

Svenska Tekniska

Vetenskapsakademien

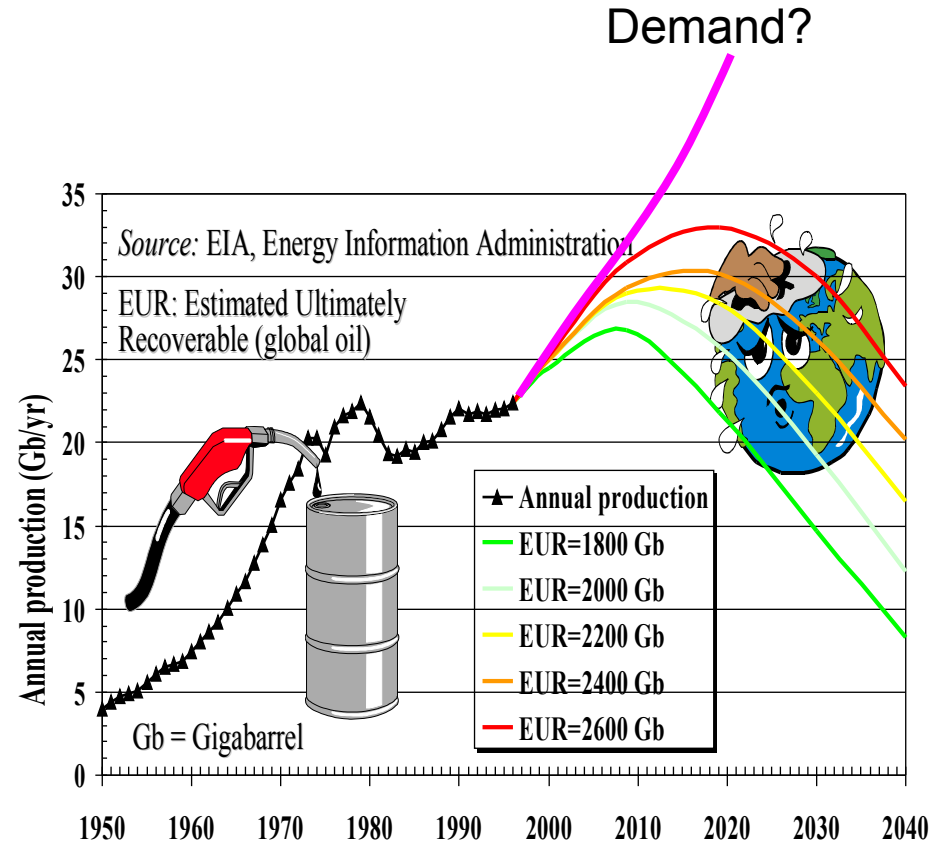
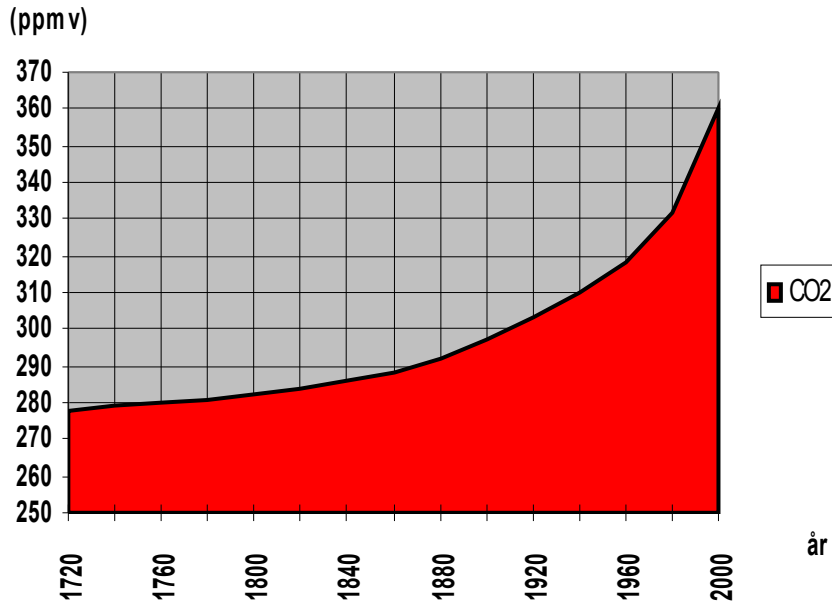
Dec 15th
2008

Case Sweden

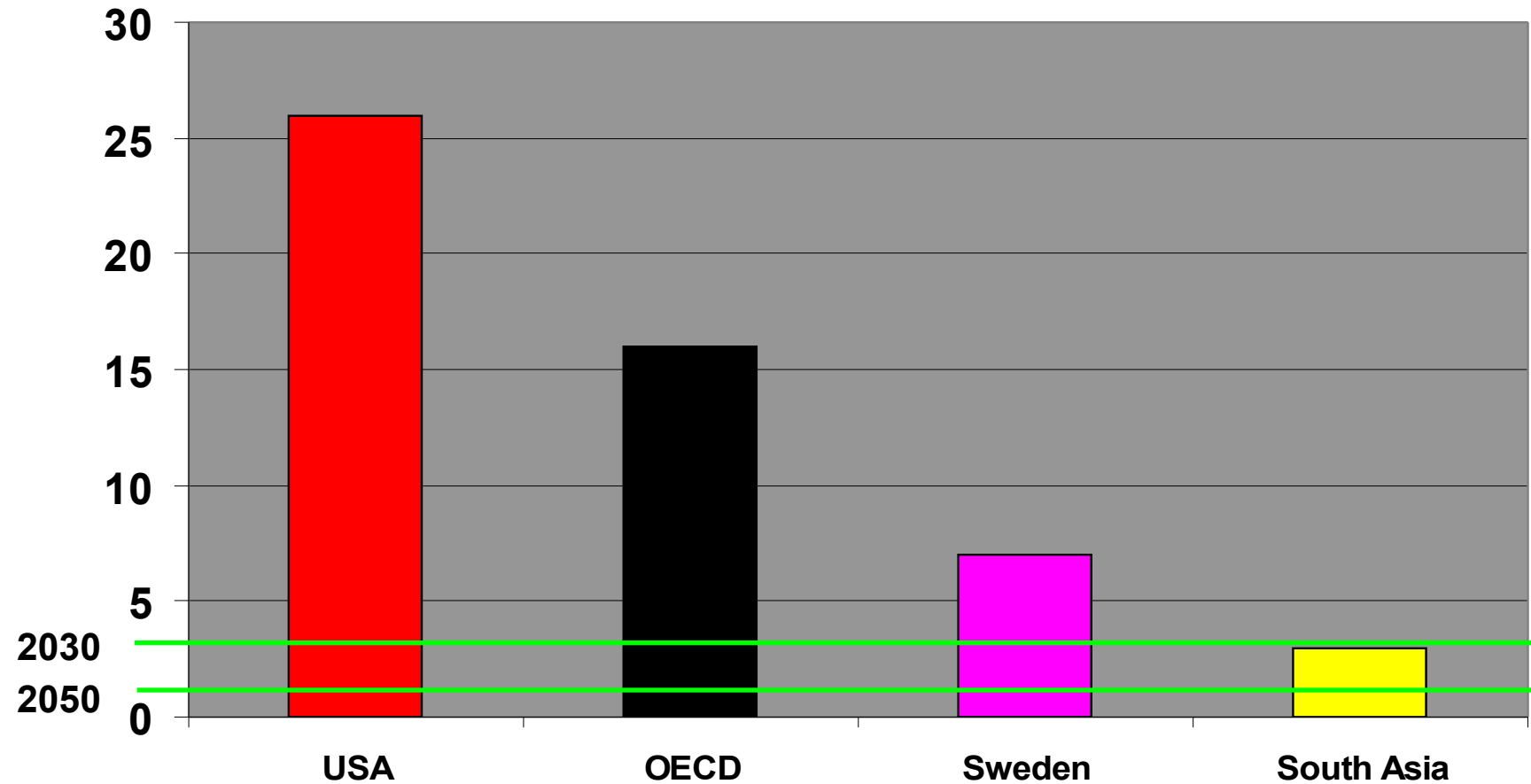
Focus on ethanol and biogas
Lessons learned

Swedish Road Administration
Olle Hådell

climate change



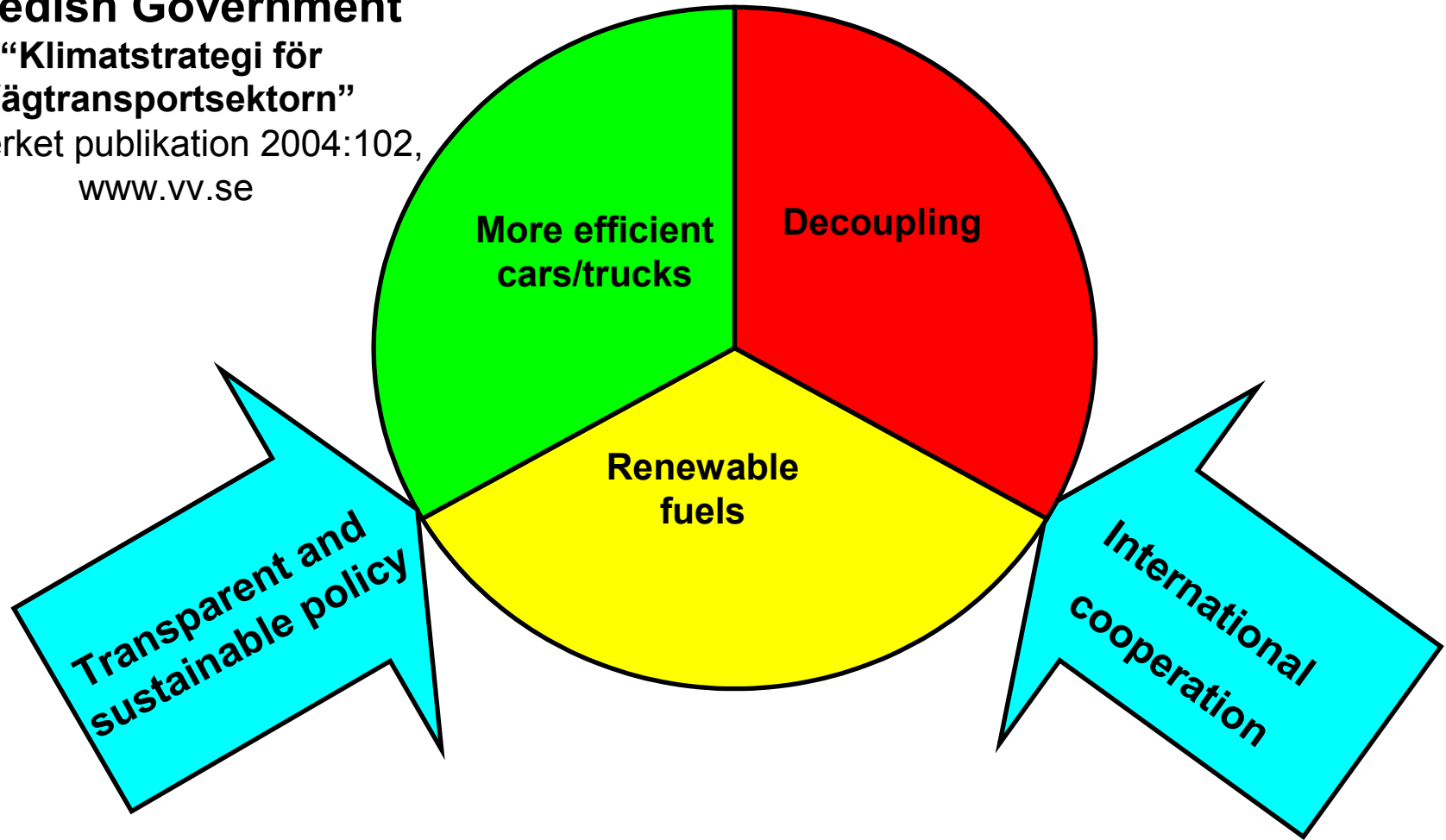
Ton CO₂/capita / IPCC



Swedish Government

“Klimatstrategi för Vägtransportsektorn”

Vägverket publikation 2004:102,
www.vv.se



Means of promoting EEC's in Sweden

- **Incentive for EEC's bought by private car buyers (\$ 1600)**
- **Procurement of vehicles purchased by governmental authorities**
- **Exemption from congestion taxes in Stockholm**
- **Free parking in bigger cities**
- **Reduced taxation of car benefit**
- **Obligation for fuelling stations to provide biofuels**
- **Exemption of energy and CO2-taxation for biofuels**
- **Vehicle taxation based on CO2 emissions**

A:

Environmentally Enhanced Cars (EEC)

Cars bought by private buyers (€ 1000)

Procurement of vehicles purchased by governmental authorities

- flexi fuel vehicles (E-85),
- bi-fuel car (bio-methane) and
- highly efficient diesel and gasoline cars
(< 120 g/CO₂/km)

B:

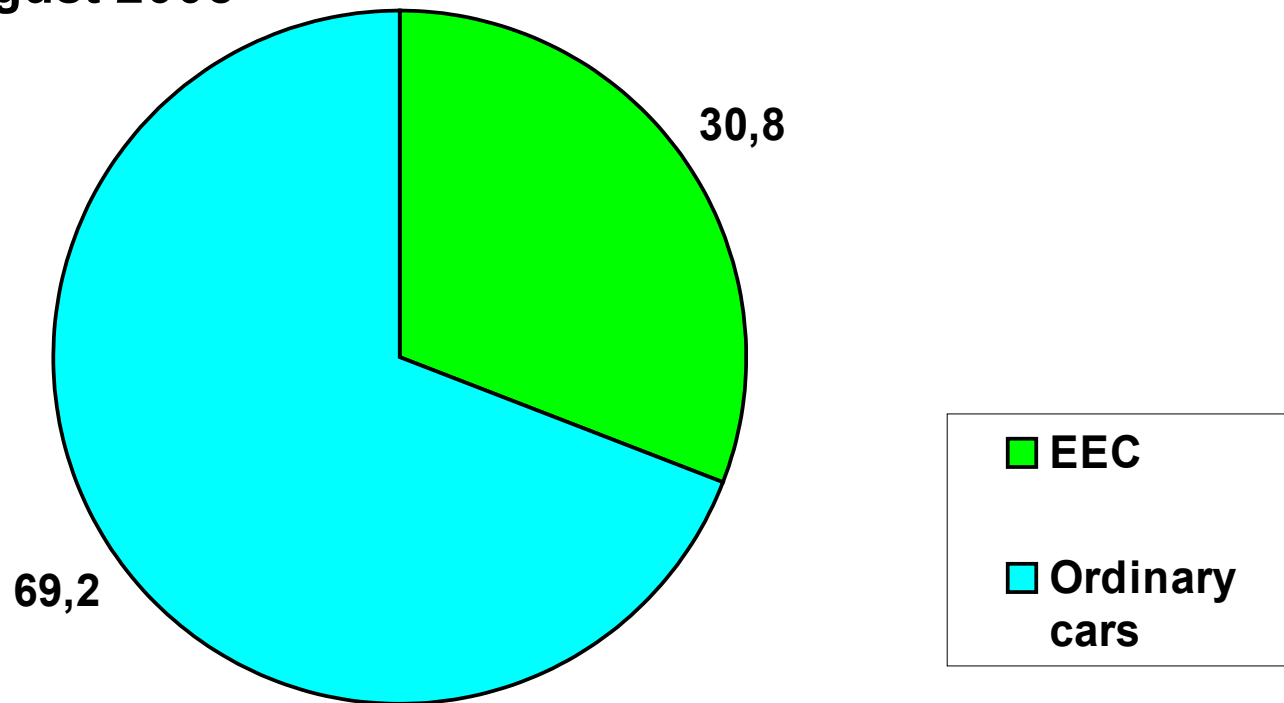
Environmentally Enhanced Cars (EEC),

(Tax exemptions and reductions)

Cars that can be fuelled with

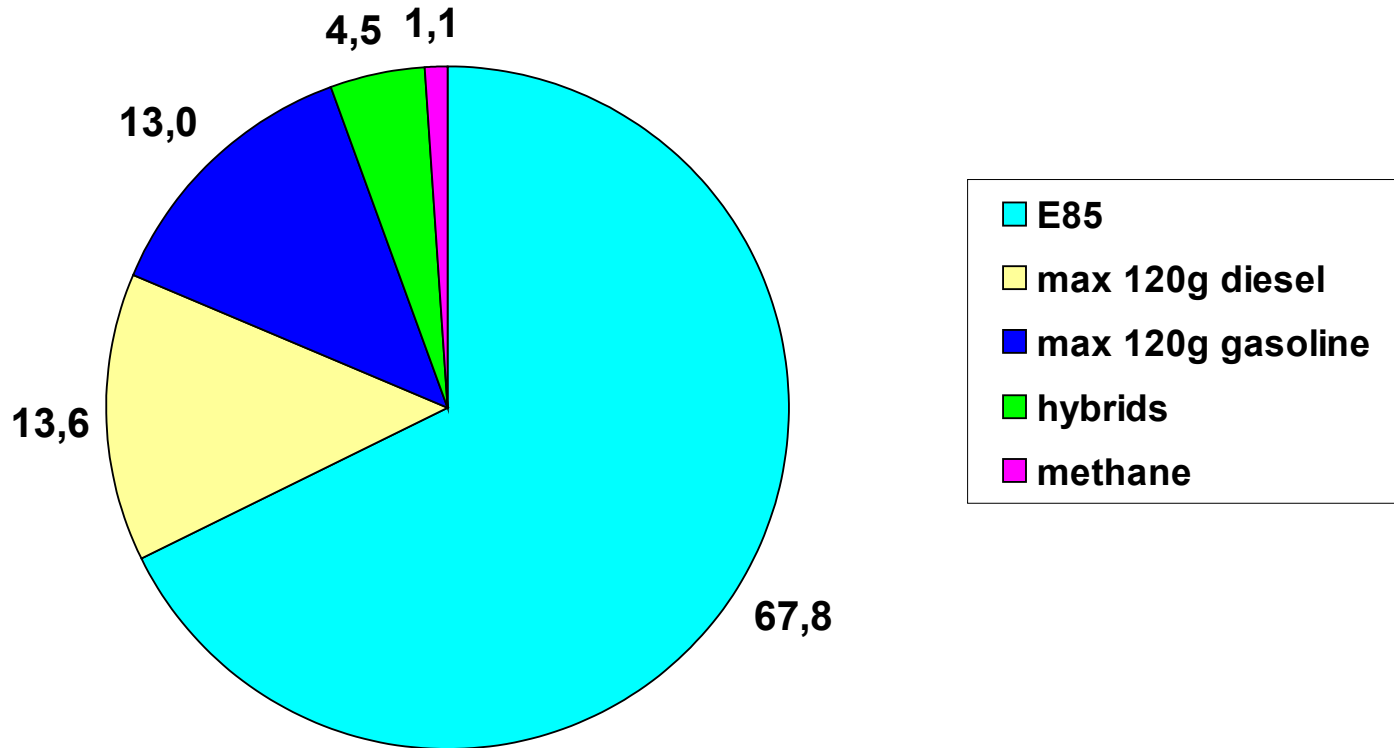
- Alcohol (=FFV)
- Gaseous fuels (=Methane)
- Electricity (=Hybrid cars)

Share of EEC's Sweden January - august 2008



The sales of EEC has exploded in Sweden and the market share is now about 35 %.

Share of different EEC's



Biofuels in Sweden today

- E-85: More than 2000 filling stations
- Biogas/Natural gas less than 100 stations
- All 95-octane gasoline contains 5 % Ethanol

Conclusions

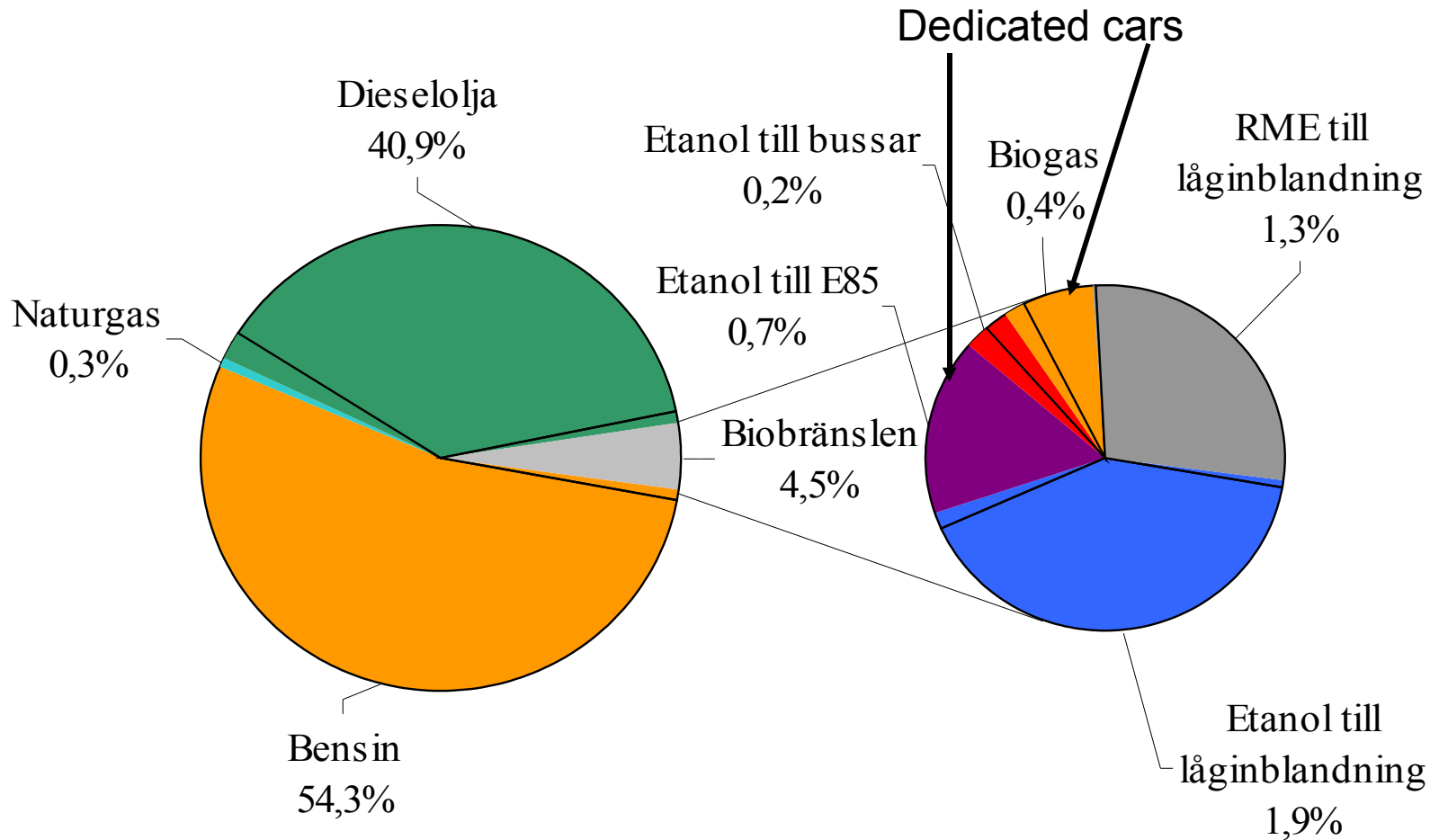
Incentives can be very powerful

Good Incentives removes "bottlenecks"

Good incentives are coordinated

But incentives can be costly.....

Use of biofuels (Sweden) 2007



Expensive way of reducing CO2

Exemption from congestion fees

€ 3/day and 200 days/y

makes

€ 600/y

FFV-car 180 g CO₂/km

Average EtOH content 81 %

CO₂ efficiency EtOH 80 %

Mileage / y 17 000 km

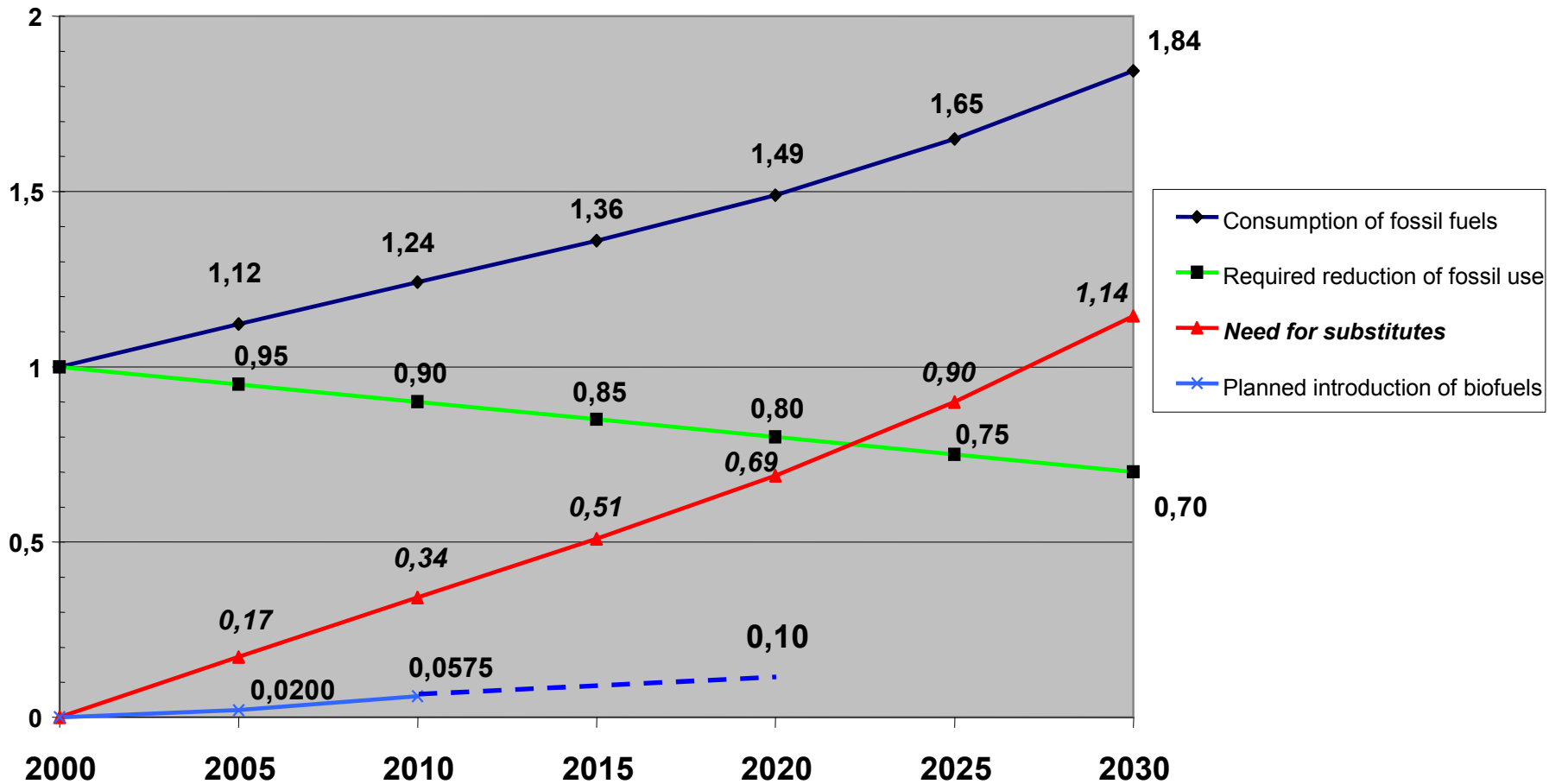
tot CO₂ red

1980 kg/y

Cost of CO₂ reduction

€ 0.3/kg

Demand for fuels: Car mileage increases 1,7% / yr; mileage heavy vehicles increases 3,3% / yr
 higher efficiency 2,2% / yr and 0,5% / yr



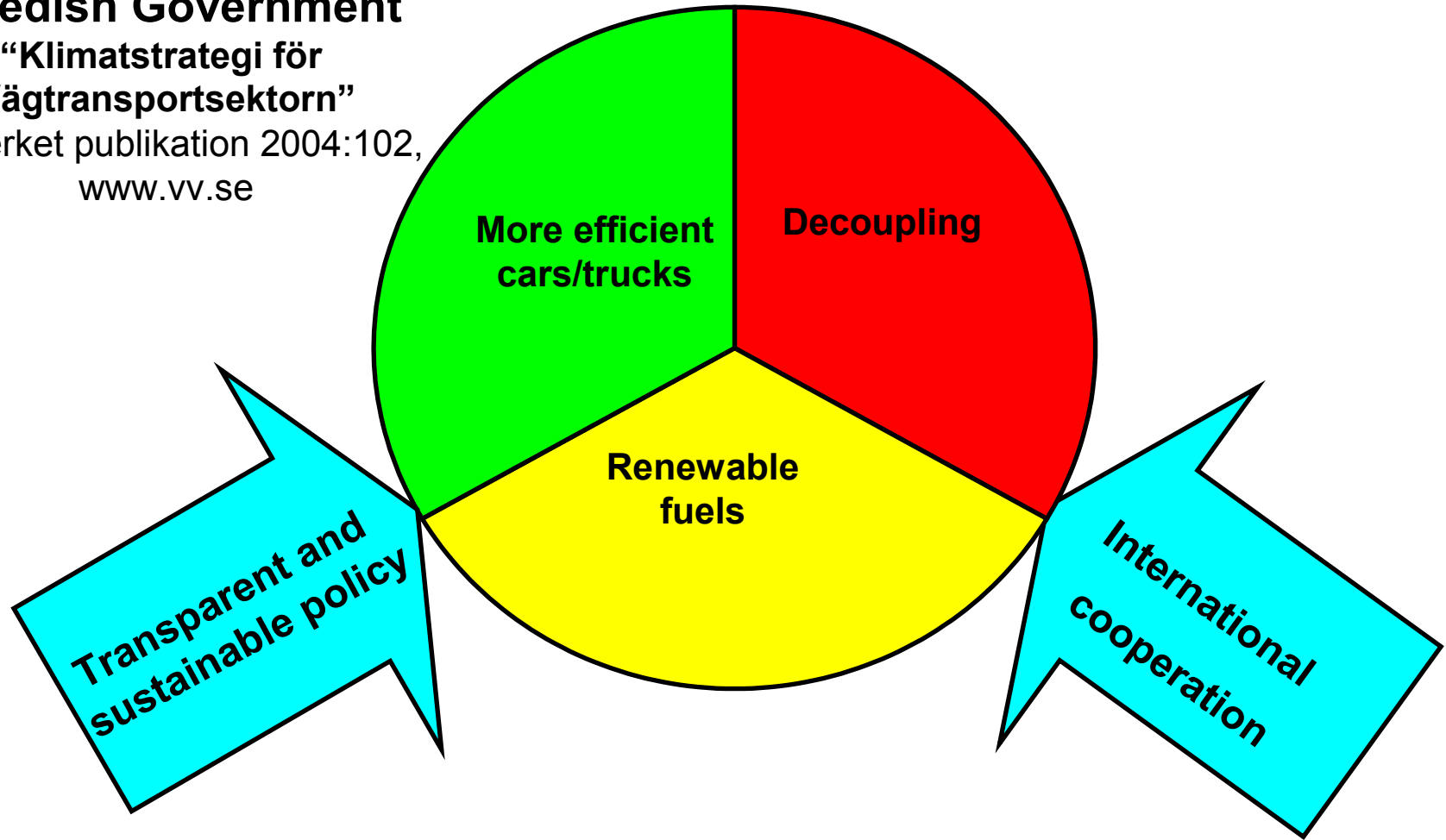
Conclusions

- Use of biofuels are only one part of the solution
- Use of ethanol is one part of the use of biofuels
- Use of FFV cars is one part of the use of ethanol

Swedish Government

“Klimatstrategi för Vägtransportsektorn”

Vägverket publikation 2004:102,
www.vv.se



What is the fuel consumption of a Volvo S40 ?



Bild: Volvo Cars

It depends!.....



**Volvo S40 2,4 aut
9,1 l/100 km**

217 g CO₂/km



**Volvo S40 1,6d DRIVE
4,5 l/100 km**

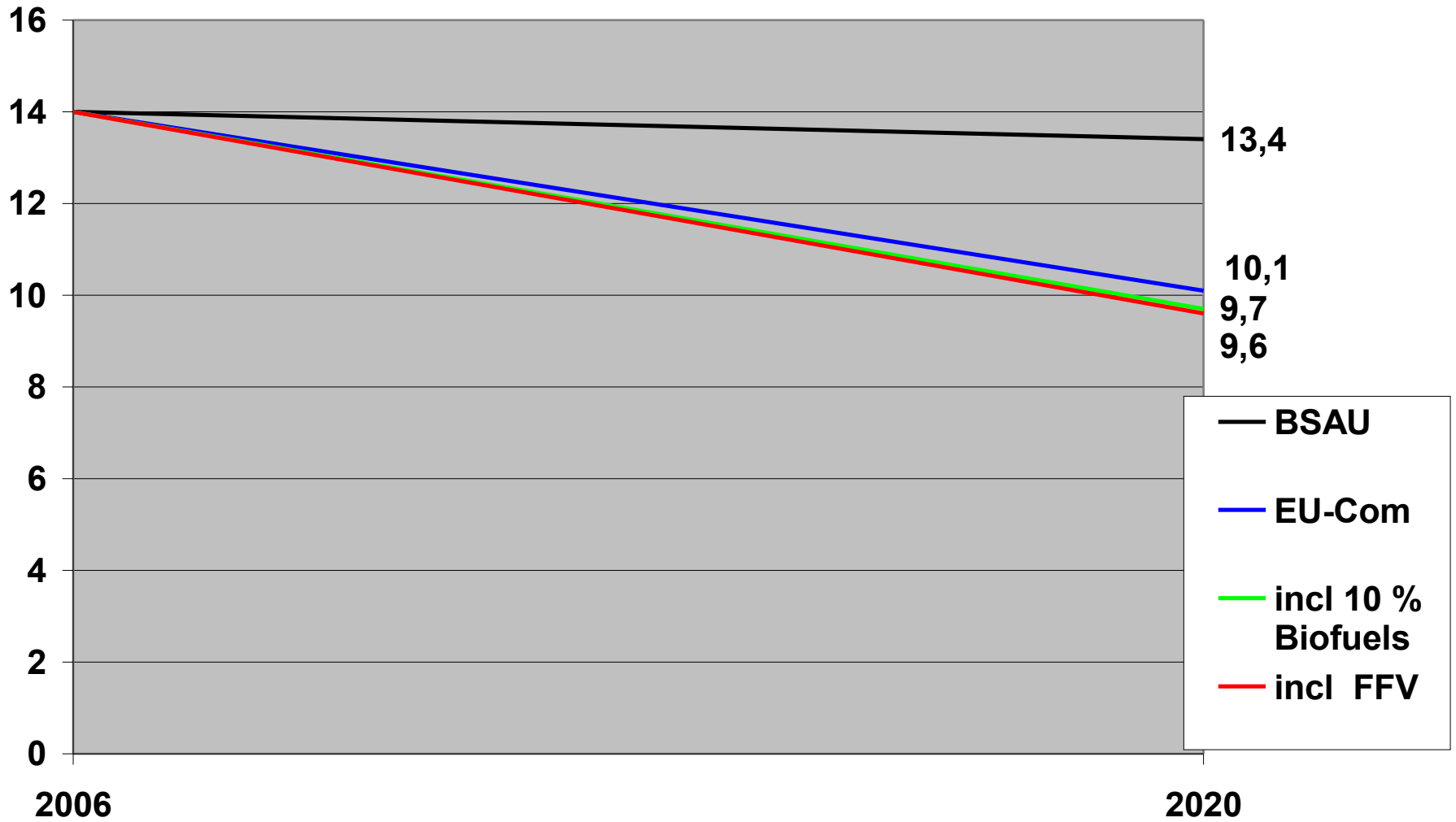
119 g CO₂/km

I.E a reduction of 45 %!

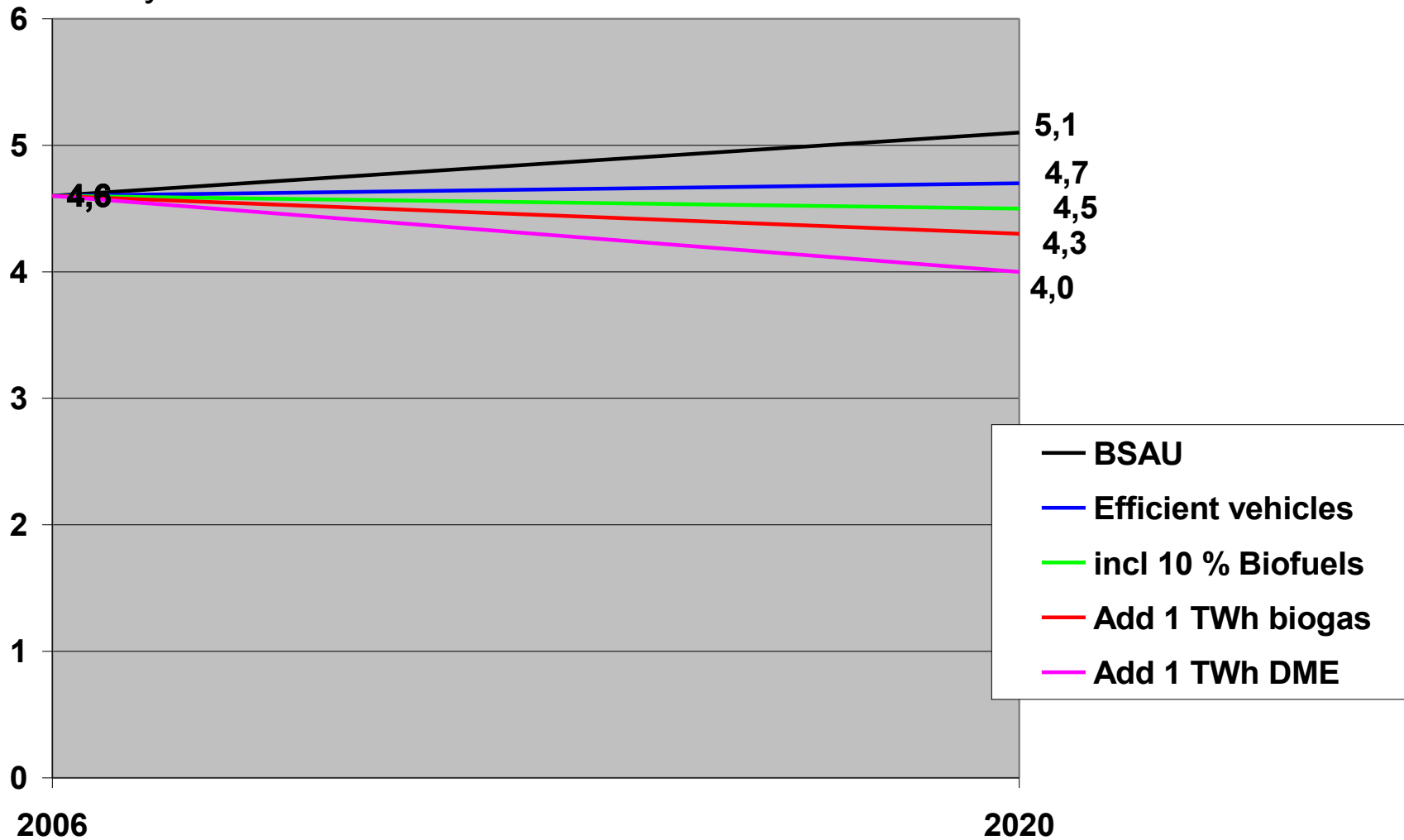
Photo: Volvo Cars

Scenario cars (Sweden)

Mton CO2/yr



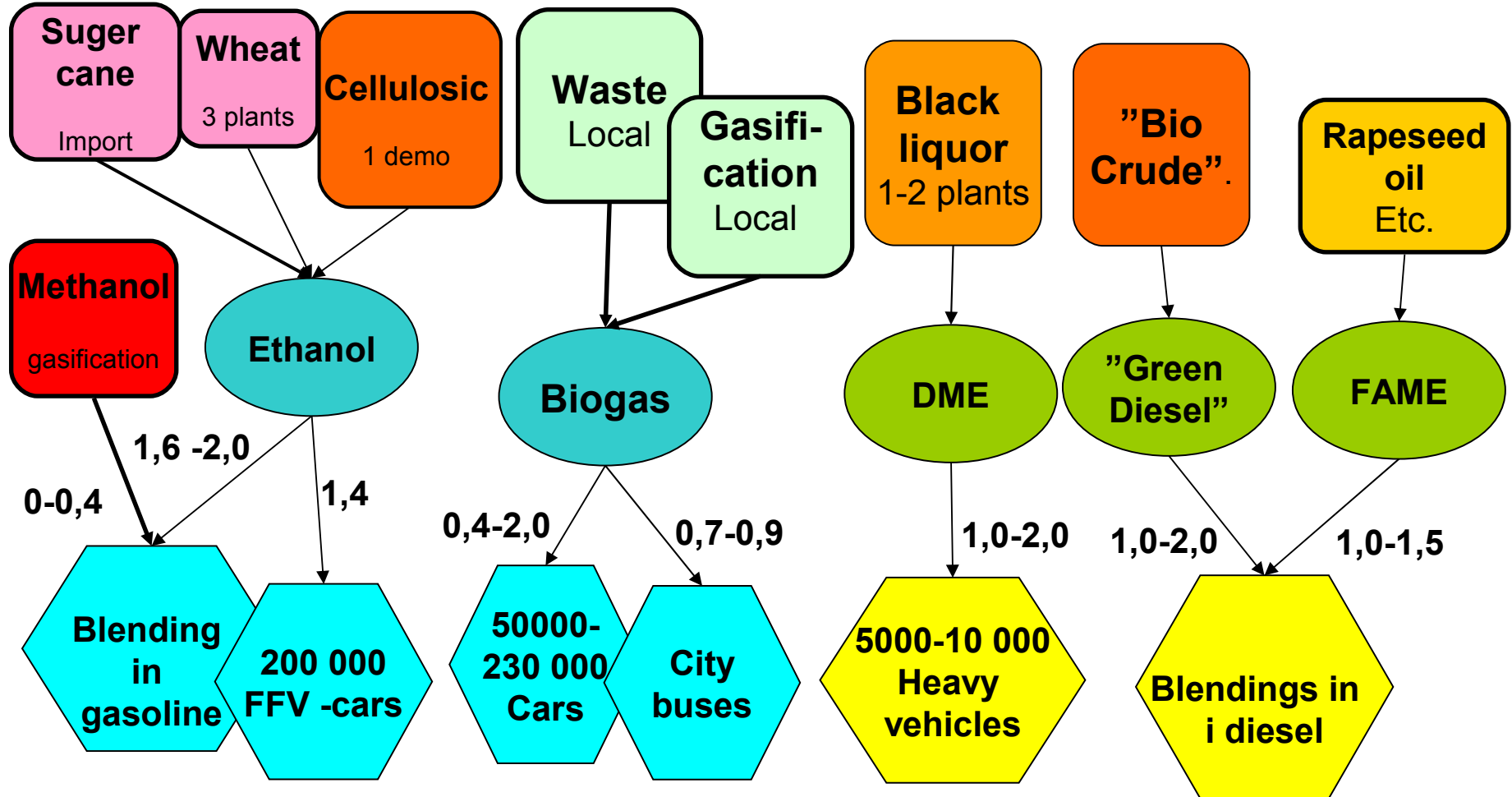
Scenario "Heavy Vehicles" (Sweden)

Mton CO₂/yr

Conclusions

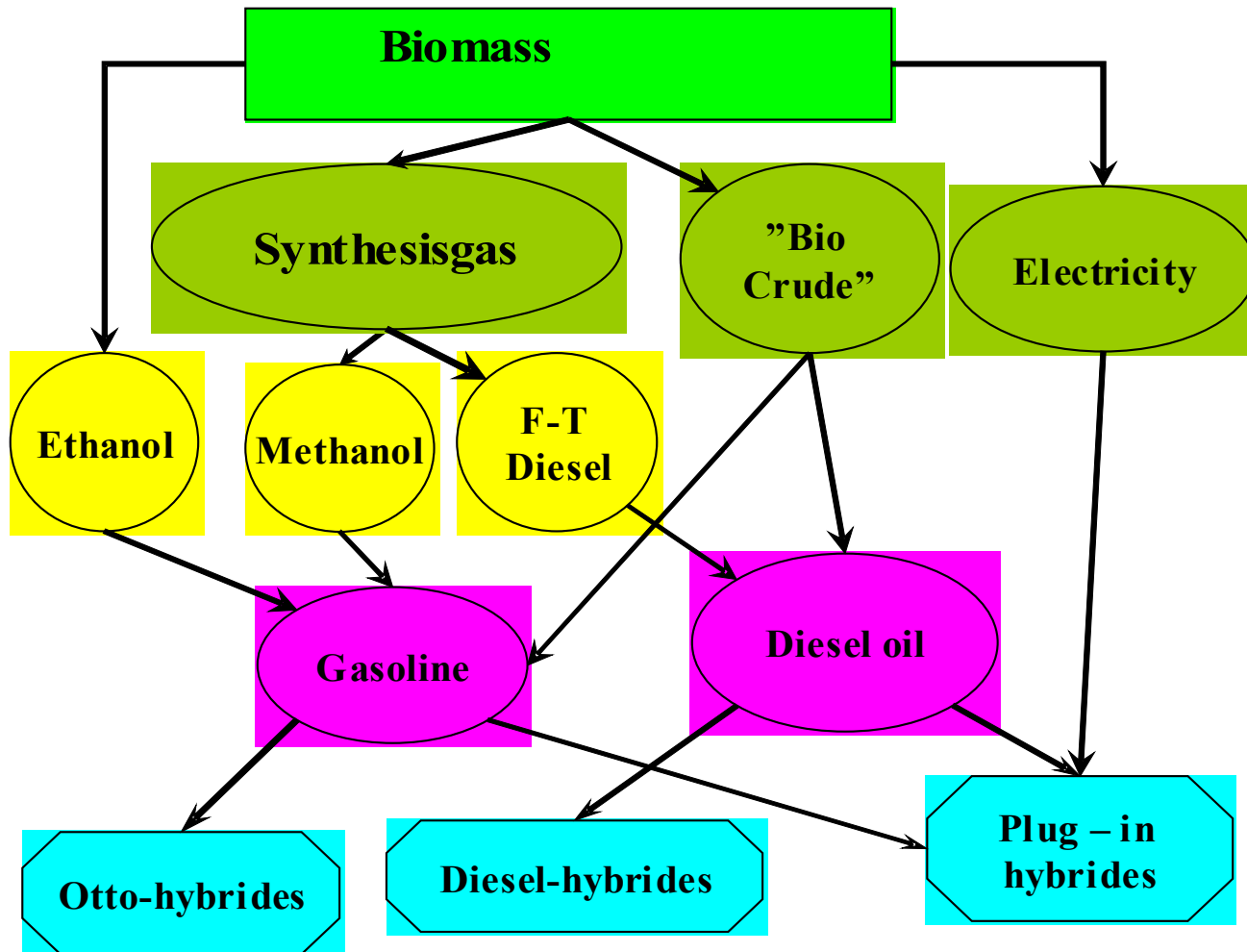
- Decoupling, a society with less demand for transports
- Use of the most efficient transport modes
- Efficiently produced Biofuels are crucial
 - Biofuels are one part of the solution
 - 2nd generation can offer efficiently produced diesel fuels
- Drivetrains have to be dramatically more efficient
 - More diesel cars is a short term solution < 2020
 - Plug in hybrids can be mid term solution > 2020
 - Are the electric cars the only known long term solution ?
 - If so, **Sustainable produced electricity** will be crucial
- But what to do with long-haul freight.....?

Scenario for biofuels in Sweden 2020 (TWh)

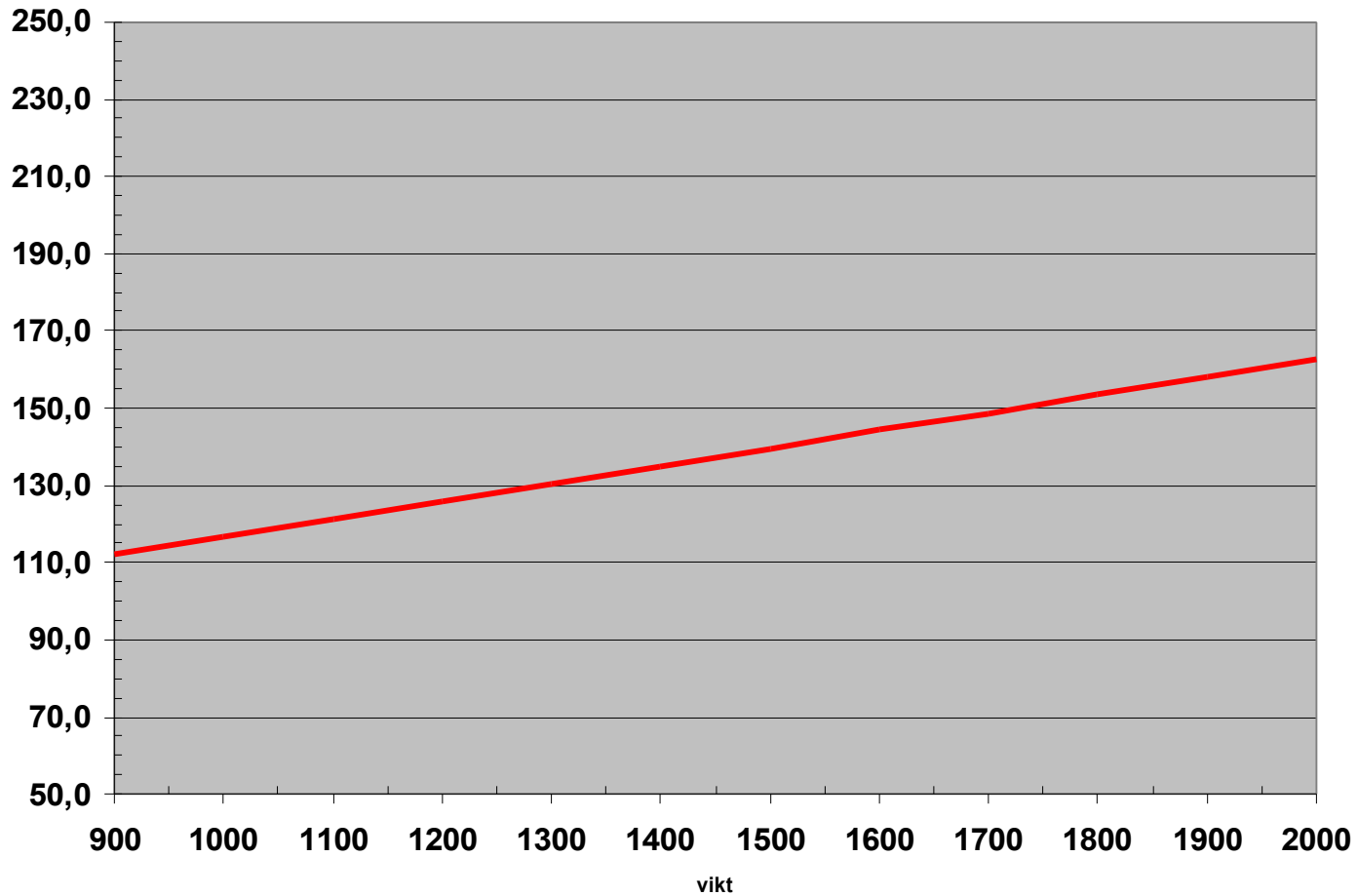


8-12 TWh i.e 12-18 % of the total transportation energy is substituted

Future fuels for private cars?



Max CO2 emission enl Eu-kommissionen



**Max CO2 enl
 EU-Kom**
