



Leveraging green games for livable cities



Centre for Science and Environment
New Delhi
May 10, 2010



Why are we discussing Commonwealth Games and air quality today?



The immediate concern: Athletes are more vulnerable to polluted air.

With every breath, athletes typically take in 10 to 20 times as much air, and thus more pollutants, as sedentary people do

There are evidences:

University of Southern California study: In high-ozone areas the relative risk of developing asthma in children playing more sports was more compared to children playing no sports. (Lancet)

Children's Health Study of California Air Resources Board: Children playing several outdoor sports and living in high ozone areas were three times more likely to develop asthma than children with the same activity level in low ozone pollution areas.





Ecological code for the Games



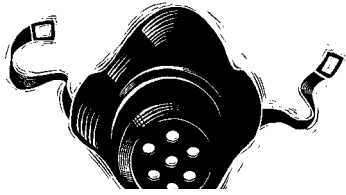
The code states –

“Reduce, measure and monitor air and noise pollution levels...”

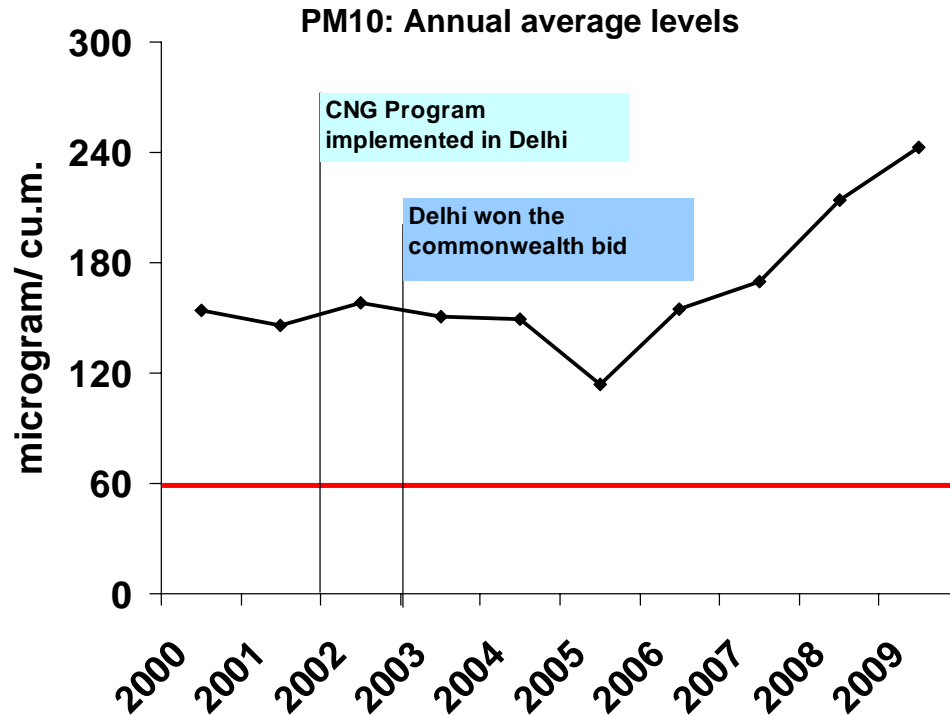
“Strive towards **achieving national standards** for air pollutants...”

“Encourage use of clean fuel driven public transportation...”



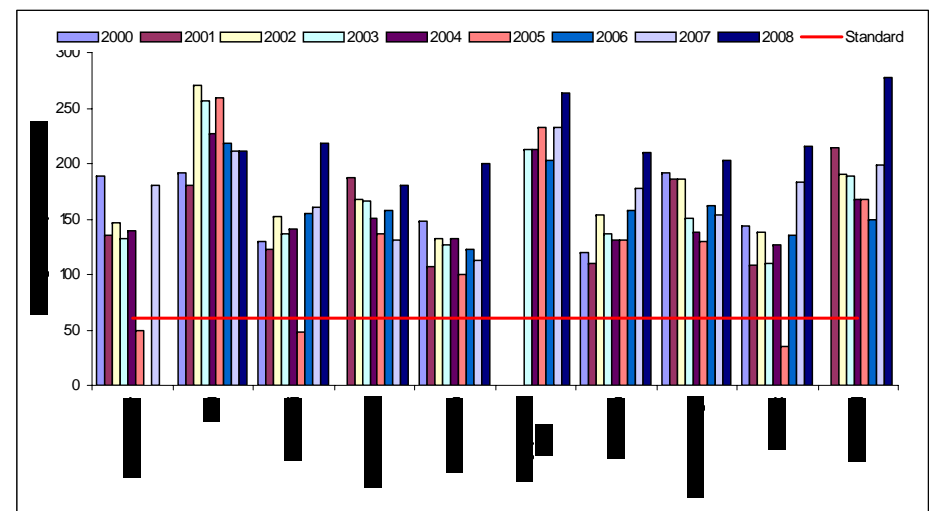


What is the reality?



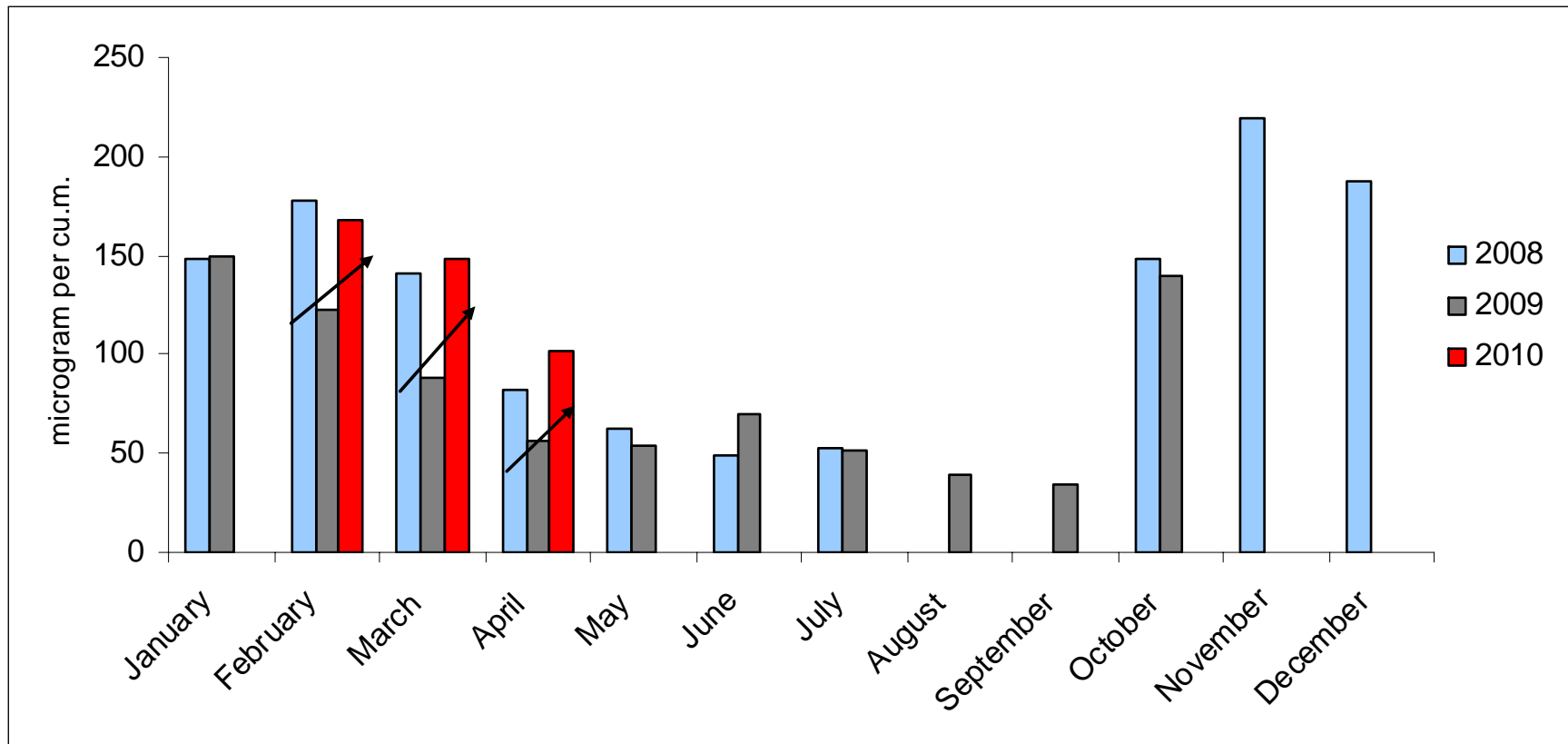
PM10 levels are back to pre-2000 levels. Gains of the CNG days are lost

PM10 levels are rising in all locations





PM2.5: Climbing





NOx: Growing threat

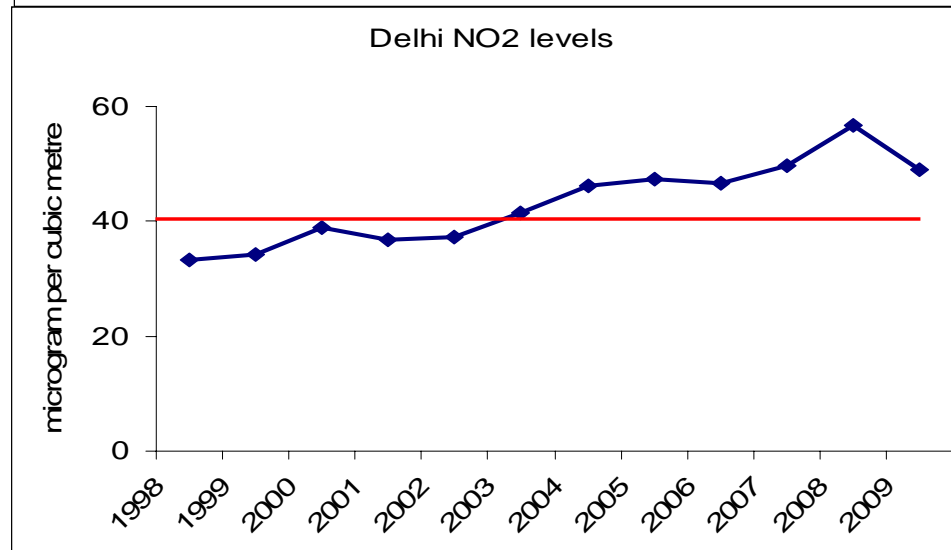
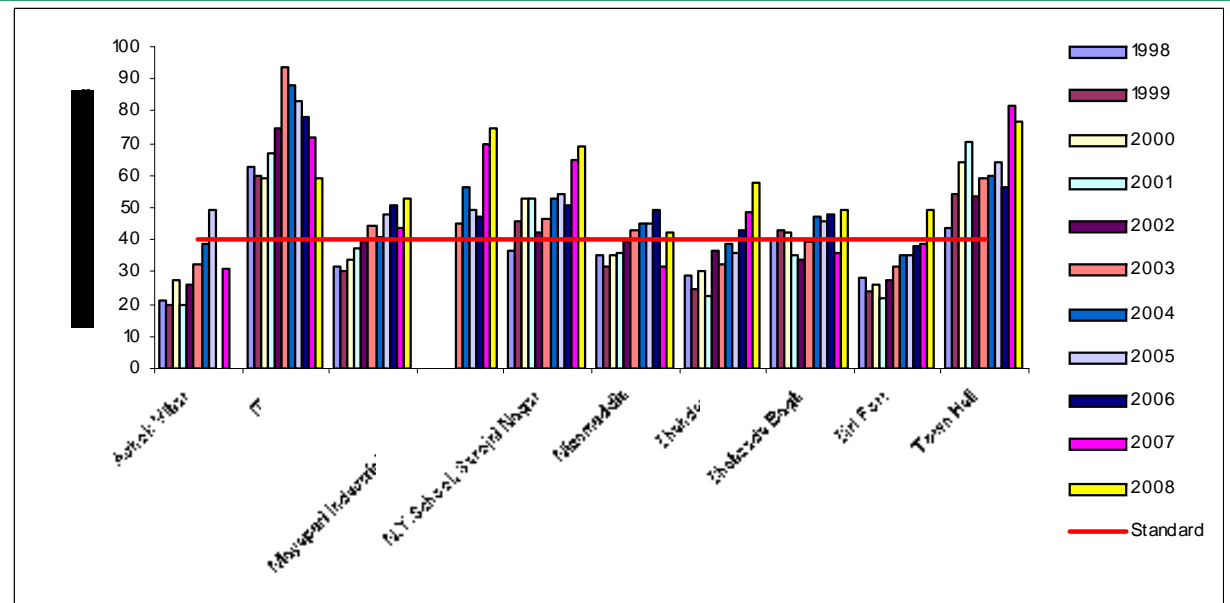


Nitrogen oxide levels are rising in almost all locations in Delhi.

The annual average levels showed a slight dip in 2009.

NO₂ relates strongly to vehicular activity and needs stringent control.

NO_x also contributes to the problem of ozone pollution



Source: CSE analysis based on CPCB air quality data



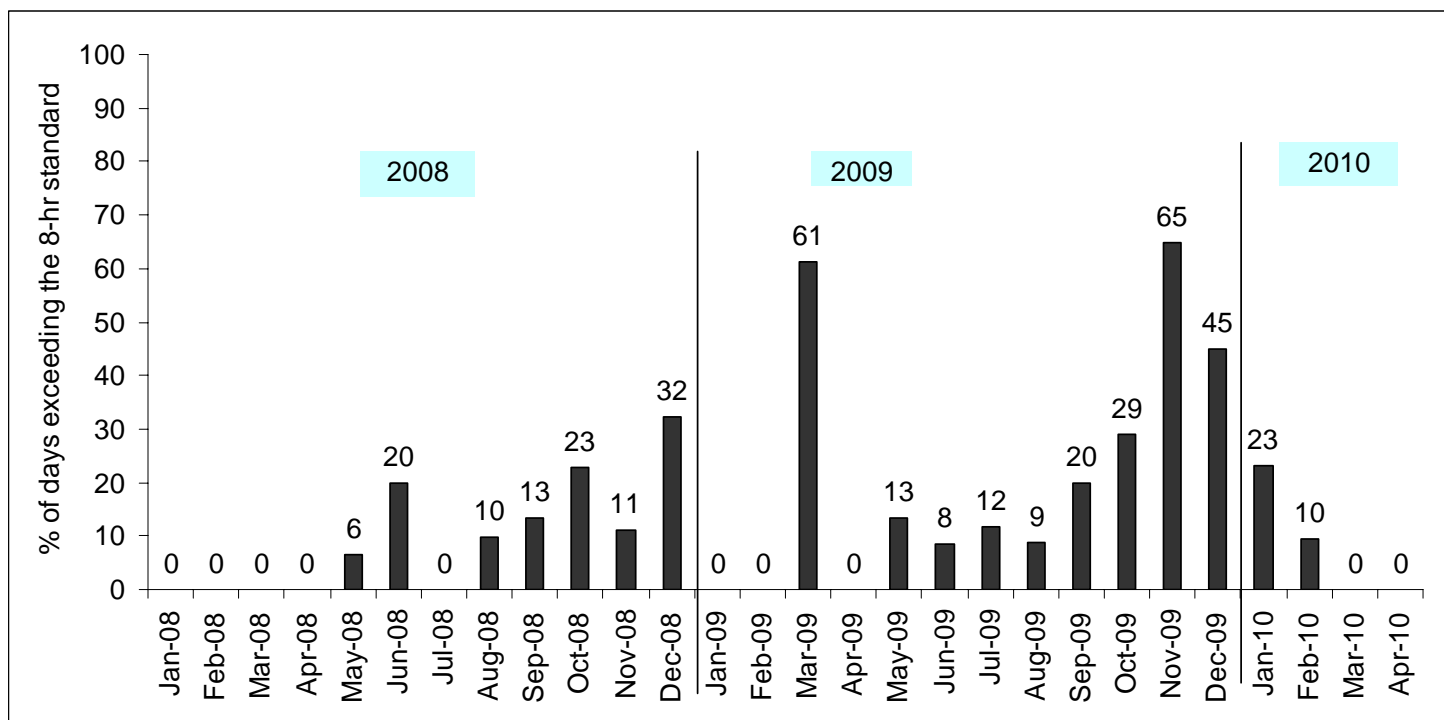
Ozone: Worrying trends



Ozone is particularly harmful for athletes and outdoor activities

Even short duration exposure can be very harmful

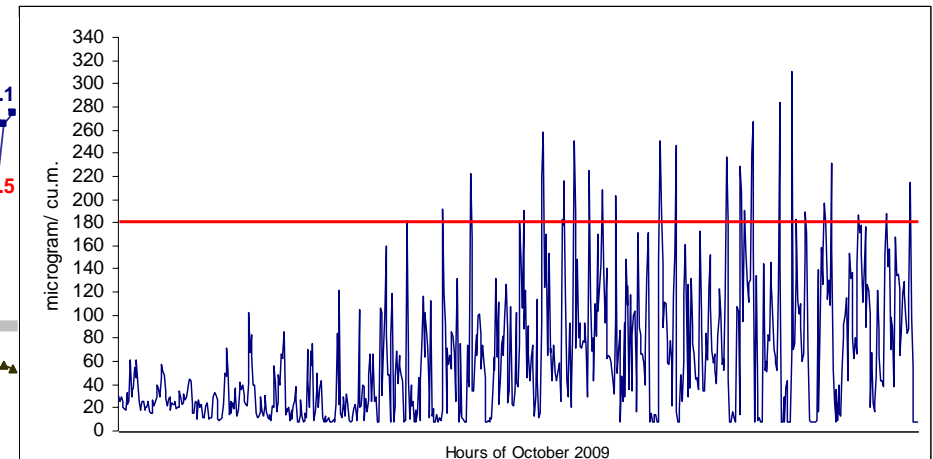
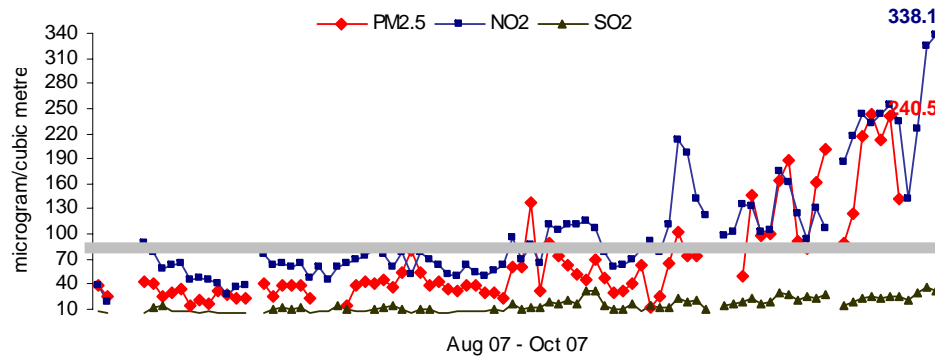
Percentage of days exceeding hourly Ozone standards (Siri Fort, 2008-2010)





Winter woes.....

October is the transition time....



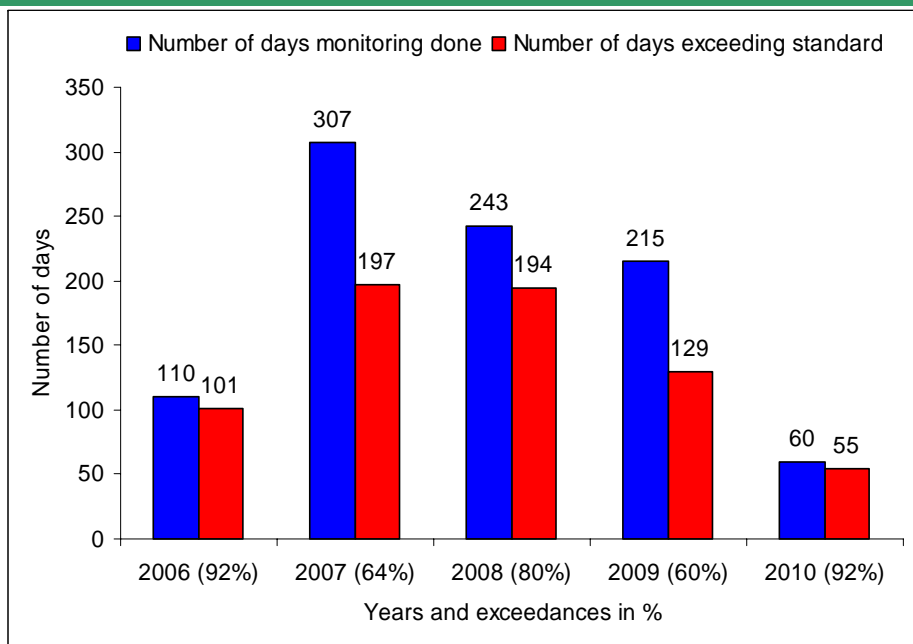
Ozone levels in October 2009:
Exceeded the 8-hourly standard on 29 per cent of days at Siri Fort

Source: CSE analysis based on CPCB air quality data

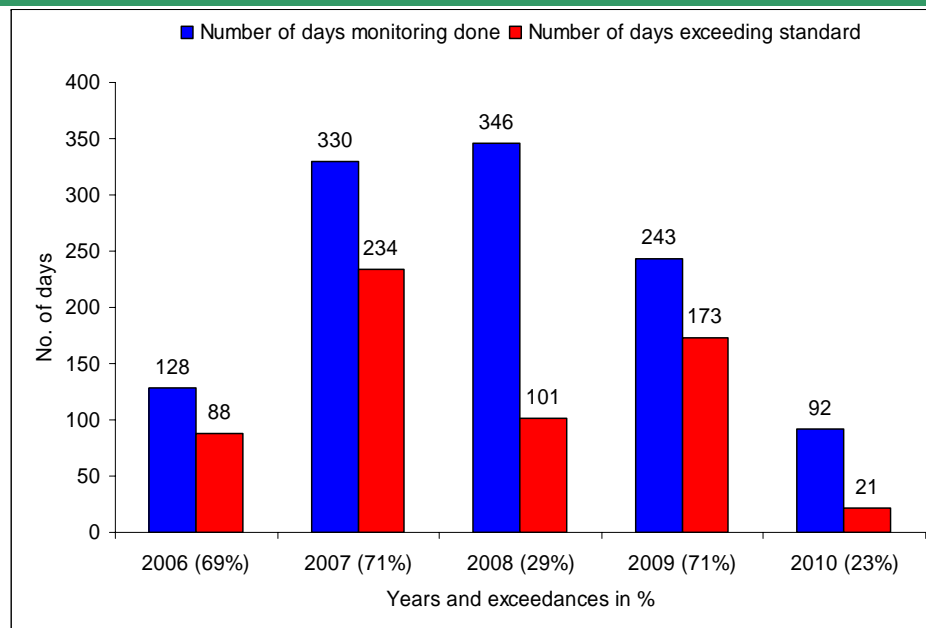
Studies in Delhi show -- pollution concentrations can be up by 40 - 80 percent during the winter months (SIM Air)



What if Delhi is asked to increase the numbers of clean air days like Beijing...



Number of days PM2.5 exceeded standards (ITO, Delhi)



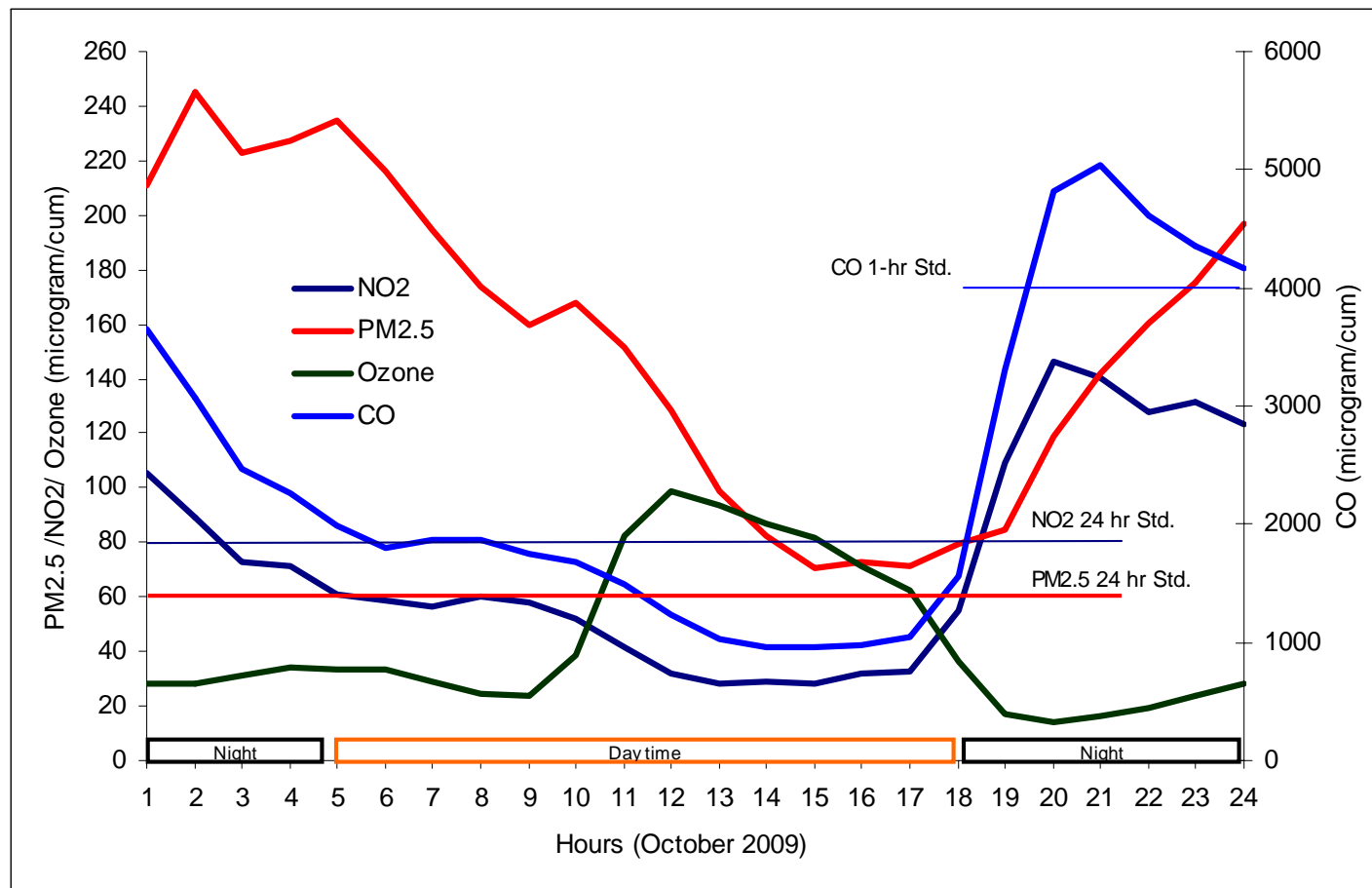
Number of days NO2 exceeded standards (ITO, Delhi)

On an average PM2.5 and NO2 standards could be met only on 30% of the days monitored

In 2009 the percentage of days meeting PM2.5 standards increased to 40% of the days



Green Games may need day to day and hour to hour pollution management



Pollution trends co-relate strongly with peak hour traffic.
Ozone, PM2.5 and CO levels remain high during morning and evening peak hours

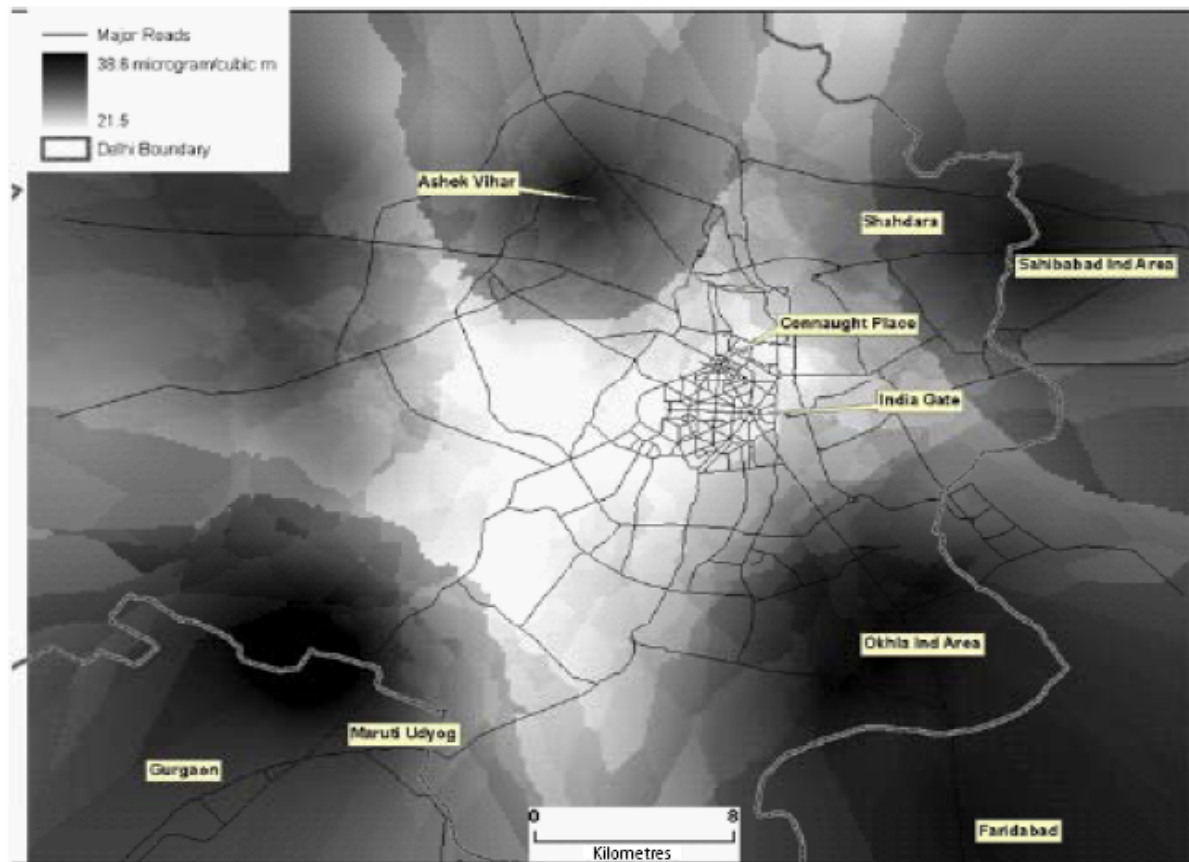
Source: CSE analysis based on CPCB air quality data



Aerial raids from outside Delhi



Figure 4: $PM_{2.5}$ ($\mu g m^{-3}$) in Delhi and Its Surroundings, July-December 2003



Source: Kumar, and Foster 2007, University of Iowa, EPW

Study at 113 locations (13 sites outside but adjacent to Delhi).
Particle levels outside Delhi were significantly higher.
Pollution control in neighbouring region is also important.



What about our health?



Polluted air kills: Evidences mounting in Delhi

National Chittaranjan Cancer Research Institute/CPCB: 33% of Delhiites have one or more respiratory symptoms; lung function impaired in 40% of residents.

Centre for Atmospheric Sciences, Delhi IIT: Increase in respiratory ailments and hospital admissions due to PM, ozone and NO₂ pollution.

Dr Rajendra Prasad Centre for Ophthalmic sciences, Venu Eye Institute: Significantly high incidence of eye symptoms and disorders in areas with high pollution levels.

AIIMS study of 2002: Strong correlation between high pollution levels and hospital visits related to cardio respiratory events,

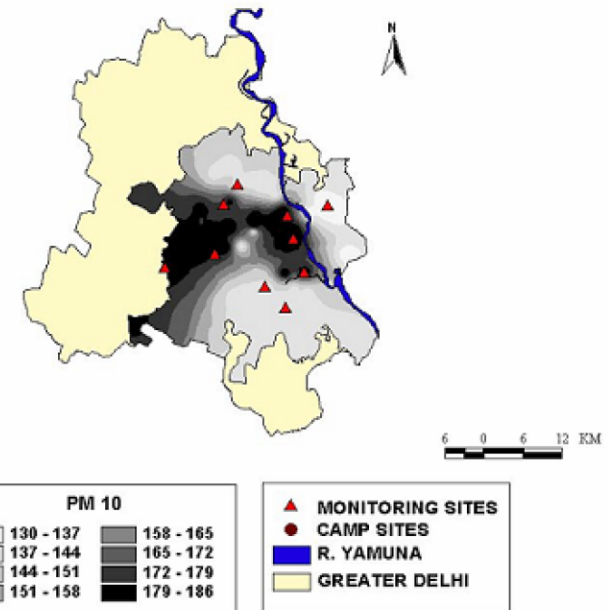
Vallabhbhai Patel Chest Institute found high respiratory symptoms in high pollution areas. Now studying the ozone link..

More evidences are piling up.....

Green games can deliver public health benefits....

Studies after Beijing Olympics have demonstrates this. (HEI, University of Medicine and Dentistry, New Jersey, Peking University)

World Bank study (2004) has shown health benefits of first generation action. Delhi avoided more than 3000 premature deaths annually



Pattern of PM10 distribution in Delhi (2000-05)

Source: Epidemiological Study On Effect Of Air Pollution On Human Health (Adults) In Delhi, CPCB



Can green games make a difference?



Mega events: An opportunity for change



UNEP: Agenda 21 for sport and the environment:

To benefit the community and the environment.

Use popularity of sports to promote environmental awareness and respect for the environment.

Promote development of environmentally friendly sports facilities.

Manufacture of environmentally friendly sporting goods.

Originally started as Olympic movement has now been extended to other mega events as well.

City	Country	Year	Type of Event
Yeosu	Korea	2012	World Expo
Shanghai	China	2010	World Expo
Zaragosa	Spain	2008	World Expo
Aichi	Japan	2005	World Expo
London	UK	2012	Summer Olympics
Beijing	China	2008	Summer Olympics
Athens	Greece	2004	Summer Olympics
Sydney	Australia	2000	Summer Olympics
Atlanta	USA	1996	Summer Olympics
Seoul	Korea	1988	Summer Olympics
Los Angeles	USA	1984	Summer Olympics
Delhi	India	2010	Commonwealth Games
Melbourne	Australia	2006	Commonwealth Games
Guangzhou	China	2010	Asia Games
Doha	Qatar	2006	Asia Games
Busan	Korea	2002	Asia Games

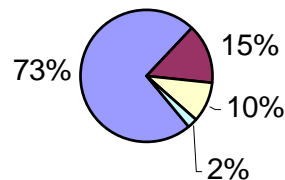
Air quality is relevant to all mega-events



Air pollution control a priority in Beijing Games

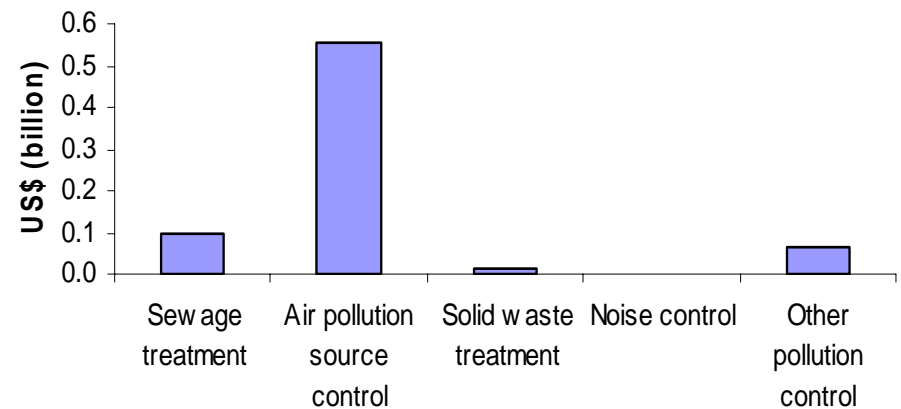


Beijing's environmental investment (2001 to 2007)



- Investment in urban environmental infrastructure
- Investment in pollution sources control
- Pollution control facilities operation cost
- Investment in environmental management capacity building

Investment in industry pollution sources control



-- Beijing authorities invested over US\$ 17 billion on environmental projects --- 73% of the investment in urban environmental infrastructure; 25% on pollution control and facilities; and 2% on environmental management capacity building.

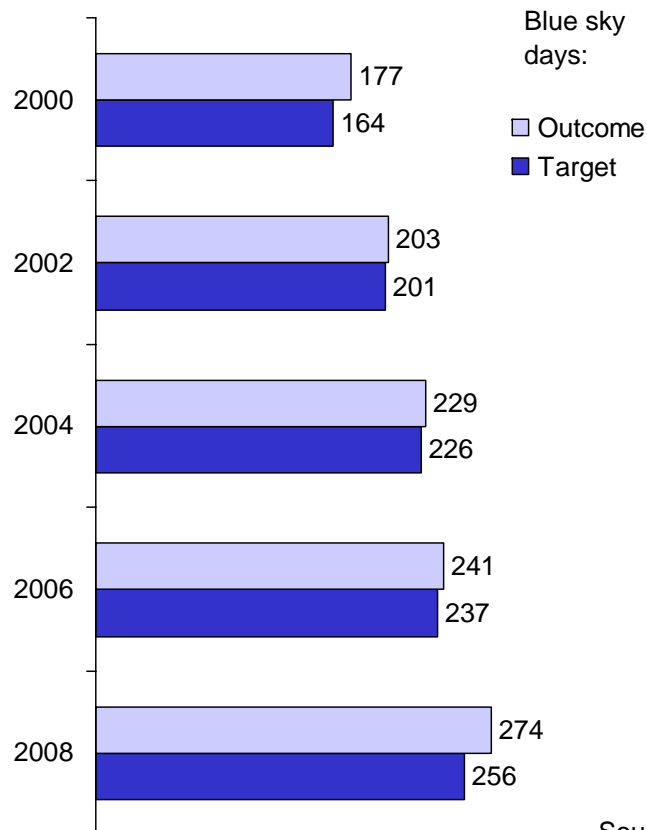
-- Of the total investment in pollution control efforts maximum on air pollution control



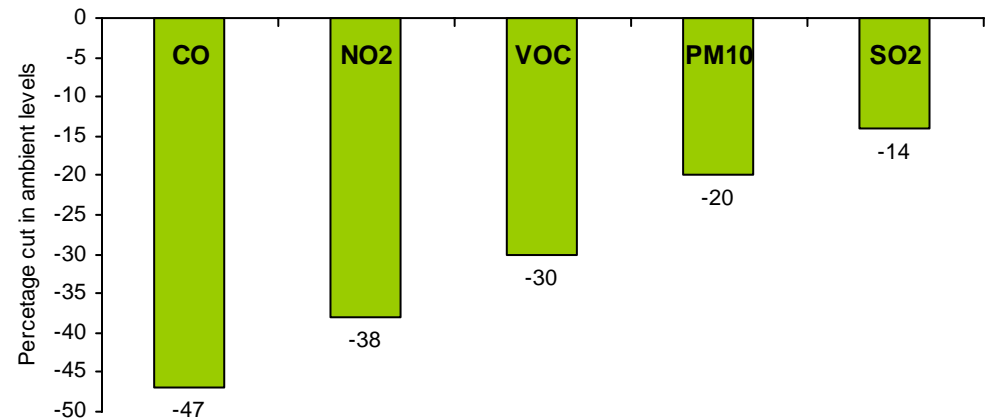
It made a difference in Beijing



UNEP's Independent environmental assessment: of Beijing 2008 Olympics noted that significant efforts before and during the Games were focused on improving Beijing's air quality



Source: UNEP





Clean air before the Games: Is Delhi living up to it?



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



What is the second generation challenge?



Mobility crisis

The Report of the Commonwealth Games Evaluation Commission for the 2010 Commonwealth Games says --

“Mobility within Delhi is currently difficult and congested, ... a risk area.”





Vehicles are a special problem



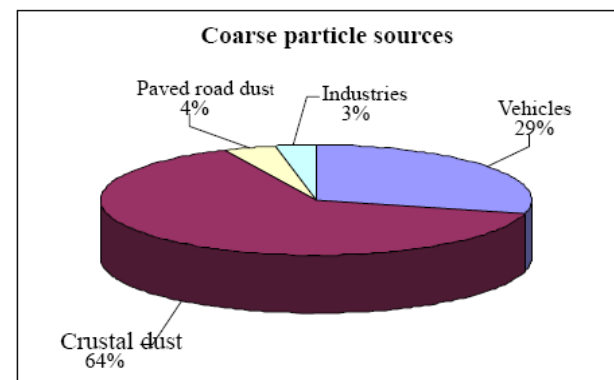
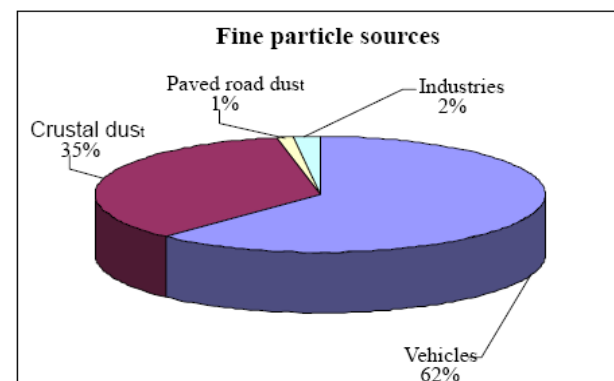
Pollutant	Transport	Industry	Domestic & others
CO	76-90	37-13	10-16
NO ₂	66-74	13-29	1-2
SO ₂	5-12	84 -95	Nil-4
PM	3-22	74-16	2-4

Source: CPCB

Central Pollution Control Board has compiled the results of various studies on relative contribution of pollution sources. Found:

- Vehicles contribute most of CO; maximum NO_x and a lot of PM.
- Industry and power plants are the major sources of SO₂ and PM

Higher share of vehicles if finer particles are considered



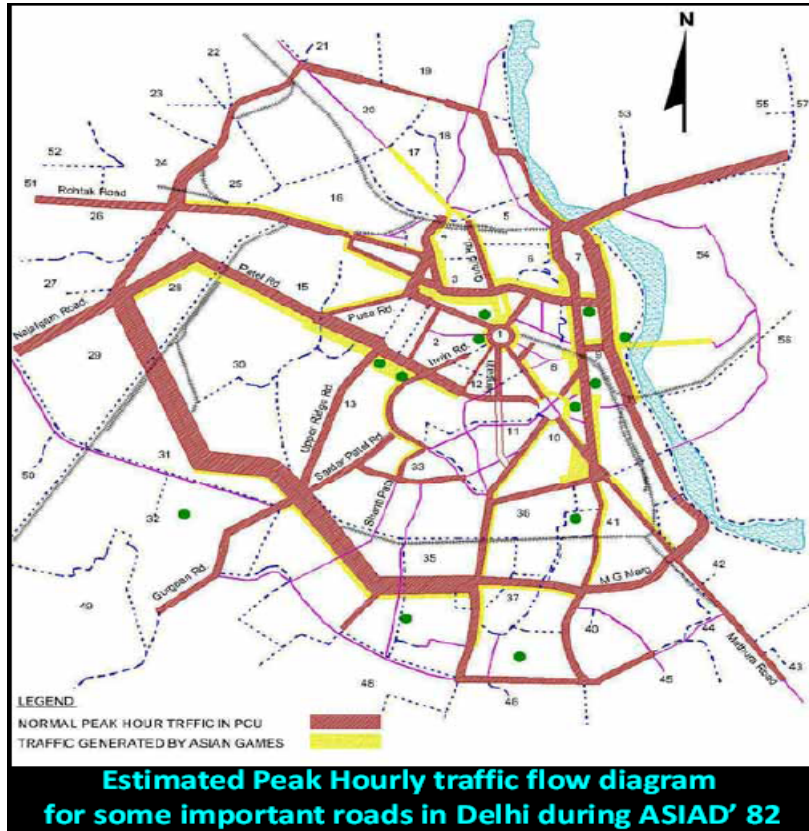
Source: A Srivastava et al 2008, Aerosol and Air Quality Research, Vol. 8, No. 2, pp. 188-200, 2008



Traffic boom on most roads....

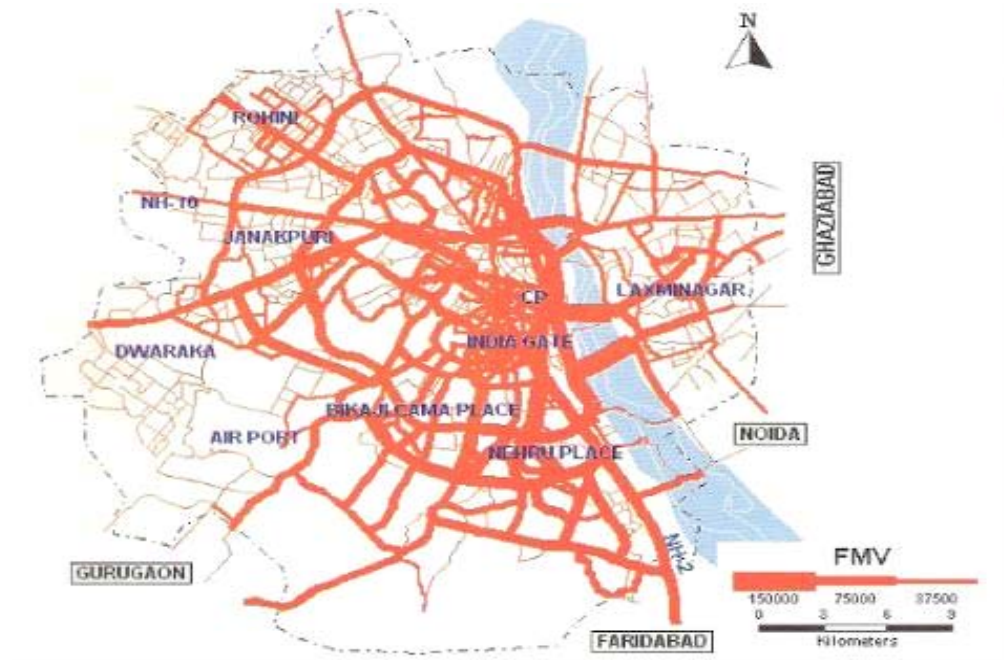


Asiad 1980



Source: CRAPHTS

Delhi before Commonwealth



Source: RITES/CRRI

During Asiad in 1980 arterial roads with dense traffic were much fewer

Central Road research Institute survey in 2007 shows now traffic in 51 arterial roads have exceeded designed capacity.

21

Majority living within the high pollution exposure zone.— 500 m to 1500 m from roads



Daily influx adds to woes...



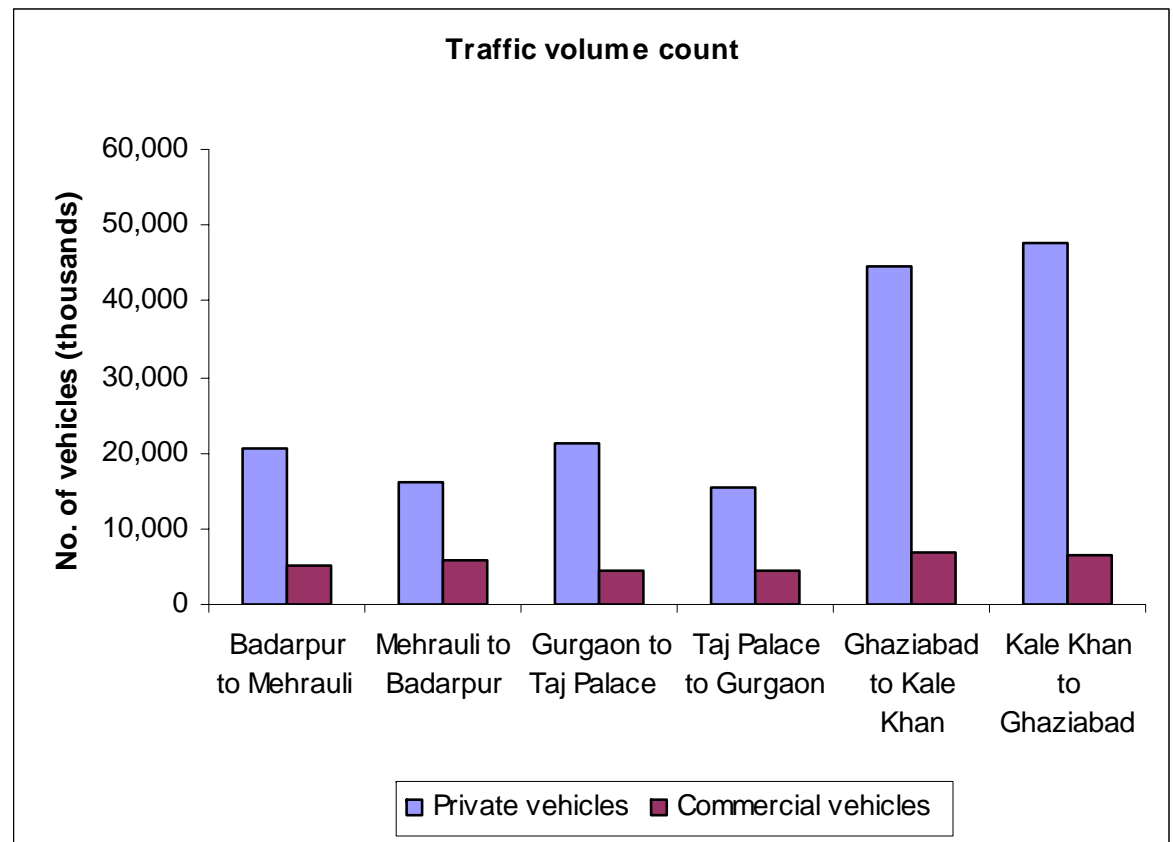
Traffic count on key roads connecting NCR. Private vehicles dominate

RITES survey:

Forecasts that in the next 11 years, personal trips within Delhi will increase by around 50 percent. But **trips from neighbouring cities will increase by 200 percent.**

Currently nearly 40 lakh trips are made to Delhi from NCR towns. By 2020, this will increase to 95 lakh trips.

This will negate Delhi's efforts.



Source: RITES

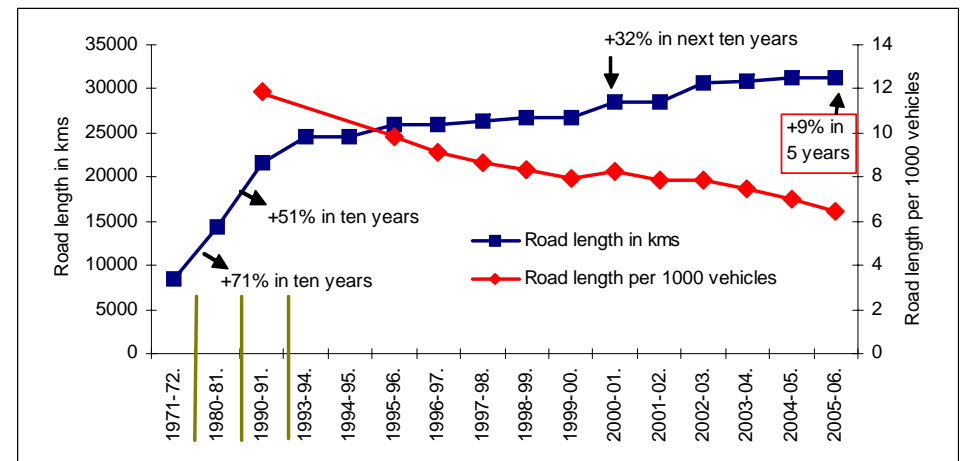


Roads..flyovers..space?



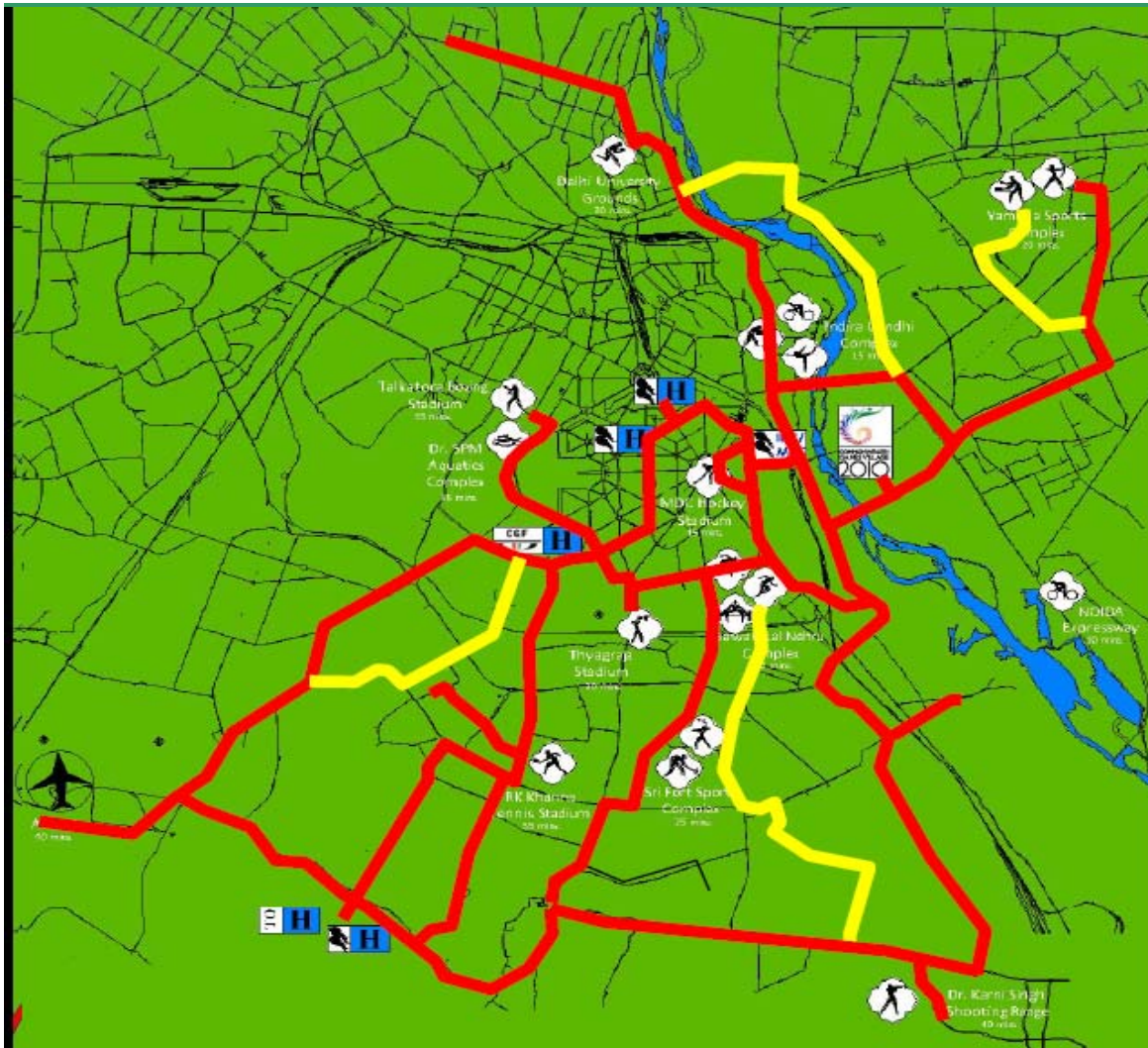
- Delhi already has **21%** of its land area under roads
- Between 1996 and 2006 road length increased by **32%**. Cars increased by **132 per cent**
- Road availability declining. Will decrease further..cannot build more and more
- Eg. Projection for Ring Road: Passenger car units may reach 4,00,000 by 2011 – will need 24 lanes. Currently, there are six lanes. Do we have this space? Where?

Trend in road availability





Games venue oriented planning....



Games venue oriented route network

Source: Traffic Police

Games planning focused on seamless traffic access to games venues.

Games oriented route network -- primary and secondary routes. These routes will earmark dedicated lanes for the games.

Dedicated lanes for dedicated car and bus service, scheduled shuttles for the games. . Bollards, and barricades to demarcate games lanes.

Massive parking facilities for the venues. .

The traffic plan does mention – **“reduce base load of traffic”**, restrict through diversion, restriction, public holiday, integrated public transport and demand management action.....

Where is the blue print for traffic restraint?.....



What will happen to the rest of Delhi if the following advisory is issued.....

Can Games be isolated from the city?



TRAFFIC ADVISORY

Avoid the highlighted roads on 8th Oct.

To facilitate passage for Commonwealth Games Delegates

General public is advised to avoid the roads marked in red on the map below

A detailed map of Delhi's road network. A complex network of roads is highlighted in red, indicating areas to be avoided. Green circles are placed at various points along these red routes, likely indicating specific landmarks or junctions of interest. The map shows the city's layout, including major roads and surrounding areas.

Avoid the following roads on 8th Oct. 2006 between 8:00 AM to 7:00 PM

• KANAL, ANAPLYN ROAD	• NOKIA
• SARFARUDDIN ROAD	• TALAKOTIA ROAD
• LODHI ROAD	• BANGLA ROAD
• MAYAPUR ROAD	• JALAN
• SHARDA MARG	• PRADESHI ROAD
• SECTOR 15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47/48/49/50/51/52/53/54/55/56/57/58/59/60/61/62/63/64/65/66/67/68/69/70/71/72/73/74/75/76/77/78/79/80/81/82/83/84/85/86/87/88/89/90/91/92/93/94/95/96/97/98/99/100	

Avoiding Corridor

- KANAL, ANAPLYN ROAD
- SARFARUDDIN ROAD
- LODHI ROAD
- MAYAPUR ROAD
- SHARDA MARG
- SECTOR 15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47/48/49/50/51/52/53/54/55/56/57/58/59/60/61/62/63/64/65/66/67/68/69/70/71/72/73/74/75/76/77/78/79/80/81/82/83/84/85/86/87/88/89/90/91/92/93/94/95/96/97/98/99/100

Use Metro as Public Transport Service

DELHI POLICE
CITIZENS FIRST
Website: www.delhipolice.nic.in
Email: delipol@vsnl.com
e-mail to CP Delhi at: ys.dadwal@nic.in

24 hrs. Traffic Help Line 011-23010101

e-mail: info@delhitrafficpolice.nic.in,
Website: www.delhitrafficpolice.nic.in



Is it possible to meet clean air targets.....



Tracking air quality during the games



Forecasting air quality during the games: CPCB is working with two French firms to set up an air quality forecasting system

More real time air quality monitoring stations: DPCC setting up six stations at Delhi Secretariat, IGI airport, Connaught Place, ISBT Anand Vihar, Punjabi Bagh and R. K. Puram. Both DPCC and CPCB to set up Open path monitors.

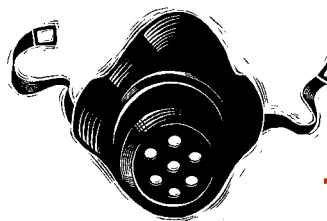
Air quality and meteorology: IMD plans installation of sophisticated equipments at all games venues to provide accurate information and forecast.

More Air quality forecasting: The IITM initiates predicting air quality levels for the CWG -- System of Air Quality Forecasting and Research (SAFAR),

Possibility of international vigilance.....: Strong rumours that participant countries may also organise their own independent air quality monitoring to assess the public health safety for their athletes.

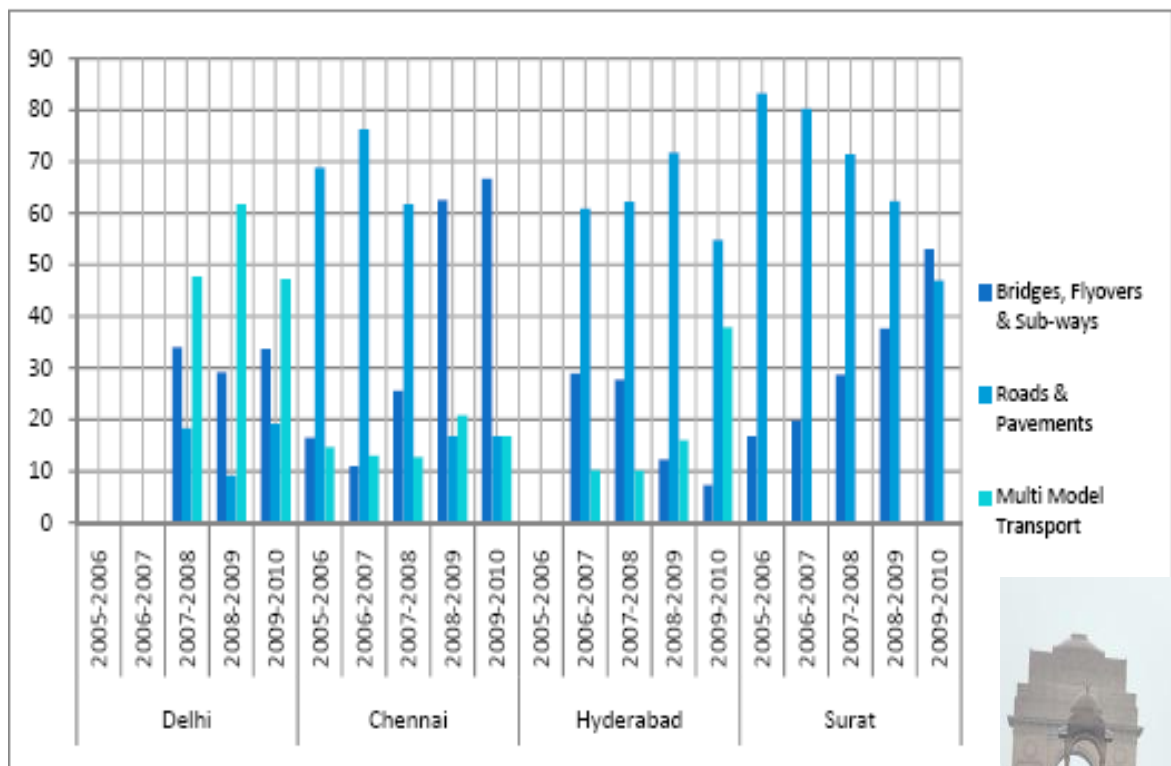
Risk of comparability of data..... More controversies if not well coordinated...

Plan to use this system for real time action.....



Infrastructure reforms....

Delhi has increased investments in multimodal transport



Percentage break up of capital expenditure in transport

G Tiwari TRIPP, 2009





Scaling up public transport...



Bus augmentation plan -- low floor buses, A.C. buses -- to add atleast 3000 more buses, Chartered buses, reform bus operations, etc

Metro rail system, covering about 120 kms across three lines;; Feeder buses operated by the DMRC and so on.

Pilot BRT project (5.6 kilometer of 14.5 kilometers) from Ambdekarnagar to Delhi gate.





Speed up implementation....



Public transport strategy

Complete key public transport projects on time

Expand bus transport system
(Augment pool of buses from all sources, new buses, more routes, rationalised routes for maximum connectivity, extend service hours)

Ensure smooth functioning of bus lanes for seamless and rapid movement.

Metro transport (Intensify and extend service hours)

Bicycle and pedestrian path

Integrate public transport, biking and walking and para transit

Pedestrianise key and busy commercial areas that are well connected.



Reduce traffic volume.... Give priority lane to buses....

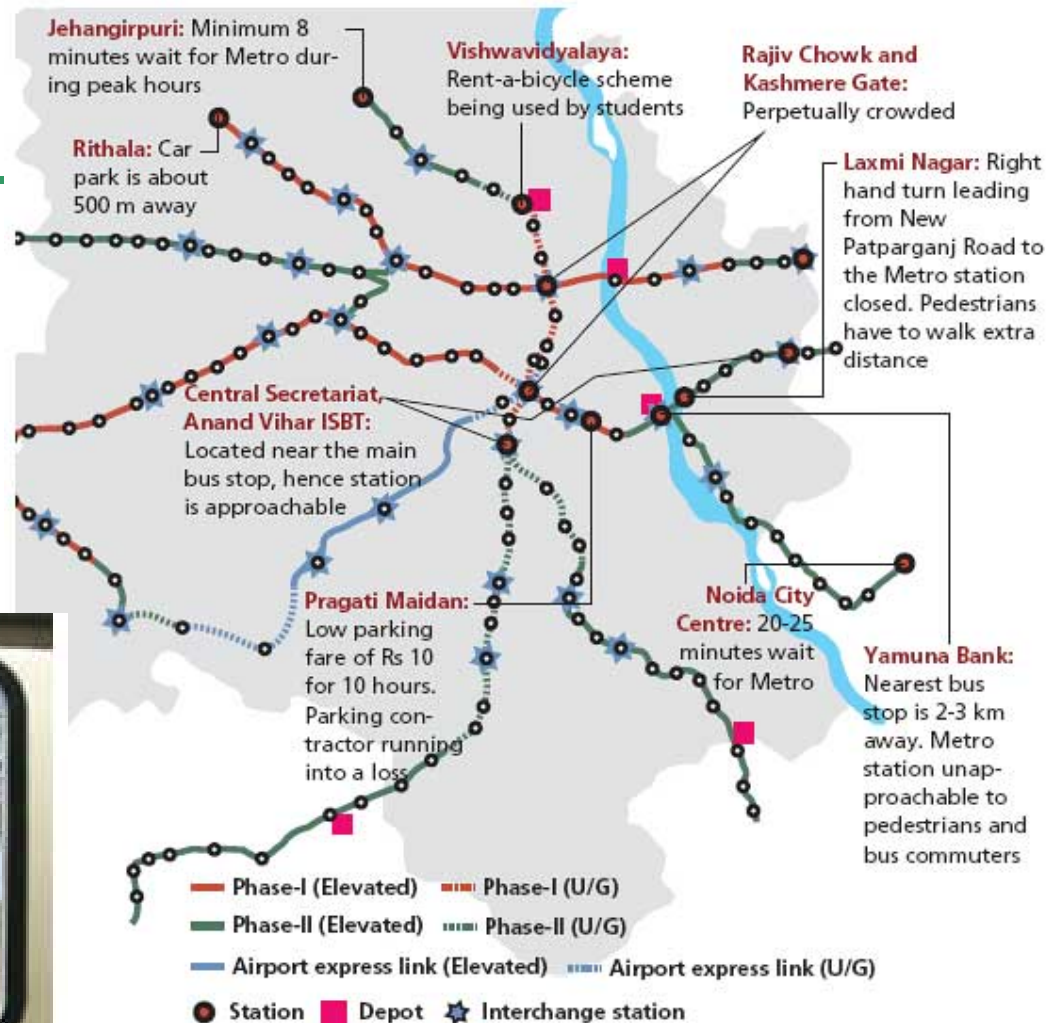


Challenge of integration:
Increase ridership



Good, bad and the neglected

It's a bumpy ride on Delhi's Metro

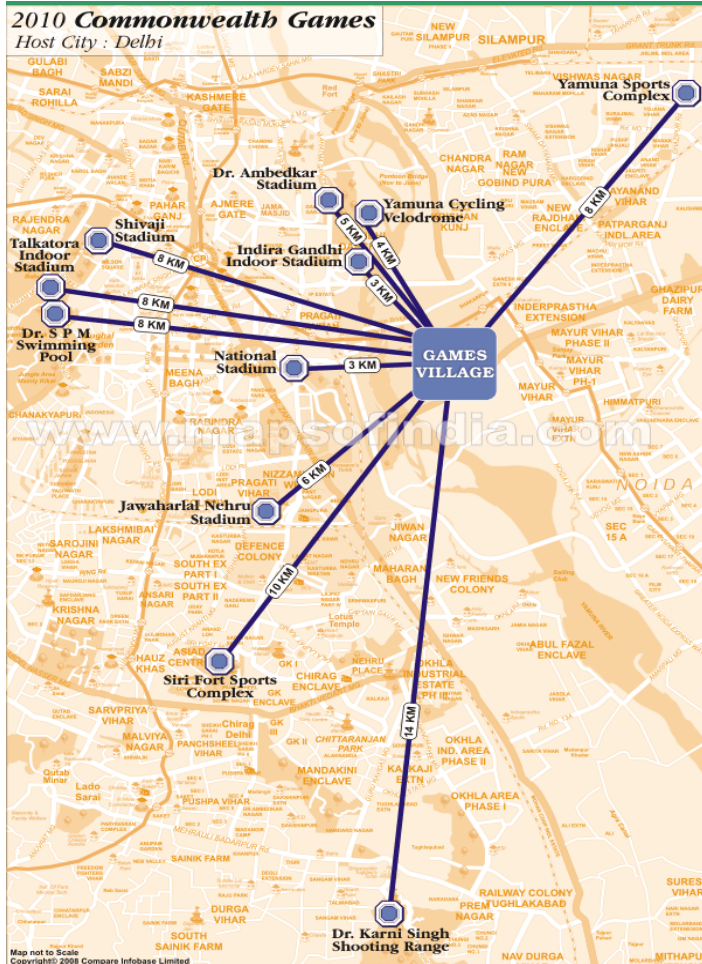


Need the big idea to work to meet clean air targets.....



Road infrastructure development ...

Can this help to relieve congestion and pollution?



Massive road infrastructure improvement to ease traffic congestion.

..... Numerous flyovers, bridges, elevated corridors, road widening, junction improvements, corridor improvement, new street lights, new signages, construction of new parking sites etc

More... Map Satellite

**8 more subways
proposed, 5 under
construction on outer
circle**

- For pedestrianised inner circle and metro connectivity need bus and walking oriented outer circle**

Underground parking at Inner Circle





Need a contingent plan to meet clean air targets



Lessons from Beijing -- Even after seven years of consistent and aggressive efforts, Beijing still found it difficult to ensure clean air during the games. Needed a contingent plan.

Beijing finally had to pilot test removal of million of cars for four days during August 2007 to improve the air quality. It actually removed 3 million cars from the roads during the games.

What will Delhi do? Air monitoring and forecasting for the games must guide this action.

Set up smog alert system and implement pollution emergency measures as needed.

Designate and authorize agencies to carry out such plans.

Carry out pilot test of the action plan





Short term action for long term gains



City needs contingent plan for traffic volume reduction

- Restrain private vehicles at the games venue. The experience of Asiad shows more than half of spectators had taken public transport to the venue.
- Regulatory as well as voluntary measures (For example, car pooling, staggered office timing, park and ride, parking controls Need innovative and workable ideas etc.)

Delhi must test restraint measures before the games on a pilot basis to assess the responsiveness of the system

Use of Intelligent Transport Systems

Other Action

- Physically remove visibly smoking vehicles. Ban their entry into Delhi. Strict emissions checks on in-use vehicles. (*Beijing did not allow old vehicles identified by their yellow label and diesel vehicles to enter the city centre*).
- Coordinate with the neighbouring state governments in the NCR to regulate and reduce traffic from outside. Augment intercity connectivity and ridership.
- Games venues to use hybrid buses, Electric shuttles etc,
- Complete all construction activities before the Games to control dust.



Need to change the practice



While car owners resent expansion of walk space

...public voice gets stronger for liveable walking city



Public protest against PWD road-widening for the CW games at Siri Fort to save the footpaths

PROTESTS PERSIST: Locals say the government body doesn't have necessary approval to undertake the work



Green games: An opportunity



- Only the compulsion to meet the clean air targets can deepen public understanding of what it takes to protect public health.
- Only this can build public support for aggressive action needed for clean and livable cities
- Help move from a car-dependent culture to public transport, cycling and Walking and clean vehicles



Thank You