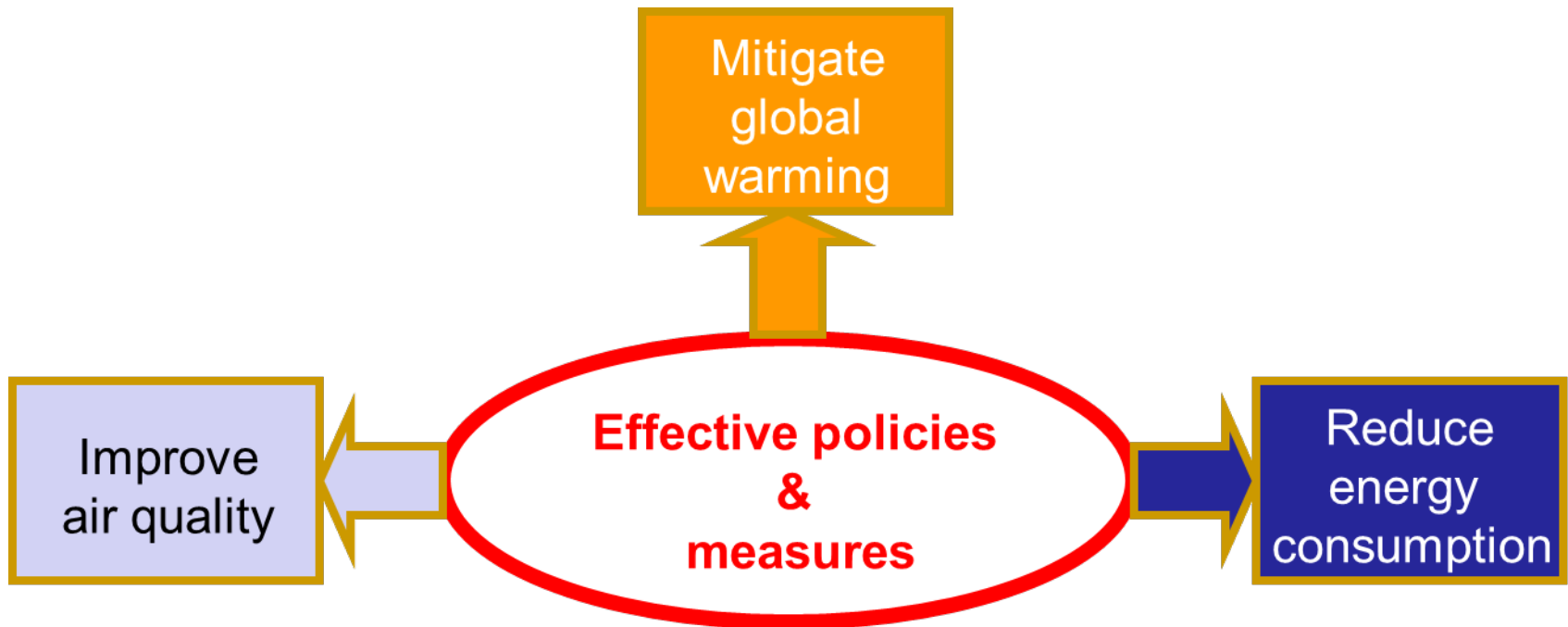


Sustainable Mobility Challenges for the Transition *Role of Electric Vehicles*

Amela Ajanovic
Energy Economics Group
Vienna University of Technology

- Introduction
- Policy framework
 - GHG
 - RES
 - Energy efficiency
- Electric vehicles
 - Economic assessment
 - Environmental assessment
- Conclusion

- oil products
- least-diversified
- energy import dependency



Climate & energy package

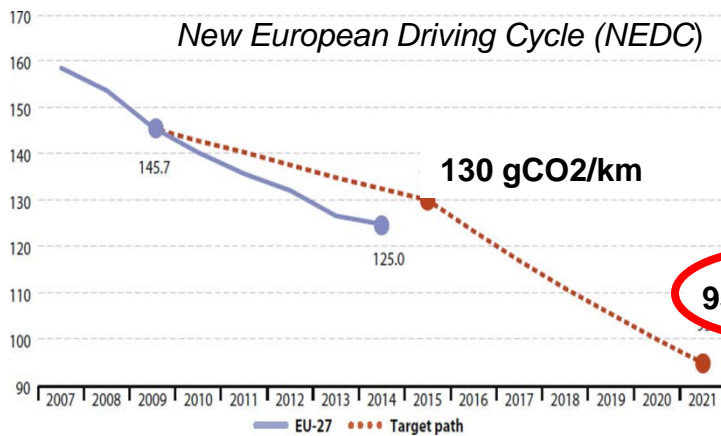
GHG: **20** - RES: **20** - EE: **20**

GHG: **40** - RES: **32** - EE: **32.5**

TRA: **10%**

TRA: **14%**

2009 2010 2015 2020 2025 2030 2050



ICE -50% in city
20% GHG (2008)

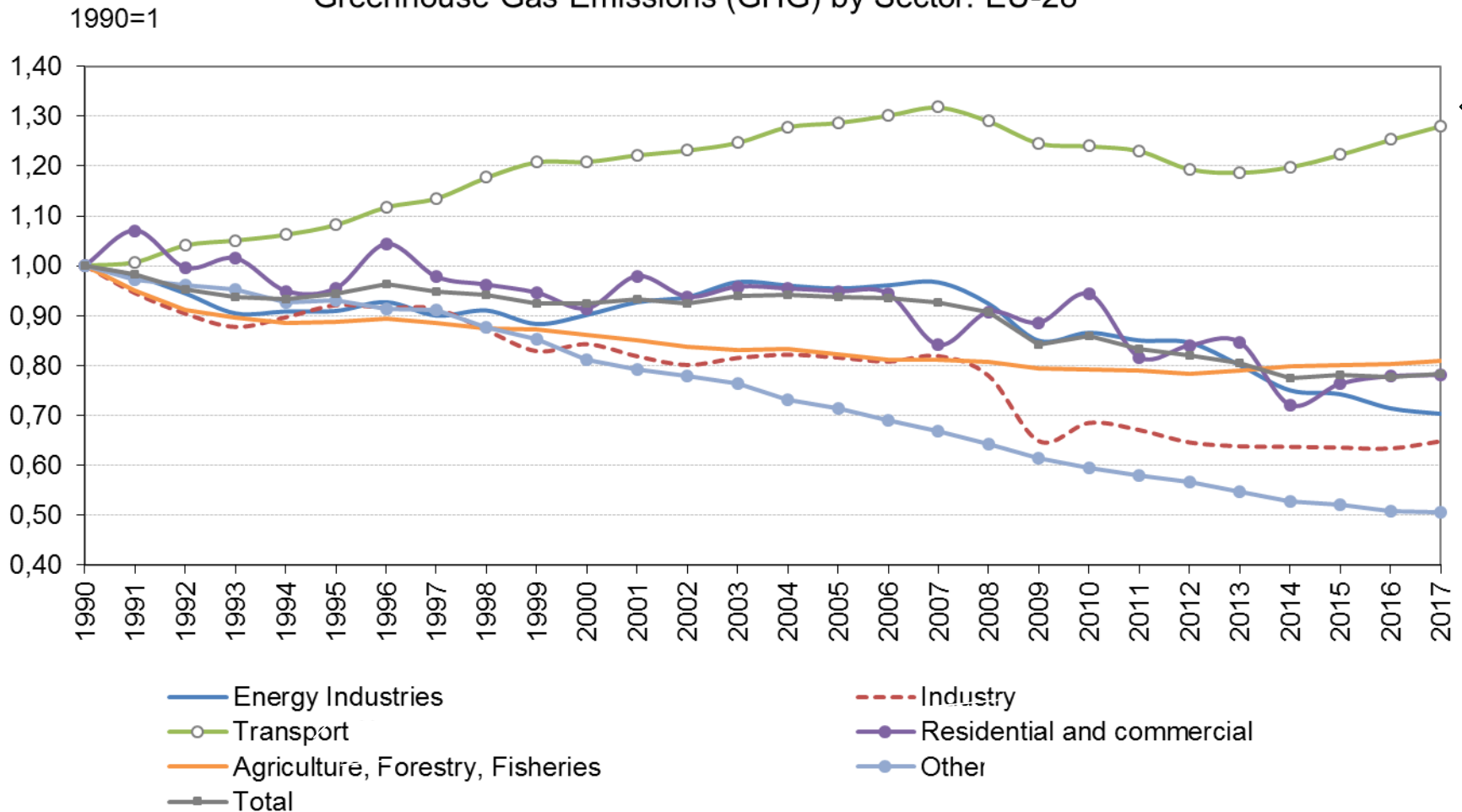
No ICE in city
60% GHG (1990)

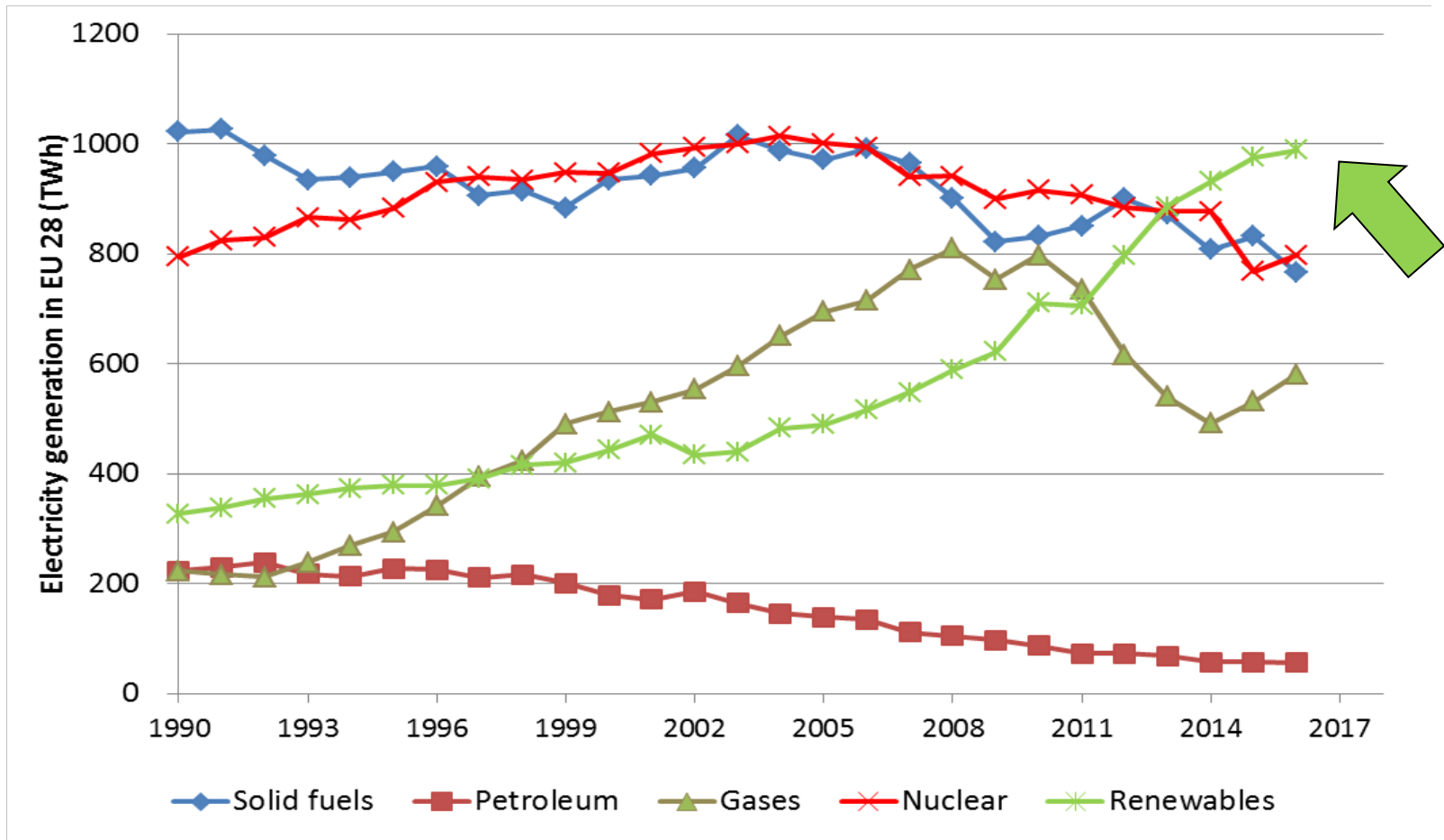
Transport White Paper

95 gCO₂/km
-15%
-37,5%

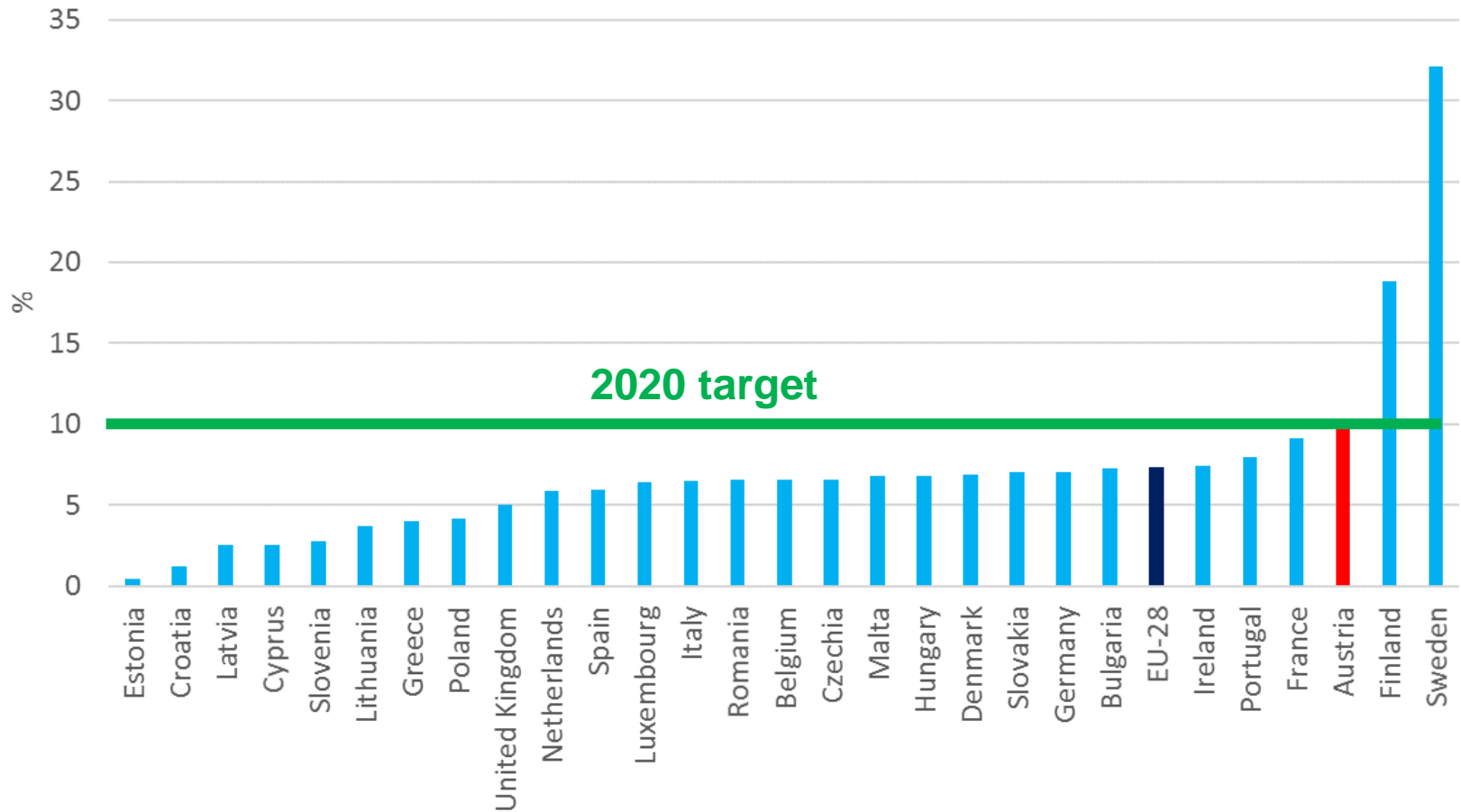
Targets and average CO₂ emissions from new passenger cars in EU countries *World harmonized light-duty vehicles test procedure (WLTP)*

Greenhouse Gas Emissions (GHG) by Sector: EU-28





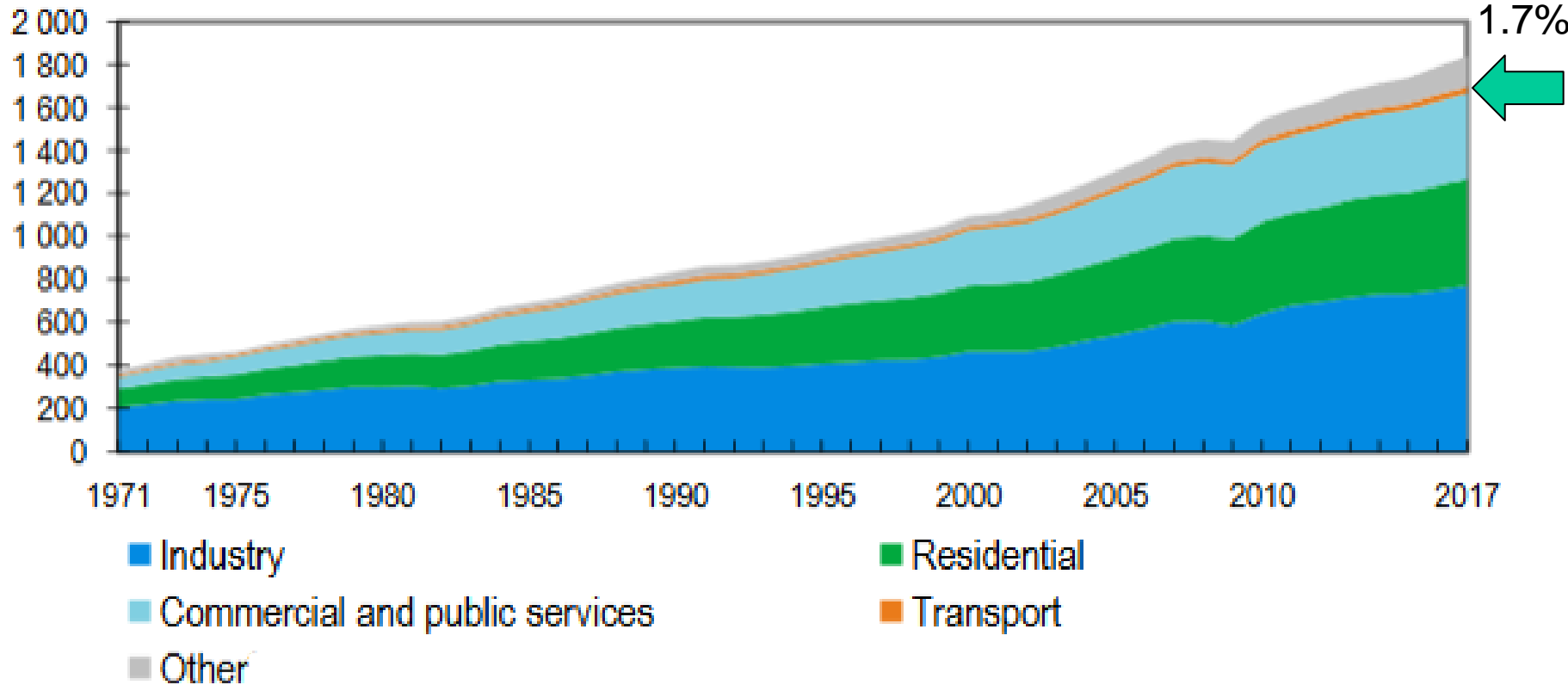
- RES in transport: 7.6%



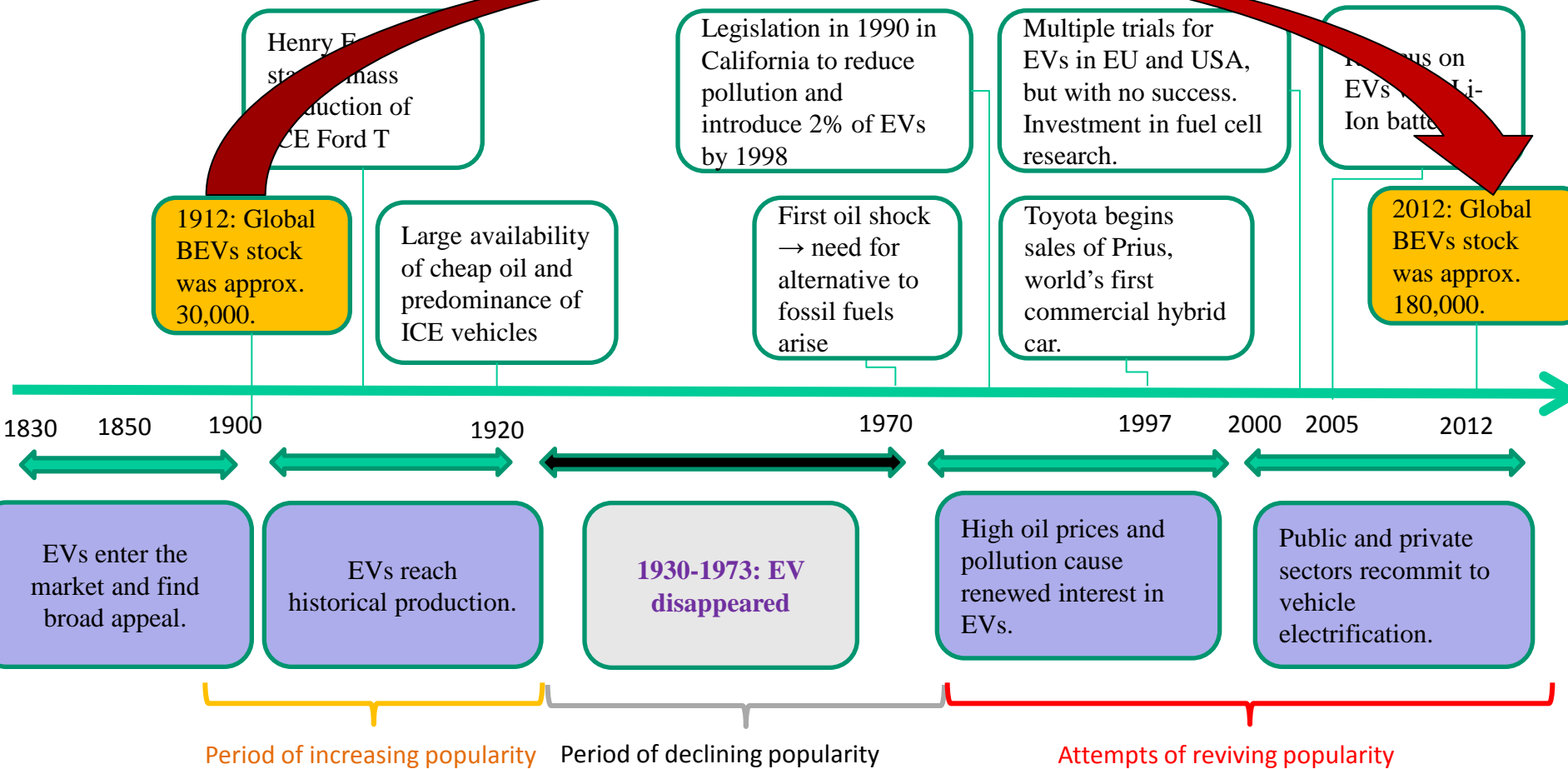
Paris Declaration on Electro-Mobility and Climate Change & Call to Action:

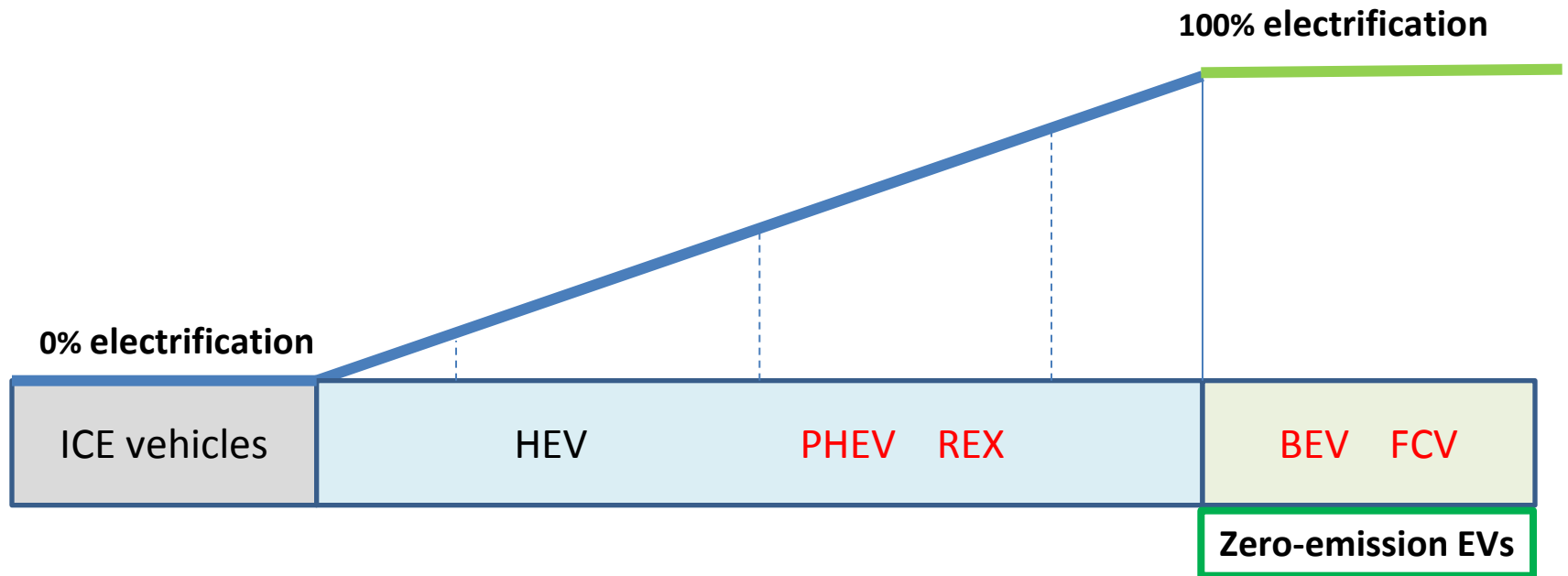
- more than 100 million EVs
- 400 million two and three-wheelers

Total final electricity consumption by sector (Mtoe)

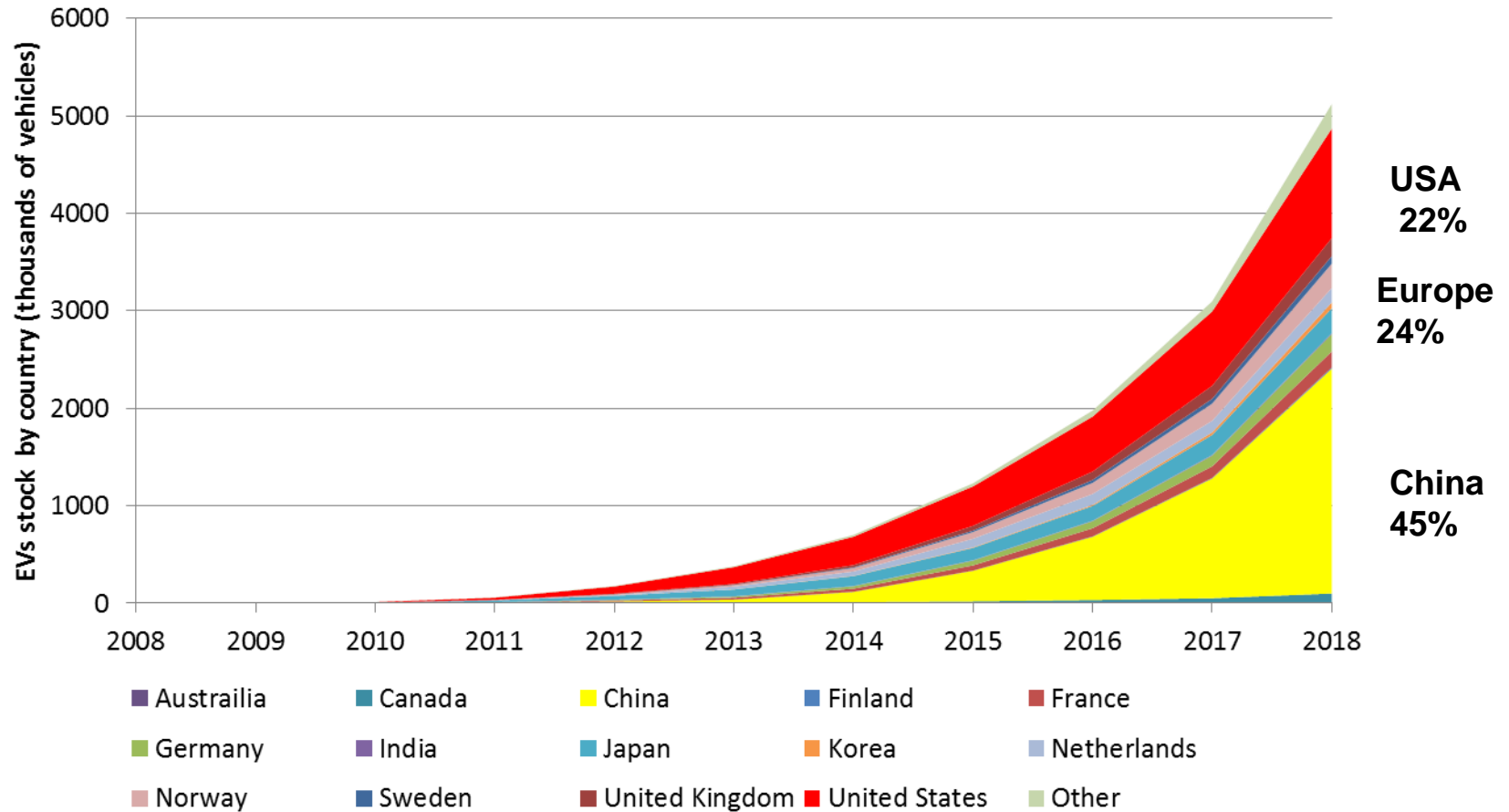


Electric vehicles





Level of electrification of electric vehicles



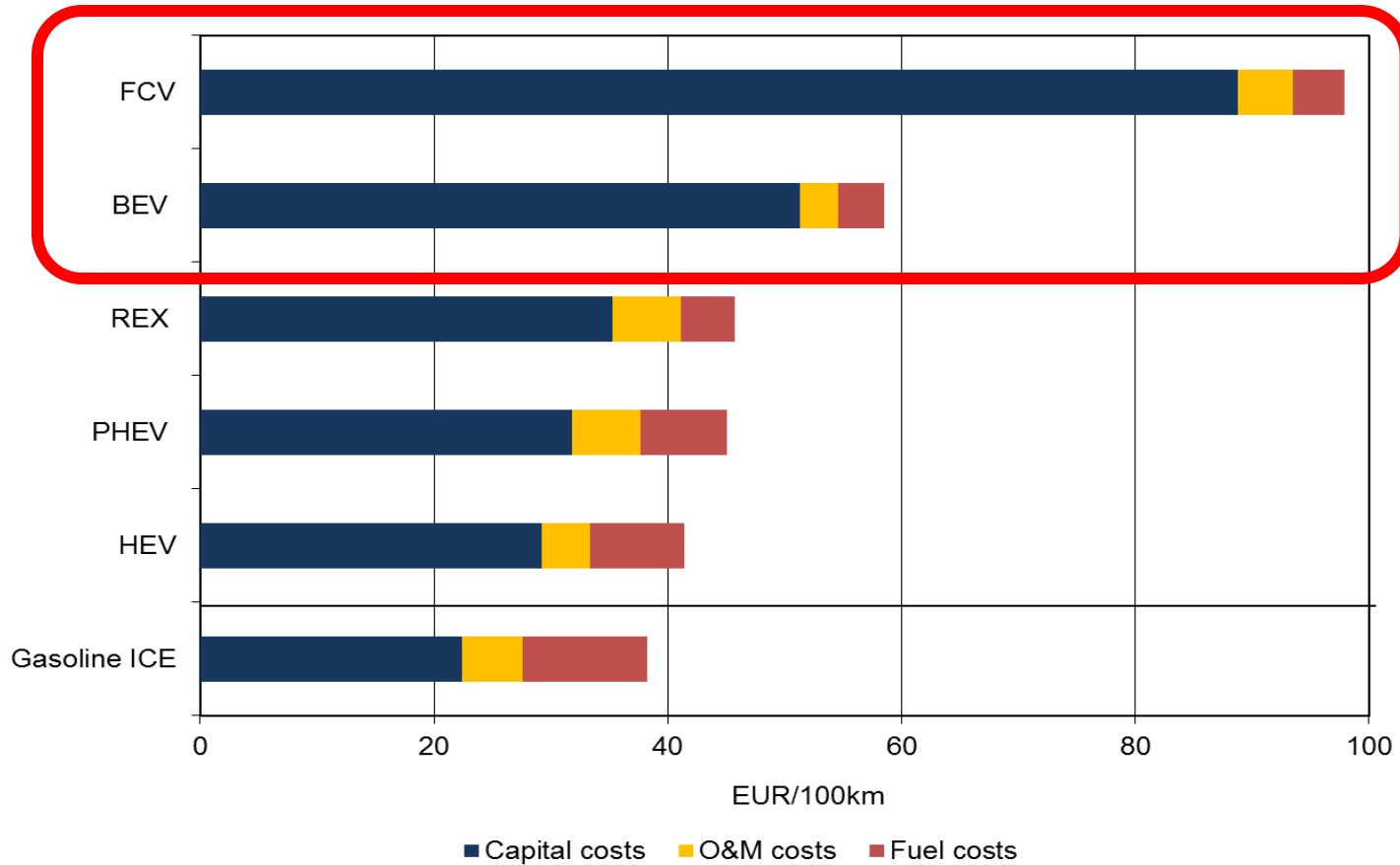
Development of the global stock of rechargeable EVs

Advantages

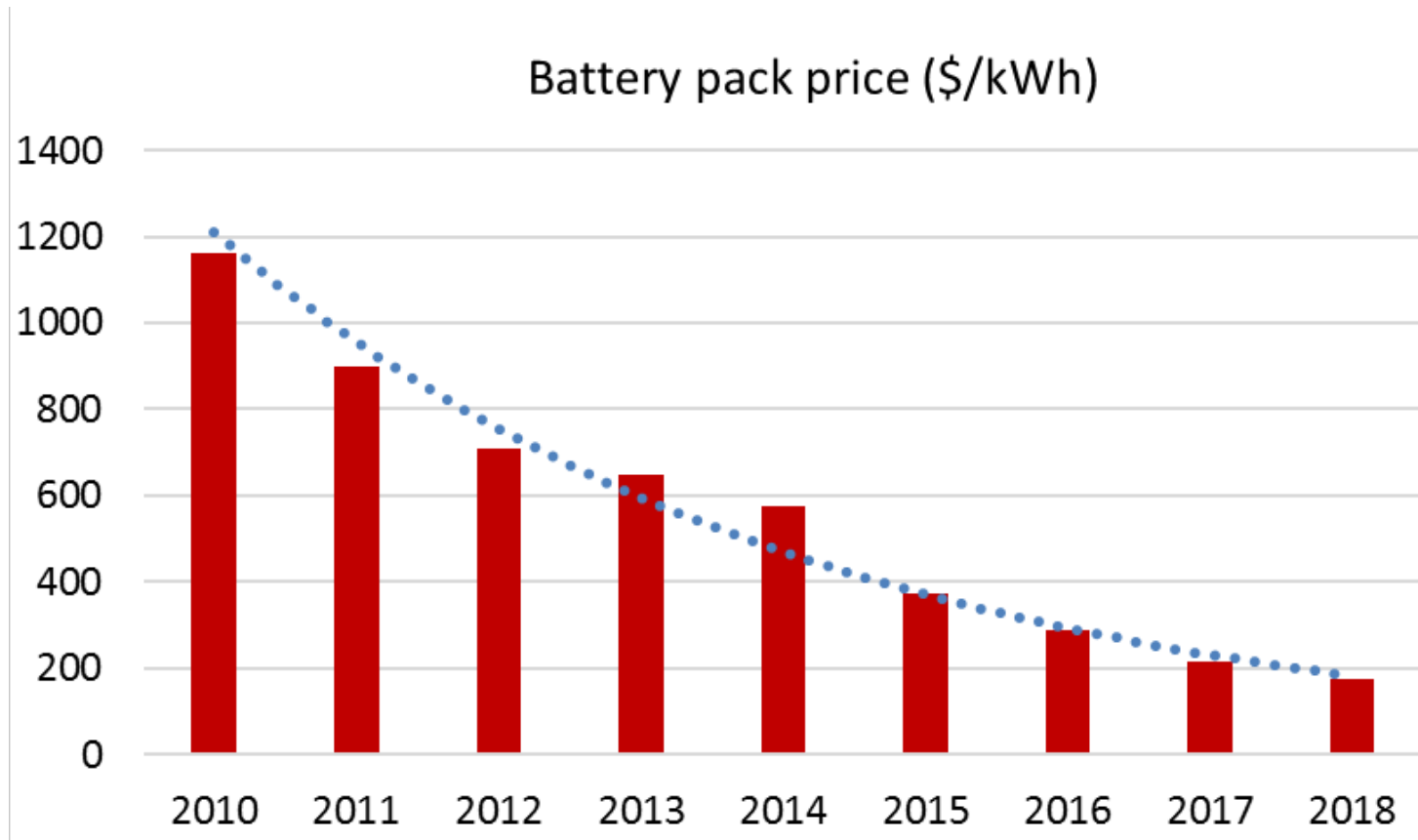
- ✓ Energy efficiency
- ✓ Energy security
- ✓ Air pollution
- ✓ Noise reduction

Disadvantages

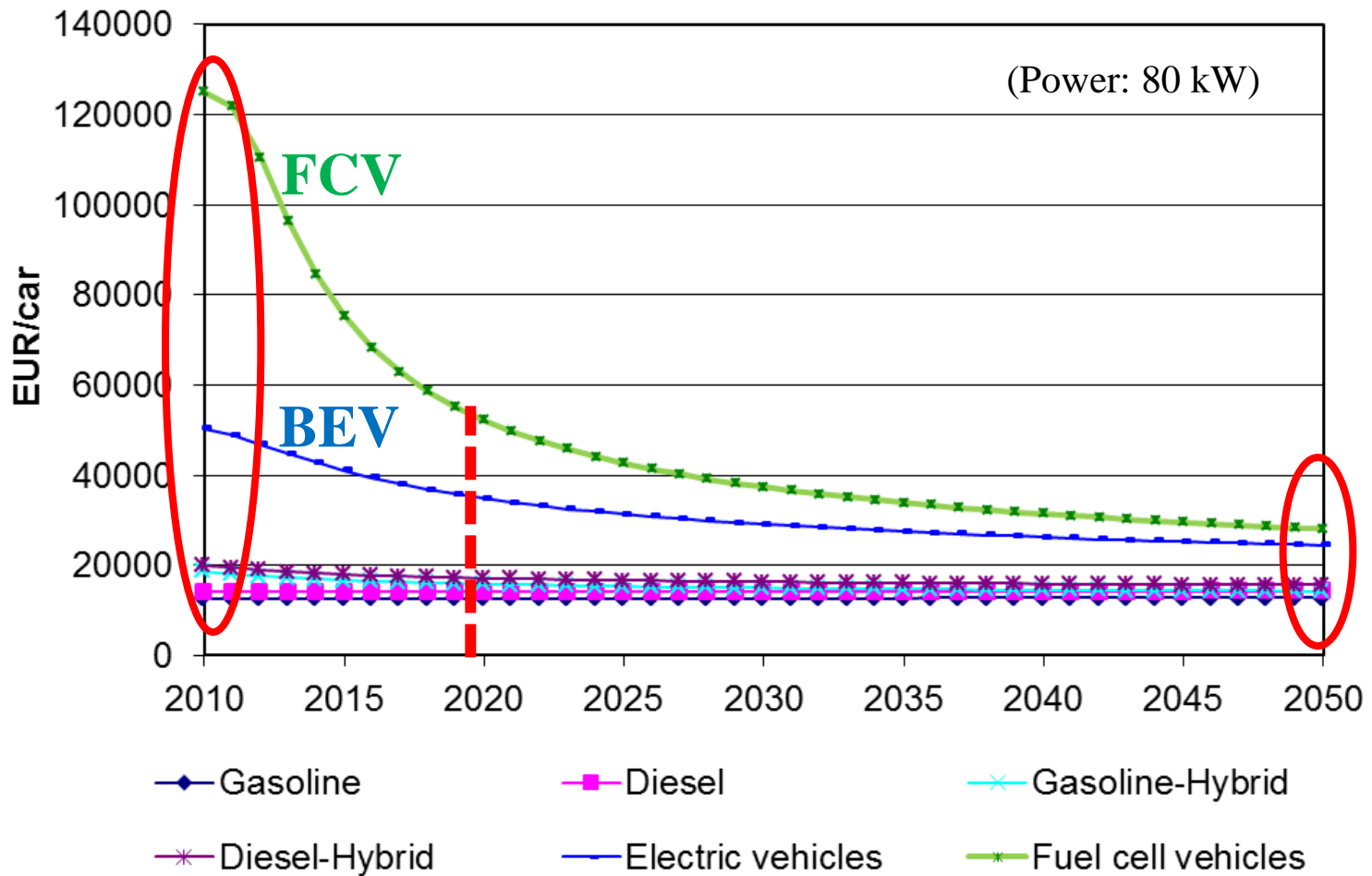
- Costs
- Driving range
- Charging time
- Charging infrastructure



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



Scenario for development of investment costs



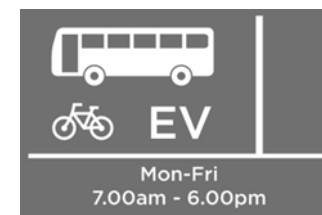
Monetary measures

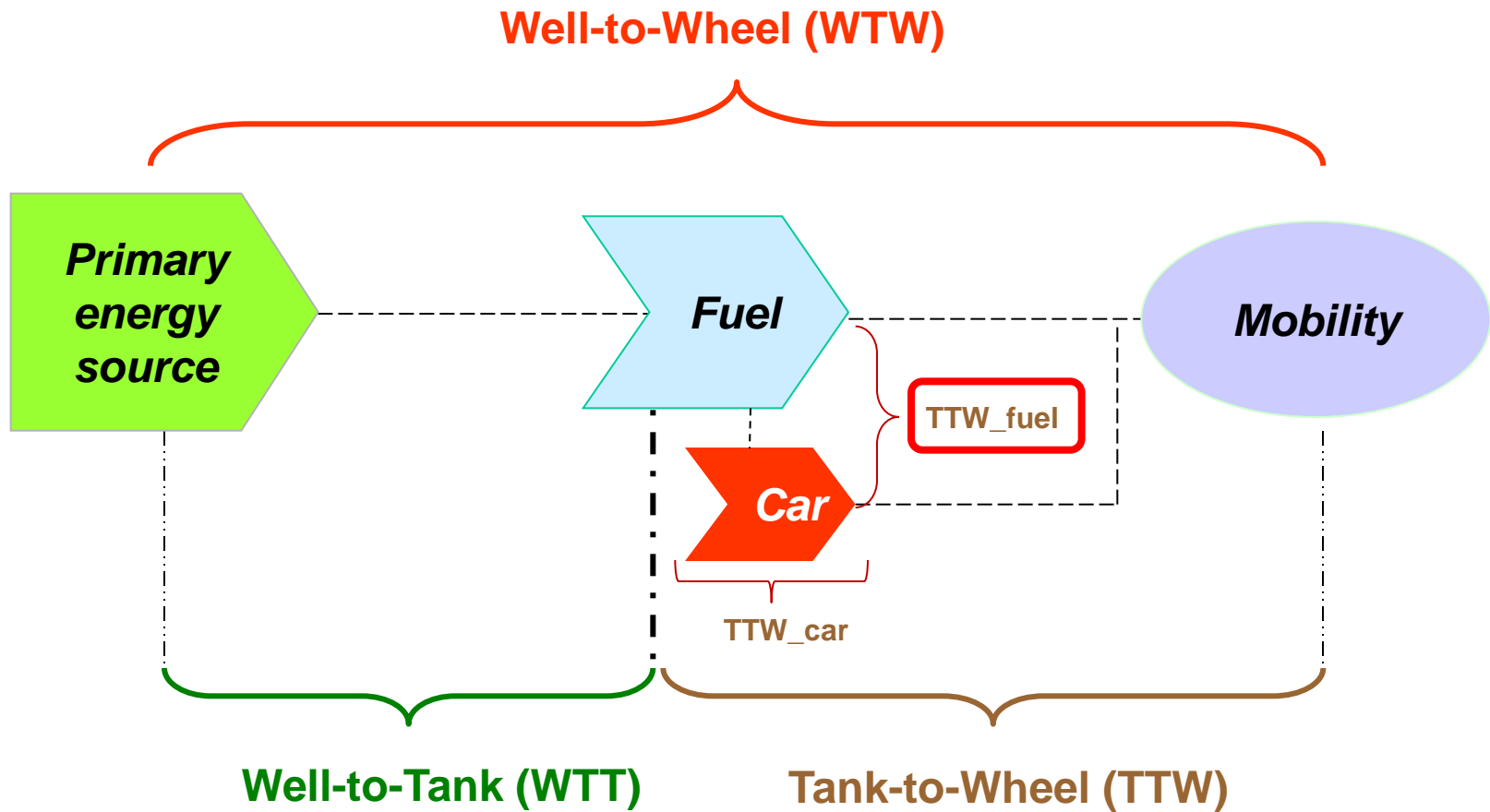
- road taxes
- annual circulation tax
- company car tax
- registration tax
- fuel consumption tax
- congestion charges

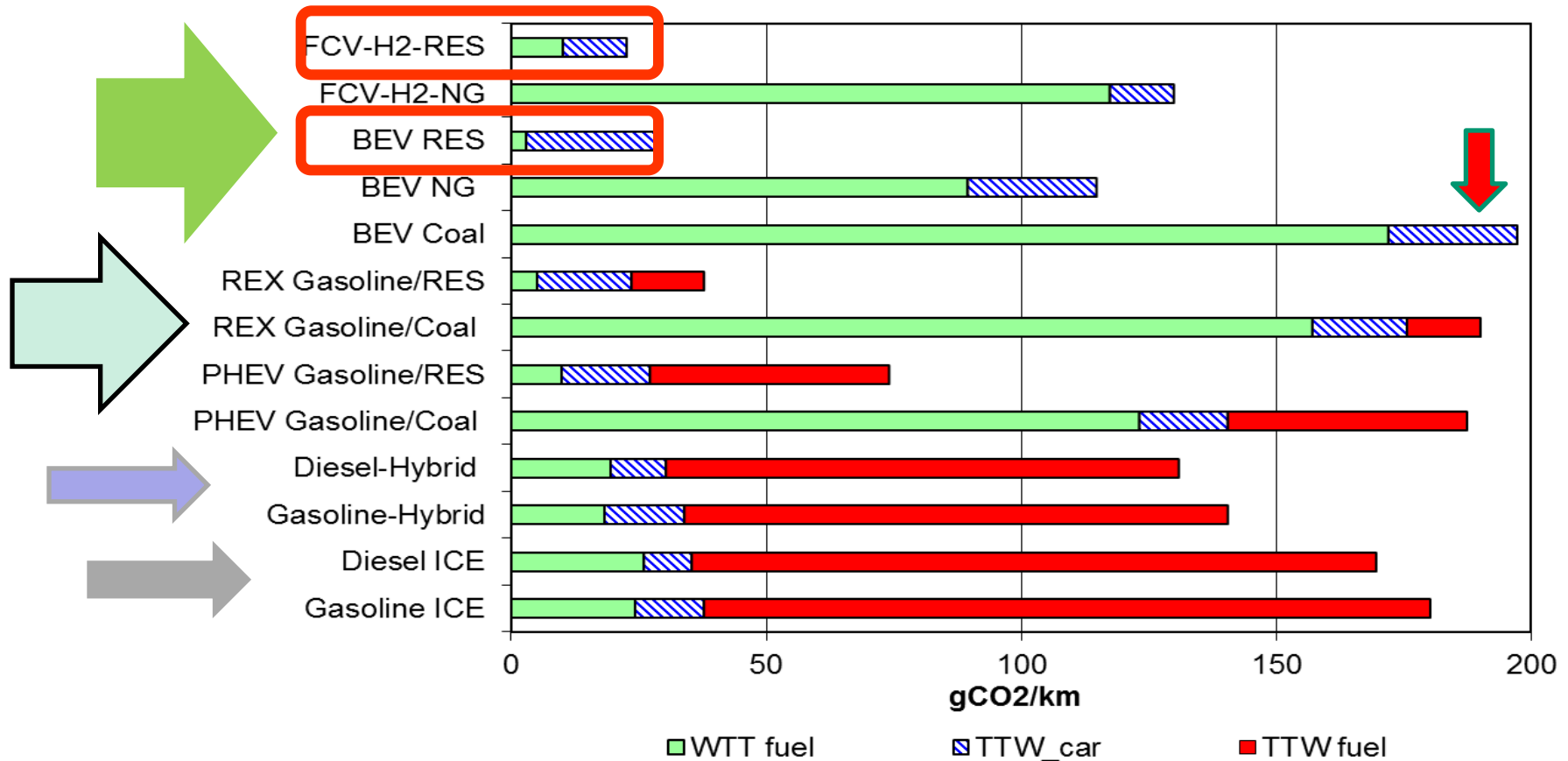


Non-monetary measures

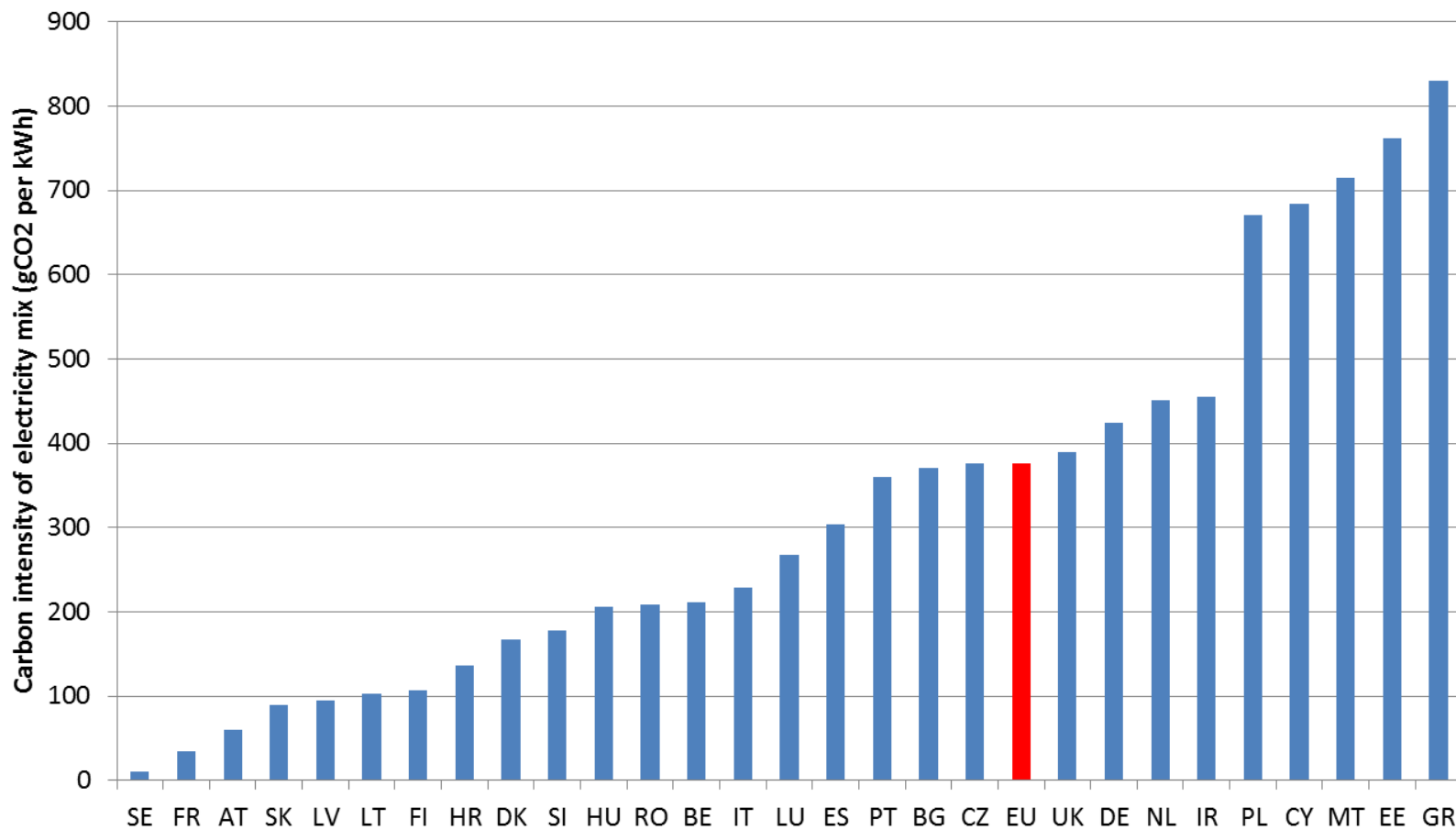
- free parking spaces
- possibility for EVs drivers to use bus lanes
- wide availability of charging stations
- permission for EVs to enter city centers and zero emission zones



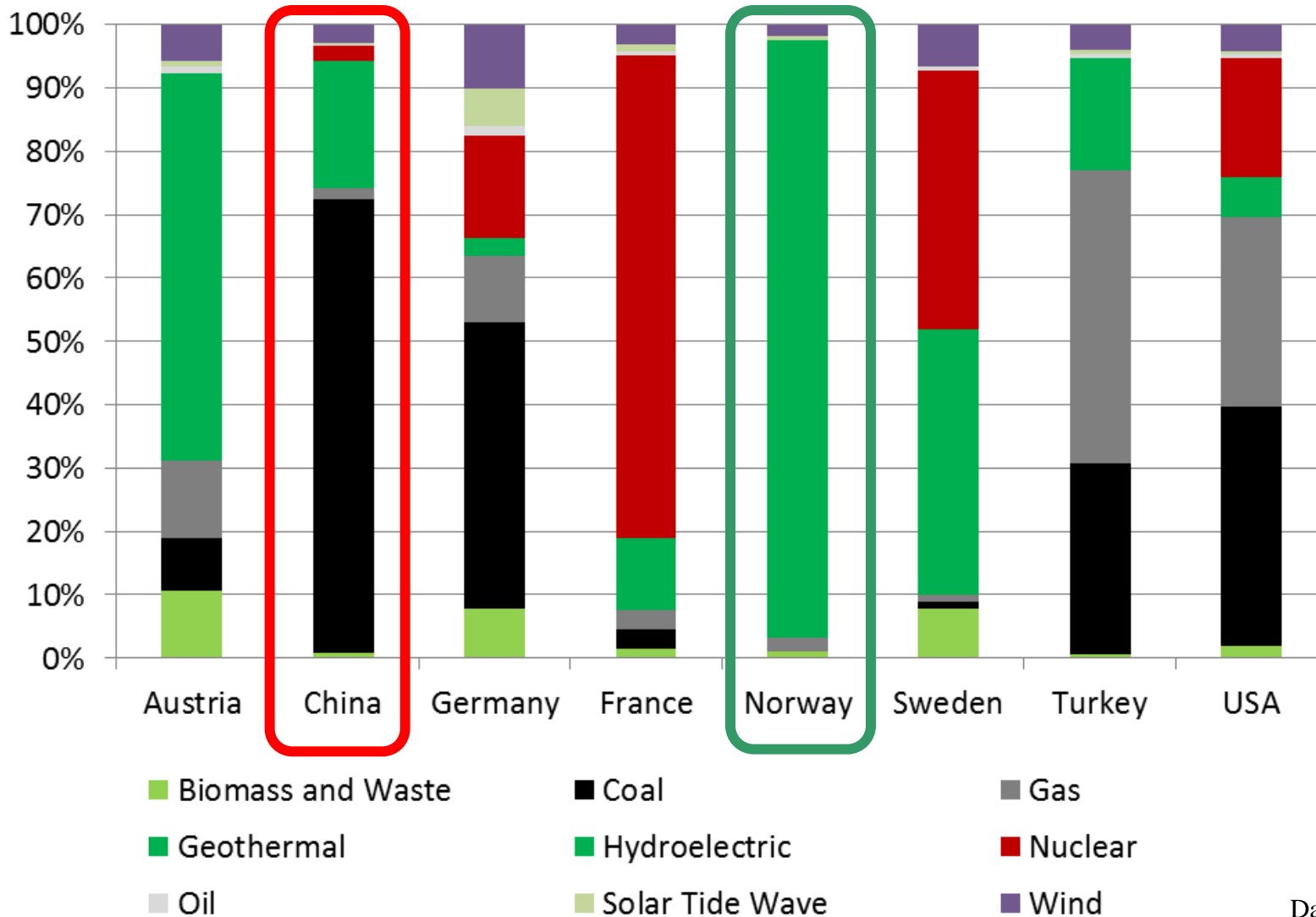


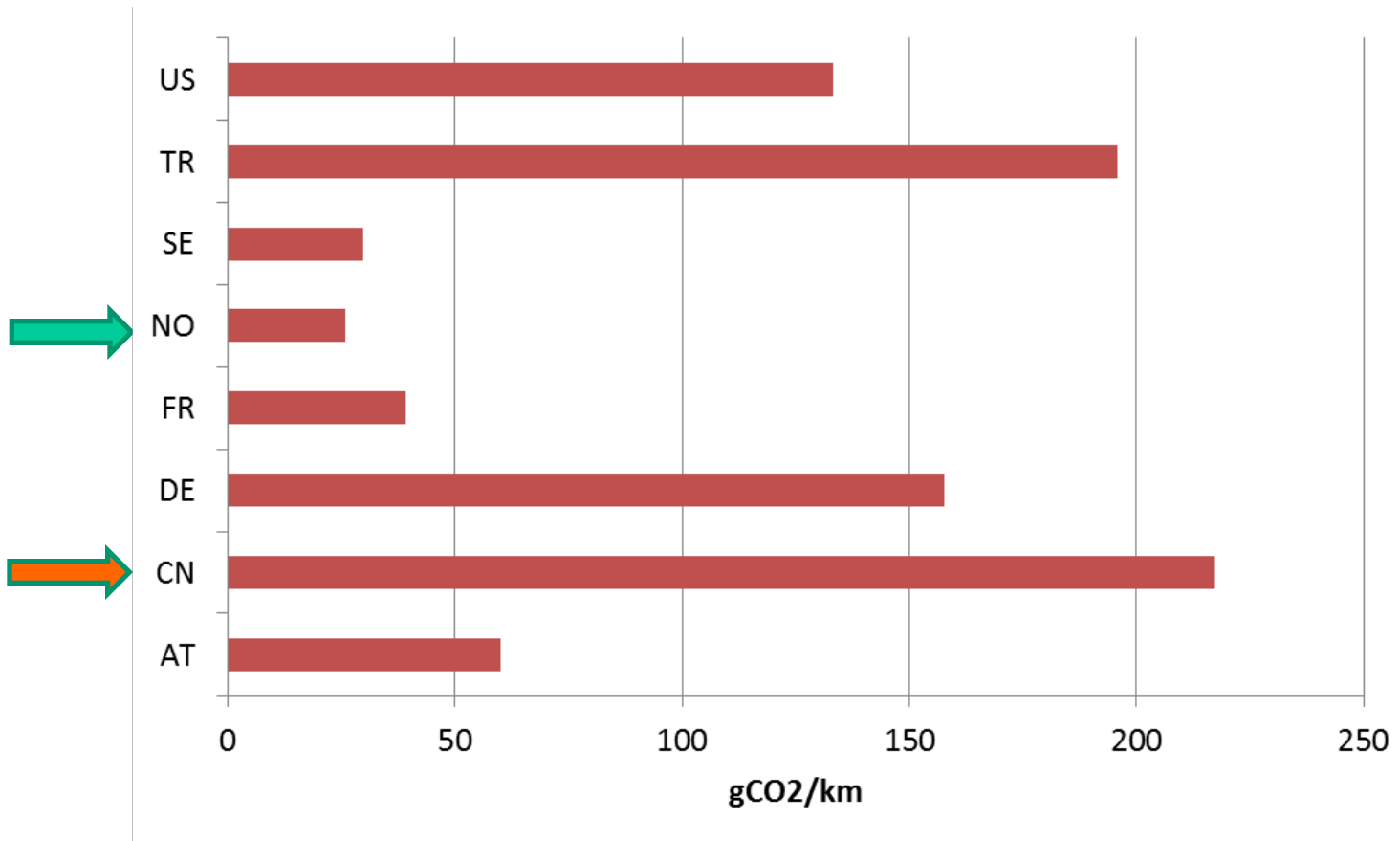


CO₂ emissions per km driven for various types of EV in comparison to conventional cars (power of car: 80kW)



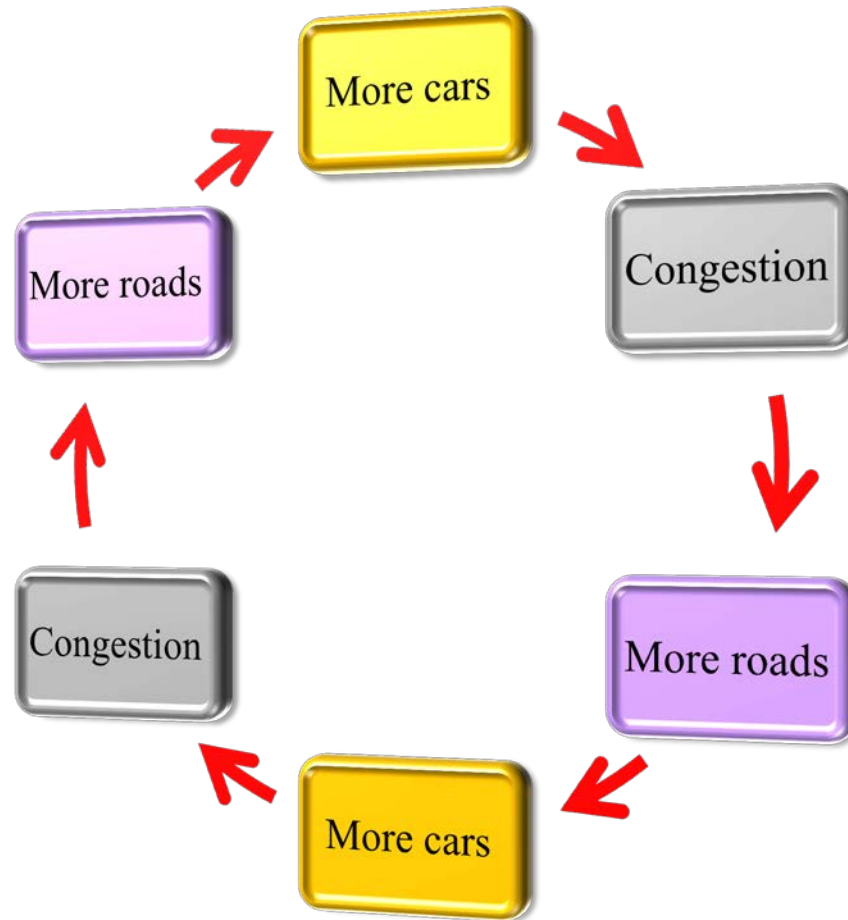
Electricity mix





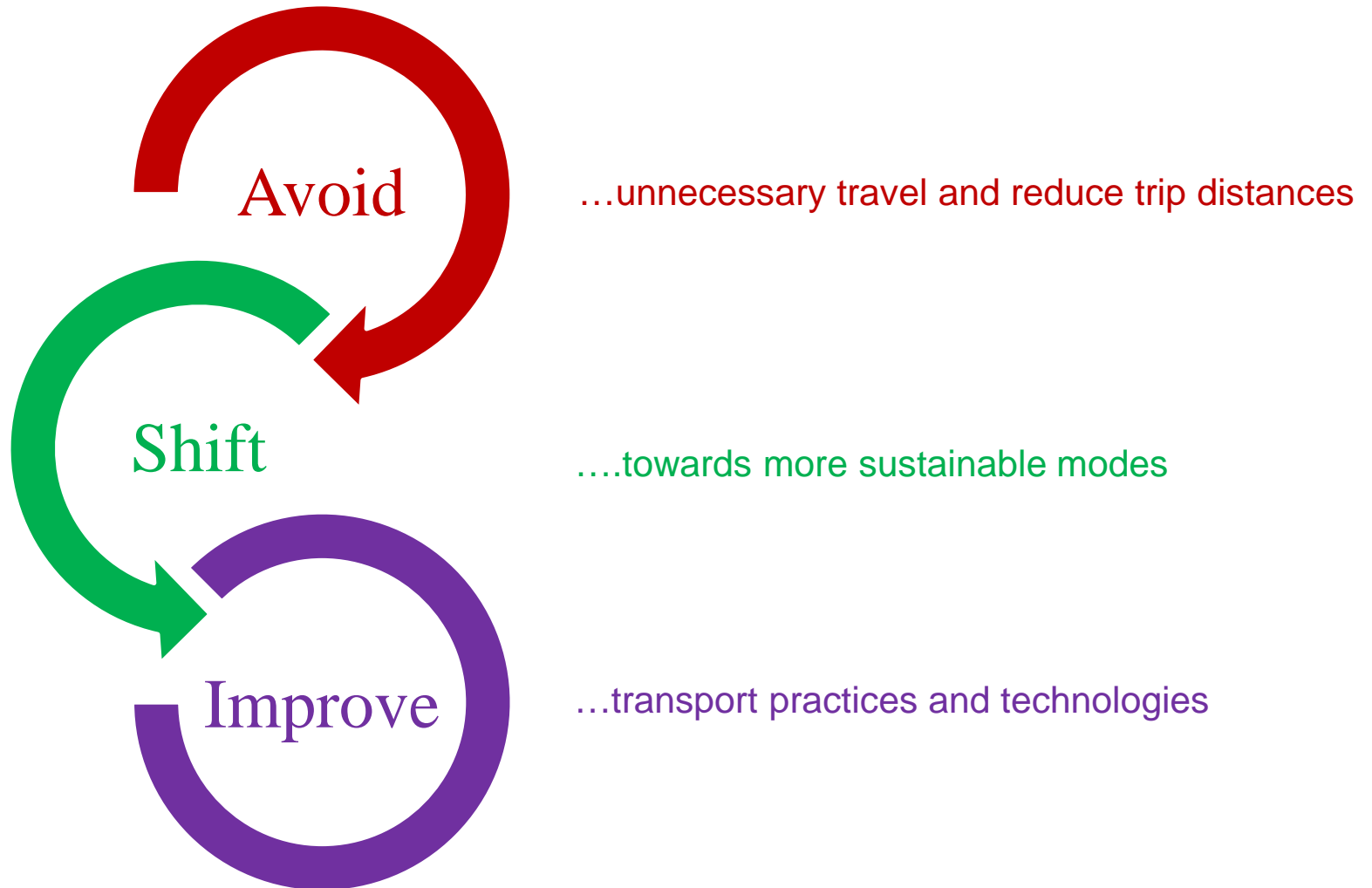
CO₂ emissions per km driven for BEVs powered by grid electricity in different countries

Car-oriented mobility





Car-oriented transport development



- EVs ...part of the solution
- New policy design...should ensure high environmental benefits of EVs.
- Full environmental benefit ...electricity from RES
- New mobility behavior

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Ajanovic A., Haas R. (2019). **Economic and Environmental Prospects of Battery Electric- and Fuel Cell Vehicles: A Review**. Fuel Cells. Wiley Online Library. DOI: 10.1002/fuce.201800171

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Ajanovic A., Haas R. (2018). **Economic prospects and policy framework for hydrogen as fuel in the transport sector**. Energy Policy 123 (2018) 280–288. <https://doi.org/10.1016/j.enpol.2018.08.063>

Ajanovic A., Haas R. (2018). **Electric vehicles: solution or new problem?**. Environ Dev Sustain (2018). <https://doi.org/10.1007/s10668-018-0190-3>

Ajanovic A. (2015). **The future of electric vehicles: prospects and impediments**. WIREs Energy Environment 2015. doi: 10.1002/wene.160, 2015