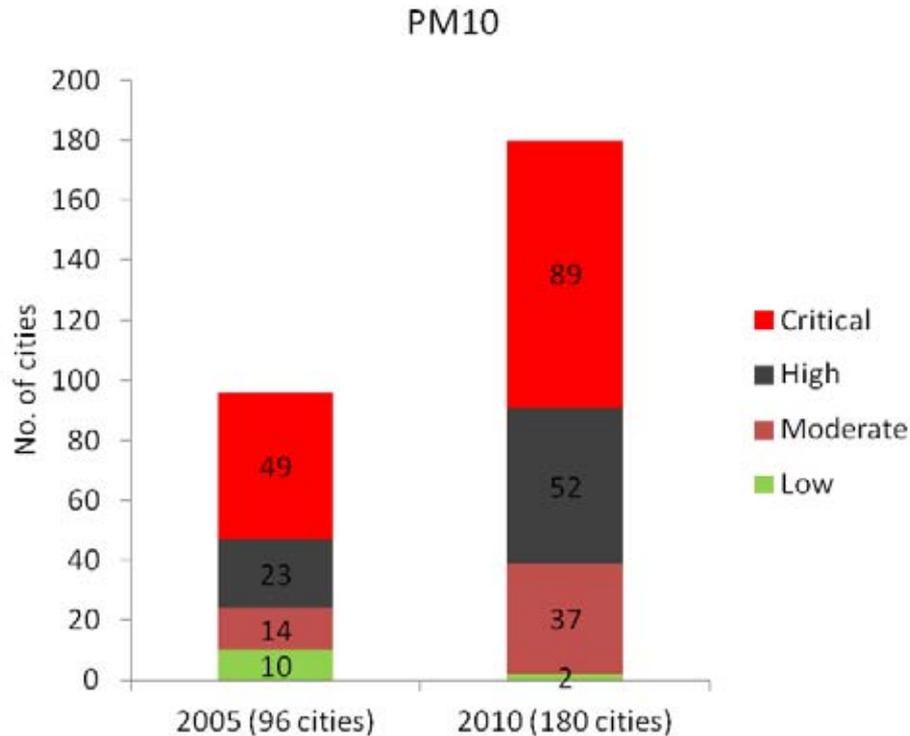
## Roll down the window of your bullet-proof car, Mr Prime Minister The security threat is not the gun. It's the air of Delhi

### PEOPLES' CHARTER ON CLEAN AIR FOR AN IMMEDIATE IMPACT

- 1. AIR POLLUTION:** Air pollution is a major public health hazard in Delhi. It is a result of uncontrolled and unchecked growth of the city. It is a result of uncontrolled and unchecked growth of the city. It is a result of uncontrolled and unchecked growth of the city.
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# 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, back to pre-CNG

# Delhi this winter



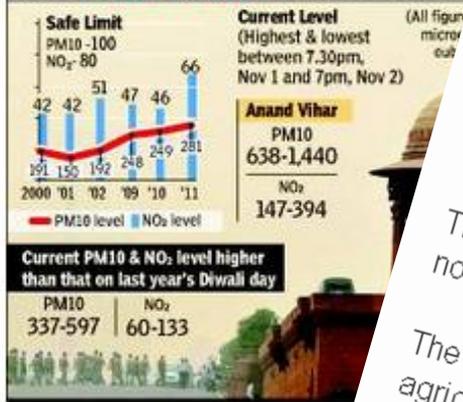
- 'सांसों' पर स्मॉग की 'स्याह' परतें

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

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...

## CITY AIR WORSE THAN EVER



### 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

# Smog leaves Delhi gasping for breath

TNN | Nov 3, 2012, 01.33 AM IST

## Smog delays Sheila Dikshit's flight to Punjab

02:44AM IST

| Punjab | NASA | flight | Flashpoint | Apex

# Disadvantage Delhi: Smog here to stay

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



email print

0 Comments



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.

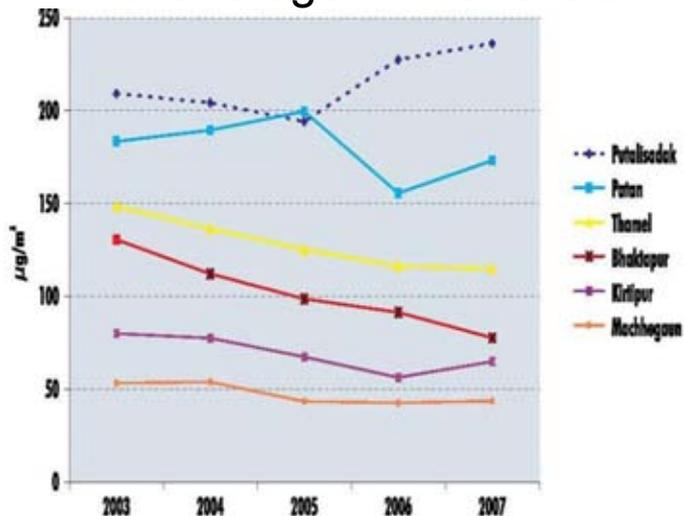
Ludhiana trip by Delhi chief minister Sheila Dikshit in a chartered plane from a telecom industrialist family became the flashpoint of the ongoing row between Delhi and Punjab when the plane was delayed by nearly three hours.



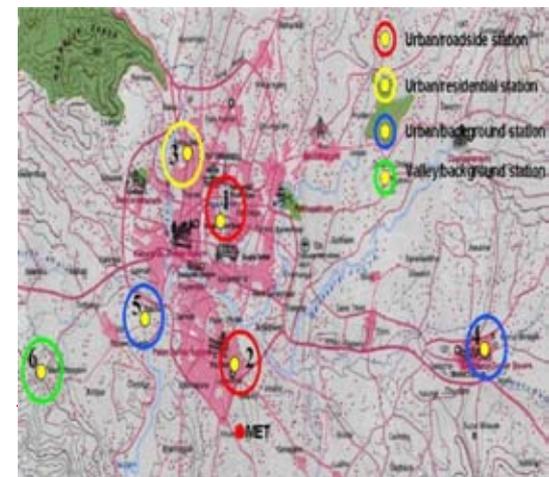
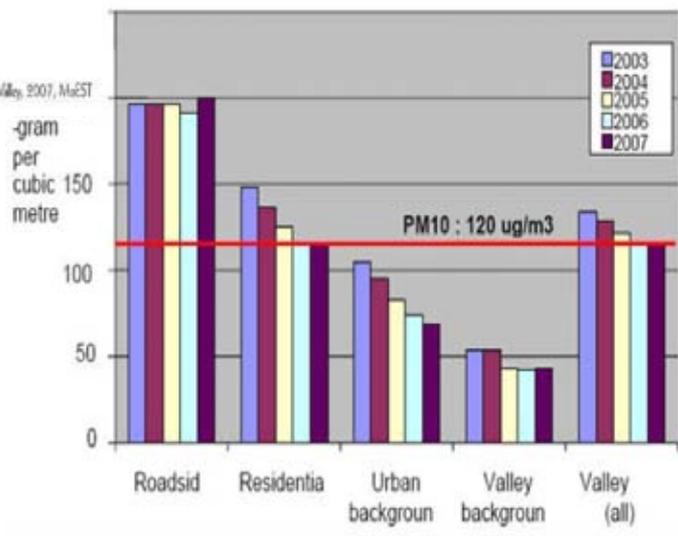
# Air quality in Kathmandu?



Annual average PM10 levels in Kathmandu (2003 - 2007)



Source: Status on ambient air quality of Kathmandu Valley 2007, MoST



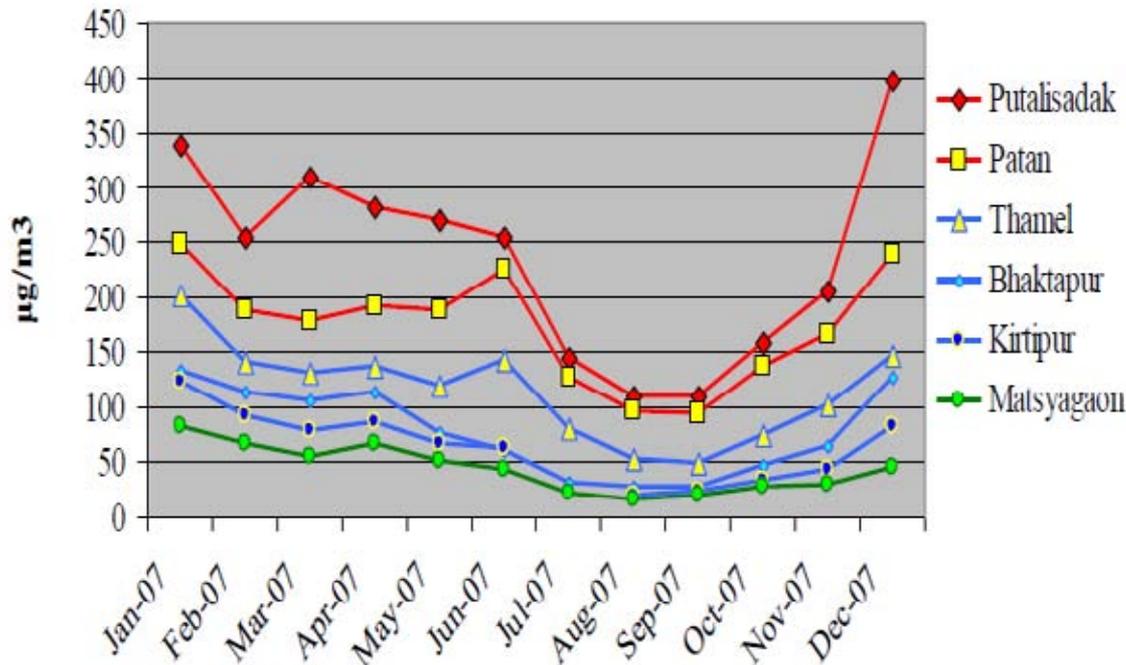
Air quality data until 2007 shows mixed trend in particulate matter and also a dip



# Winter pollution



Monthly average PM10 levels (2007)



Monthly average PM10 levels in 2007 show high winter pollution

PM10: Monthly Average

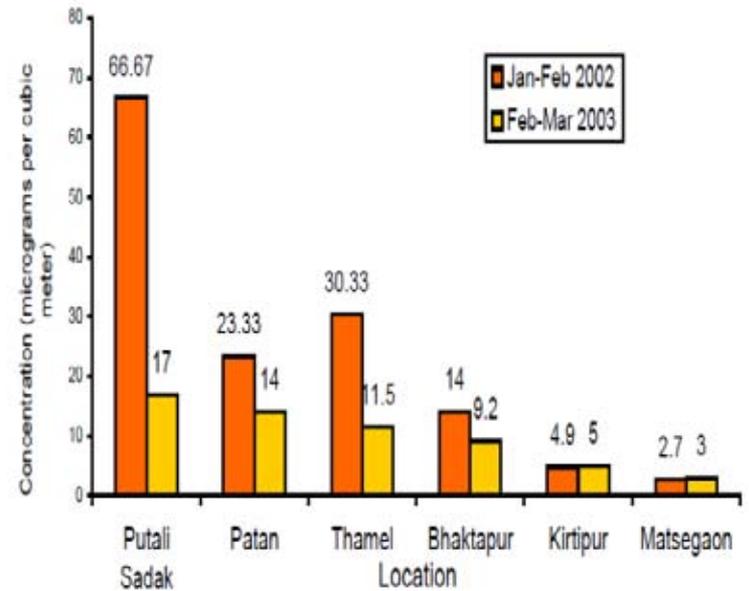
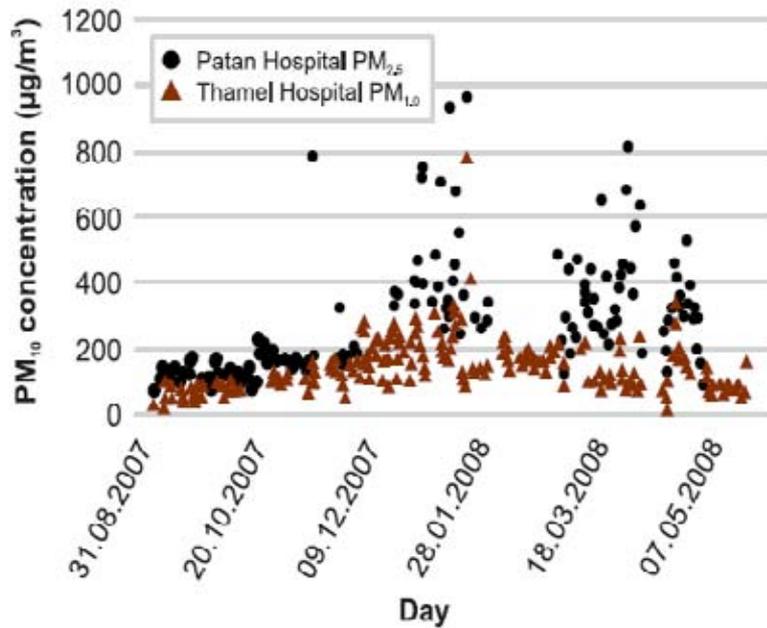
Source: Ambient Air Quality of Kathmandu Valley, MOEST, 2007



# Kathmandu: More threats



## Benzene concentration in Kathmandu (2002 – 2003)





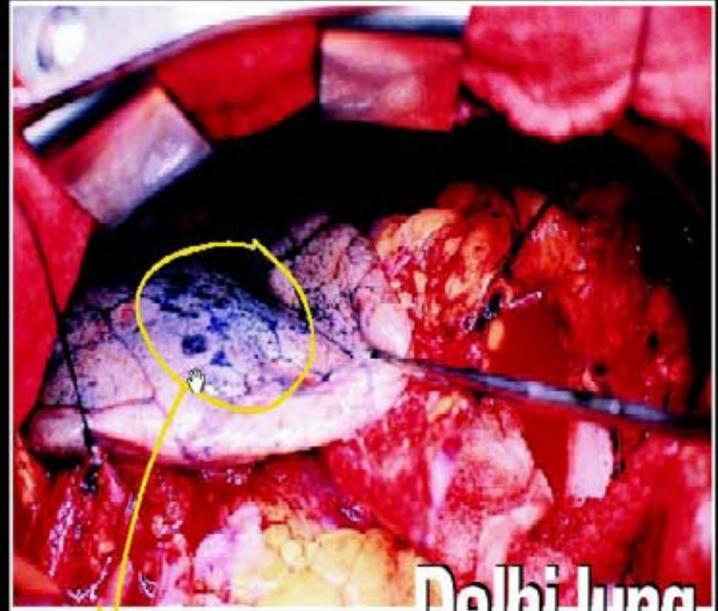
# More stringent air quality benchmark



- **Revision of ambient air quality standards:**
  - Revised the NAAQS in 2012.
  - Introduced standards for pollutants like PM2.5 and ozone.
  - Requires effective monitoring and collection of eight-hour and 24-hour samples of air pollutants like TSP, PM10, PM2.5, CO, lead and ozone for at least 347 days out of a 365-day year.
  - No particular place should fail to monitor air samples for two consecutive days.
  - Continuous air quality monitoring has remained a challenge since 2007 due to lack of proper maintenance and an intermittent power supply



## 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. Actually, you are getting polluted.

**Delhi lung**  
Capital punishment

Scary? But those cars are so sexy!



## 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.

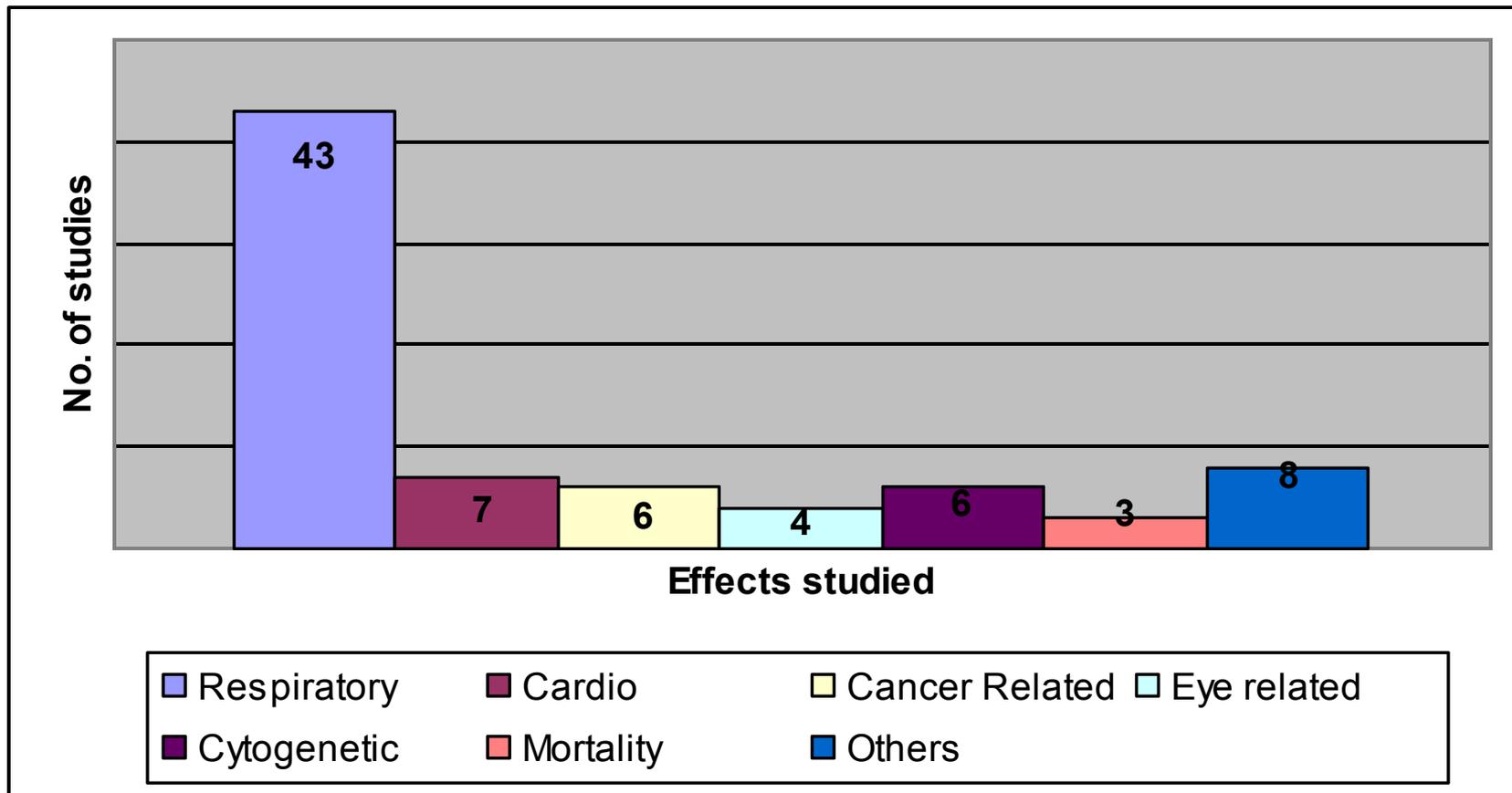
These findings are equally valid for India ....  
Our lungs are same.....



# 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

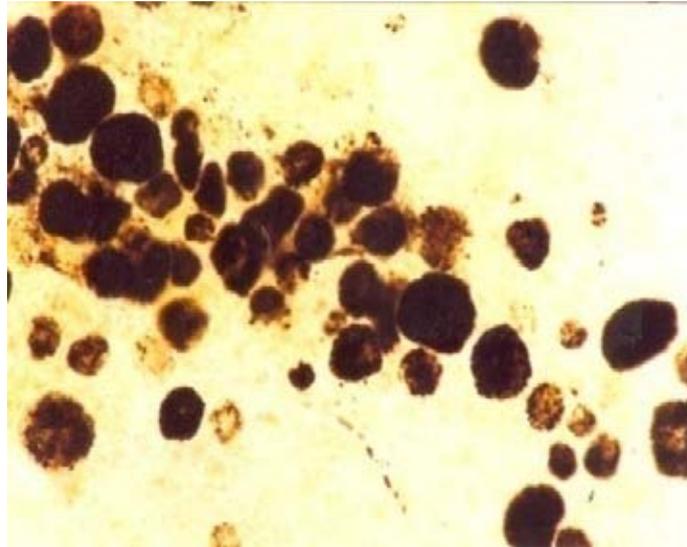
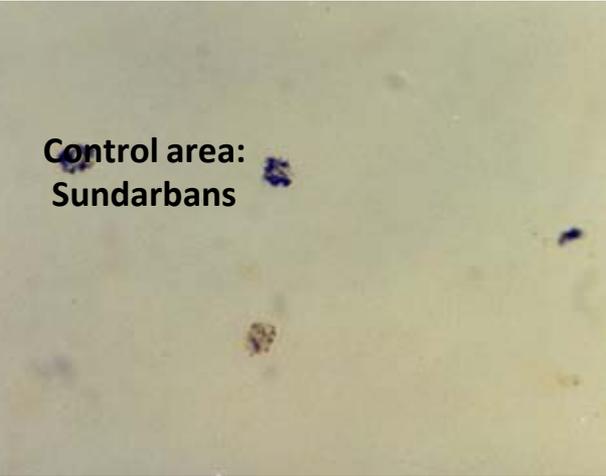


## More evidences.....



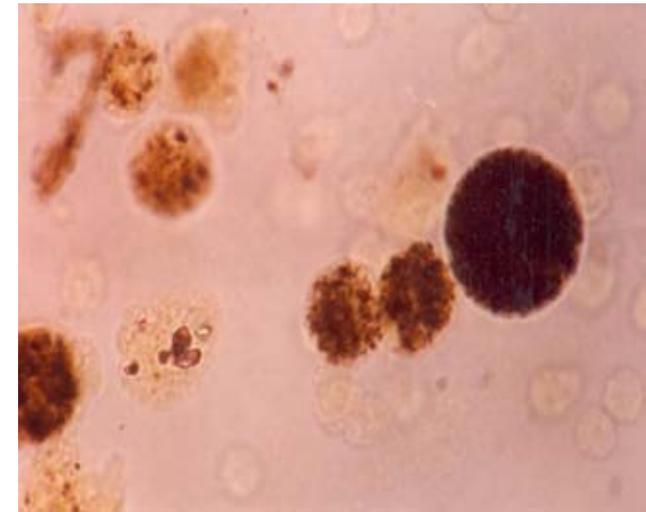
### Alveolar macrophage - biomarker of air pollution

Control area:  
Sundarbans



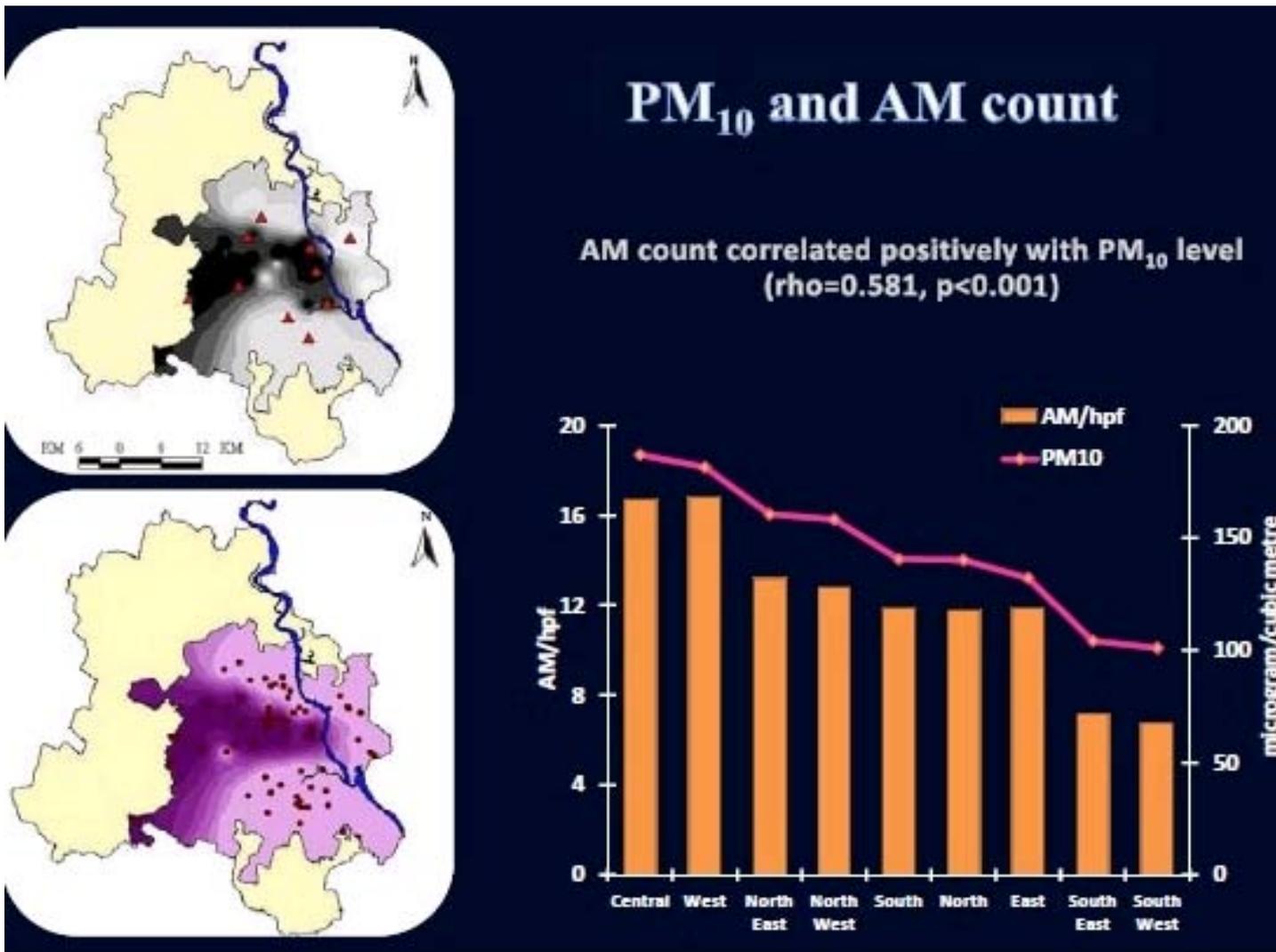
Exposed group; Kolkata taxi driver  
Increase in AM number

Larger AM – particle laden





# Co-relating health evidence with air pollution





# Emerging evidences in Kathmandu



- **An analysis of COPD patients in Patan Hospital** (April 1992 to 1994) -- COPD cases 1.96 times higher for Kathmandu valley compared to outside. Increase four folds. COPD - number one killer
- **The database of total OPD visits**, and the percentage of respiratory disease for two years reflects the increase in respiratory disease. (1996 - 1998) Number of ARI patient increased at the rate of 22.89 per cent per year. Share of ARI patient out of total OPD visit also increased from 9.99 to 10.11 per cent.
- **A 1997 World Bank study** -- mortality and morbidity impacts due to PM10 levels -- Kathmandu's PM10 resulted in 84 cases of excess mortality, 506 cases of chronic bronchitis, 4,847 cases of bronchitis in children and 18,863 asthma attacks per year.
- **A study on number of in-patients in three major hospitals in Kathmandu valley** suffering from COPD significantly increased between 1992 and 2003. Increase highest during winter
- **A study found that Kathmandu's residents experienced over 1.5 million respiratory symptom days per year.**
- **A survey done by Clean Energy Nepal and Environment and Public Health Organization in 2003** studied patients with respiratory illnesses in emergency departments of major hospitals in Kathmandu. Most of them are from Kathmandu valley and belong to the age group of 51 to 75.
- **The Ministry of Environment, Science and Technology (MoEST) estimated in 2005** that the valley's air pollution results in approximately 1,600 premature deaths per year.
- **Estimate by the Clean Energy Nepal/Environment and Public Health Organization** the total benefit of reducing valley's PM10 levels to 50  $\mu\text{g}/\text{m}^3$  would amount to US\$1.86 billion per year.
- **Benefits of reducing benzene and PAH concentrations to half their current values would amount to US\$ 30-70 million per year**
- **A study in Atmospheric Pollution Research on Kathmandu** Feb 2008 to Jan 2009 found high density traffic areas severely polluted by PM10 and can be considered as



# Health benefits from reduction in air pollution



- A South Asian Network for Development and Environmental Economics (SANDEE) study: estimated the health benefits from reduction in air pollution levels to a safe level in the Kathmandu metropolitan and Lalitpur sub-metropolitan areas of Kathmandu valley, Nepal
- The annual welfare gain to a representative individual is NRS 266 per year (USD 3.70)
- If extrapolated to the total population of Kathmandu and Lalitpur, the monetary benefits would be NRS 315 million (USD 4.37 million) per year.
- Discounted benefits over the next twenty years can be as high as NRS 6,085 million (USD 80.53 million).



Source; Naveen Adhikari 2012, *Measuring the Health Benefits from Reducing Air Pollution in Kathmandu Valley*, South Asian Network for Development and Environmental Economics, Kathmandu



# 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.

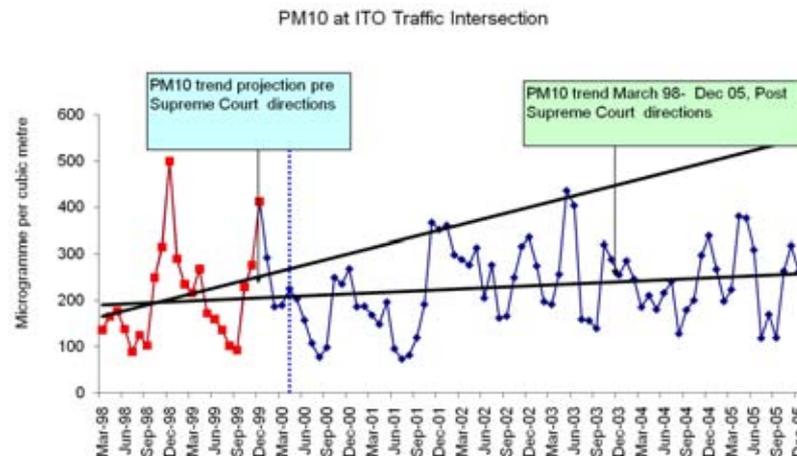
#### Air quality monitoring

- 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





# First generation action in Kathmandu



**Kathmandu has already initiated series of action to clean up its air:**

- Introduced Nepal Vehicle Mass Emission Standard,
- Ban on import of second-hand and reconditioned vehicles, two-stroke engine vehicles
- Phase out of three-wheeler diesel tempos (1999), three wheeler two-stroke engine vehicles, and 20 years old taxis from Kathmandu valley (2004)
- Introduction of electric and LPG three-wheelers
- Introduction of Vehicle Emission Standards for in-use vehicles. Green stickers for vehicles meeting emission standards. In-use emission standards further improved after 1998 to include HC- and gas-operated vehicles such as LPG in 2000.
- On-road tailpipe emission monitoring of polluting vehicles (2003)
- Ban on trucks and other heavy goods carrying vehicles during night (1999/2000)
- Ban on new registration of Bull's Trench Kiln brick manufacturing industries in the valley. Others changed to cleaner technology (2004)
- Emission standards for brick kilns of 900 mg/m<sup>3</sup> by Industrial Promotion Board in 2004.
- National Indoor Air Quality Standard and Implementation Guidelines 2009
- Implemented Polluter Pay Principle in Kathmandu valley by placing Rs. 0.5 per liter petrol and diesel to reduce air pollution Kathmandu valley.

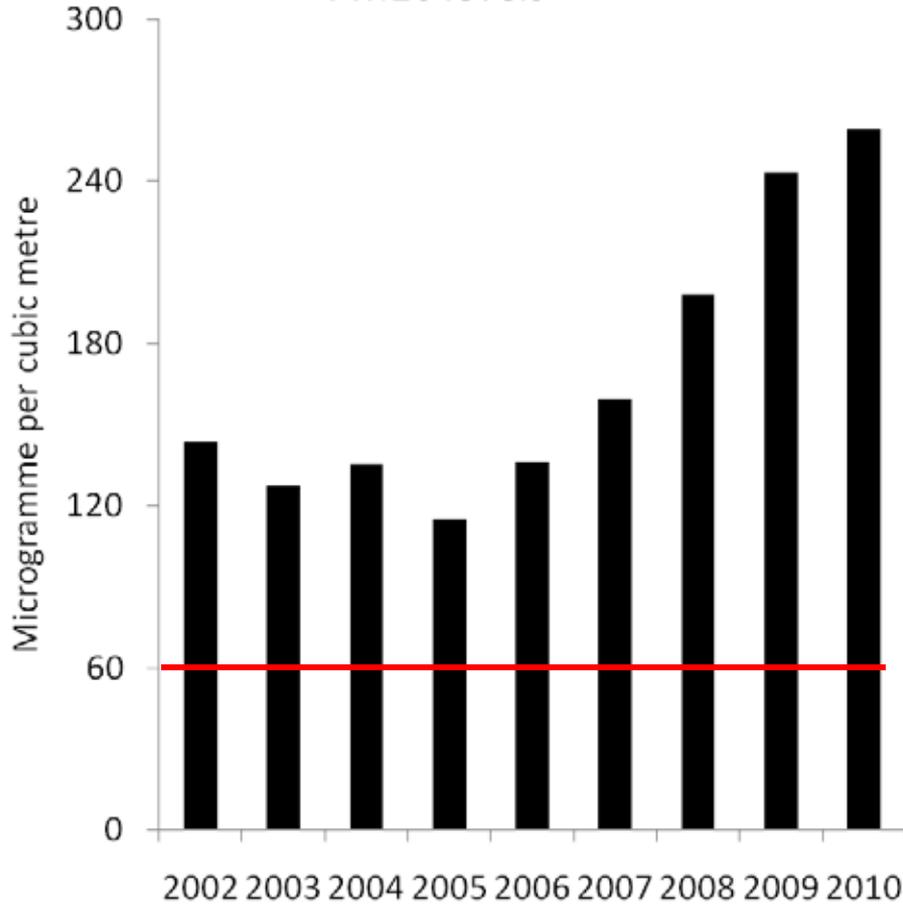


# Pollution levels up: Delhi losing its gains

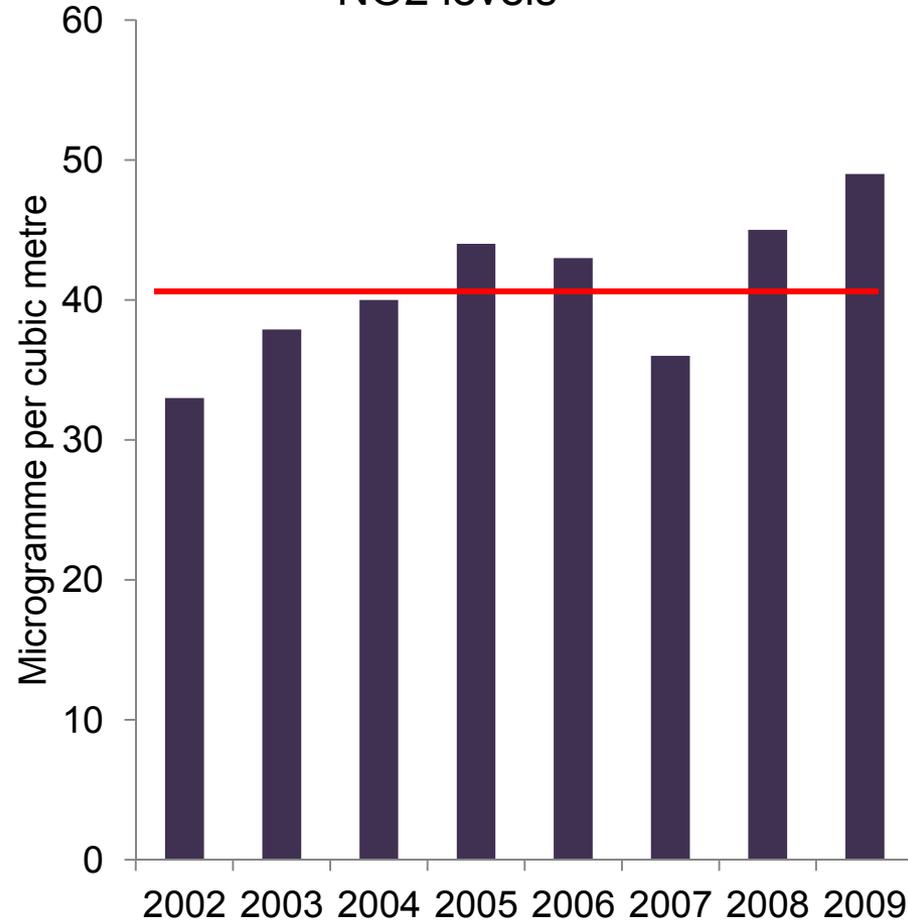


Both PM10 and NO2 levels show an increasing trend and exceed the safe levels. PM10 exceed the standard by nearly 4 times and NO2 by 1.3 times

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



## 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.



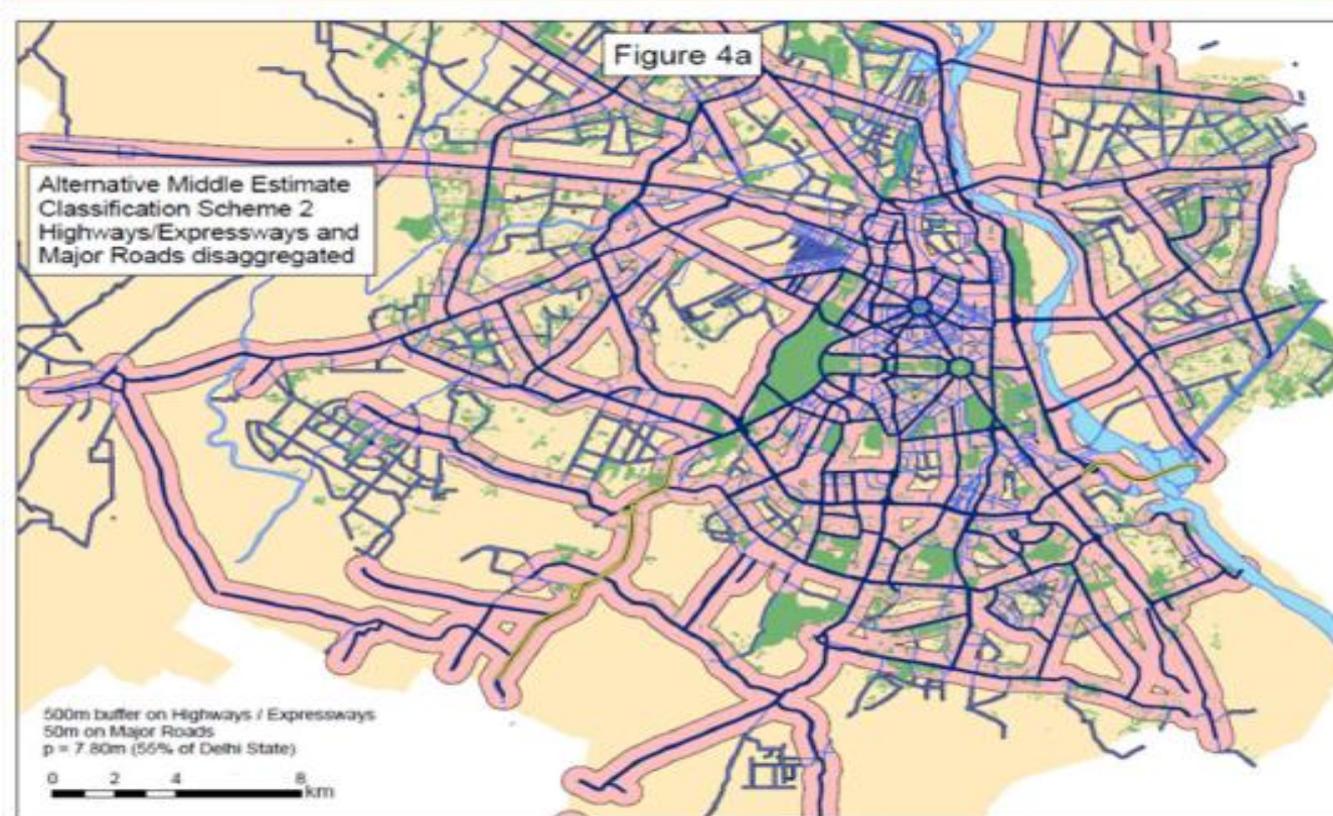


# People living close to roads are most exposed to vehicular fume

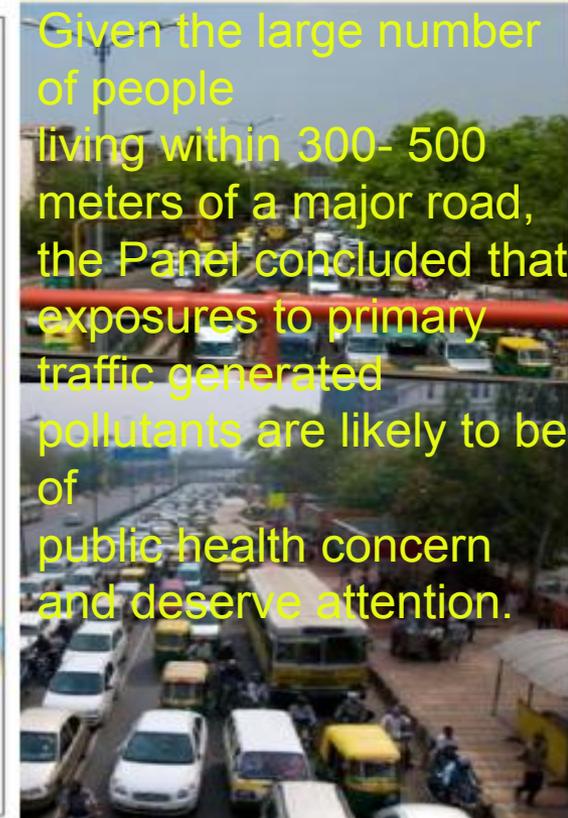
Evidence from Delhi....



## *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*

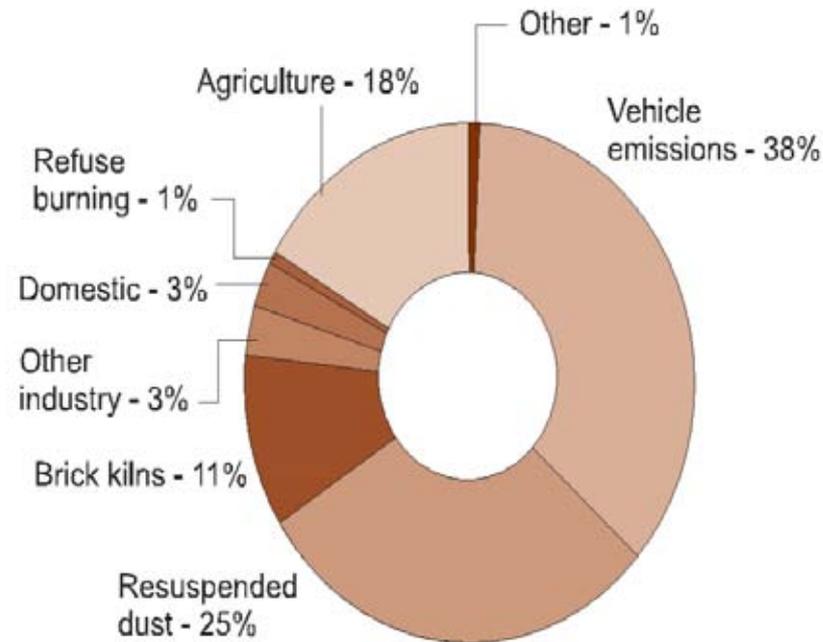


Given the large number of people living within 300- 500 meters of a major road, the Panel concluded that exposures to primary traffic generated pollutants are likely to be of public health concern and deserve attention.





# Vehicles major source of air pollution in Kathmandu



Source apportionment of  $PM_{10}$  in Kathmandu Valley

- Vehicles contribute overwhelmingly to the air pollution load in Kathmandu
- Vehicle emissions contribute 38% of the  $PM_{10}$  levels



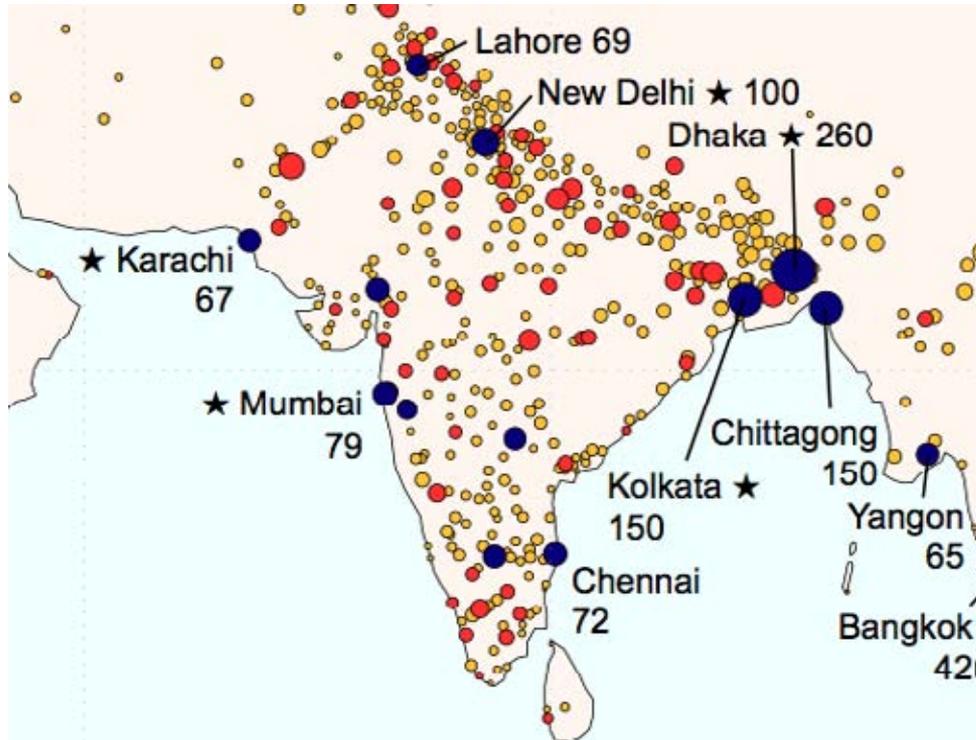
# Traffic: Prime source of PM emissions



- Study on impact of vehicular shutdown during bandhas (general strikes) in Kathmandu and based on PM10 data (January 2003-February 2008) valley found:
- Lower PM10 concentrations were observed during the monsoon season compared to the winter, across all monitoring stations, with the largest reduction observed for the urban high traffic area (mean  $\pm$  standard deviation:  $290 \pm 71$  vs  $143 \pm 36$   $\mu\text{g}/\text{m}^3$ )
- In the high traffic area, there was 36 microgramme per cubic metre decrease in PM10 concentration during the bandh period compared to 2 days preceding the bandh, adjusting for season, rainfall, temperature, and windspeed
- The improvements in air quality were short lived: PM10 concentration in the urban high traffic area increased by an average of 26 microgramme per cubic metre within the first 2 days after the bandh.
- Suggest that controlling vehicular traffic can have an immediate impact in improving particulate matter air quality
- Source: Fransen M et al 2013, Impact of vehicular strike on particulate matter air quality: results from a natural intervention study in Kathmandu valley, in *Environmental Research*, Vol 122, April



# 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.

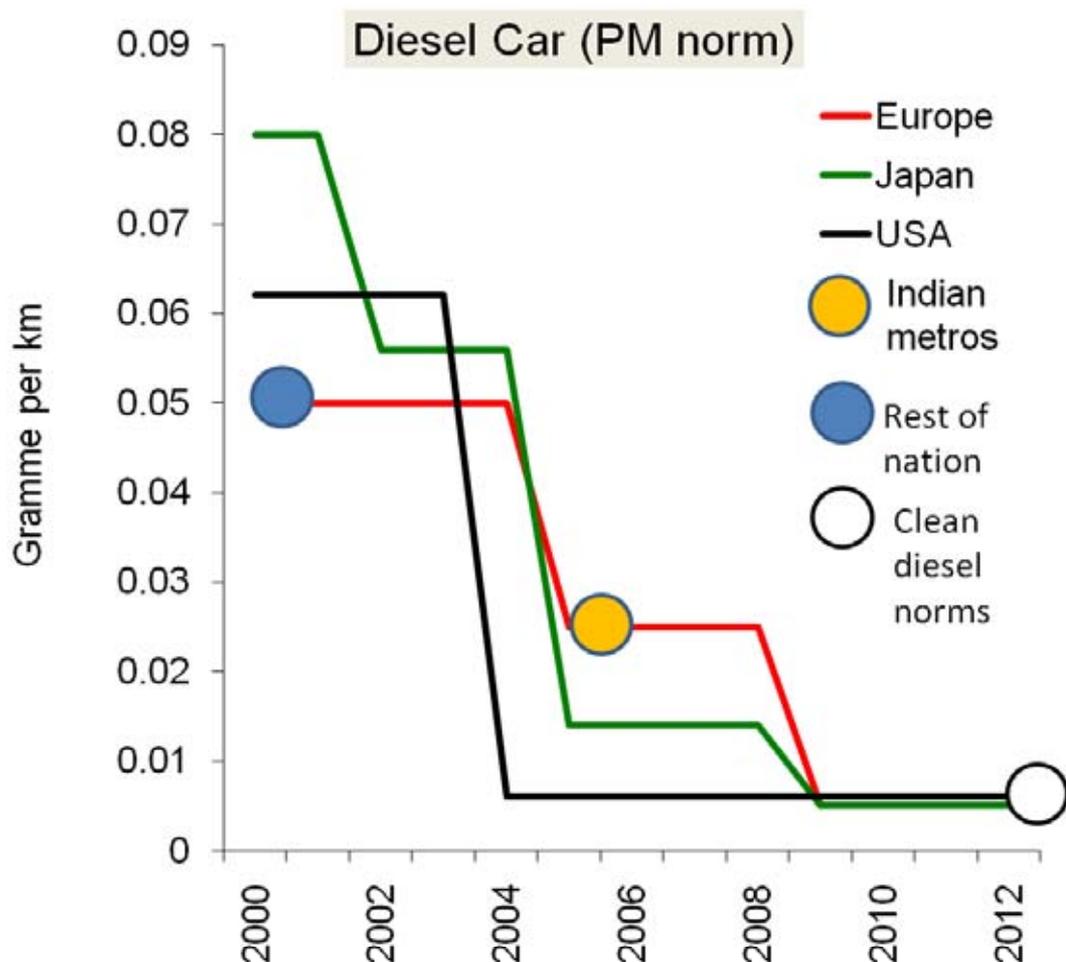


## Technology leapfrog.....

-- Bharat Stage III 12 years behind Europe

-- Bharat stage IV seven years behind

### Diesel car emission norm trajectory and India's position



During 12<sup>th</sup> plan refinery capacity will expand 1.6 times.

But this is not linked with stringent emissions standards roadmap.

There is no fiscal strategy

Nepal has moved to Euro III in 2012



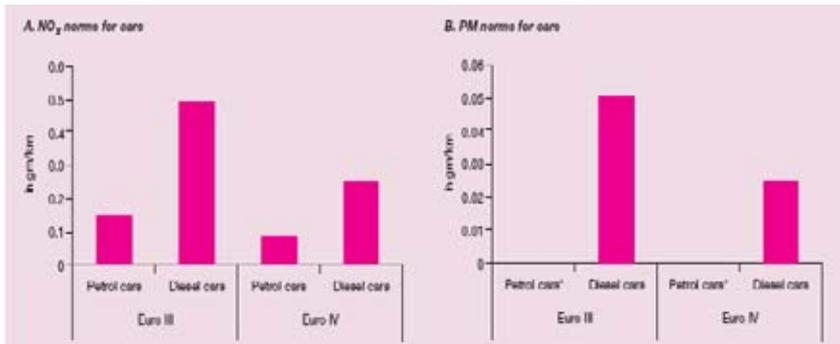
# WHO has reclassified diesel emissions as class 1 carcinogen



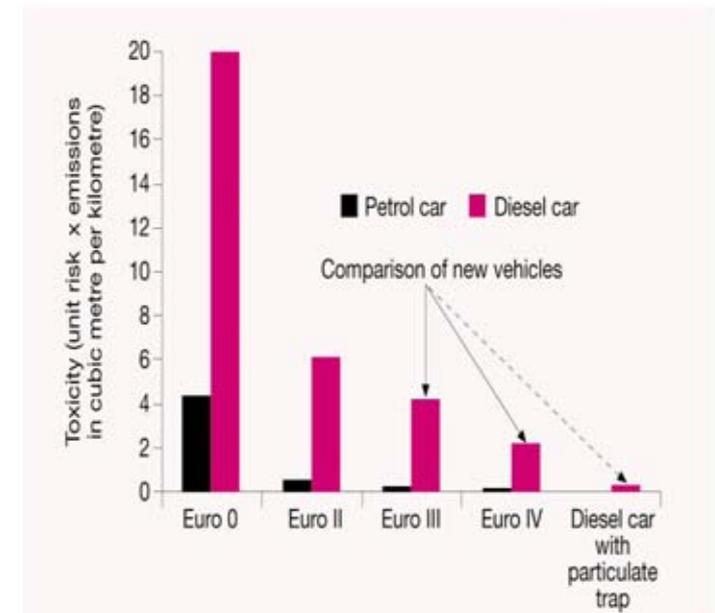
Diesel cars are legally allowed to emit three times more NO<sub>x</sub> than petrol cars under the Euro norms

NO<sub>x</sub> norms for cars

PM norms for cars



## Toxicity of diesel emissions





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



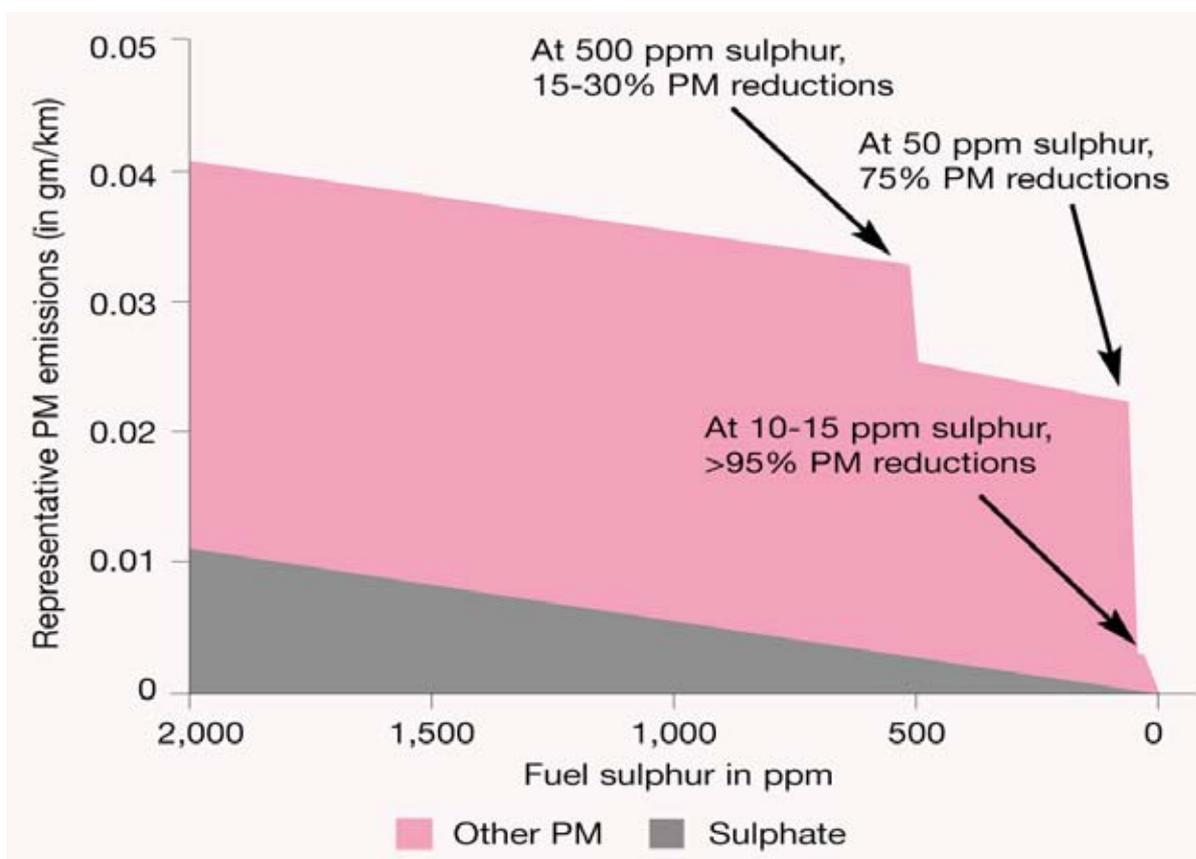
- Cheaper diesel fuel encourages bigger and more powerful cars. Eg, --
  - Due to higher gasoline prices 85% of the gasoline cars sold in India have less than 1200 cc engines
  - But 64 % of diesel cars are just under 1500 cc and the rest above.
- Diesel fuel has higher carbon content than petrol. If more diesel is burnt encouraged by its cheaper prices and more driving, more heat-trapping CO<sub>2</sub> will escape.
- Black carbon emissions from diesel vehicles are several times more heat trapping than CO<sub>2</sub> 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. CO<sub>2</sub> 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.



# 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.

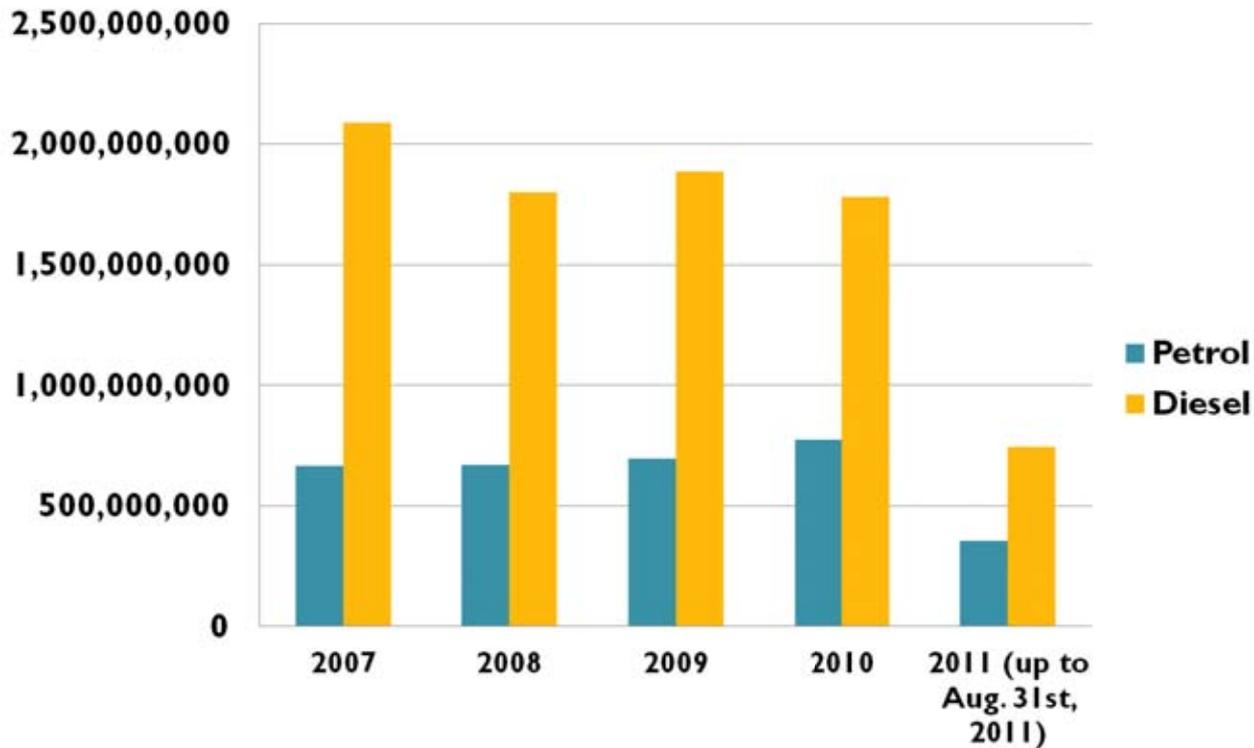


# Nepal and Sri Lanka have one of the highest import duty on cars



Eg... Sri Lanka imposes close to **436.90%** import duties on diesel cars as opposed to **244.47%** % on petrol cars. With that they have changed the market trends.

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



# Change technology paradigm



- **Transition to electric vehicles in India**
- **High powered committee in India has set a roadmap for transition to electric and electric hybrids. Rs 1300 crore to be spent until 2020 for tax incentives and R&D**
- **Proposed tax incentives to promote electric drive**
- **State governments in India have begun to incentivise the electric vehicle programmes**
- **Challenges remain in terms of battery technology, charging facility, costs, battery disposal systems etc.**
- **Kathmandu has taken the lead in the region**



# 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

## Kathmandu has taken the lead in improving in-use emissions inspection regime

- Construction of a high-tech vehicle fitness test centre for scientific check pass of vehicles, embossing number plates of vehicles, implement the concept of third party insurance and maintaining transparency in service delivery have been taken ahead





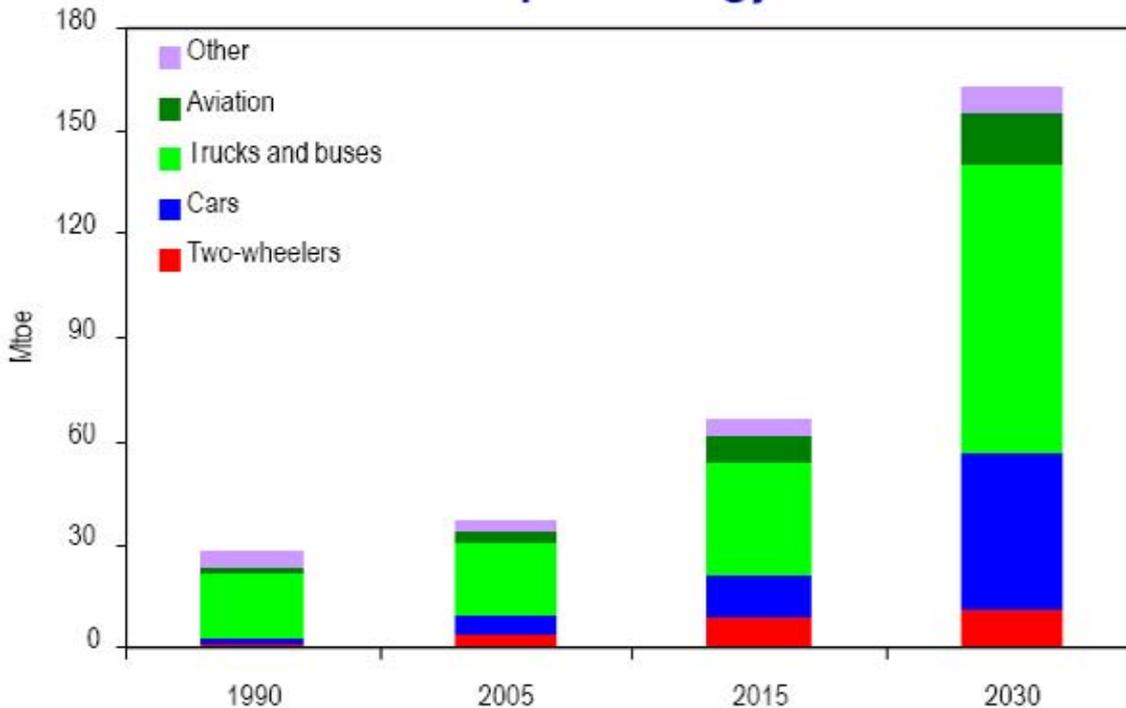
Vehicles make us more energy insecure....  
Climate insecure..... Resolve efficiency vs  
emissions trade-off



# 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



# MOBILITY CRISIS



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

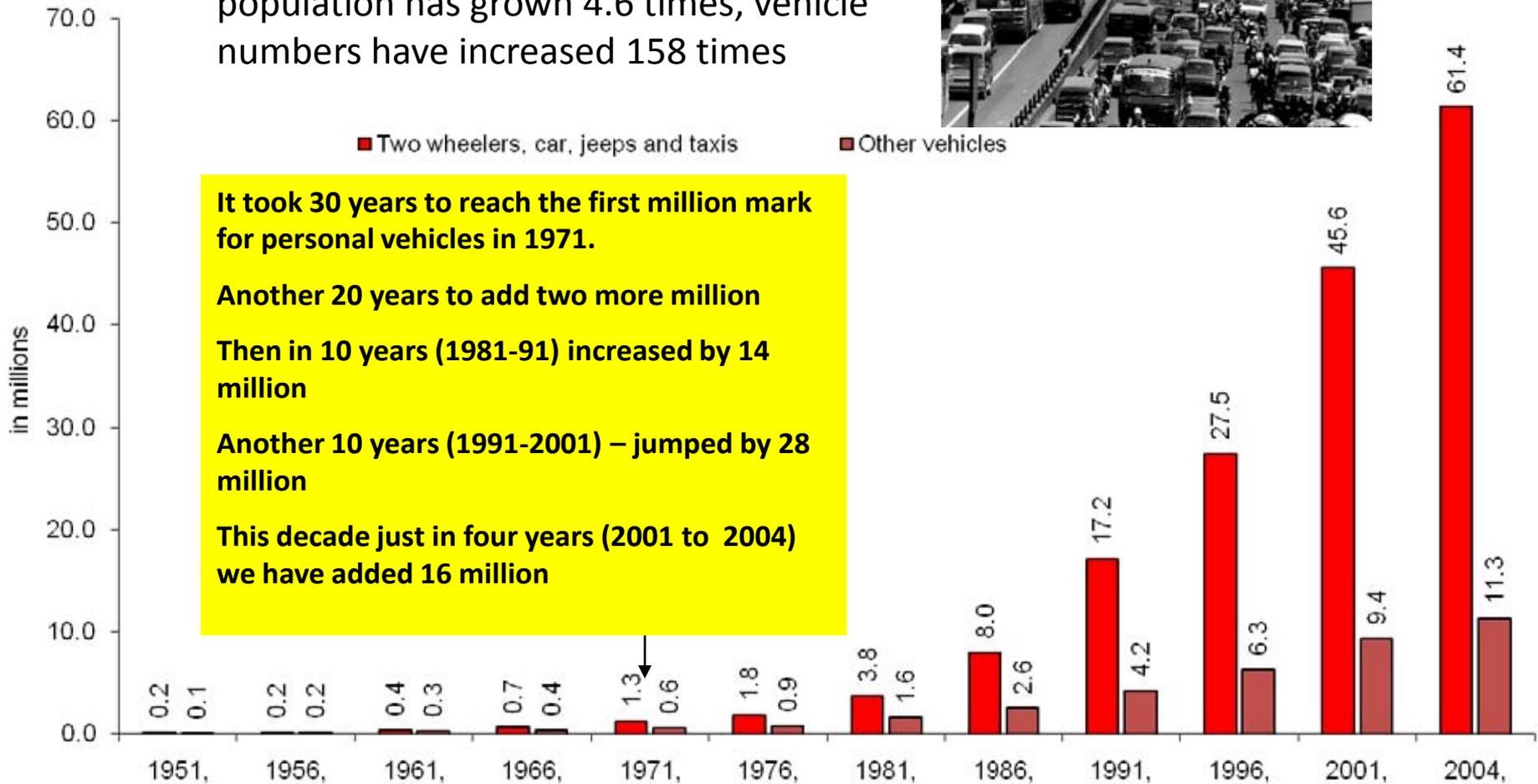




# Explosive numbers in India



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





# Vehicles in Nepal: Explosive



- Economic Survey: the country has a total of 1,178,911 registered vehicles between 1989/90 and 2010/11.
- During the first eight months of the 2011/12, the number of registered vehicles increased by 101,79 (8.6 per cent) reaching a total of 1,280,690 vehicles in the country.
- By mid-March of 2011/12, the average ratio of vehicles per kilometre of road across the country is estimated to reach 55 from the previous year's 53.

Type of Vehicle	Fiscal Year		Total**	Growth percent First (8 months)
	1989/90 to 2010/11	2011/12		
Bus	24853	1016	25869	4.09
Minibus	10247	602	10849	5.87
Car/Jeep Van	121901	5403	17304	4.43
Tractor	64764	2512	67276	3.88
Motorcycle	883634	90305	973939	10.22
Tempo (3 Wheeler)	7384	6	7390	0.08
Microbus	2323	61	2384	2.63
Truck/Dozer/Crane	11104	152	11256	1.37
Pick Up	9768	1208	10976	12.37
Truck Tipper	36826	441	37267	1.20
Others	6107	73	6780	1.20
<b>Total</b>	<b>1178911</b>	<b>101779</b>	<b>1280690</b>	<b>8.63</b>

\*Till mid-March of FY 2011/12

Source: Department of Transport Management

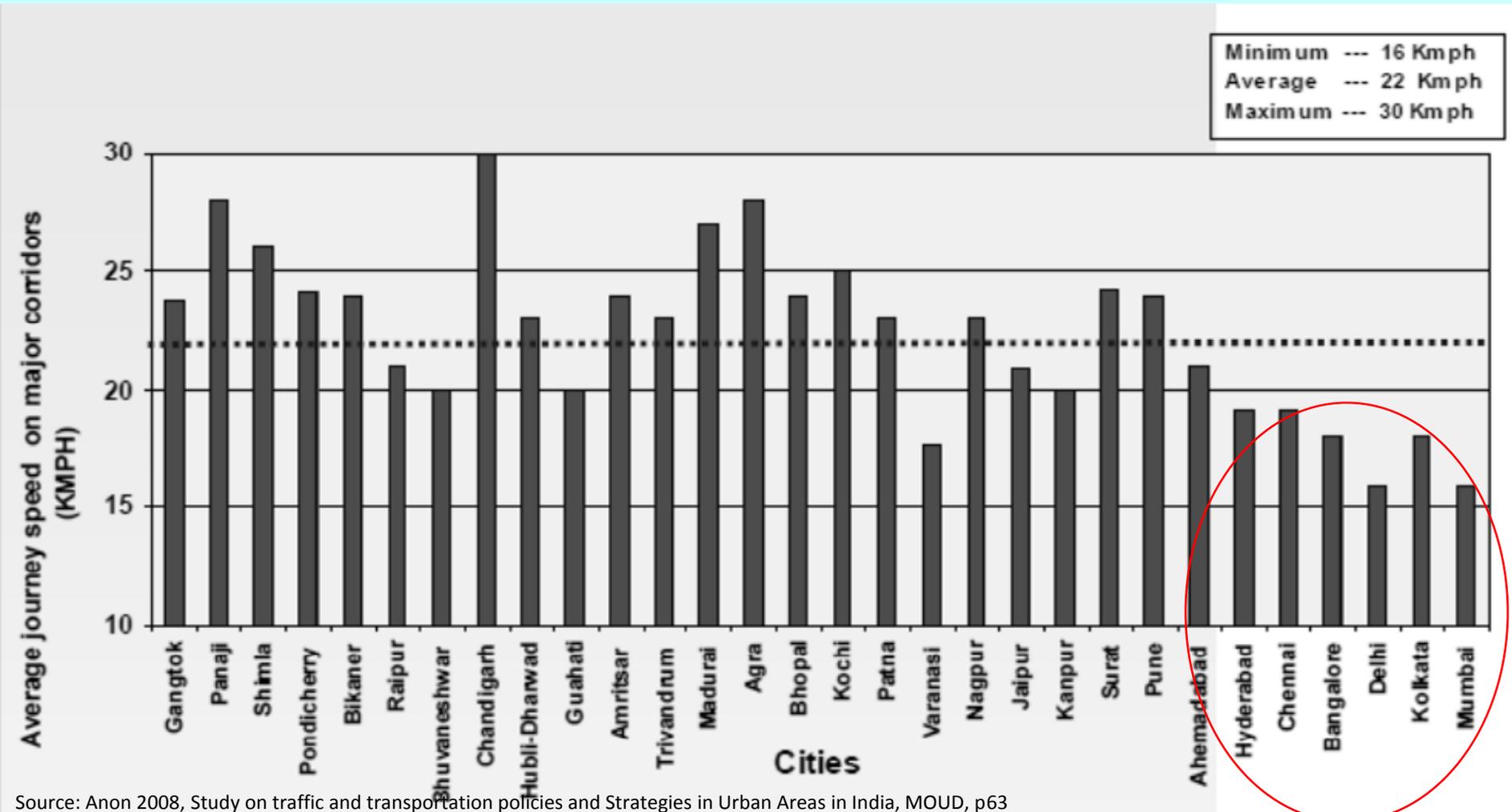


# Indian cities are paralyzed

## 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

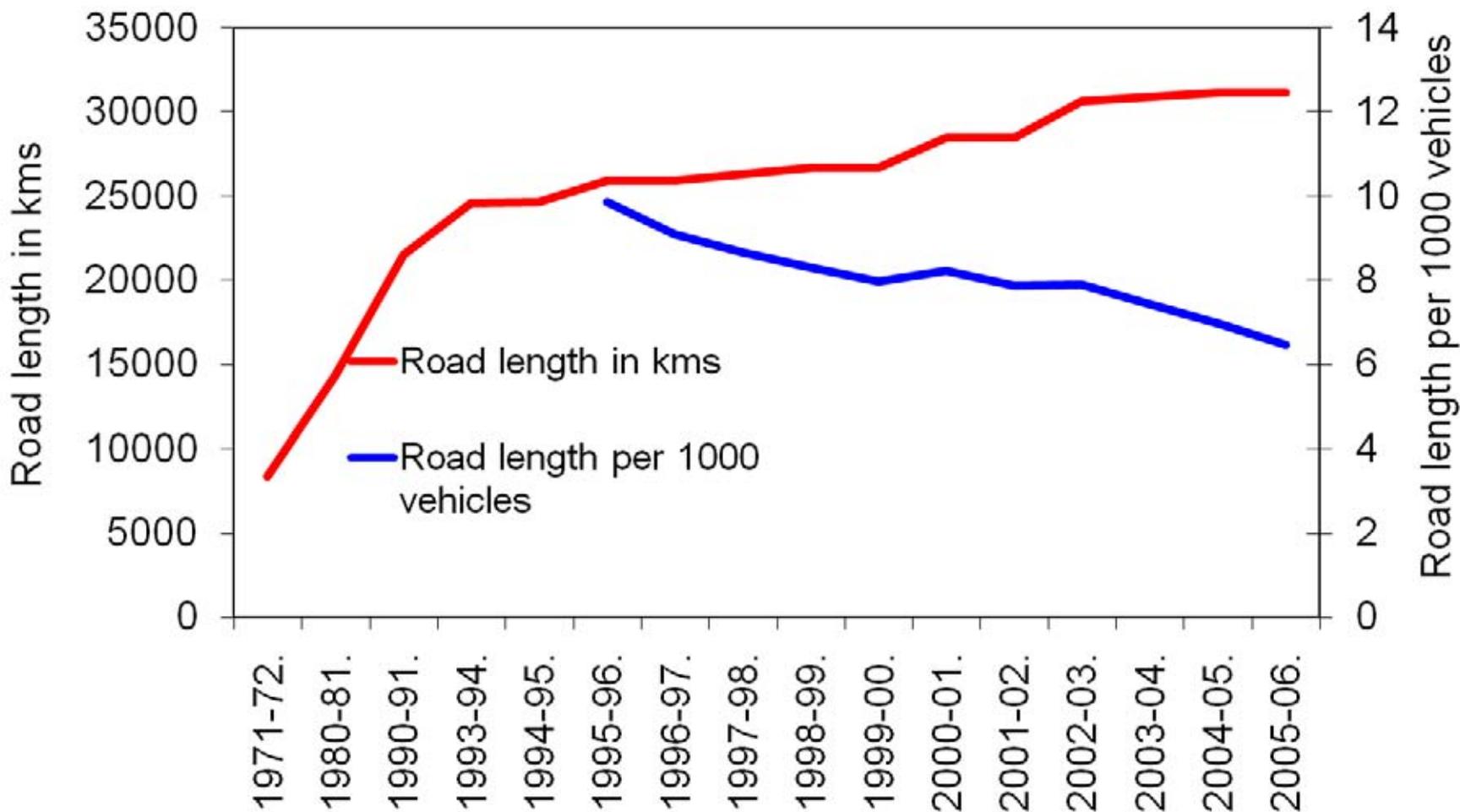




# Can building more roads help? Delhi has failed to solve the problem of congestion by widening road network ..... *We can never build enough roads*

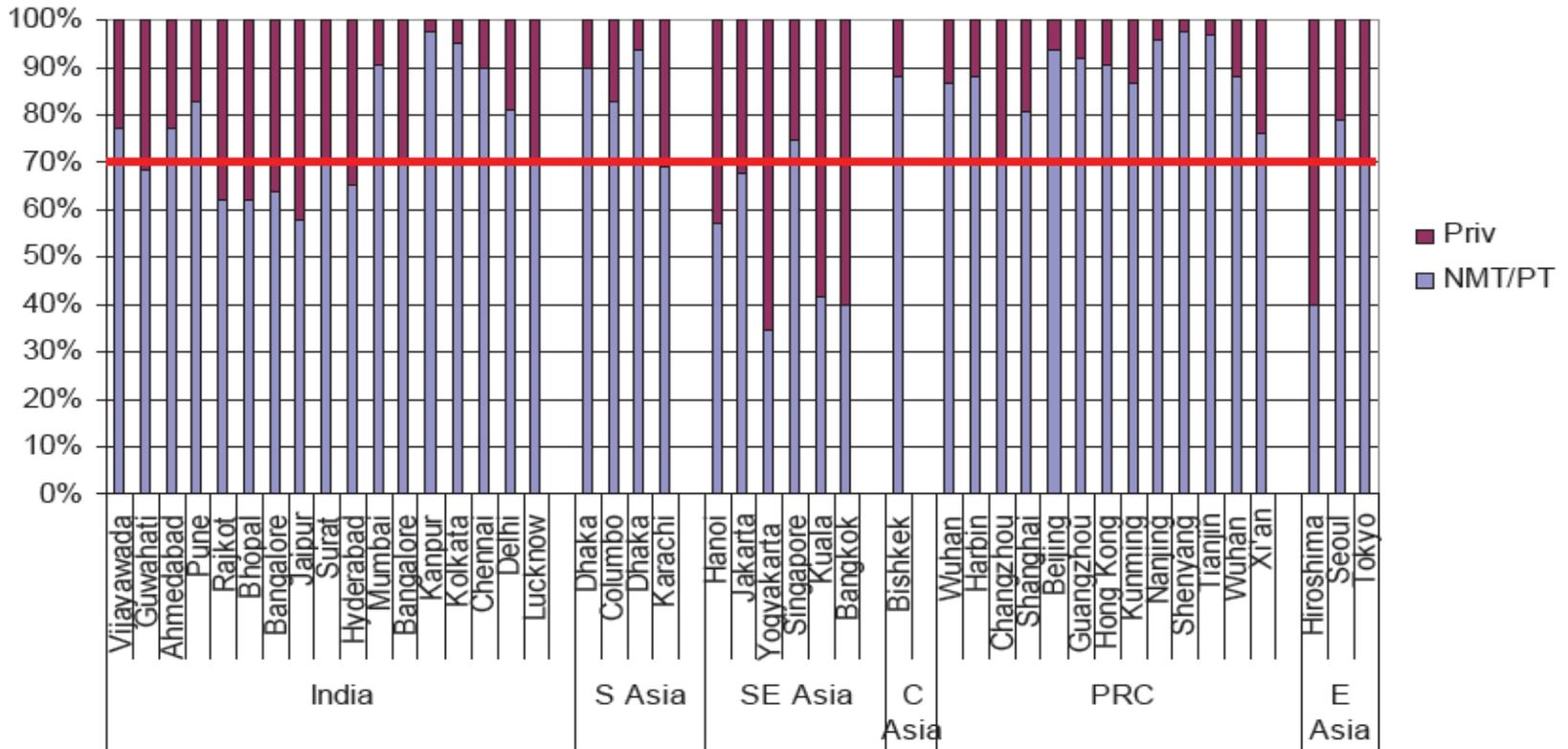


Delhi has built 66 flyovers. It has not helped....





# 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

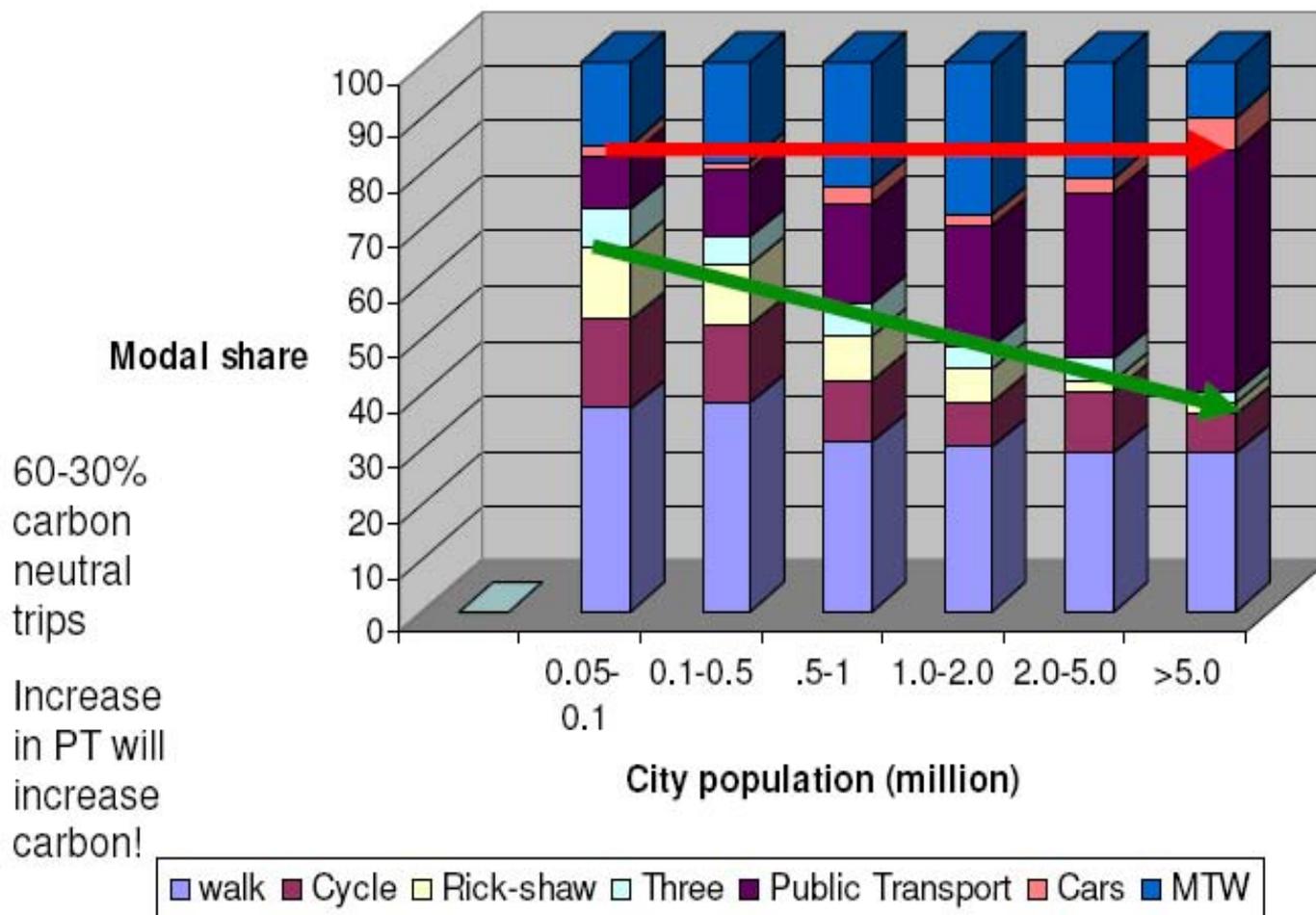


# Strength of our cities....



## Urban Mobility

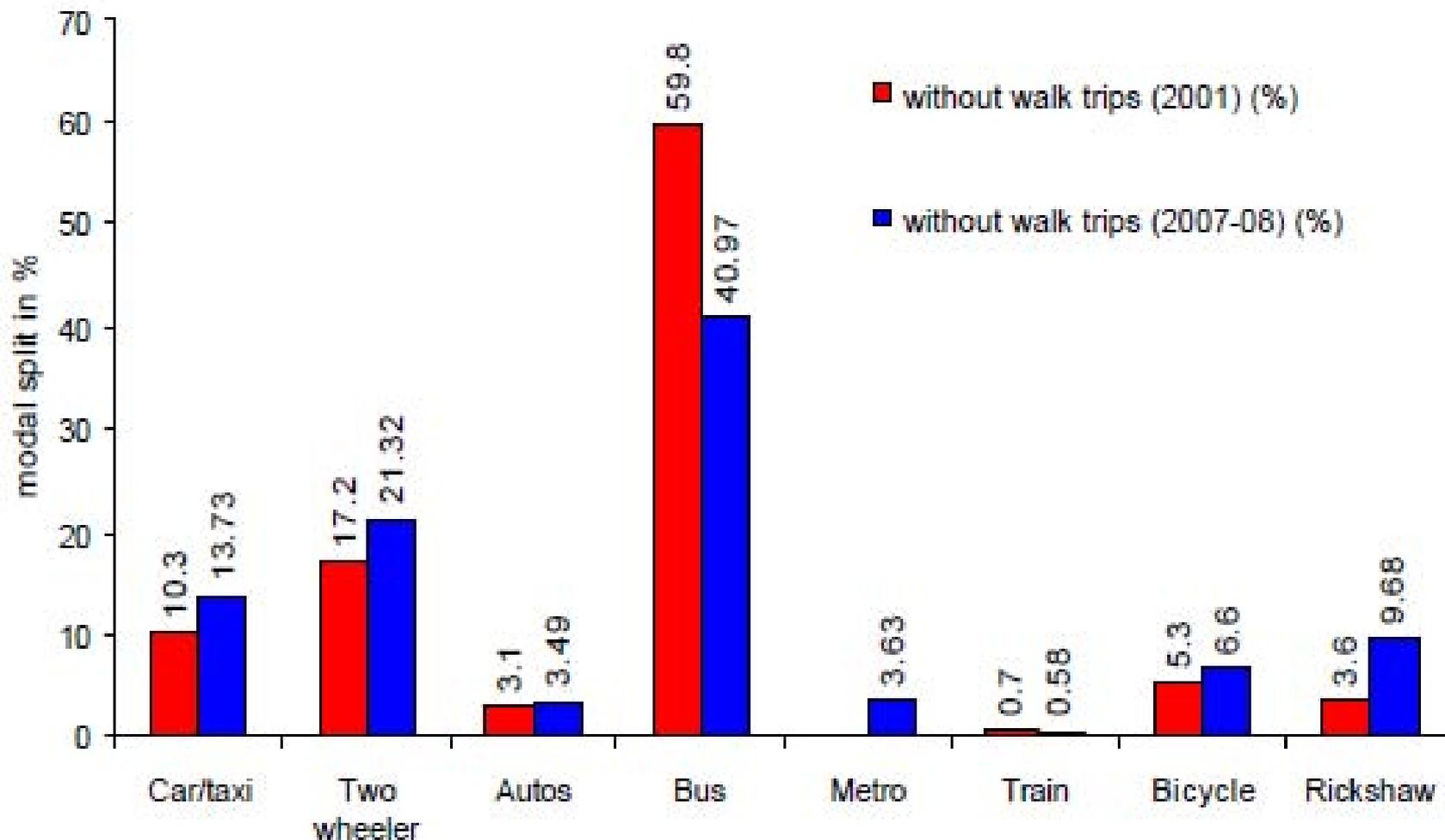
PT and NMV based, MTW majority personal vehicles





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

## Public transport losing ground

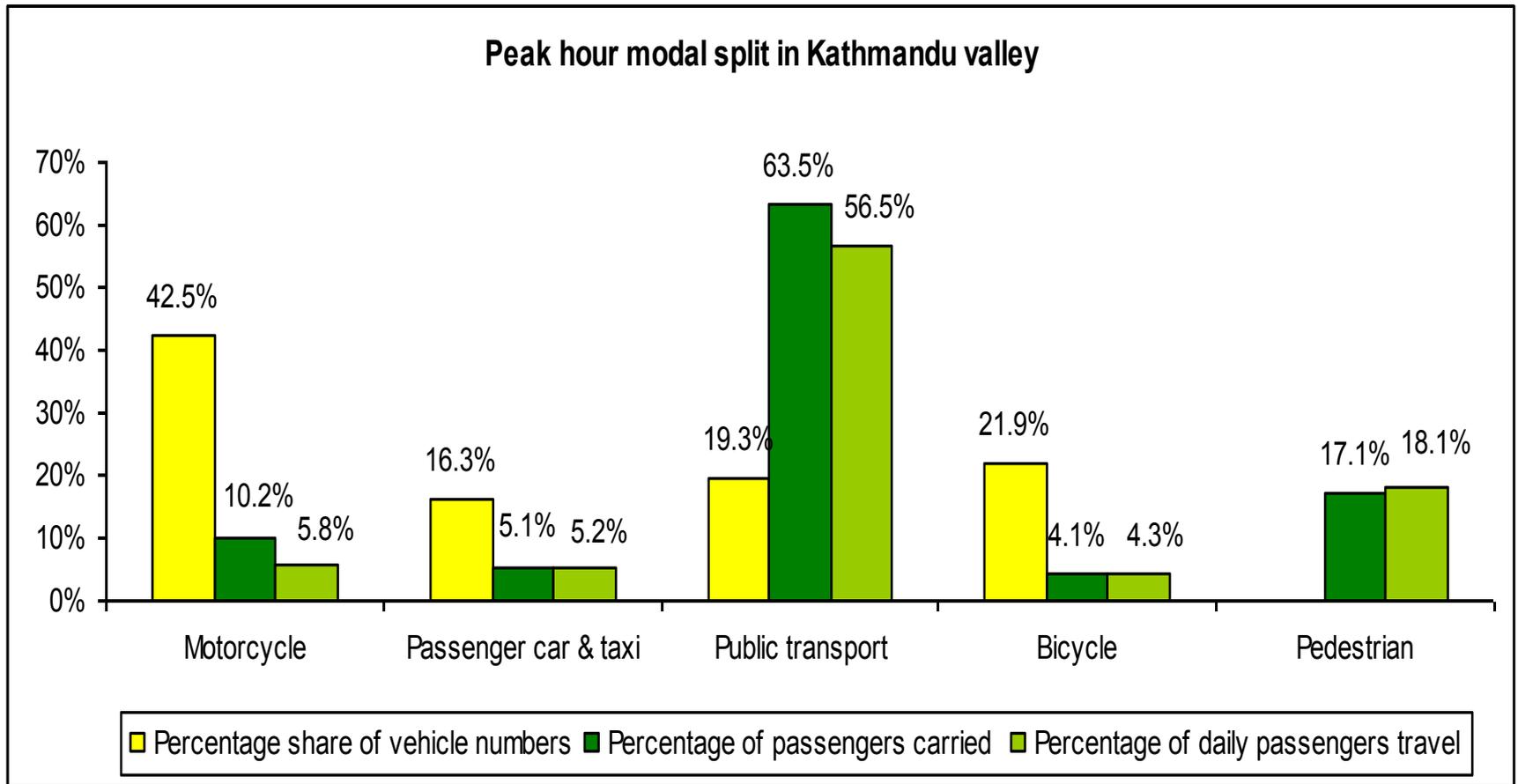




# Transport modal share in Kathmandu (2001)



Bus is 19% of the vehicles kms but carries 63.5% of the passenger km





# Kathmandu.....





# Challenges of rebuilding public transport



# Buses: present and future



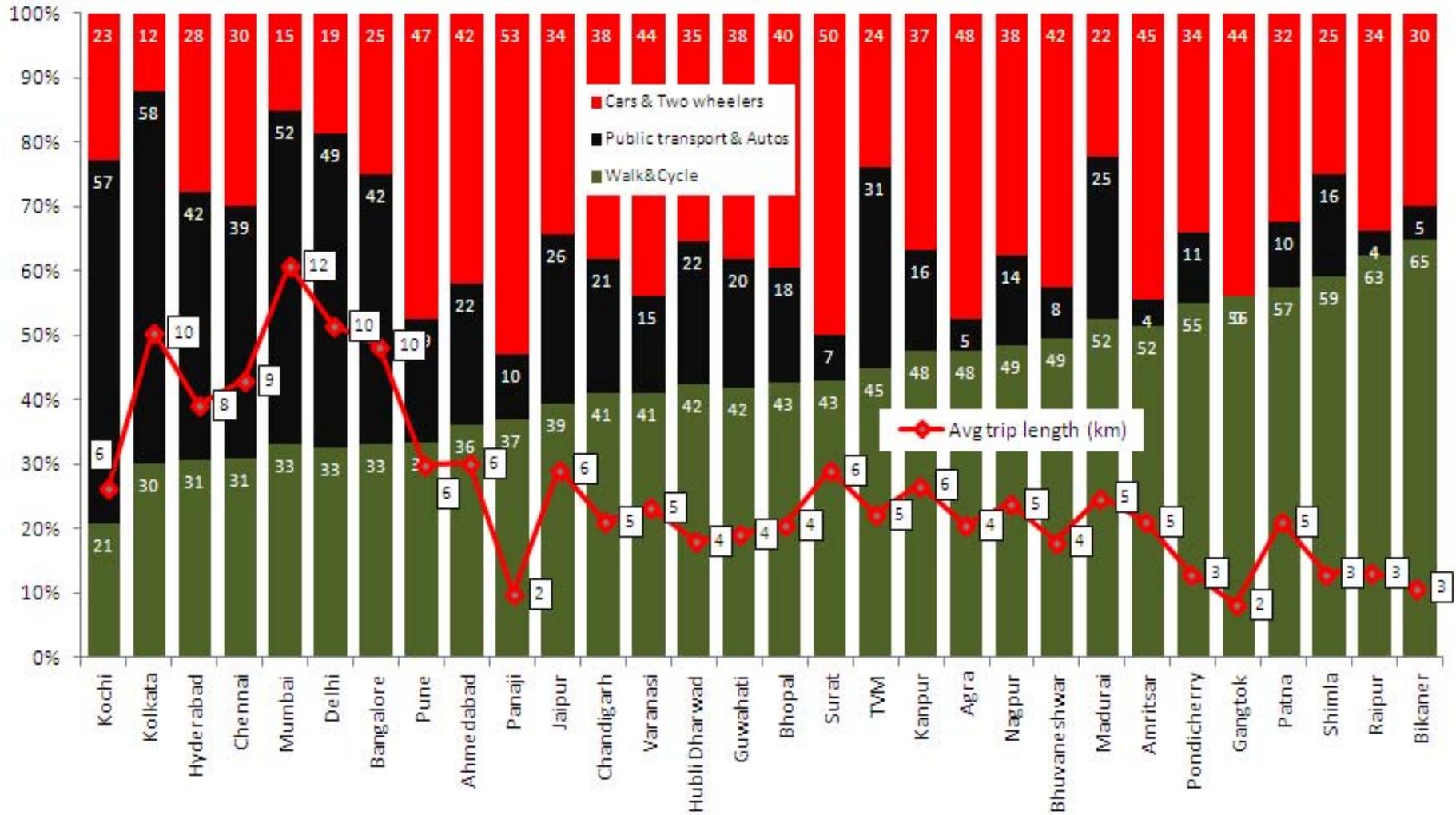
- Cities grow with walk; cycle and then instead of bus move to car
- Buses are critical as spine of city mobility -- **allow greater flexibility, geographical coverage, cost effectiveness, and space efficiency**
- Buses are fuel efficient – move people in most cost-effective way

## 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



# Need organised public transport to reduce the impact of motorisation



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

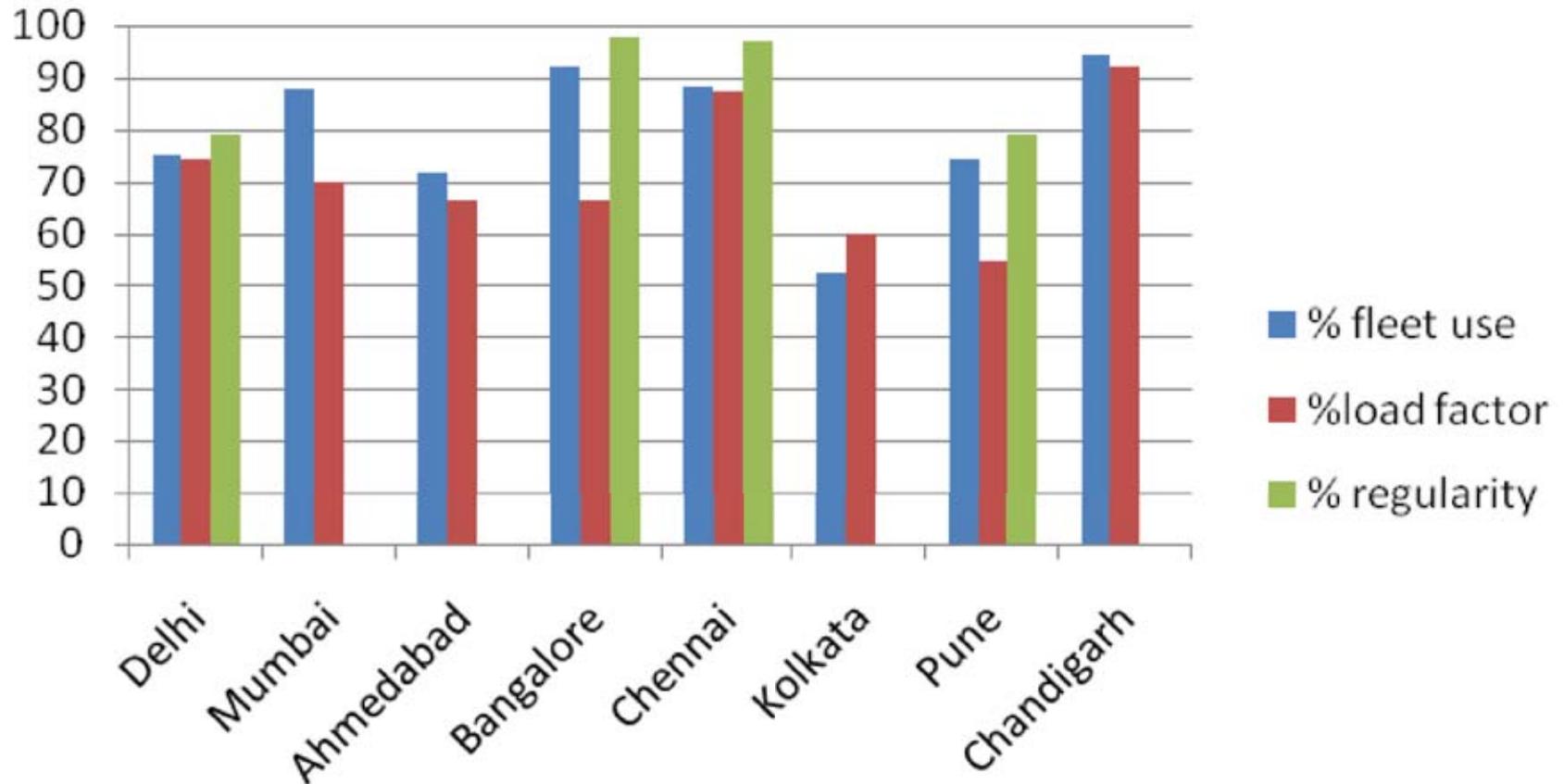


# Bus transport can make a big difference... But....

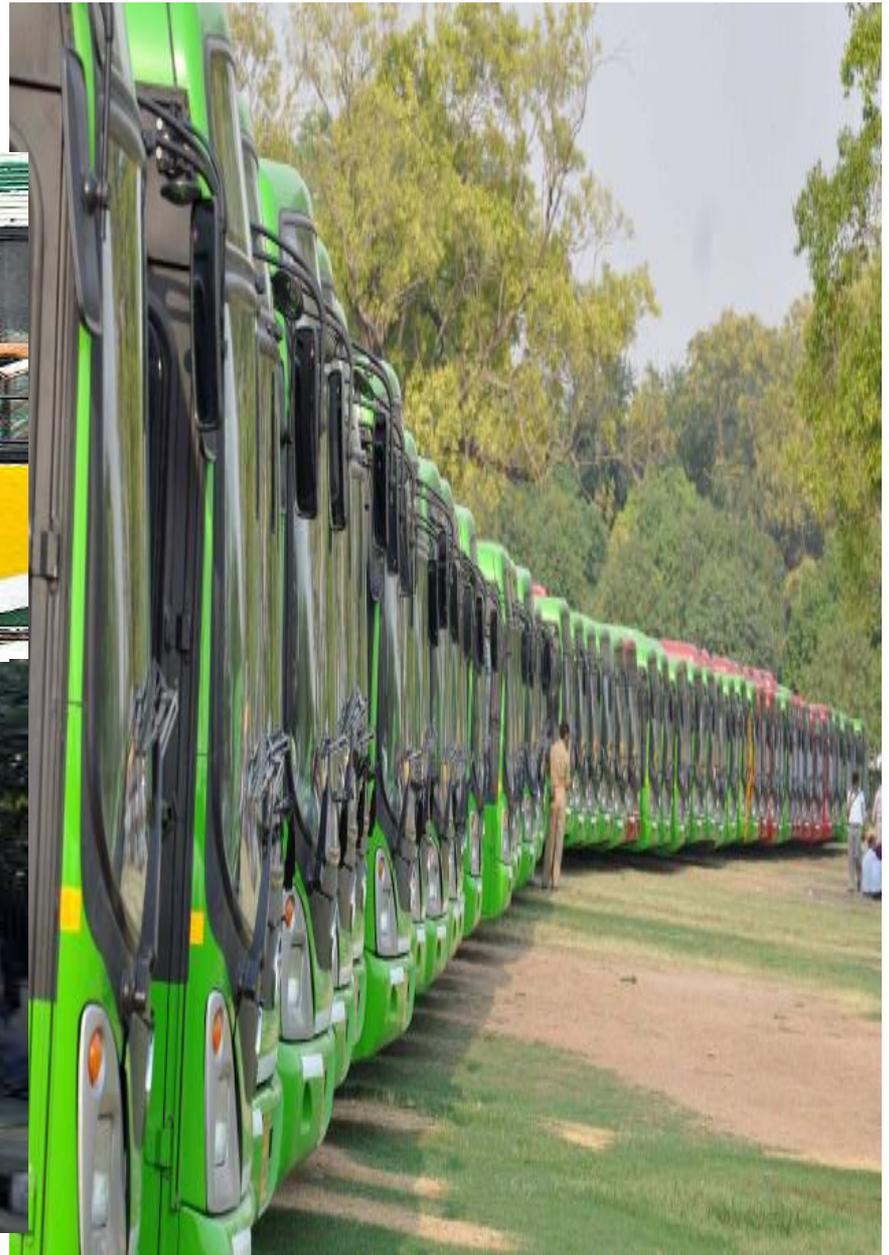


- **COLOMBO:** A increase in bus share from 76% to 80% can save 104,720 tonnes of oil equivalent, or 3% of the fuel consumed in the baseline case. This means 5% reduction in total vehicles and freeing up of roadspace equivalent to removing 62,152 cars.
- This can also lead to 5% reduction in total vehicles (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**

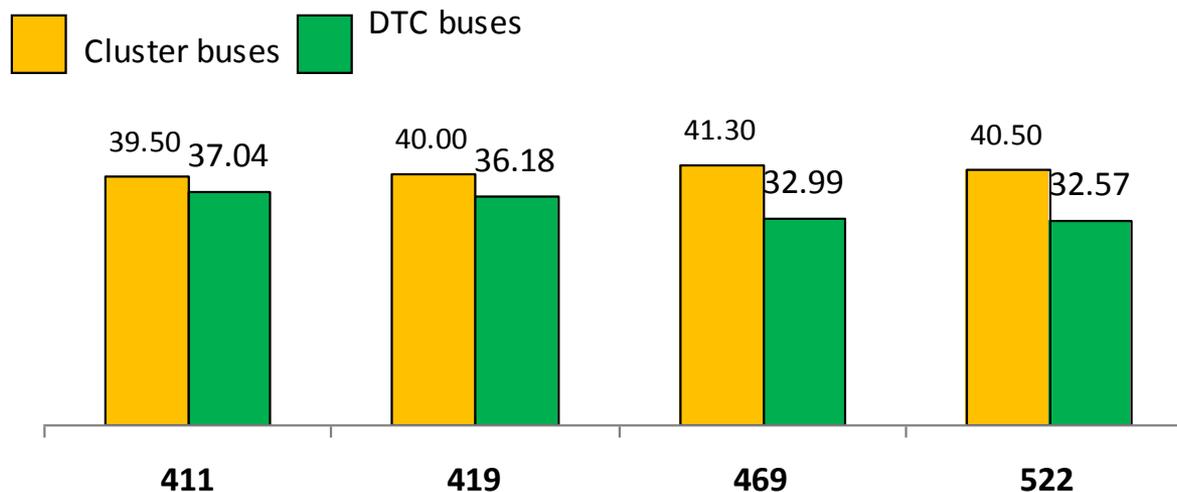


# Delhi: Big transition started

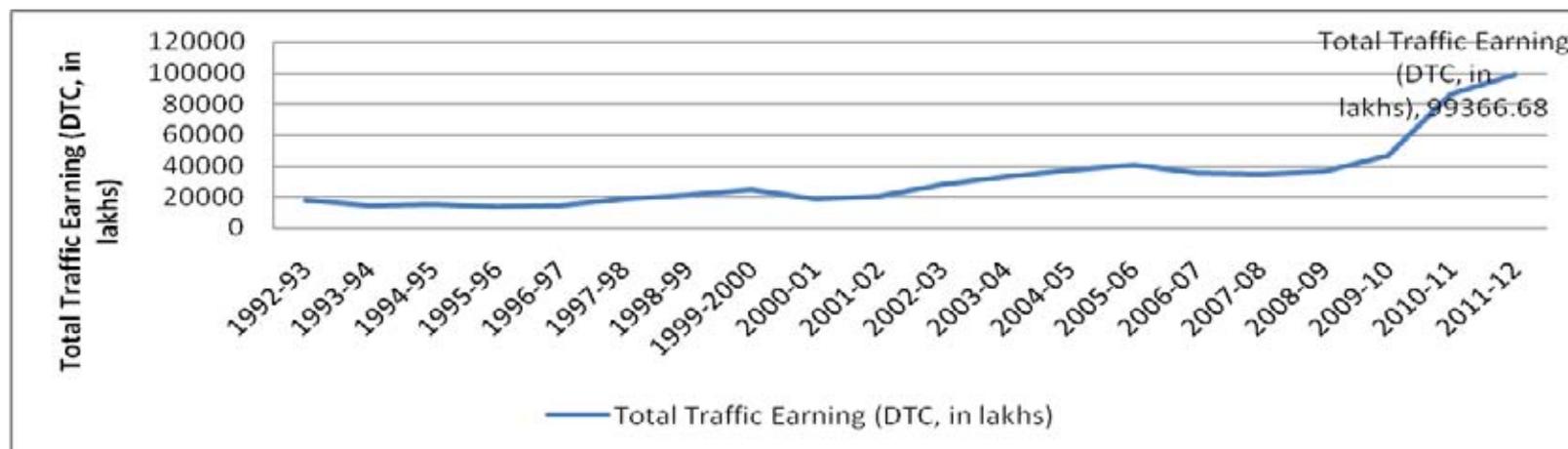
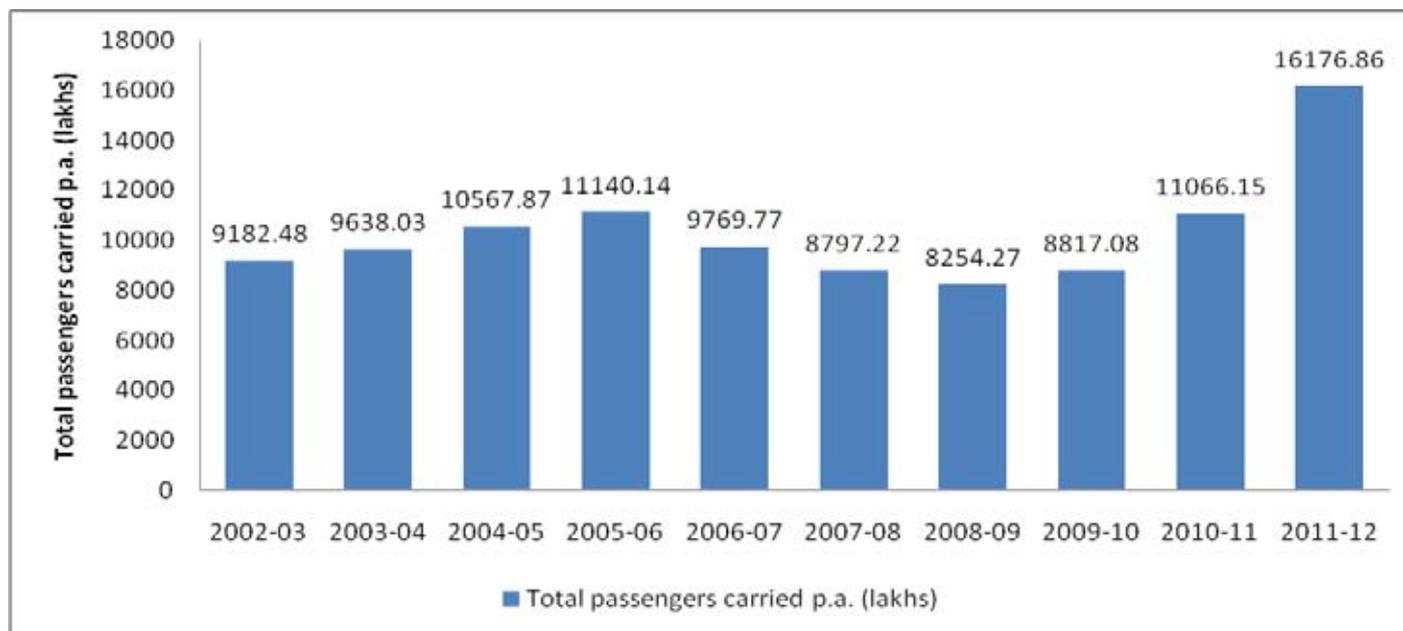


# Delhi: restructures buses

- 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



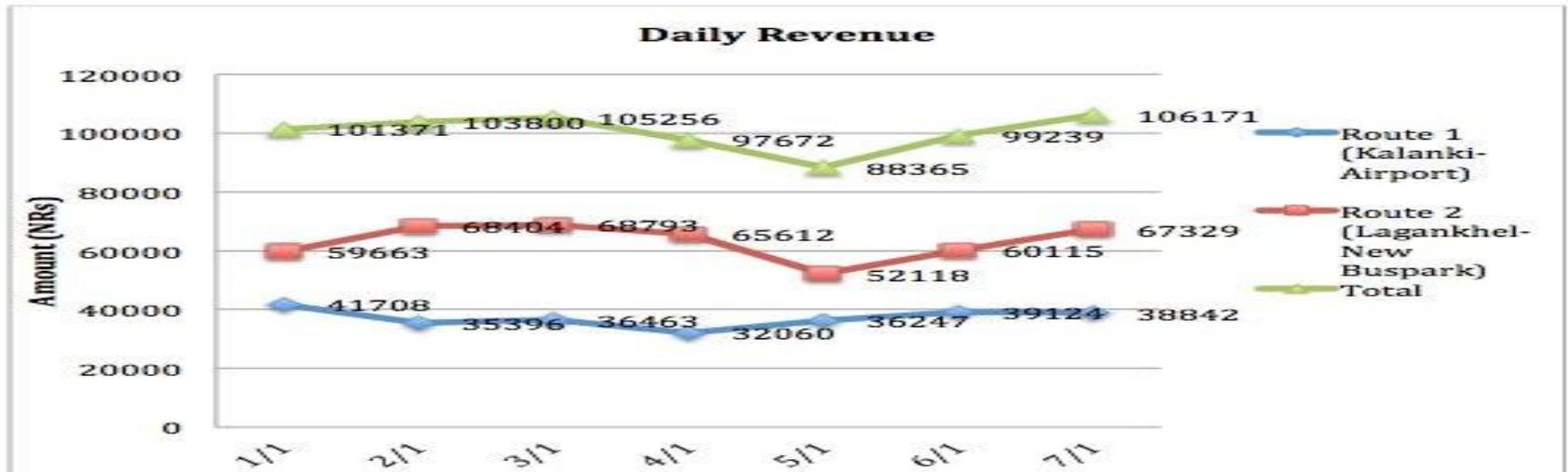
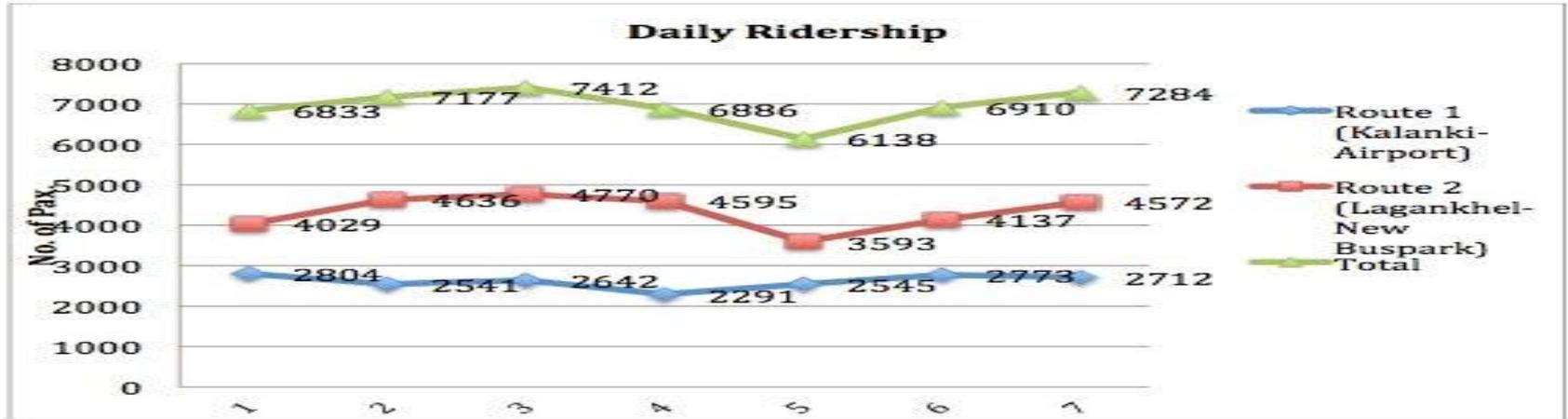
# Revival of Sajha Yatayat

- After a decade long gap, Sajha resumed services with 16 new buses on 2 routes on April 13, 2013
- Plying on two routes, Satdobato Lagankhel-Jawalakhel-Tripureshwor-Ratna Park-Maharajgunj-Basundhara New Bus Park and Kalanki-Kalimati-New Baneshwor-Tinkune-Airport
- Sajha buses are Euro III compliant and have automated doors, CCTV cameras and display screens for advertisements, public notices and entertainment, 15 strap hangers for standee passengers and with a seating capacity of 55
- To expand the Sajha Yatayat bus fleet.
- The cooperative has been looking for funds from bank and financial institutions to buy buses for its expansion plan



# Revival of Sajha Yatayat

More than 10,000 commuters have been riding Sajha buses daily





# 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.....





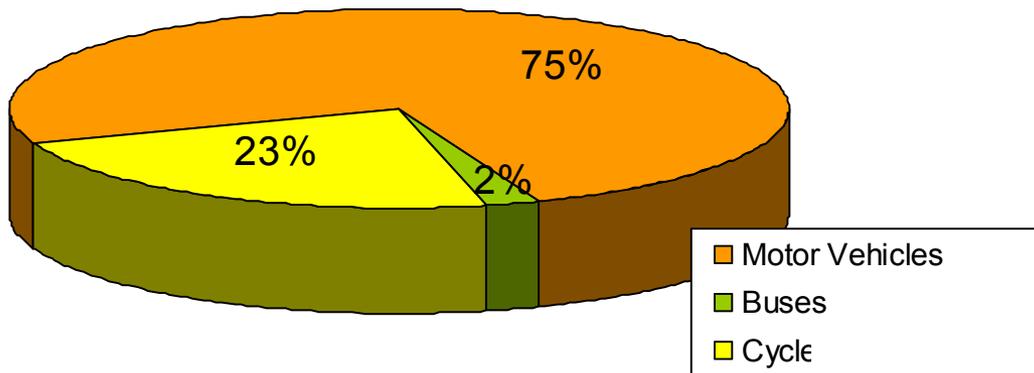
# Who must get the priority – People or Vehicle? Plan for people. Not vehicles.



## Understand the BRT corridor in Delhi....

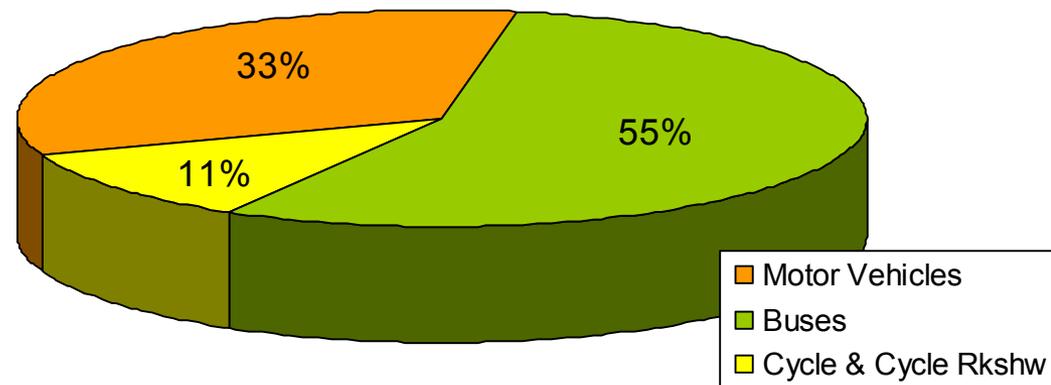
- -- **Buses are 2% of the fleet but carries 55% of the trips**
- **Cars and two-wheelers are 75% of the fleet but carry 33% of the trip.**
- **Important to take buses out of congestion**

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





## We tax our public transport more than cars...

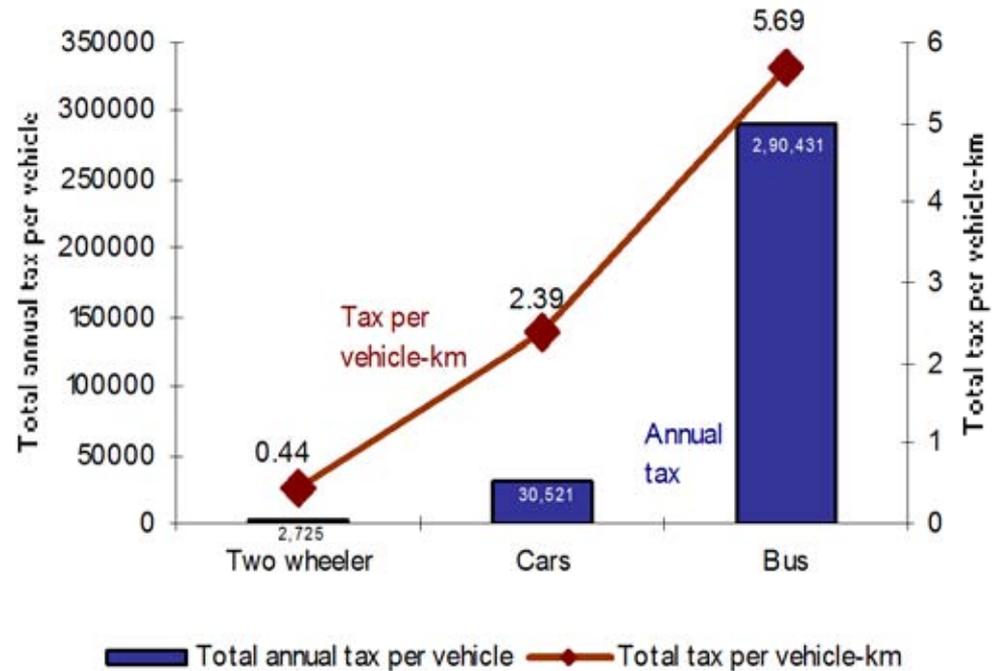


### Correct distortions...

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.



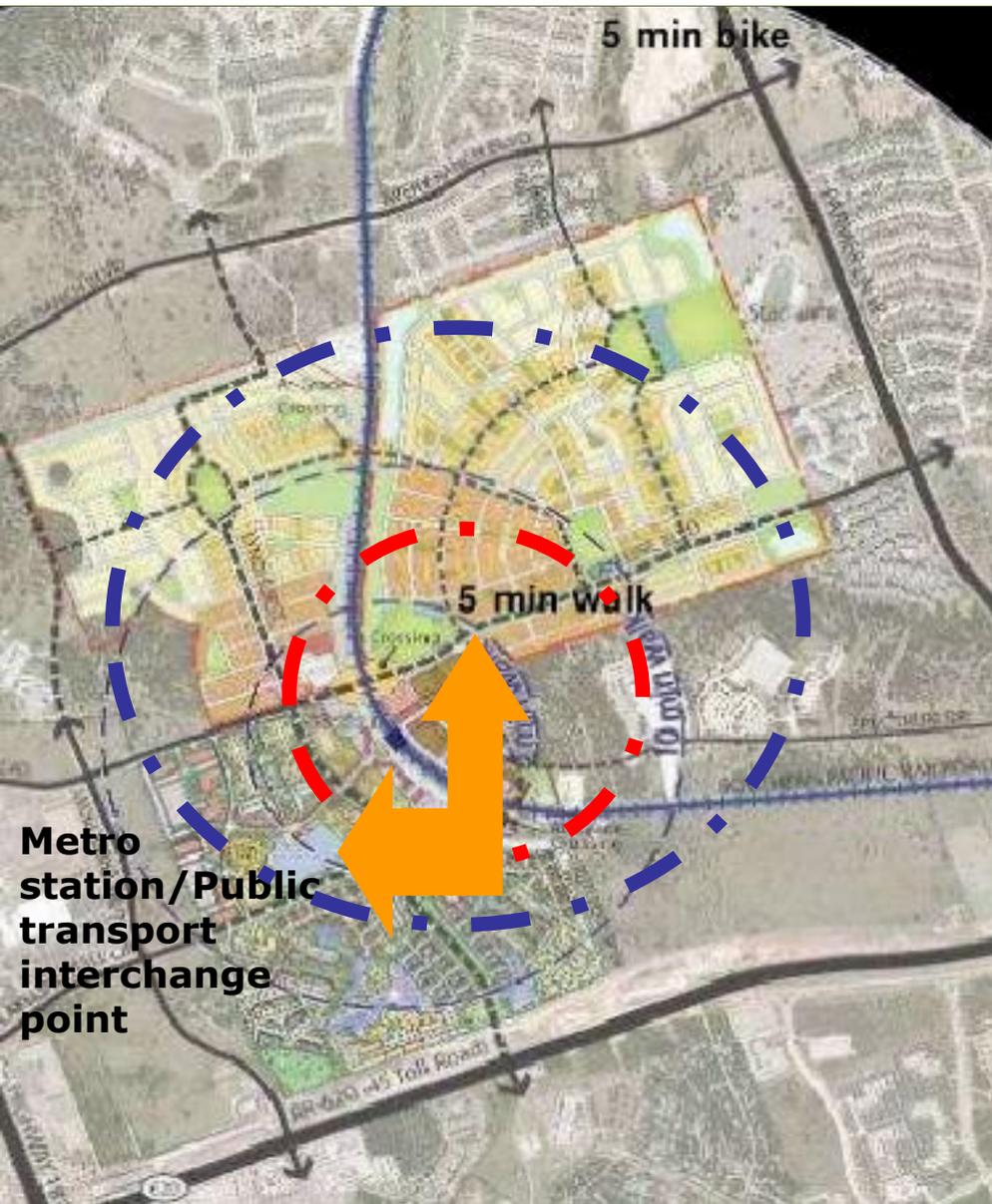


**Integrate, integrate integrate.....**

# 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.**



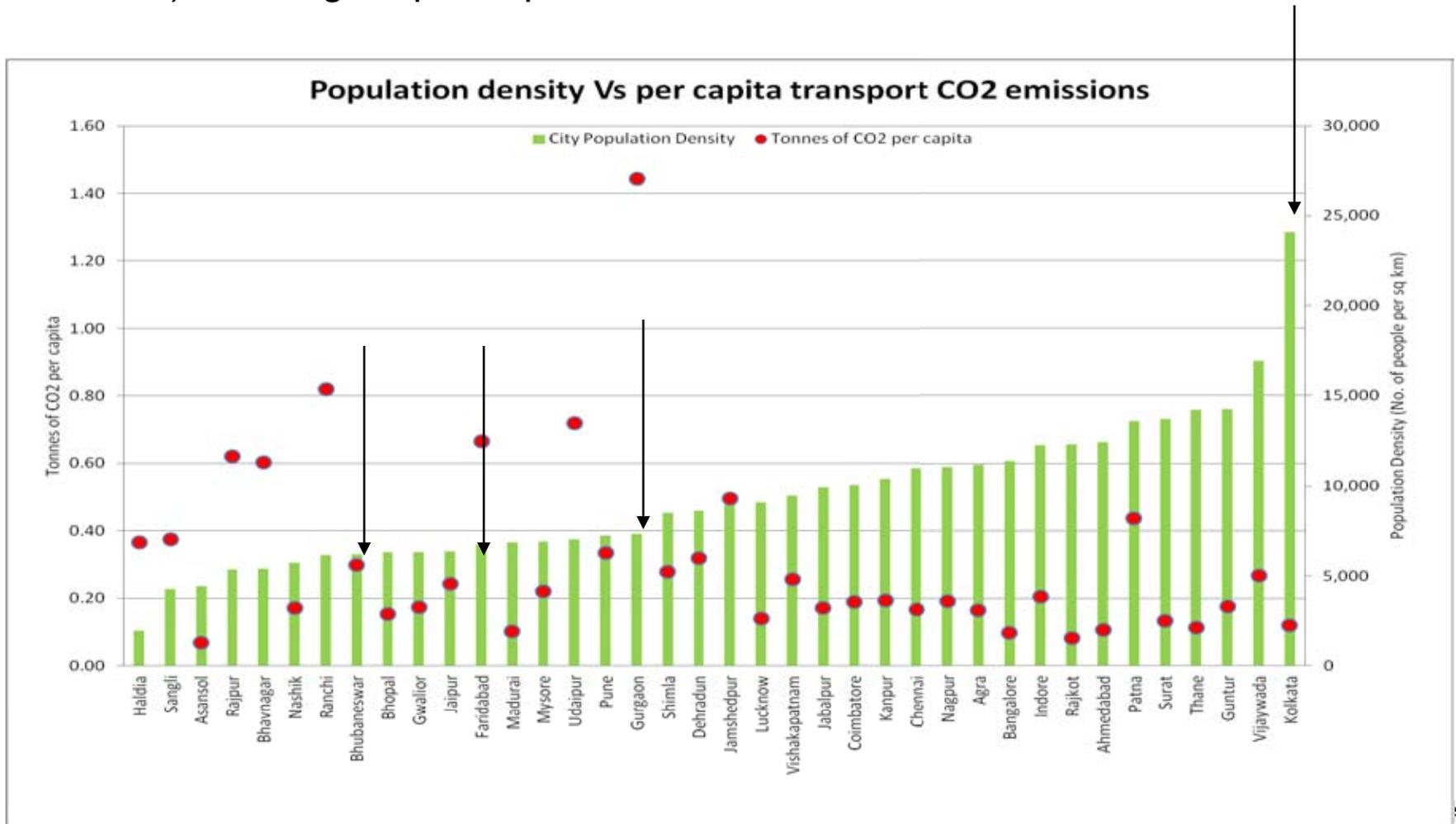
**Public transport cannot work in isolation.....**



# 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





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





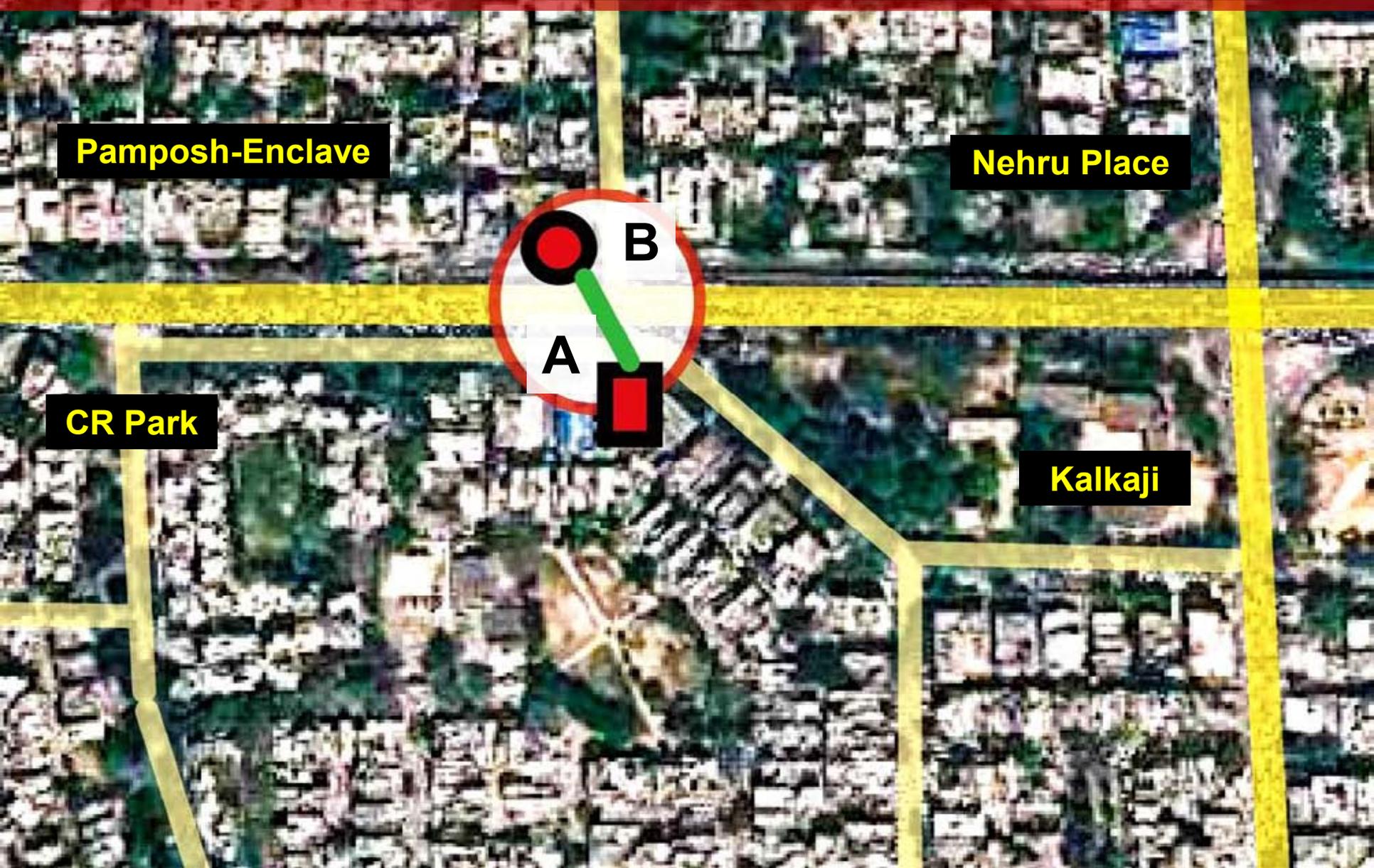
# Why signal free corridors?



# Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B

Originally 30M across the road



Pamposh-Enclave

Nehru Place

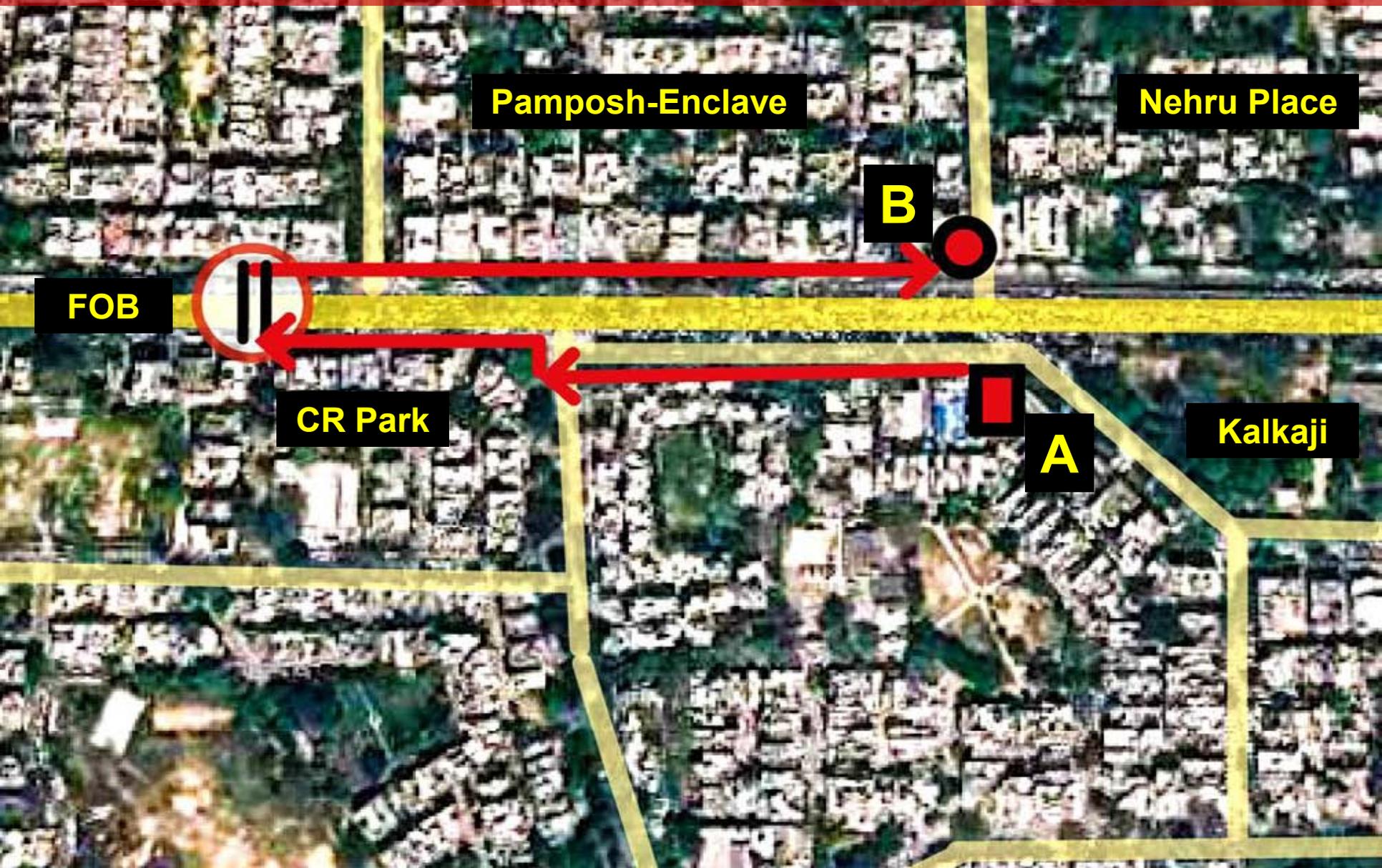
CR Park

Kalkaji

# Case Study – Outer Ring Road (Nehru Place Flyover)

Travelling from A to B – Pedestrian Route 1

1000M via FOB



Pamposh-Enclave

Nehru Place

B

FOB



CR Park

A

Kalkaji



# 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
- **Number 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***

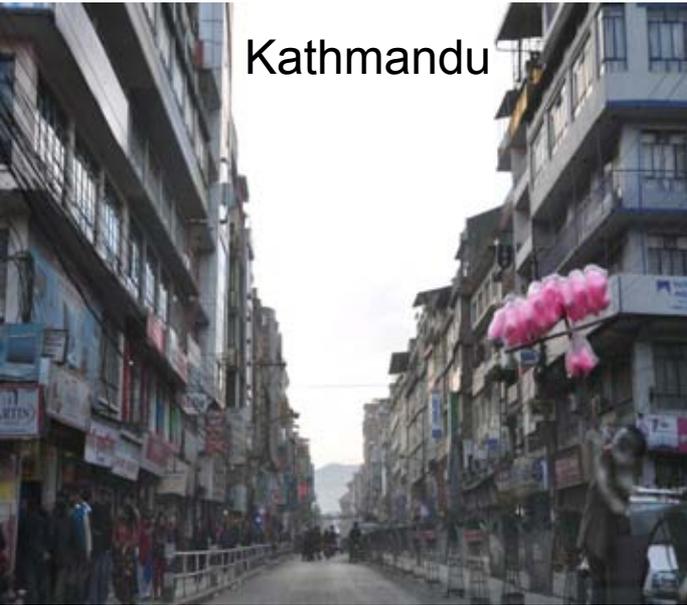
- **95% of residences should have daily needs** retail, parks, primary schools and recreational areas accessible **within 400m walking distance.**
- **95% residences should have access to employment and public and institutional services by public transport or bicycle or walk or combination of two or more.**
- **At least 85% of all streets to have mixed use development.**
- **Need small block size with high density permeable streets etc**

### **UTTIPEC guidelines**

<b>Hierarchy of Facilities</b>	<b>Accessibility Standard from each home/ work place.*</b>
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



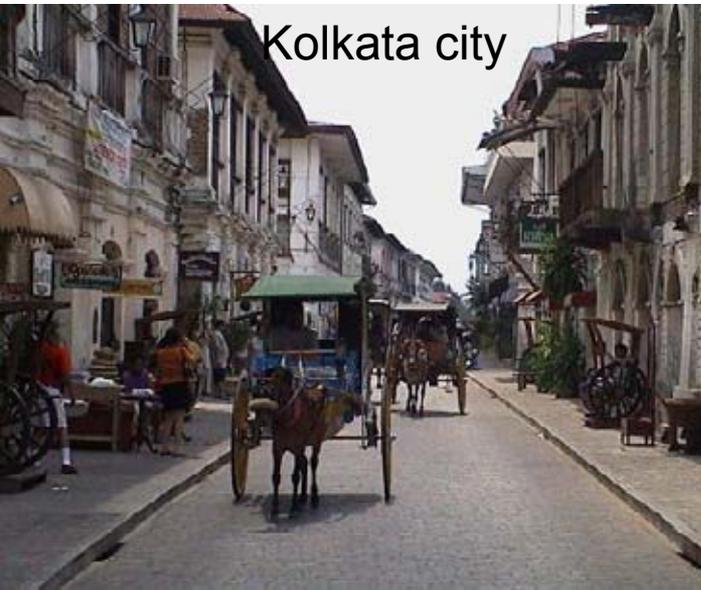
Kathmandu

**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



Kolkata city

**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



# Retrofitting changes.....



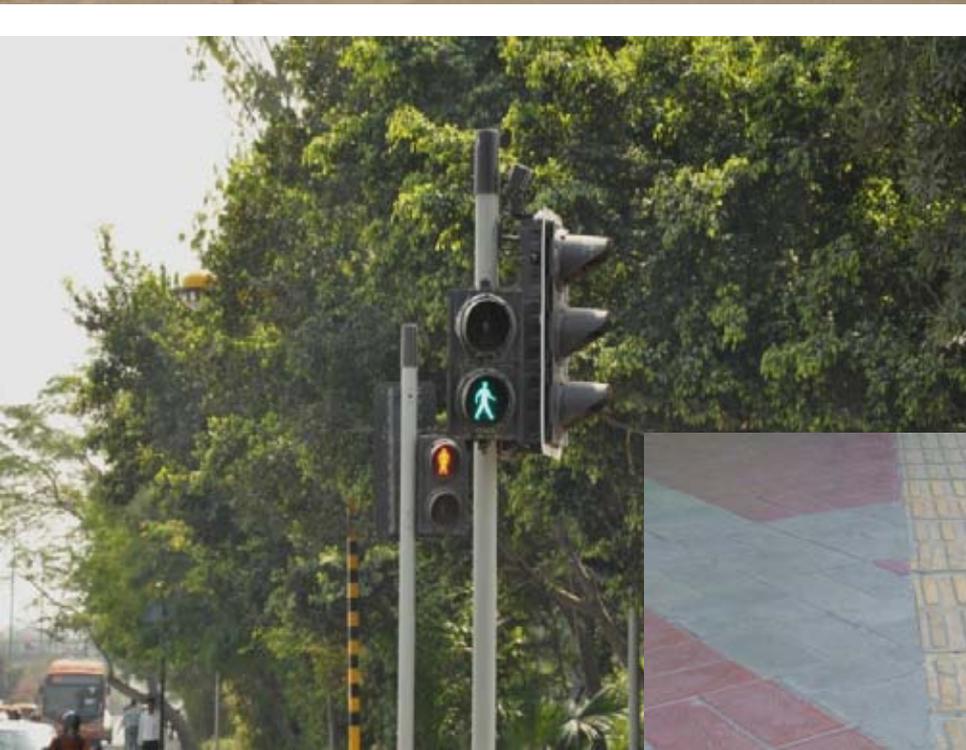
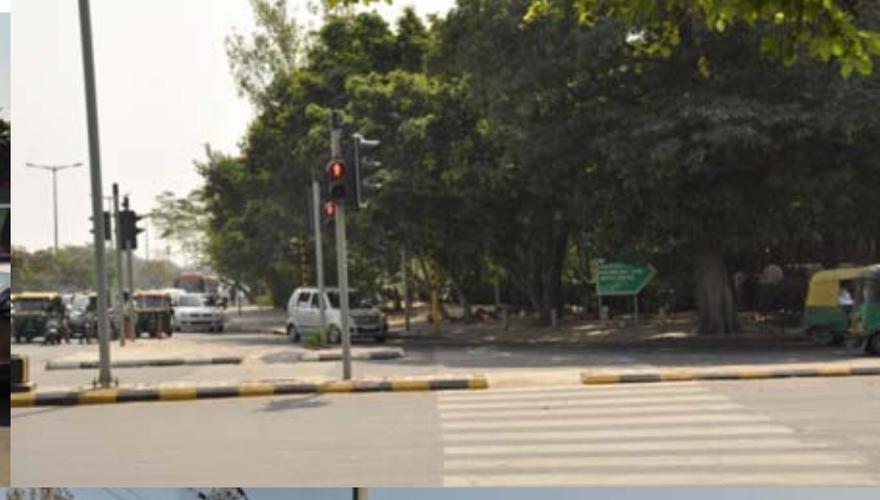
Connaught Place

- Sidewalks are now being rebuilt in Delhi





# Design details demonstrates that walkers and cyclists matter

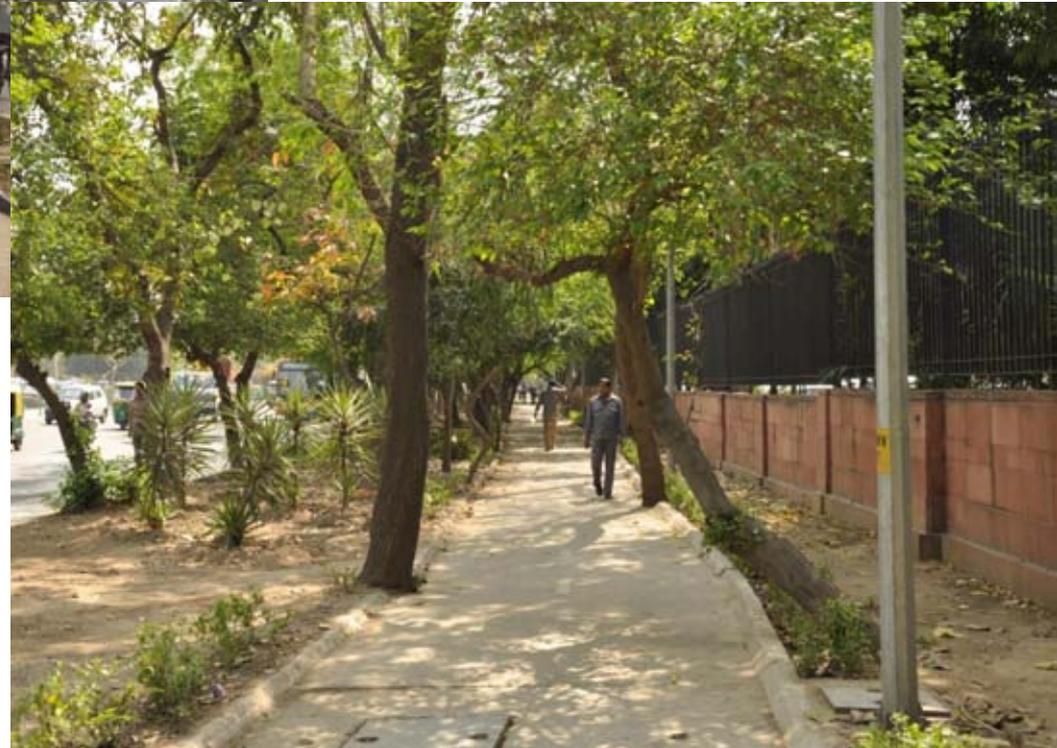


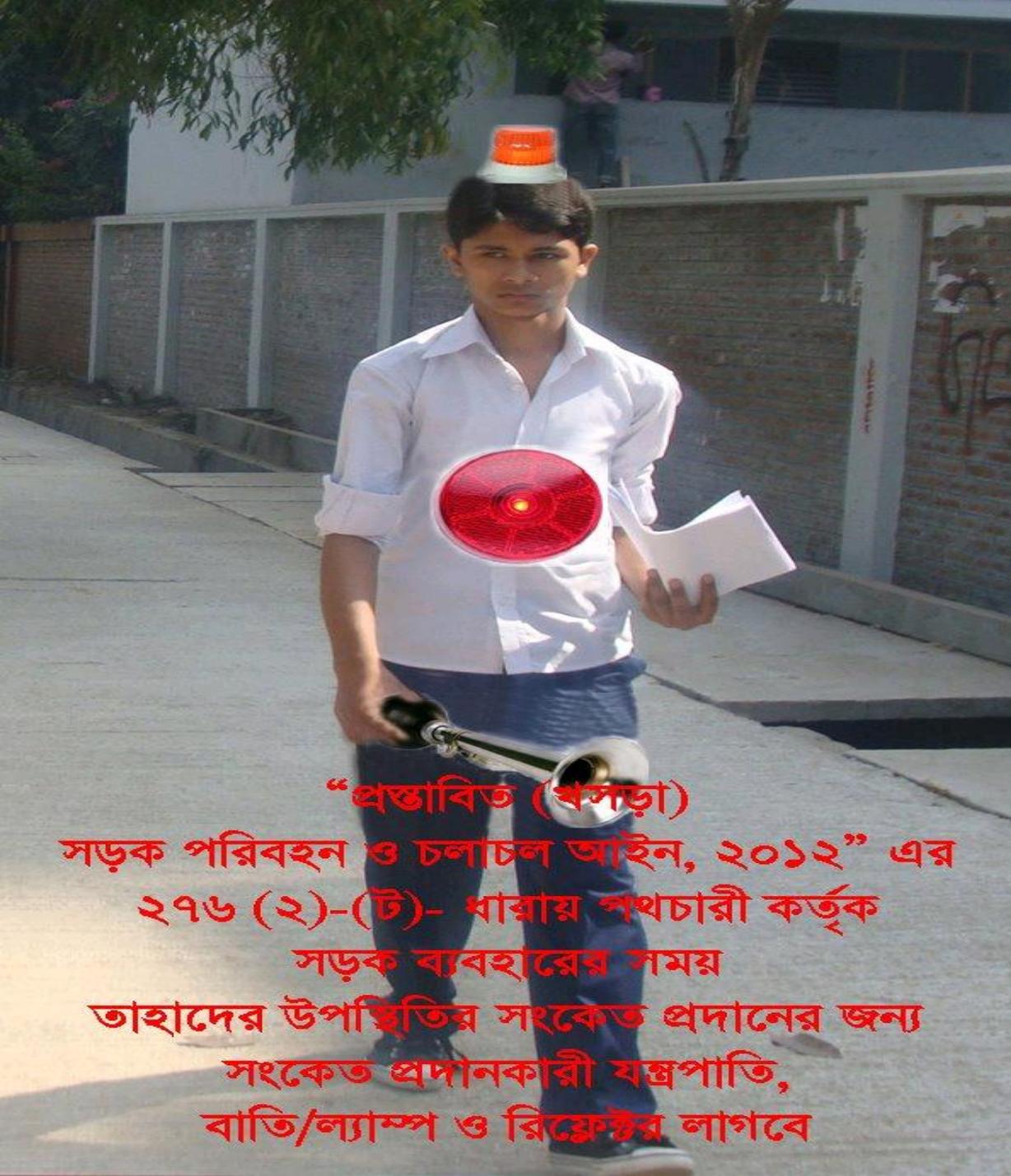


# Smooth ride on a well design wide track.....



VIKAS MARG





“প্রস্তাবিত (খসড়া)  
সড়ক পরিবহন ও চলাচল আইন, ২০১২” এর  
২৭৬ (২)-(ট)- ধারায় পথচারী কর্তৃক  
সড়ক ব্যবহারের সময়  
তাহাদের উপস্থিতির সংকেত প্রদানের জন্য  
সংকেত প্রদানকারী যন্ত্রপাতি,  
বাতি/ল্যাম্প ও রিফ্লেক্টর লাগবে

Onus on whom?

Experience from  
Dhaka

Bangladesh Road  
Transport  
Regulations and  
Rules 2012 requires  
pedestrians to carry  
indicators including  
reflector, lamp etc

People are  
complying to protest



What might still be going wrong.....

Treating walking and cycling spaces as streetscaping and not as usable infrastructure.....



# Discontinuous: Goes nowhere





# Beautiful well designed stretch. But design bars entry. No amenity



**VIKAS MARG.  
New Delhi**



# Assessment of the new cycle and foot paths





# High speed motorised traffic at the entry point of the track.



No traffic calming for easy and safe access to the lane



**VIKAS MARG**



# Unsafe Junction: How do we turn without protection?



**VIKAS MARG**



**TUGHLAKABAD  
FORT**



# Invasion



**BRT  
CORRIDOR**



# Where is our “Right of Way”? Walk and cycle lanes encroached



**BRT  
CORRIDOR**





# Checking out the universal design



**City regulators crossing roads on wheelchair to understand universal road design**

**Disability and walking.....** Samarthy am survey: 58% of the disabled found steps, ramps, difficult to negotiate; 45% of elderly found steps and ramps daunting; 20% found uneven, narrow sidewalks difficult. Engineering guidelines for disables are not implemented

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



# Steps towards growth of NMT infrastructure



- Few Kilometers of cycle track is built in Kathmandu
- Several Kilometers of cycle lane is being planned
- The capital will finally have a 2,600- meter cycle lane from Tinkune to Maitighar within two months.
- Started in July, the government has already completed 80 percent of the construction work-despite the Constituent Assembly



**Kathmandu: Vehicle free zone  
(Pedestrianized) – A great place to hangout  
for city dwellers and tourists**



**Pokhara: A long stretch of lakefront is being  
pedestrianized**



**Pedestrianization in Bhaktapur  
Whole core area of Bhaktapur as vehicle  
free zone from  
2050 A. D. onwards**

Source: CAI Asia Nepal



# Kathmandu: On right direction





# Colombo: does it naturally





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





# Delhi: Opportunity to transform streets

## Street Design Guidelines

"...for Equitable Distribution of Road Space" - NUTP



© UTIPEC, Delhi Development Authority, New Delhi  
Guidelines Adopted: Nov 2009. Revision 1: Nov 2010

### 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.

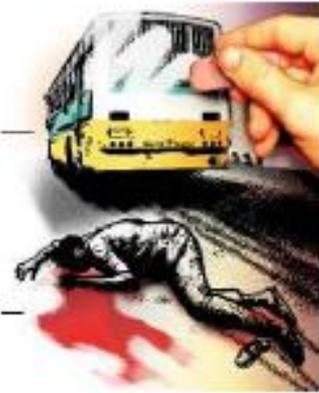
Remove gates on public streets from gated colonies from vulnerable areas.



# Features of UTTIPEC street design guidelines



**GOAL 1:**  
**MOBILITY AND ACCESSIBILITY –**  
Maximum number of people should be able to move fast, safely and conveniently through the city.



**GOAL 2:**  
**SAFETY AND COMFORT –**  
Make streets safe clean and walkable, create climate sensitive design.



**GOAL 3:**  
**ECOLOGY –**  
Reduce impact on the natural environment; and Reduce pressure on built infrastructure.



# Features of UTTIPEC street design guidelines



## Ensure Accessibility, Legibility and Usability of streets



## For Climatic comfort provide: Shading- High albedo materials



## Amenities along streets, Signage on pedestrians street, Tactile paving for



## Prevent run off. Utilise natural treatment system





# Features of UTTIPEC street design guidelines



## How to achieve Goal 2:



### To ensure Safety of Pedestrians:

- Create “eyes on the street”
- Provide adequate Street Lighting for pedestrians and bicycles.
- Create commercial/hawking zones at regular intervals



# 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.

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

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





# Vehicle of the future.....

## Patiala Green



## Fazilka Ecocab



## Amritsar Ecocab

### The Delhi High Court ruling:

-- The Municipal Corporation of Delhi (MCD)'s policy to restrict cycle rickshaw licenses was declared unconstitutional as it violated the right to earn livelihood.

**Court said -- Since cars were not regulated, cycle rickshaws could not be blamed for causing congestion.**



# Global rich transforming public spaces Adding Human dignity and respect





# Making people places.....



Source: GIZ



**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



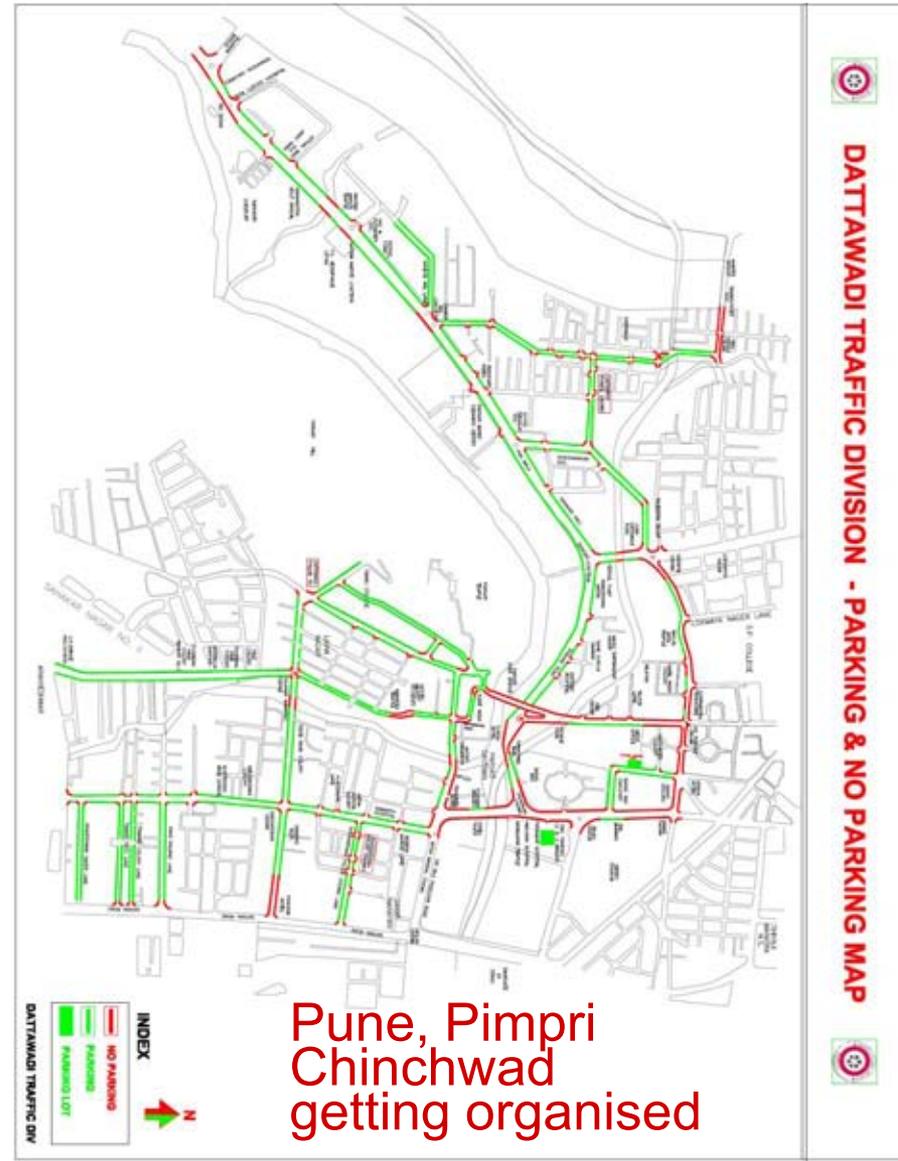
# Enforcement: The first steps.....

Find method in the madness....Tame the chaos

EPCA directives to MCD, NDMC in Delhi

- Demarcate legal parking spaces. Organise them well.
- Inventorise the parking spaces. Put out the list on the website
- Prevent encroachment of walkways
- Put up signages and information systems
- Introduce metering
- Impose penalty
  
- Similar moves in other cities – Chennai, Pune, Pimpri Chinchwad etc

**On-street parking cannot be eliminated. Needs to be managed well.**





# Enforcement

Eg... Proposed Asaf Ali Road, New Delhi



**Off street car and auto rickshaw parking area along the road**

Source: I Trans, Anvita Arora



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



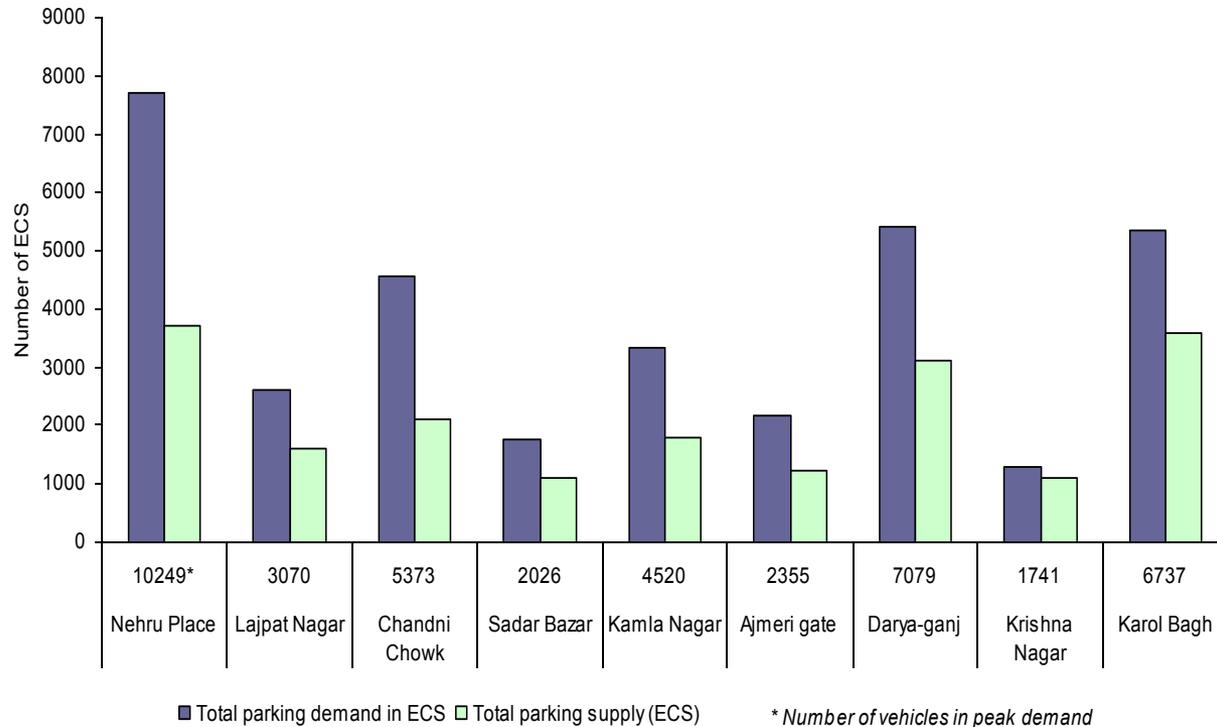
**Should we keep supplying more parking? Is that the solution?**

**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**





# Concern over parking crisis in South Asian cities



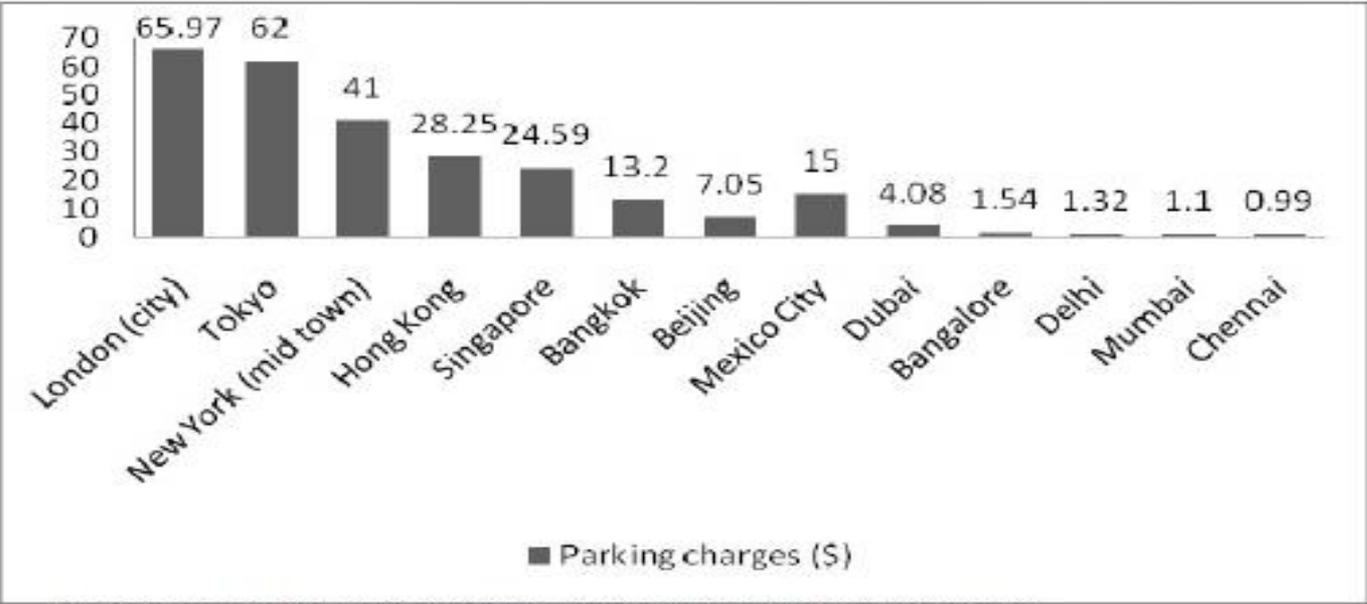
## Kathmandu focusing on parking supply

- Though KMC has designated 30 places for parking two-wheelers and small four-wheelers, there are mushrooming parking lots in the metropolis, many illegally run.
- Proposal legalise some illegal parking lots.
- The KMC has identified three long-term parking areas to ease traffic chaos in the capital. There is a proposal to construct new parking areas at Bhugol Park, Social Welfare Council and National Academy Hall which has been forwarded to the DoTM and Traffic Police. The existing parking spaces in New Road will be removed once the underground parking is constructed at Bhugol Park
- KMC has also circulated a notice to all malls and shopping complexes to use their basement areas for parking in order to ease traffic pressure on roads
- Directive from the Public Account Committee to remove parking from blacktopped roads. Acting on the direction. the KMC has been searching for wider spaces in the valley
- Currently, there are 33 parking areas operated by private contractors of which 32 are near crowded roads. KMC has fixed Rs 5 and Rs 10 for two-wheelers and four-wheelers respectively for one hour parking. However, public complaints against the monopoly of contractors have been coming to the fore time and again.
- Kathmandu needs to formulate a parking policy as a travel demand management measure
- Proposal for 73 multi level car parks
  
- Court stay on free parking



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

Comparison of daily rates in commercial business Districts in different cities

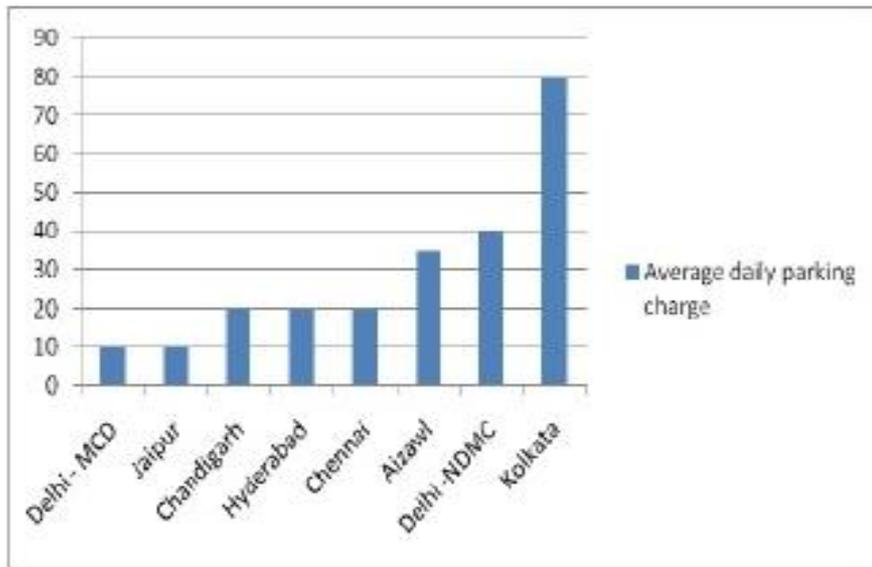


Source: Colliers International (2011) - CBD daily parking charges (in US \$)

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



## 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





# On-street parking pricing has major impact.....



**No meters**



**Meters**



**Prices quadrupled**

Grosvenor square, London

Source: TRL in ITDP (2011): Europe's Parking U-Turn



## **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.....

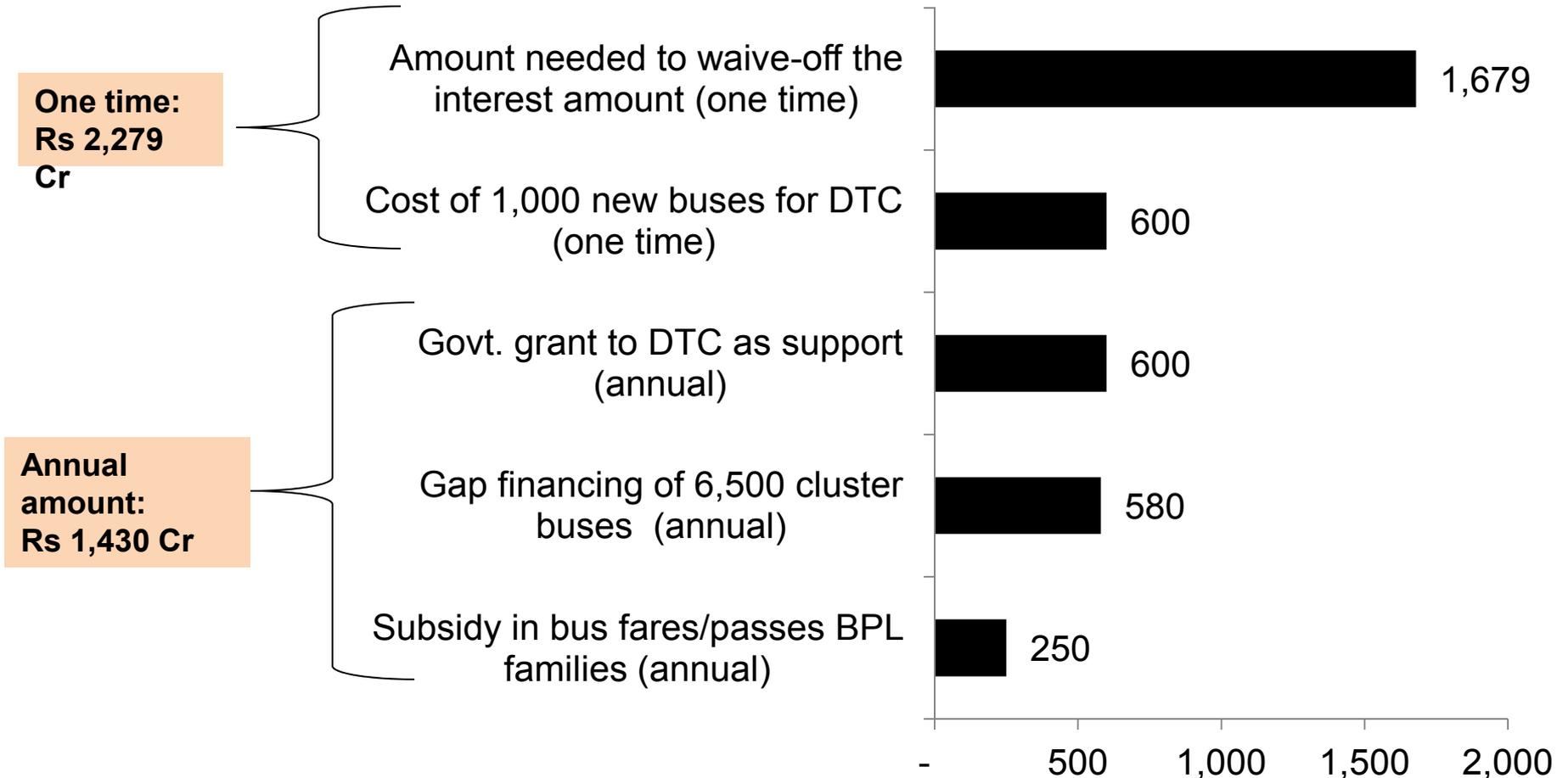




# Public transport reforms presents a serious fiscal challenge.....



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.**



## 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

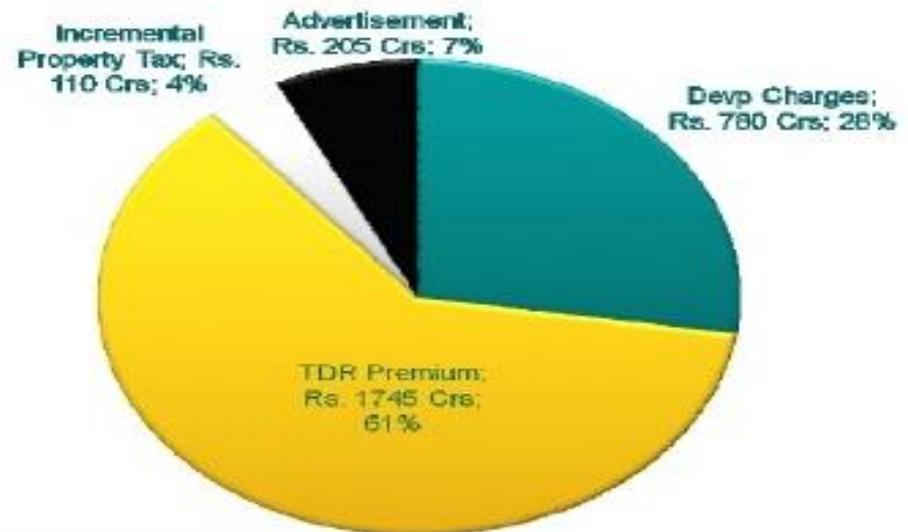
**Generates a lot more than the target of meeting the O&M cost of 93 billion units**



## 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???**



# Change is possible: Early Singapore



- **Severe Traffic Congestion**
- **Rising travel demand**
- **Unreliable bus services**

Some of the SIA slides have been provided by Monhinder Singh, Director LTA Academy

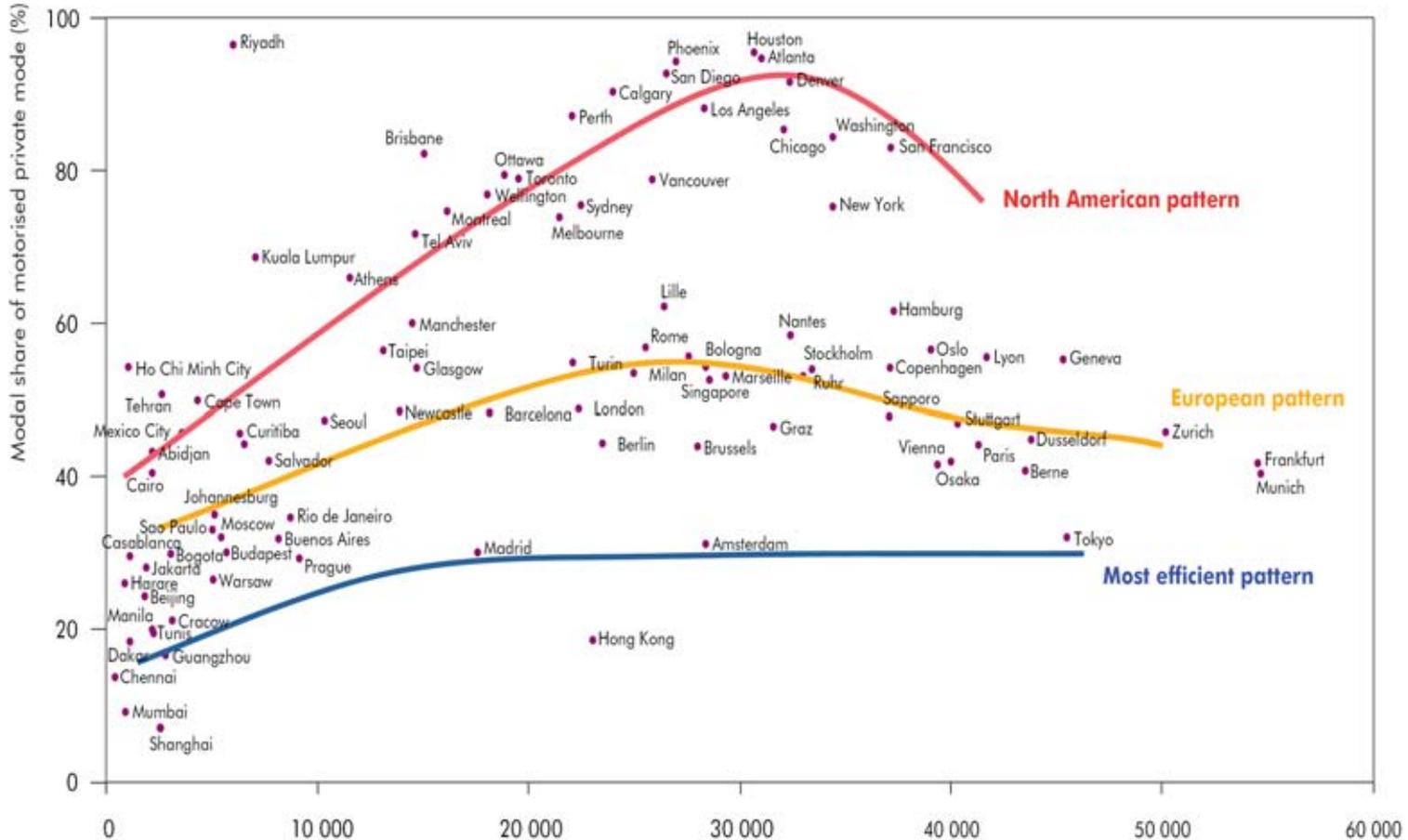


Source: GIZ



# Rich cities have less cars.....

## Relationship between GDP per Capita and Individual Motorised Modal Share



Decoupling of economic growth and individual motorised transport achievable!



# Dutch Minister visits the queen

Source: GIZ



Thank You...

