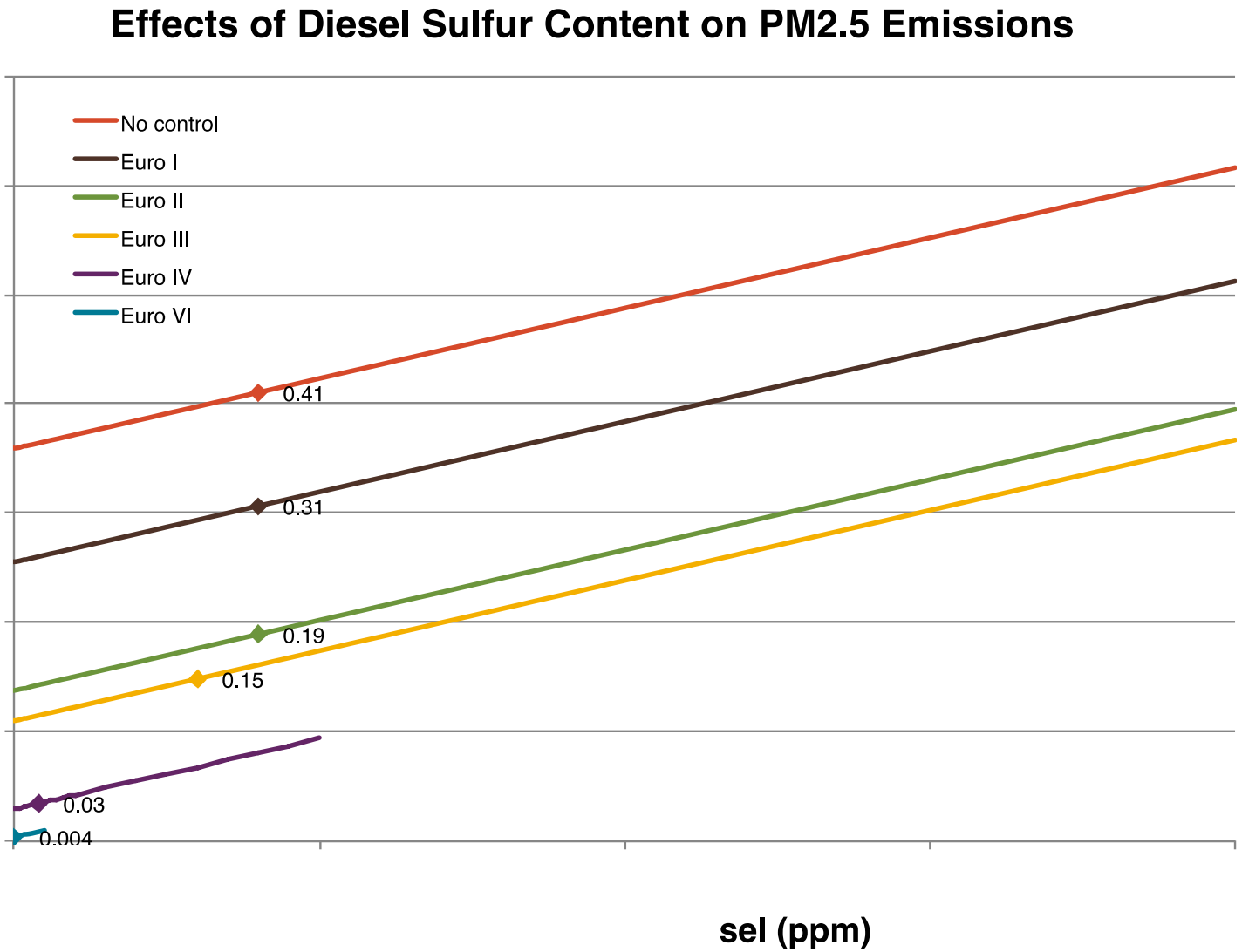
# Effects of Diesel Sulfur Content on PM2.5




Source: ICCT Roadmap model 1-K. 2013

# Cleaner, More Efficient Vehicles:

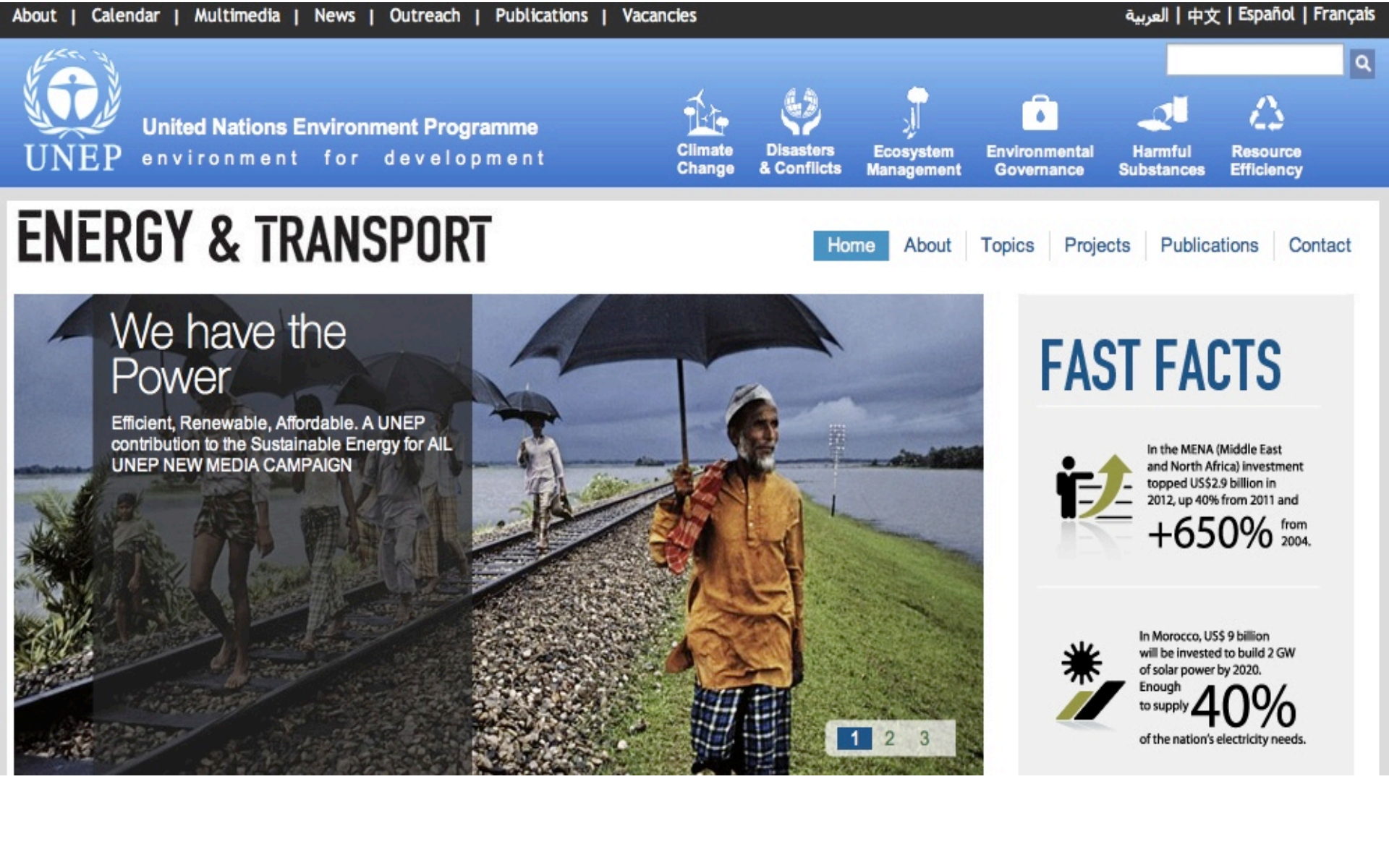
## The Role of Partnerships in Transformational Change

Elisa Dumitrescu, UNEP

New Delhi Anil Agarwal Dialogue 2015

11-12 March 2015

# www.unep.org/transport



I. Introduction
II. Partnership for Clean Fuels and Vehicles (PCFV)
III. Climate and Clean Air Coalition (CCAC)
IV. Global Fuel Economy Initiative (GFEI)

Partnerships: "*Voluntary and collaborative relationships between various parties, both public and nonpublic, in which all participants agree to work together to achieve a common purpose or undertake a specific task and, as mutually agreed, to share risks and responsibilities, resources and benefits*."

– United Nations General Assembly Resolution 60/215 "Toward Global Partnerships" 2006


# Avoid

# Shift

# Improve

# ***+ Improve***

Partnership for Clean Fuels and Vehicles

CCAC
CLIMATE AND CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

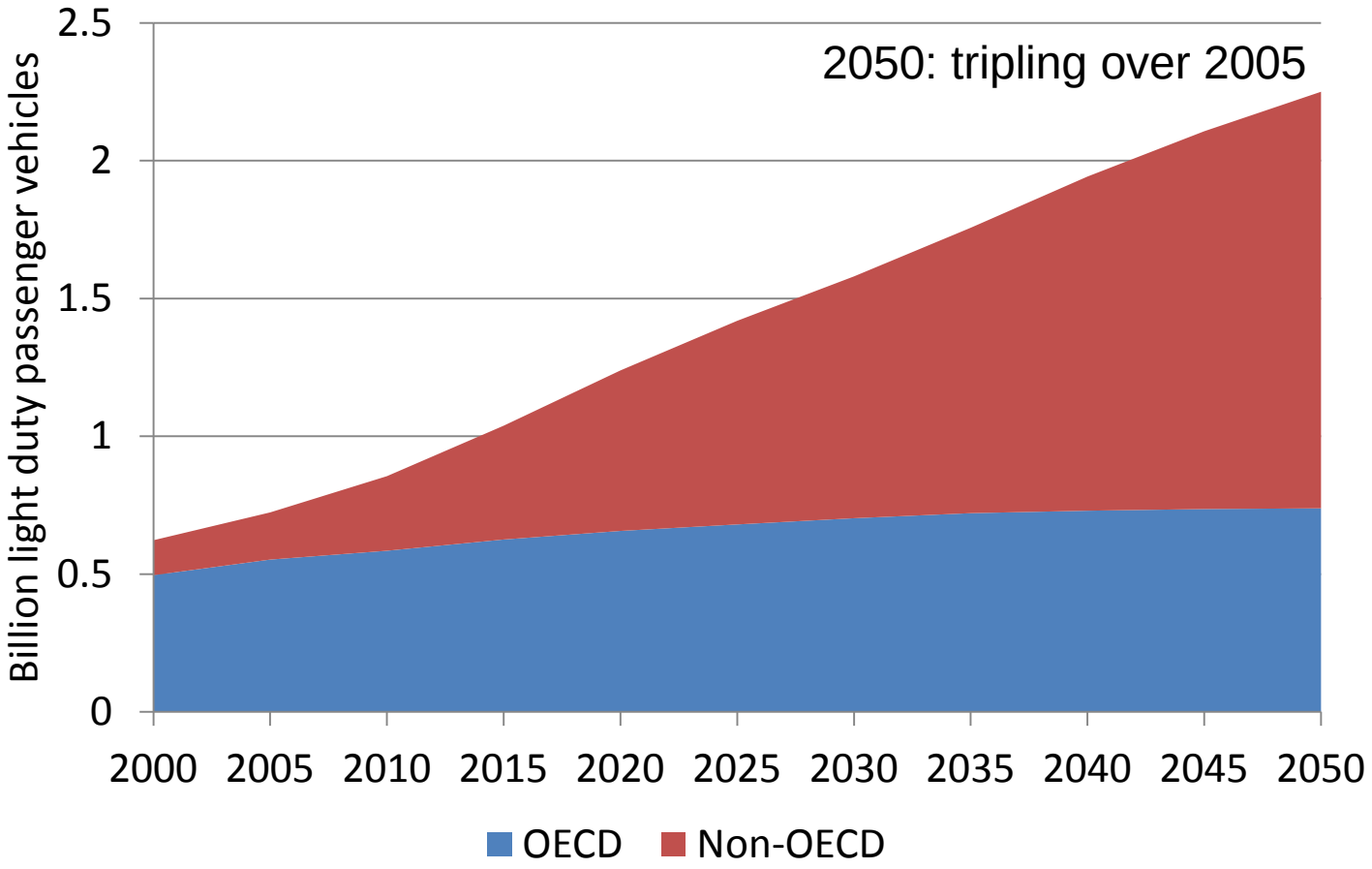
GFEI
GLOBAL FUEL ECONOMY INITIATIVE

- Fuel quality: 50 ppm or less sulfur in petrol and diesel
- Vehicle emission standards: Euro 4-6/IV – VI
- Transport black carbon, $PM_{2.5}$ reductions
- Doubling Auto Fuel Economy by 2050: “50by50”

# Growth in light-duty vehicles

## 2005 - 2050

*90%+ of growth in developing countries*

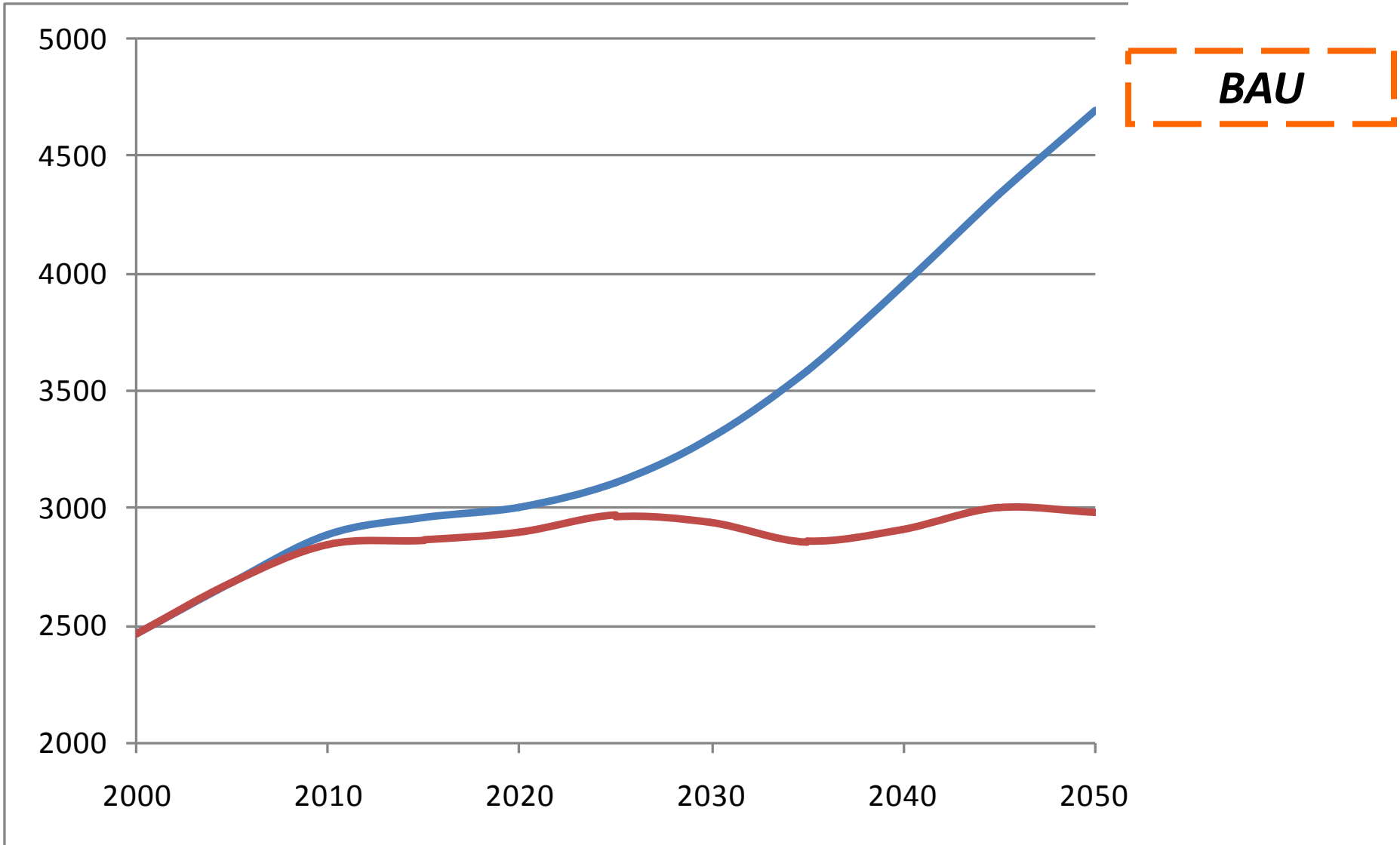



Source: IEA Energy Technology Perspectives, 2012

# BAU vs. Stabilization:

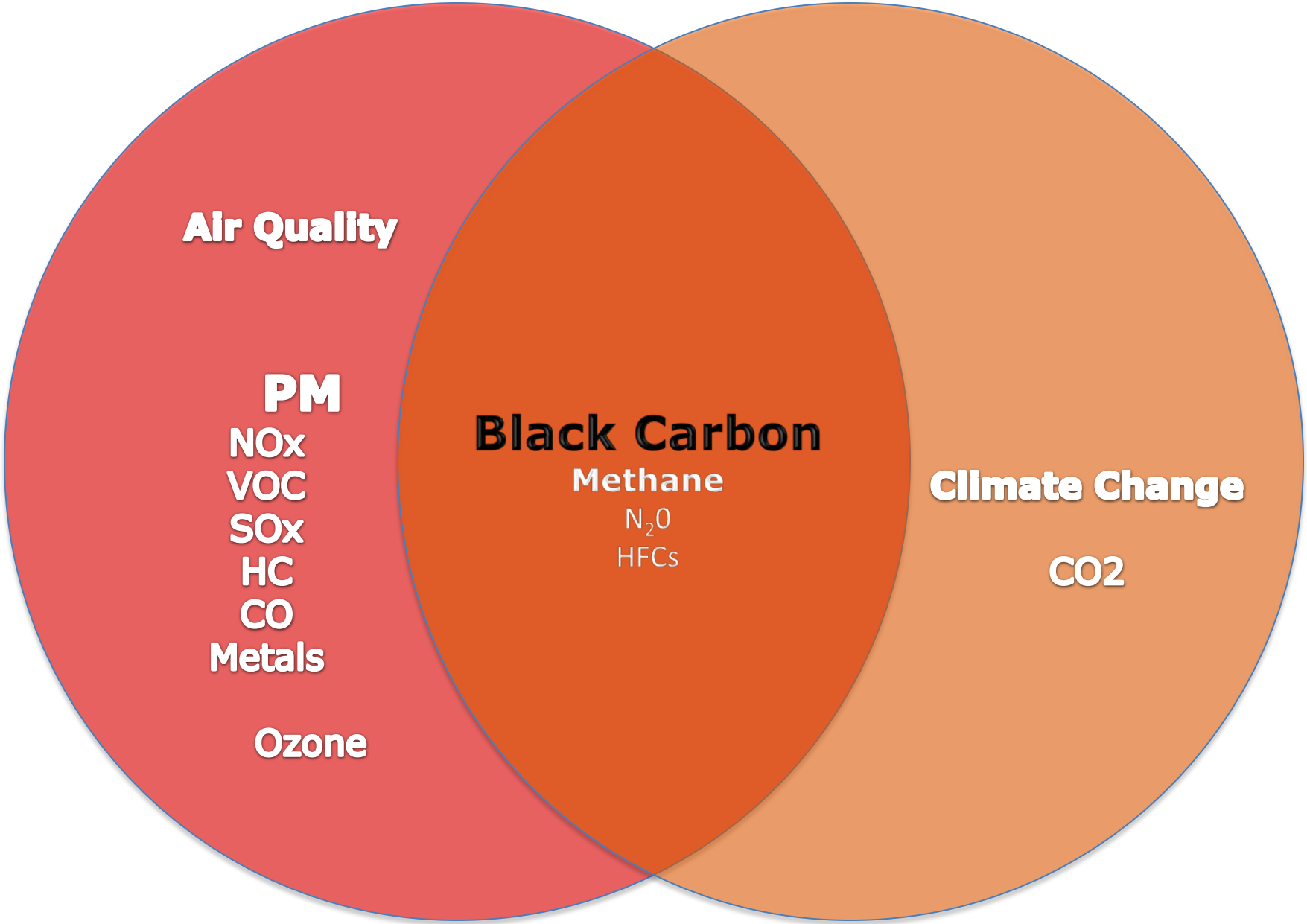
fuel consumption, CO2 from cars to double 2000-2050 (IEA)

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



- Heavy-duty trucks and buses currently account 80% + of PM2.5 emissions from on-road vehicles (ICCT 2013)

- 25% of BC from transport, diesel (both on and off-road)


Air Quality
PM
NOx
VOC
SOx
HC
CO
Metals
Ozone
Black Carbon
Methane
$N_2O$
HFCs
Climate Change
CO2

## Main challenges to cleaner fuels and vehicles

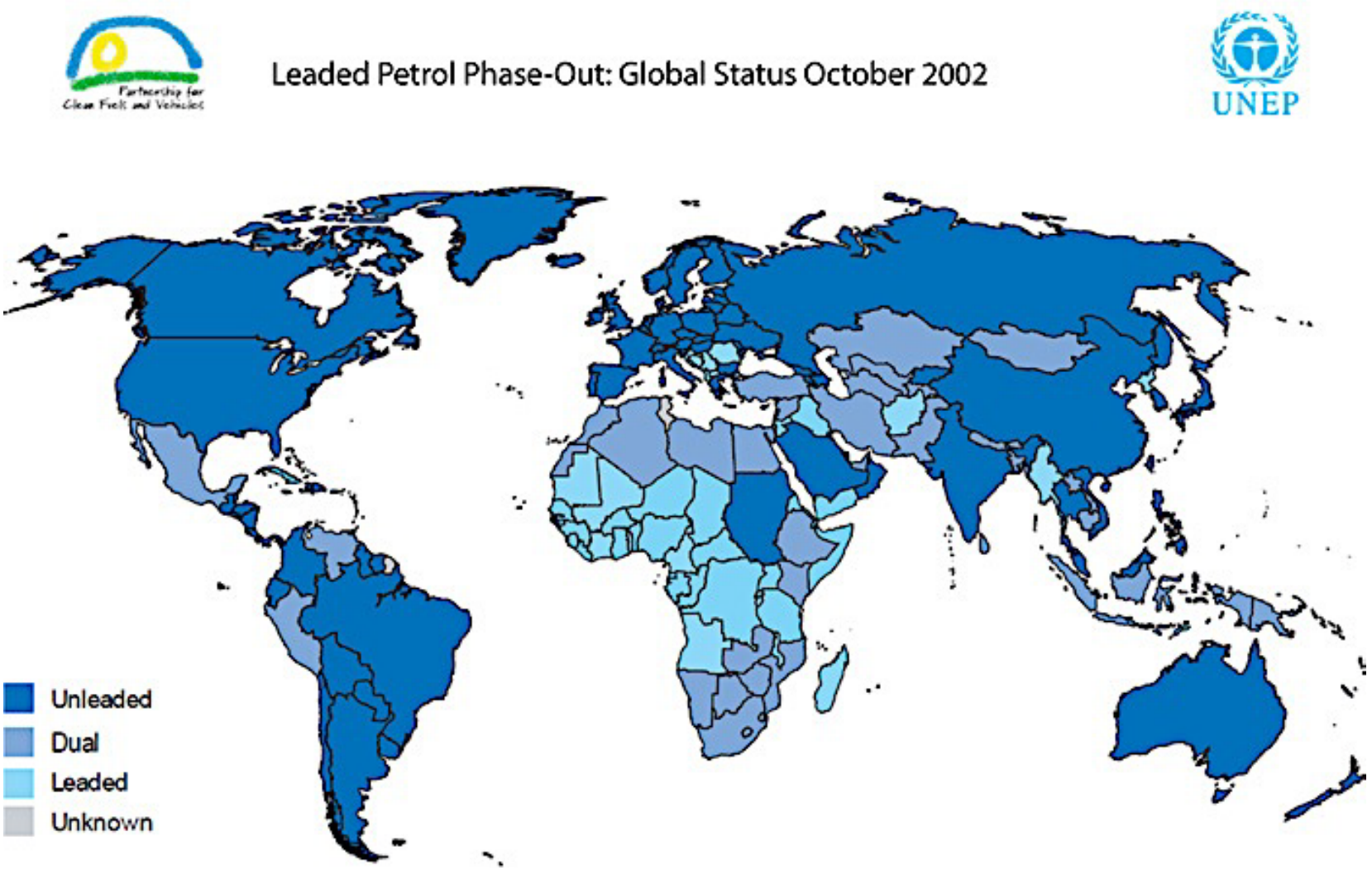
- Awareness of policy and technology – demanding good technology
- Prioritization of cleaner fuel and vehicle solutions vis-a-vis other health, environment, economic issues
- Finance and investment in refineries
- Import costs of cleaner fuels
- Fuel subsidies and distortionary vehicle taxation
- Economics of vehicle ownership – measures taxing older carts are unpopular, as are import restrictions on older vehicles

# Partnership for Clean Fuels and Vehicles

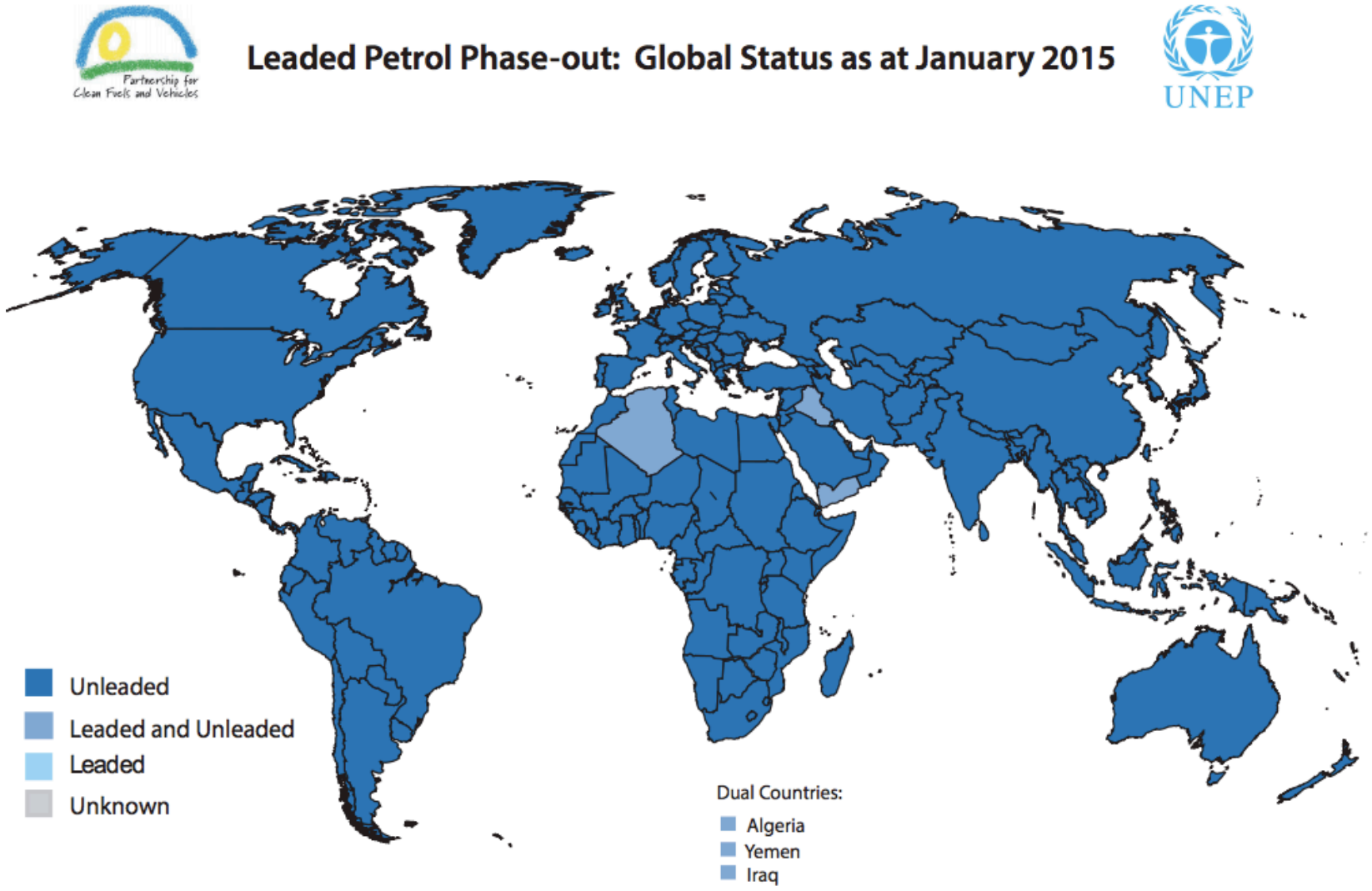
www.unep.org/pcfv


- Founded 2002 as leading global partnership for cleaner fuels and vehicles worldwide, 100+ members from gov't. industry, NGOs and academia
- Lead-free, low sulfur (50 ppm or less) petrol and diesel, complementary vehicle standards

# 2002: leaded petrol use



# 2015: leaded petrol use

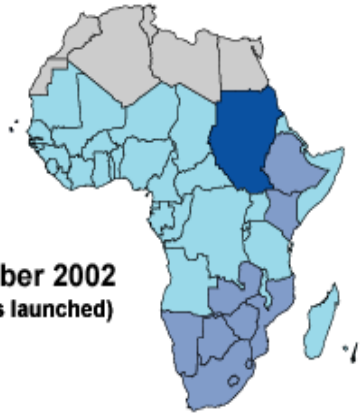


# Progress of leaded petrol phase out in sub-Saharan Africa

Partnership for Clean Fuels and Vehicles

UNEP

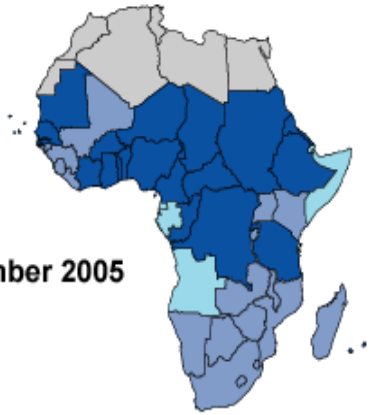
**June 2001**
(A sub-regional agreement reached to phase out leaded gasoline by January 1, 2006)



**September 2002**
(PCFV was launched)

**September 2003**

**September 2004**



**September 2005**

**January 2006**

Leaded

Leaded and unleaded

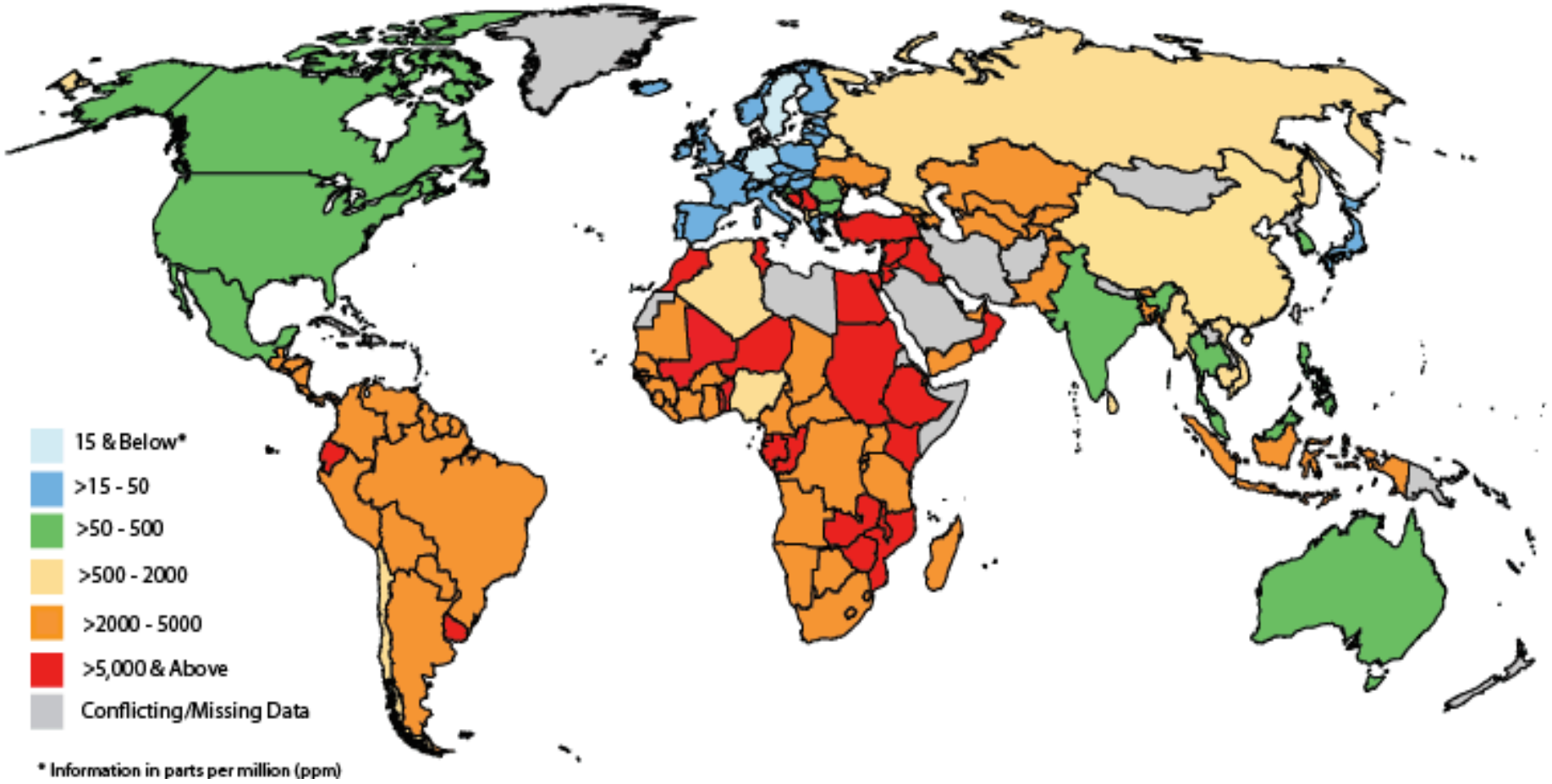
Unleaded

- UNEP's independent Evaluation Office evaluated PCFV Lead Campaign in Sub-Saharan Africa entitled *Outcome and Influence Evaluation of the UNEP Based Partnership for Clean Fuels and Vehicles*, published in 2010. The evaluation found that, as a very conservative estimate, it would have taken ***ten years rather than five*** to achieve the elimination of lead from fuel in Sub-Saharan Africa in the absence of PCFV.

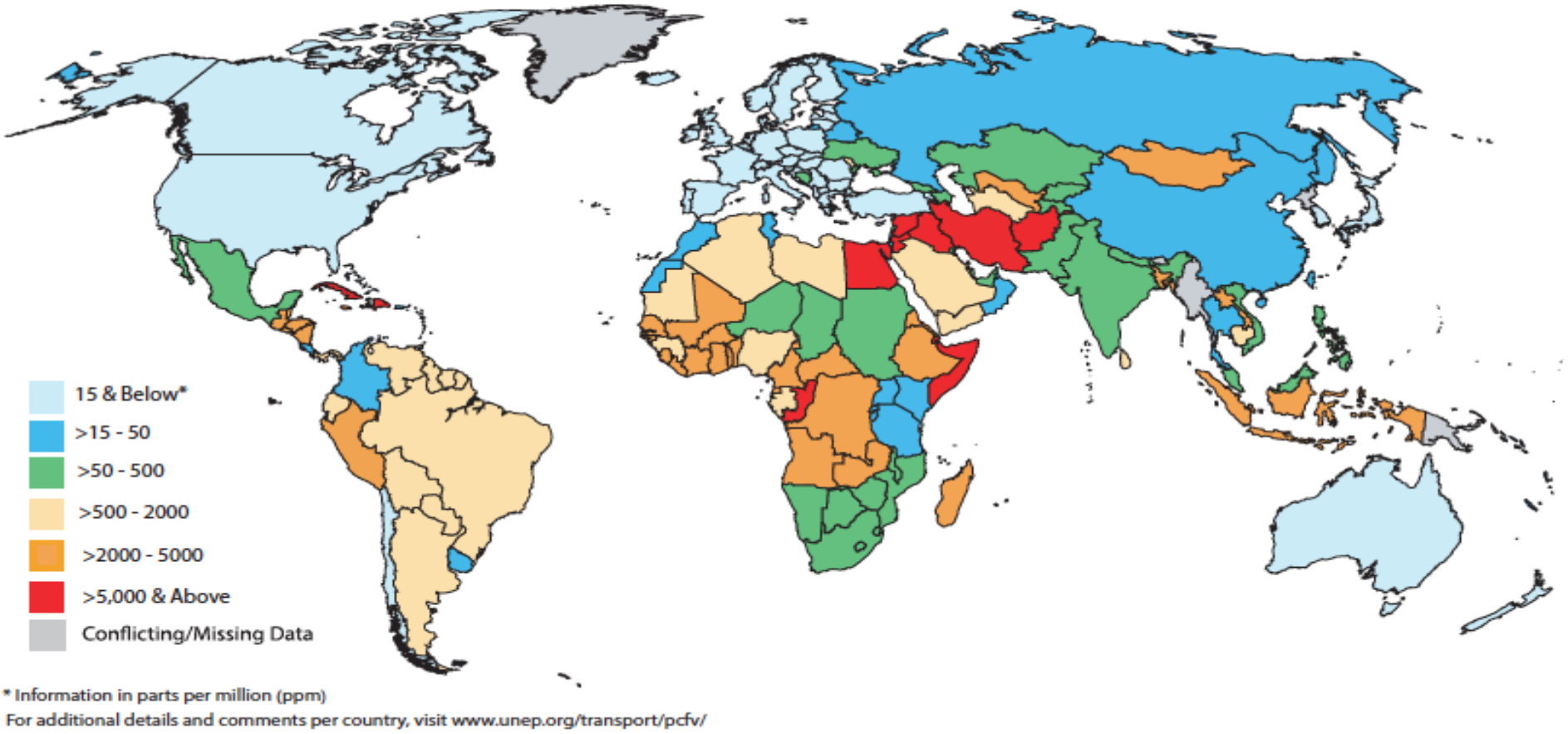
- A 2010 study by California State University assessed of the global benefits of phasing out leaded fuel: **over one million deaths avoided each year** and o**ver US $2 trillion (or 4% of global GDP)** is saved by eliminating lead from fuel.

Tsai, Peter L. and Thomas H. Hatfield, "Global Benefits from the Phase out of Leaded Fuel" *Journal of Environmental Health*, Volume 74, No. 5 December 2011

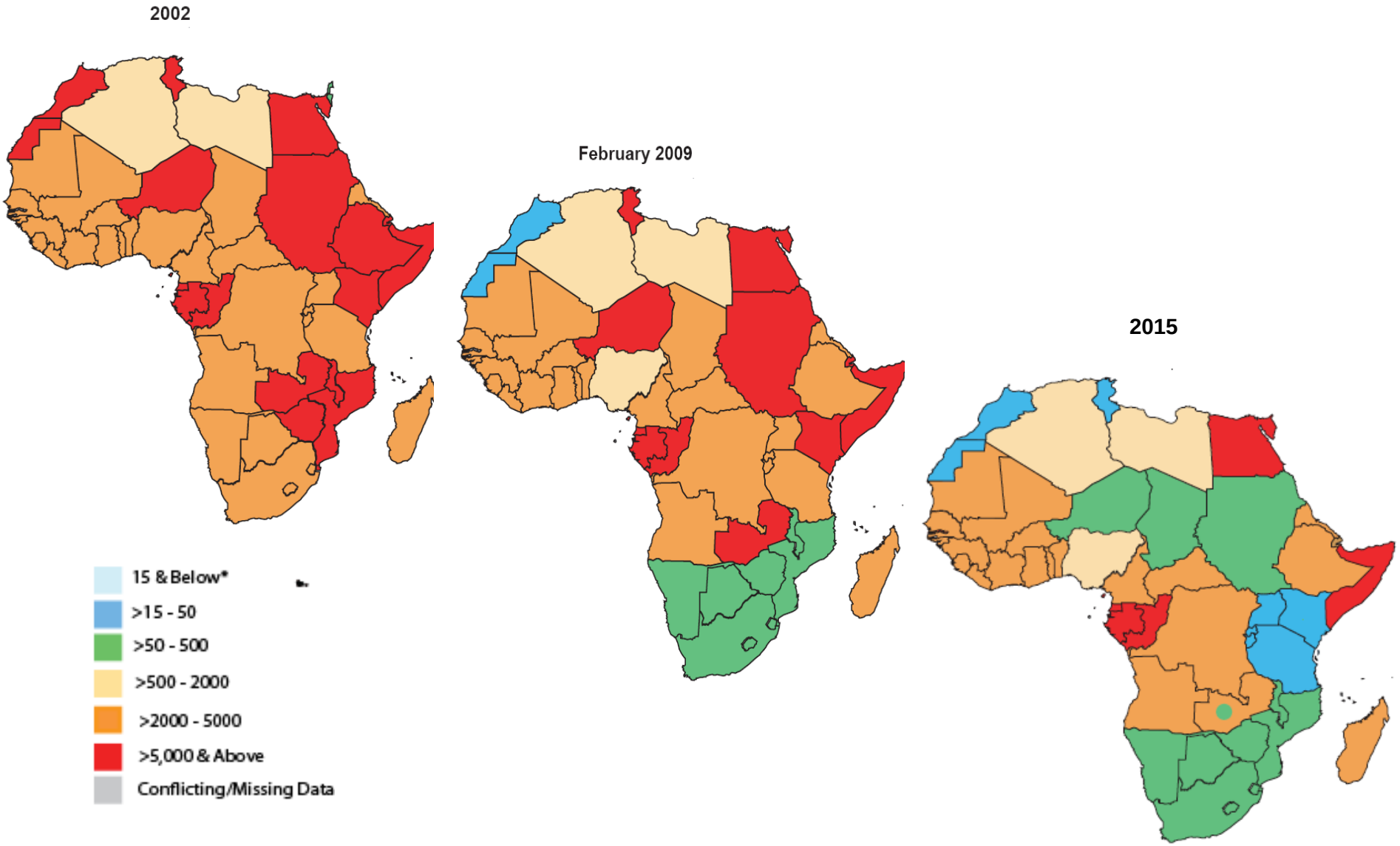
# Global Diesel Fuel Sulfur Levels
# 2006



# Global Diesel Fuel Sulfur Levels 2015



# Low Sulfur Diesel: Africa



# What makes an effective partnership?

*Design Principles*

- **Develop clear goals**: focus on a few highly ambitious targets and campaigns
- **Neutral Clearing-House/ Secretariat**: **<u>trust</u>** (and fundraising)
- **Design for buy-in and trust:** Governance Rules, Chatham House Rule, no contribution requirement or onerous membership – *<u>but</u>* partners are expected to contribute (in-kind or financial)
- **Build a strong core membership:** Advisory Group representing sectors

2011 **EPA Evaluation of the Partnership for Clean Fuels and Vehicles (PCFV) Lead Campaign:** Summary of Findings on Design Principles for Successful Voluntary Global Partnerships
http://epa.gov/evaluate/pdf/international/pcfv-eval-design-principles.pdf

# Climate and Clean Air Coalition


Initial focus is on SLCP's methane, black carbon, and HFCs. Action on short-lived climate pollutants must complement and supplement, not replace, global action to reduce CO2.

- Raising awareness of SLCP impacts and mitigation strategies
- National and regional action
- Improving scientific understanding of impacts and mitigation

**45 Country + 50 non-state partners**

http://www.ccacoalition.org/

Diesel

# Heavy Duty Diesel Initiative

*"…substantial reductions of fine particulate matter and black carbon emissions from heavy duty diesel vehicles…through adoption of clean fuel and vehicle regulations and supporting policies."*

*Through the adoption of clean vehicle and fuel standards globally reduce 2.7 million metric tons of fine particles, 1.9 million metric tons of black carbon emissions from heavy-duty vehicles = 1.4 million cases of premature mortality by 2030.*

# HDDI Leads: Canada, U.S., UNEP, ICCT

- **Global fuel sulfur strategy:** financing and sub-regional fuel hubs
- **National programs and policies**: low sulfur diesel, emission standards in
  - Latin America: Mexico adopts Euro VI, Peru black carbon reduction strategy, DPF pilots in Montevideo and Lima
  - Africa: East Africa adoption of 50 ppm
  - Asia: Emissions inventory and clean ports strategy Jakarta
- A **high-level coalition** of industry, country and NGO leaders on Green Freight Call to Action to improve the energy efficiency and environmental performance of freight operations worldwide

**2015 - 2016:**

- HDV standards to match fuels: East, West, Southern Africa
- Marine vessels (coast, in-land and Arctic)
- Ports of Chittagong, Valparaiso, Aqaba, Tema
- Cities: Soot-Free Urban Buses

# The Global Fuel Economy Initiative

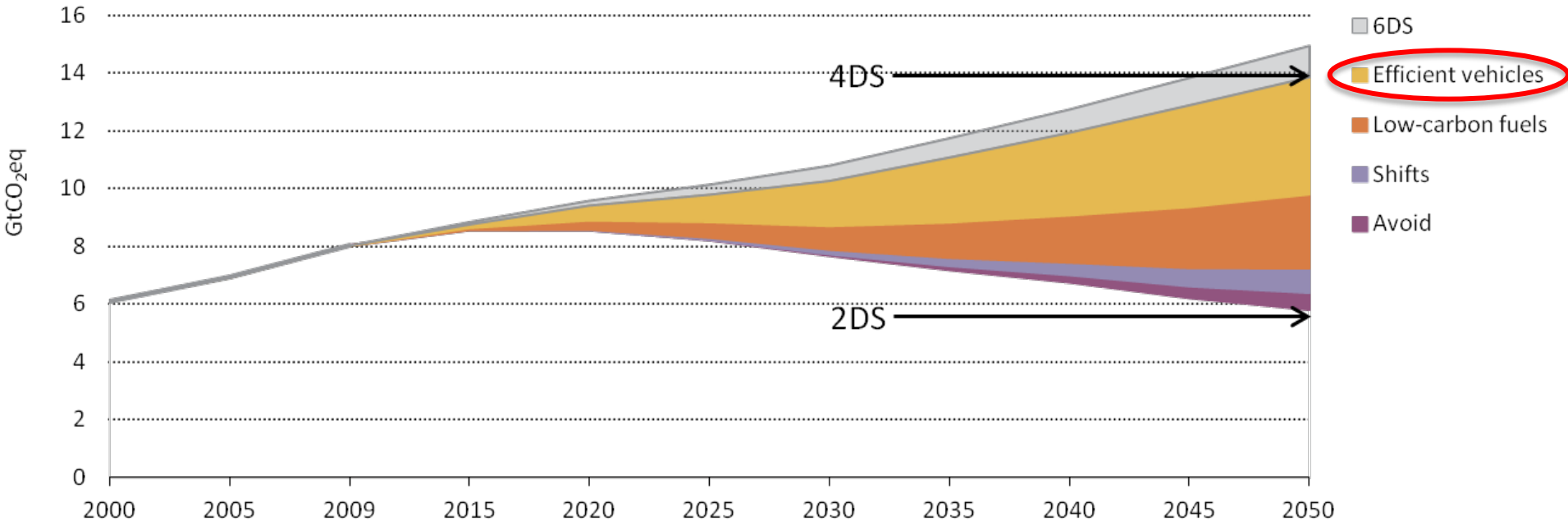
Facilitate **large reductions of greenhouse gas emissions and oil use** through improvements in automotive fuel economy in the face of rapidly growing car use worldwide, as per IPCC and G8 recommendations.

GFEI at G20 Brisbane

Chile announces LDV FE label 2012

www.globalfueleconomy.org

# **Auto fuel economy** improvement plays largest role, particularly through 2030, in cutting transport energy-related CO2 emissions by more than half in 2050 (compared with 2009)




Source: Lewis Fulton, UC Davis & IEA Energy Technology Perspectives 2012

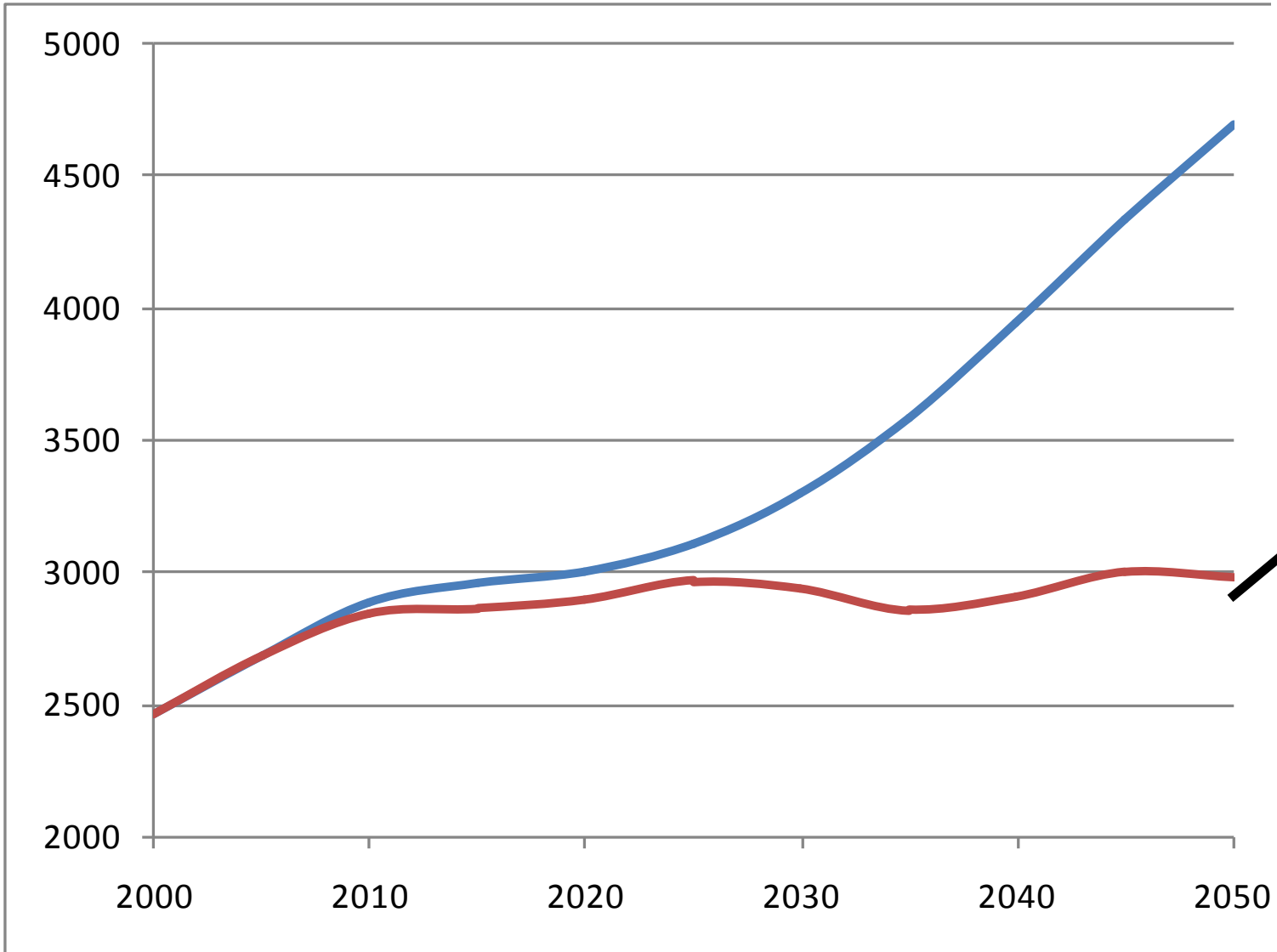
# ’50by50’ or
## 8 Lge/100km to 4 lge/100km

| | 2020 | 2030 | 2050 |
|---|---|---|---|
| **New Cars** | **30%** reduction in L/100km in OECD: **engines, drive trains, weights, aerodynamics; PHEV, EV, FC not required** | **50%** average improvement globally: **full hybridisation of most models; PHEV, EV and FC not required** | **50% + (PHEV, EV, FC required)** |
| **All Cars - Global** | **20%** reductions with lag time for **stock turnover**; eco-driving, maintenance | **35%** | **50by50** |

# BAU vs. Stabilization:

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)**




***double auto fuel economy by 2050 + flanking measures***

| | | 2005 | 2008 | 2011 | 2013 | 2030 |
|---|---|---|---|---|---|---|
| OECD average | average fuel economy (Lge/100km) | 8.6 | 7.9 | 7.3 | 6.9 | |
| | annual improvement rate (% per year) | -2.7% | -2.6% | -2.6% | | |
| | | | | **-2.6%** | | |
| Non-OECD average | average fuel economy (Lge/100km) | 7.3 | 7.4 | 7.3 | 7.2 | |
| | annual improvement rate (% per year) | 0.5% | -0.4% | -0.9% | | |
| | | | | **-0.2%** | | |
| Global average | average fuel economy (Lge/100km) | 8.3 | 7.7 | 7.3 | 7.1 | |
| | annual improvement rate (% per year) | -2.3% | -1.9% | -1.8% | | |
| | | | | **-2.0%** | | |
| **GFEI target** | average fuel economy (Lge/100km) | **8.3** | | | | **4.2** |
| | required annual improvement rate (% per year) 2005 base year | | | **-2.7%** | | |
| | required annual improvement rate (% per year) 2014 base year | | | **-3.1%** | | |

Source: GFEI 2014 International Fuel Economy Comparison, http://www.globalfueleconomy.org/Documents/WP11_IEA_report_update_2014.pdf

# GFEI Approach

- ✓ Financial Support
- ✓ Technical Expertise
- ✓ Global Network

UNEP

FIA Foundation for the Automobile and Society

International Energy Agency

International Transport Forum

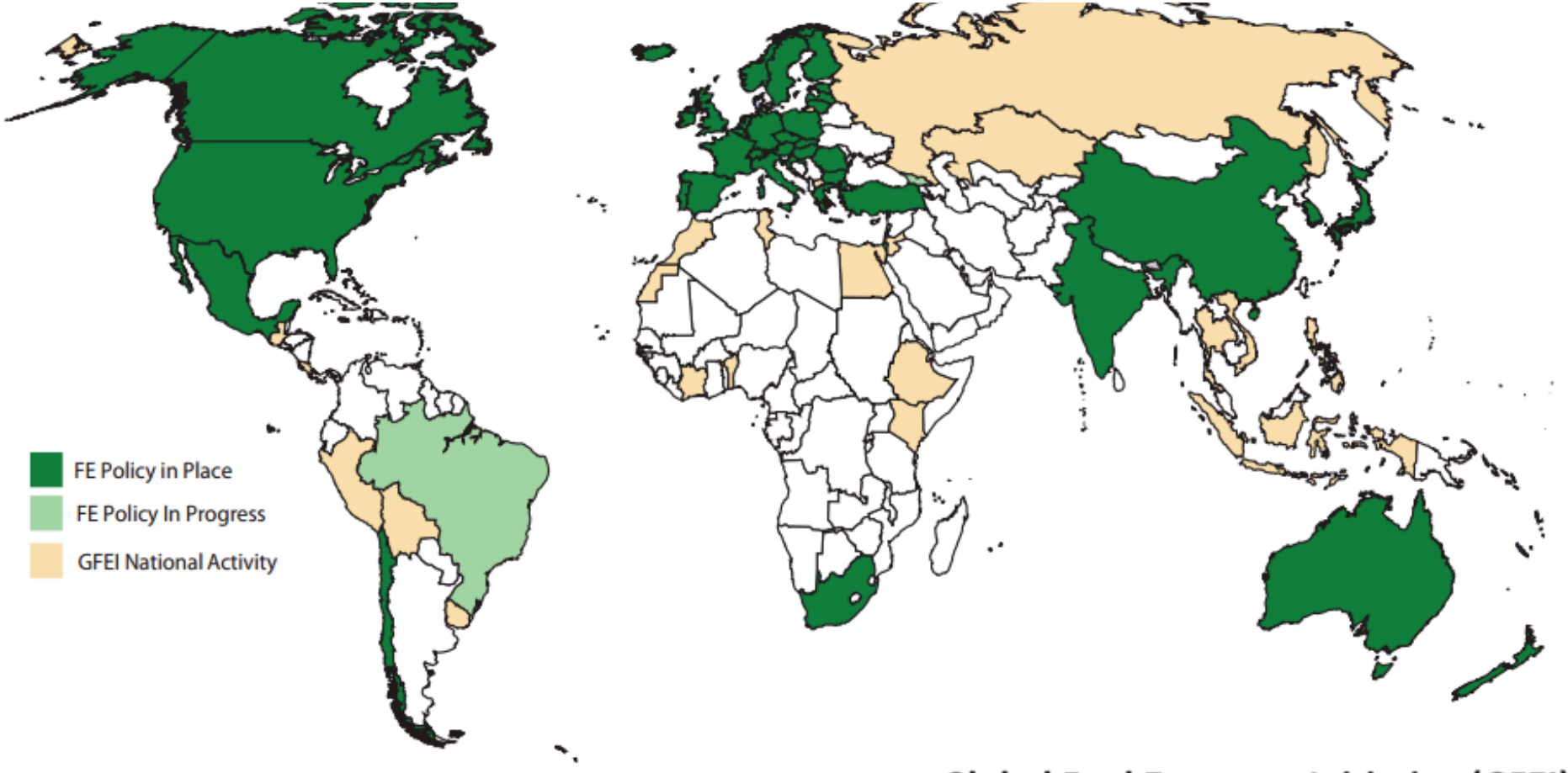
icct THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

1. **Analysis**: Data, modeling, baseline, projections
2. **Options**: feebate, labeling, standard?
3. National **strategy development**, dialogues
4. Awareness, communication

ITS UCDAVIS INSTITUTE OF TRANSPORTATION STUDIES

# Global Fuel Economy Policies

(2014)




September 2014 Update. For additional information visit www.globalfueleconomy.org

**Global Fuel Economy Initiative (GFEI)**

GFEI UNEP GEF

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globalfueleconomy.org

www.ccacoalition.org/

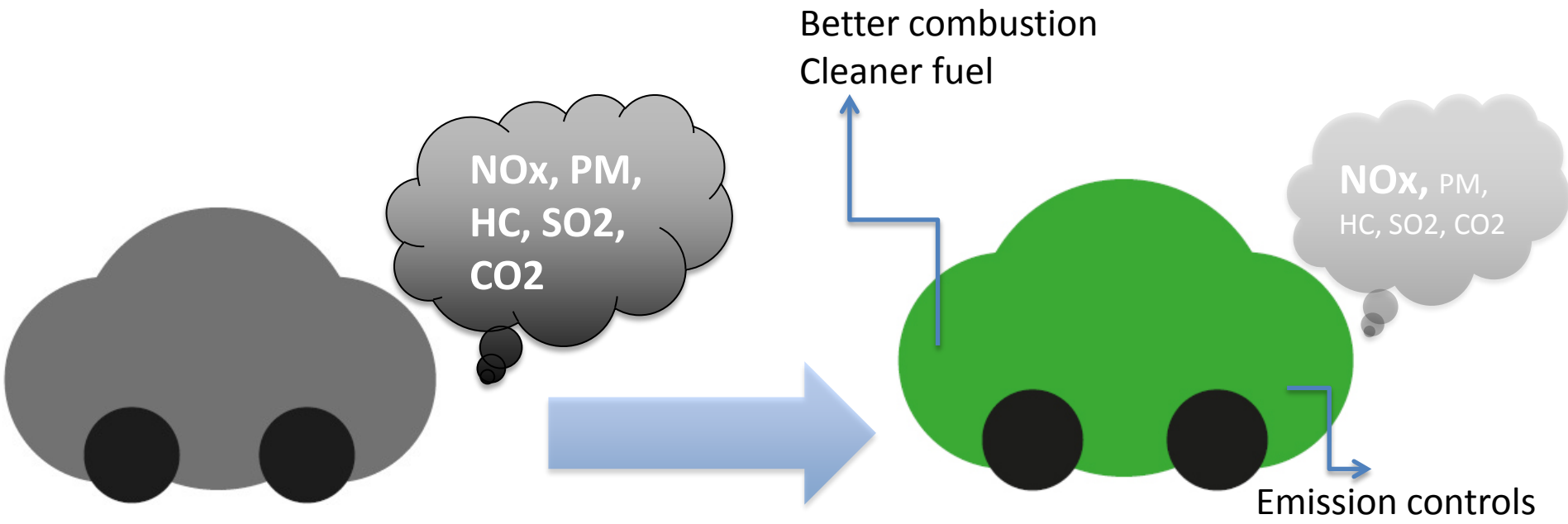







# Fuel and Vehicle Technology

**A Systems Approach**: clean fuels open the door to technology, technology drives fuel quality

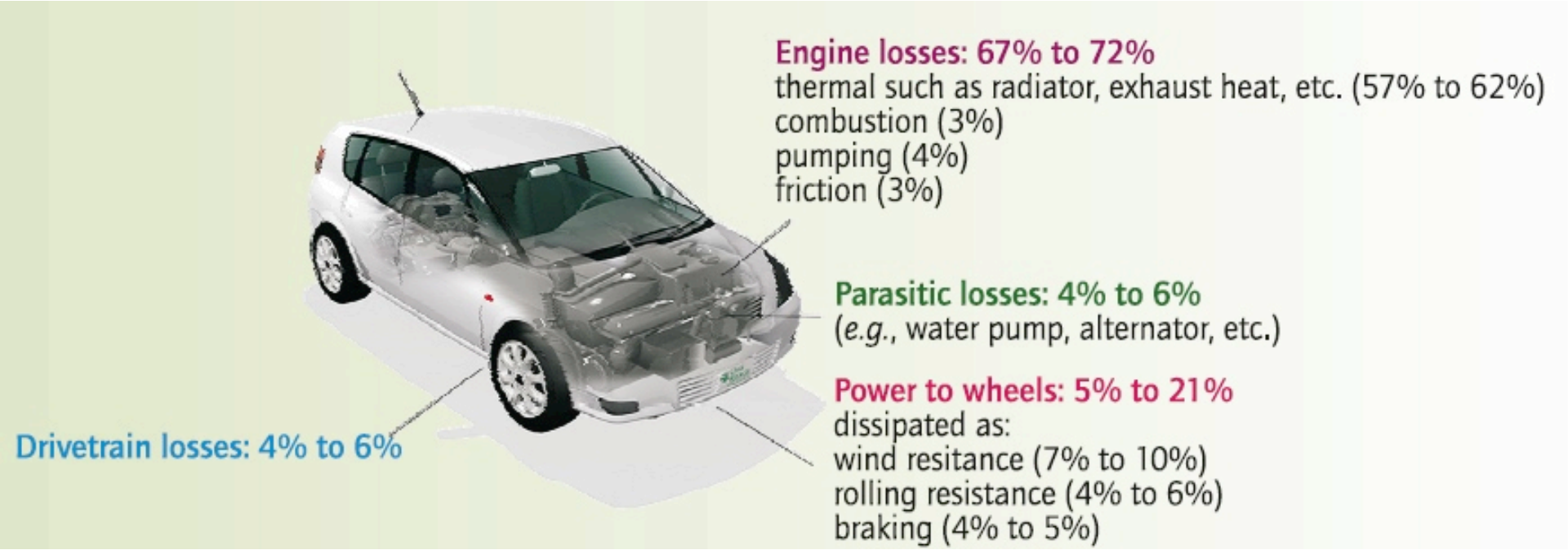



**Fuel quality**: 50 ppm or below sulfur in fuels

**Vehicle emission standards**: Euro 4/IV and above

# Only 20% of the energy is converted into movement

- **Most energy lost as heat**




IEA 2012