



**GFEI Roundtable
Global Fuel Economy 2010
Congress Centre, Leipzig
27 May 2010**

Toward 50by50: An Assessment of Prospects and Progress

By George C. Eads

Executive Editor

GFEI 2010 Report

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



- **Purpose of report:**

- **To assess the prospects for reaching the 50by50 goal in the light of on-going research and other developments that have occurred over the past year or so**
- **To assess the progress being made in reaching the goal**

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Report overview: Topics

1. Factors explaining current cross-country differences in average new car vehicle fuel economy
2. Recent studies of the technical potential to improve average new car fuel fuel economy
3. “Technical potential” does not necessarily translate into equivalent actual improvement in average new car fuel economy even if technologies are adopted
4. Major policy initiatives recently finalized by the EU and the US to improve average new car fuel economy; policy initiatives being undertaken by certain other governments
5. Potential to accelerate fleet turnover: possible lessons from recent policy initiatives
6. Cross-country flows of used cars
7. GFEI capability building efforts

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



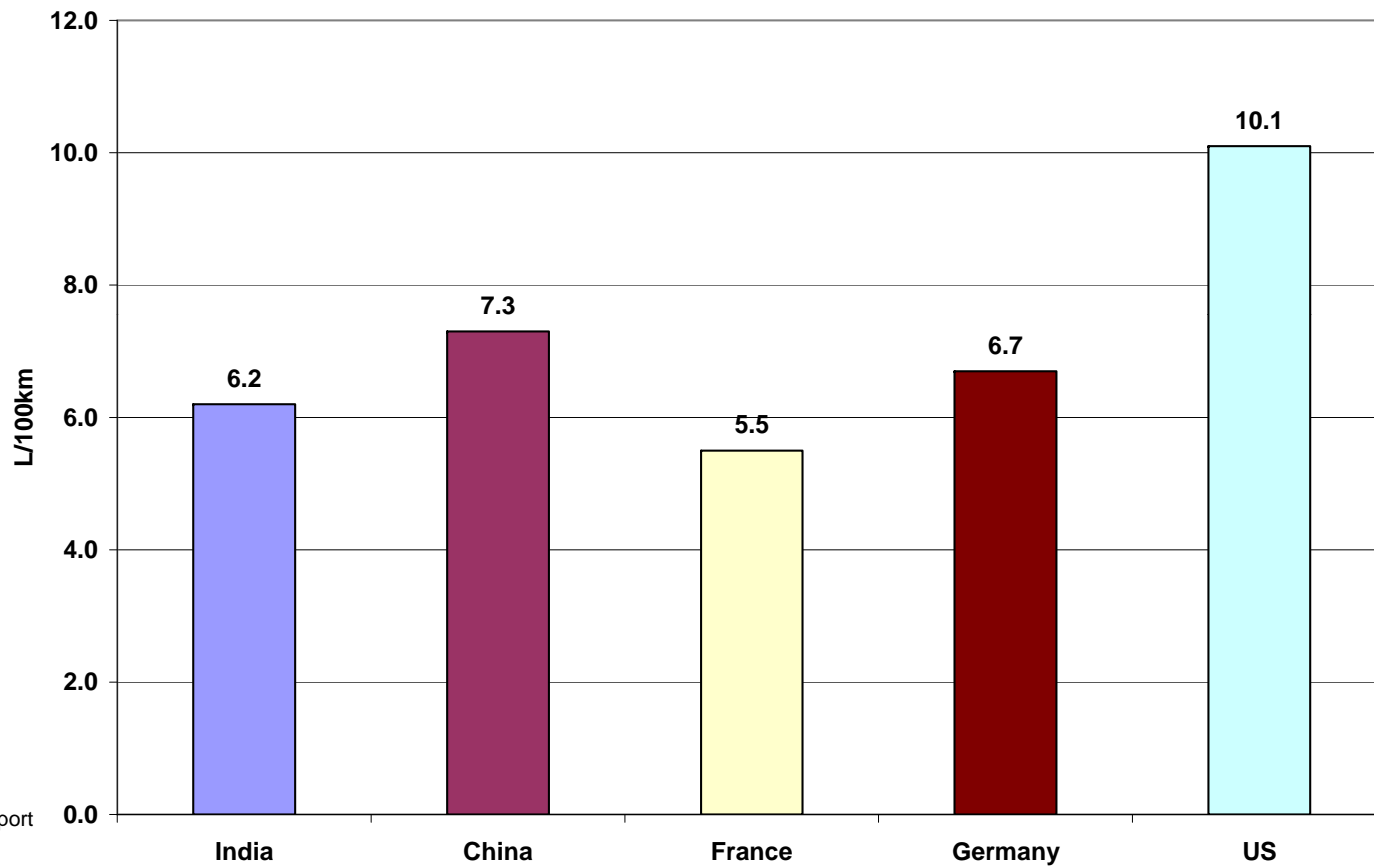
1. Factors explaining cross-country differences in average new car fuel economy

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Cross-national comparisons in average new passenger vehicle fuel economy (L/100km) -- 2008

Average Fleet Fuel Consumption in 2008 -- NEDC Cycle (L/100km)

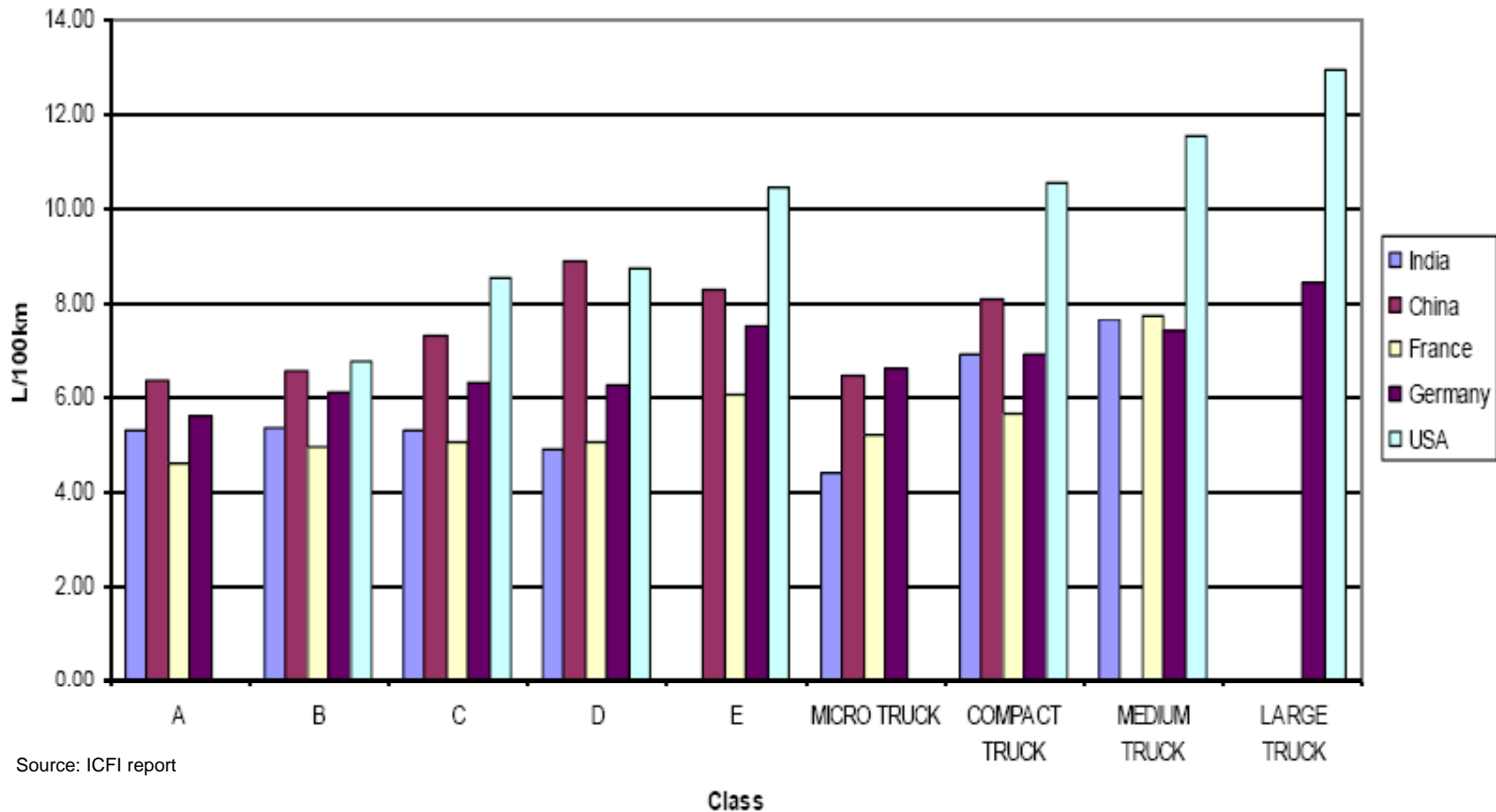


Source: ICFI Report

Making Cars 50% More Fuel Efficient by 2050 Worldwide



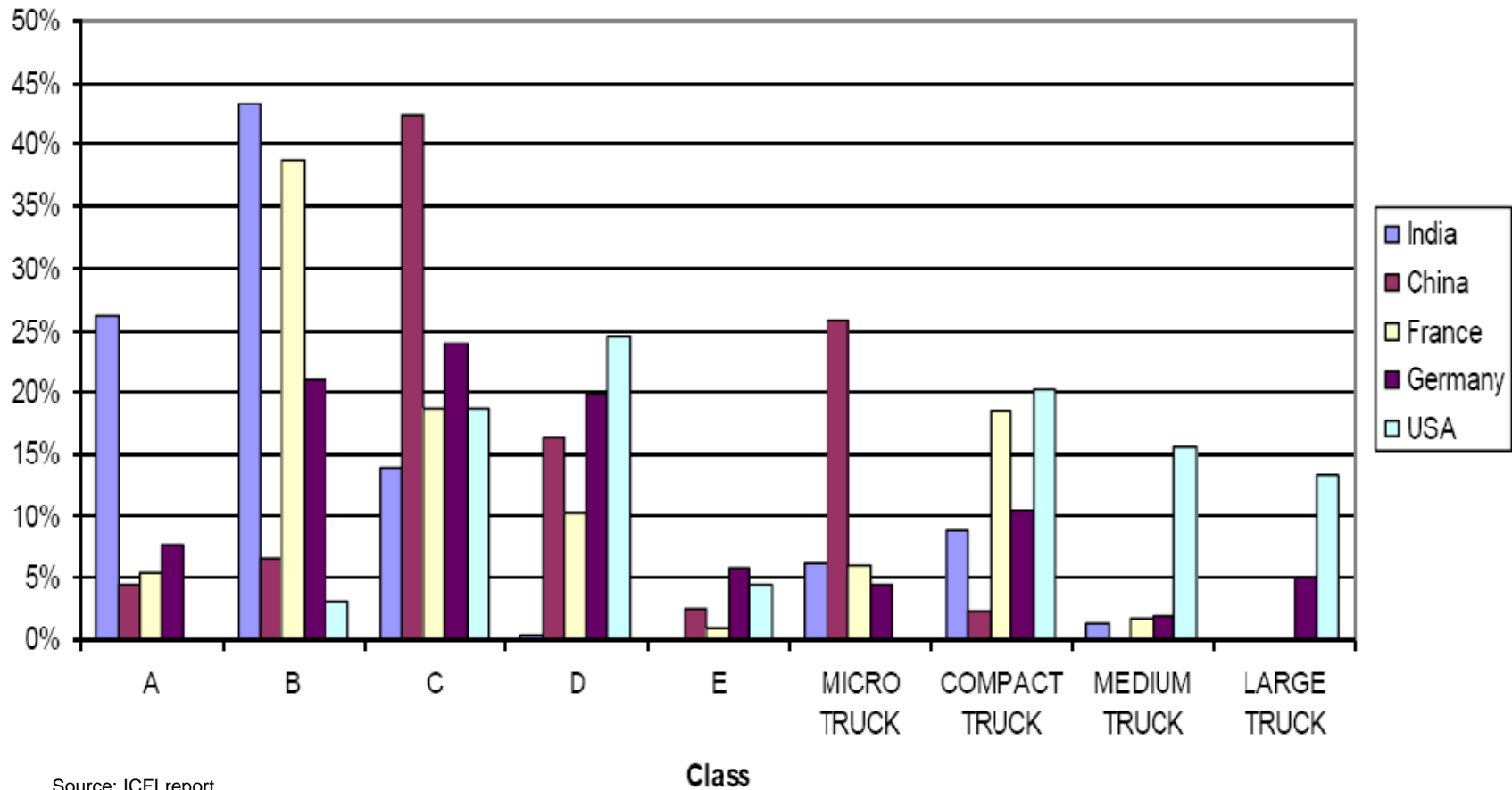
Within-class differences in average fuel economy performance by class and by country (L/100km) -- 2008



Making Cars 50% More Fuel Efficient by 2050 Worldwide



Market share by class by country -- 2008



Source: ICFI report

Making Cars 50% More Fuel Efficient by 2050 Worldwide



Cross-national differences in fuel consumption performance: Findings and conclusions

- According to ICFI report:
 - Differences in diesel penetration, vehicle performance, weight, and the use of automatic transmissions almost completely explain the differences in class-specific fuel consumption across the OECD countries
 - There is a technology opportunity of about 10% in most high sales volume classes in China.
 - There also is a significant technology opportunity in the high sales volume segments in India, but this must be tempered by the fact that the opportunities are in very cost sensitive segments.

Making Cars 50% More Fuel
Efficient by 2050 Worldwide

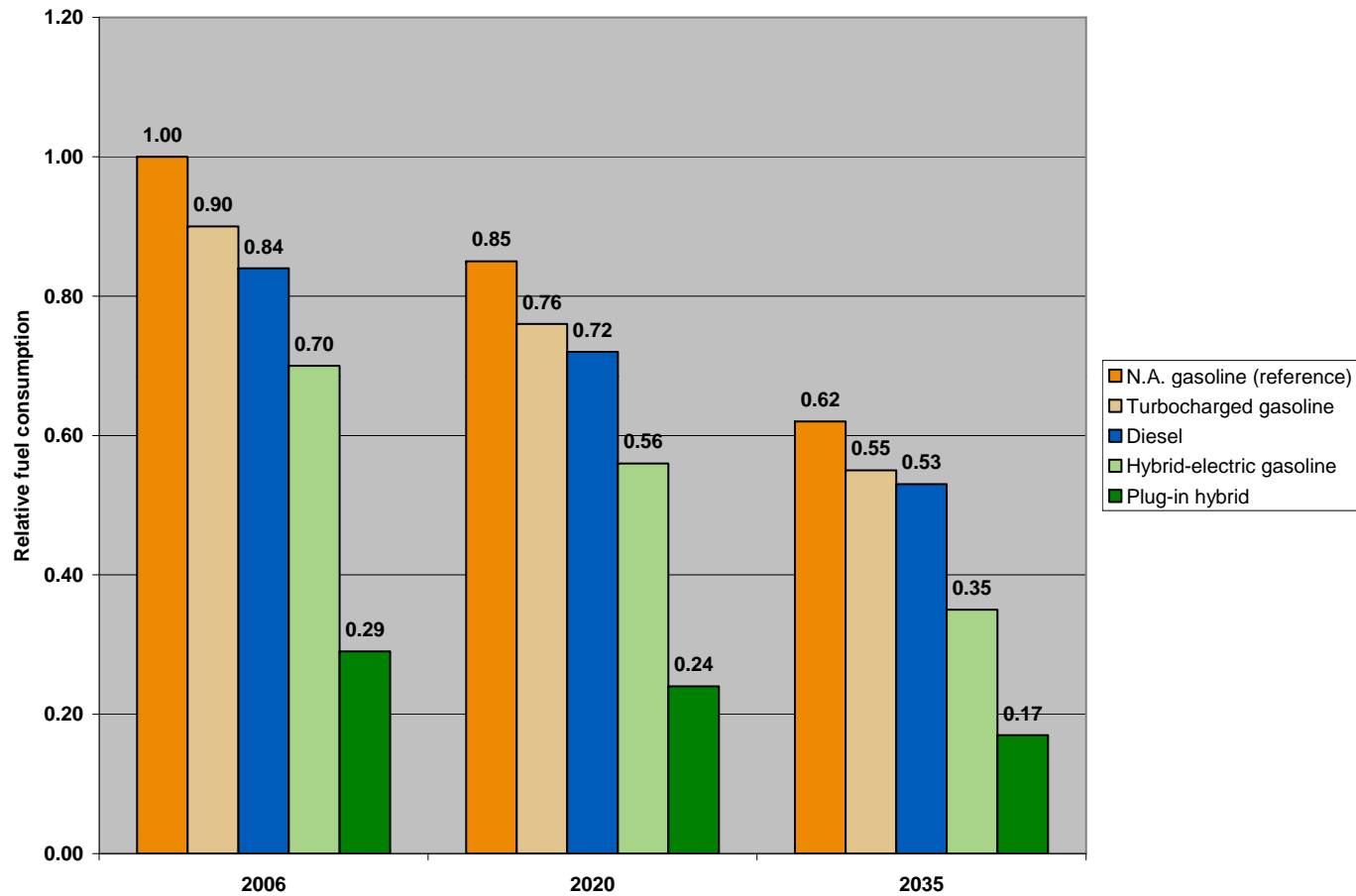


2. Recent studies of the technical potential to improve new LDV fuel economy

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



US National Research Council: Potential Reduction of New US LDVs by MY2020 and MY2035 relative to MY2006 Using Different Powertrain Types

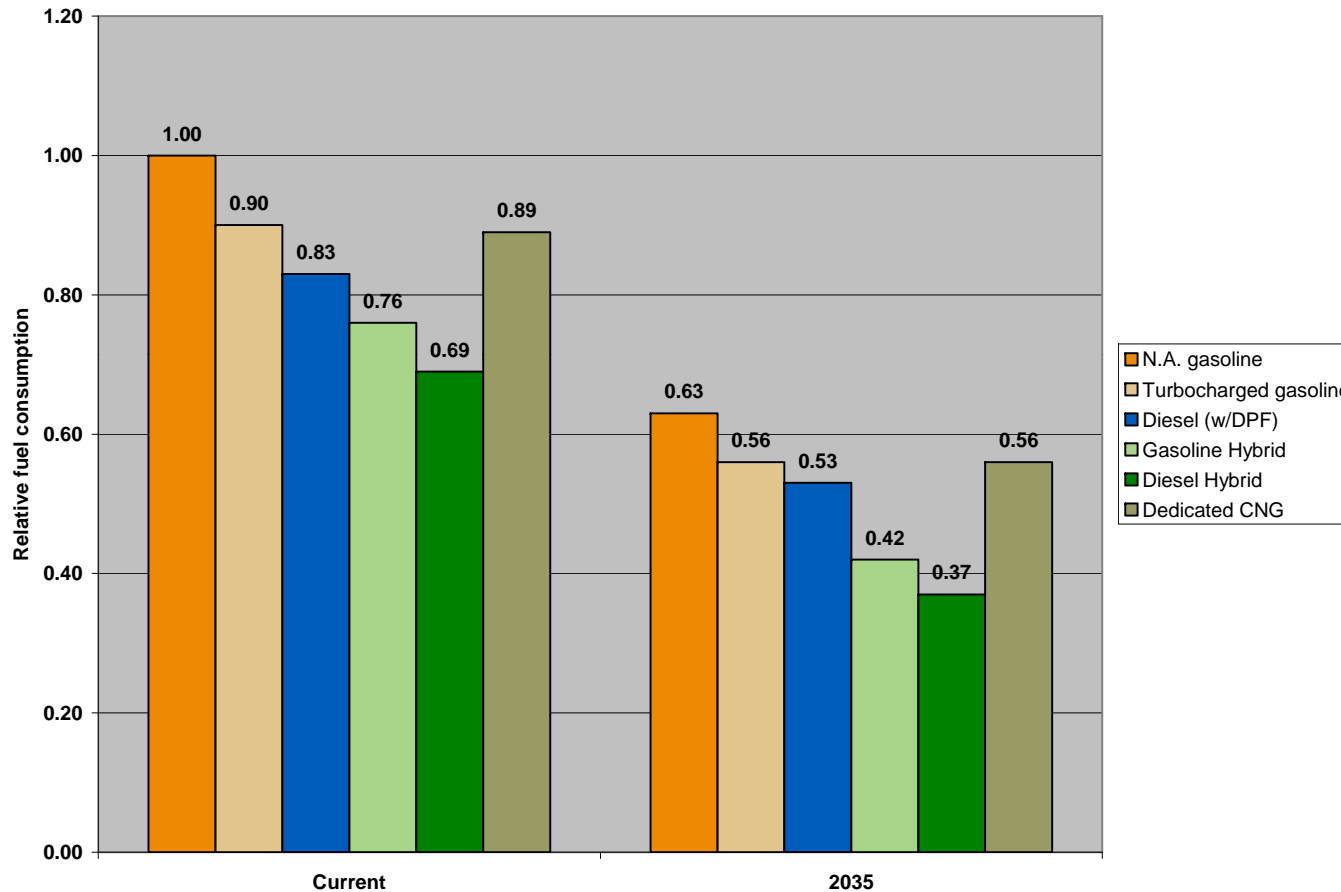


Source: Compiled from NRC 2009

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



MIT Laboratory for Energy Research and the Environment: Technical potential to reduce fuel consumption in European vehicles by 2035



Source: Compiled from Bandivadekar, 2008

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Technical potential to achieve the GFEI goals: Findings and conclusions

- The GFEI is correct in asserting that “...the technologies required to improve the efficiency of new cars 30% by 2020 and 50% by 2030...mainly involve incremental change to conventional internal combustion engines and drive systems, along with weight reduction and better aerodynamics...”

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



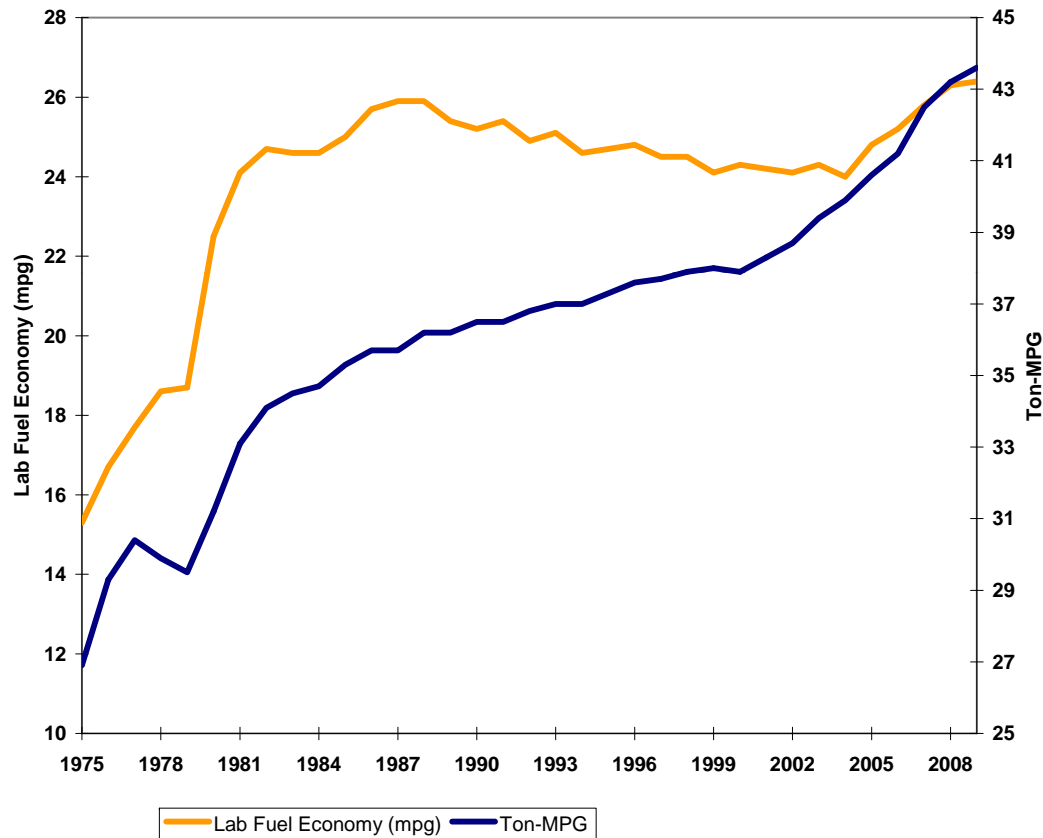
3. **“Technical potential” does not necessarily translate into equivalent improvement in fuel economy even if technologies are adopted**

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Between the mid-1980s and about 2005, US fuel economy (as tested) declined even though the technical potential to improve fuel economy of these vehicles increased

Lab fuel economy (mpg) and ton-miles per gallon: New US Light-Duty Vehicles, 1975-2009



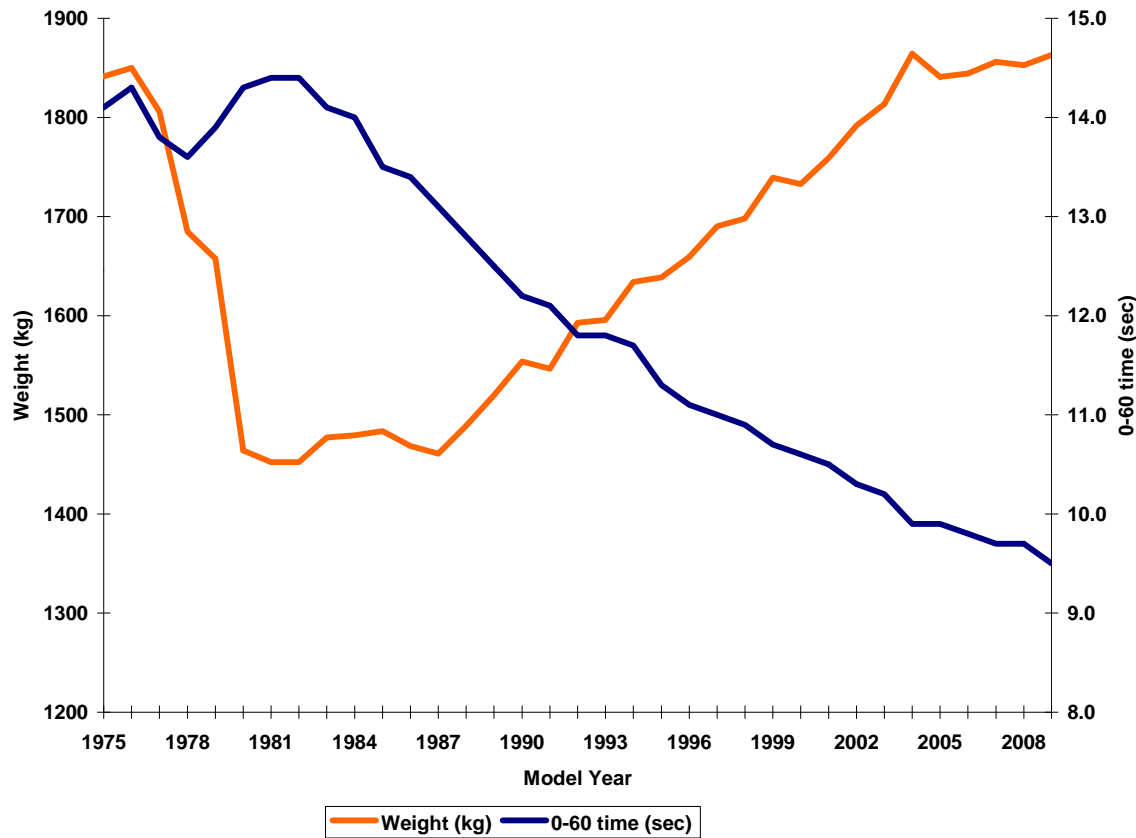
Source: Plotted by author from data in USEPA, Light-Duty Automotive Technology, Carbon dioxide Emissions, and Fuel Economy Trends: 1975 through 2009

Making Cars 50% More Fuel Efficient by 2050 Worldwide



During this period, all the improved technical potential to increase fuel economy was instead used to increase vehicle weight and performance

Weight (kg) and 0-60 time (sec) for New US LDVs, 1975-2009

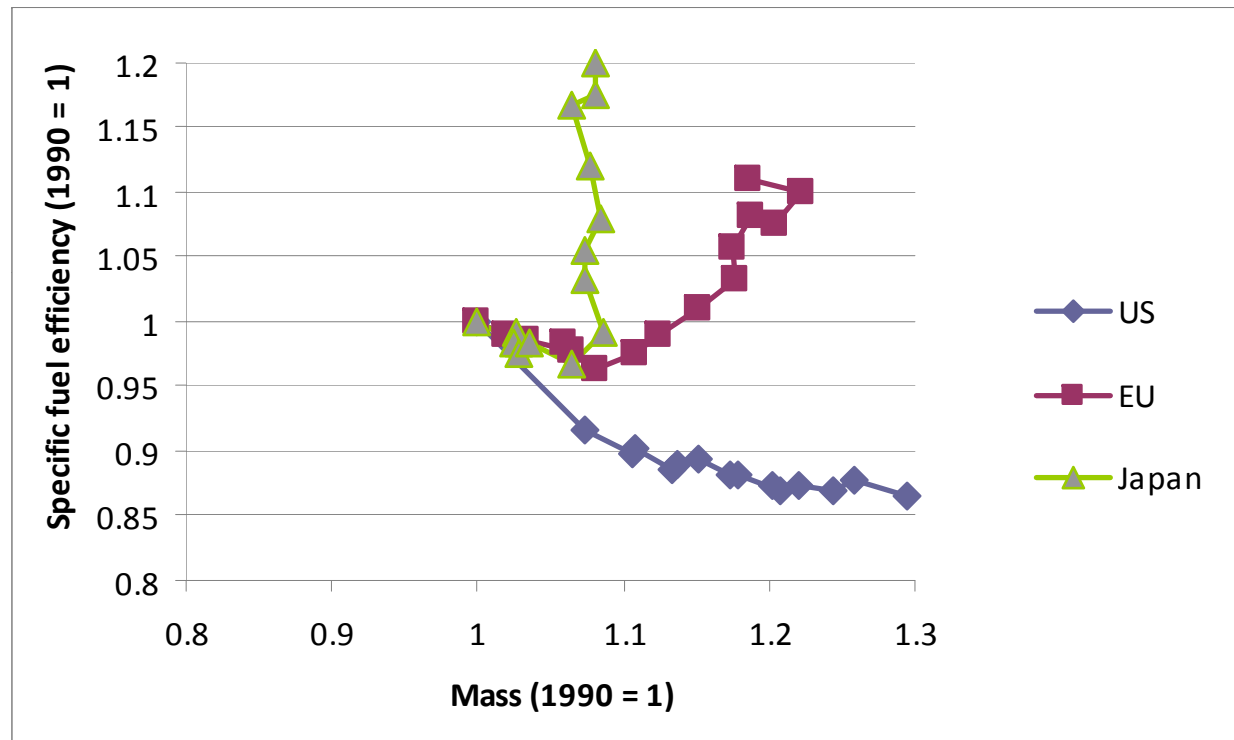


Source: Plotted by author from data in USEPA, Light-Duty Automotive Technology, Carbon dioxide Emissions, and Fuel Economy Trends: 1975 through 2009

Making Cars 50% More Fuel Efficient by 2050 Worldwide



Evolution of Fuel Economy and Weight for New Passenger Vehicles in the US, EU, and Japan: 1990-2004



Source: Adapted from IEA, 2009

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



What might be required to reduce average new US LDV fuel consumption by 50% by 2035?

Illustrative Future Vehicle Sales Mix Scenario Used in the NRC Panel's Analysis: "Optimistic Scenario"¹

Date	% ERFC ²	% Light Trucks ³	% Vehicle Weight Reduction ⁴	% Market Share by Powertrain					Fuel Consumption Reduction (%)
				NA SI	Turbo SI	Diesel	Hybrid	Plug-in Hybrid	
2020	75	40	17	52	26	7	15	0	26
2035	75	30	25	36	26	9	20	9	50

Notes: ¹ The "Optimistic" scenario meets the CAFE target of 35 mpg in 2020, and then extrapolates this rate of improvement through 2035. In this case, the average fuel economy in 2035 reaches 52 mpg, roughly double today's value.

² ERFC = Emphasis on reducing fuel consumption; indicates the tradeoff between vehicle performance and fuel consumption

³ Current level is approximately 50%

⁴ Assumed average new vehicle weight (cars and light trucks) currently is 1,900 kg (4,180 lb). Thus average weight reductions per vehicle of 700 lbs (318 kg) to 1050 lbs (476 kg) would be required.

Source: NRC 2009

Making Cars 50% More Fuel Efficient by 2050 Worldwide

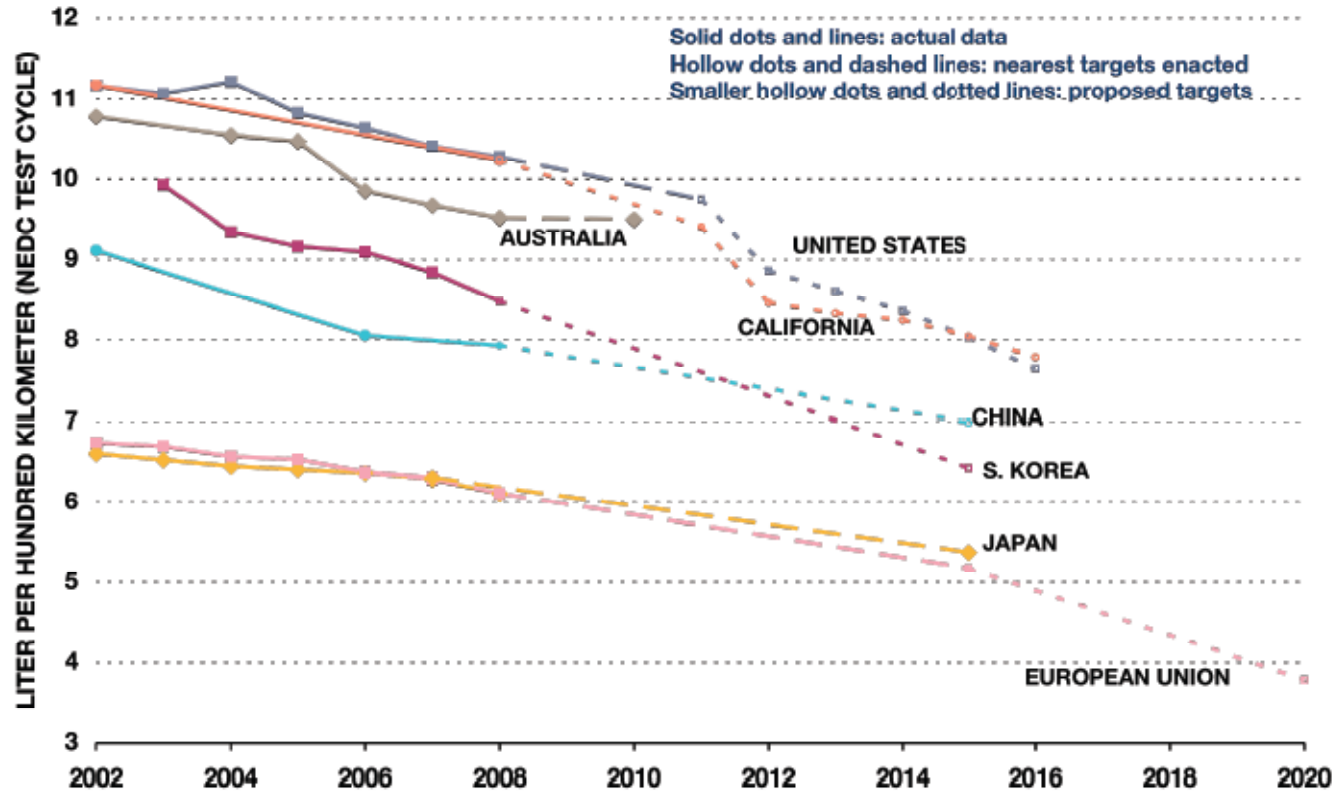


4. Major policy initiatives recently finalized by the EU and the US; policy initiatives being undertaken by certain governments

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Actual average fleet fuel efficiency data through 2008 and nearest targets enacted or proposed thereafter



Source: ICCT 2009

Making Cars 50% More Fuel Efficient by 2050 Worldwide



5. Potential to accelerate fleet turnover: Possible lessons from recent policy initiatives

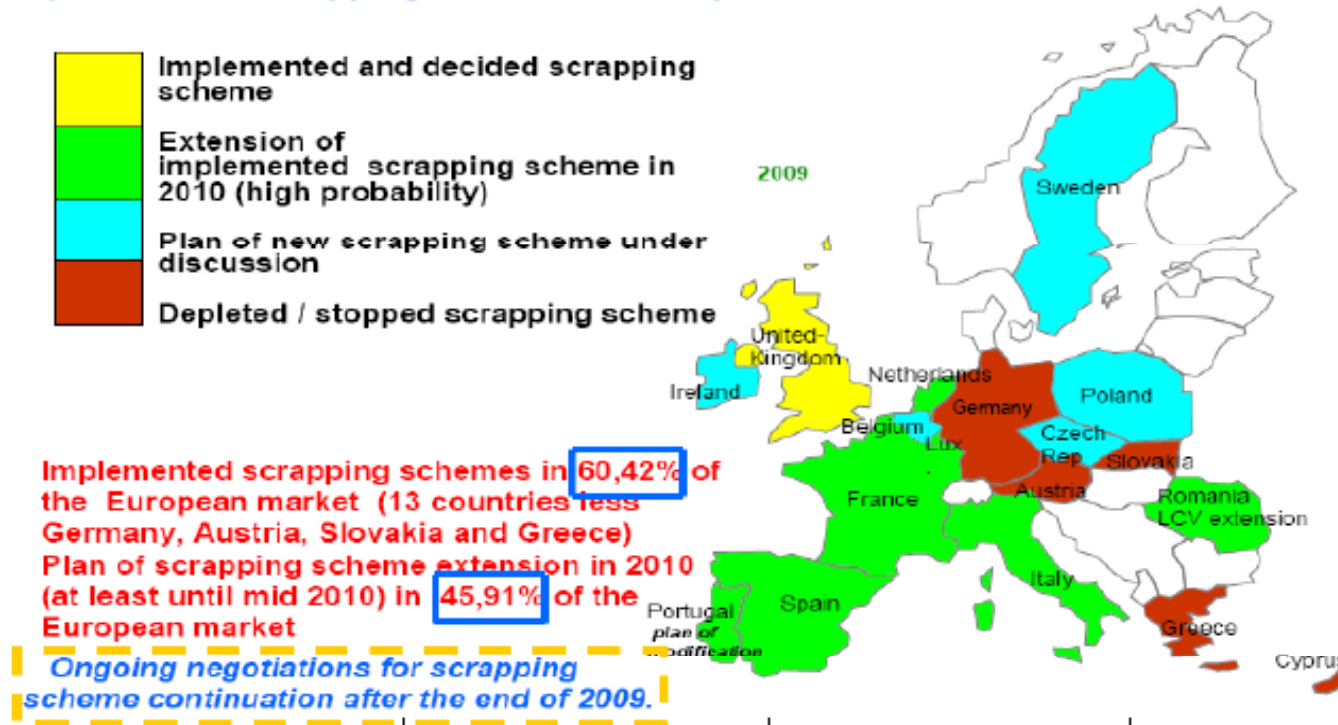
Source: ICCT 2009

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



During the recent severe recession, many countries have adopted policies to enhance vehicle sales

Update of the scrapping schemes in Europe/ 2010 Forecast



Source: Bastard, 2010

Making Cars 50% More Fuel Efficient by 2050 Worldwide



What have we learned from these efforts?

- Research on topic sponsored by GFEI is ongoing
- Results of recently-released US GAO study:
 - The CARS program [“Cash for Clunkers”] helped to stimulate the economy, thereby achieving one of its broad objectives.
 - The extent to which the program stimulated vehicle sales, as measured by the number of vehicle sales attributable to the CARS program, is unclear.
 - The CARS program put more fuel-efficient vehicles on the road, thereby achieving one of the program’s broad objectives....The average combined fuel economy of trade-in vehicles was 15.7 miles per gallon and that of new vehicles was 24.9 miles per gallon, a 58.6 percent increase in fuel economy.
 - [T]he extent to which the program reduced overall fuel consumption is uncertain.
 - [A]lthough preliminary analysis indicates that the program will have a significant net reduction in energy consumption and greenhouse gas emissions, the magnitude of the net reduction is very sensitive to the expected remaining life of the trade-in vehicle in the absence of the CARS program.

Source: United States Government Accountability Program, *Lessons Learned from Cash for Clunkers Program: Report to Congressional Committees*, GAO-10-486, April 2010

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



6. Cross-border flows of used cars

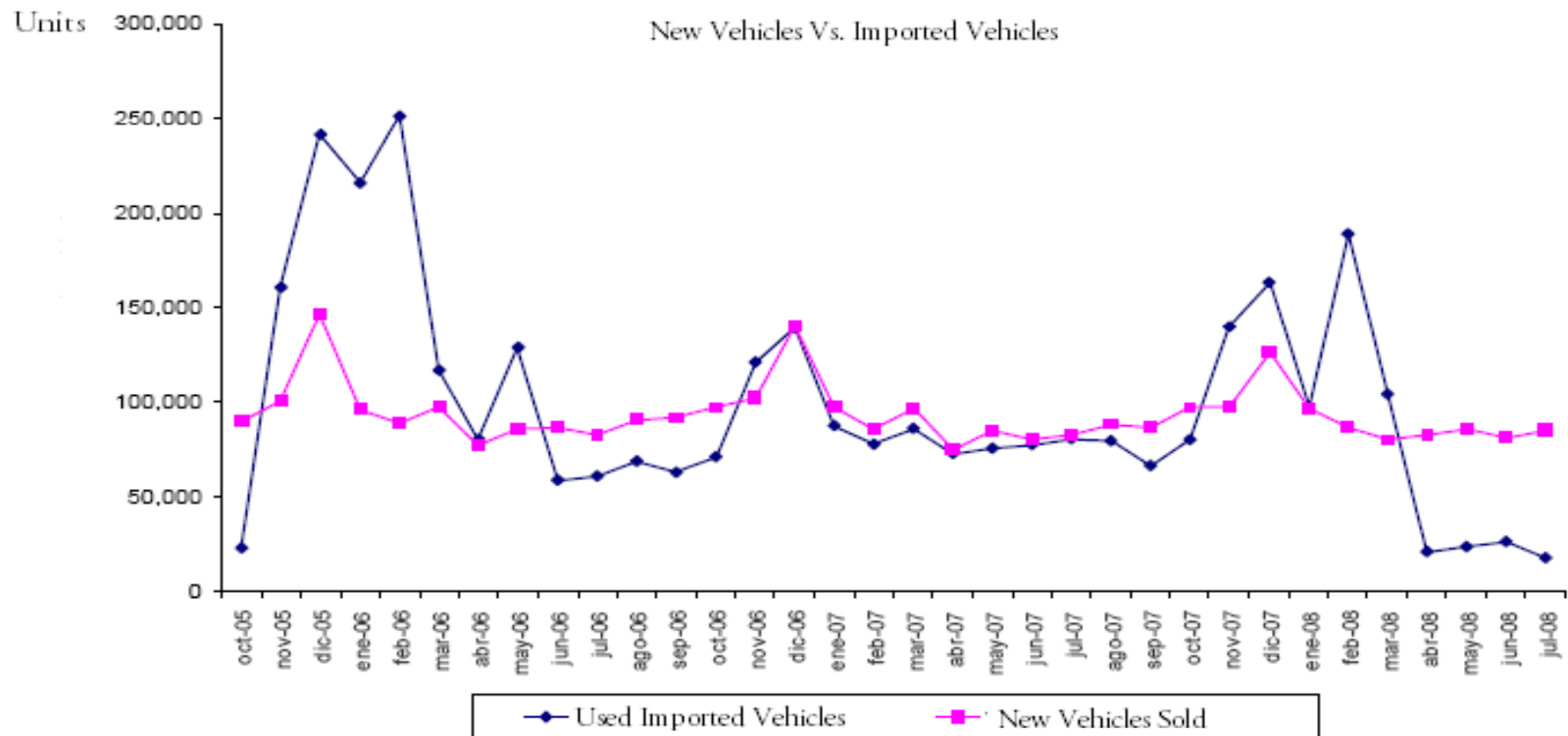
Source: United States Government Accountability Program, *Lessons Learned from Cash for Clunkers Program: Report to Congressional Committees*, GAO-10-486, April 2010

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Cross-border flows of used vehicles are significant

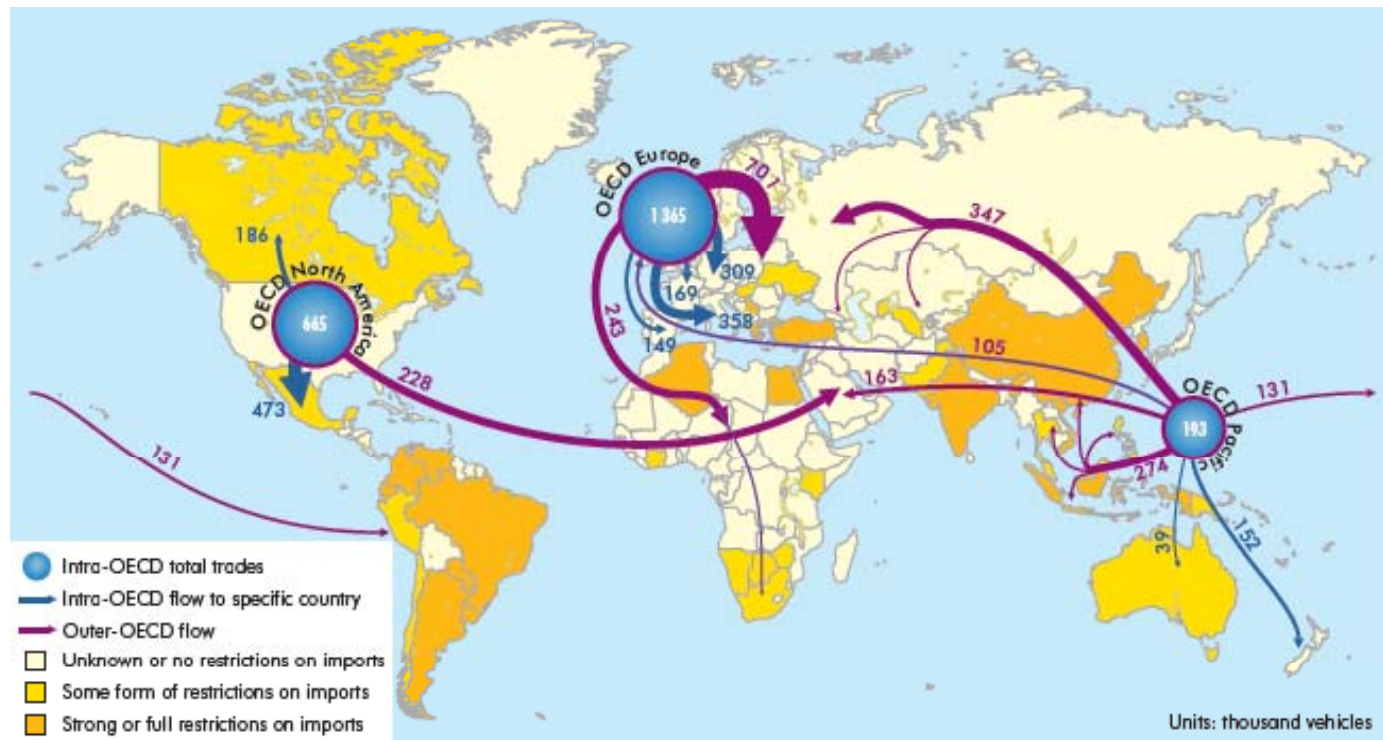
Data for Mexico: October 2005-July 2008



Source: Center for Sustainable Transport: Mexico, *Policy Handbook Imported Second Hand Vehicles*, Draft, May 2010, p 39.

We need to understand the volume as well as the emissions and energy use characteristics of internationally-trade used vehicles

Estimated flows by region for 2005



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Source: Fusa et al., 2008.

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



7. GFEI capability building efforts

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



The GFEI's commitment to enhancing capability

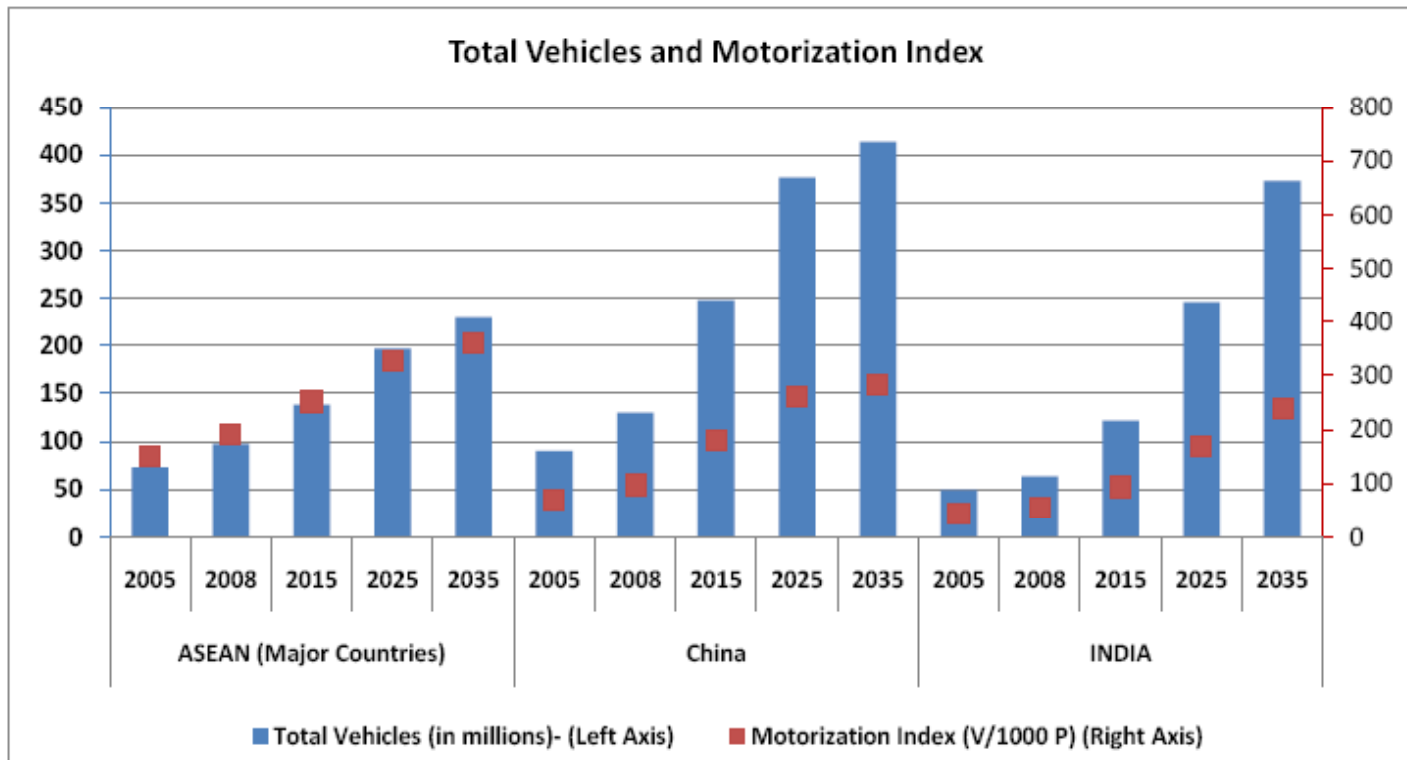
- “The global initiative will support the development and strengthening of fuel economy policies by governments worldwide. A first step will be to better understand the relevant policy development processes and frameworks, and report on the current status of fuel economy policies in key countries.”
- “On the basis of this information the initiative, led by UNEP, plans to develop a fuel efficiency policy “Tool Kit” which will provide information to governments and their partners on possible policies and action to improve national fuel efficiency.”
- “In the first year of the initiative, a broad dialogue will be launched in countries around the world, with the possibility of developing more intensive work with organisations in a few countries, or regional groups of countries, based on expressions of interest. To facilitate this policy dialogue, GFEI is planning to organise events at the global, regional and national level to promote fuel efficiency policy initiatives in general and the GFEI targets in particular.”

Source: “50by50” Program Document

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



“Improving Vehicle Fuel Economy in the ASEAN Region” – Joint Project of 50by50 and CAI Asia

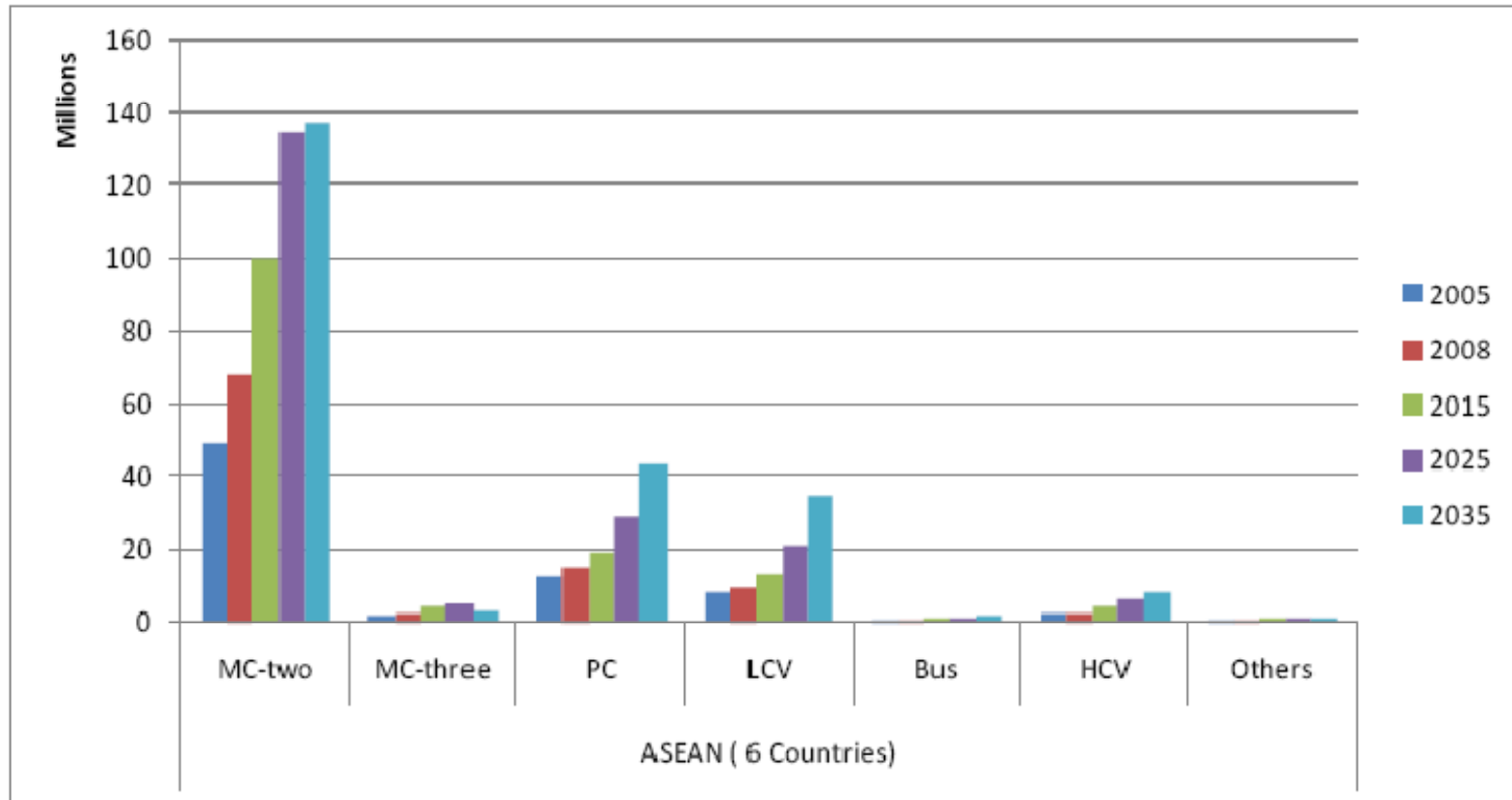


Note: ASEAN = Association of Southeast Asian Nations; ASEAN countries included are Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.
 Source: Asian Development Bank and Clean Air Initiative-Asia. 2009 (draft).

Making Cars 50% More Fuel Efficient by 2050 Worldwide



Growth of Motor Vehicles per Mode for 6 ASEAN Countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam)



MC-two = Motorized motorcycles; MC-three = Motorized three-wheelers; PC = Personal cars; LCV = Light commercial vehicles; HCV = Heavy commercial vehicles
 Source: Asian Development Bank and Clean Air Initiative-Asia. 2009 (draft).

Making Cars 50% More Fuel
 Efficient by 2050 Worldwide



Page from UNEP's draft toolkit



Making Cars 50% More Fuel Efficient by 2050 Worldwide



Findings and Conclusions: The “bottom line” (1)

- Based on recent literature, incremental technologies available to improve fuel economy are estimated to be able to cut average new car fuel consumption by around 50% at least for OECD countries -- and possibly worldwide -- across the time frame 2005-2030. These are the findings of well known engineering studies in the US (e.g., Heywood 2008) and Europe (e.g., King 2007) and are confirmed by other relevant work discussed in this report.
- This suggests that by around 2030 average new car fuel economy in many OECD countries might be close to 4 L/100km (25 km/L, 60 mpg,) or 90gCO₂/km. An indicative target of 25 km/L also seems feasible around 2030 for large car markets in developing countries such as China and India, given the lower average weight of vehicles in these markets.

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Findings and Conclusions: The “bottom line” (2)

- However, to meet GFEI 50% target around the world, (and its implication of achieving something close to 4 L/100km on average), it may be necessary in some countries to supplement technology-based improvements with shifts in size mix and performance (i.e. reductions, rather than just holding steady for some OECD countries, and moderated increases in some non-OECD countries). It may also be necessary to introduce plug-in electric drive vehicles, in order to benefit from the efficiency improvements associated with these vehicles. More research on fuel economy status and trends for various countries around the world will help to better elucidate the need for such supporting actions, beyond relying on technology to achieve targets. The GFEI plan to develop vehicle fuel economy baseline and trend data for more countries and regions should play a valuable role in this regard.

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Findings and Conclusions: The “bottom line” (3)

- From a policy perspective, the key to achieving this scale of improvement is creating a regulatory and fiscal environment that steers manufacturers to using technological improvements to deliver fuel economy rather than enhanced performance and heavier vehicles and that steers consumer demand towards more energy-efficient vehicles. In order for manufacturers to make the necessary investments in engine and auto plants the regulatory framework needs to create certainty. Risks are minimized when binding targets are set well in advance. This underlines the importance of early conversion of the EU’s 95gCO₂/km target into an agreed emissions standard and for other countries to adopt standards that apply 10 or more years in the future.

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Findings and Conclusions: The “bottom line” (4)

- Finally, it is important for those countries that have not done so, especially those that will experience major growth in their vehicle fleets in the coming years, to start developing national fuel economy initiatives now. This will ensure that the necessary fiscal and regulatory environments are in place to achieve significantly improved fuel economy. The GFEI has begun a process to help regions and countries move forward in this regard.
- The GFEI should also work toward raising awareness and capacity of lawmakers, stakeholders, and the general public on the issue of fuel economy. This can be done by supporting labeling programs, public information campaigns, and continued use of workshops and conferences to share information and recent research.

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Thank you. Questions?

Making Cars 50% More Fuel
Efficient by 2050 Worldwide



Global Fuel Economy Initiative – The Partners



Making Cars 50% More Fuel
Efficient by 2050 Worldwide

