Fuel and Vehicle Technologies for Air Pollution Reduction

Vladimir Moshkalo
Moscow, December 2013
The challenge & opportunity in road transport
UNEP Transport Unit: Key Programmes

Avoid:
Share the Road

Shift:
Low Carbon Mobility: India
Bus Rapid Transit: Africa
Highly Effective Interventions

- Fuel quality: 50 ppm or below sulfur in fuels
- Vehicle emission standards: Euro IV, Euro V, Euro VI
- Black Carbon, PM
- Auto Fuel Economy
Partnership for Clean Fuels and Vehicles

Leading global initiative to promote cleaner fuels and vehicles at global, regional and national level

Public – private partnership – 100 members
Governments – NGOs – oils & vehicles - international organisations

Global campaigns:
- Phase out leaded petrol
- Introduce low sulfur fuels
- Introduce vehicles emissions standards

PCFV well established and recognized
Climate and Clean Air Coalition (CCAC)

Heavy Duty Diesel Vehicles and Engines initiative:

- Global Fuel Sulfur Strategy
- Global Green Freight Declaration and Charter
- Ports
The Global Auto Fleet

...is set to triple,...

...with 90% of this growth taking place in developing countries....

Global passenger light duty vehicle stock (billions)


Non OECD
OECD

IEA 2011
Co-benefits: climate efforts will reduce outdoor air pollution (and vice versa)

- PM$_{2.5}$, BC, GHG reductions linked

- Measures to reduce emissions of greenhouse gases to 50% of 2005 levels, by 2050, can reduce the number of premature deaths from the chronic exposure to air pollution by 20 to 40%.
  (Netherlands Environmental Assessment Agency (pbl) 2005)

- 1/4 of global Black Carbon emissions come from diesel engines burning high-sulfur fuel
“Air Pollution Is a Leading Cause of Cancer”
WHO IARC, October 17, 2013

Particulate matter affects more people than any other pollutant.”

- Small particulates are responsible for an estimated 3.2 million premature deaths annually. (HEI 2012)
Transport Key to CO2 Reductions: fuel consumption, CO2 from cars to double 2000-2050 (IEA)

World LDV CO2 emissions, business as usual vs GFEI, million tonnes (Mt) CO2, GFEI intervention (IEA 2009)
25% of BC from transport, diesel

Source: ICCT and Bond, 2009
Cleaner Fuels + Vehicles = Systems Approach

Better Combustion
Tailpipe Emission Controls
Cleaner Fuel
Vehicle Emission Standards

- Diesel particulate filters (DPFs) can virtually eliminate black carbon particles
- Clean, low sulfur fuels = direct link to PM emissions
  - Fuel quality: 50 ppm or below sulfur in fuels
  - Vehicle emission standards: Euro IV and above.
Petrol Fuel Sulphur Levels: Central and Eastern Europe, Caucasus & Central Asia

* Information in parts per million (ppm)
Sulphur levels are maximum allowable, best available information as of August 2013. For additional details and comments per country, visit www.unep.org/pcf.
Low Sulphur Fuels reduce PM directly, open door to emission controls and advanced technology.

At 500 ppm sulfur, 15-30% PM reductions

At 50 ppm sulfur, 75% PM reductions

At 10-15 ppm sulfur, > 95% PM reductions

500 ppm, 50 ppm critical vehicle technology breakpoints for catalysts and filters.
Filters & tailpipe emissions

- Reductions of 85% in Black Carbon

Diesel particulate filters achieve dramatic emission reductions
Global non-CO2 climate benefits of Accelerated Policy (Euro VI vehicle standards) relative to Baseline scenario in 2030. Positive numbers indicate a warming effect and negative numbers indicate a cooling effect.

<table>
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<tr>
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<th>2030 Annual Climate Benefits</th>
<th>Cumulative Climate Benefits (2015–30)</th>
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<tbody>
<tr>
<td></td>
<td>GWP-20</td>
<td>GWP-100</td>
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<tr>
<td>Black Carbon (BC)</td>
<td>760</td>
<td>220</td>
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<tr>
<td>Methane (CH₄)</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Nitrous Oxide (N₂O)</td>
<td>-10</td>
<td>-10</td>
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<tr>
<td>Organic Carbon (OC)</td>
<td>-60</td>
<td>-20</td>
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<tr>
<td>Sulfates</td>
<td>-30</td>
<td>-10</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>710</strong></td>
<td><strong>200</strong></td>
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Source: ICCT Health Climate Roadmap 2013
Global non-CO2 greenhouse gas (GHG) emissions from on-road vehicles under the Baseline and Accelerated Policy

Source: ICCT Health Climate Roadmap 2013
Russia

• Russia’s planned vehicle standards do not go beyond Euro V…

• But 10 ppm fuels will be available by 2015 due to massive refinery investments

• A Euro VI-equivalent standard is possible for both light and heavy duty vehicles – capitalize on clean fuel investments!