

***Sustainable mobility:  
Role and challenges of the European automotive  
sector  
Electrification of mobility***

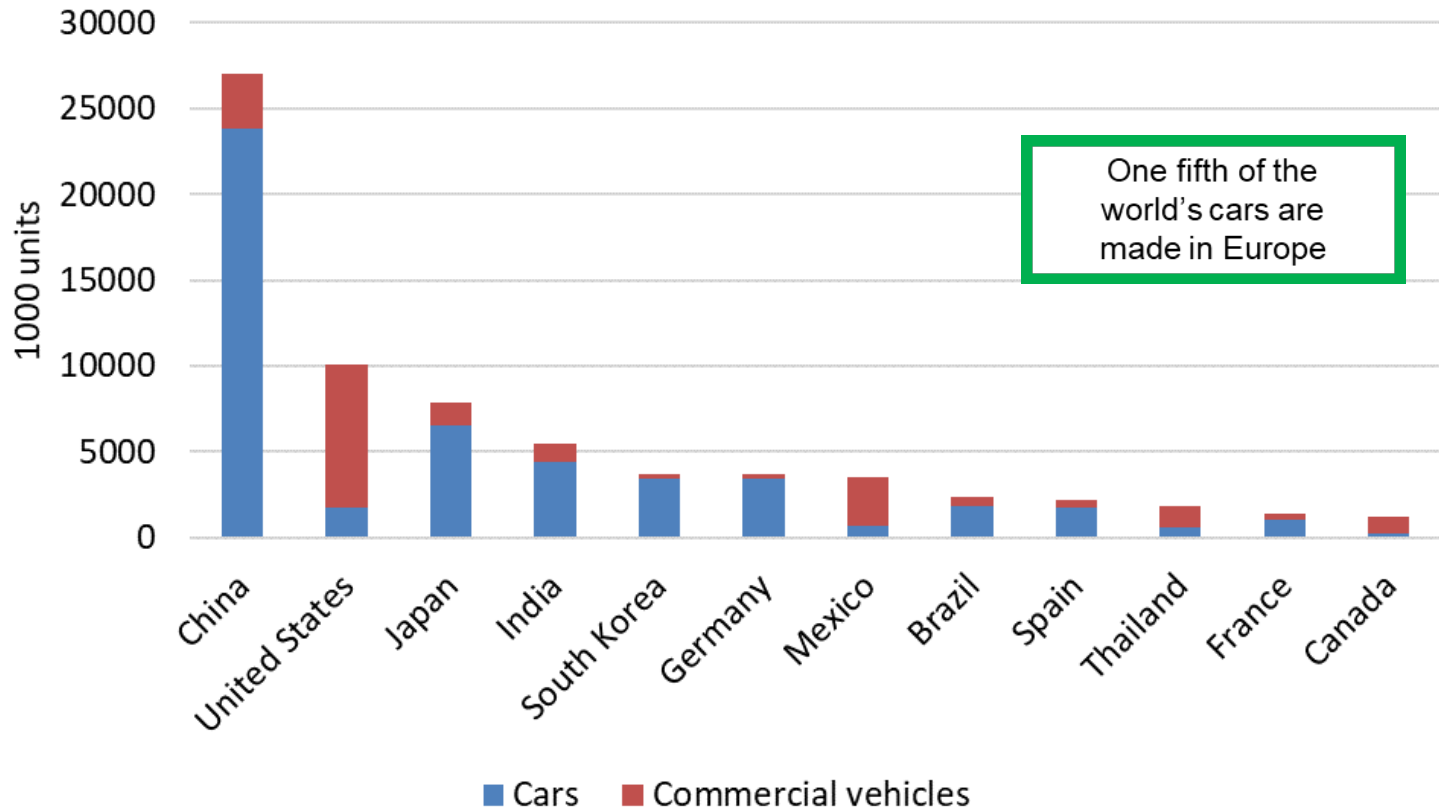
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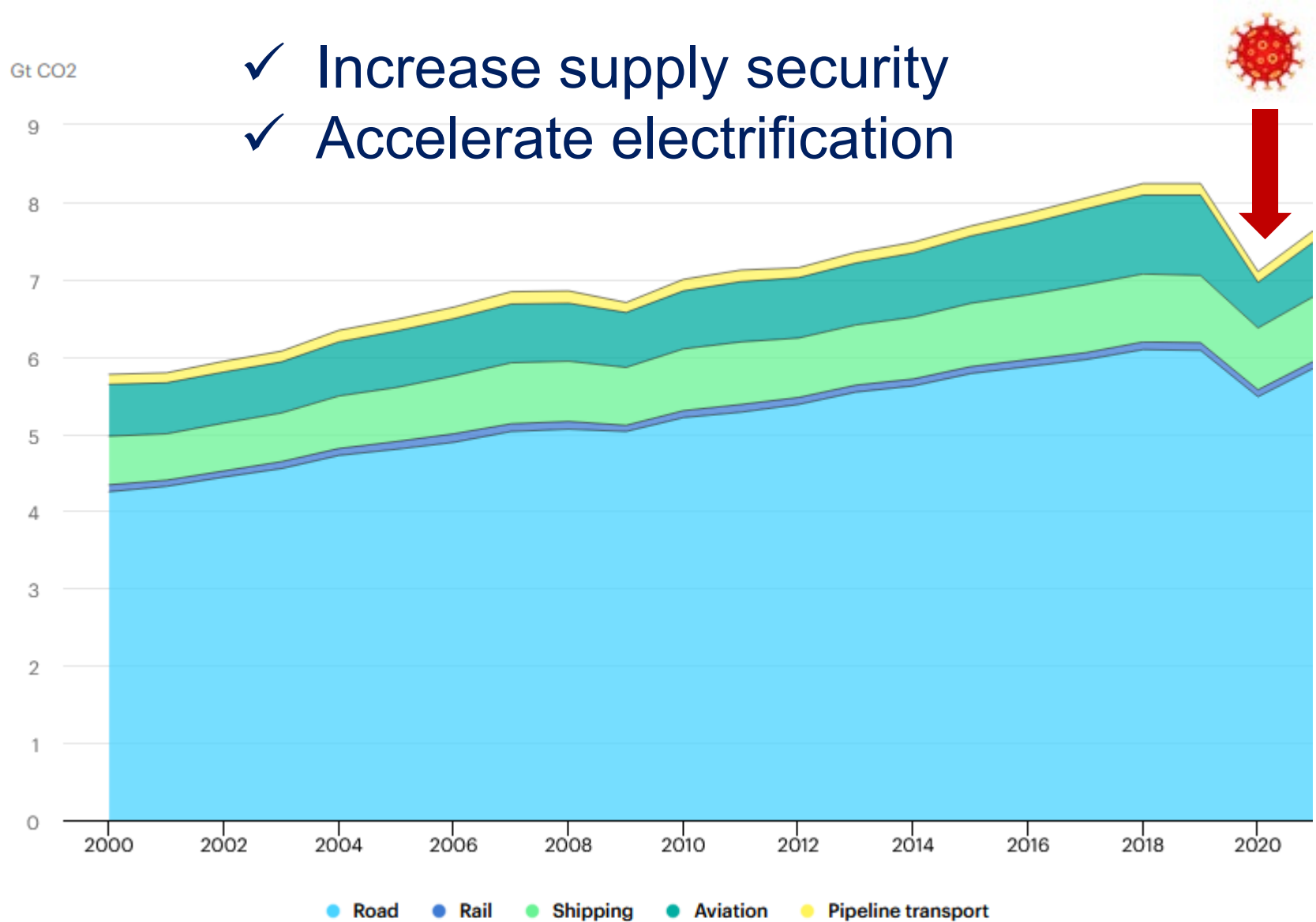
**IAEE**  
**26 July 2023, Milan**

- Introduction
- Recent developments and challenges
- COVID crisis
- Policy framework
- Electrification of mobility
- Conclusions

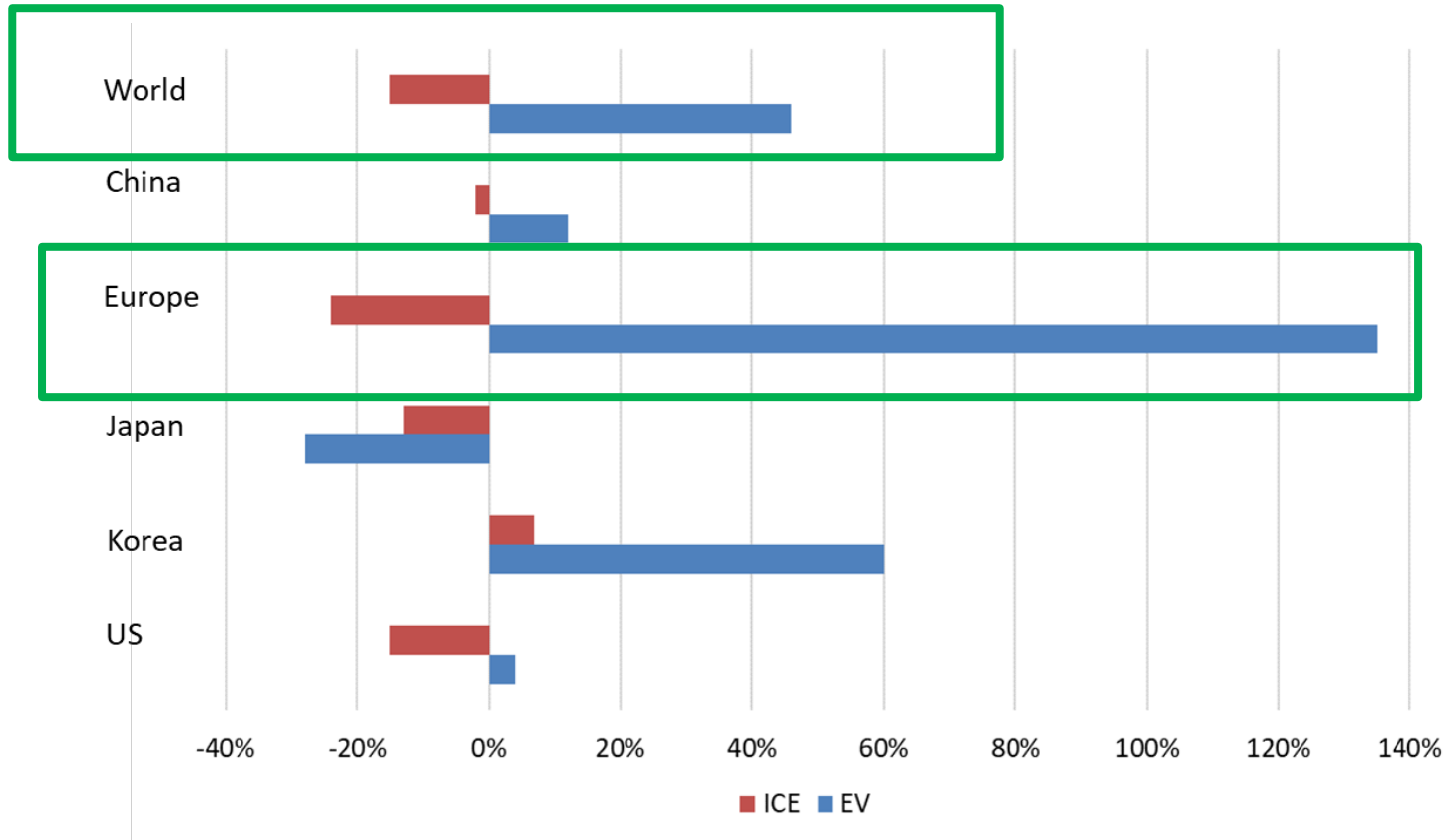
- ...a fundamental human right (UN Universal Declaration of Human Rights as “freedom of movement”)
- Road transport is a critical component of the UN 2030 Global Sustainable Development Agenda
- ...a urgent need to shift into a sustainable and resilient path
- ...clean, green technology, innovations in vehicles, reducing the environmental impact of transport by cutting emissions

# Leading car manufacturing countries worldwide 2022



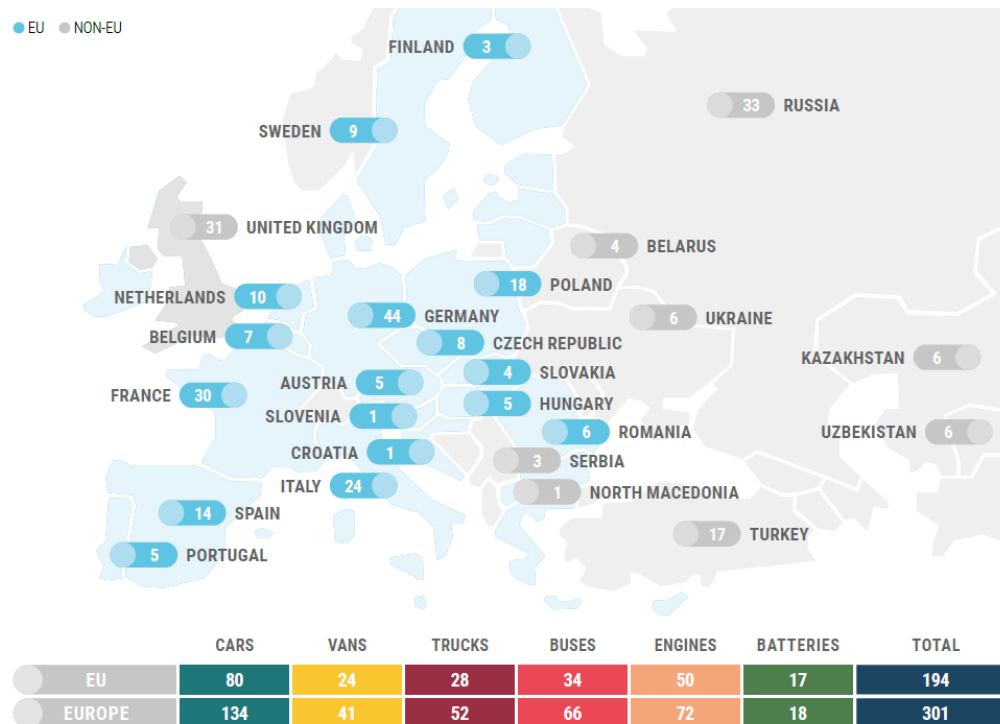


- ✓ Increase supply security
- ✓ Accelerate electrification

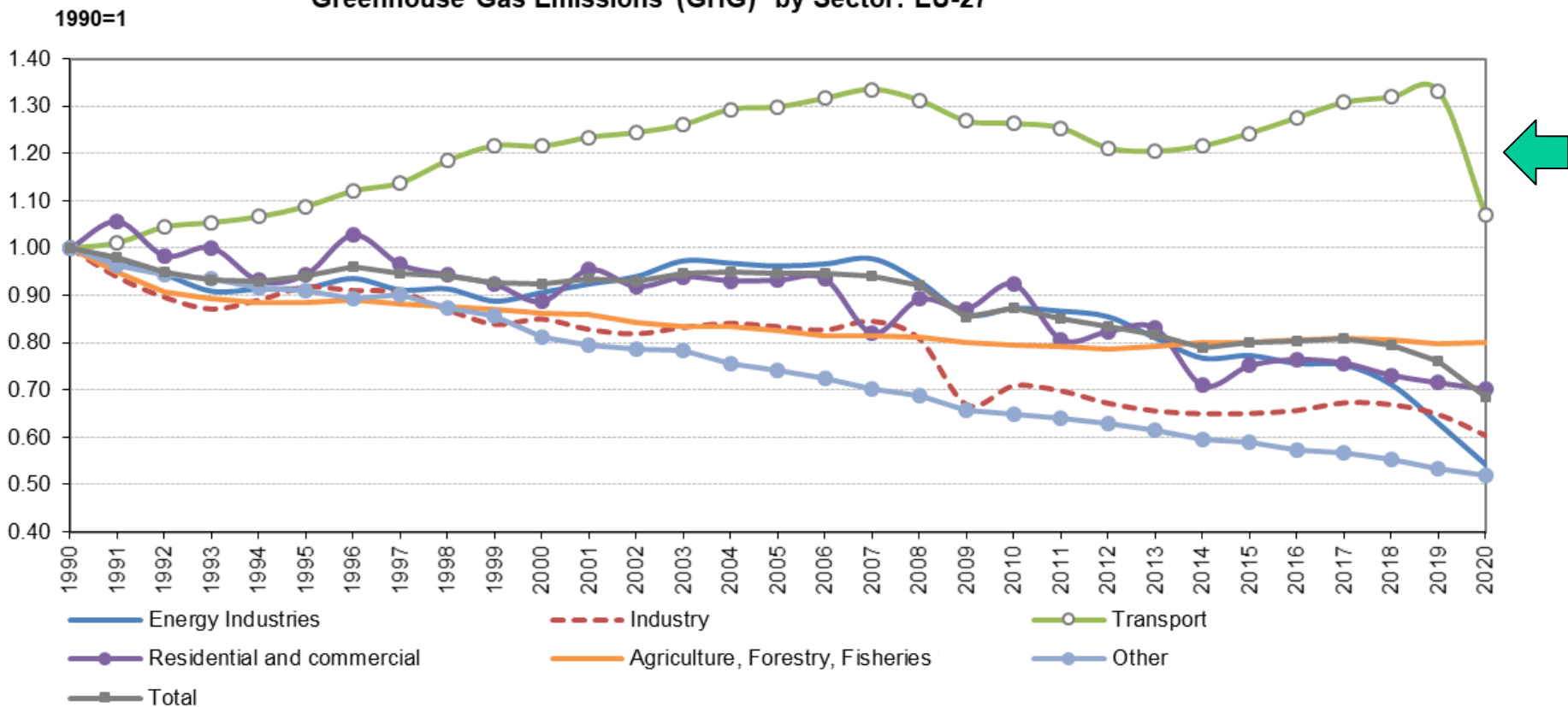


Increases and decreases in total car- and electric car sales in selected countries/regions in 2020 in relation to 2019

- Important contributor to the EU economy
- > 6% of total EU employment is linked to the automotive sector ...12.7 million jobs
- > 190 automobile factories operate in the EU



**Greenhouse Gas Emissions (GHG)\* by Sector: EU-27**





EU - the first climate-neutral continent by 2050

## European Green Deal

### 2030 climate & energy framework

14%

### Sustainable and Smart Mobility Strategy

at least 30 million zero-emission cars will be in operation on European roads

nearly all cars, vans, buses as well as new heavy-duty vehicles will be zero-emission.

2010

2020

2030

2050

**ICE -50% in city**

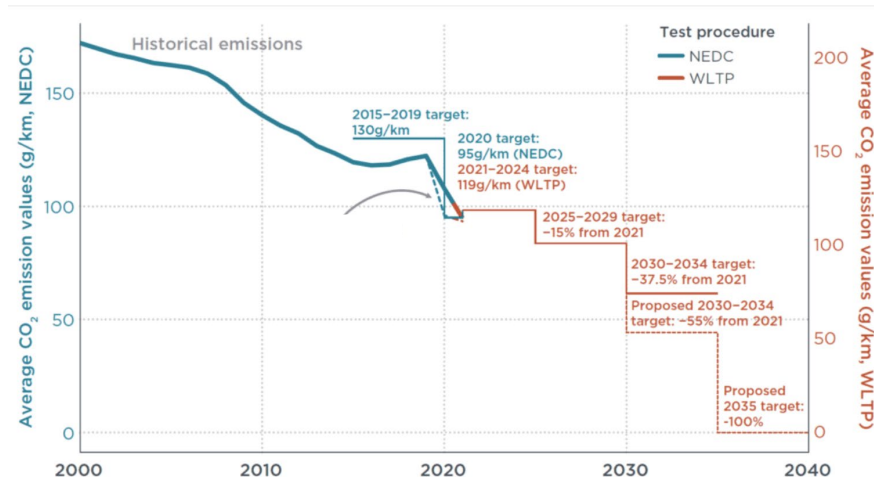
20% GHG (2008)

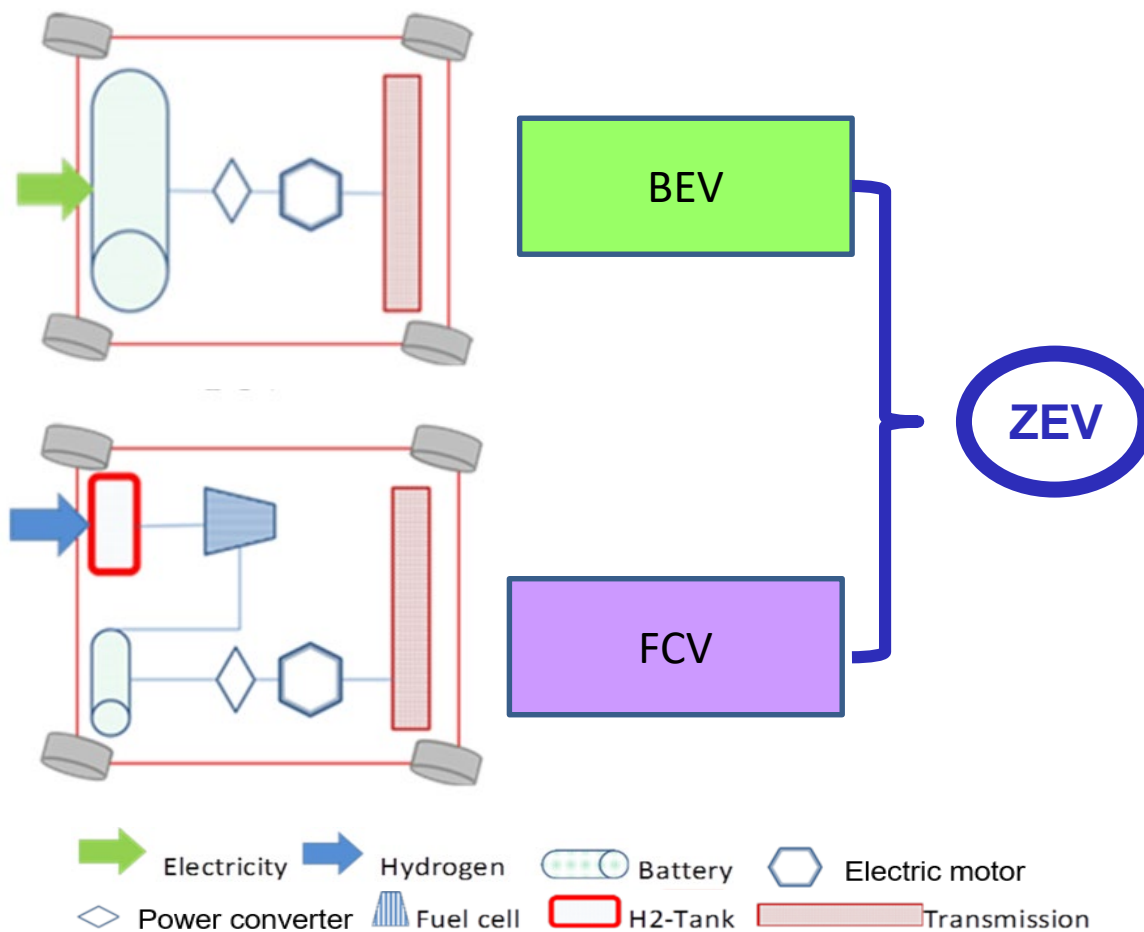
**No ICE in city**

60% GHG (1990)

**Transport White Paper**

**Announced 100% ZEV sales targets and bans on ICE vehicle sales**





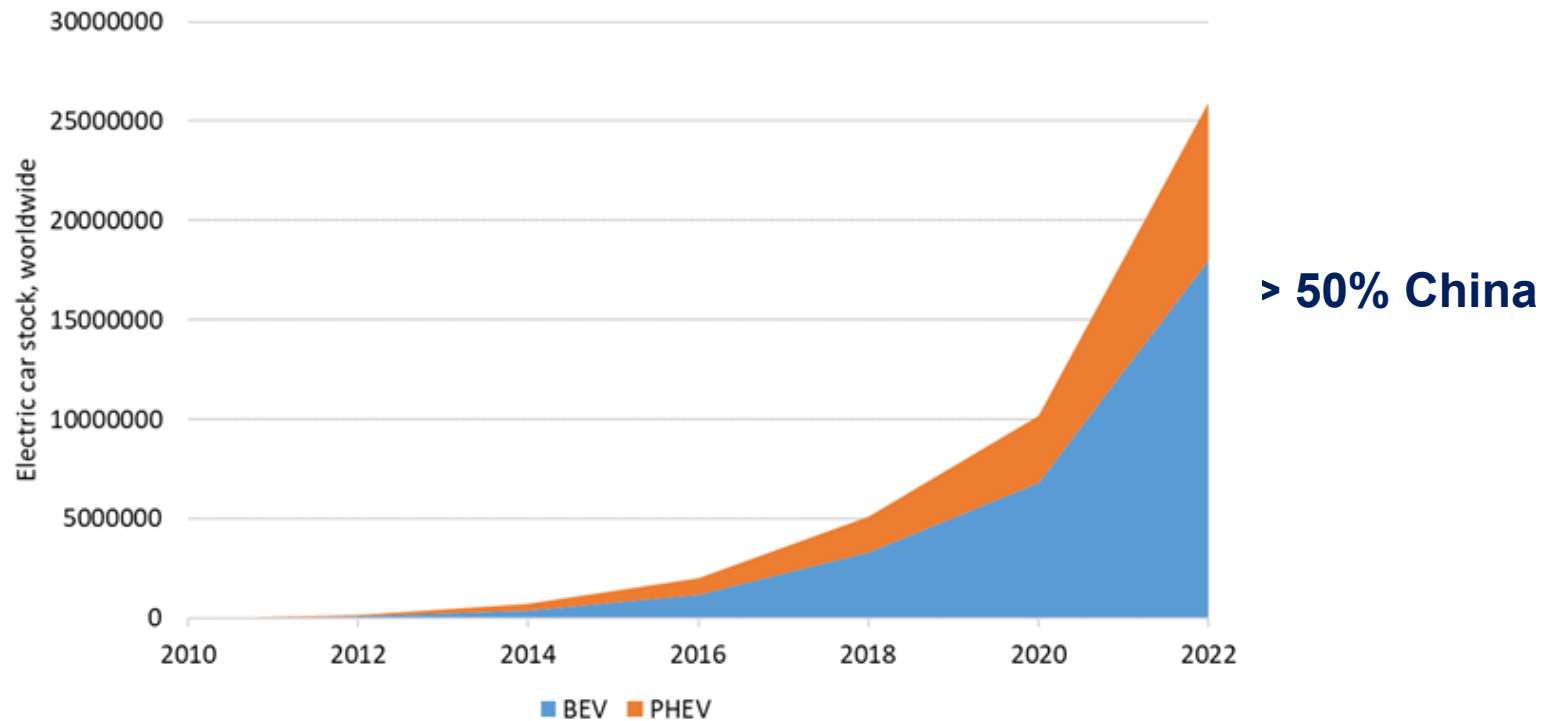
## Advantages

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

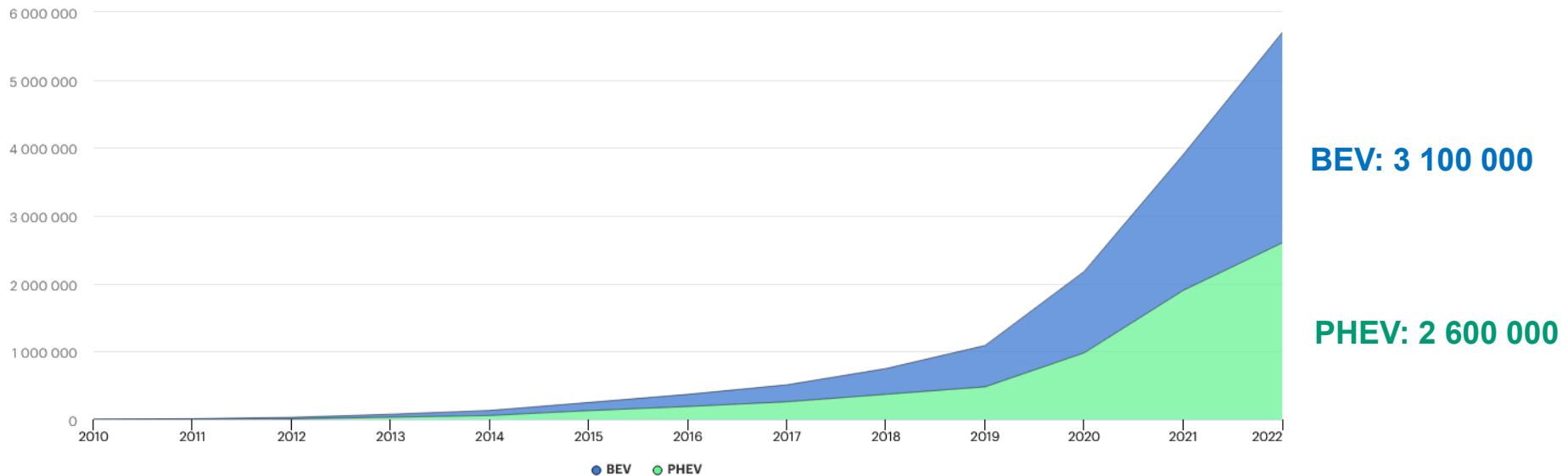
## Disadvantages

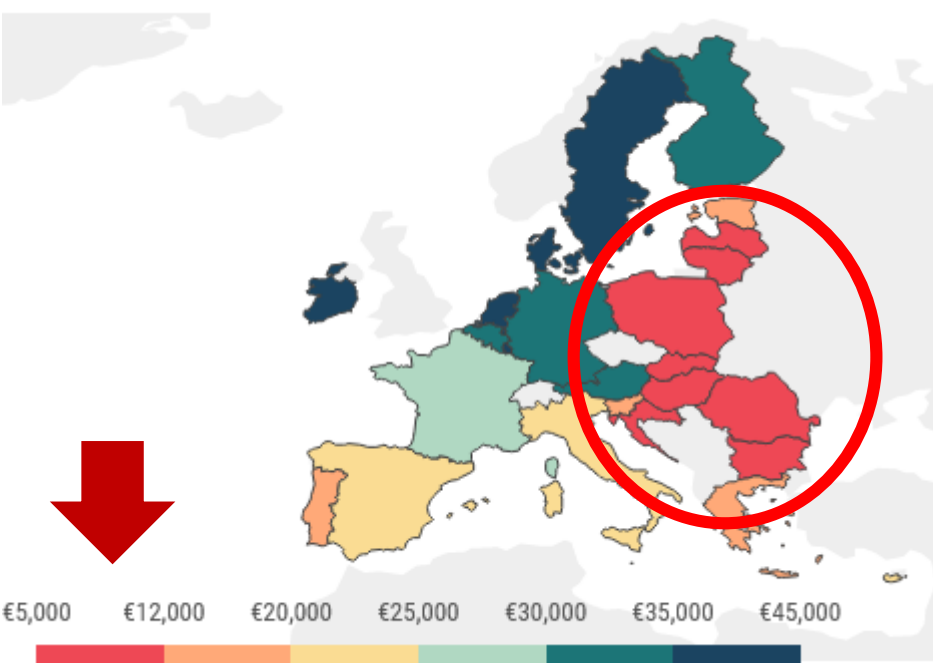
- Costs
- Driving range
- Charging time
- Charging infrastructure

Over 26 million electric cars were on the road in 2022

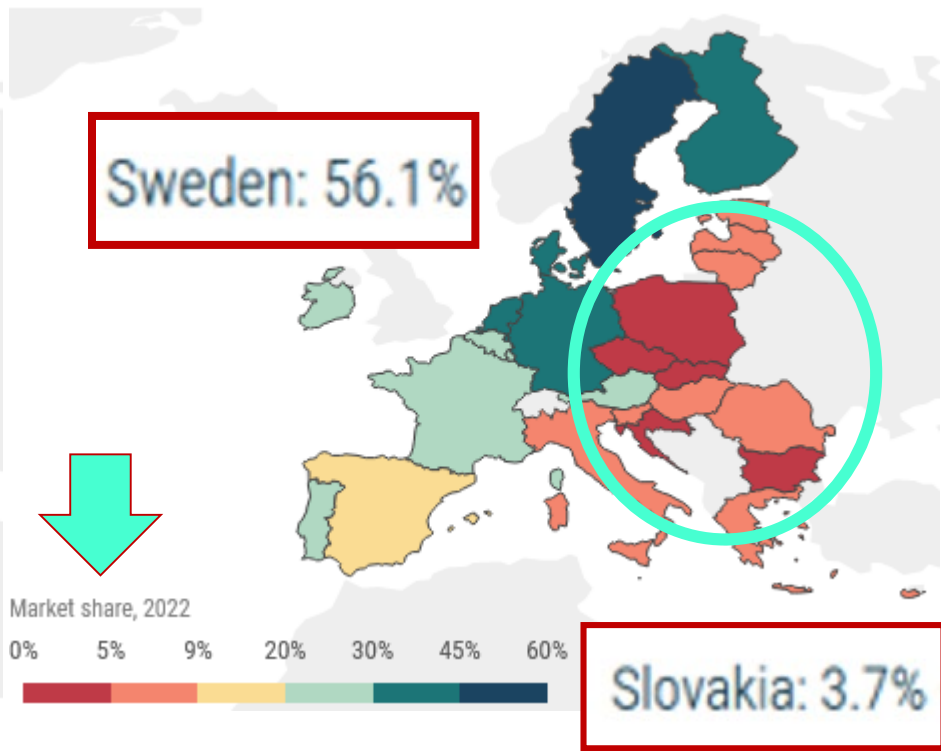


1% of all cars on EU roads are electrically-chargeable





Annual net income in the EU

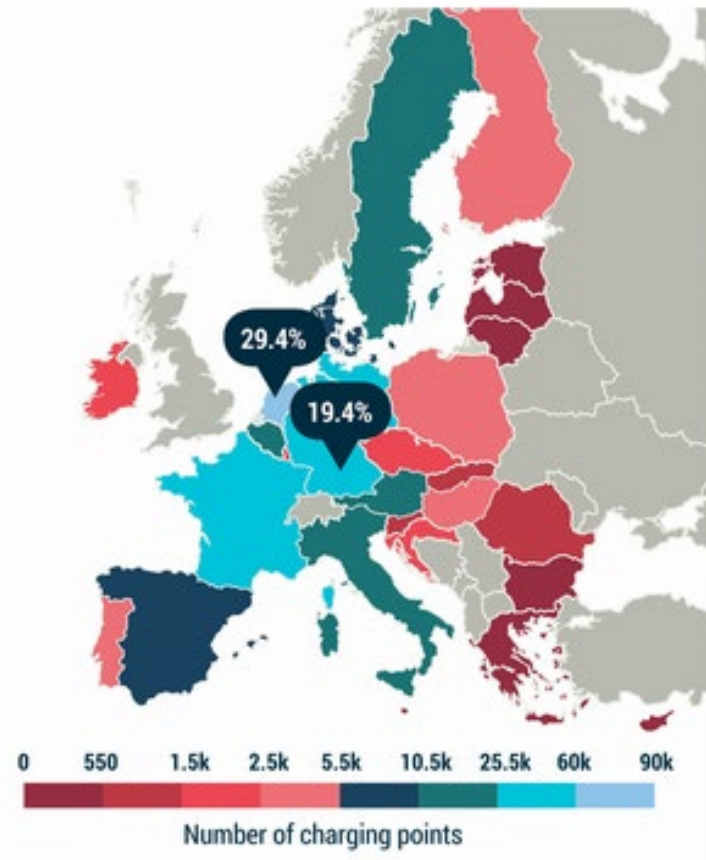


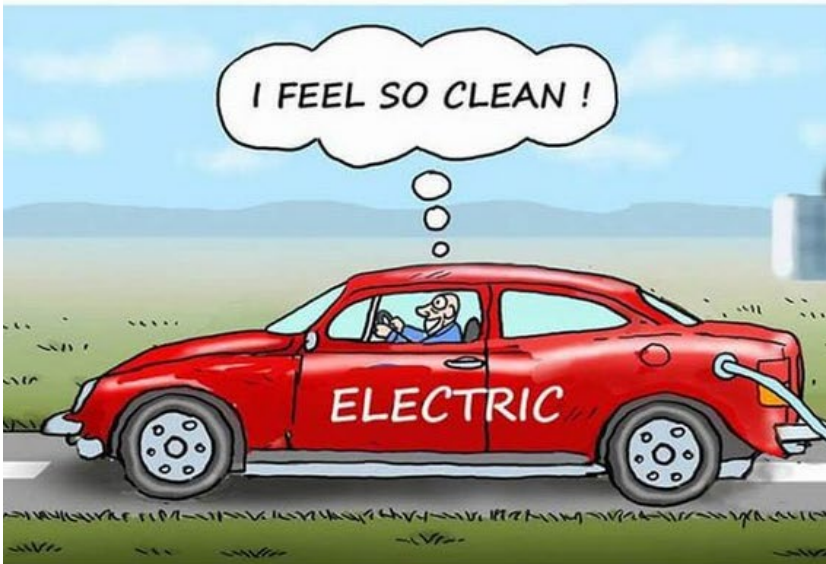
Market share of electric vehicles

Half of all chargers in EU concentrated in just two countries...  
These two countries make up less than 10% of the entire EU surface area !

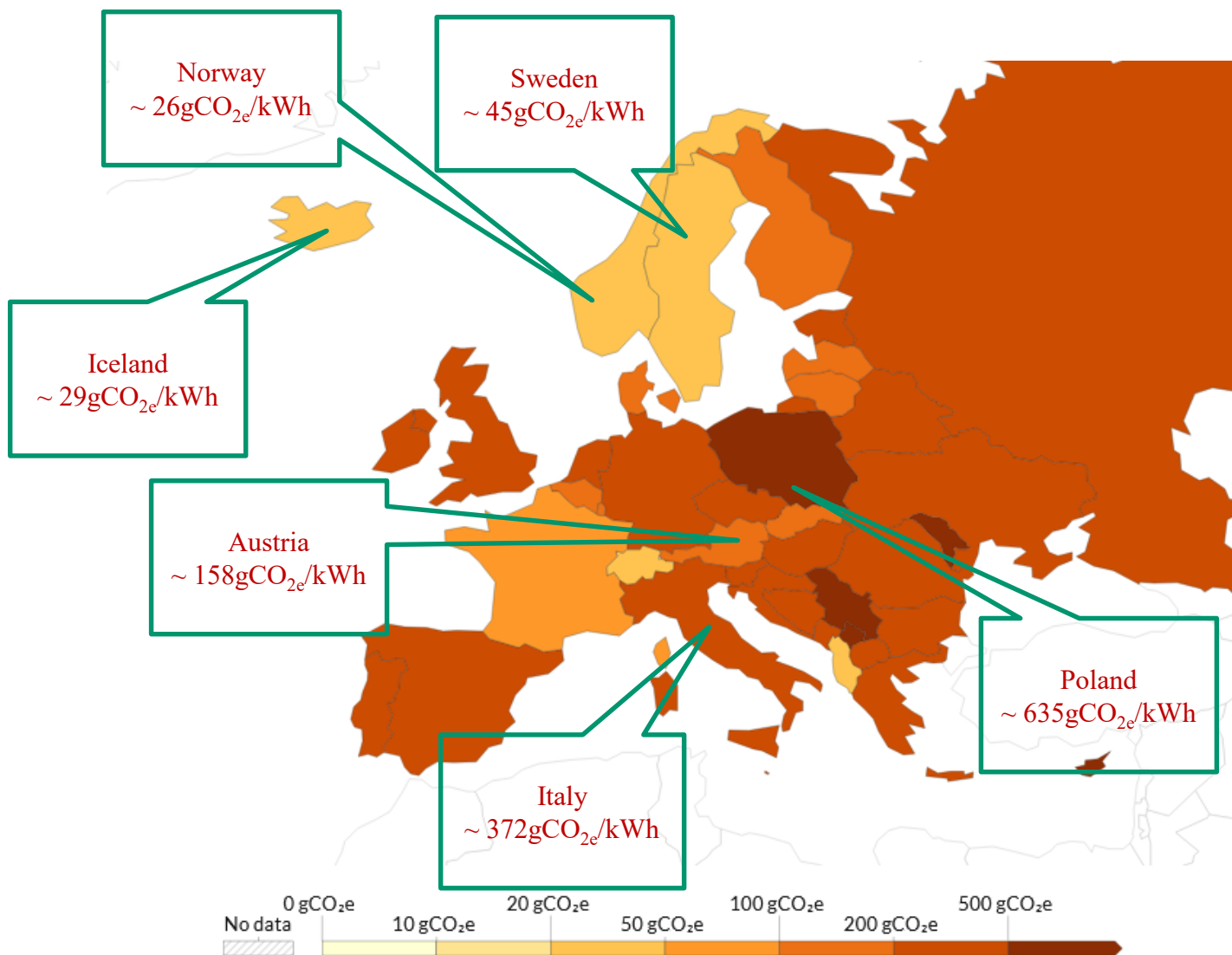
Some 50% of all charging points:  
Concentrated in just 2 EU countries

29.4% Netherlands      19.4% Germany



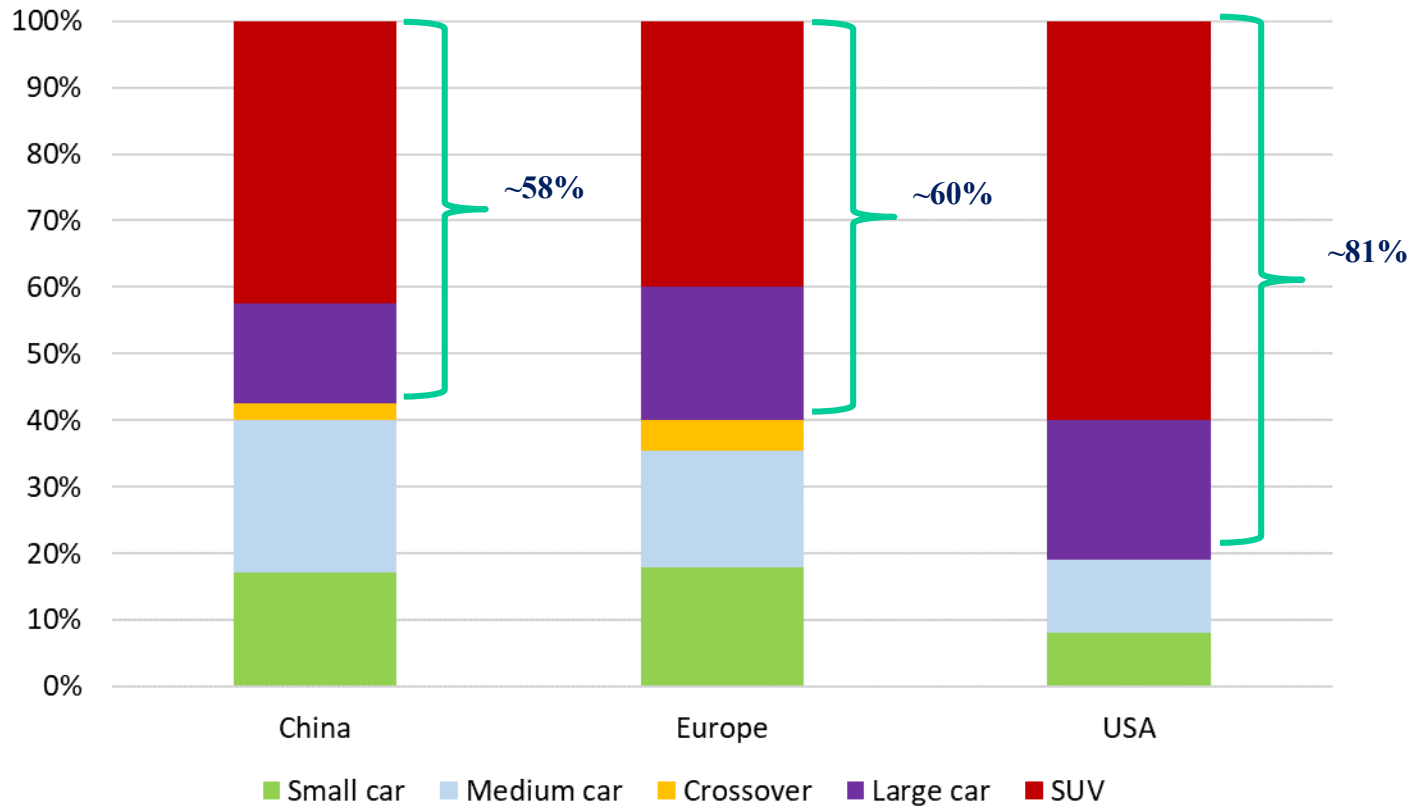


Artist: Marian Kamensky

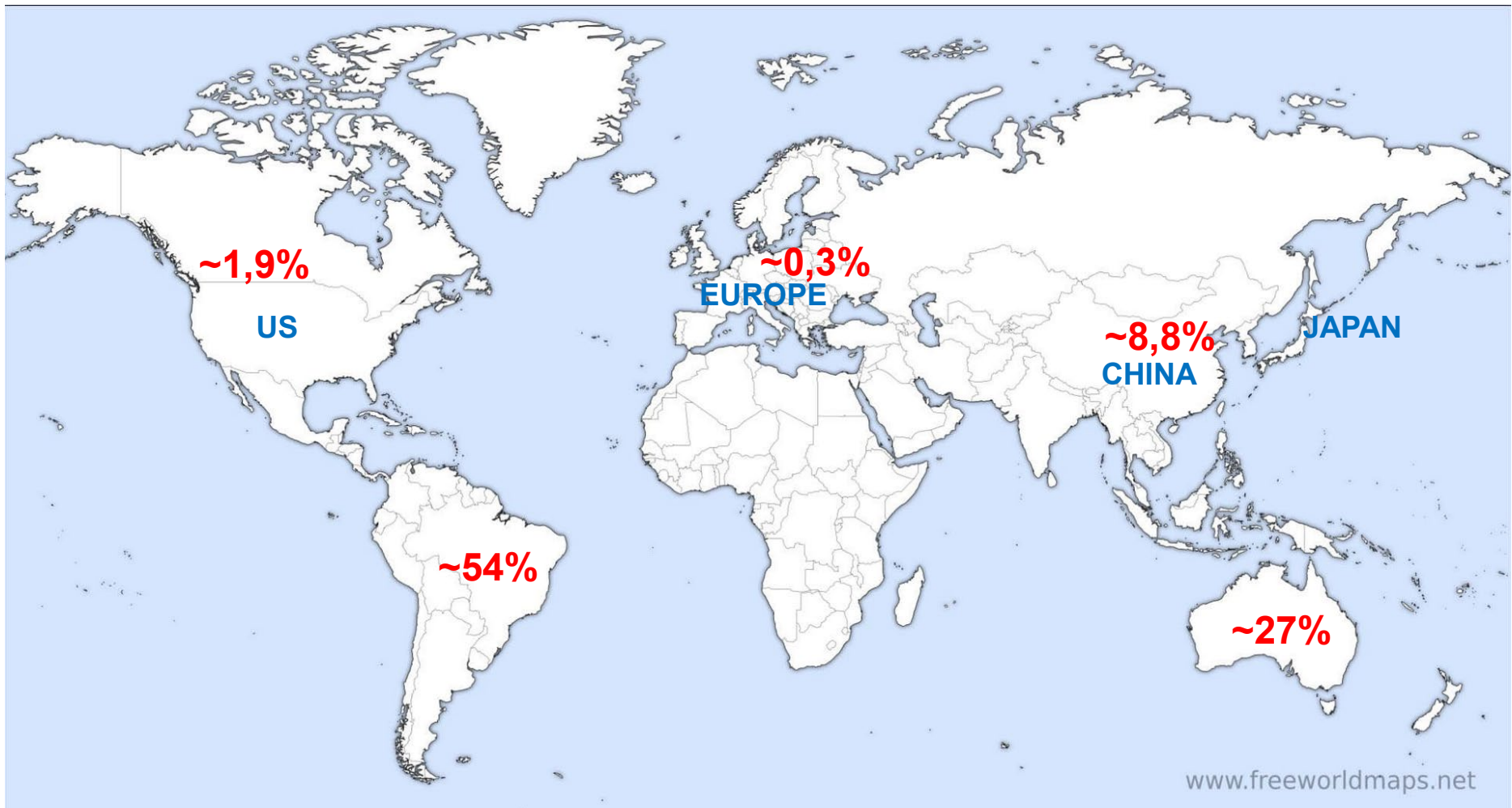


Carbon intensity is measured in grams of carbon dioxide-equivalents emitted per kilowatt-hour of electricity.





# Auto industry



# Lithium & Cobalt



- the transport sector and the automotive industry are at a crossroads ....fossil fuels ....green energy
- increasing global competition for car markets and resources
- EVs ...part of the solution...cost reductions, improvement of battery characteristics, as well as development of infrastructure
- Most of the policies implemented will be abolished with the increasing number of EVs
- Future policy design should ensure high environmental benefits of EVs...incl. mining of the materials used in batteries as well as battery recycling

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Ajanovic A., R. Haas, M. Schrödl (2021). **On the Historical Development and Future Prospects of Various Types of Electric Mobility**, *Energies* 14 (4), 1070

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/face.201800171

Ajanovic, A., Haas, R. (2019). **On the Environmental Benignity of Electric Vehicles**, *Journal of Sustainable Development of Energy, Water and Environment Systems*, 7(3), pp 416-431, DOI: <https://doi.org/10.13044/j.sdewes.d6.0252>

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