

The Contribution of Innovation to Greening the Dutch Road Transport Sector

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Key challenges

- Strong dependence on oil
 - rising oil prices
 - dependence on Middle East
- Climate change
 - CO₂ emissions still increasing
- Local air pollution



Solutions?

1. Reduce transport demand
2. Improve driving behaviour
3. Improve vehicle efficiency
4. Use low carbon fuels

*Clean & Efficient
policy package*

Hybrids
Tires, ICT

Biofuels
Hydrogen
CNG

Additional innovation

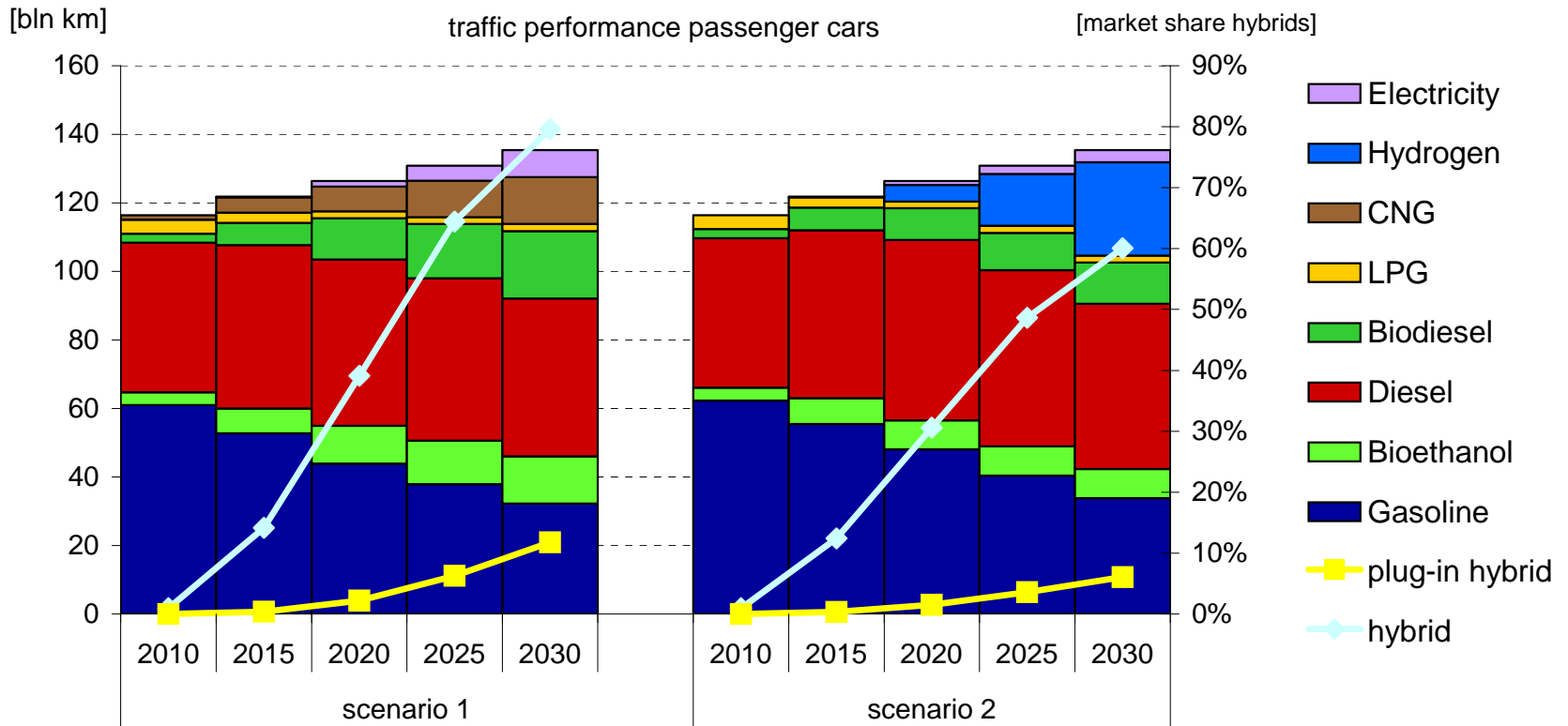
Approach

- Scenario's have been formulated and discussed with policymakers
 - Scenario 1: *generic innovation*: (plug-in) hybrids, biofuels, CNG
 - Scenario 2: *technology specific innovation*: hydrogen breakthrough
- Calculations using the TEMPO model (Transport Emissions Model for Policy evaluation)

Scenario's

Reference: Clean and Efficient policy scenario with moderate EU policy	Scenario 1: generic innovation in the Netherlands and the EU	Scenario 2: hydrogen innovation in the Netherlands and the EU
Policy as announced in the programme 'Clean&Efficient': <ul style="list-style-type: none"> • Road pricing • European CO2 regulation for passenger cars at 130 g/km in 2015, moderate CO2 regulation for vans • Fiscal measures • Promotion of ecodriving 	<ul style="list-style-type: none"> • Large penetration of hybrid cars; in 2020 is over 80% of newly sold cars a hybrid; 6% of these is a plug-in hybrid • CNG for vans and buses • Limited number of hydrogen buses • Heavy duty vehicles: 15% hybrids 	<ul style="list-style-type: none"> • Quick market penetration of the fuel cell car (20% in 2030) • Hydrogen in vans and buses • 60% of newly sold cars is hybrid in 2020, 5% of these is plug-in hybrid. After 2020, fuel cell cars grow faster to the detriment of hybrids • HDV: 15% hybrids
Biofuels: 10% 2020	20% in 2020, 30% in 2030	15% in 2020, 20% in 2030
Efficient tyres: 25% passenger cars, 2-5% commercial vehicles	Market share efficient tires and energy saving ICT up to 75%	Complete penetration of efficient tires in 2030, high penetration of ICT

Example: passenger cars

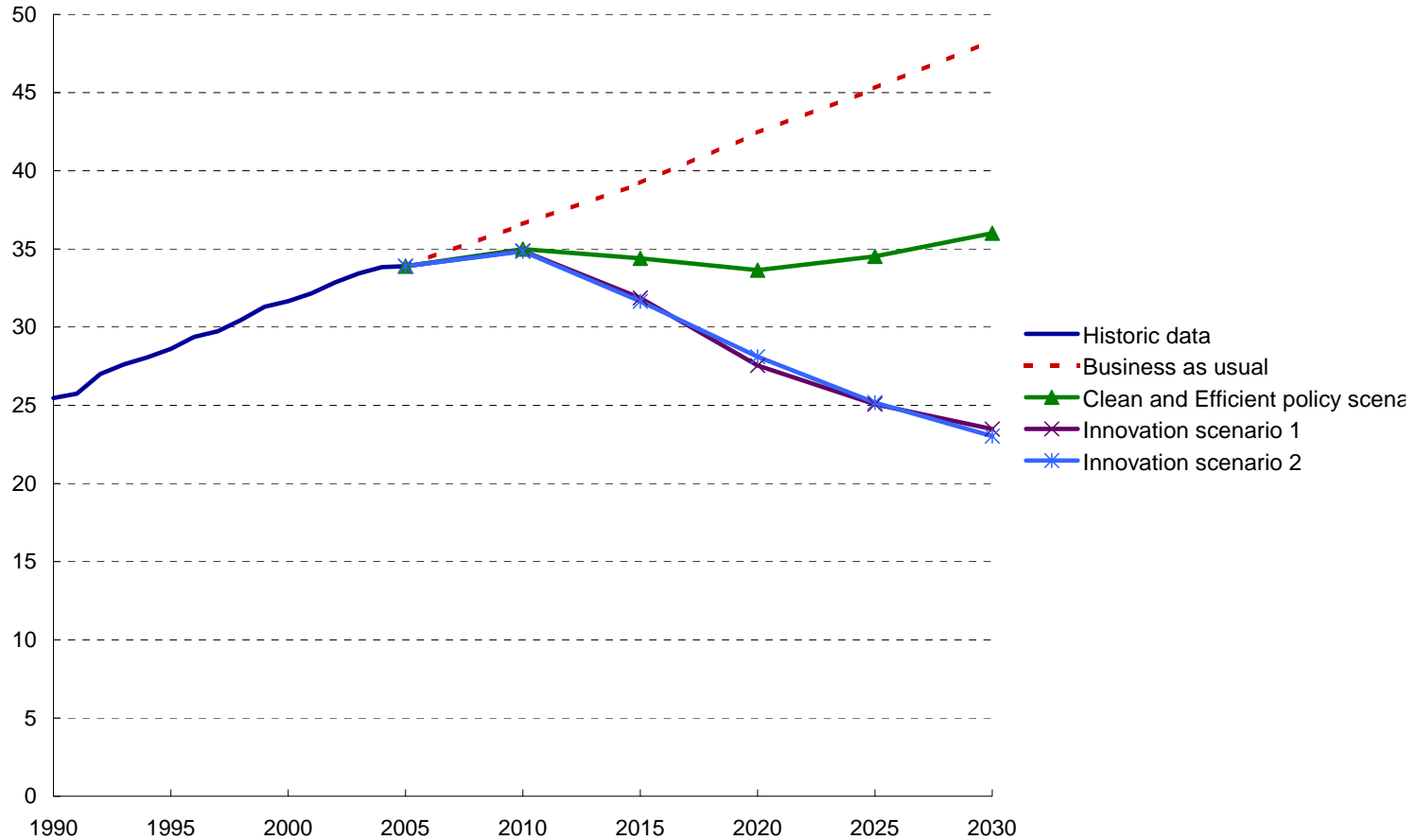


Results – CO₂ emissions

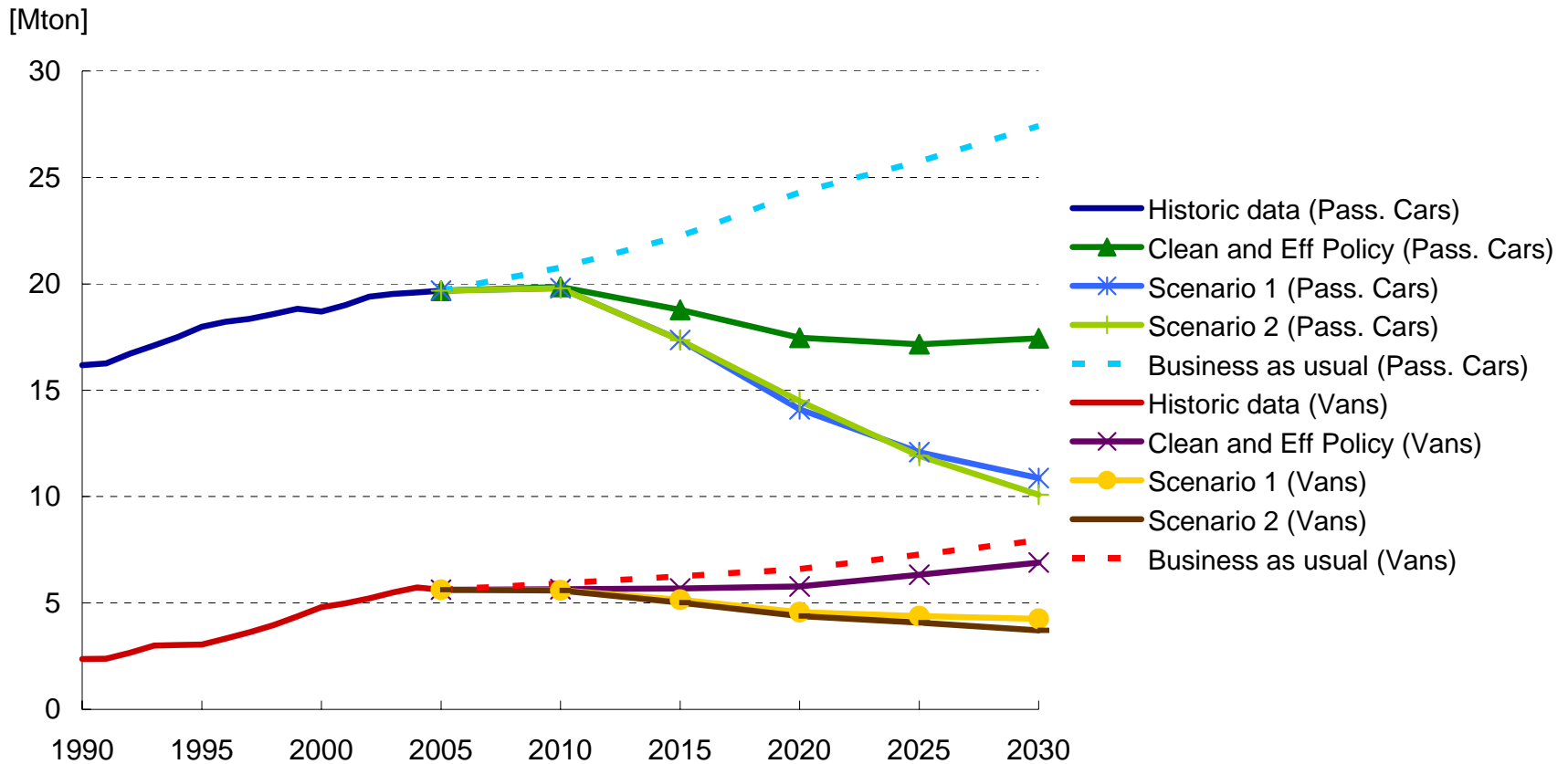


CO₂ emissions road transport

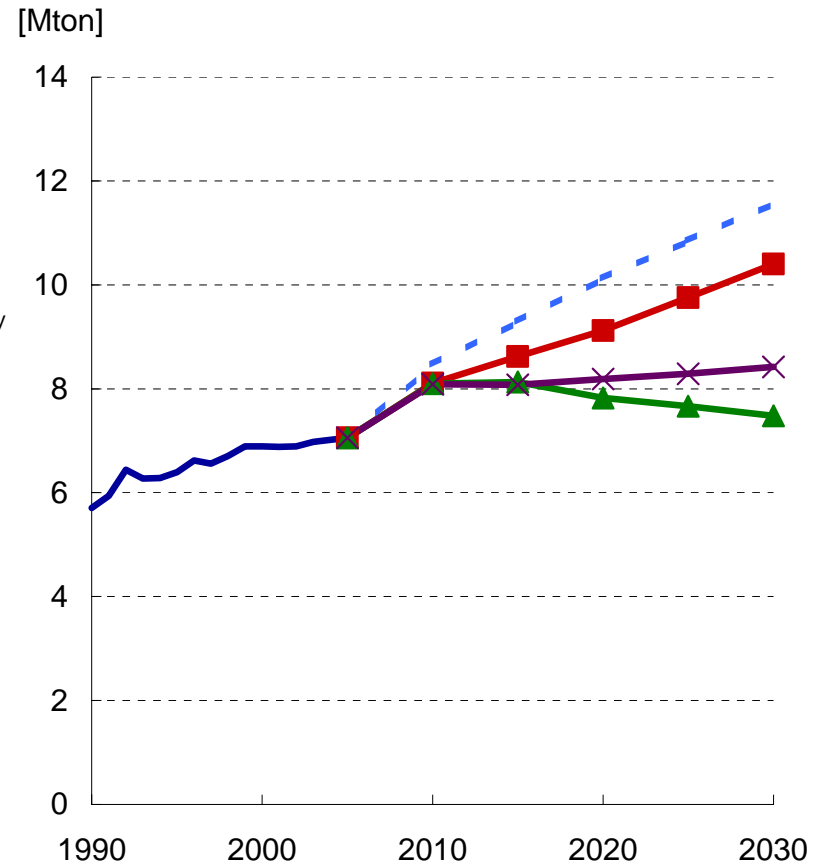
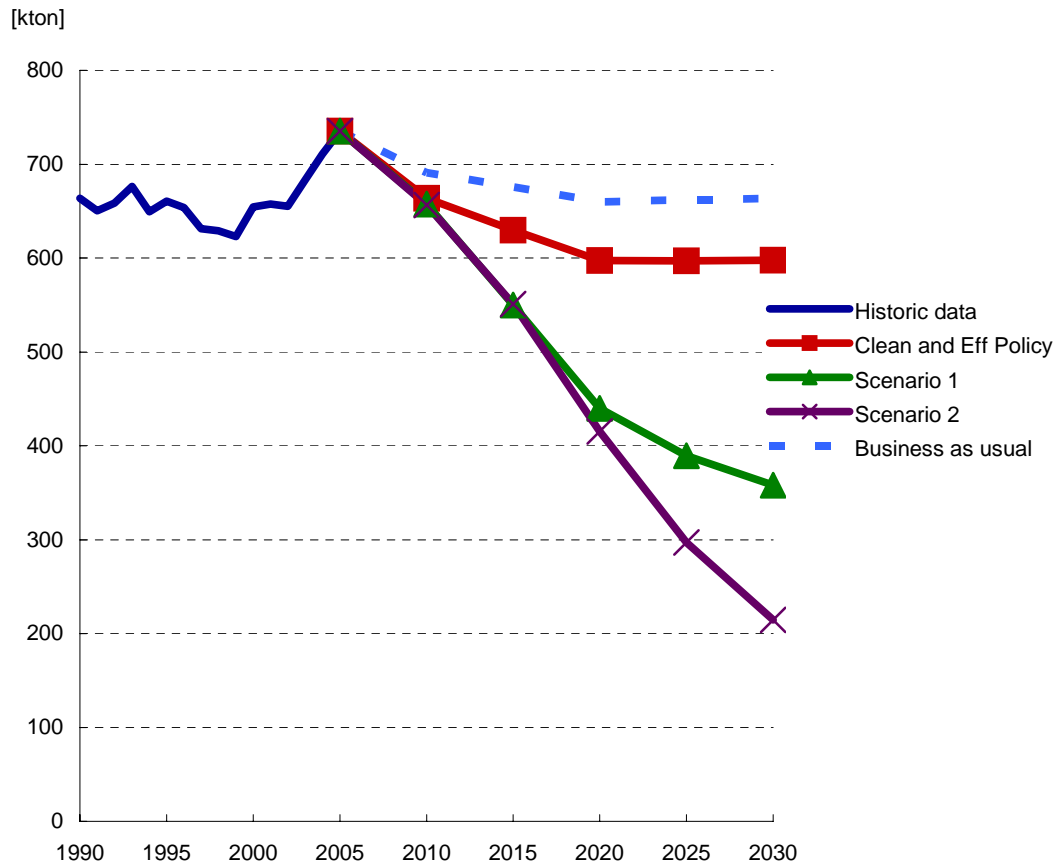
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CO₂ emissions passenger cars and vans



CO₂ emissions buses and trucks



Costs

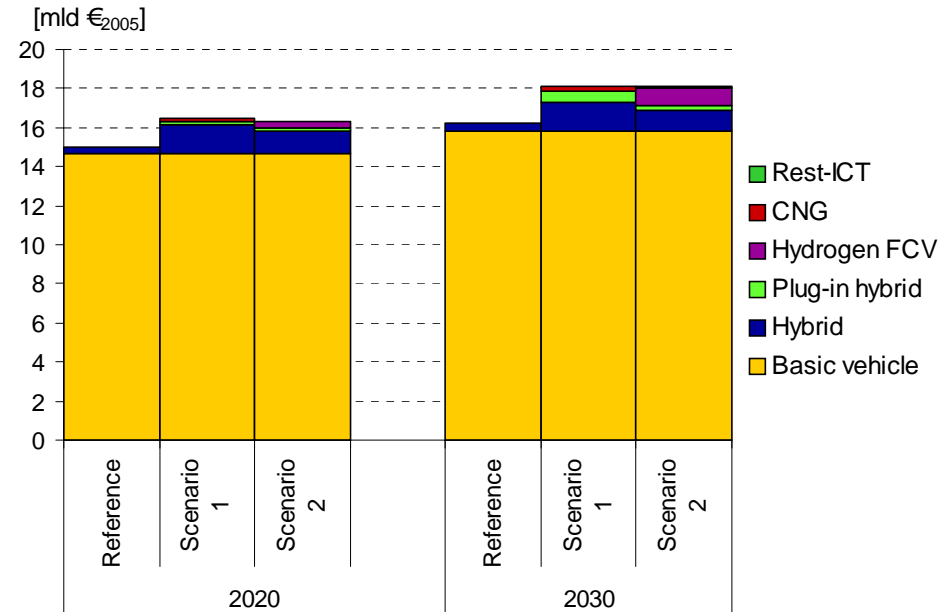
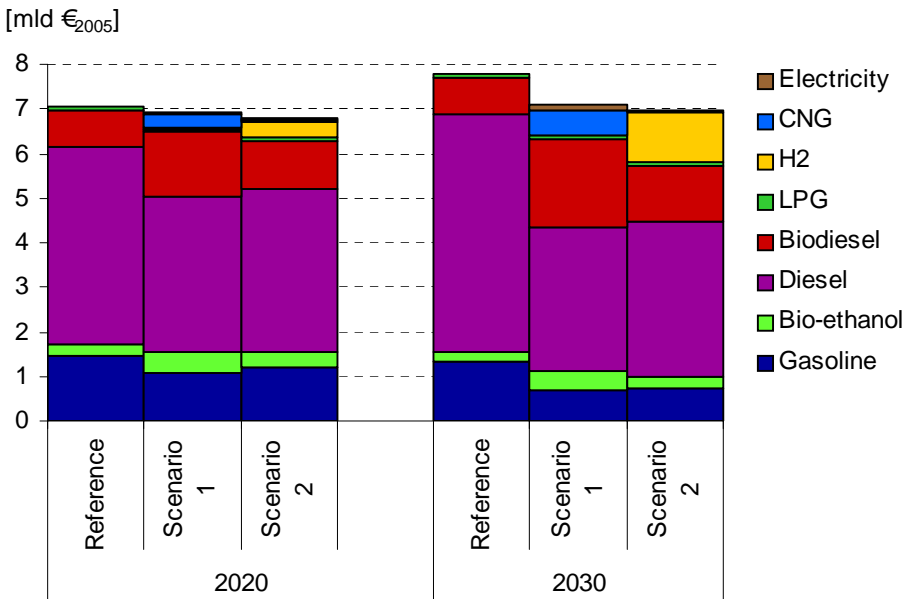


Assumptions

- National costs: not taking into account transfers between government and consumers (e.g. subsidies and taxes)
- Variable costs :
 - Only fuel costs, no maintenance/insurance
- Investments annualized:
 - Depreciation 10 years, discount rate 4%
- Fuel prices based on 'moderate' oil price scenario (gasoline and diesel prices 10% below 2007 levels)
- Vehicle costs from literature; 30-50% margins found

Fuel cost savings

Vehicle stock 12% higher cost



- Net annual cost in 2030 5% higher than reference scenario

Cost effectiveness and uncertainties

- In 2020 the specific costs of the innovation scenario's amount to some € 200 / ton avoided CO₂, decreasing below € 100 / ton CO₂ in 2030
- But other benefits are not quantified
- Cost effectiveness more favourable for consumer
- What if?
 - If crude oil and natural gas prices are 50% higher:
 - in 2020 some € 160 / ton avoided CO₂
 - in 2030 < 50 €/ton CO₂
 - If other EU Member States do not support innovation in road transport: 175 €/ton CO₂ in 2030

Conclusions



Strategic choices

- Long term perspective of the innovation scenario's differs
- Passenger cars and vans amount to 75% of today's CO₂ emissions in Dutch road transport
- Buses as innovation *niche*
- Biofuels and efficient tires can be used in the current vehicle stock
- Efficiency has multiple benefits!

Main conclusions

- Innovations in drive trains and alternative fuels can achieve substantial CO₂ emission reductions in the Dutch road transport sector
 - But don't forget the demand side
- Specific costs of the innovation scenario's amount to some € 200 / ton avoided CO₂, decreasing below € 100 / ton CO₂ in 2030
 - Dependent on oil price, international technological developments
- Needed:
 - A long term vision, strategic choices, perseverance and international cooperation

Thank you!



See also: <http://www.ecn.nl/docs/library/report/2007/e07106.pdf>