Wuppertal Institut
für Klima, Umwelt, Energie
GmbH

Assessment of technical and policy options for mitigating transport emission

Presentation at the Expert Group Meeting
on Transport for Sustainable Development
United Nations DESA, New York 27 – 28 August 2009

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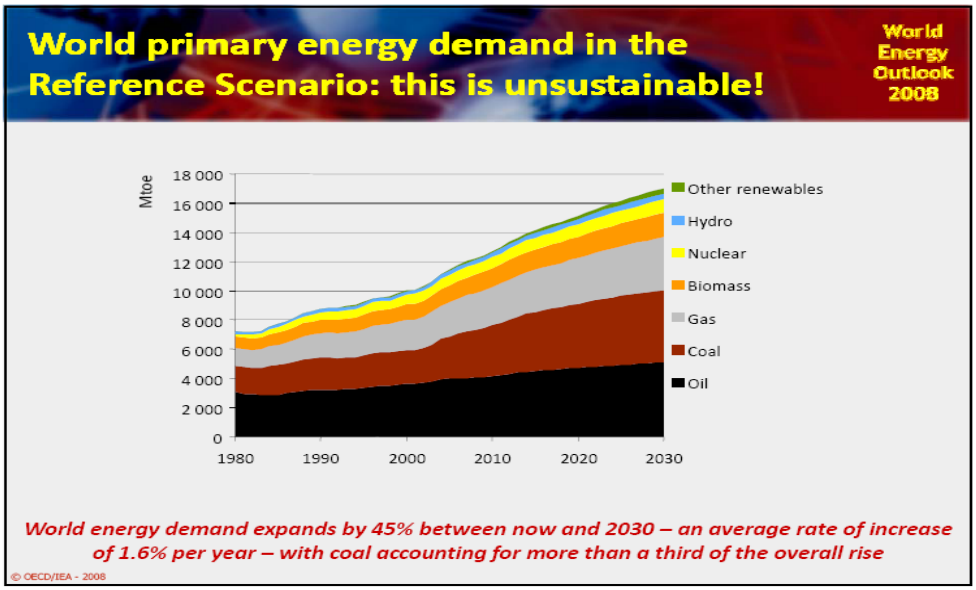
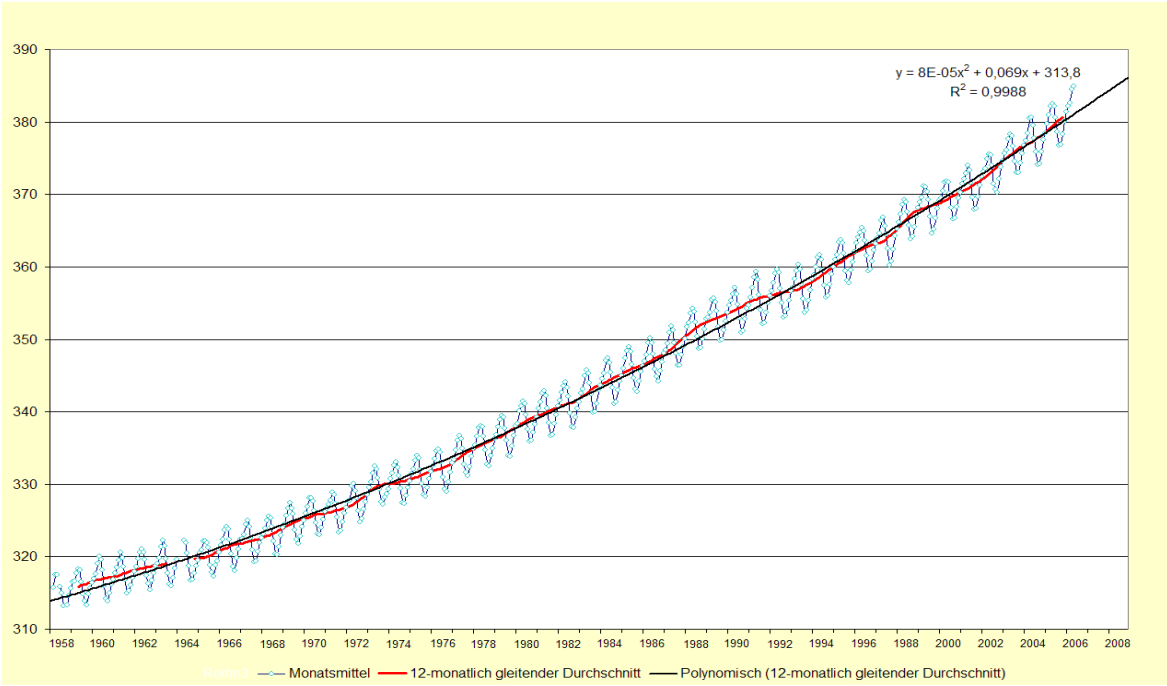
Energy: reference path is not sustainable



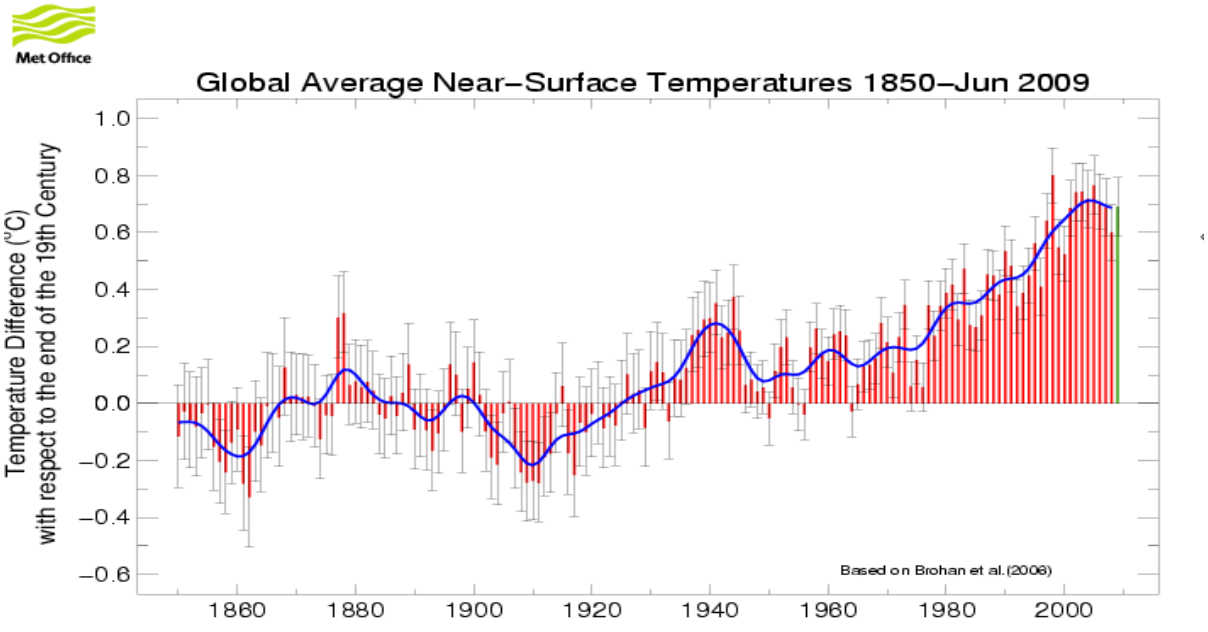
Quelle: OECD/IEA: World Energy Outlook 2008, Presentation to the Press, London 12 Nov 2008

CO_2-concentrations at the Mauna Loa Observatory (Hawaii)



source: Keeling/Whorf 2005, NOAA/ESRL 2006; own calculations

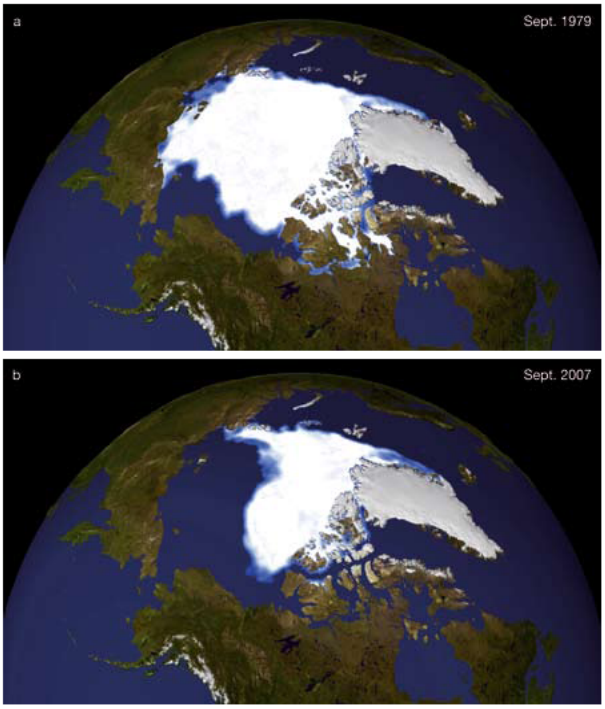
Temperature changes 1850 -2009



source: www.metoffice.gov.uk/climatechange/science/monitoring/indicators.html

Arctic ice cover, Sept 1979 and Sept 2007

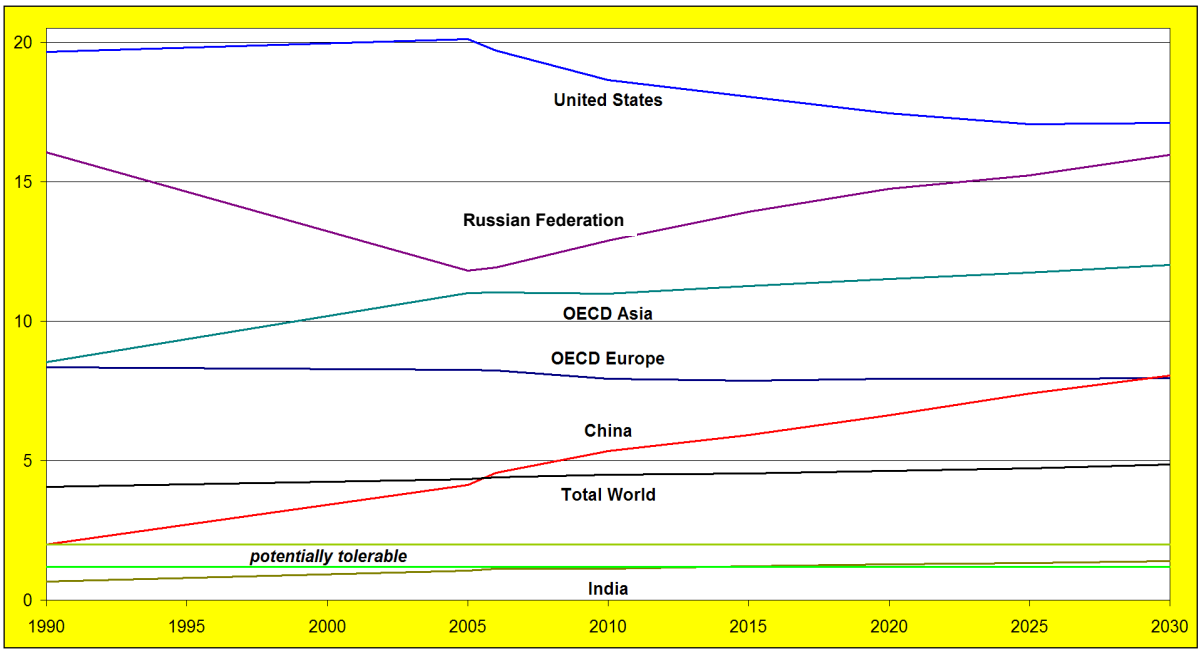
Figure 2.2-2
Satellite images of Arctic ice cover
a) September 1979;
b) September 2007.
Source: NASA/Goddard Space Flight Center Scientific Visualization Studio, 2009



Source: WBGU: Solving the climate dilemma: The budget approach, Berlin 2009, p.12; cf. www.wgbu.de

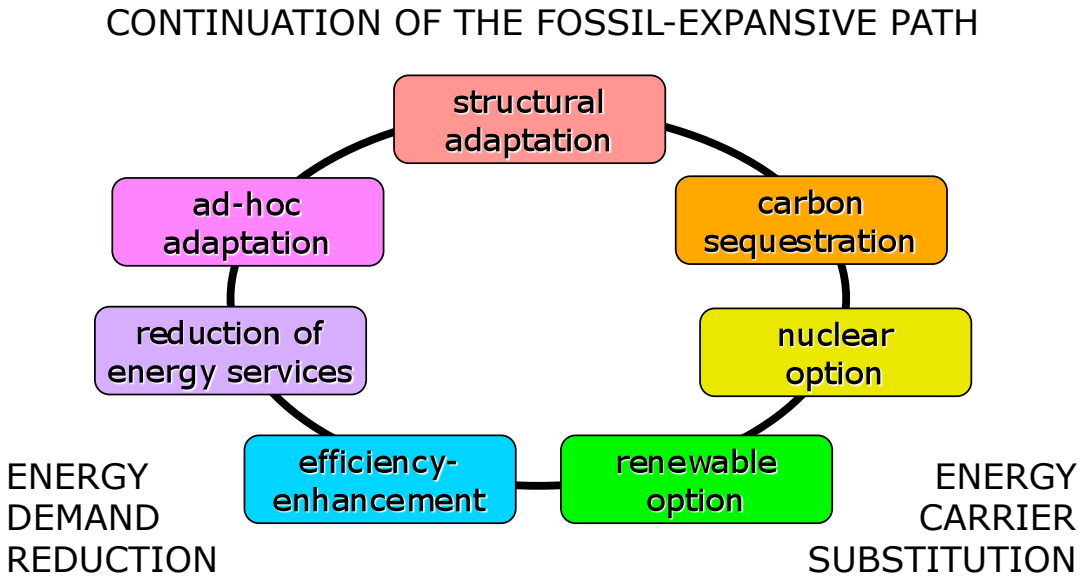
The challenge in general: *GHG-emissions exceed by far tolerable levels*

Annual CO2-emissions per capita 1990 - 2030, selected countries and regions, metric tons per capita



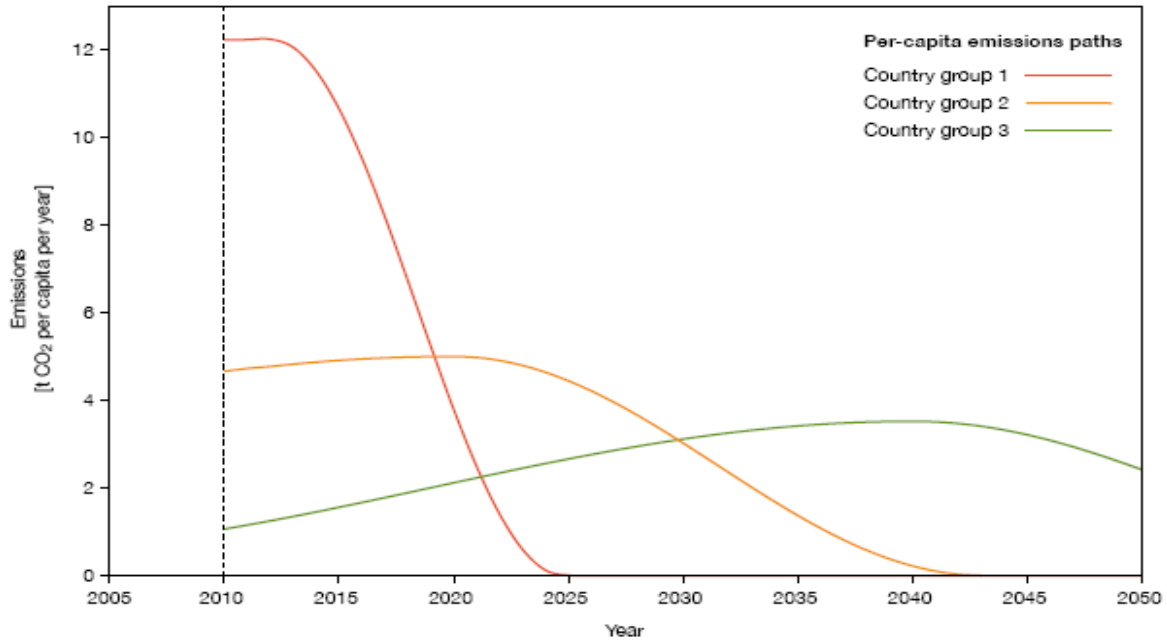
Source: per capita levels derived from U.S. DoE, EIA: International Energy Outlook 2009, May 2009

Energy strategies and options



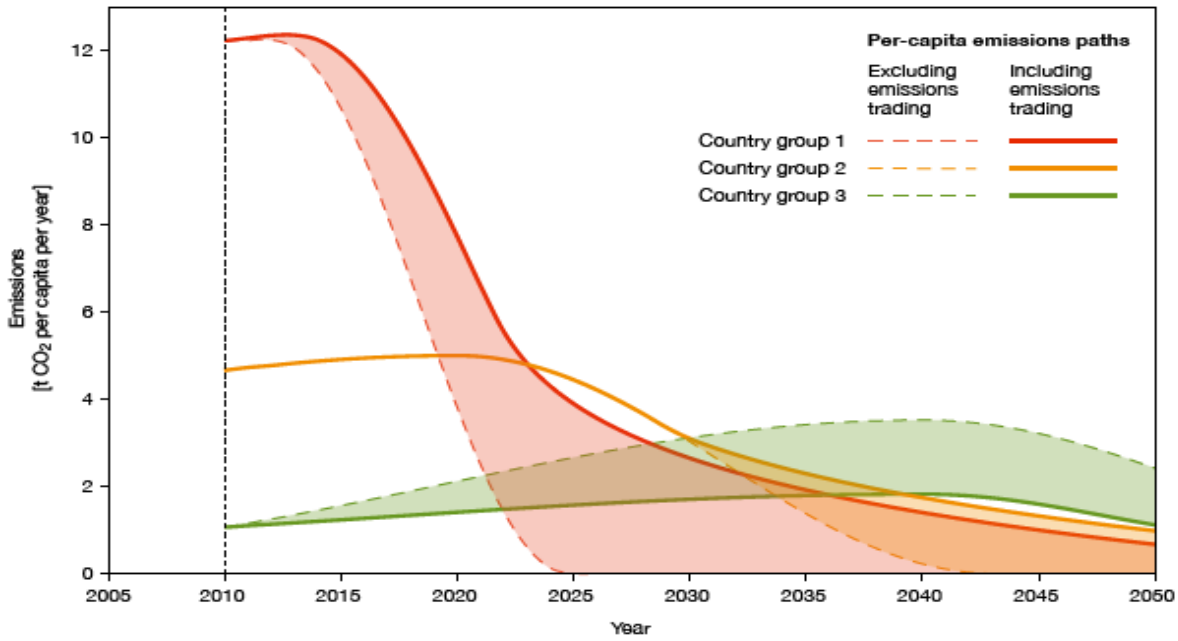
Source: Schallaböck, Presentation at the 1st Assembly of the European Geosciences Union, Nice 2004

Potential paths to meet the 2°C target *(target-missing likelihood 33 per cent)*



Source: WBGU: Solving the climate dilemma: The budget approach, Berlin 2009, p.4; cf. www.wgbu.de

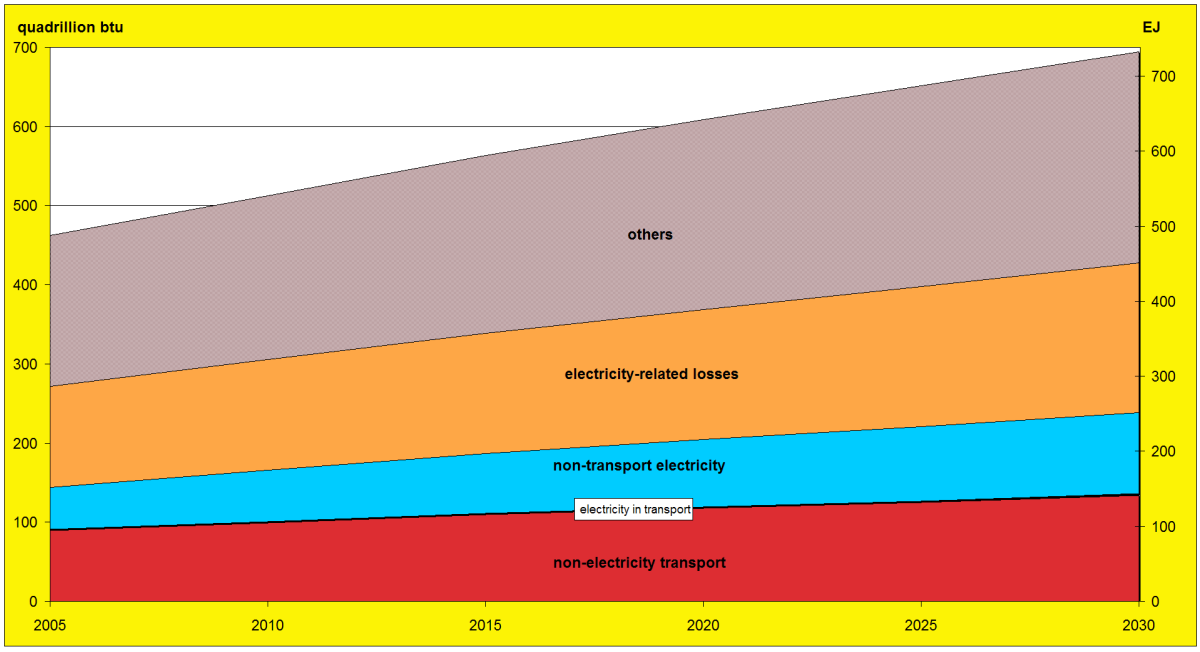
Potential paths to meet the 2°C target incl. emission trading *(target-missing likelihood 33 per cent)*



Source: WBGU: Solving the climate dilemma: The budget approach, Berlin 2009, p.5; cf. www.wgbu.de

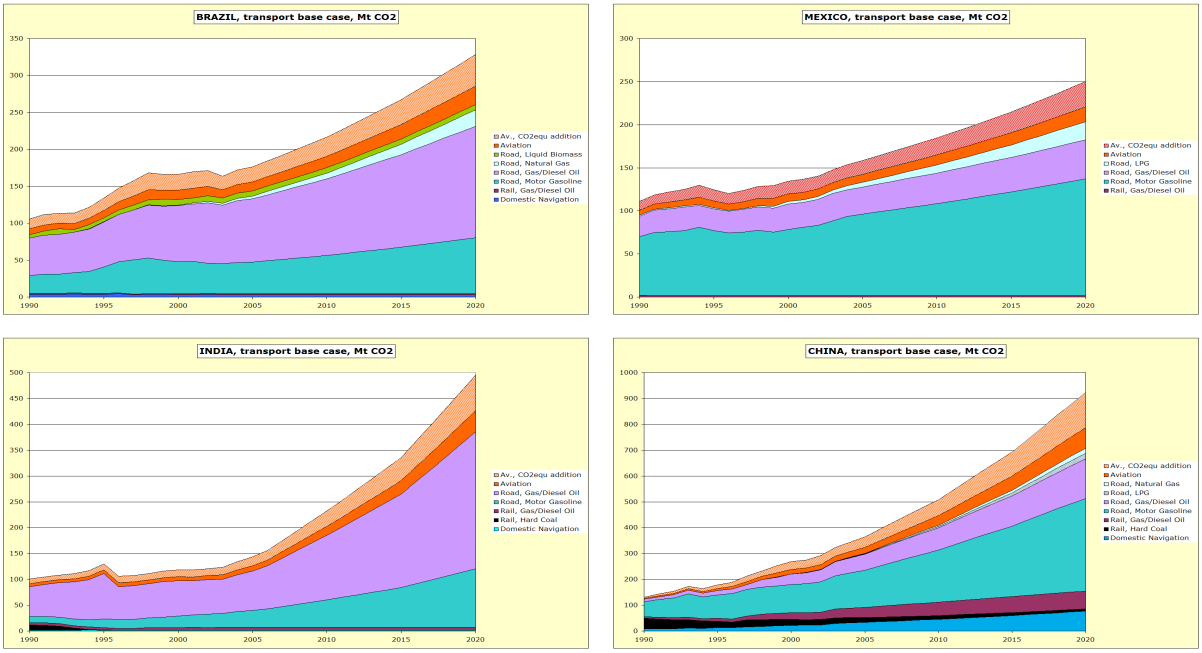
The challenge in detail: *Transport is a major source of GHG-emissions*

Energy consumption by major segments 2005 –2030: transport accouts for roughly 20 %



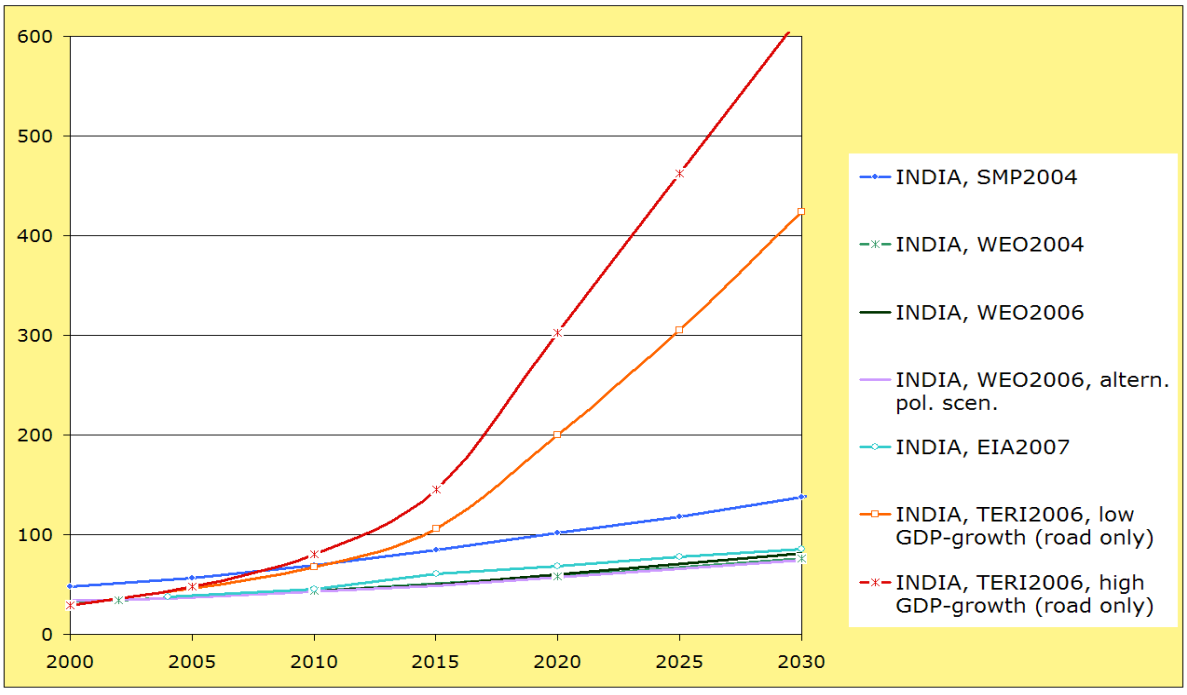
Source: U.S. DoE, EIA, International Energy Outlook 2008, Reference Case; own calculations

Trends of transport related CO2-emissions
- selected countries -



Quelle: Schallaböck 2007

India‘s future transport energy demand, mtoe
- various studies in comparison -



Mitigating transport emission
Basic logic

- **Reduce the transport volume**

  Less vehicle-km, passenger-km, ton-km

  - absolute attractivity of transport

- **Modify the modal split**

  In favour of less harmful means of transportation

  - relative attractivity of transport modes

- **Improve the vehicles**

  For constructions with higher energy efficiency a.s.o.

  - technical development / regulations

- **Optimise the traffic flow**

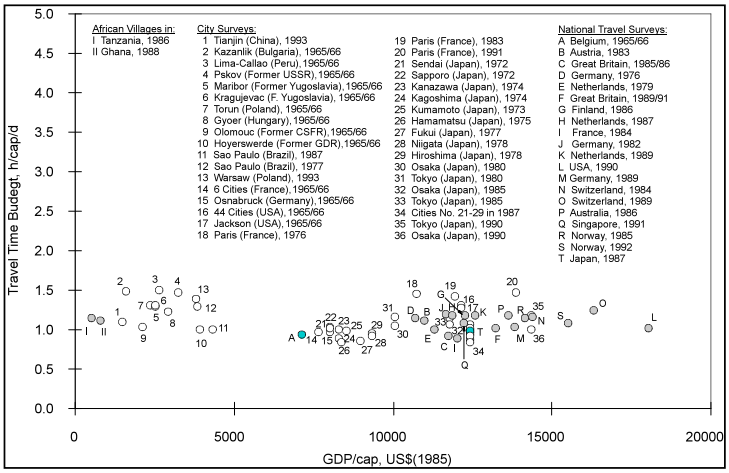
  To less consuming and emitting procedures

  - transport organisation and driver habits

Planer‘s first consideration:
Travel time per capita

- *The average daily travel time per capita comes to about 70 to 75 minutes, rather universally.*
- *This travel time equals a time-budget share of roughly 5 per cent.*

Daily Travel Time Budget per capita



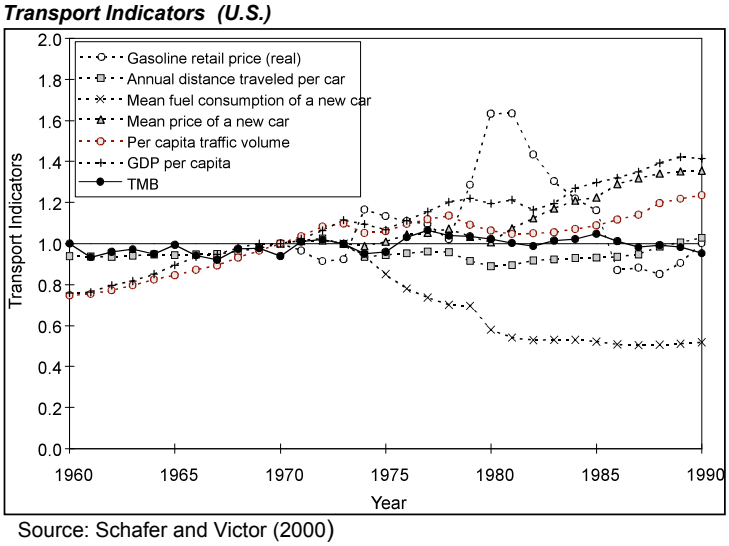
Source: Schafer and Victor (2000)

- **For a reduction of transport volume: Reduce the speed**

Planer‘s second consideration:
Real travel cost per capita

- *Also, the average money-budget‘s share of travel budget remains rather constant.*
- *In industrialized countries this share mostly is in the range of about 10 to 15 per cent.*

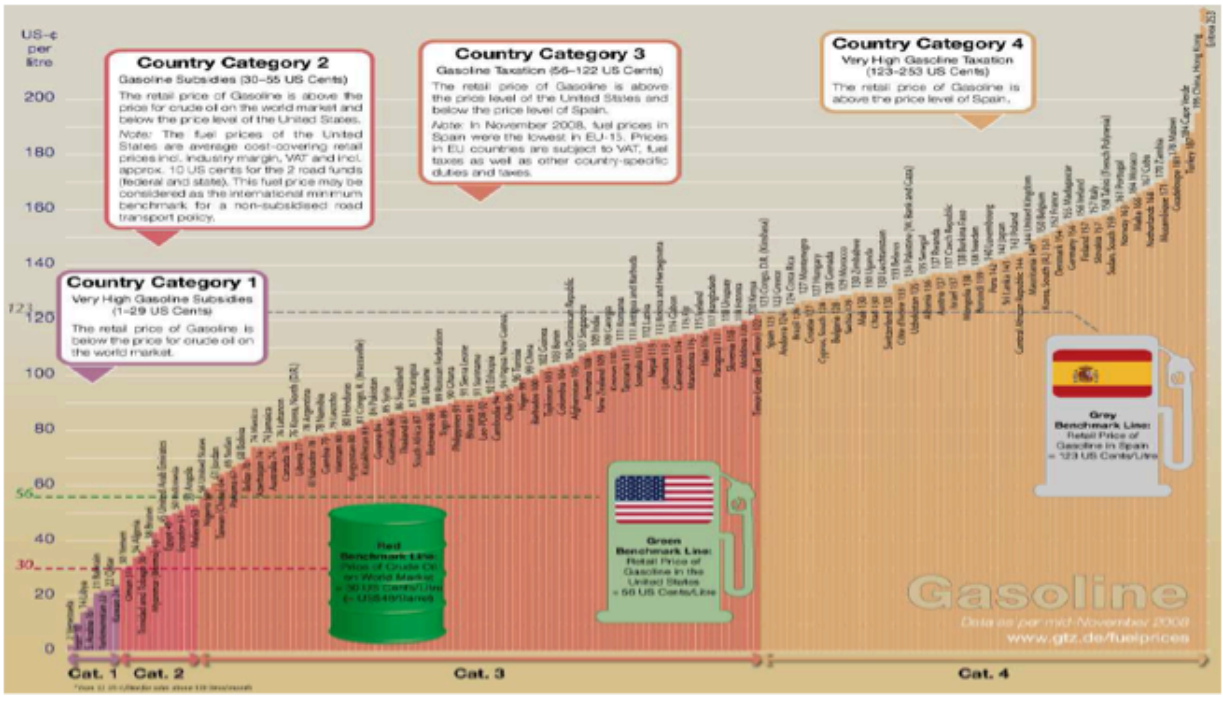
Transport Indicators (U.S.)



Source: Schafer and Victor (2000)

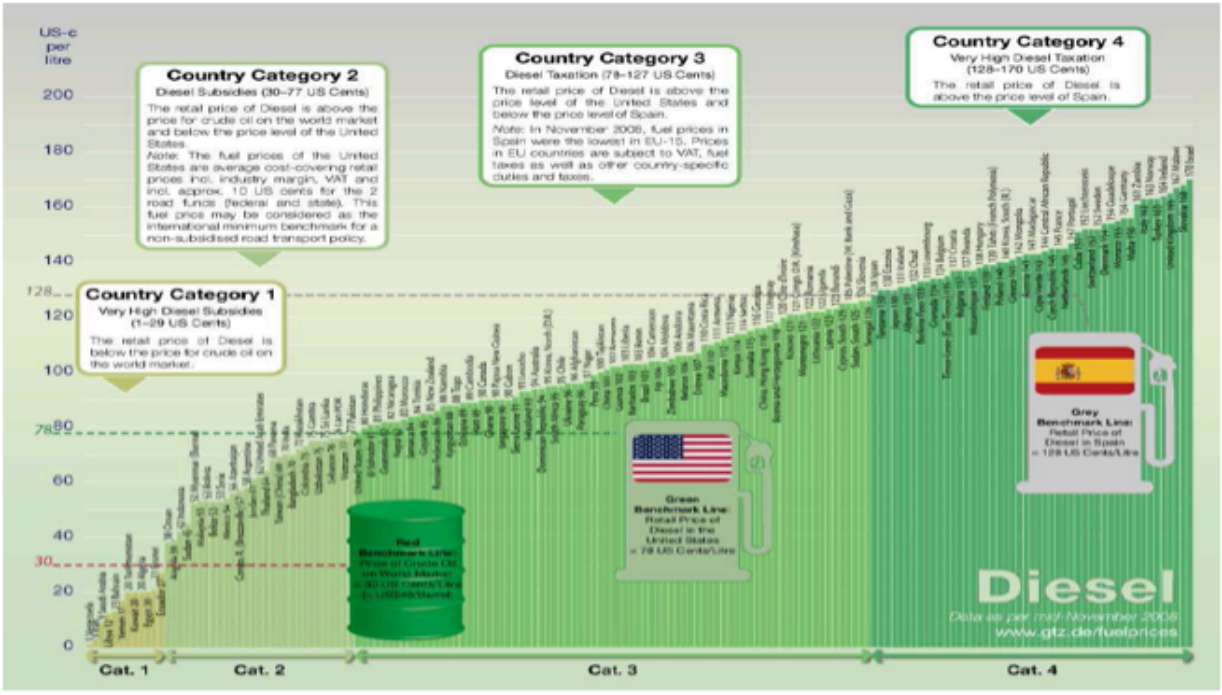
- **For a reduction of transport volume: Rise the cost**

Global Gasoline Prices, mid-November 2008
GTZ International Fuel Prices 2008, 6th Ed. - Data Preview



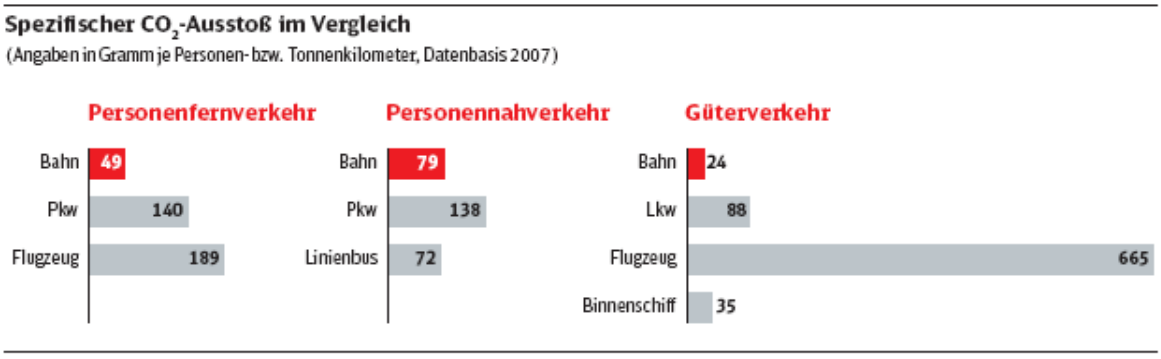
Source: www.gtz.de/en/themen/umwelt-infrastruktur/transport/25630.htm

Global Diesel Prices, mid-November 2008
GTZ International Fuel Prices 2008, 6th Ed. - Data Preview



Source: www.gtz. de/en/themen/umwelt-infrastruktur/transport/25630.htm

Transportation means in comparison
Germany 2007

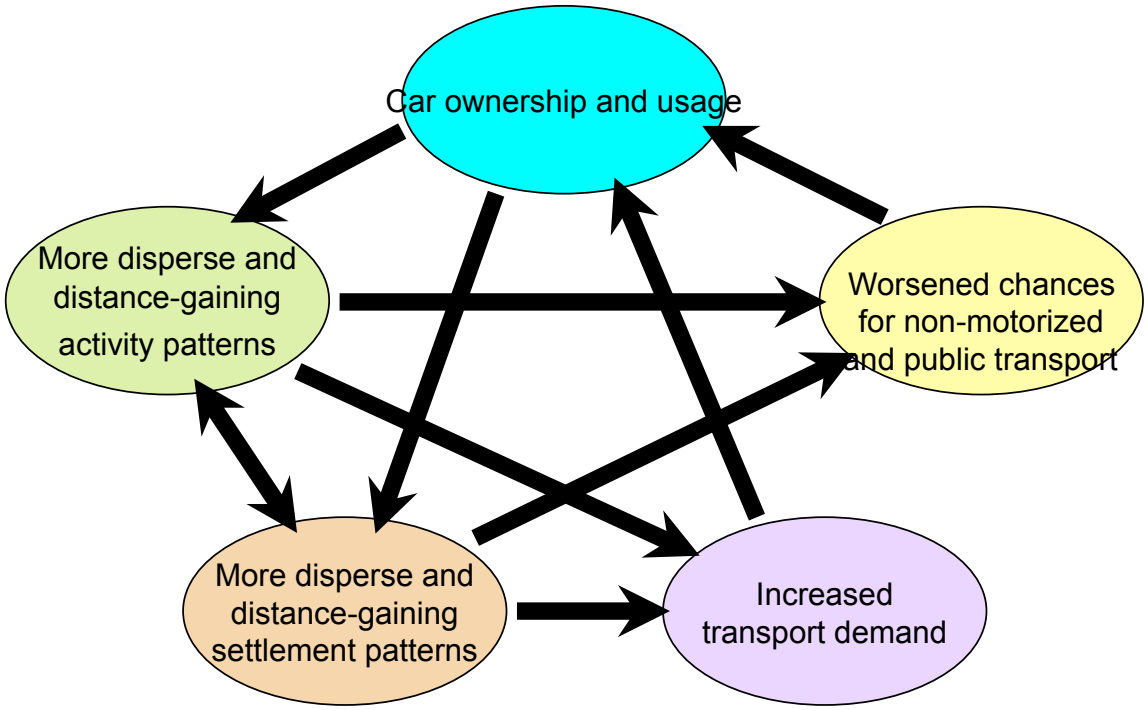


Translation:
Specific CO2-emission in comparison (g CO2 per pass.-km and per ton-km, respectively; data basis 2007

pass. long-distance	pass. short-distance	freight transport
rail	rail	rail
car	car	truck
aircraft	urban bus	aircraft
		barge

Source: Deutsche Bahn AG, ed.: Mobilität sichern – Klima schützen, Berlin 2008

Car transport and desurbanisation:
A vicious circle of positive feedbacks

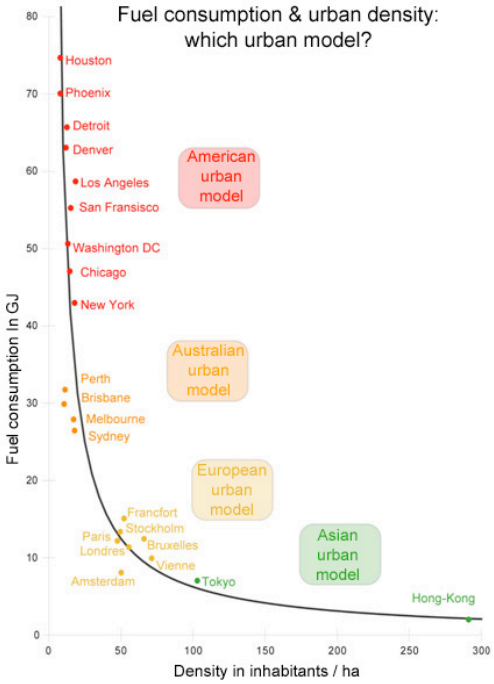


Empirical evidence:
Newman & Kenworthy's curve

Newman/Kenworthy's finding:

The higher the population density,

the lower the car density, car use, and energy consumption

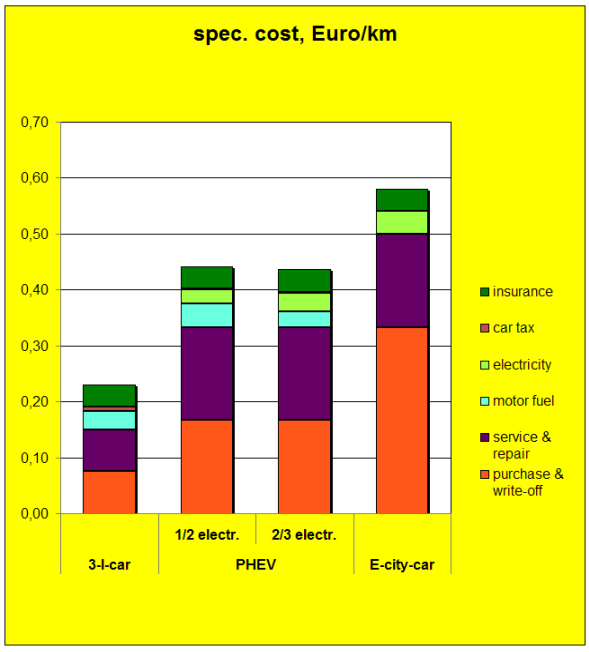


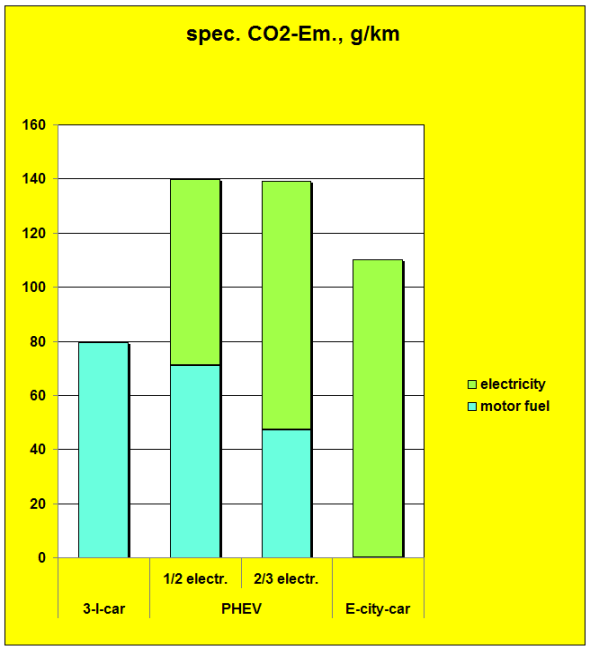
Source: Taken from Newman & Kenworthy, 1989, quoted in planet-energy.com

Re-urbanization:
Options @ 100 inhabitants per hectare (10,000 sqm)

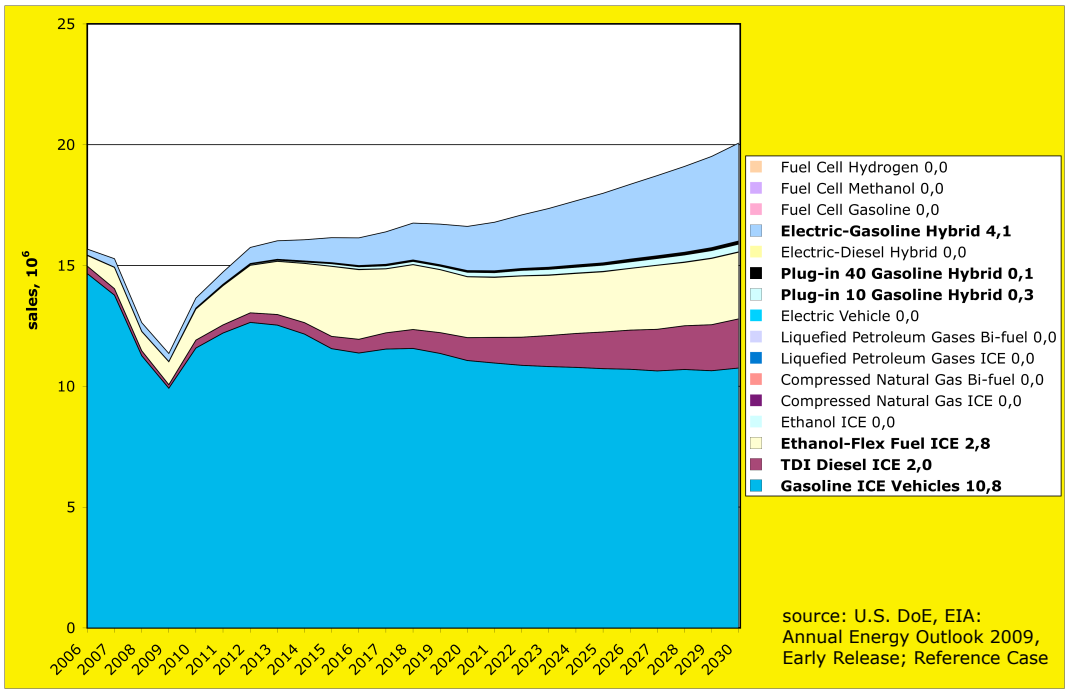
- SMALL: 5,000 inhabitants, diameter 800 m
  - kindergarden, elementary school
  - full scale basic supply with products and services
  - pedestrian area; outbound p.t. connection
- MEDIUM: 50,000 inhabitants, diameter 2,5 km
  - full scale educational supply
  - well differentiated supply with products and services
  - traffic calmed; basic supply with internal p.t., fast and frequent outbound p.t. connection
- LARGE: 500,000 inhabitants, diameter 8 km
  - full scale educational supply incl. university
  - highly specialized supply with products and services
  - predominantly non-motorized transport; fast and frequent internal and outbound p.t.

Electromobility in comparison (basis: Germany 2010):
Not only more expensive but also more emissive

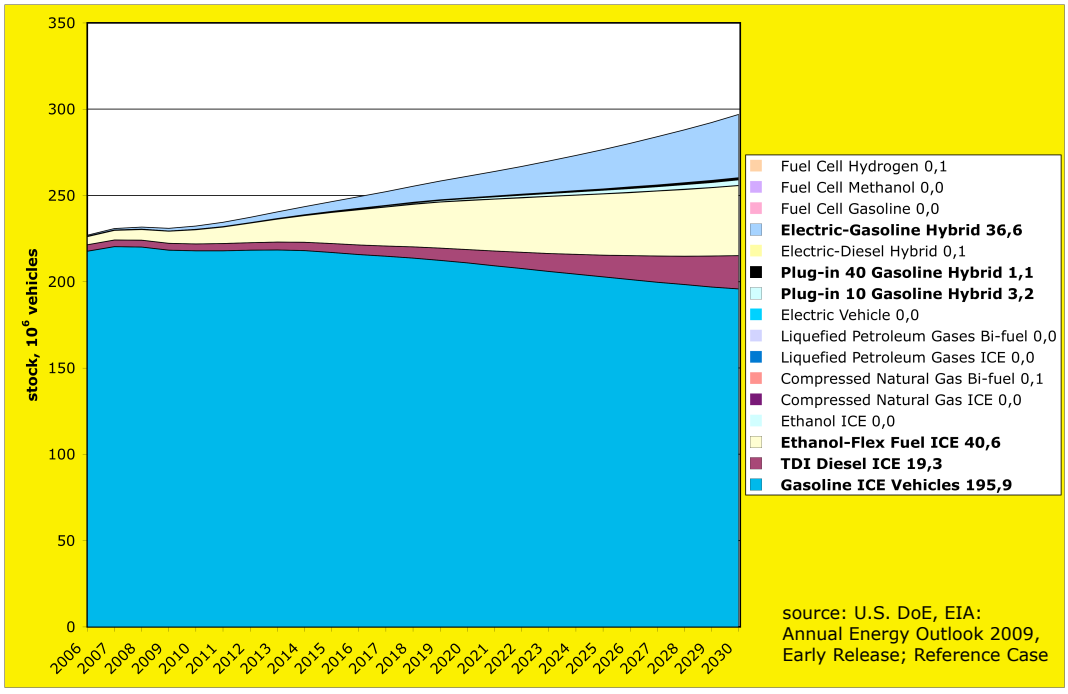




US-Perspective on car propulsion technologies
- *annual sales in millions* -



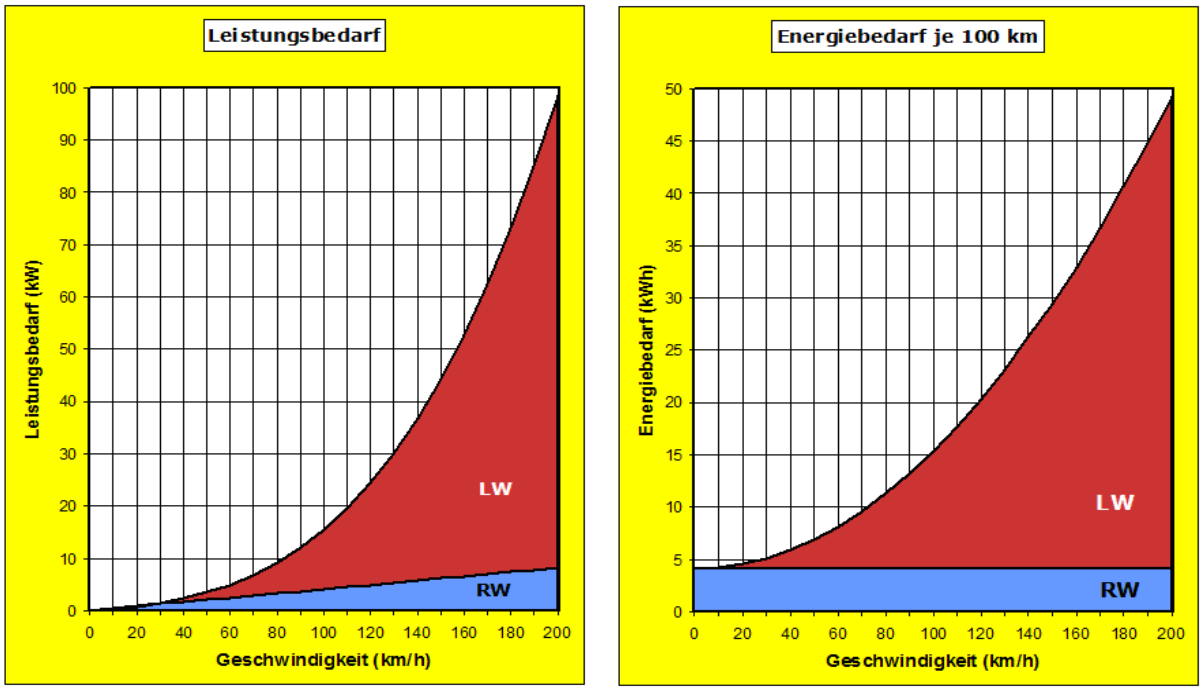
US-Perspective on car propulsion technologies
- *development of stocks in millions* -



Reducing the cars‘ CO2 emissions

- Most important and mostly neglected (up to the fresh McKinsey study from March) is the modification of the cars‘ layout. It‘s just physics: a smaller, more lightweight, weaker car will burn less energy.
- The Tata Nano ows its consumption figure some 75 per cent below an U.S. SUV not to a superior engine (which is not built in), but to the difference in size, weight, and power.
- And, by the way, the fulle price of a Tata Nano is fairly below the subsidies, which e.g. the German and the U.S. government is willing to pay as a contribution to the purchase of a more or less environment friendly car.
- Why not provide half the subsidies to improve the Nano by an optimized engine to reduce the car‘s emissions from some 100 to 67 g CO2/km? – Even such an improved Nano would save a lot of the customer‘s money, and not burden additional costs, as normally is taken into account as a precondition of CO2 reduction.

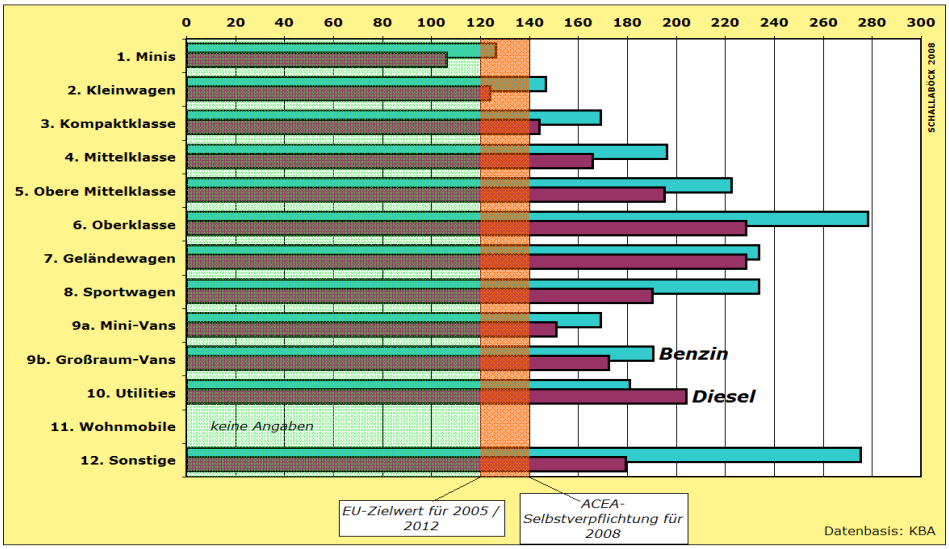
Speed matters: Power and Energy demand by speed
to overcome the the air resistance (LW) and the rolling resistance (RW)



Basis: mid size car, level ground street at still air, demand at wheels

Size and Fuel prove essential:
Spec. CO_2-emissions of new cars in Germany 2007, g/km

- Smaller cars: Less energy
- Diesel beats Gasoline



source: Kraftfahrt-Bundesamt

Policy options:
Selected elements of an integrated approach

Integrated transport policy

City of short distances

Associations in public transport

Town bus concepts

Traffic calming outside cities

Fuel economy standards

New energy and propulsion techniques

Heavy truck duty

Dematerialisation

Ecotaxes in transport

Internalizing external costs

Urban traffic calming

Integrated regular p.t.

Rural railways

Speed limits

Car-sharing

Telematics

Strengthening regional economic cycles

Dampening air transport

Bottom line

- Though, certainly, experts know it in more detail, and there is broad evidence from good practice:
- May it be urban transport (e.g. bicycling in the Netherlands, traffic calming in Germany or erlsewhere a.s.o.), may it be public transport (e.g. in Switzerland or Japan), or may it be low-consuming cars.
- In general, virtually everybody can understand what to do.
- It just has to be done.

  - Foot passengers and cyclists meet the highest standards of fuel efficiency and emission reduction.
  - A well operated public transport will be about three times as efficient compared to cars.
  - About two thirds of the cars‘ fuel consumption and CO2-emissions are not mobility-caused but result from oversized, overengeneered layouts.

Remaining problems

- The challenges can‘t always be met by win-win solutions, and in particular not by instant win-win results.
- The people in rich countries are used to wasting energy particularly in transport, and are not very compliant to change their habits.
- Car-dependency connected to desurbanisation is widespread in rich countries constituing some kind of a social addiction (most similar to individual addictions like smoking or alcoholism).
- For many – particularly male – persons a car is not just a matter of usefulness, but a socially accepted substitute for personality (providing support for infantile phantasies of omnipotence by thrill, power, and social status), hence they repel proper designs.
- Last not least: Cars and Oil traditionally are the paradigms of big business, used to control, not to be controlled.

- *As a result, policy often prefers flawy long-term solutions instead of stepwise enforcing the available and necessary removal of climate loads by „insistently drilling bulky planks“ (Max Weber).*

A final joke:
How useful SUVs sometimes can be

Source: unknown

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