



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



+ Improve



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



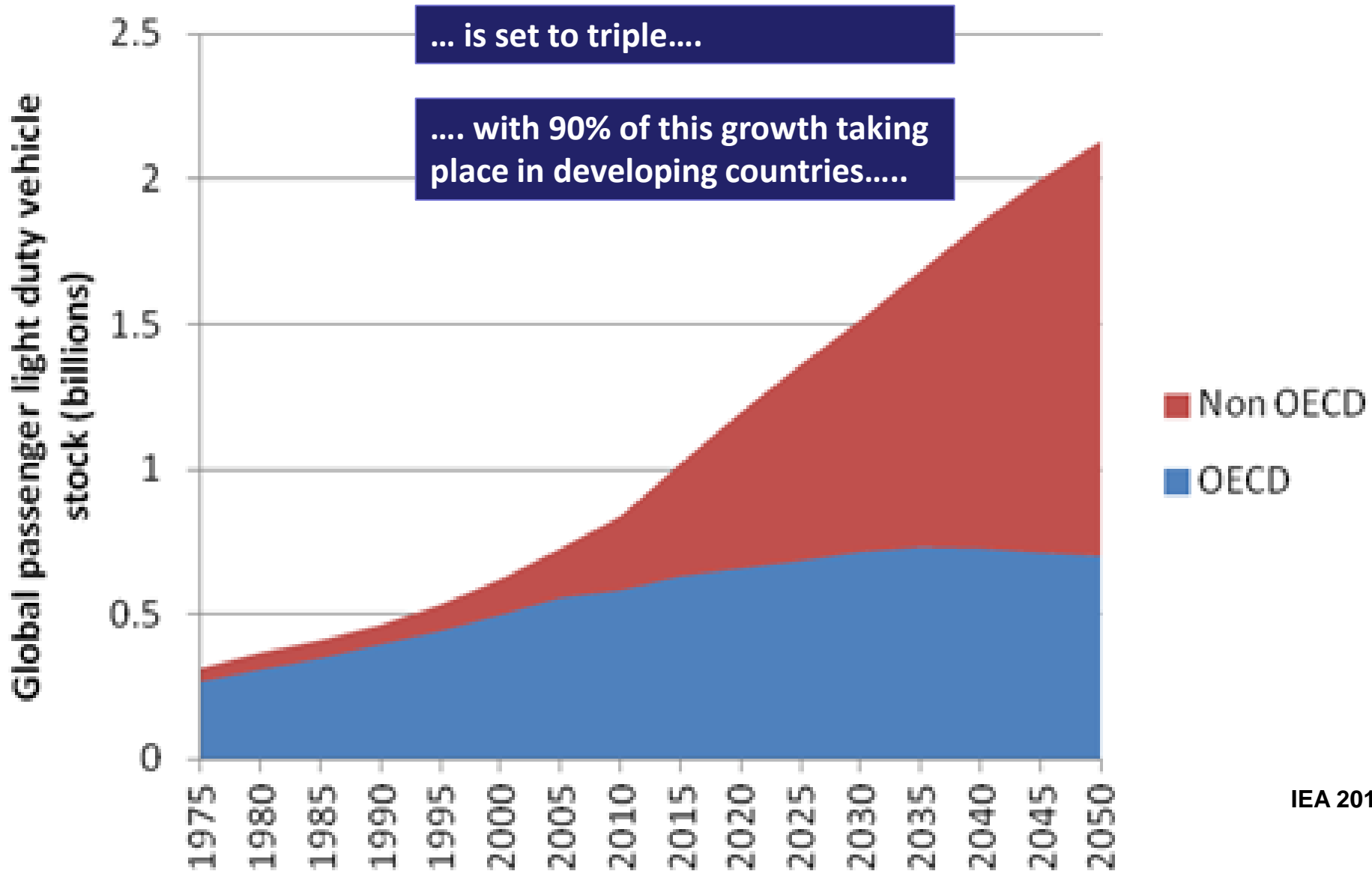
Climate and Clean Air Coalition (CCAC)



Heavy Duty Diesel Vehicles and Engines initiative:

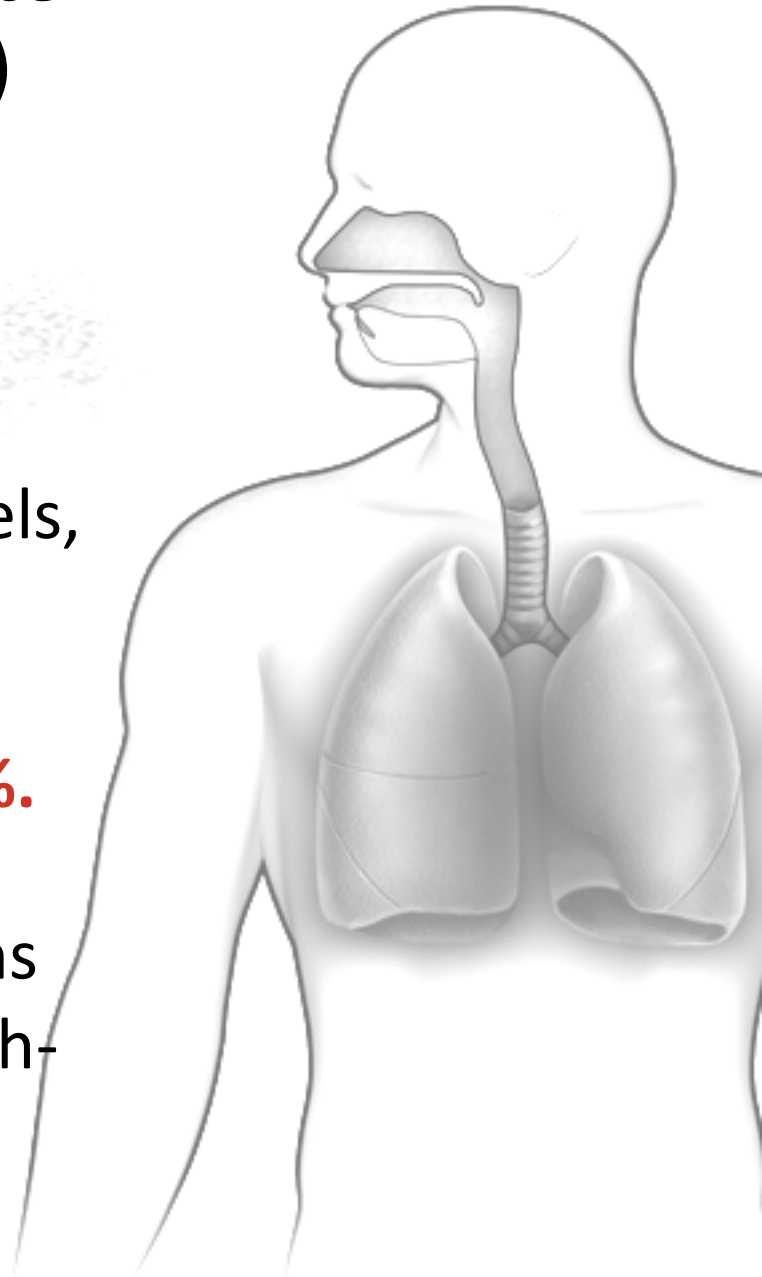
- Global Fuel Sulfur Strategy
- Global Green Freight Declaration and Charter
- Ports

The Global Auto Fleet



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)

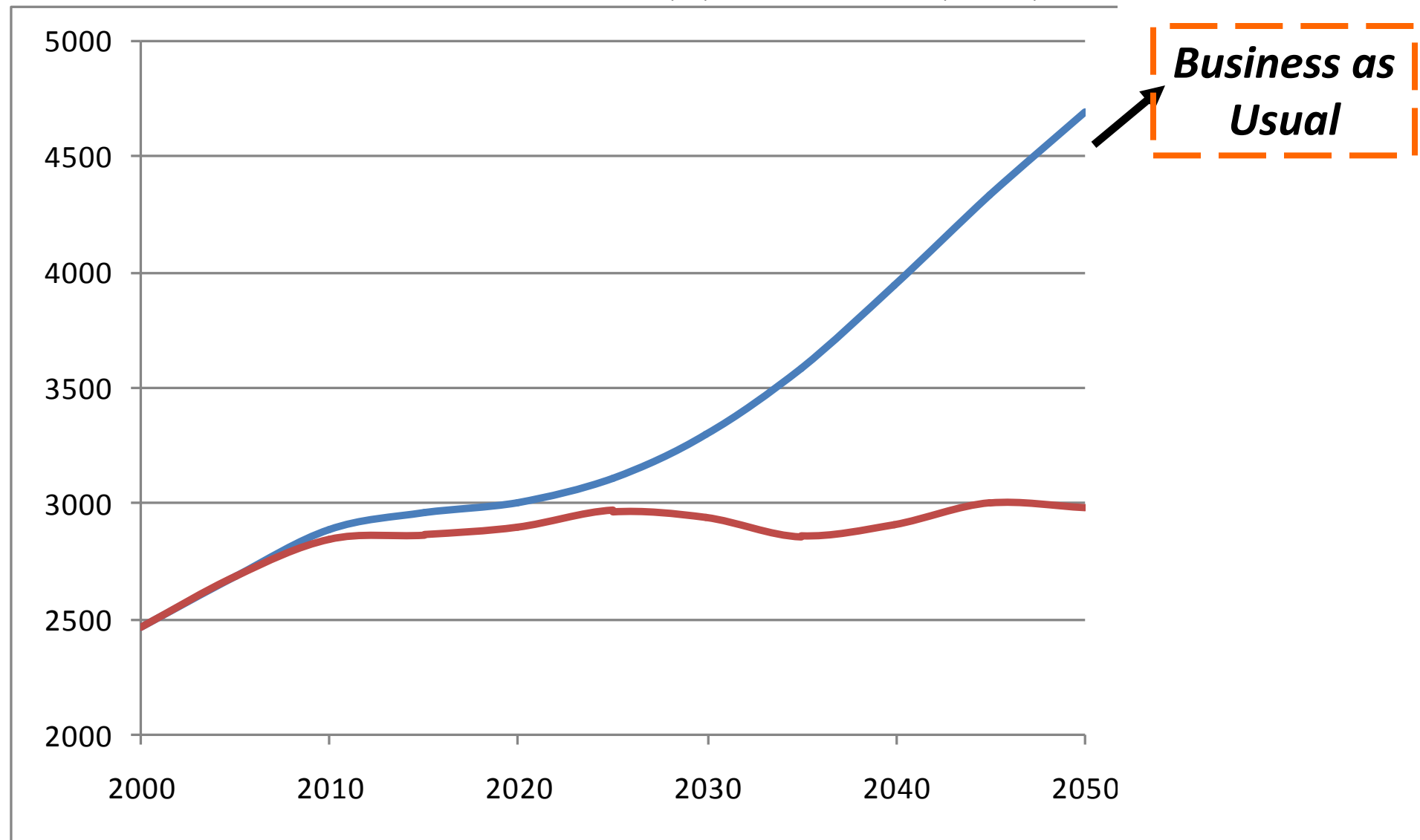


This is what 500 micrograms/cubic meter looks like.

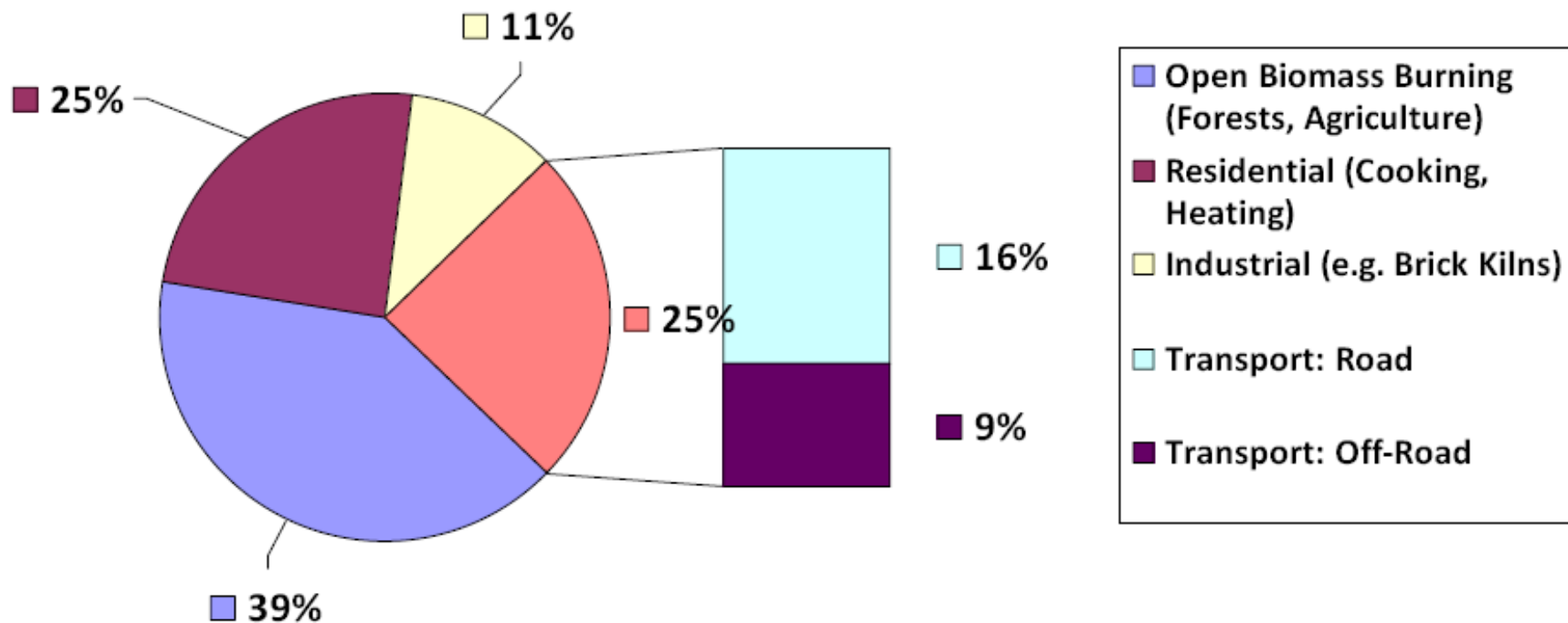
REUTERS

Transport Key to CO2 Reductions: fuel consumption, CO2 from cars to double 2000-2050 (IEA)

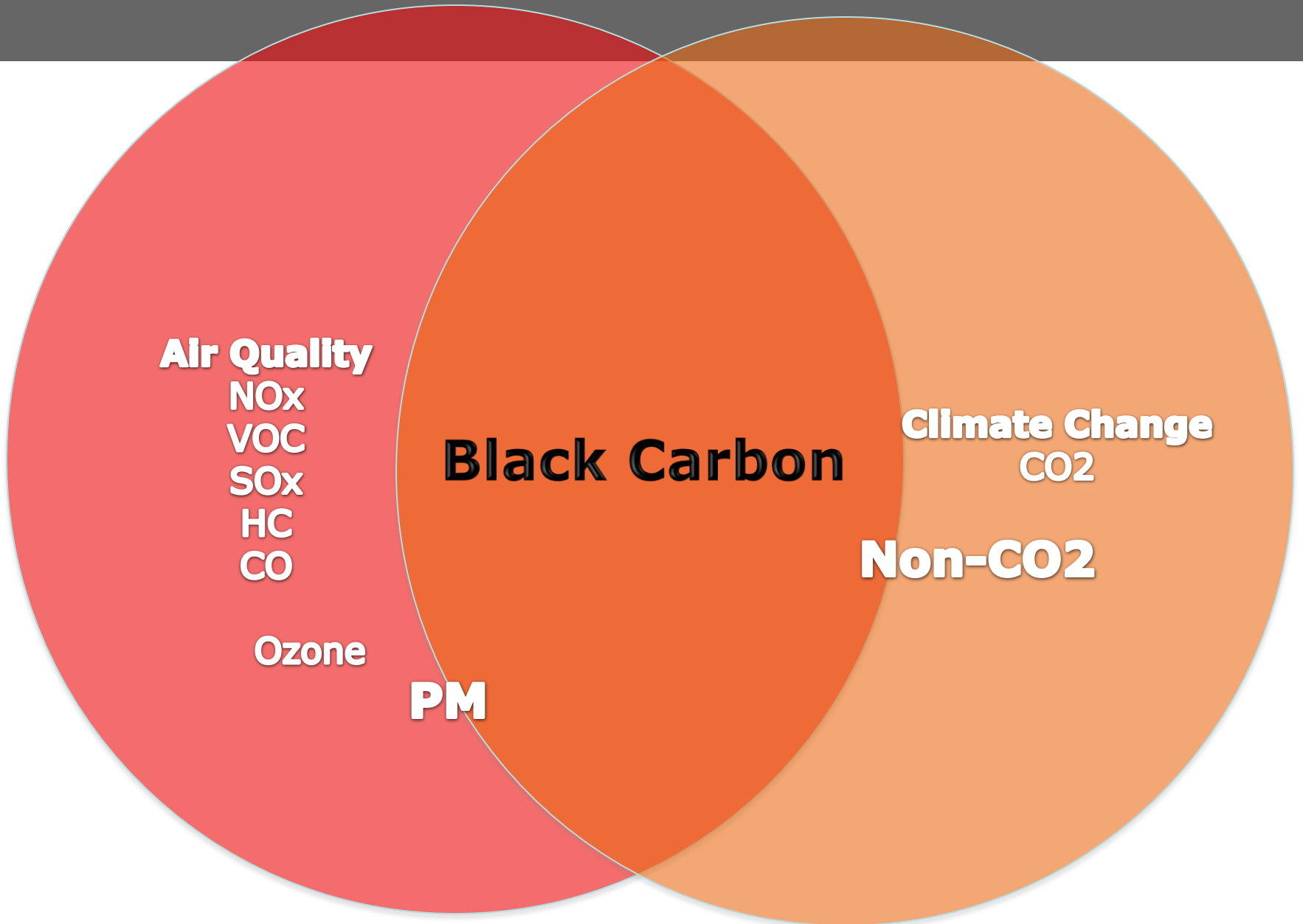
World LDV CO2 emissions, business as usual vs GFEI, million tonnes (Mt) CO2, GFEI intervention (IEA 2009)



25% of BC from transport, diesel



Source: ICCT and Bond, 2009



Air Quality

NOx
VOC
SOx
HC
CO

Ozone

PM

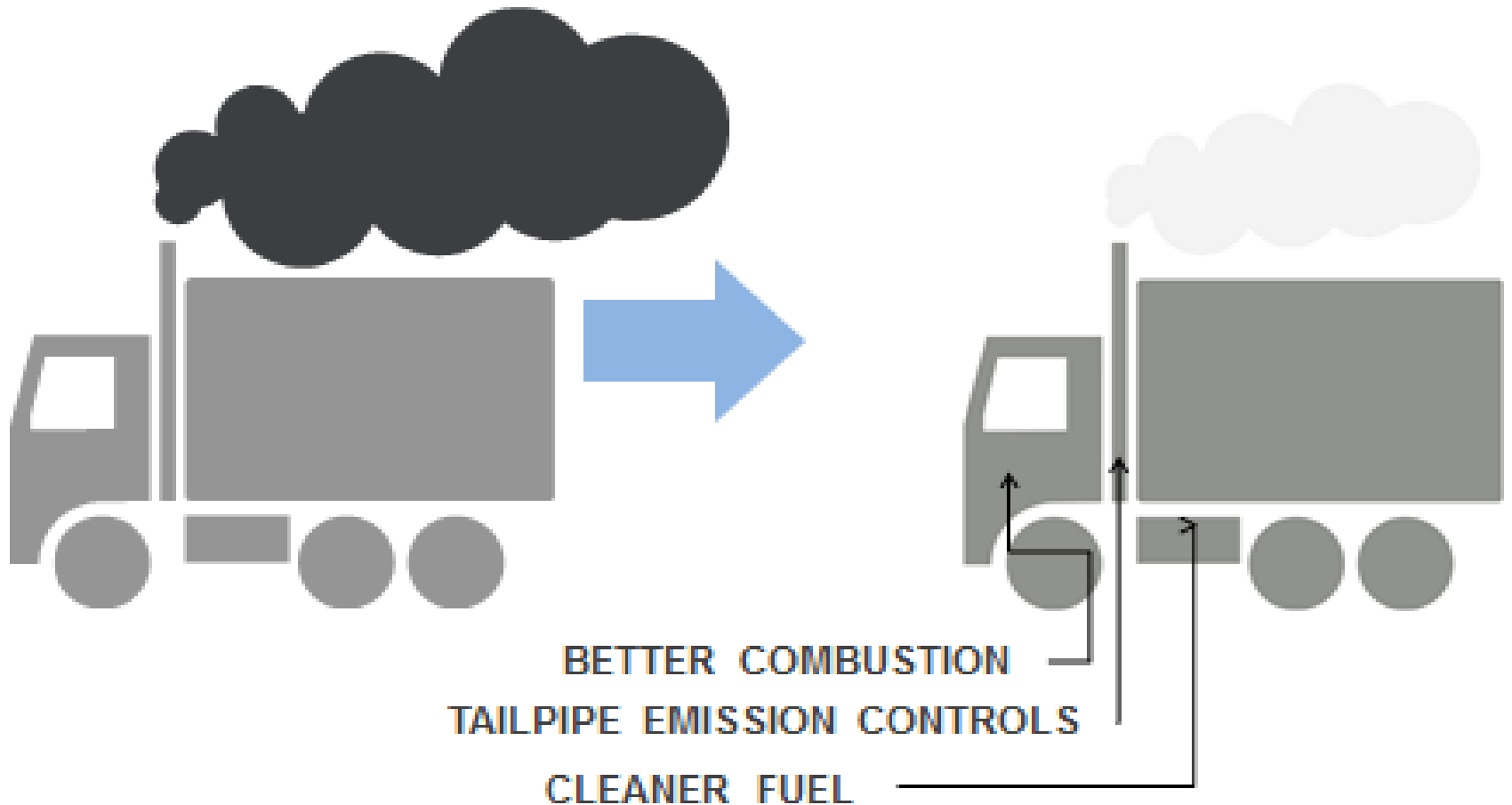
Black Carbon

Climate Change

CO2

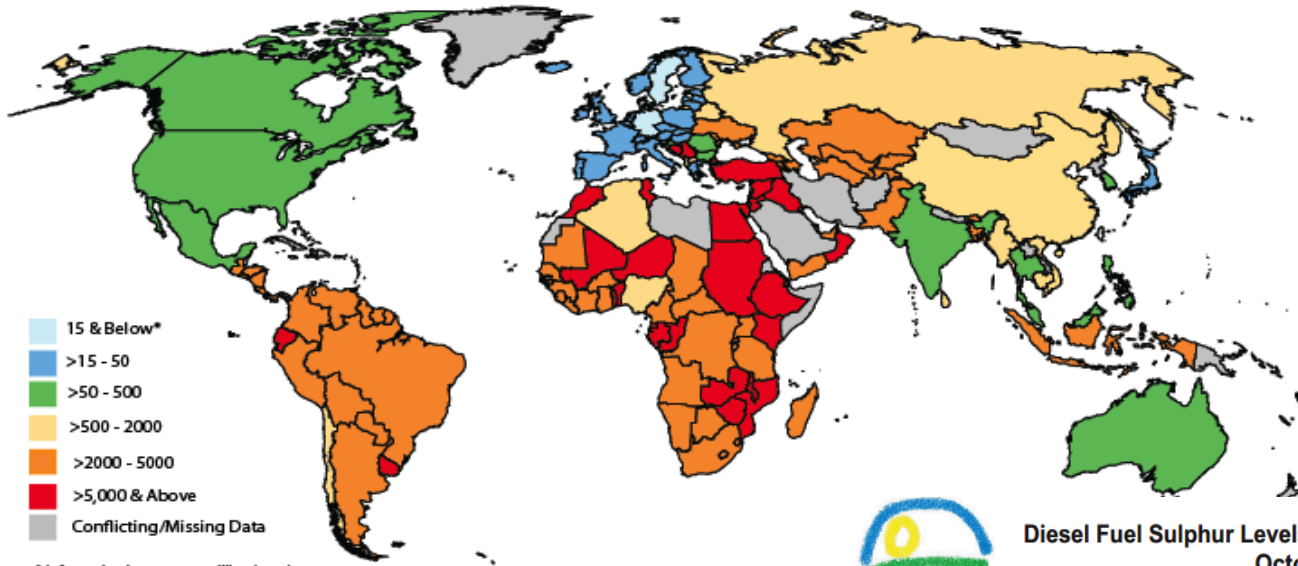
Non-CO2

Cleaner Fuels + Vehicles = Systems Approach



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.



- 15 & Below*
- >15 - 50
- >50 - 500
- >500 - 2000
- >2000 - 5000
- >5,000 & Above
- Conflicting/Missing Data

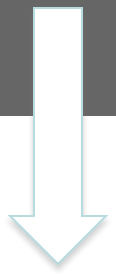
* Information in parts per million (ppm)



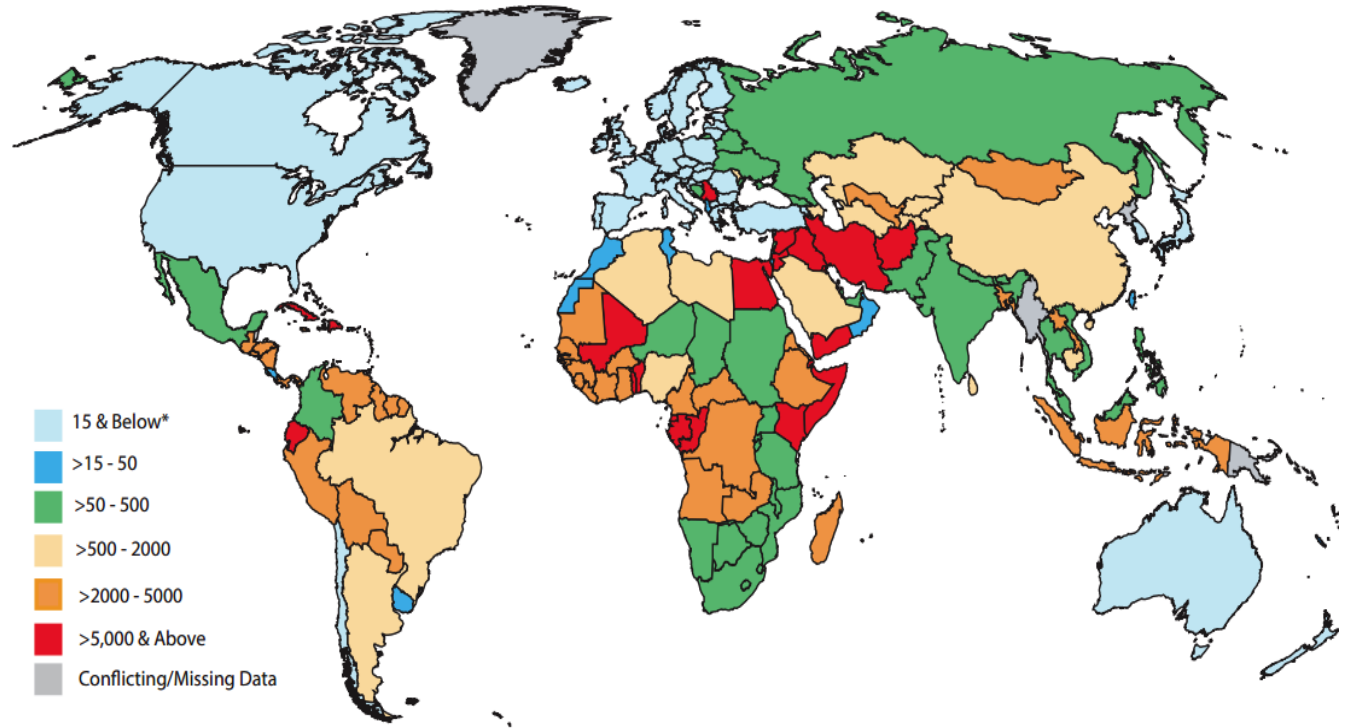
Diesel Fuel Sulphur Levels: Global Status
October 2013



2006



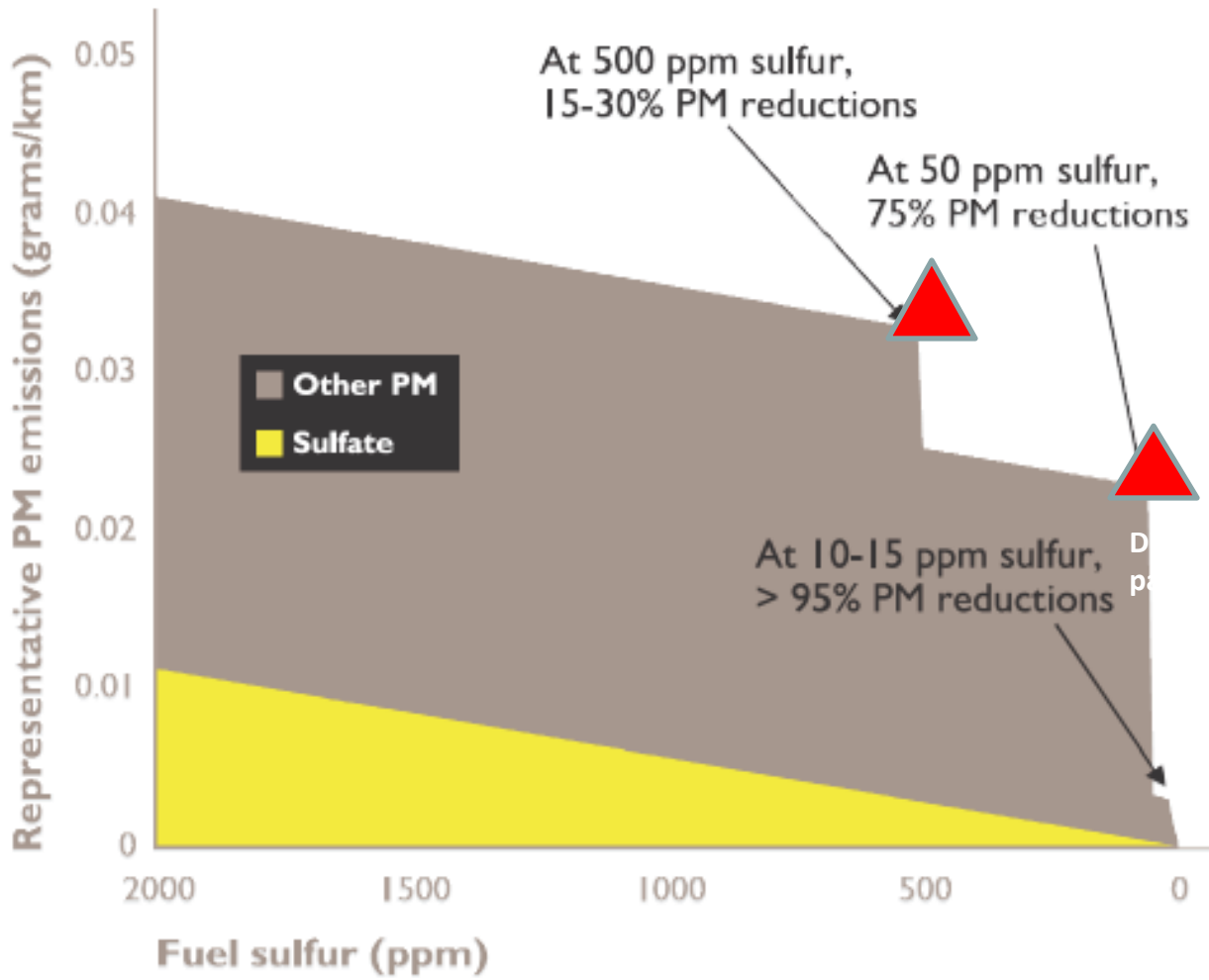
2013



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Low Sulphur Fuels reduce PM directly, open door to emission controls and advanced technology



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



Overview: The exhibits above are actual PM collection samples from an engine testing laboratory used to collect and measure diesel particulate matter (PM) emissions. Test conditions are:

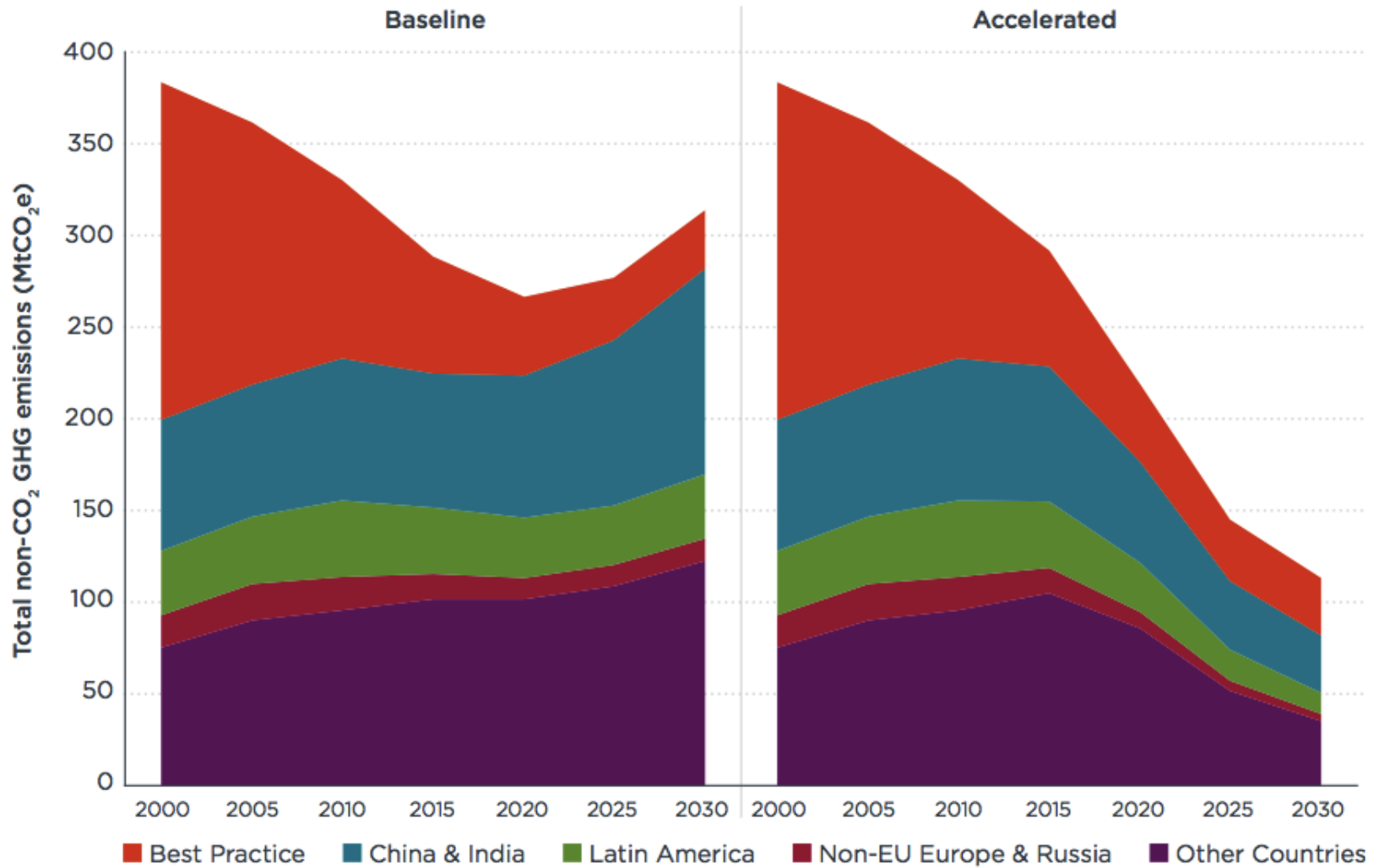
- Test Cycle: UDDS (Urban Dynamometer Driving Schedule)
- Test Distance: 5.5 miles over 17 minutes
- Fuel Consumed During test: 1.1 gallons
- Test Vehicle: Heavy-duty truck with a 370 hp Cummins engine (1999 model year)
- PM material on collection samples is 1/1,800th of actual

Combined Euro 6 + clean fuels

	2030 Annual Climate Benefits		Cumulative Climate Benefits (2015–30)	
	GWP-20	GWP-100	GWP-20	GWP-100
Black Carbon (BC)	760	220	5,770	1,650
Methane (CH₄)	30	10	280	100
Nitrous Oxide (N₂O)	-10	-10	-50	-60
Organic Carbon (OC)	-60	-20	-440	-130
Sulfates	-30	-10	-340	-90
Total	710	200	5,230	1,470

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.

Global non-CO₂ greenhouse gas (GHG) emissions from on-road vehicles under the Baseline and Accelerated Policy



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!



<http://www.unep.org/transport/>
www.unep.org/pcfV
<http://www.unep.org/ccac/>

