Possibilities for the Decarbonization of the Transport Sector with Electricity and Hydrogen

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Salzburg - REFORM Group Meeting 2018

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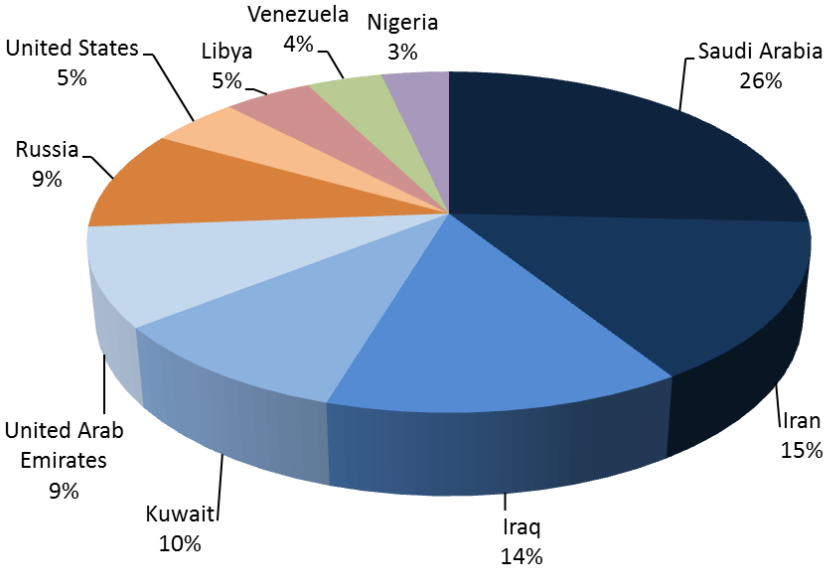
Transport sector

- **93%**

oil products' share of final energy consumption for transport, making the sector the least-diversified

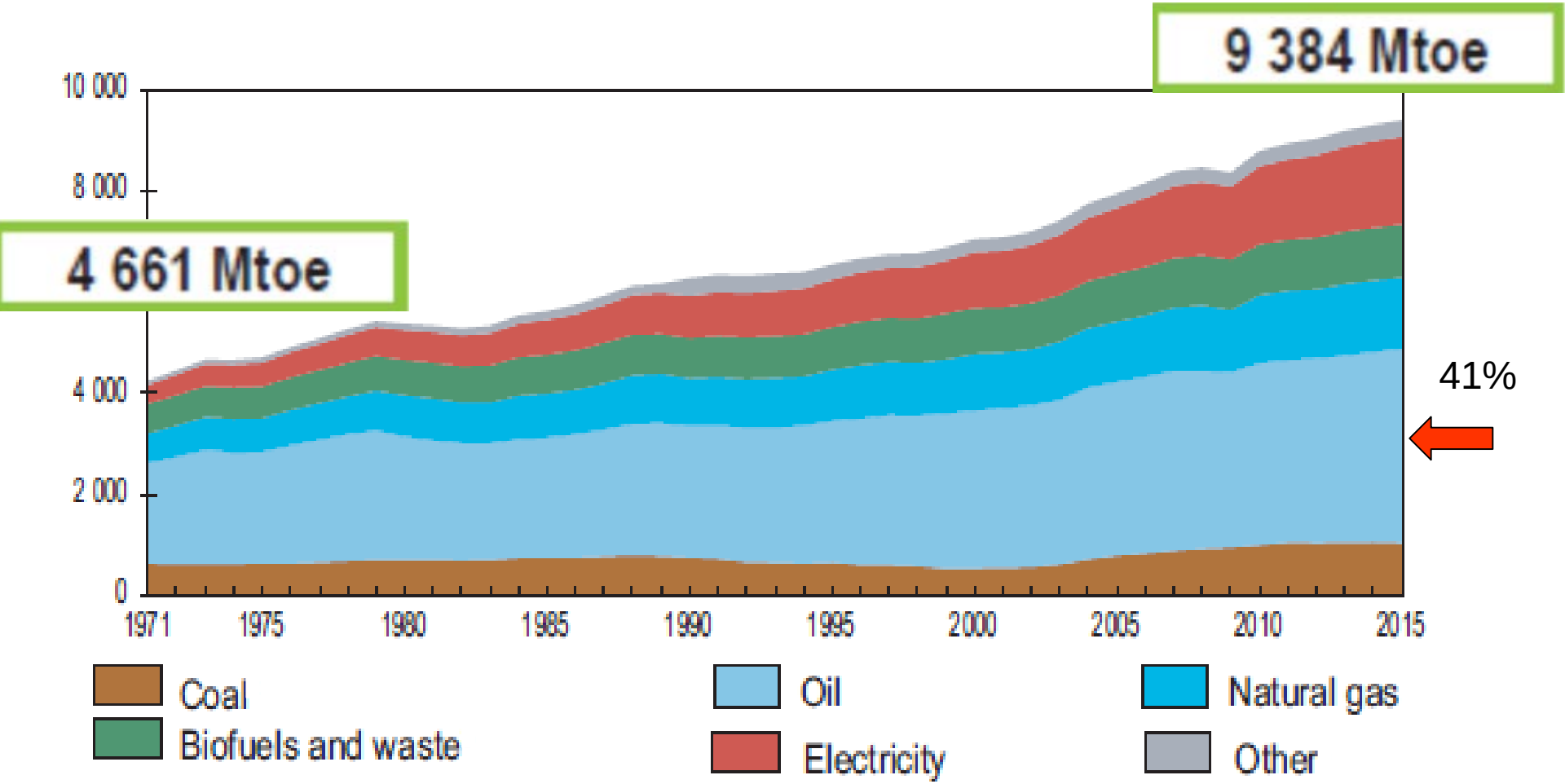


Countries with largest conventional oil reserves

- **28%**

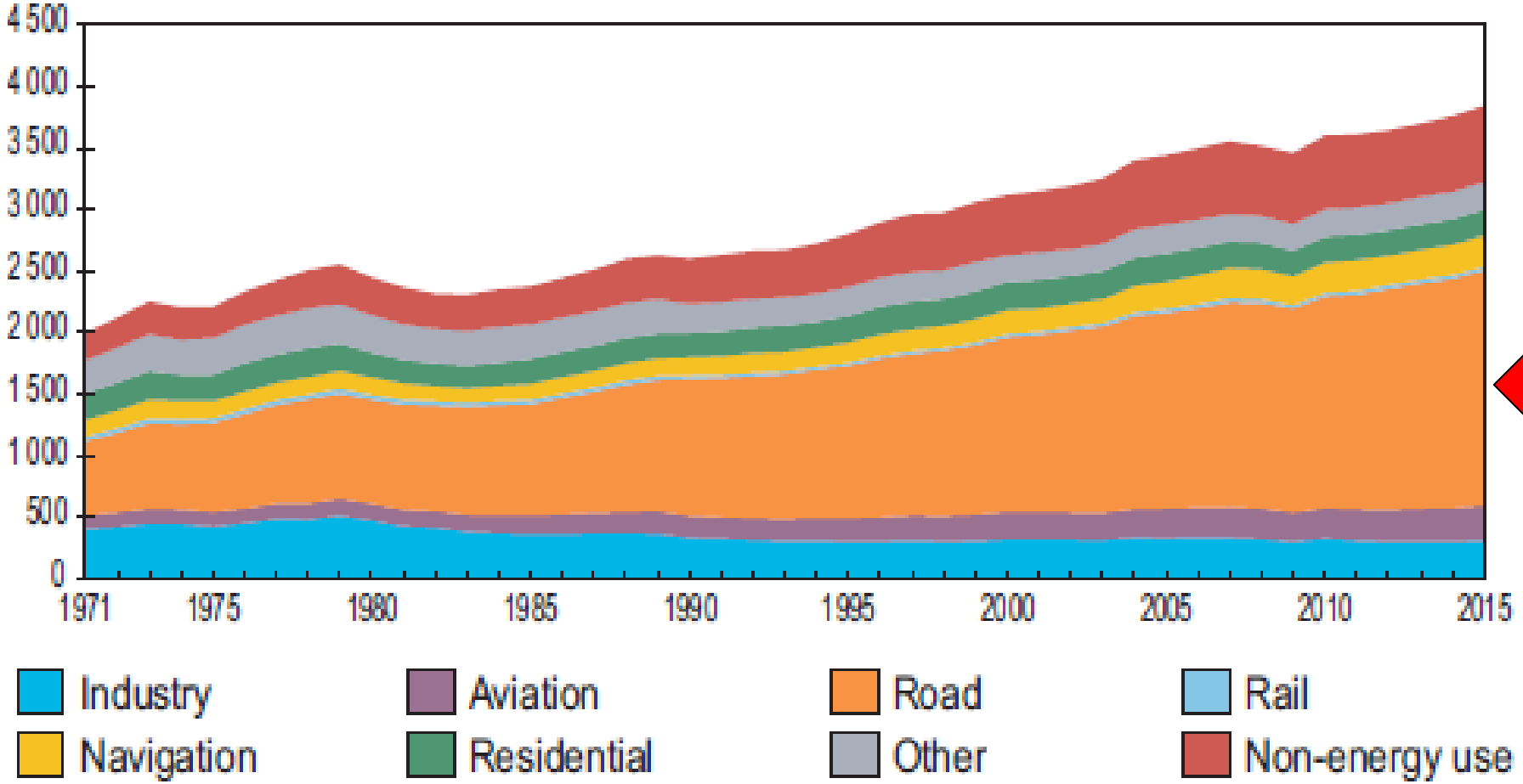
the amount that transport energy and CO2 emissions have increased since 2000

World total final consumption by fuel (Mtoe)



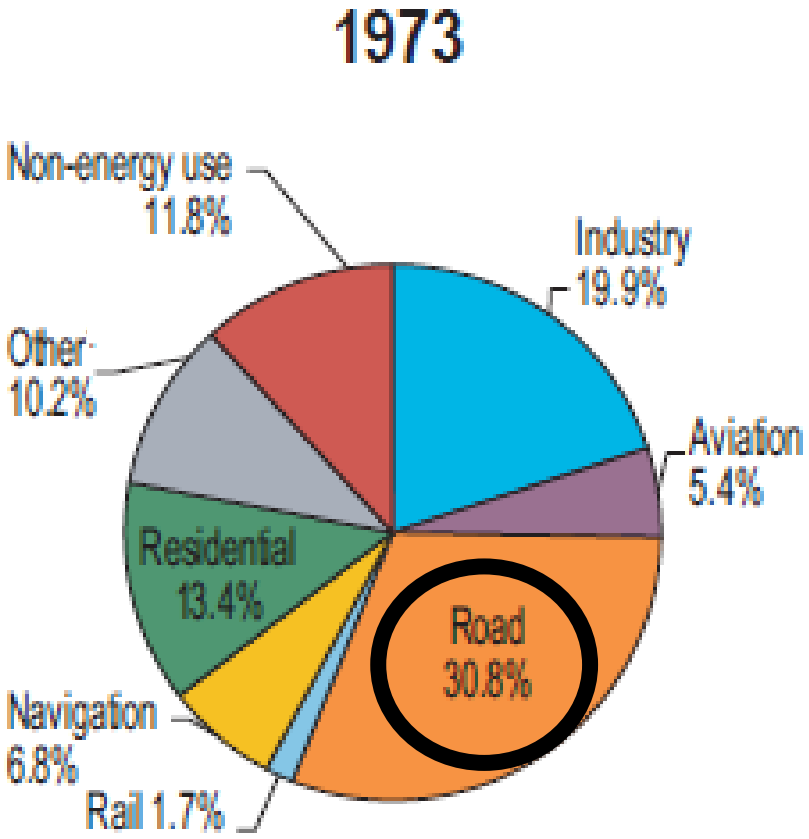
IEA,2017

Total final consumption by sector: oil (Mtoe)

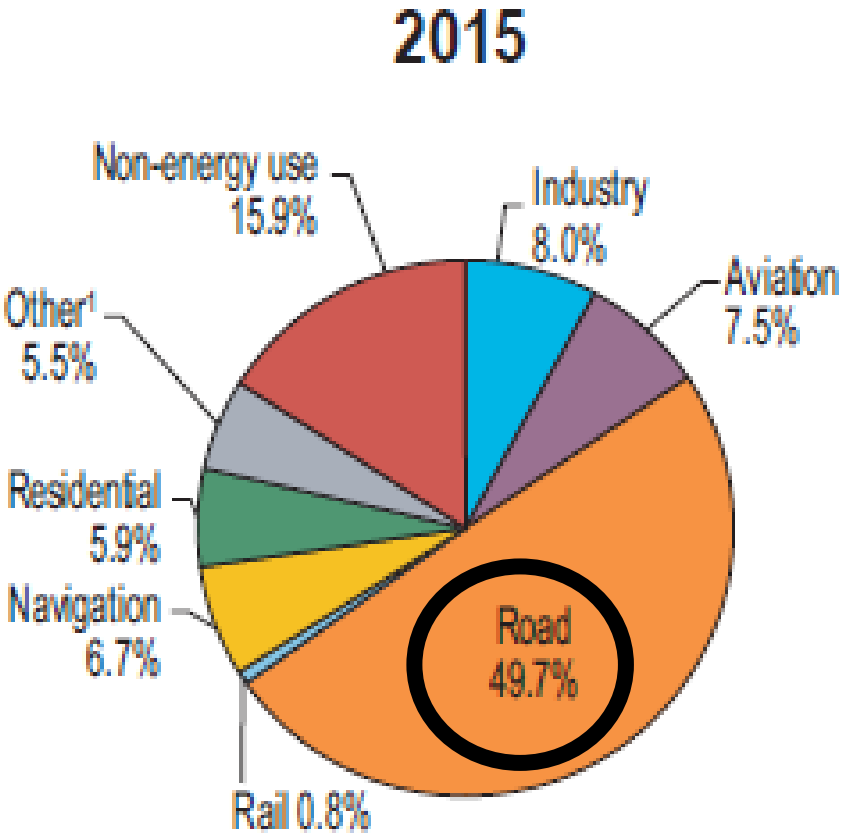


IEA,2017

1973 and 2015 shares of world oil consumption



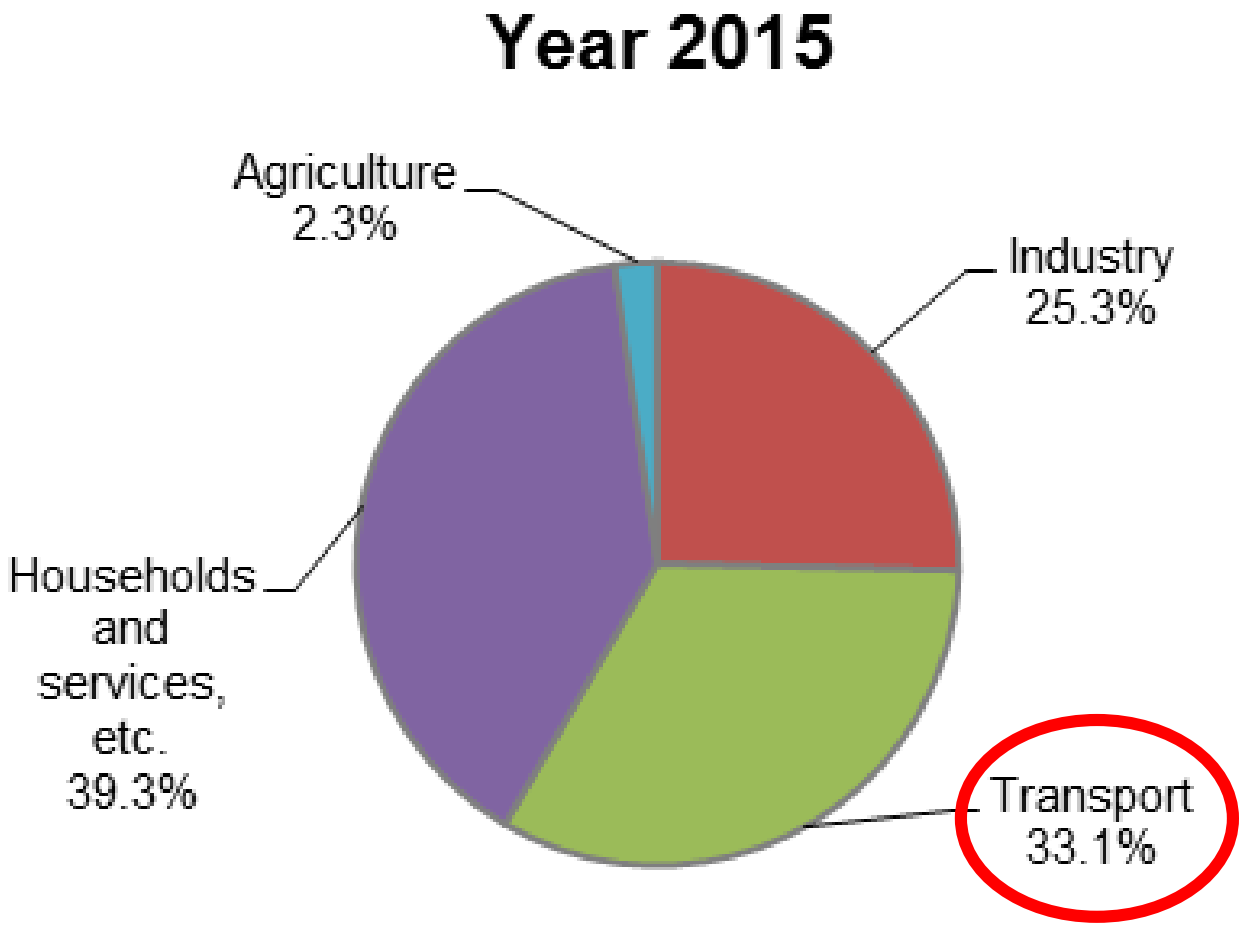
2 252 Mtoe



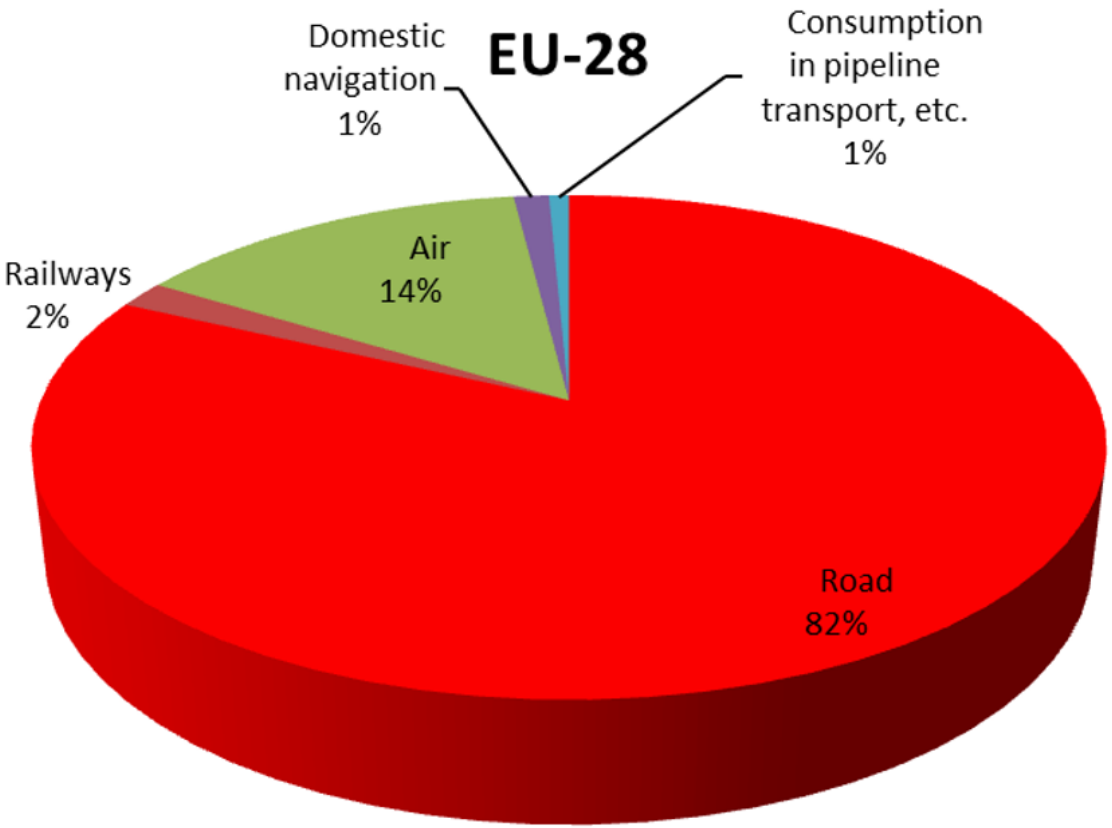
3 840 Mtoe

IEA,2017

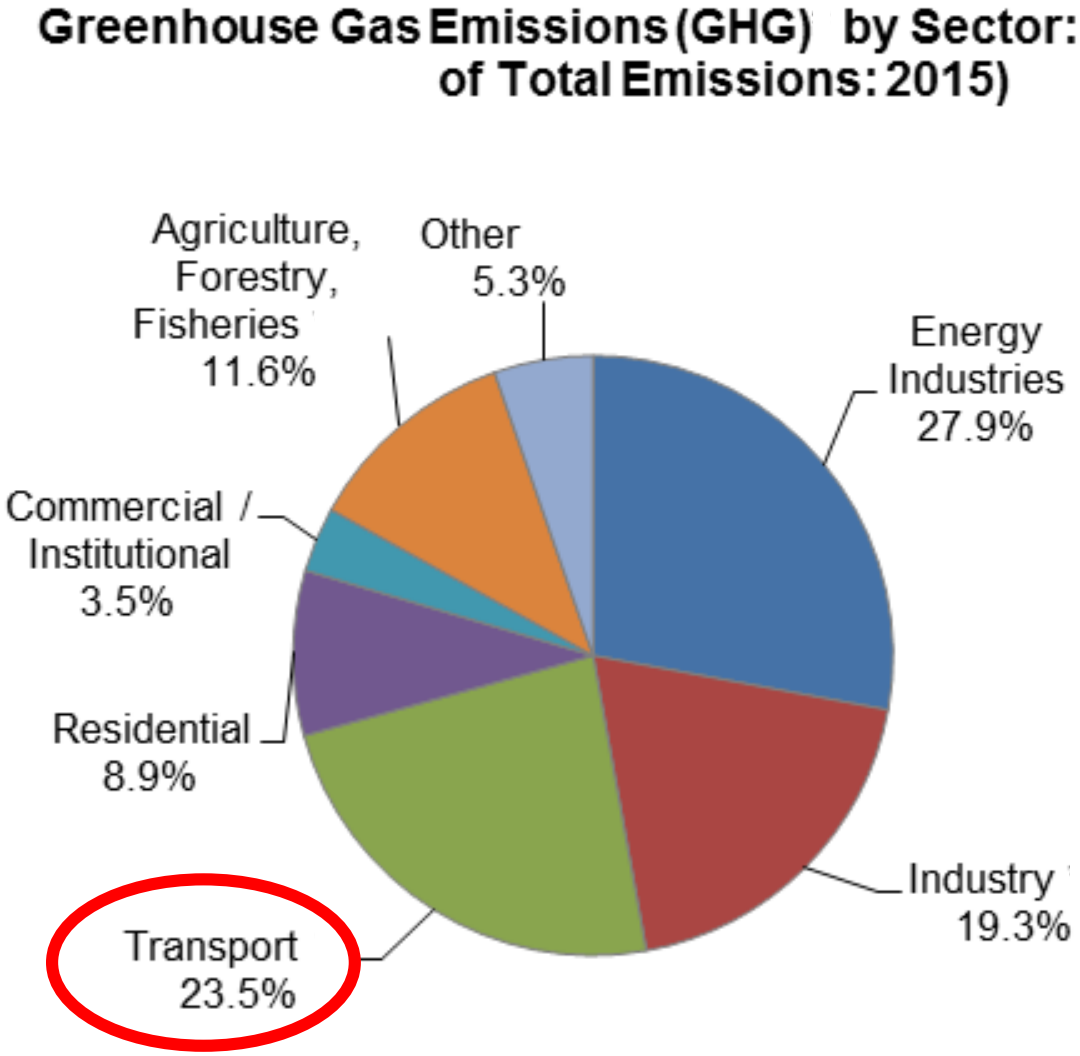
Final energy consumption by sector in the EU



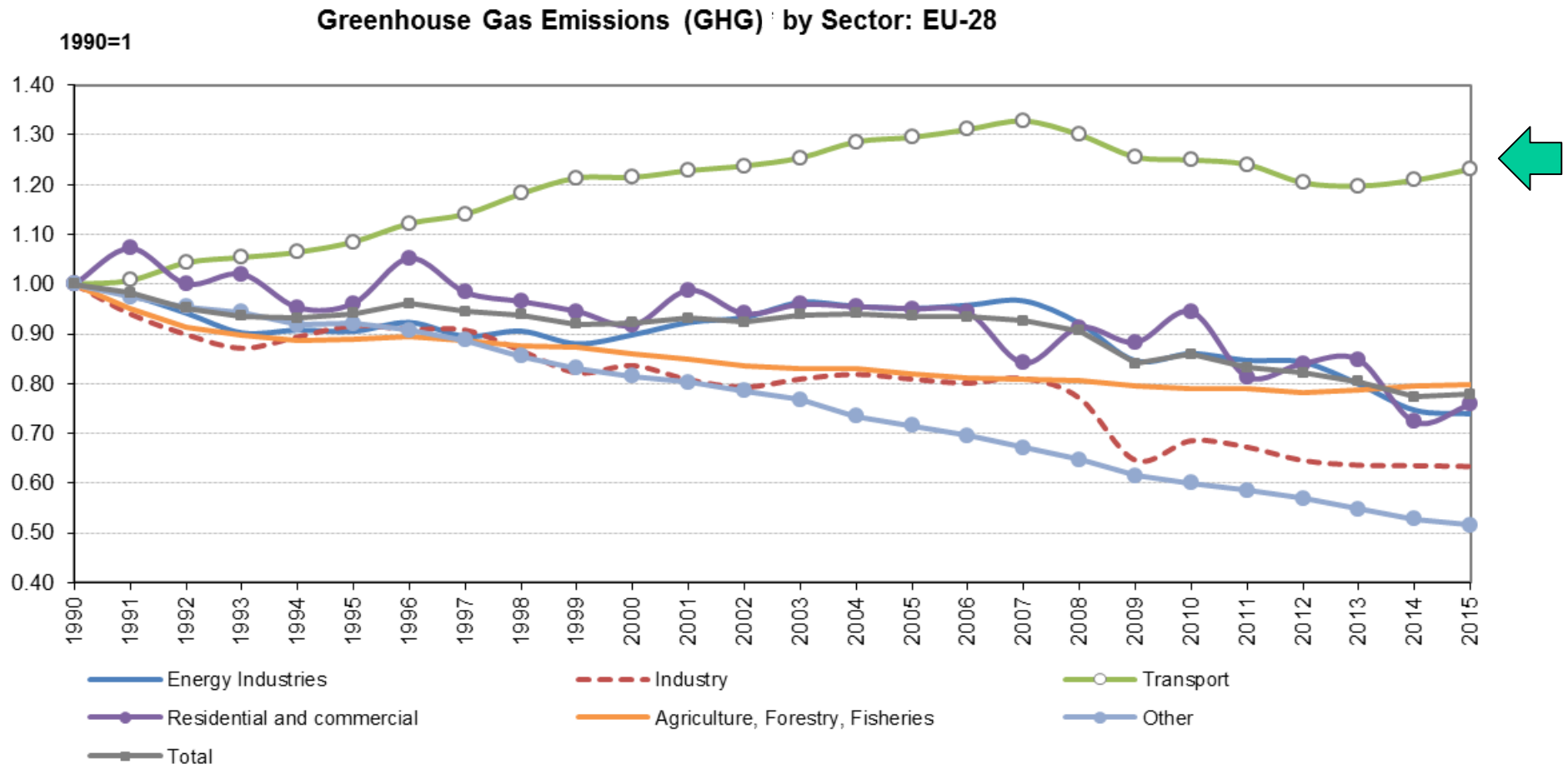
Final energy consumption by sector 2015 in the EU



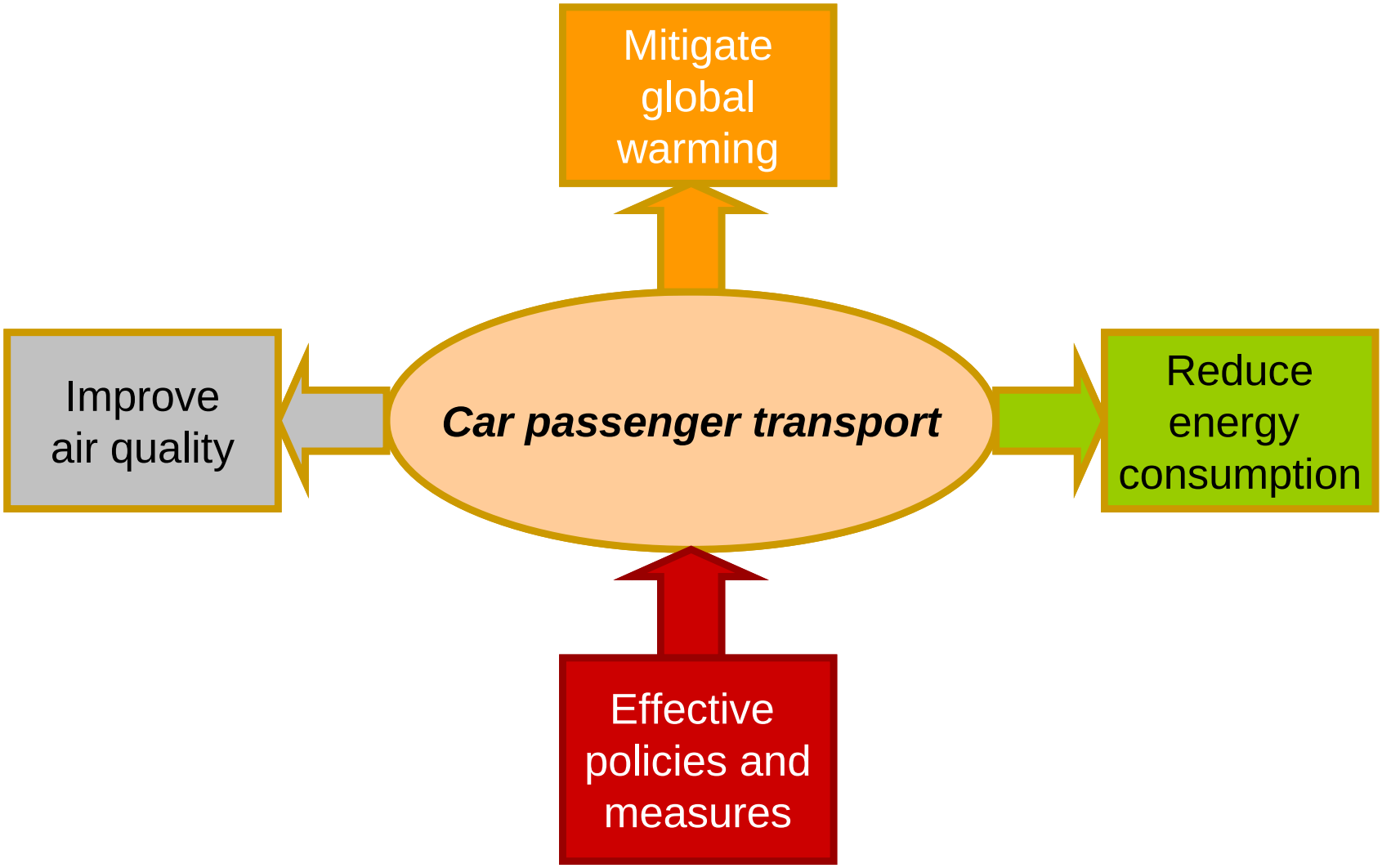
GHG


Greenhouse Gas Emissions (GHG) by Sector: EU-28 (Shares of Total Emissions: 2015)
Agriculture, Forestry, Fisheries 11.6%
Other 5.3%
Energy Industries 27.9%
Commercial / Institutional 3.5%
Residential 8.9%
Industry 19.3%
Transport 23.5%

GHG


Greenhouse Gas Emissions (GHG) by Sector: EU-28
1990=1
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Energy Industries
Industry
Transport
Residential and commercial
Agriculture, Forestry, Fisheries
Other
Total

The challenges for EU climate and energy policies



EU policies and targets

20-20-20

10%

40-27-27

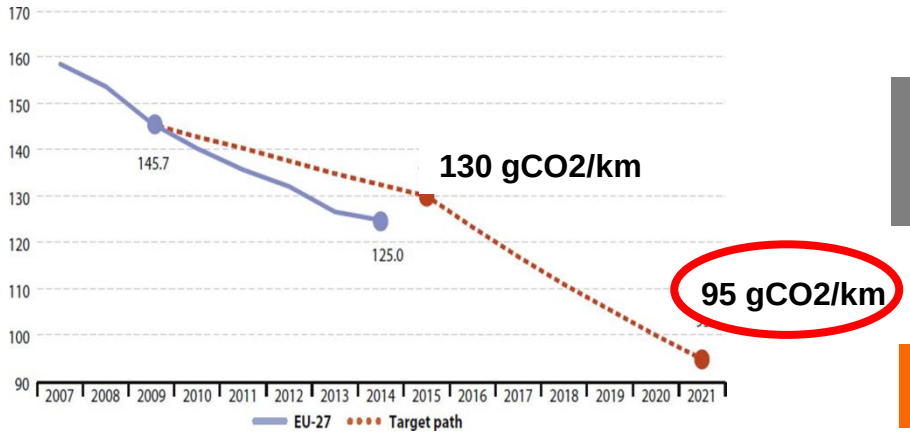
ICE -50% in city

No ICE in city

2009 2010 2015 2020 2030 2050

20% GHG (2008)

60% GHG (1990)



The White Paper on Transport Policy

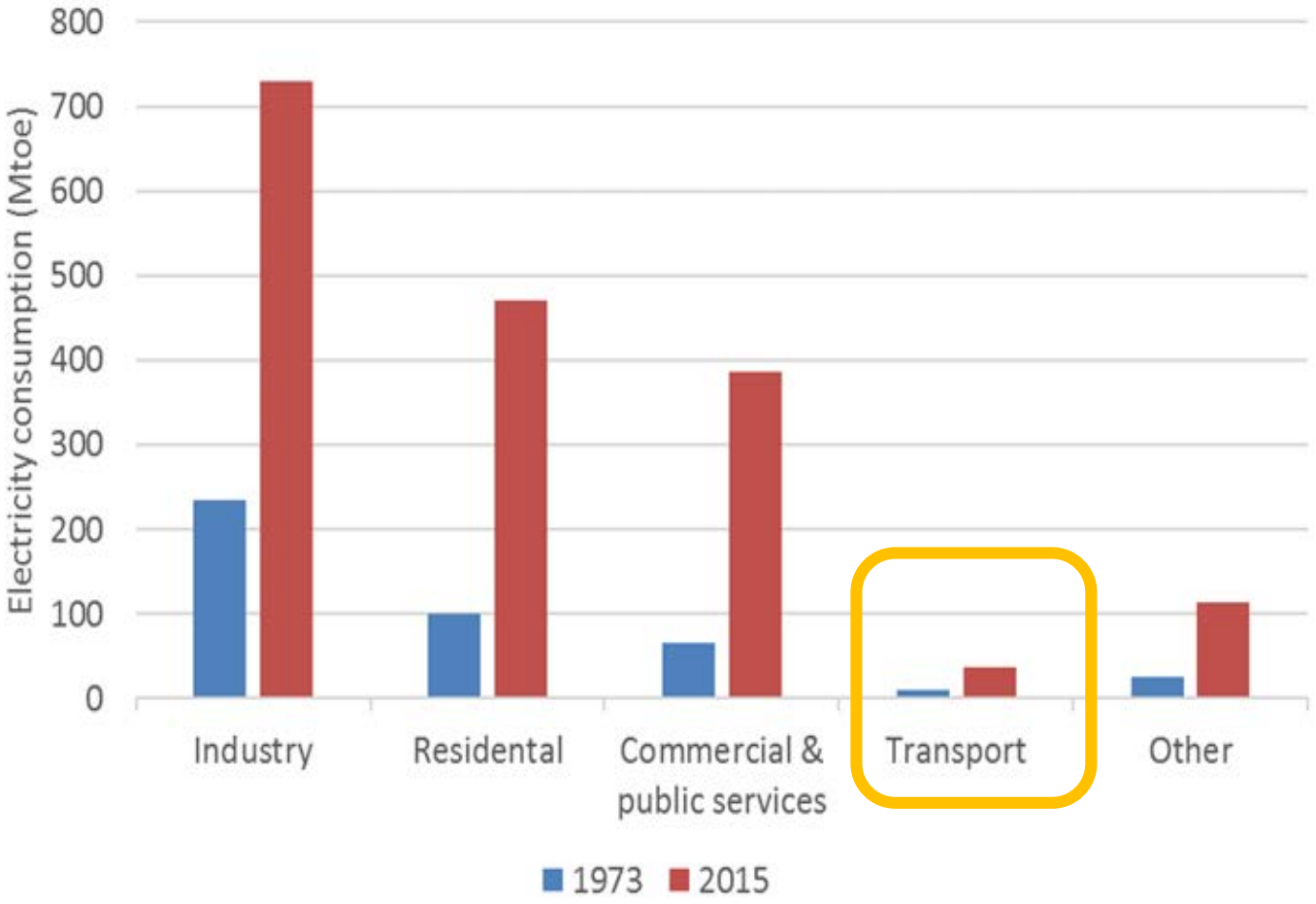
Targets and average CO_2 emissions from new passenger cars in EU countries

Electric vehicles

Paris Declaration on Electro-Mobility and Climate Change & Call to Action:

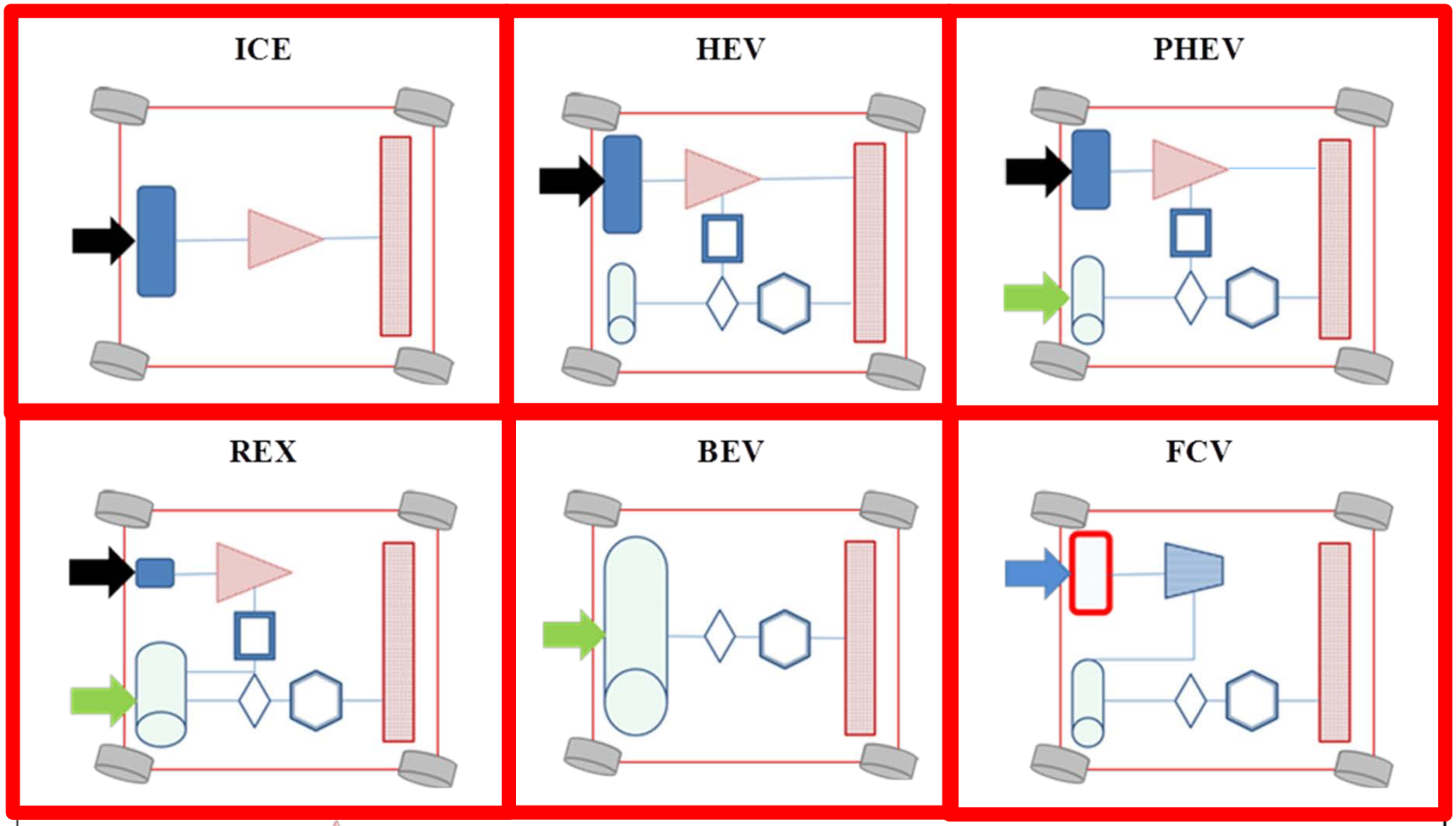
- more than 100 million EVs
- 400 million two and three-wheelers

World total final electricity consumption by sector

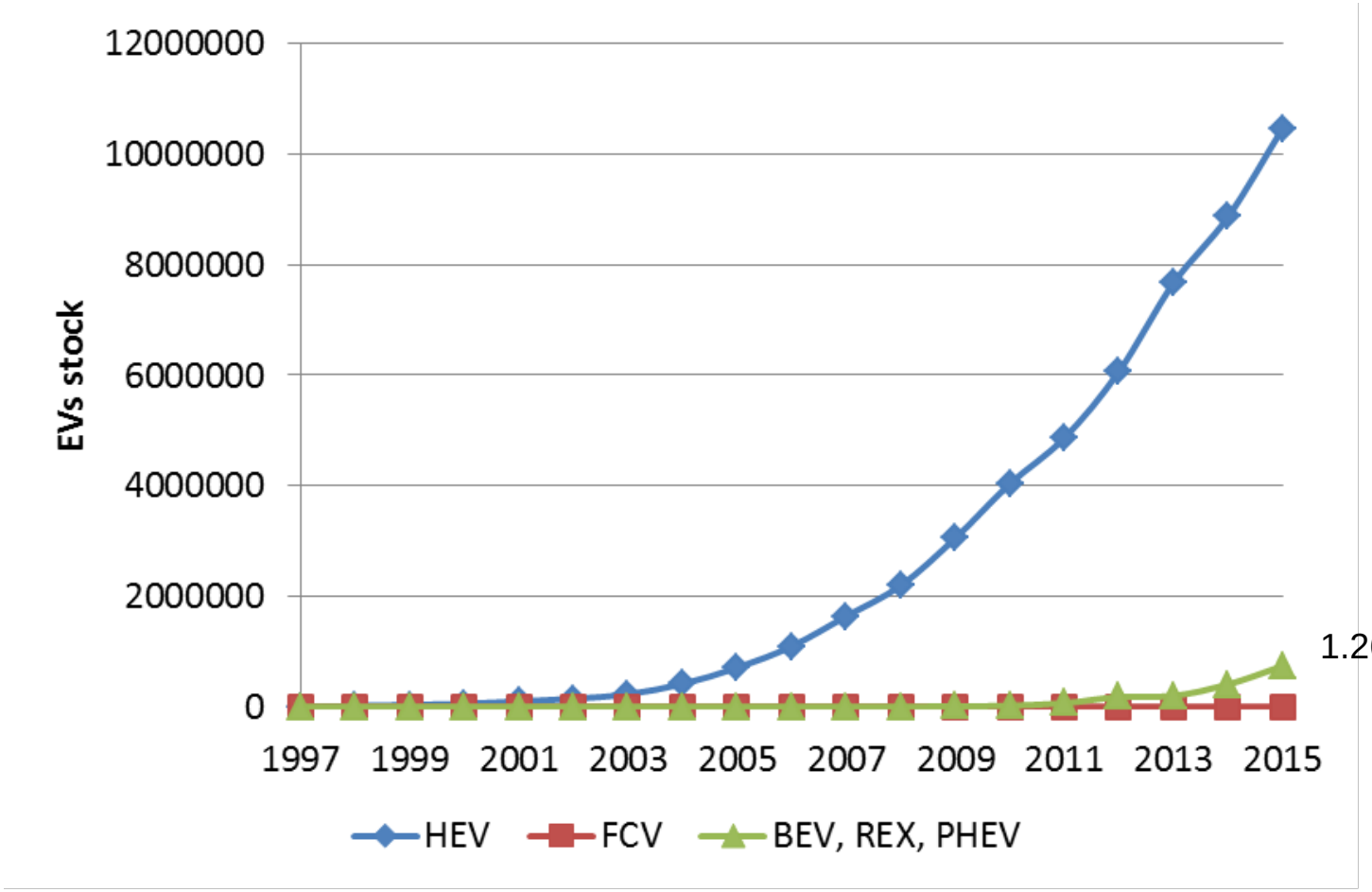


440 Mtoe →1737 Mtoe

Electric vehicles



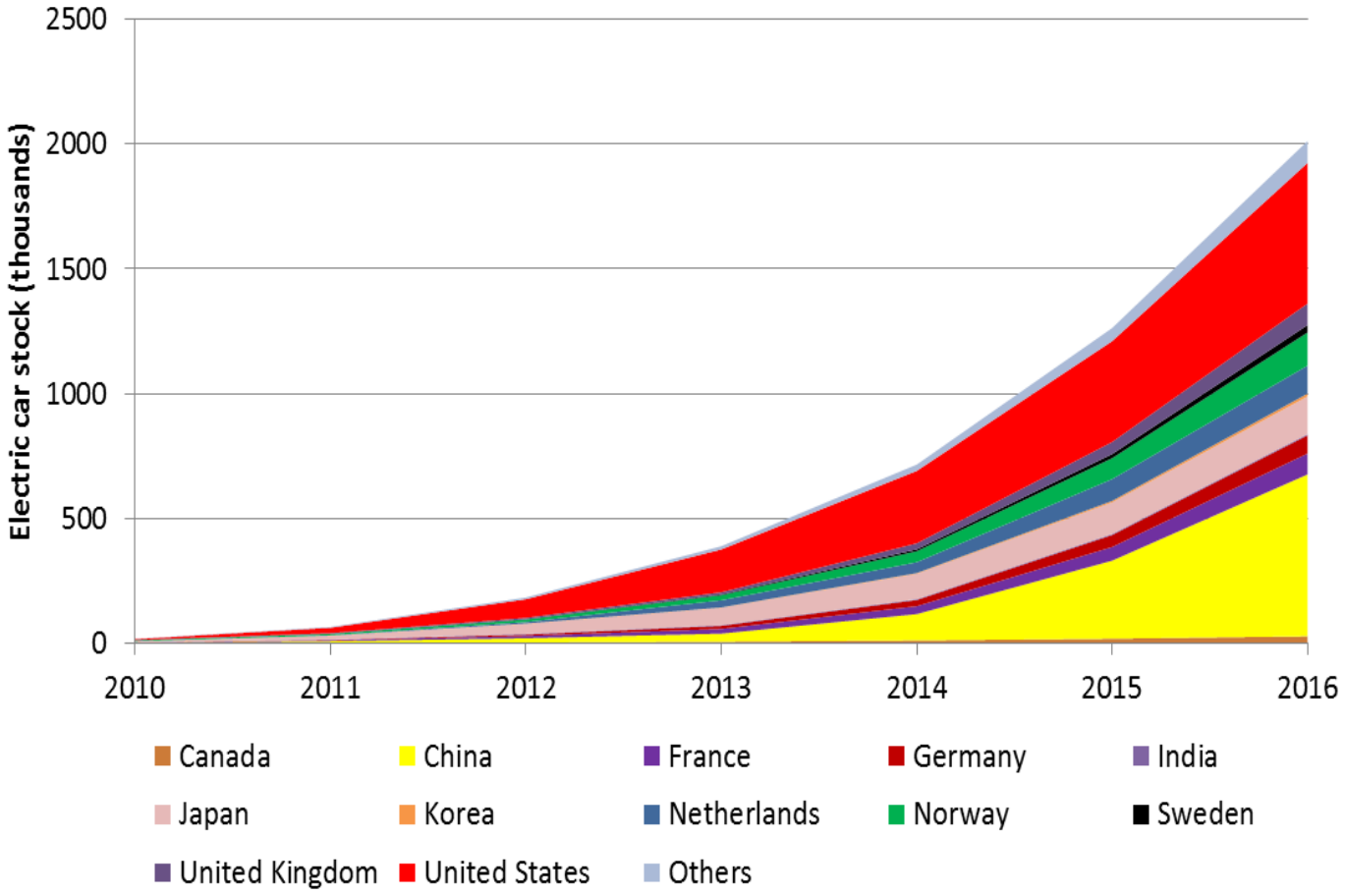
Electric vehicles



1.26 milion

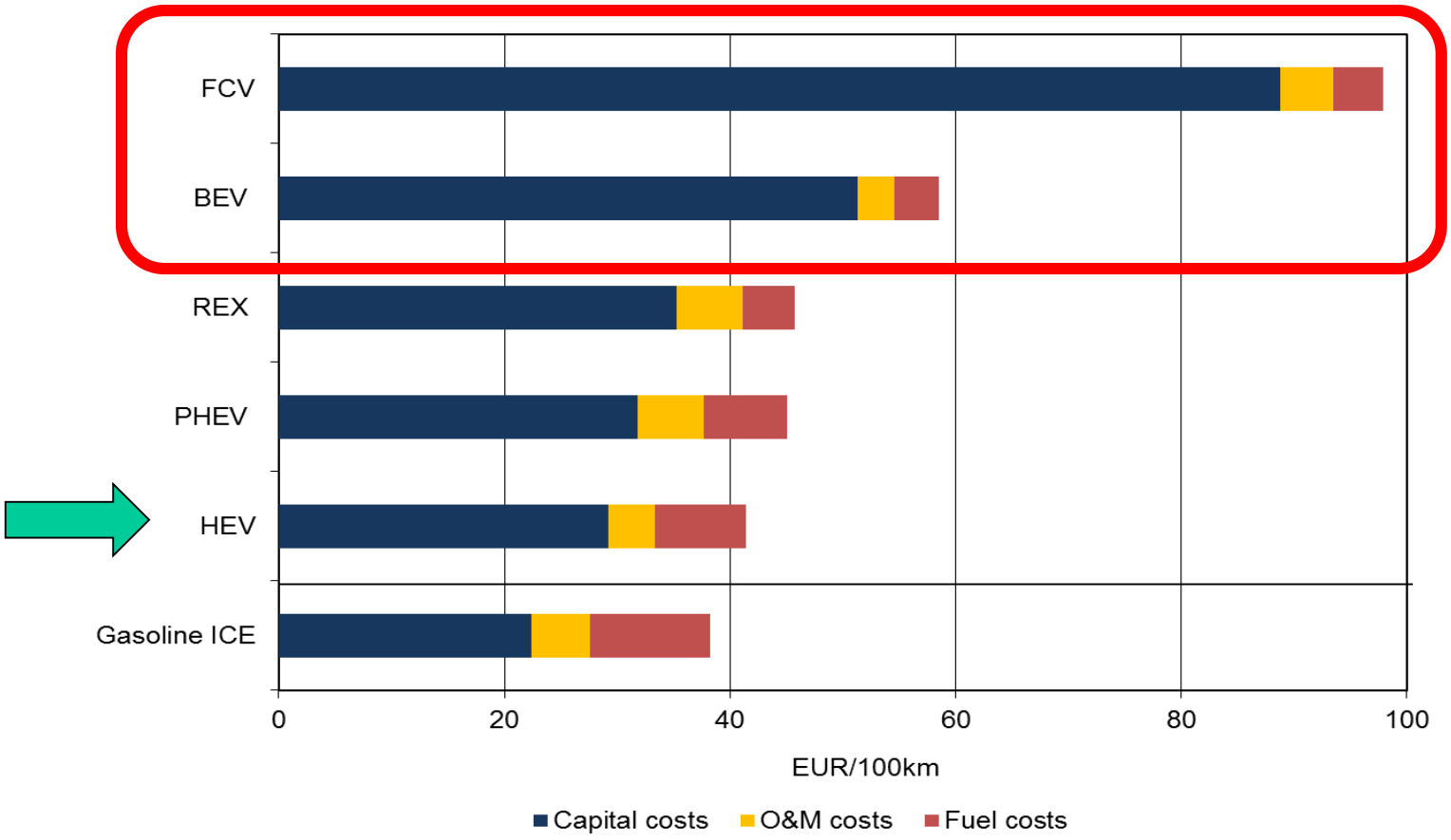
Development of the global stock of EVs

Electric vehicles



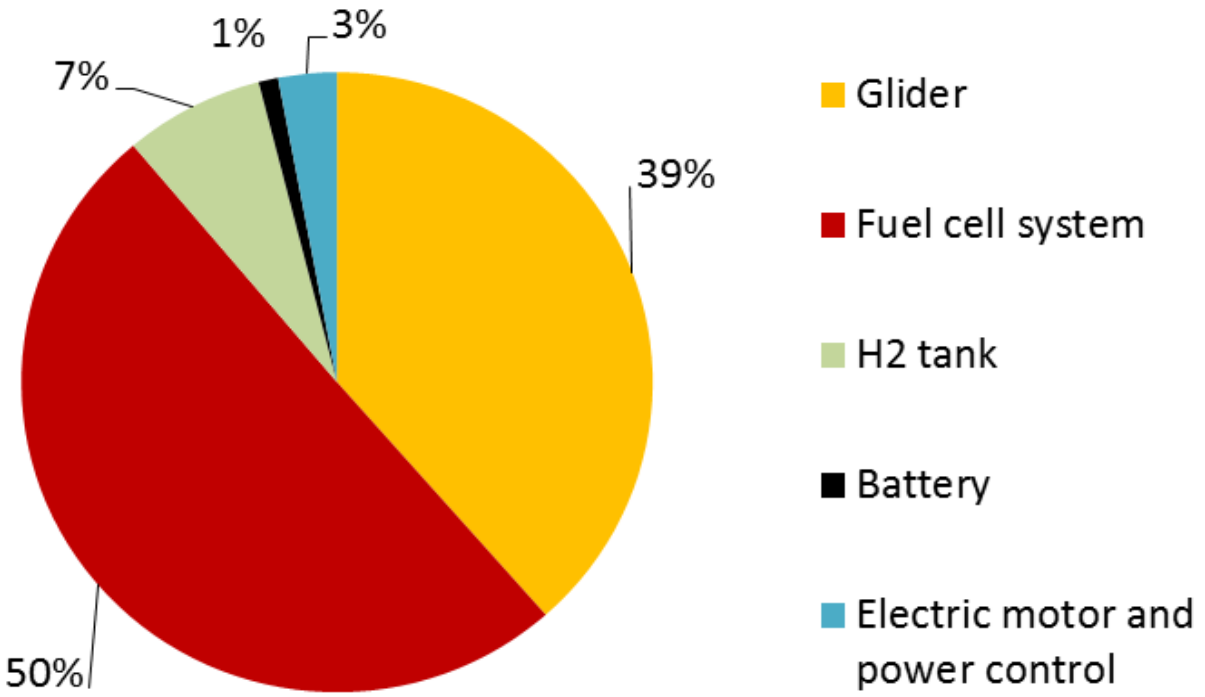
Development of the global stock of rechargeable EVs

Economic aspects



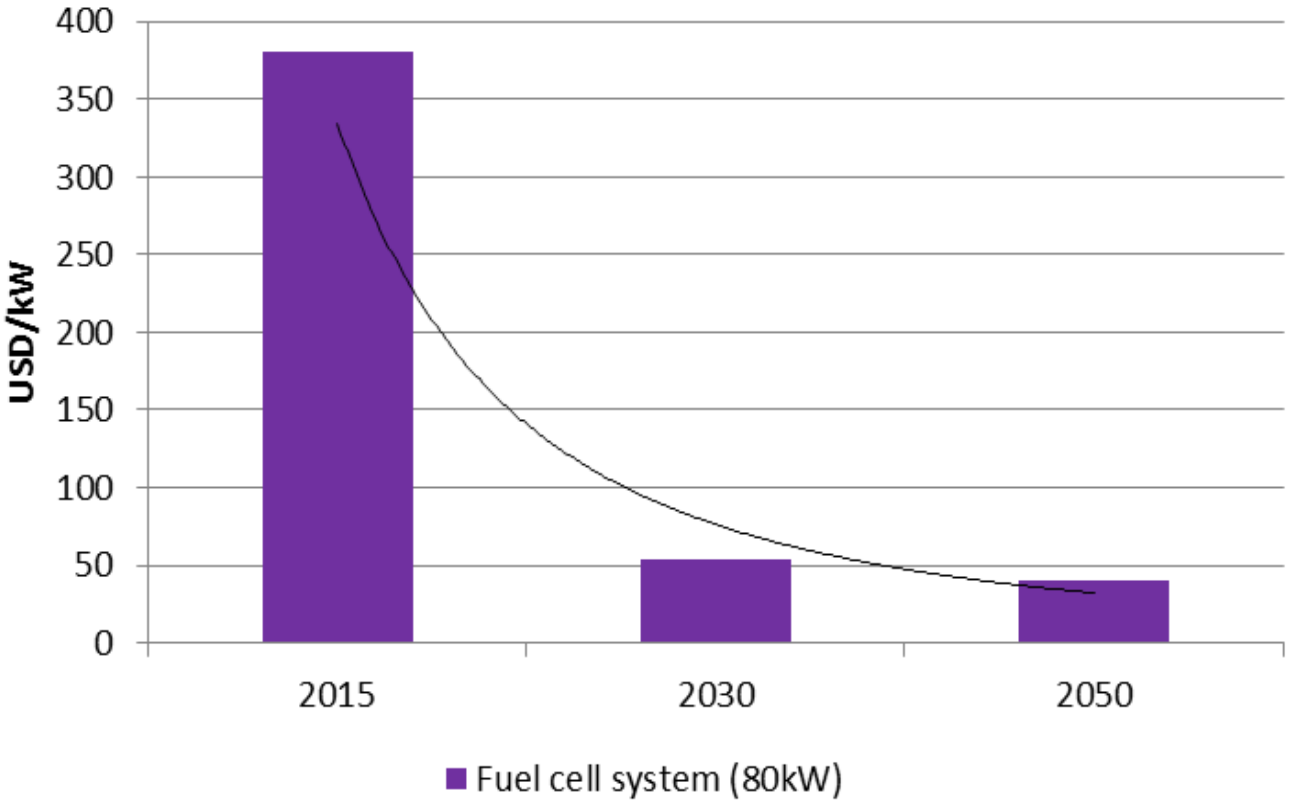
Total costs of service mobility of various types of EV in comparison to ICE cars

Fuel cell vehicles



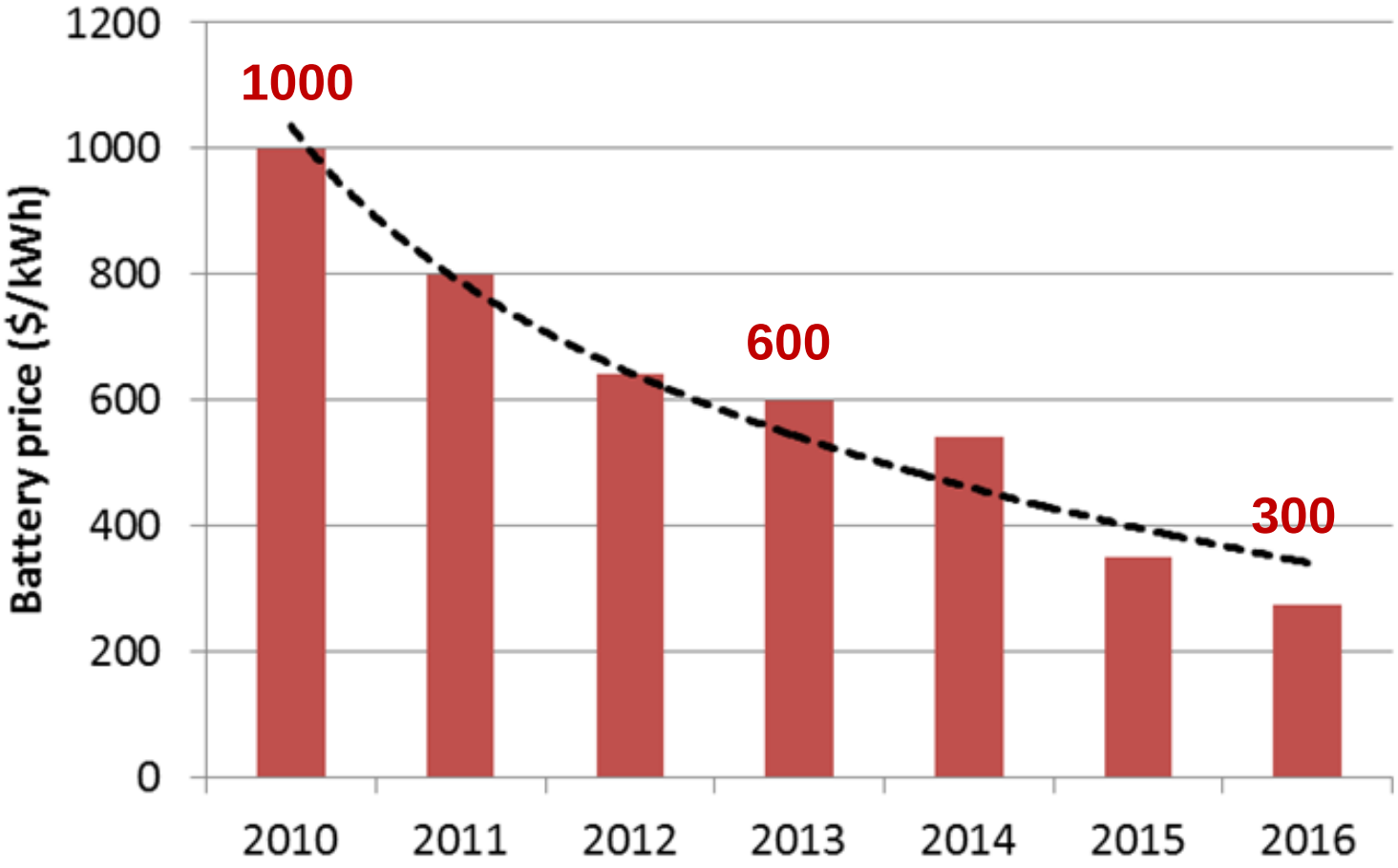
Structure of investment costs of fuel cell vehicles

Technological learning – Fuel cell

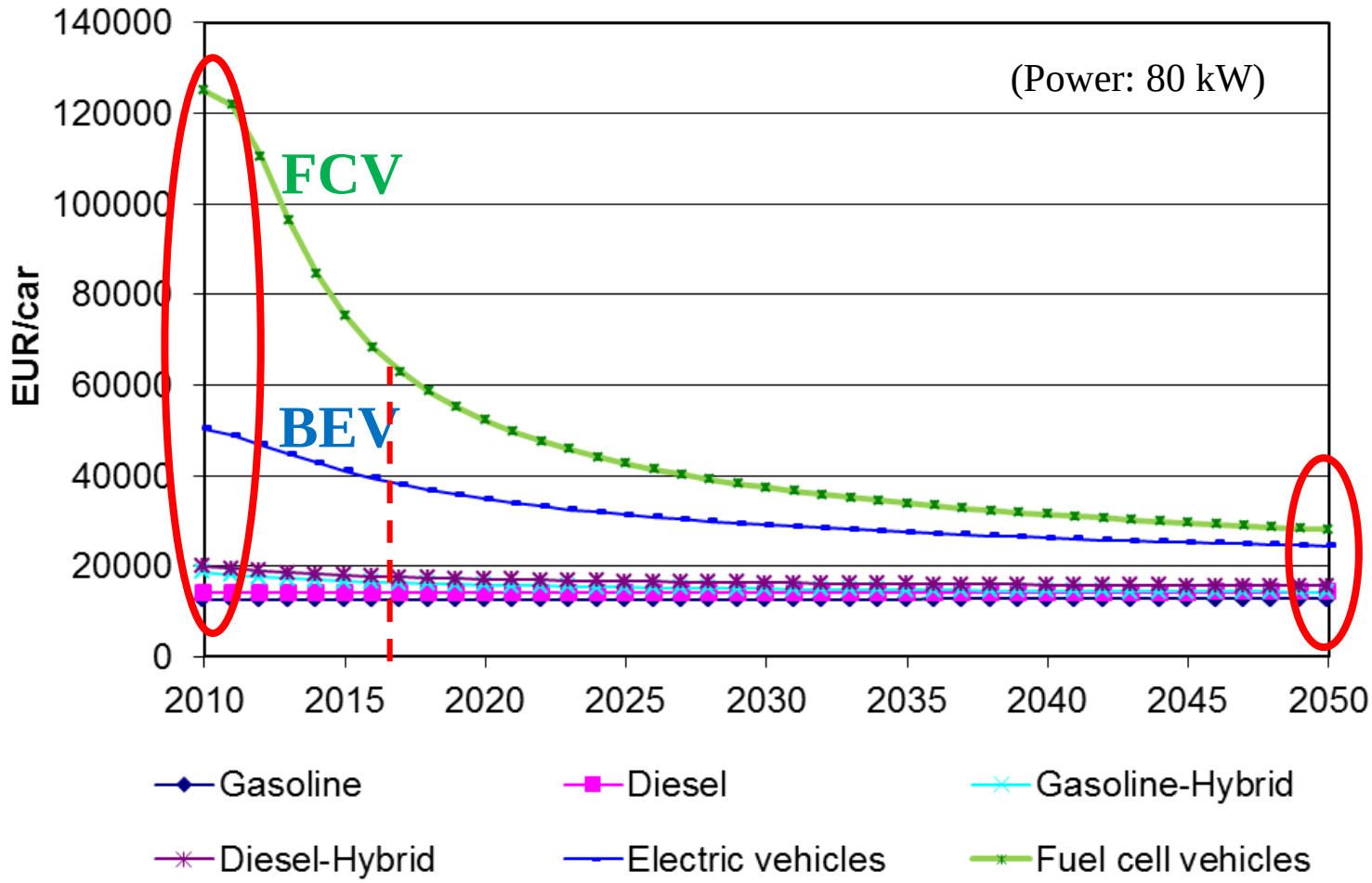


Development of the costs of the fuel cell system

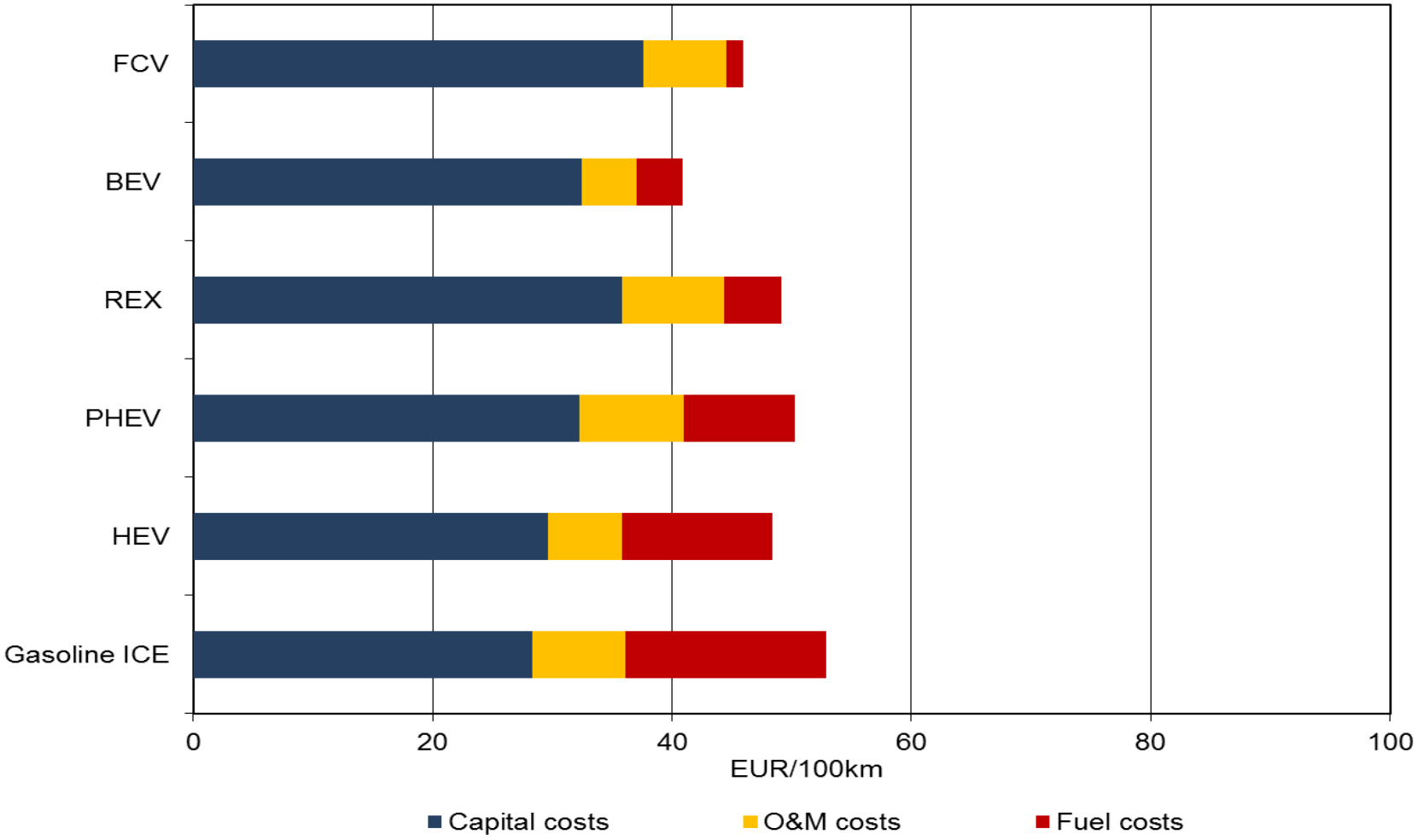
Technological learning – Battery



Scenario for development of investment costs



Costs of mobility – 2050

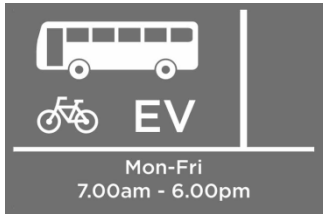


Monetary measures

The most commonly used monetary measures are subsidies and exemptions (or reductions) from:

- road taxes
- annual circulation tax
- company car tax
- registration tax
- fuel consumption tax
- congestion charges

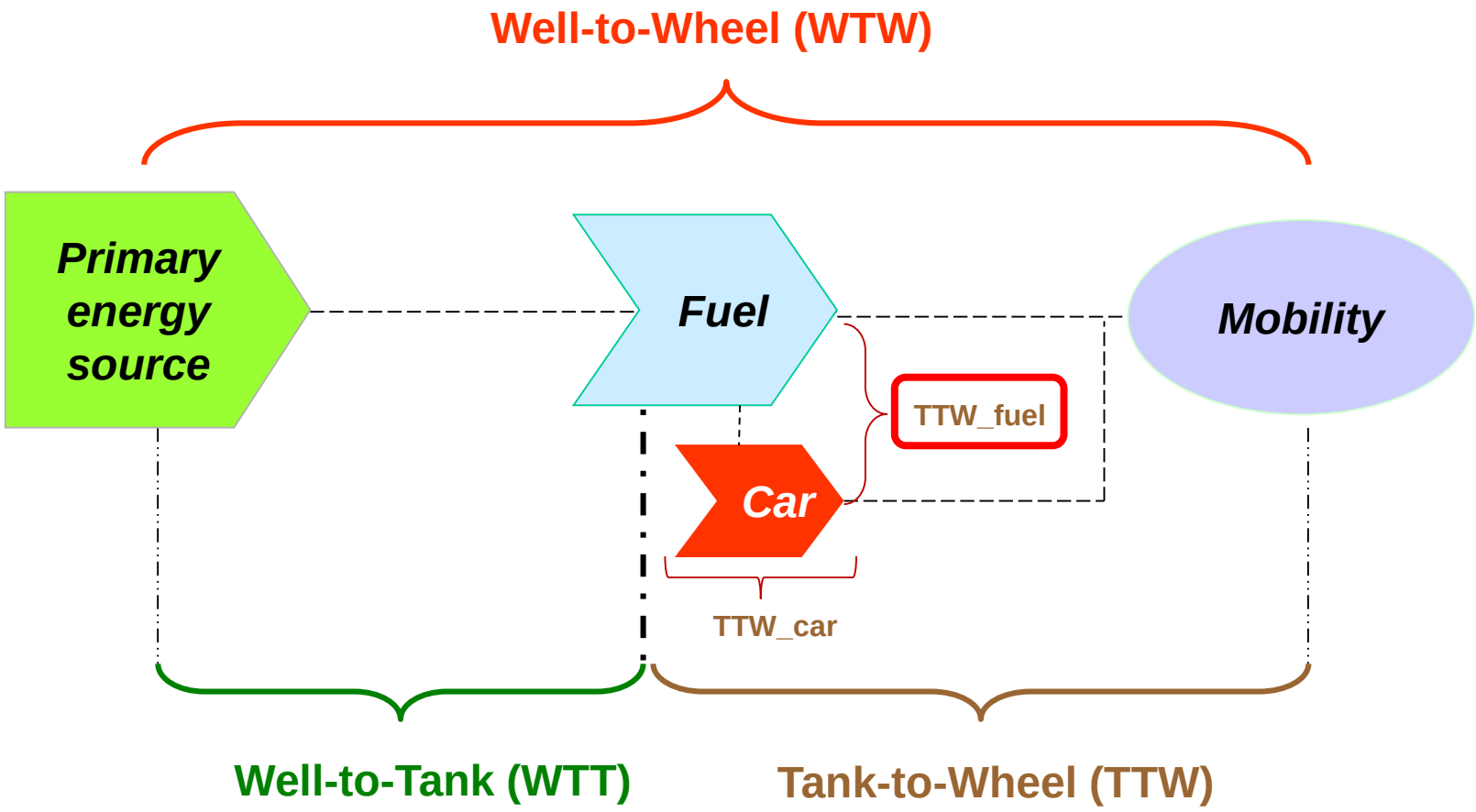
Non-monetary measures



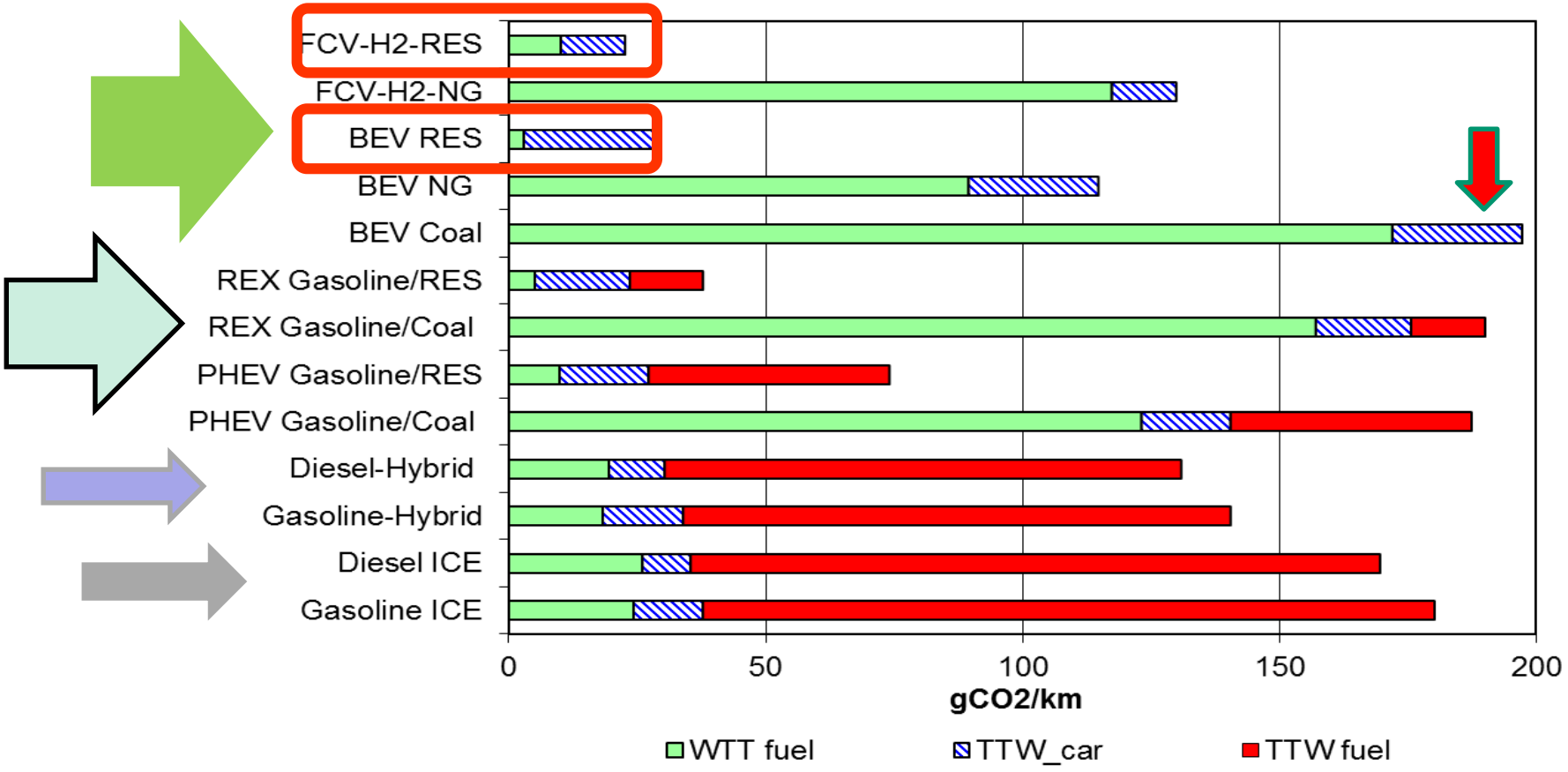
- free parking spaces,
- possibility for EVs drivers to use bus lanes,
- wide availability of charging stations,

- permission for EVs to enter city centers and zero emission zones.

Environmental assessment

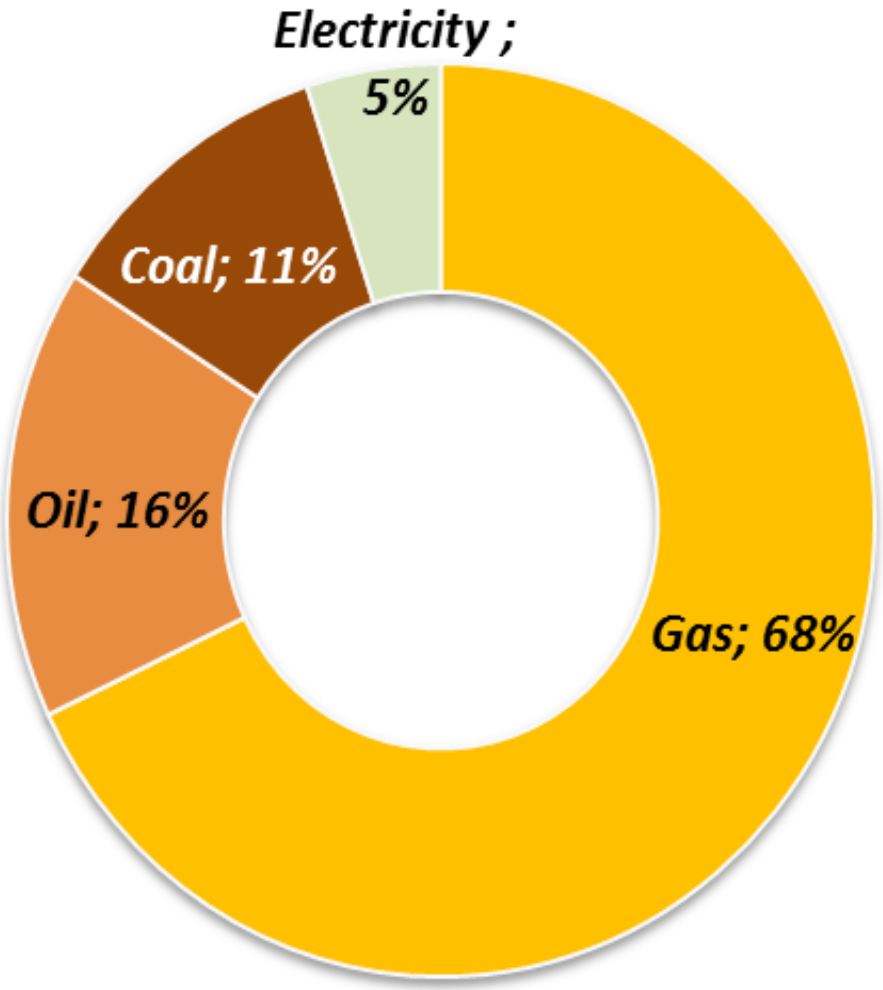


Environmental assessment

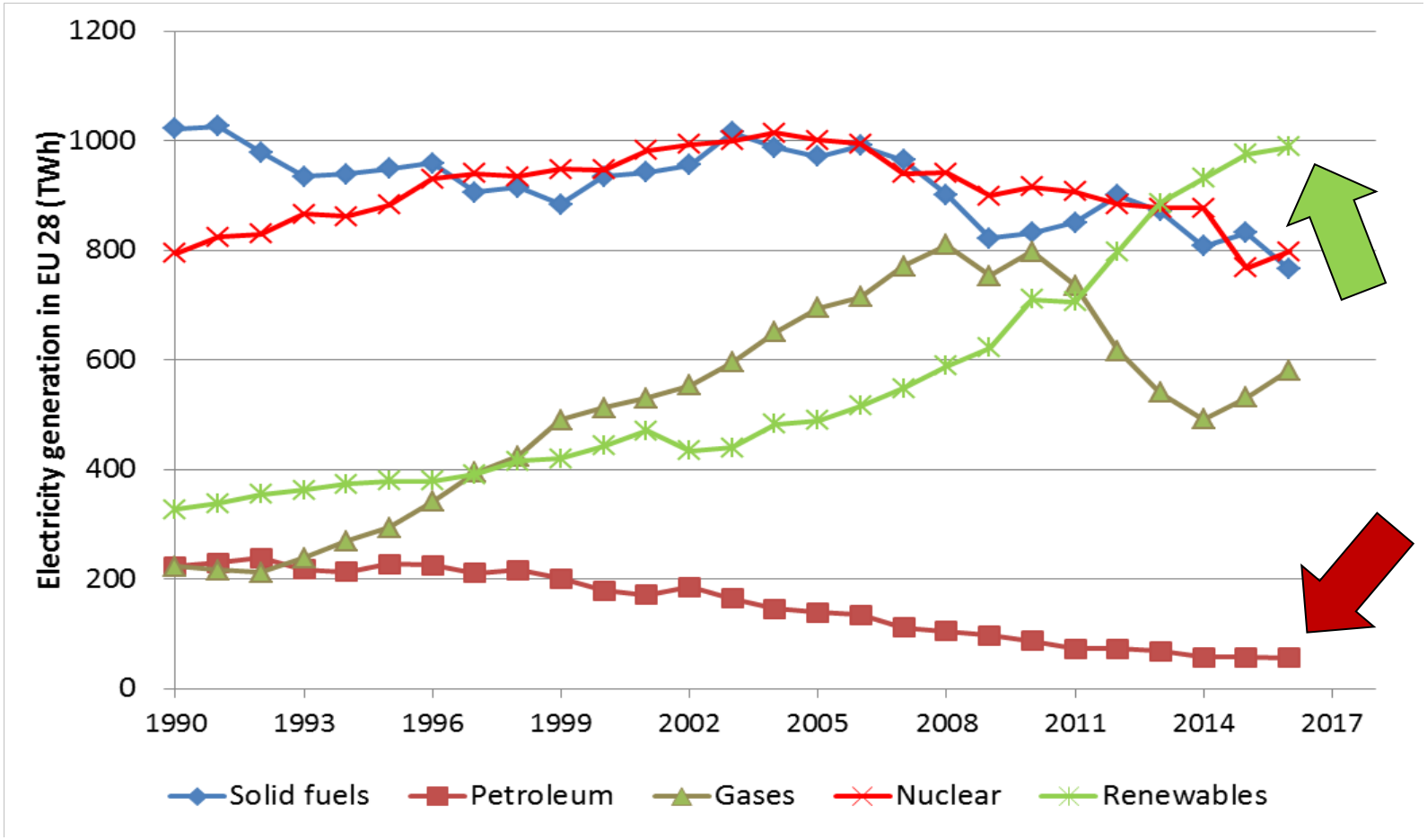


CO_2 emissions per km driven for various types of EV in comparison to conventional cars (power of car: 80kW)

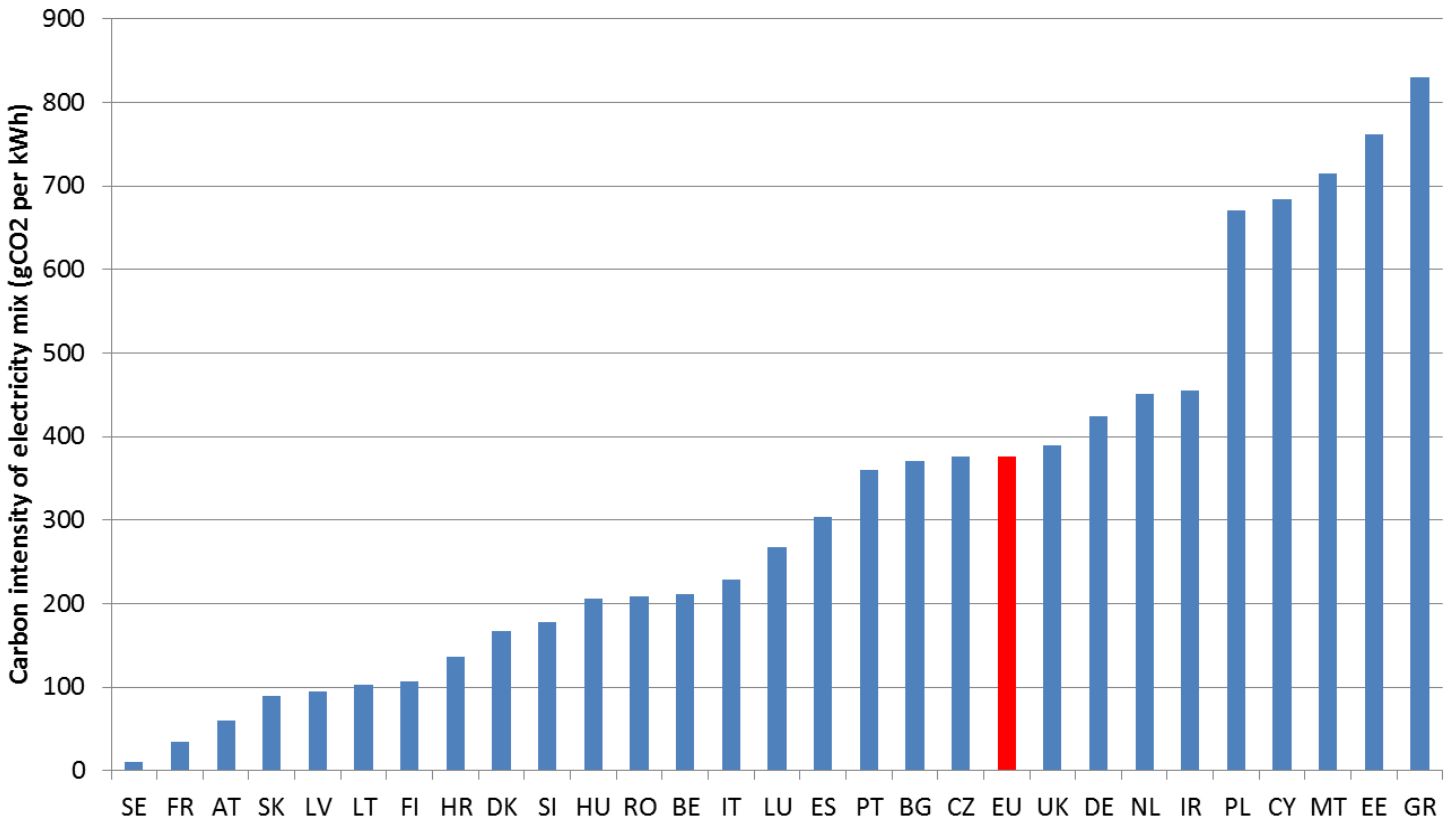
Hydrogen production



Electricity generation in the EU 28

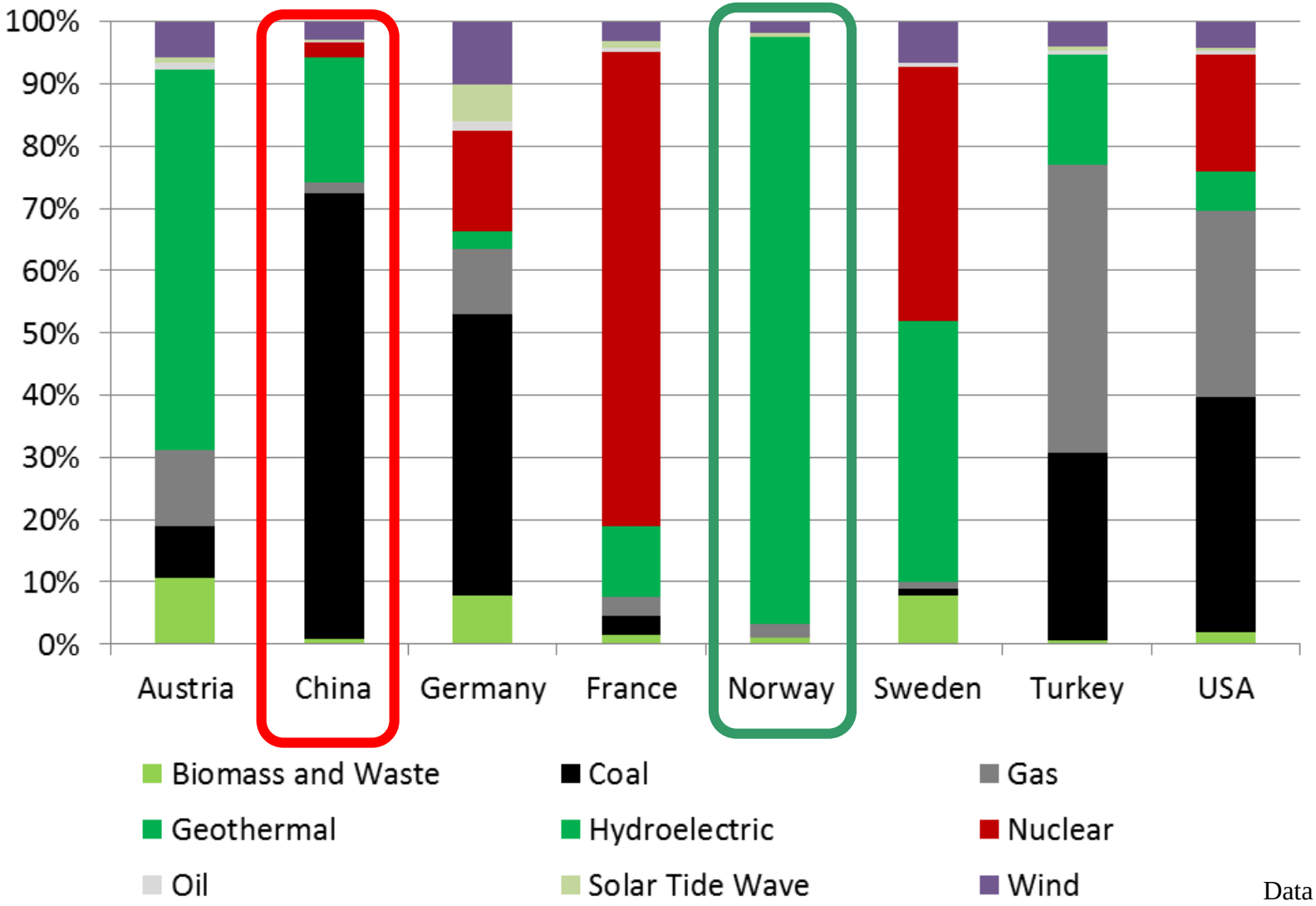


The carbon intensity of electricity mix



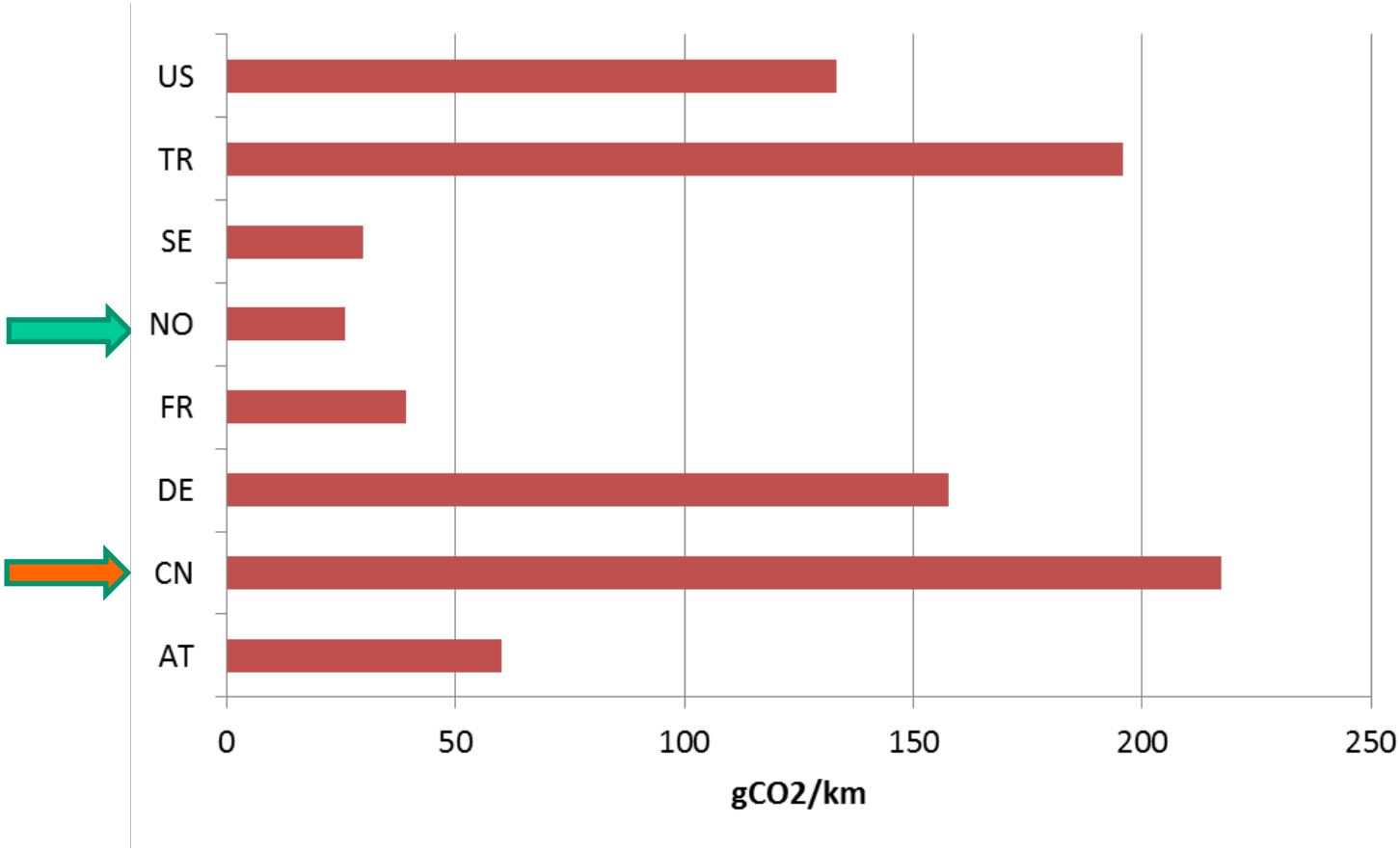
CO2 per kWh electricity generated in different European countries, 2014

Electricity mix



Data source: tsp,2014

Environmental assessment

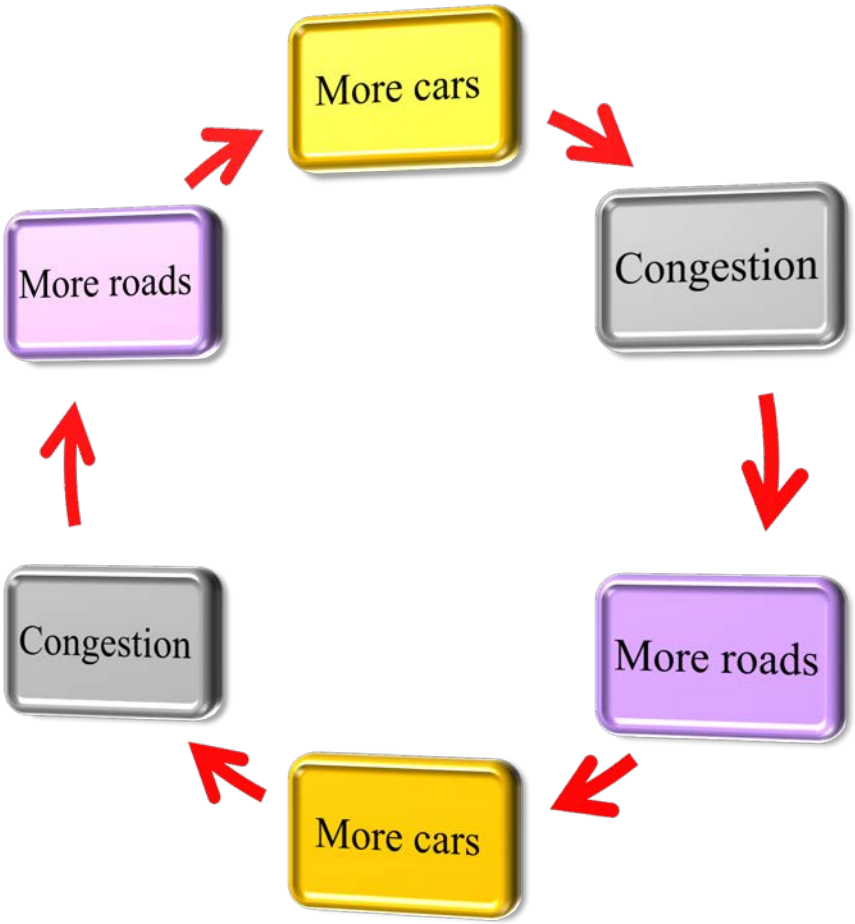


CO_2 emissions per km driven for BEVs powered by grid electricity in different countries

Conclusions

- EVs …cost reductions, improvement of battery characteristics as well as development of infrastructure
- New policy design….most of the policies implemented will be abolished with the increasing number of EVs
- Full environmental benefit – only if EVs are powered by electricity generated from renewable energy sources
- FCV …long term

Car-oriented mobility

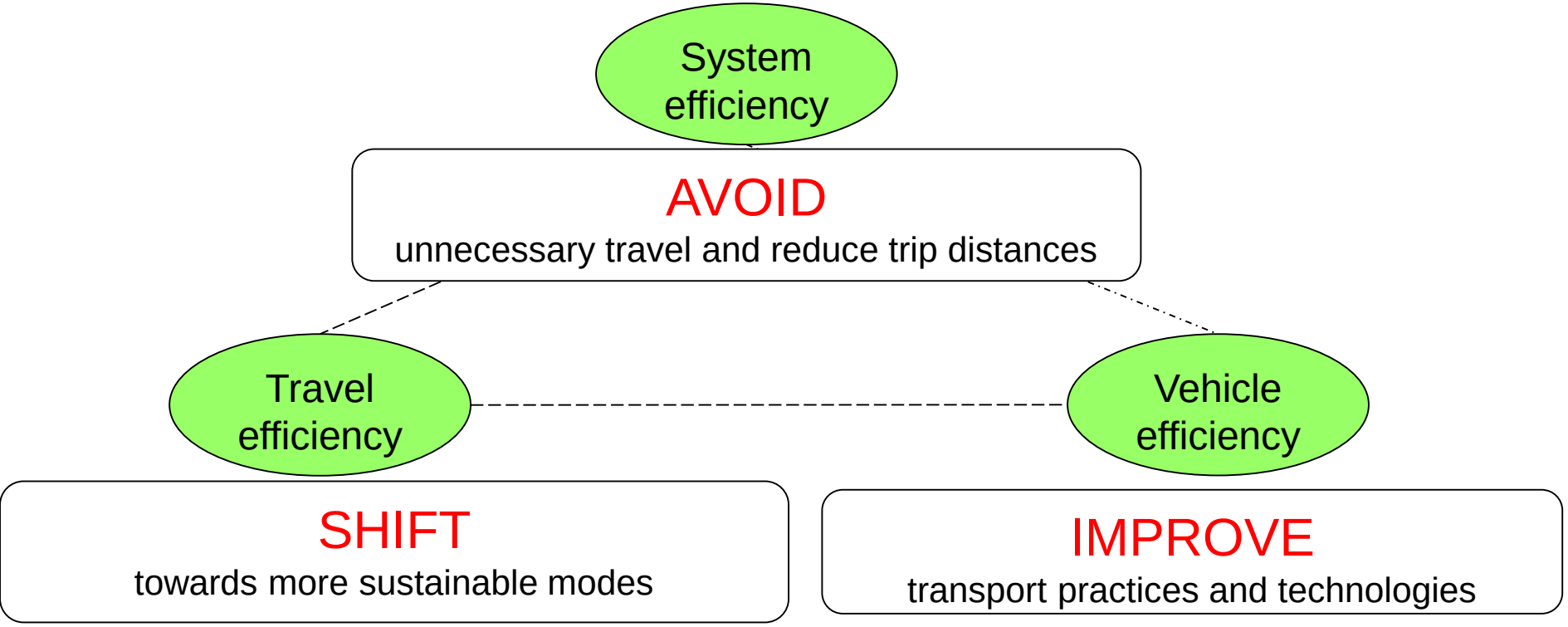


Mobility

Car-oriented transport development

https://simotron.files.wordpress.com

AVOID-SHIFT-IMPROVE strategie



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