Vehicles and fuels
Public health and energy challenge: Terms of action

Conference: Clean and Sustainable Mobility for All
Centre for Science and Environment
New Delhi September 28-29, 2011
The next gen environment challenge for emissions regulations…
Lost its gain(s…….. After a short respite pollution curve turns upward (Delhi)

Based on CPCB data
New risks in our cities

Ozone: emerging threat

Ozone is particularly harmful for those suffering from respiratory and asthmatic problems, and those involved in outdoor activities.

Even short duration exposure can be very harmful.

Out of 30 days in November, 2010 the 8-hourly average of ozone exceeded standard on 28 days in Civil Lines.
Cities in pincer grip of public health crisis and energy guzzling...

- Indian cities show strong correlation between emissions of air pollutants and GHGs
- As cities grow in size, transport emissions increase
- Importance of catching cities early before they start to grow.

Source: Analysis of MOUD - Study on Traffic and Transportation Policies and Strategies in Urban Area by CAI-Asia

Source: CAI ASIA 2008
The energy challenge…
Cars, trucks and buses will drive the future oil demand...

Various estimates on how vehicles will drive the transport energy demand

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). Personal vehicles will be one of the primary drivers

Shifting of freight from railways to trucks will also add to the energy stress: (Railway share only 26%)

Source: IEA
Explosive numbers…
Shift towards bigger engines…

Reality check…Vehicle mass, and size increasing steadily ---

2006-10: -- 6-10% increase in average mass
-- 6% increase in engine size.
…….. This means increased guzzling……

Average fuel economy of new cars stagnating for the last four years (Only ~ 1% improvement in average fuel economy)

It can get worse….
Fleet weight increase by 2% a year can lead to a cumulative losses of fuels between 2010 and 2020 - nearly equal to the fuel use of all four-wheeled passenger vehicles in 2006 --.
Energy crisis and price shocks

Who is sharing the burden of oil price increase?

- Government: 36%
- Oil companies: 51%
- Consumers: 13%

Government and public sector oil companies absorbed 87 percent of the price hike.

India’s energy security at risk:
India is already importing more than 80 per cent of its petroleum crude requirements. This makes India very vulnerable to price vagaries.

Economic risk: Huge under recoveries -- Varies according to the crude oil prices – Rs 19/litre in May to Rs 6.05/litre of diesel

Consumers want fuel savings:
High petrol prices increase cost per km. Already share of household expenses on transport has increased phenomenally
Emerging policy opportunities for vehicle fuel efficiency standards in India:

-- The Integrated Energy Policy 2006 -- 50% improvement in vehicle fuel economy by 2030. This can reduce oil requirement by nearly 86 million tonnes by 2031-32. – 65% of total current consumption or equal to removing carbon dioxide emissions from 7 million of today’s four wheeled vehicles.

-- National Climate Action Plan provides for fuel economy standards
-- National Habitat Mission incorporates the proposal for fuel economy standards

-- The process has started…
   Bureau of Energy Efficiency/Ministry of Power setting the fuel economy standards and fuel economy labelling programme for passenger cars.
   Ministry of Road Transport and Highways to implement the standards

Draft notification awaited…..But what must we expect from this notification?
There are many ways of setting these standards

**Fuel economy standards:** Based on either fuel consumption (litre per 100 km or, miles or kilometres per /litre);

- **Japan:** Top runner standards linked to the fuel economy of the most fuel efficient vehicle model on sale (km/L).
- **US:** Corporate Average Fuel Economy (mpg)
- **Canada:** Mandatory FE standard post 2010
- **China:** per vehicle fuel economy standards.(km/L)
- **Australia** – Only light duty in L/100-km

**Carbon dioxide (CO2) emissions, fleet average:**

- **European Union** directly regulates CO2 emissions from its light duty fleet in g/km as a fleet average target – corporate average standards

**Greenhouse gas (GHG) emissions standards:**

- **California:** Control tailpipe CO2 equivalent GHG emissions and includes GHG emissions from car air conditioning, nitrous oxides from cat-converters, methane etc. (car and light trucks)

**India has decided to adopt corporate average CO2 emissions standards**
Where is India in this race?
The advantage.....
How will India finish this race?

<table>
<thead>
<tr>
<th>Country</th>
<th>Fleet average CO2 emissions (g/km) In 2010 (approx)</th>
<th>Fleet average CO2 emissions (g/km) target proposed for 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union</td>
<td>145</td>
<td>95</td>
</tr>
<tr>
<td>United States</td>
<td>187</td>
<td>121</td>
</tr>
<tr>
<td>China</td>
<td>179</td>
<td>117</td>
</tr>
<tr>
<td>Japan</td>
<td>130</td>
<td>125 (in 2015)</td>
</tr>
<tr>
<td>India</td>
<td>141*</td>
<td>???</td>
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</tbody>
</table>

Source: Based on the estimates of the International Council of Clean Transportation that has compared the fuel economy/CO2 regulatory targets for the countries US, European Union, Japan and China based on NEDC cycle. * IEA for India 2010

If we follow the proposal in Planning Commission’s -- low Carbon Growth Report:

If CO2 emissions are reduced at 2% per year from 2010-2015, and at 3% per year from 2015-2020, the average CO2 emissions in 2020 can be as low as 109.4 g/km. --- Cumulative cost savings can be more than USD 80 billion
Why this is doable?

The average weight of car fleet in Europe is 1300 kg and average fleet CO2 emissions is about 145g/km. But Europe is proposing to meet 95 gCO2/km in 2020.

The average weight of car fleet in India is 1050 kg and the current average fleet CO2 emissions is 141 g/km — much less than Europe. India can easily narrow gap with the proposed target of Europe and prevent future emissions.

Need quick and effective decision
Fuel economy of Indian small cars can be better
Need technology forcing fuel economy standards....
Standards make a difference.........

Studies show FE performance of industry varies according to regulatory stringency of the markets.
Source: WRI
Need strategies to influence consumers

Consumer information
- Display posters in car showrooms
- Fuel economy labelling
- Publish fuel consumption and CO2 emissions guide
- Include fuel consumption and CO2 emissions data in advertising, brochures etc.

Tax policies
- **The US:** Gas guzzler tax
- **Canada:** National Fee-bate program by fuel consumption for cars, minivans, SUVs and light trucks
- **Japan:** Engine size based annual vehicle tax
- **European Commission** proposed car registration taxes and annual circulation tax to be totally or partially CO2 based
- **UK,** the Vehicle Excise Duty (VED) is an annual road tax based on CO2 emissions.
- **The Netherlands** -- tax break based on the energy bands etc
Announce and implement fuel economy standards.

-- Need immediate decision on mandatory fuel economy standards for 2015 and 2020.

-- Prevent up-weighting: Combine fuel economy standards, labelling and fiscal measures to prevent increase in average weight of the fleet. Disincentivse SUVs.

-- Avoid trade-offs: Combine fuel economy standards, fiscal measures and clean emissions standards to prevent trade-offs between efficiency and harmful emissions. Eg Diesel.

-- Need tax measures linked with fuel efficiency and emissions.

-- Need administrative preparedness, data management to implement corporate fuel economy standards.

-- Need compliance strategy along with effective penalty to implement corporate standards.
Next steps…

Bring two-wheelers and heavy-duty vehicles within the ambit of regulations

Motorized two-wheelers have the smallest energy footprint (60-70 km/litre).

Buses in Bangalore: Concern over declining fuel economy in public transport buses due to increase in power and size and on-road conditions

Source: Karnataka Metropolitan Transport Corporation, Bangalore
What may go wrong? -- Unresolved trade-offs.....

Important to address local air pollution emissions and warming gases together...
Diesel cars – an example of this trade off

Diesel cars more than 36% of new car sales
In compact segment diesel cars are already close to half......
Price difference will fan this further...
Cars the biggest beneficiary
Dieselisation set to explode….

Cars already the second biggest beneficiaries of the official tax policy after trucks.

- **Cars use up 15% of diesel in the country**
- Buses and agriculture 12% each,
- Industry 10 %
- Railways 6 %
- Power generation 8 %

- A quirk in the definition of small diesel car to take advantage lower tax on cars -- For the purpose taxation small diesel car is defined as -- length not exceeding 4,000 mm and with an engine capacity not exceeding 1,200 cc for petrol cars and 1,500 cc for diesel cars.

- This has seen rapid proliferation of diesel models even in small segments
Technology lag

Two step emissions standards created two classes of citizens:
Public health ignored

13 cities Euro IV
Rest of the country at Euro III
Diesel cars have the legal license to emit more PM and NOX that are the key concerns in our cities.

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

NOx norms for cars

PM norms for cars

One diesel car emits as much NOx as 3 to 5 petrol cars. PM is several times higher.

Source: MP Walsh
India does not have post-2010 emissions standards roadmap

Only a voluntary plan of gradual spread of Euro IV compliant fuel (50 ppm sulphur) --- in 50 cities by 2015

Dieselisation without emissions standards roadmap can enhance public health risks
Euro III diesel cars emit more harmful pollutants than petrol cars… But less CO2

Emissions vs efficiency remains unresolved in India………………

Source ARAI
Why are we specially worried about diesel?
Need strong action on toxic emissions

Special concern over Toxicity of diesel emissions.

Branded as probable human carcinogen.

Diesel particulate cause 300 excess cancer cases per million people per micrgramme per cubic meter of concentration over a 70 year lifetime exposure.

Source: MP Walsh
Studies have found very high contribution of diesel combustion to PM2.5 in Indian cities

- In three cities among six cities reviewed by the World Bank shows that vehicles contribute an average 50 percent of the direct PM emissions but 70 percent of PM exposure.

- The WHO report of 2005 Health effects of transport-related air pollution weighed in that epidemiological evidences for the adverse health effects of exposure to transport related air pollution is increasing.
Diesel cars can also make India more energy and climate insecure. How?

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

**Europe: Share of diesel cars in new sales in Western Europe**

Cheaper diesel, disproportionate focus on diesel cars to meet CO2 targets etc have led to massive dieselisation… ……But at a cost..

European cities are violating air quality standards: NO2 levels strongly co-relate with PM2.5 in European cities.
Between 1996 and 2005 the amount of fuel used for each 100 km driven by new cars in the UK decreased by 6% as a result of improvements in efficiency.

Emissions of CO2 from private cars rose by 4% in the same period, mainly because of increasing distances travelled by car, which rose by 10%.

PM10 emissions declined by 29% between 1996 and 2000 but subsequently decreased by only a further 3% … the improvements offset by an increase in the use of, and emissions from, diesel cars.
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. Beijing does not allow diesel cars.

  - UK has equalised diesel and petrol prices.

  - Germany, Hong Kong etc introduced differential pricing to expand the market of cleaner diesel.

  - Delhi government increasing road tax on diesel cars. Need national action.
It is possible to reduce harmful diesel emissions drastically.
But India is dieselising without clean diesel roadmap

Diesel PM can be made comparable with petrol vehicles only if advanced emissions control systems (like particulate traps) are used along with near zero sulphur fuels

Source: ICCT
Set stringent benchmark for the new investment in auto sector

Car production is expanding in spurts

Source, India-stat
Vehicles and fuels need integrated action….

Fuel sulphur destroys emissions control systems also contributes to PM formation…

Other fuel components add to toxicity…..

Euro V and Euro VI need 10 ppm sulphur fuels

Can our refineries do this?
Despite under recovery and losses refinery capacity has expanded as planned

Installed capacity has increased

Source: CSE compilation based on MOPNG data
Design fiscal measures
Make cars pay for clean fuel

Imposition of Rs 80,000 per car from 2011-12 (that is roughly equal to excise incidence on a compact diesel car priced Rs 5L) will accumulate Rs 42,484 crore at the end of 2015-16

Source: CSE compilation and estimation from market sources
Cost benefit analysis convince other governments to take hard decision.....

USEPA calculates cost benefit of clean air regulations to justify aggressive action

Our government under tax diesel and also hesitate to invest in clean diesel

So who is losing in India?
Government and our health

Why should government bear the cost of subsidy to rich car owners

- If the use of subsidised diesel continues to increase the government will continue to incur a huge revenue losses as it earns much less from excise on a litre of diesel used by cars, as opposed to petrol – about three times.

- Revenue losses will compound with increased share of diesel cars and SUVs.

- Delhi has taken the lead to increase the road tax on diesel cars. A big step forwards....
Need immediate decision on the roadmap

• The six city study has recommended working groups. Expedite the process

• Recommended control strategies for the 2015-17 timeframe:
  – Progressive incremental introduction of BS IV from 2010 onwards
  – Progressive incremental introduction of BS V/VI from 2015 onwards

Good beginning. But need a definite date. Need uniform standards nation-wide
India will have to prepare for the new genre emissions standards – particle number standards etc

**New genre of technology**

Diesel cars: Exhaust aftertreatment, PM filters, SCR for NOx control (Urea based...), NOx absorber.

- Tighter controls for petrol vehicles
- Electric and hybrid vehicles
- Real world emissions and In-use compliance strategies: On-board diagnostic systems.

This can be addressed comprehensively only through and Auto Fuel Policy.

*We cannot afford to wait.......*
Thank You