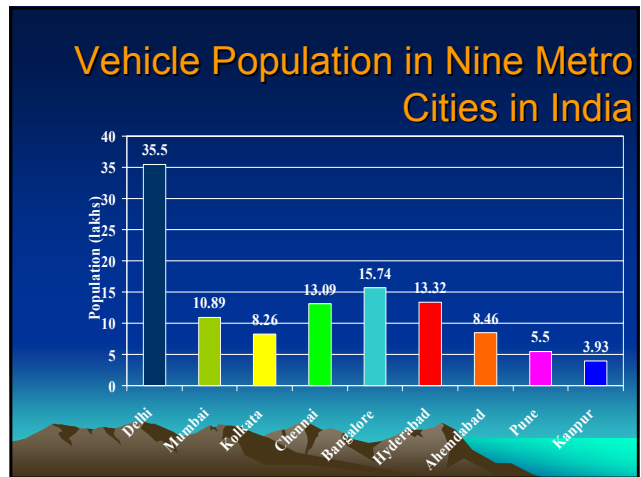
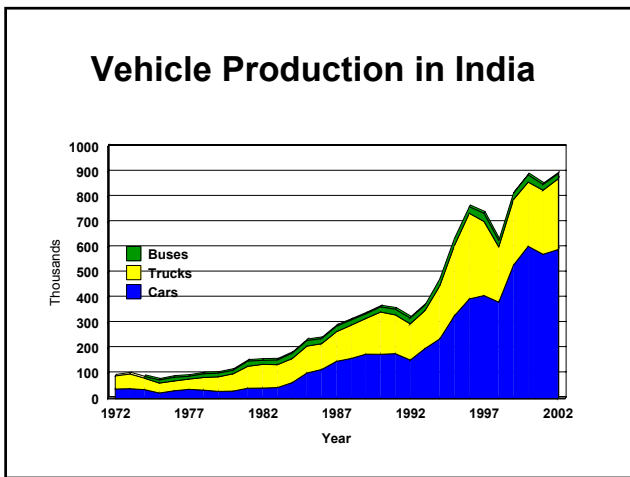
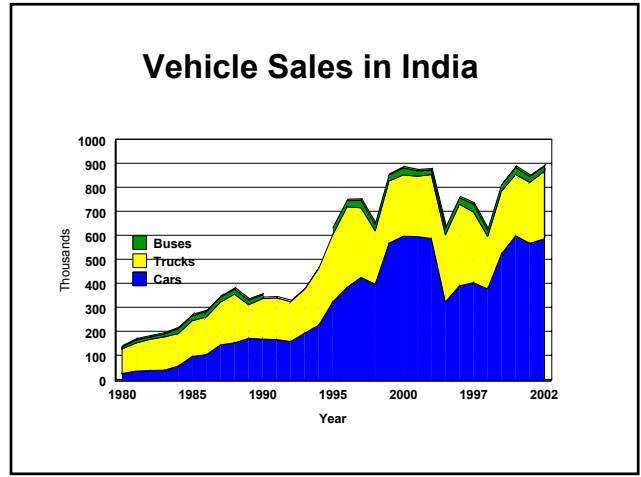
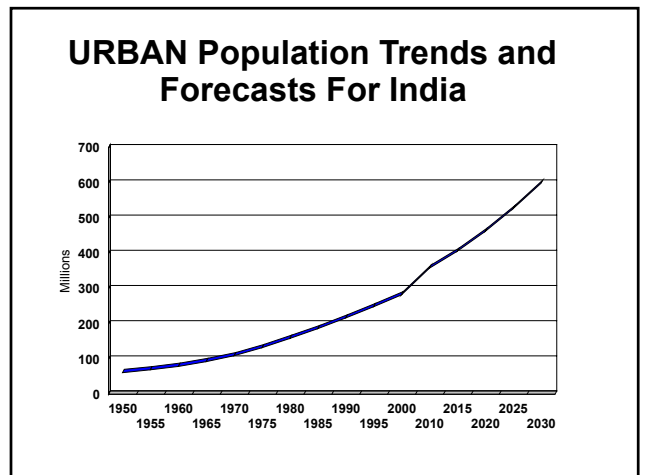
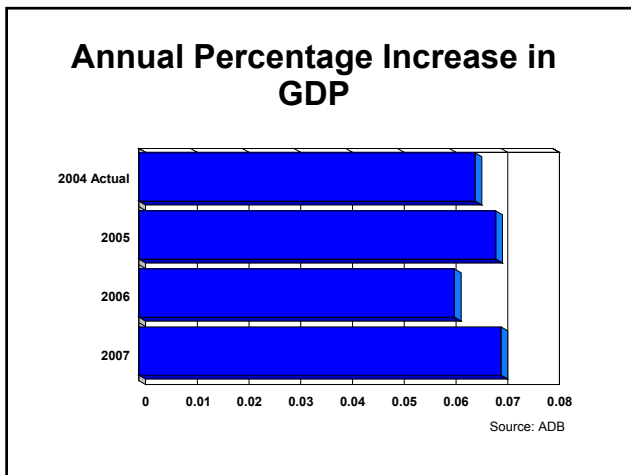
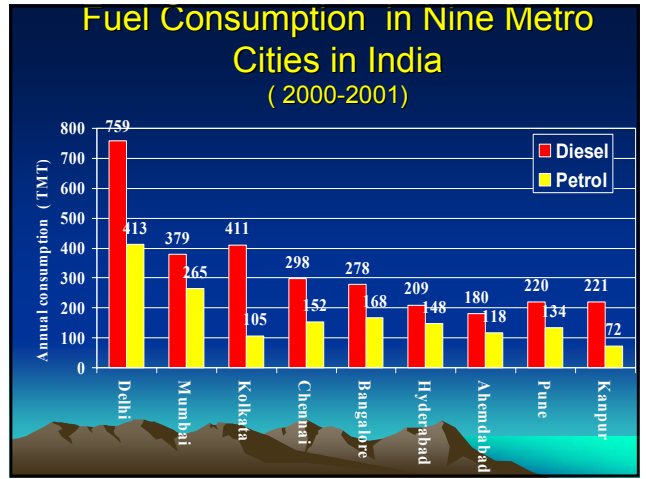
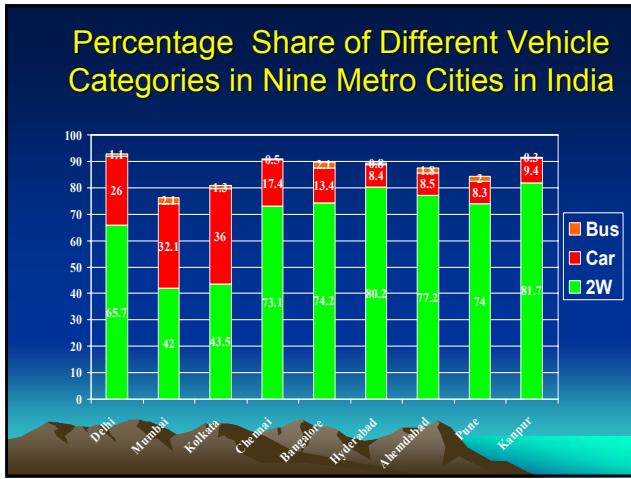


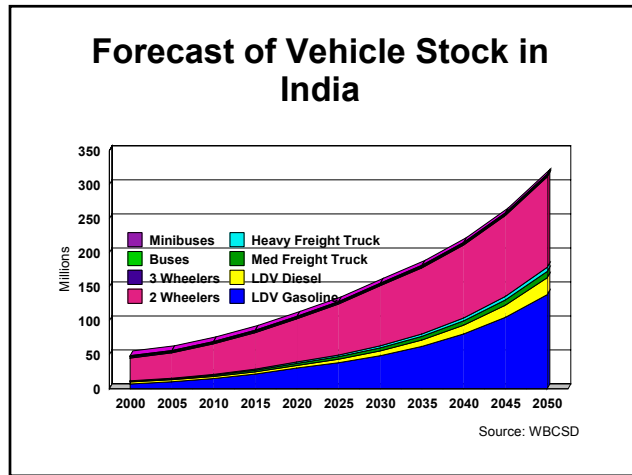
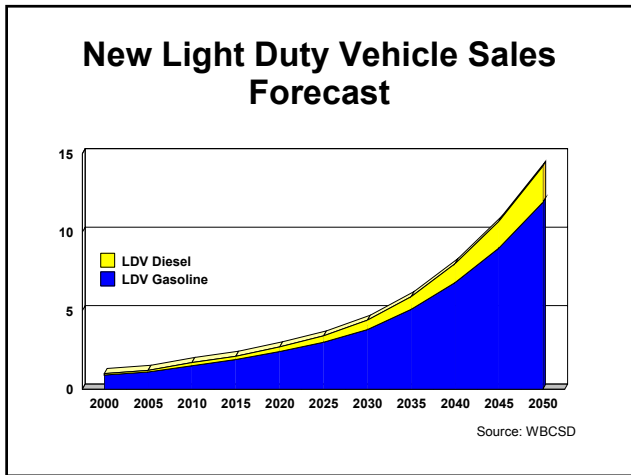
# India: The Next Global Automotive Hub?



**Michael P. Walsh**  
 SAE 2005 Technical Innovation Forum  
 April 13, 2005







## Non-Attainment Areas

Observed Annual Mean Concentration of a Criterion Pollutant

$$\text{Exceedence Factor} = \frac{\text{Observed Annual Mean Concentration of a Criterion Pollutant}}{\text{Annual Standard for the Respective Pollutant and Area Class}}$$

The Four Air Quality Categories are:


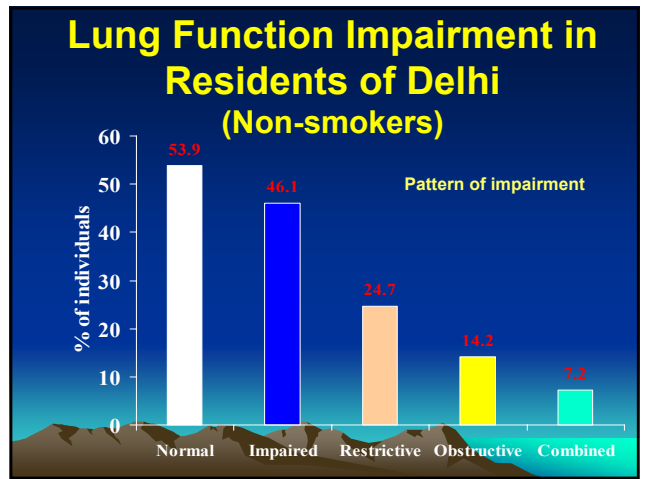
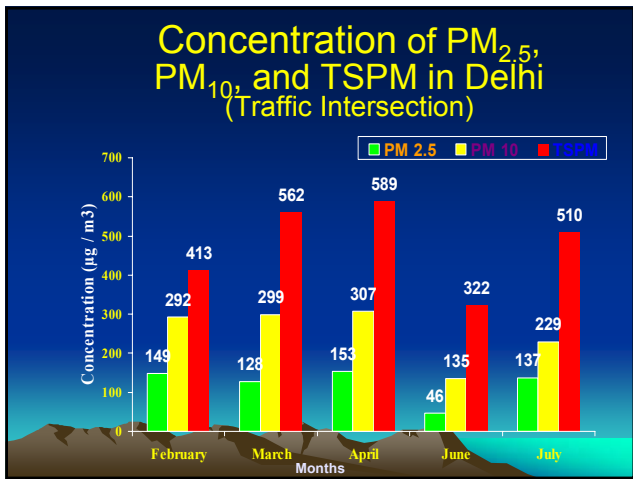
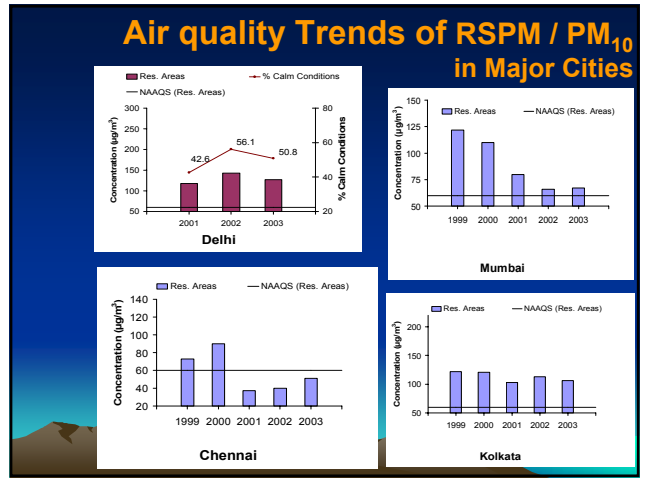
- Critical Pollution (C): When EF is more than 1.5;
- High Pollution (H): When EF is between 1.0 - 1.5;
- Moderate Pollution (M): When EF is between 0.5 - 1.0;
- Low Pollution (L): When the EF is less than 0.5.

## Air Quality Status of India During 2003

| Pollutants                              | Industrial |      |      |      | Residential |      |      |      |
|---|------------|------|------|------|-------------|------|------|------|
|   | L          | M    | H    | C    | L           | M    | H    | C    |
| Sulphur dioxide                         | 98 %       | 2 %  | -    | -    | 98 %        | 2 %  | -    | -    |
| Nitrogen dioxide                        | 85 %       | 12 % | 3 %  | -    | 70 %        | 25 % | 5 %  | -    |
| Respirable Suspended Particulate Matter | 13 %       | 37 % | 28 % | 22 % | 2 %         | 17 % | 28 % | 53 % |
| Suspended Particulate Matter            | 31 %       | 46 % | 18 % | 2 %  | 5 %         | 17 % | 26 % | 52 % |

## Major Air Pollution Issues in India

1. Major Cities (53 non-attainment areas mainly due to vehicular pollution)
2. 24 – Critically polluted areas (Industrial Air Pollution)
3. Indoor Air Pollution (Rural Area) and Air Pollution in work zone area

## Vehicular Pollution Control Initiatives

| Norms                                     | Cities of Implementation            | Implementation            |
|---|-------------------------------------|---------------------------|
| 1991 emission norms                       | Throughout the country              | 1.4.1991/92               |
| 1996 emission norms                       | Throughout the country              | 1.4.1996                  |
| Cat converter norms ( for passenger cars) | 45 cities                           | 1.10.1998                 |
| India stage 2000 norms                    | Throughout the country              | 1.4.2000                  |
| Bharat stage-II norms (Euro 2)            | 11 cities<br>Throughout the country | 2000-2003<br>1.4.2005     |
| Bharat stage-III norms (Euro 3)           | 11 cities<br>Throughout the country | 1.4.2005<br>1.4.2010      |
| Bharat stage-IV norms (Euro 4)            | 11 cities<br>Throughout the country | 1.4.2010<br>To be decided |

## Diesel Fuel Specification in India

| YEAR               | 1996 | 2000                 | 2005 | 2010  |
|--------------------|------|----------------------|------|-------|
| Cetane No, Min     | 45   | 48                   | 48   | 51    |
| Sulphur % W/w, Max | 0.50 | 0.25<br>0.05 (METRO) | 0.05 | 0.035 |
| Distillation T95   | -    | 370                  | 370  | 360   |
| Polyaromatic       | -    | -                    | -    | 11    |

## Gasoline Specification in India

| YEAR                  | 1996                             | 2000                | 2005                     | 2010  |
|-----------------------|----------------------------------|---------------------|--------------------------|-------|
| RVP at 38deg.c.kpa    | 35-70                            | -                   | 35-60                    | 60    |
| BENZENE %by Vol.,Max  | 5.0                              | 5.0<br>3.0 (metros) | 3.0 (all)<br>1.0 (metro) | 1.0   |
| Lead G/m3, Max        | 0.15%(low pb), 0.013% (unleaded) | 0.013               | 0.013                    | 0.005 |
| Sulphur %by Mass,max  | 0.10(unleaded)<br>0.20 (leaded)  | 0.10                | 0.05                     | 0.015 |
| Aromatics % v/v., Max | -                                | -                   | 45                       | 42    |
| Oxygen %by Vol.,max   | -                                | -                   | 2.0                      | 2.7   |

## Concluding Remarks

- India is poised to be a major hub
- The Vehicle Population is Expected To Grow Rapidly Driven By
  - GDP/Capita
  - Urbanization
- Such Growth Has the Potential To Exacerbate Existing Serious Air Pollution Problems
- To Prevent This From Occurring
  - Rapidly Improve Fuel Quality
  - Upgrade Vehicle I/M Program
  - Accelerate New Vehicle Controls
  - Retrofit Appropriate Vehicles
  - Substantially Improve Public Transportation
  - Better Land Use Planning

Thank You!

