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10 US cents 11 US cents 1991 20 to 35 million *3-5 US cents* 5 steps 65-80 million Africa America Asia **Barrel** benchmark *benefits* brent CHINA climate commodity congestion costs developing countries diesel EGYPT energy efficiency EU Directive 92/82 Europe Fuel Price survey fuel-efficient vehicles GHANA goal GTZ INDIA INDONESIA

ADDRESSING ENERGY EFFICIENCY IN THE TRANSPORT SECTOR

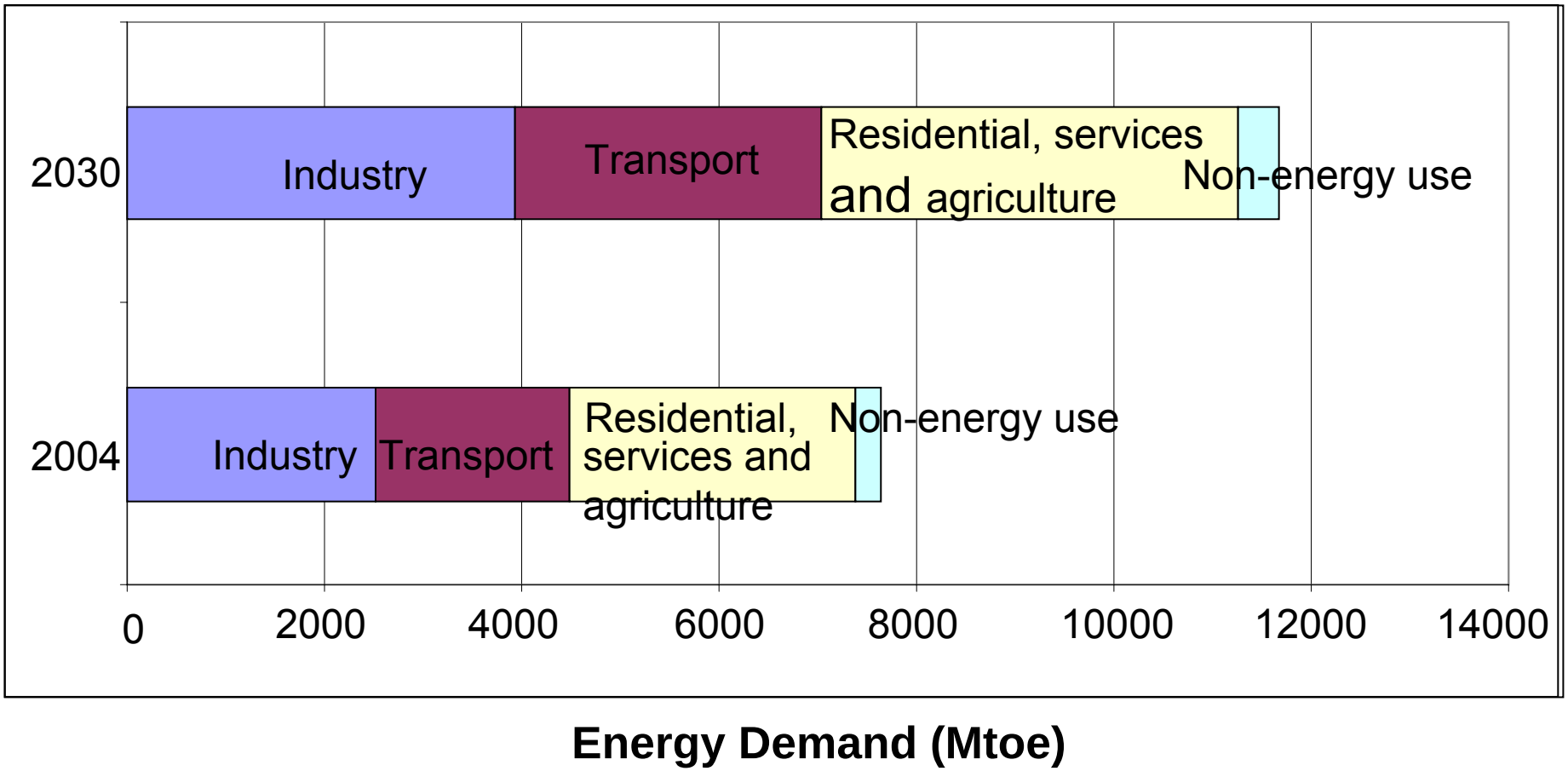
– WITH SPECIAL CONSIDERATION OF FUEL TAXATION

legislation maintenance negative effects *NIGERIA* oil price over 100 million pollution RUSSIA salutary shock **scarcity** smuggling subsidization Summary and outlook super gasoline taxation USA value-added tax *VENEZUELA* worldwide YEMEN

Dr. AXEL FRIEDRICH
Umweltbundesamt
Germany

Background

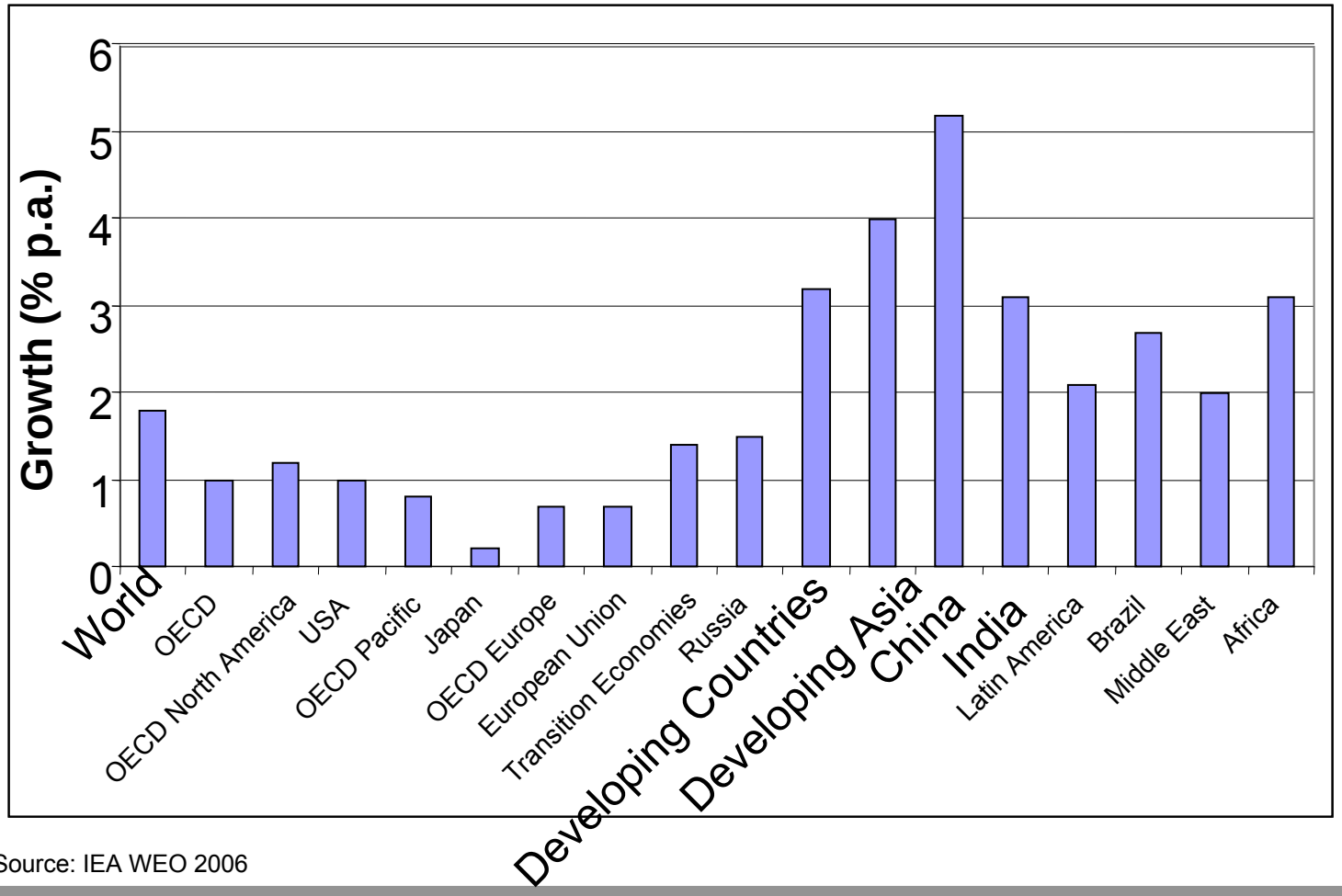
- Final Energy Consumption by Sector 2004 / 2030
  (World – Reference Scenario)



Source: IEA WEO 2006

Background

- Energy Demand in the Transport Sector: Annual Average Growth Rate (%) by Region 2004 - 2030



In 2004, 94 % of transport energy were based on fossil oil.

The share will only slightly decrease to 93 % in 2030.

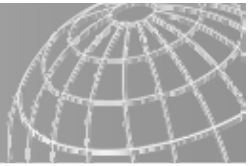
Source: IEA WEO 2006

Other key developments

- Outdoor air pollution causes **530,000** premature deaths in Asia every year
- The number of vehicles in Asia doubles every 5 years
- Until 2030, car population in China is expected to rise to 190 million – 15 times as high as today
- GHG-emissions are set to increase 3.4-fold in China and 5.8-fold in India in the next 30 years
- More 1.2 million people are killed in road accidents annually

Source: ADB; World Bank, various sources

Energy and Transport Demand



Energy Demand

= Population x Trips p.a. and capita x km per trip x Energy intensity per km

= Population x Derived freight trips p.a. and capita x km per trip x

- Bus / Rail
- Cycling /Walking
- Car / Truck

Avoid / Improve

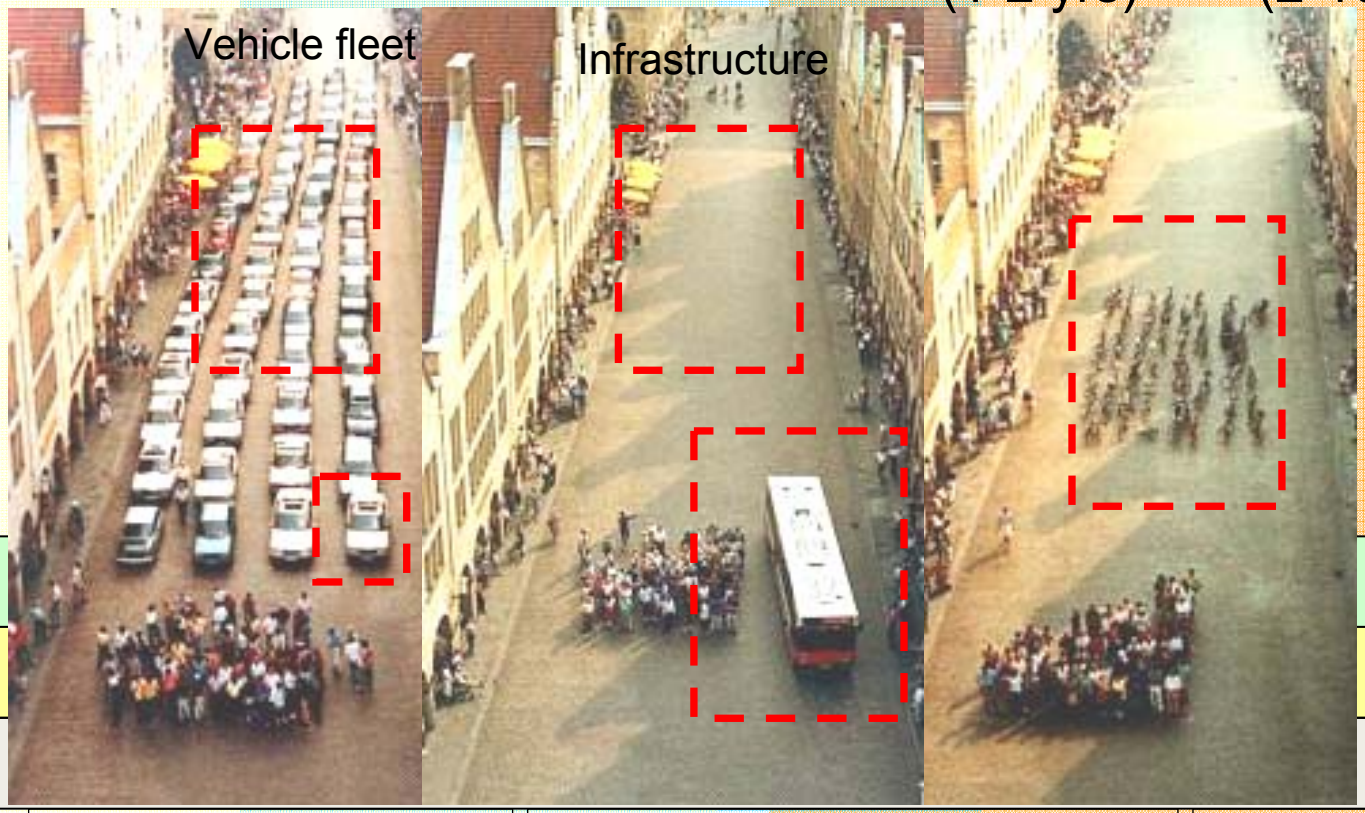
Mode Shift

Improve Unit Efficien

Aspects

- Average daily travel time per capita is relatively constant
- Strong urbanisation trends correspond with higher personal incomes and higher car ownership
- Higher car ownership means higher travel speeds
- → more mileage per capita

Enhancing Energy Efficiency – Layers



Short-term (1-2 yrs) | Mid-term (2-10 yrs) | Long-term (10 - ∞ yrs)

Regulatory Instruments

Economic Instruments (more flexible / adaptable)

Local	
Regional	
Global	

IMPROVE existing systems	SHIFT transport demand to more efficient modes	AVOID non-essential transport

Picture Source: GTZ-Photo CD-ROM

Good Practices and Approaches: Overview

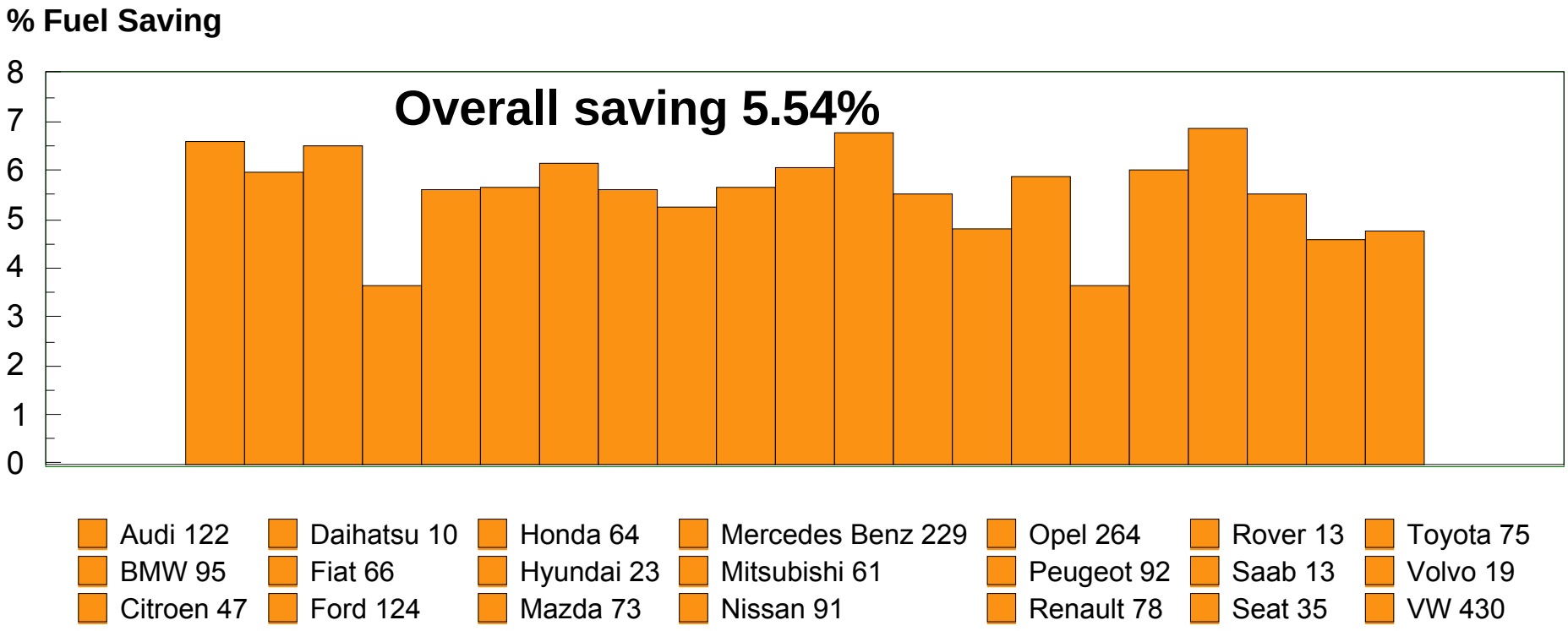
IMPROVE existing systems	SHIFT transport demand to more efficient modes	AVOID non-essential transport
• Speed limits • Improved lubricants • Correct tire inflation • Low Rolling Resistance Tires • Eco-Driving (Raising Awareness) • Fuel consumption standards	• More efficient vehicles • Transport Demand Management & Mobility management • NMT & IMT & Public Transport Pull-measures • Replacement of vehicle fleet / higher share of NMT/IMT	• Integration of Transport and Land-use planning • New vehicle concepts • Shift to alternative fuels

Selected Good Practices and Approaches – Short-term I

Objective	Measure / Notes	Impact
Lower average speed and harmonised traffic flow	Speed limits	Example Germany: Speed limit at 120 km/h: 3 % less fuel consumption in transport sector
Higher engine and transmission efficiency	Improved lubricants	Castrol SLX 0W-30 compared to SAE 15W-40: Approx. 4% - 5% reduction in fuel consumption
Higher unit efficiency	Correct tire inflation	0.2bar underinflated – 1% increase in fuel consumption 0.4bar underinflated – min 2% increase in fuel consumption

Fuel Saving by Low Friction Lubrication Oil

Customer Field Test
2116 Cars



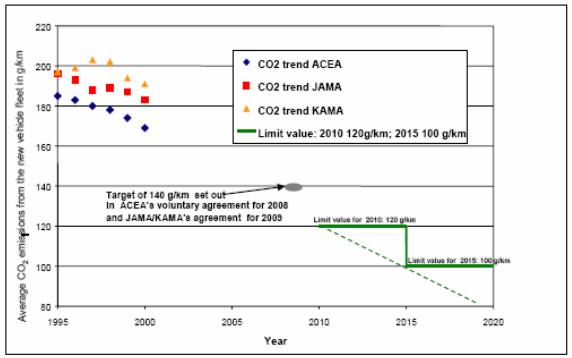
Selected Good Practices and Approaches – Short-term II

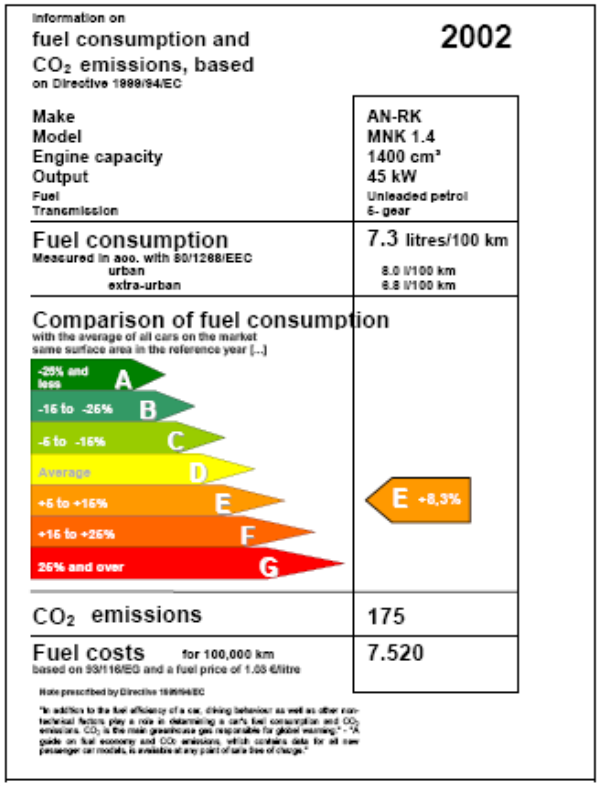
Objective	Measure	Impact
Higher unit efficiency	Low Rolling Resistance Tires	Approx. 30% reduction of the rolling resistance Only one example in force: California *city driving: 4- 6%* *extra urban driving (70 to 89 km/h) 3- 5%* *autobahn driving (120 km/h): 2- 3%*
Higher unit efficiency	Eco-Driving (Raising Awareness)	Less engine speed: gear change at 2000 – 2500 RPM [cars] Less vehicle dynamics (acceleration/ deceleration/speeding/ overtaking/ aggression: anticipation) *5-10% (up to 20% for professional drivers)* *Estimated EU-wide: 10%*

Selected Good Practices and Approaches

Short –term II

Objective	Measures	Impact / Example
Higher unit efficiency / More efficient vehicles	Tighter fuel efficiency standards: Fuel efficiency standards are available in all key car producing countries: EU; USA; Japan, Korea Better labelling needed	Voluntary fuel efficiency standards failed in Europe





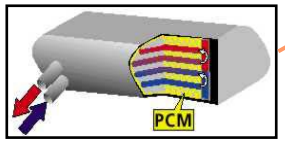
Selected Good Practices and Approaches – Short term III

engine stop at idling

gearbox with long transmission

gearshift indicator

Light weight seats



heat storage

smoth under flow

lower body

smoth covers

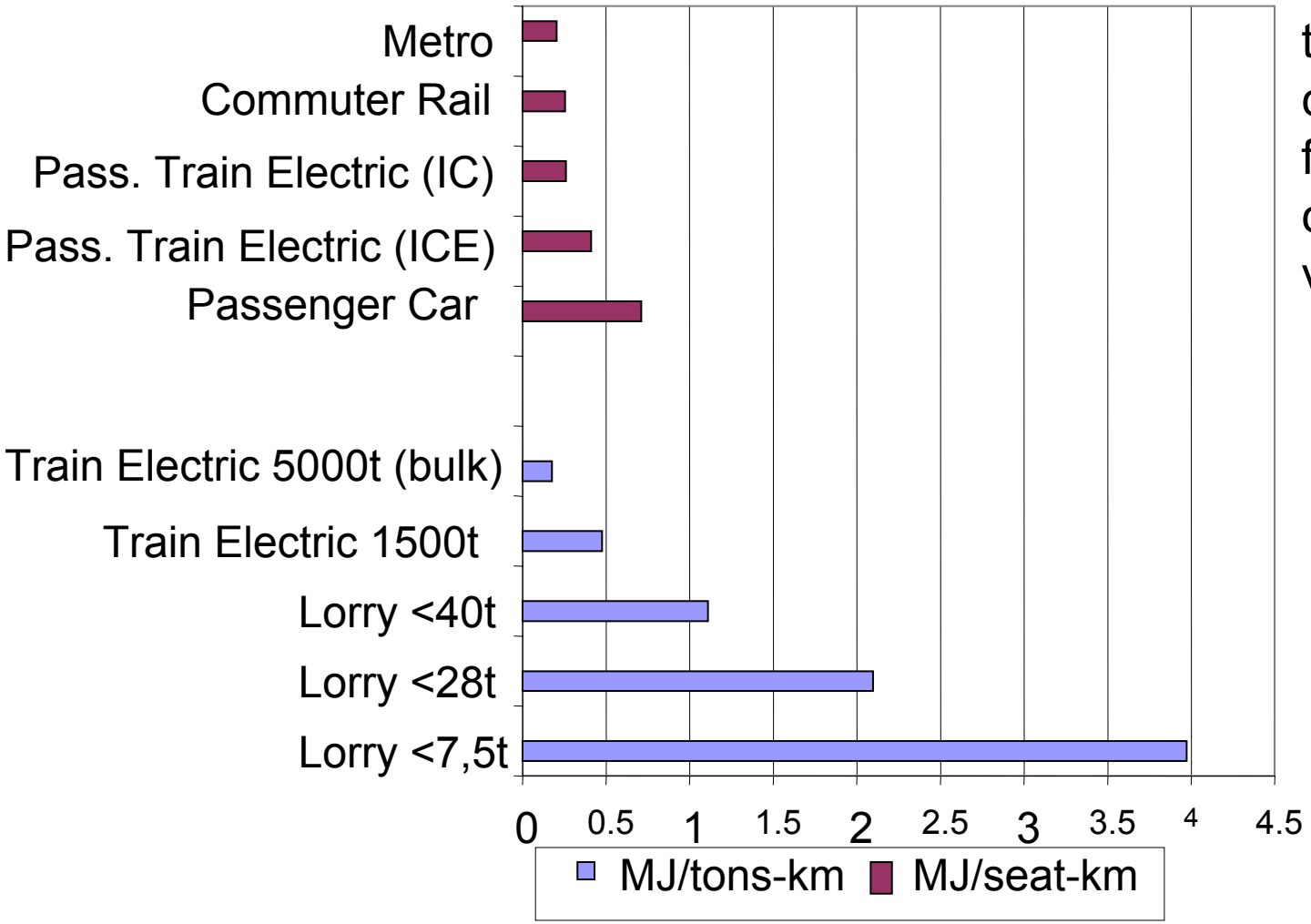
narrower low rolling resistance tires

Selected Good Practices and Approaches – Mid-term II

Objective	Measures / Notes	Impact / Example
Higher system efficiency / Transport Demand Management & Mobility management	e.g.: Introduction of charges, access restrictions etc. plus general application of pull & push measures	Congestion charge in London: Approx 8 % reduction in energy consumption (in restricted area due to mode-shift), but high administration cost
Replacement of vehicle fleet / higher share of NMT/IMT	Phasing out of old vehicles (scrapping): Should be based on performance not on age Vehicles: taxes on high capacity engines Reduction / exemption of import taxes for bicycles, capacity buses and other	Kenya: 15 % import duty on bicycles waived: Sales increased by 20-30 %

Outlook:

Specific Primary Energy Consumption of different Road and Rail Systems*



* Differs according to operating conditions, load factor and composition of vehicle fleet

Source: IFEU: EcotransIT (www.ecotransit.org), German Railways (www.umweltmobilcheck.de)

Selected Good Practices and Approaches – Long-term

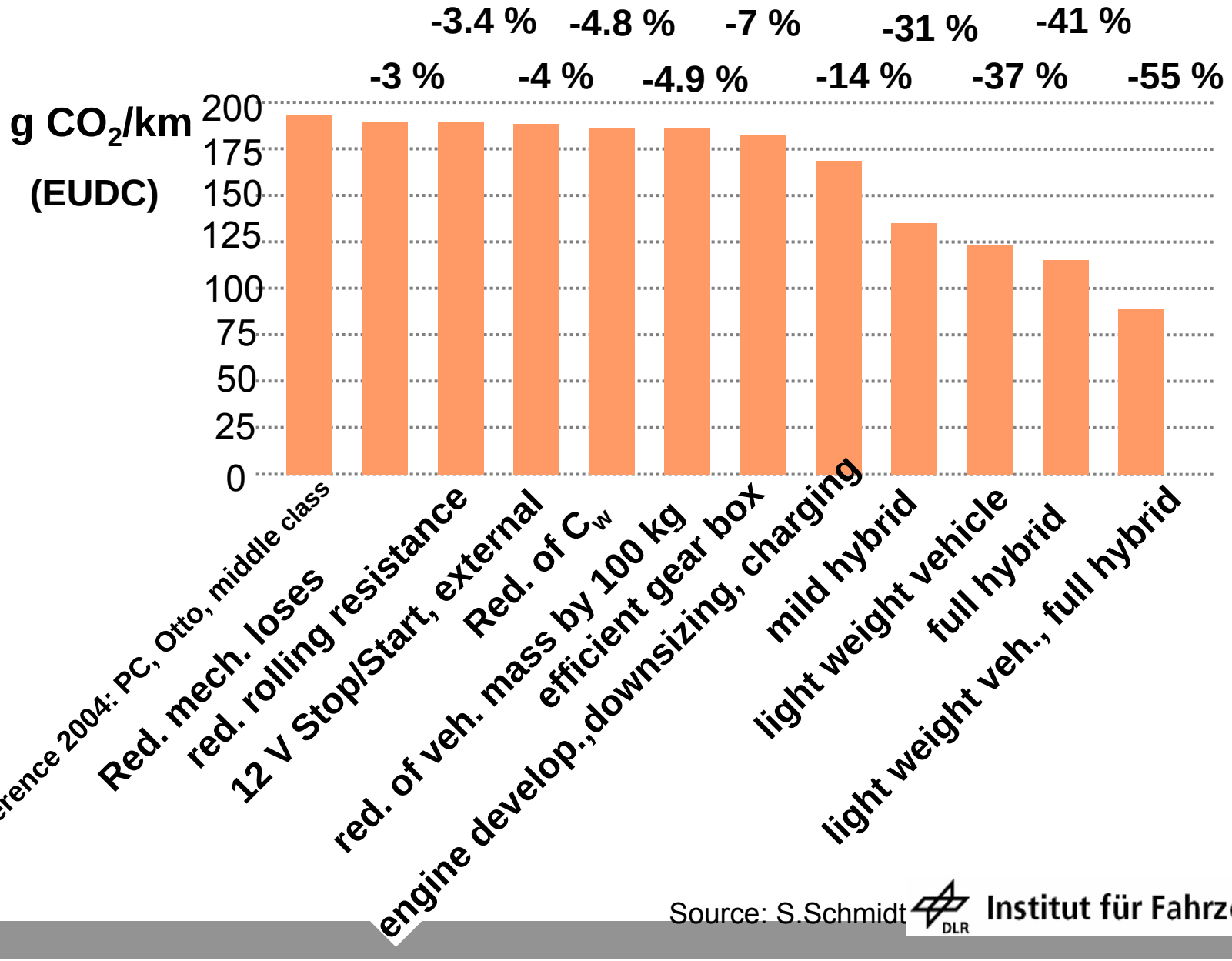
Objective	Measures	Impact / Examples
Integrated transport and land-use planning (that supports short trips and trip chaining)	Revitalization of central urban areas Support in developing high-capacity public transport systems Measures against sprawl Development along Public transport nodes	Quartier Vauban/Freiburg Seoul – Revitalization of central area Curitiba – Development along high-density links and nodes

The case of Curitiba: land use and transport

Selected Good Practices and Approaches – Mid -term

Measures	Notes	Impact / Examples
New vehicle concepts	Hybridisation, continous variable transmission, shut-down of single cylinders Downsizing Light weight material	Limited public acceptance (VW Lupo) but changing perception (Toyota Prius, Honda Civic), VW Passat Blue Motion

Selected Good Practices and Approaches – Long-term / New vehicle concepts



Source: S.Schmidt

Institut für Fahrzeugkonzepte

Create Preconditions for Use of Energy-efficient Transport Modes (1)

- **invest in public mass transit systems like busses, trams, metros (depending on size of cities, transport volume, costs of land etc.)**
- **for medium distance passenger traffic speeds of railways must be increased to reduce travel time to compete with land and air traffic.**
- **invest in and upgrade of railways, where cargo-volumes and distances justify rail transport (especially, mass goods, containers).**

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Create Preconditions for Use of Energy-efficient Transport Modes (2)

- **invest in coastal waterways and ports, where bulk goods dominate**
- **invest in inland waterways but avoid negative impacts for the environment**
- **invest in facilities for inter-modal transfer to create fast and efficient transport chains**
- **improve the conditions for the more environmentally friendly modes by incentives and by internalizing the external cost**

First Summary

- No single solution but package of well coordinated measures
- Critical assessment of local and regional conditions required
- Define timeline and actors/responsibilites
- Costs can vary considerabely
- Co-benefits with Climate Change and Local Air Pollution issues are obvious

+

Appropriate instruments (both regulatory and economic) are needed to help translating measures into practice

Why fuel taxation ?

Level of fuel taxation has direct or indirect impact

- Speed
- Improved lubricants
- Correct tire inflation
- Improved Inspection and Maintenance
- Eco-Driving (Raising Awareness)
- More efficient vehicles
- Transport Demand Management & Mobility management
- Replacement of vehicle fleet / higher share of NMT/IMT
- Priorisation of NMT and Public Transport
- Integration of Transport and Land-use planning
- New vehicle concepts
- Shift to alternative fuels

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Fuel Taxation & International Fuel Prices

→ Background

- Since 1991 GTZ has carried out regular worldwide Fuel Price Surveys. One of its goals is to provide a worldwide comparison of selling prices as a vehicle for highlighting energy price policies in developing countries.
- Data available for 170 countries for Diesel and Gasoline based on survey in Mid-November 2006
- Part of World Bank Indicator Set (World Development Indicators)
- New 2007 Survey now available on: www.gtz.de/fuelprices

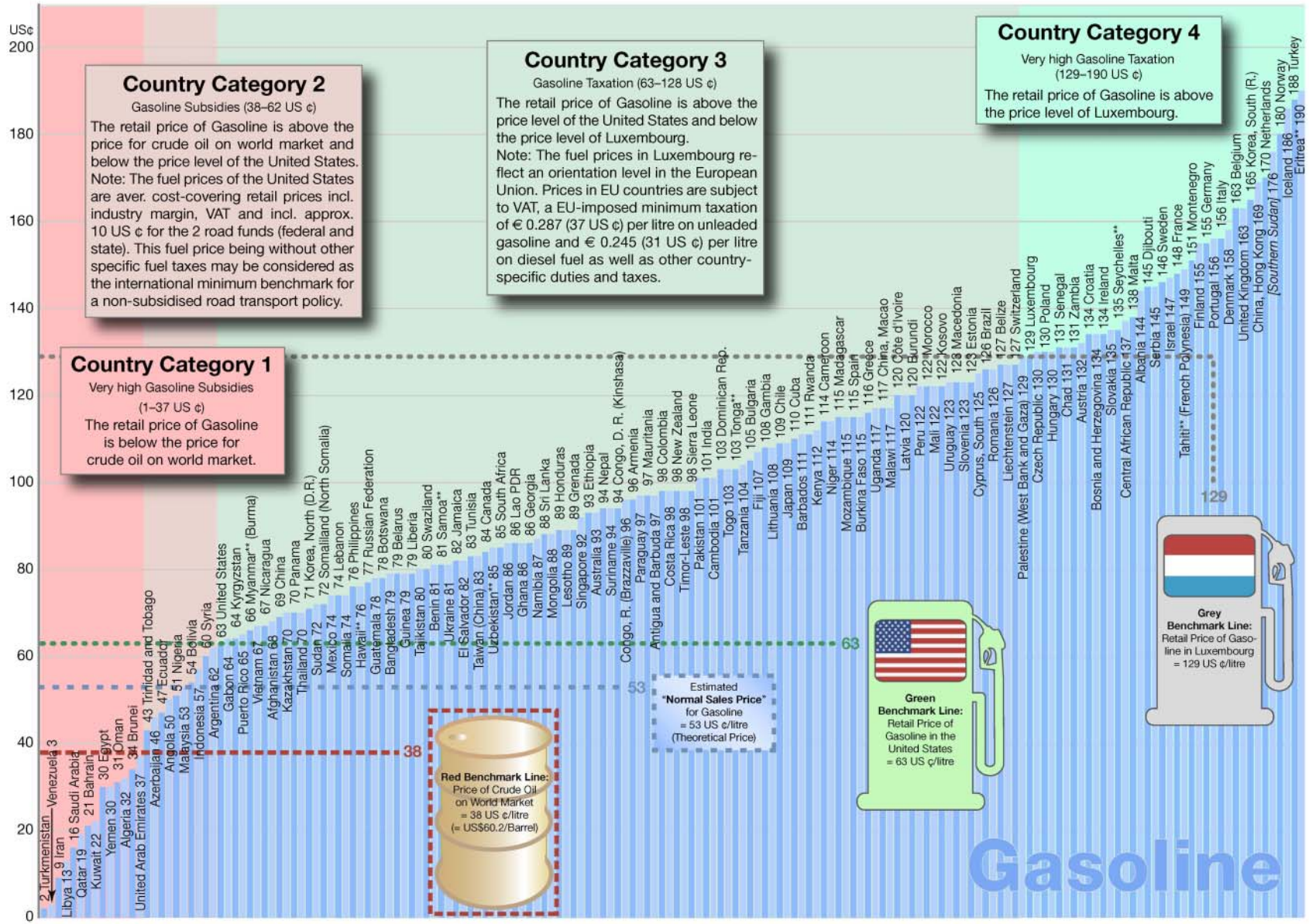
“Brent” crude oil price at time of survey	per barrel (159 litres)	per litre
Mid-November 2004	US$ 42.84	27 US cents per litre
15-17 November 2006	US$ 60.21	38 US cents per litre
Price increase in 2 years	US$ 17.37	11 US cents per litre

International Fuel Taxation

3 Principles

- **Fuel taxation should be based on the "users pay" principle**, i.e. through the fuel tax road users should be charged the full cost of providing a country's road network.
- **Transport should contribute to state finances**. We also maintain that fuel is a normal good just as any other good and should be subject to full VAT. This VAT should be charged in addition to the fuel tax, and possibly even additional or sumptuary taxation can be levied. In many developing countries tax revenue from the transport sector could make a major contribution towards financing core state functions, such as the health services, education and security, particularly if other forms of taxation are too difficult to administer.
- **Prices in transport always have a guiding function**. Taxation should thus be designed to avoid undesired price distortions; for example, between different forms of transport such as private transport, local public transport, rail transport etc. In addition, fuel taxation can also be used to shift the burden of the indirect negative effects of transport (such as environmental impacts, noise pollution, congestion costs, etc.) onto transport users.

International Fuel Prices

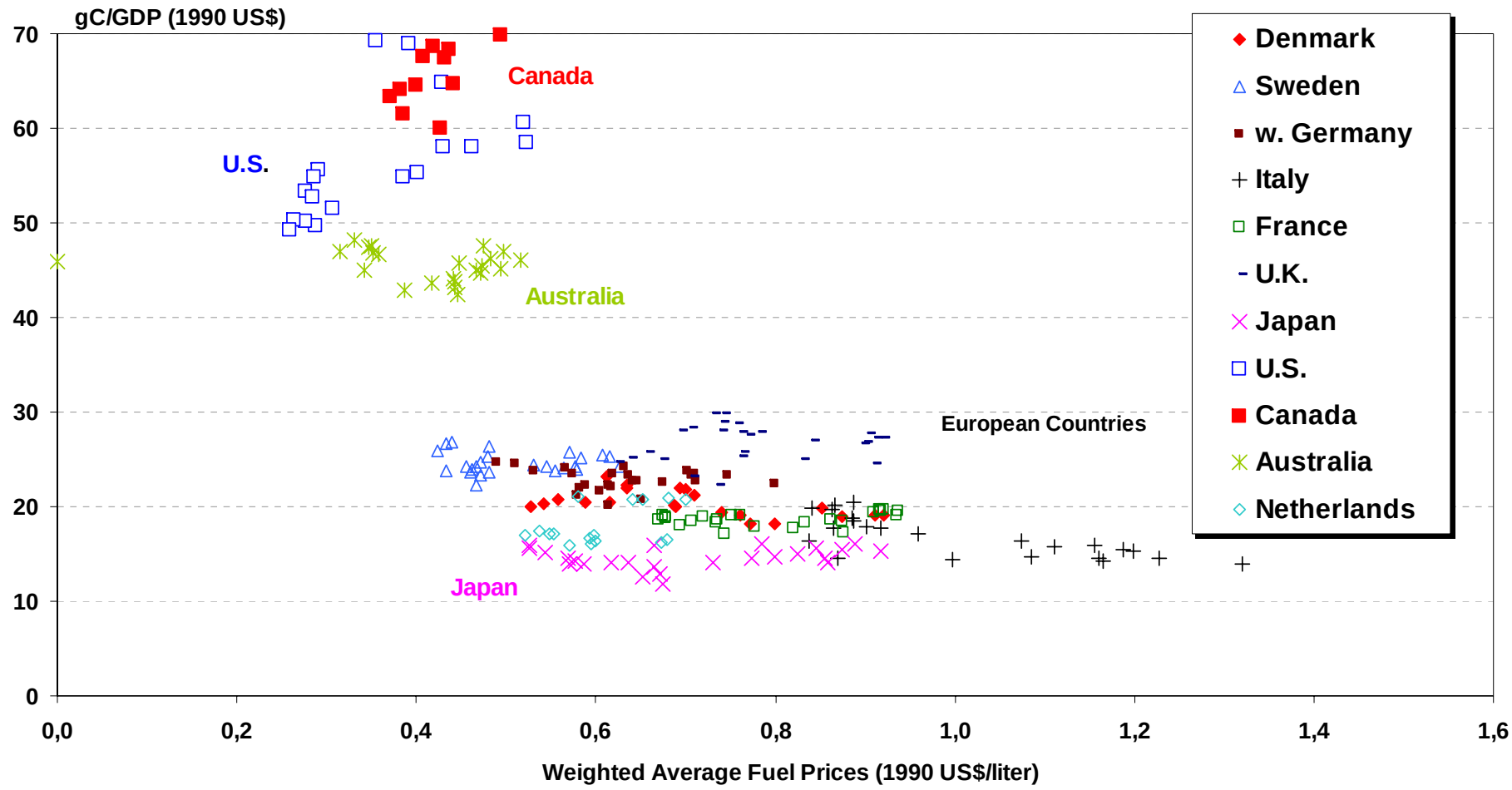


www.gtz.de/fuelprices

International Fuel Prices

Main categories	Type of oil	Filling station prices or, for crude oil, world market price (November 15, 2006)
I. World market	Crude oil - Brent spot price Nov.2006 (60 US$/barrel)	**38 US cents per litre** **Fuels are subsidized below price of production**
II. USA	US, diesel	**69 US cents per litre**
	US, super gasoline	**63 US cents per litre**
III. EU	EU-Luxembourg, diesel	**113 US cents per litre**
	EU-Luxembourg, super gasoline	**128 US cents per litre**
IV. Germany	Germany, diesel	**138 US cents per litre**
	Germany, super gasoline	**155 US cents per litre**

….and fuel taxes DO work



Source: Lee Shipper

DaimlerChrysler (DCX) CEO Tom LaSorda

U.S. House Subcommittee on Energy and Air Quality (2007)

- He called for the U.S. to adopt policies that use market forces to drive consumer demand in order to improve the fuel economy of the U.S. vehicle fleet and fight climate change.
- The European vehicle fleet gets 50% better fuel economy than the U.S. fleet because European policies leverage demand and market forces, he said. "They've highly taxed gasoline, making the price three times higher than in the U.S., and they have incentives on diesel fuel. As a result of these policies, fuel economy is always high on a customer's list and not just when there's a spike in fuel prices."

International Fuel Prices

Summary (1)

The dramatic spike in the price of oil in the summer of 2006 has had a salutary effect worldwide.

- Countries which had previously followed a low fuel-price-policy (such as China, Russia and Viet Nam) have allowed prices to rise.
- Numerous countries have pressed ahead with the reduction of subsidies, particularly populous countries such as Indonesia, Nigeria and China.
- Higher fuel prices in many countries point to heavier fuel taxation, not only in India but above all in the eastern European EU accession countries and in Russia.

International Fuel Prices

Summary (2)

- Wide-spread fears of economic collapse due to increased fuel prices have proved groundless. Instead, a country like India, with prices of USD 0.75 per litre (USD 2.89 per gallon), is showing remarkably strong economic growth.
- In Europe and selected other countries, fuel taxation is accepted as instrument to promote energy efficiency addressing various levels, such as the vehicle level, transport demand level and land-use level.

Energy Efficiency & International Fuel Taxation

Recommendations

- Formulate internationally recognized recommendation on national fuel taxation based on 3 principles (“users pay” principle [minimum requirement: operation costs and network maintenance are covered], guiding function [internalisation of external costs; signalling shortages], transport should contribute to state finances)
- Harmonise international/regional taxation frameworks in the transport sector focusing on energy efficiency
- Set up joint working group with international partners such as ESMAP, IEA, SSATP and bilaterals on Energy Demand in the Transport Sector to enhance knowledge and improve database
- Link efforts with action on Climate Change and Air Quality

More information:

www.sutp.org

www.gtz.de/fuelprices

www.gtz.de/transport

www.umweltbundesamt.de

Equity / Affordability

Based on a study in Ghana, Mali, Bolivia, Jordan and Sri Lanka, an IMF study reveals:

- Fuel subsidies (intending to shield the poor from high fuel prices) entail a substantial leakage of benefits to higher-income groups
- For every unit transferred to the poorest households, 3 to 5 or more units are transferred to better-off households.
- Phased plans for eliminating subsidies combined with well-designed social protection programs can reduce adverse effects on the poor.
- Budget savings from reduced fuel subsidies should go to education and health services – directly helping the poor

Source: IMFSurvey – Rethinking Fuel Subsidies 2007