THE 12th INTERNATIONAL SCIENTIFIC SYMPOSIUM
ELEKTROENERGETIKA 2024

Keynote Lecture: On the role of electromobility in sustainable development of the transport sector

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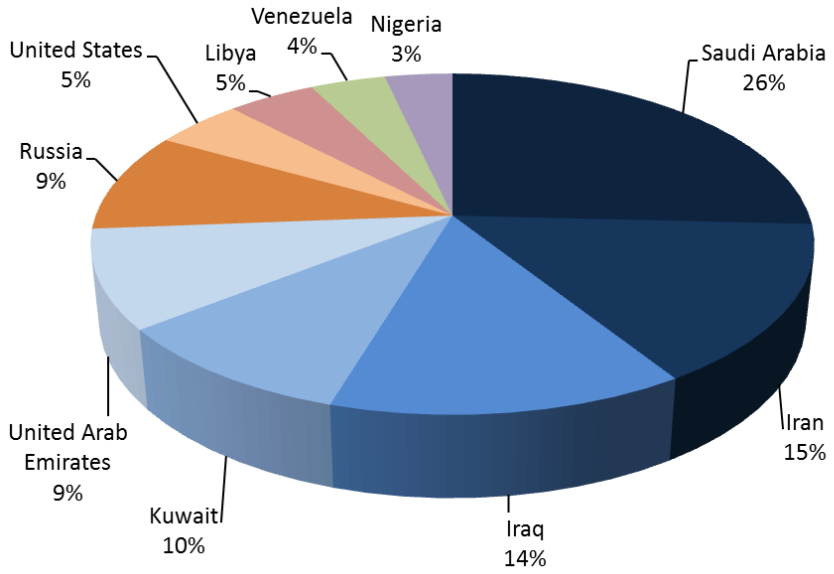
Content

- Introduction
- Recent developments and challenges
- Electric vehicles
  - Economic sustainability
  - Environmental sustainability
  - Social sustainability
- Conclusions

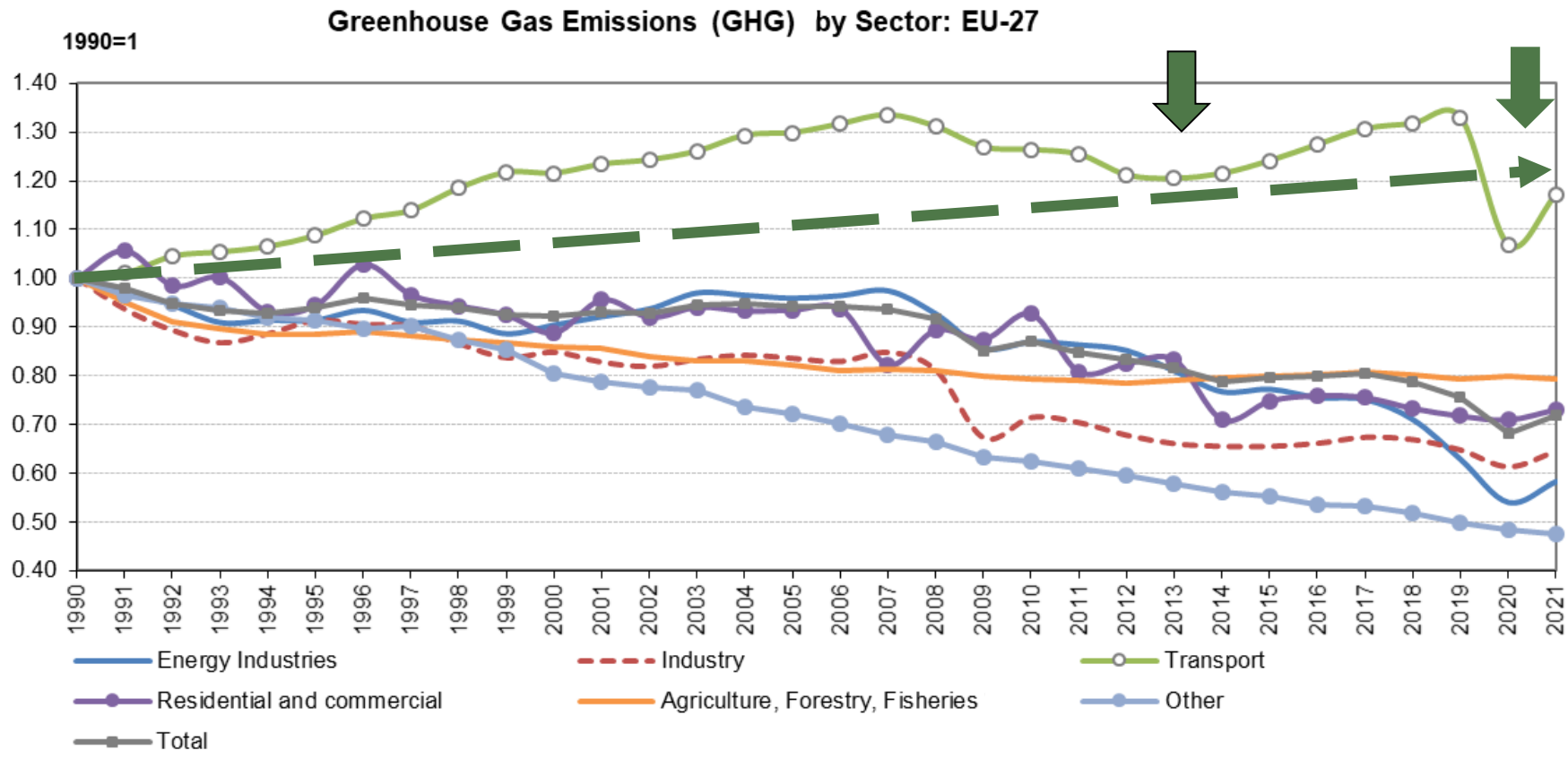
Transport sector

- oil products
- least-diversified
- energy import dependency



Countries with largest conventional oil reserves

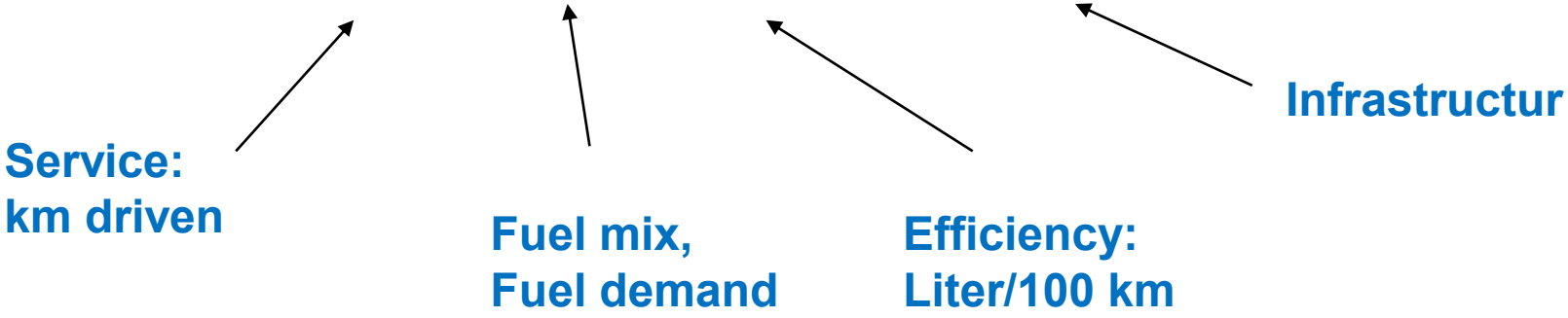
GHG


Greenhouse Gas Emissions (GHG) by Sector: EU-27
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 2016 2017 2018 2019 2020 2021
Energy Industries
Industry
Transport
Residential and commercial
Agriculture, Forestry, Fisheries
Other
Total

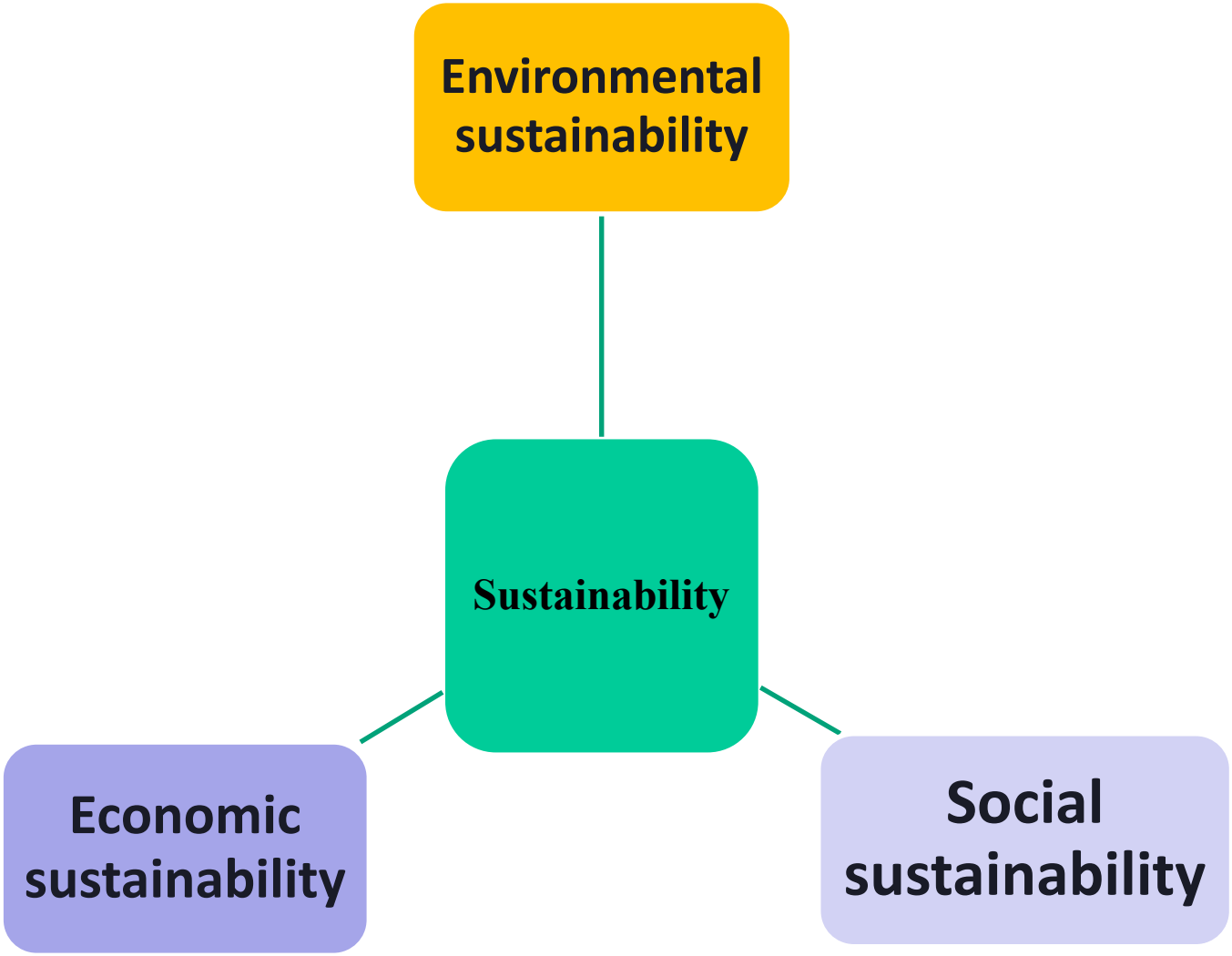
SPB, 2023

Energy service - mobility

$$S=f(E, \eta (Tc), \eta (Tis))$$



Sustainability



Electric vehicles

Advantages

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

Disadvantages

- – Costs
- – Driving range
- – Charging time
- – Charging infrastructure

EU policy

EU - the first climate-neutral continent by 2050

European Green Deal

RED III: at least **29%** renewables in the final energy consumption in the transport sector by 2030

Sustainable and Smart Mobility Strategy

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

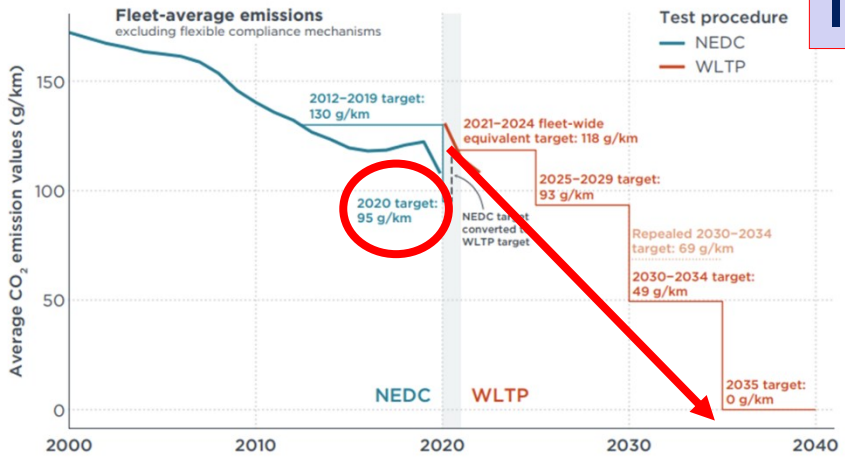
nearly all cars, vans, buses as well as new heavy-duty vehicles will be zero-emission.

2009 2010 2015 2020 2025 2030 2050

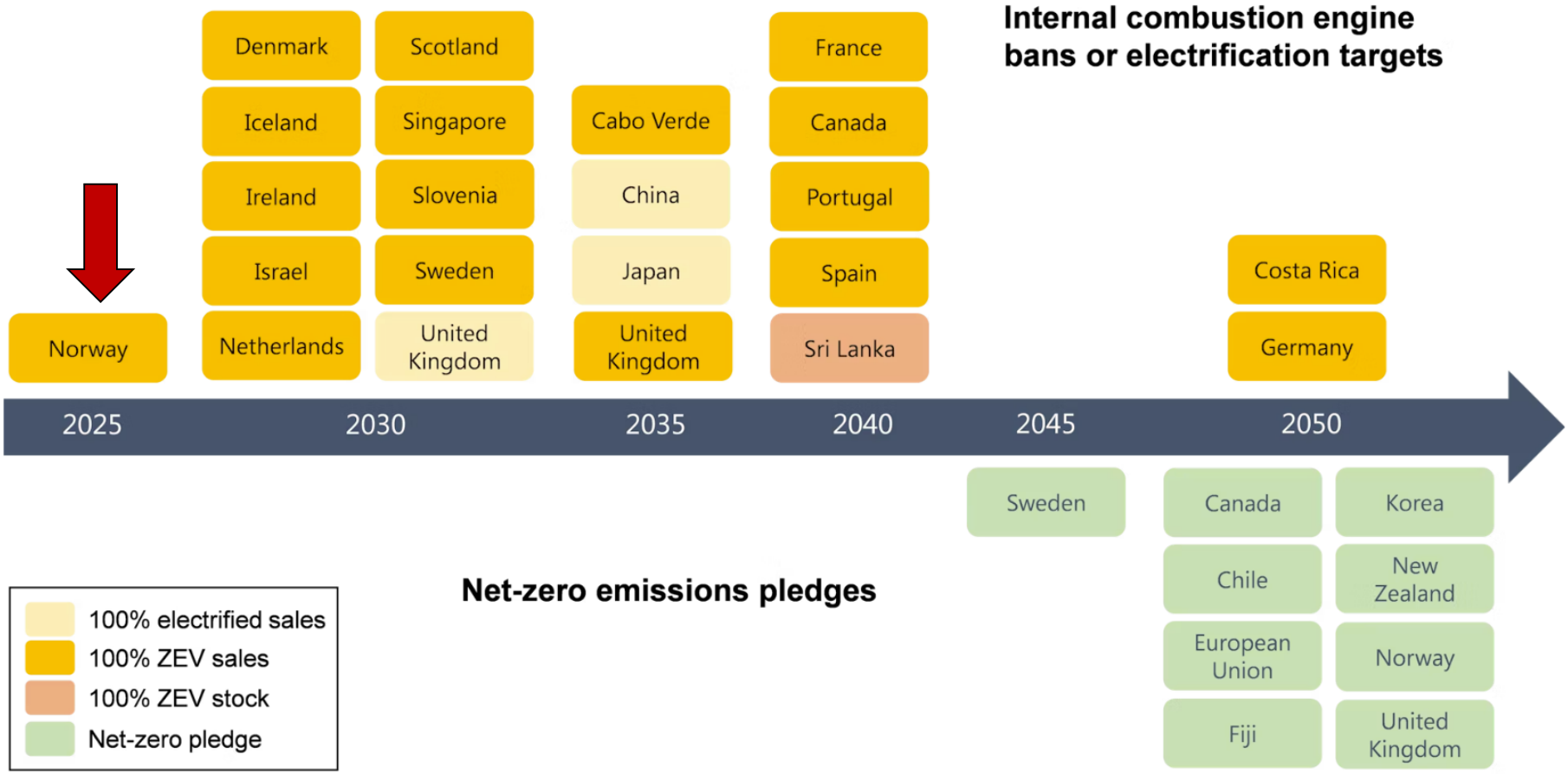
ICE -50% in city

No ICE in city

Transport White Paper

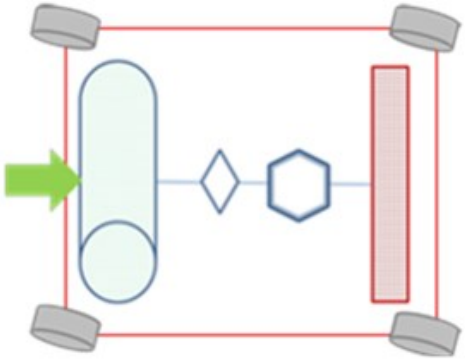


Announced 100% ZEV sales targets and bans on ICE vehicle sales

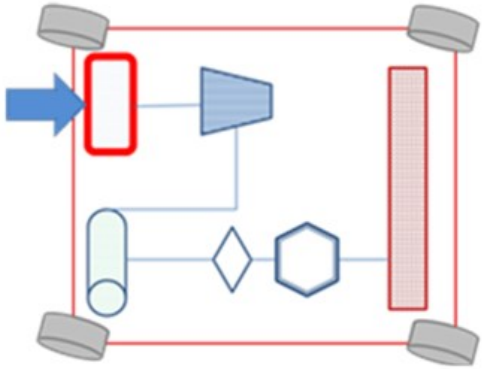


IEA, 2021

Zero-emission cars



BEV



FCV

ZEV

BEV: 28 000 000
FCV: 66 000

JOURNAL ARTICLE

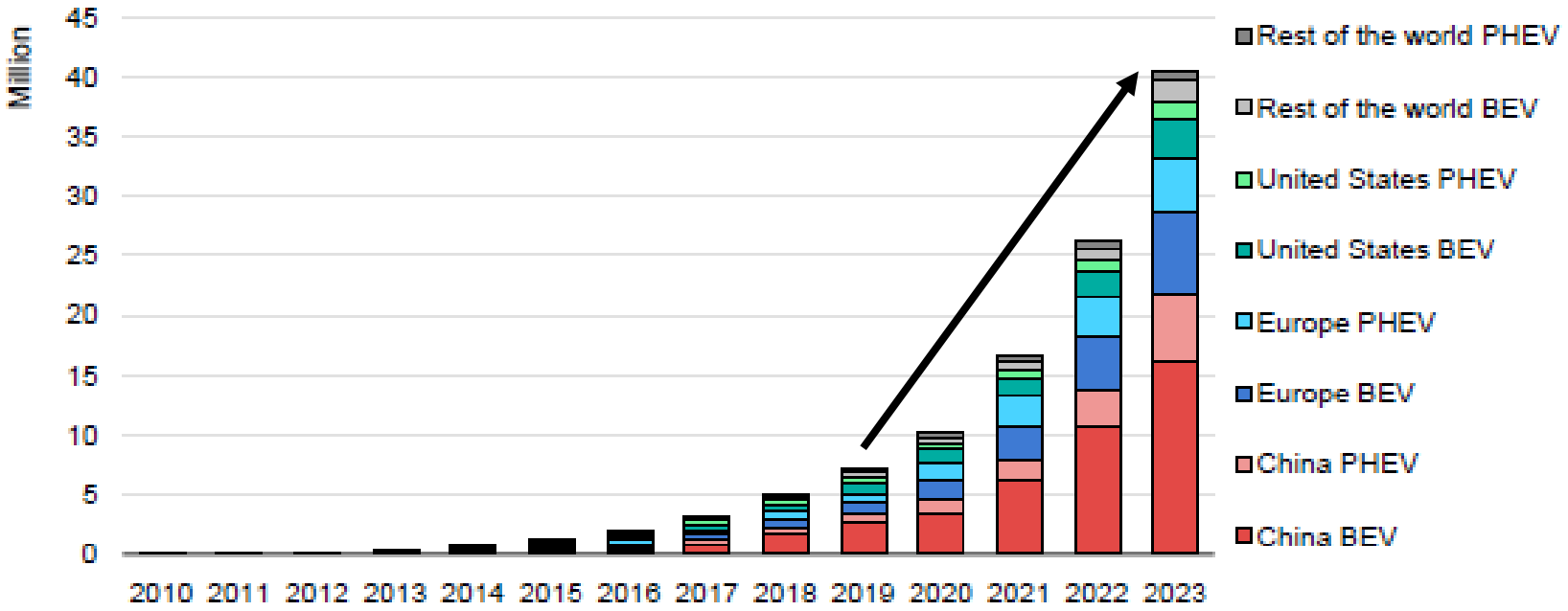
Electricity vs hydrogen in the transition towards sustainable mobility

Amela Ajanovic

Oxford Open Energy, Volume 2, 2023, oiad013,
https://doi.org/10.1093/ooenergy/oiad013

Electric vehicles

BEV: 28 000 000
PHEV: 12 000 000



Over 40 million electric cars were on the road in 2023

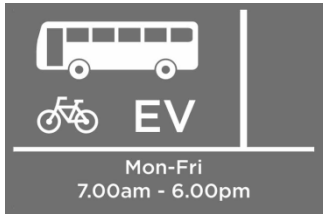
IEA, 2024

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.

GDP and EV sales

73% of all electric cars are sold in just 4 countries (with some of the highest GDPs)

Electric cars < 3% of total sales
= average GDP < €17,000

Electric cars > 15% of total sales
= average GDP > €46,000

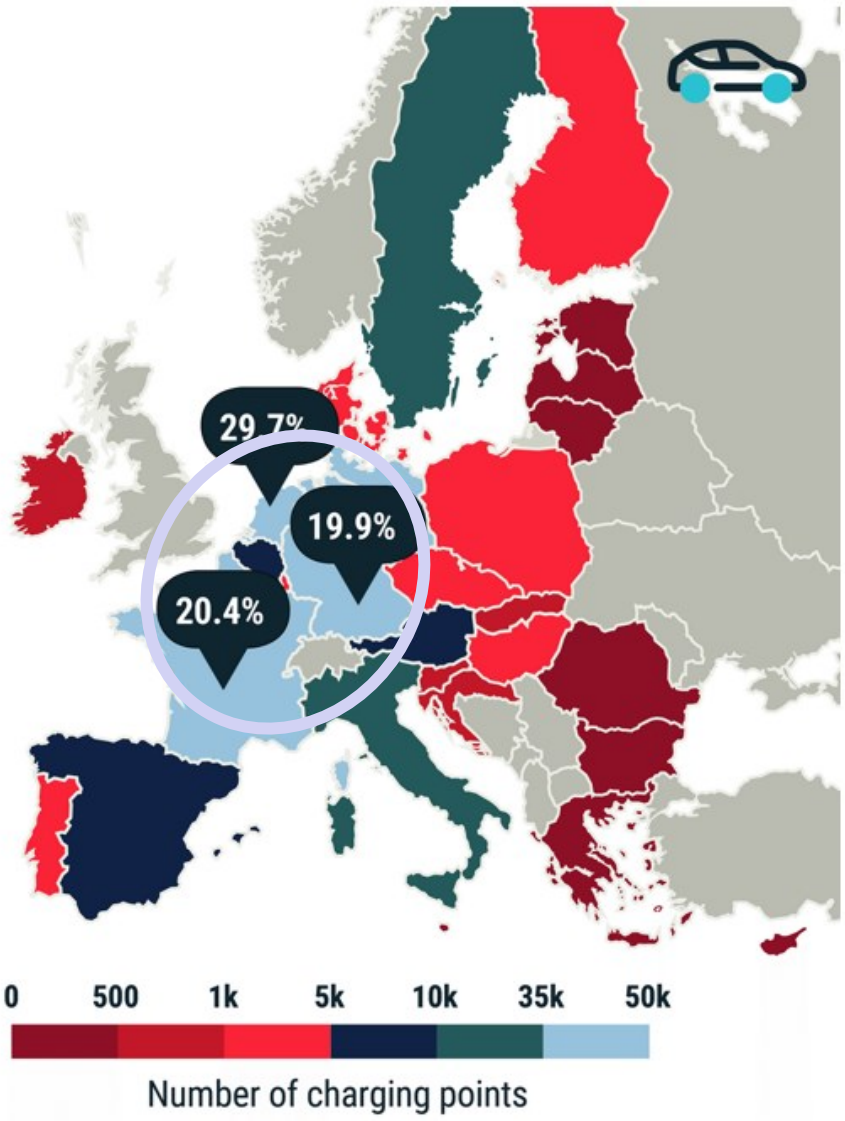
ACEA

GDP and charging infrastructure

70% of all charging points:

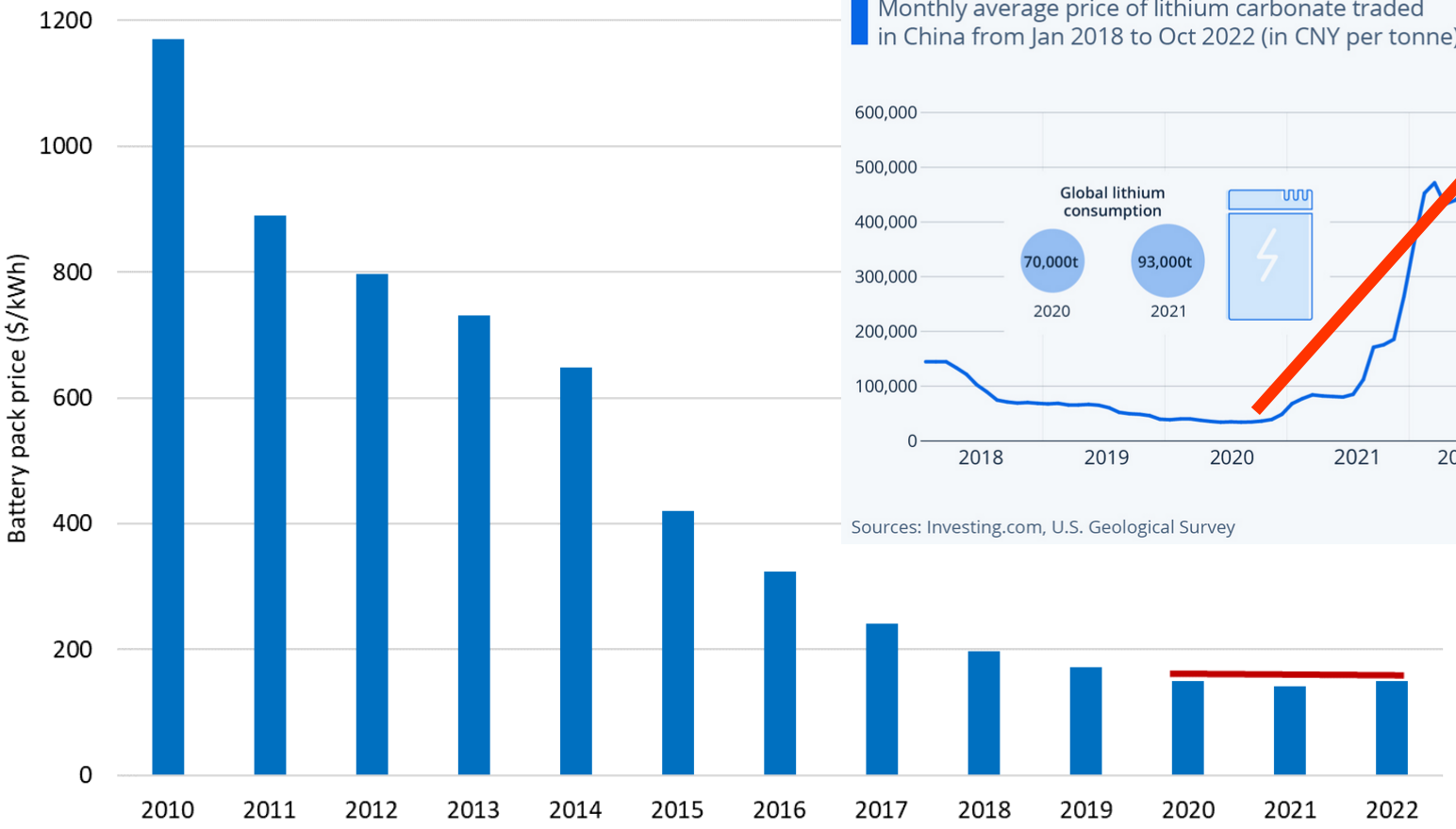
Located in just 3 EU countries

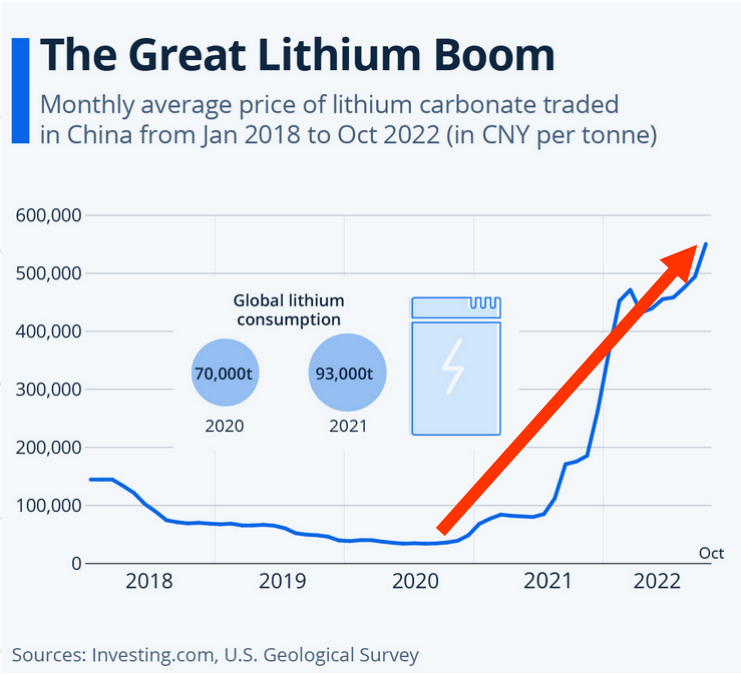
29.7%	Netherlands	20.4%	France
19.9%	Germany		



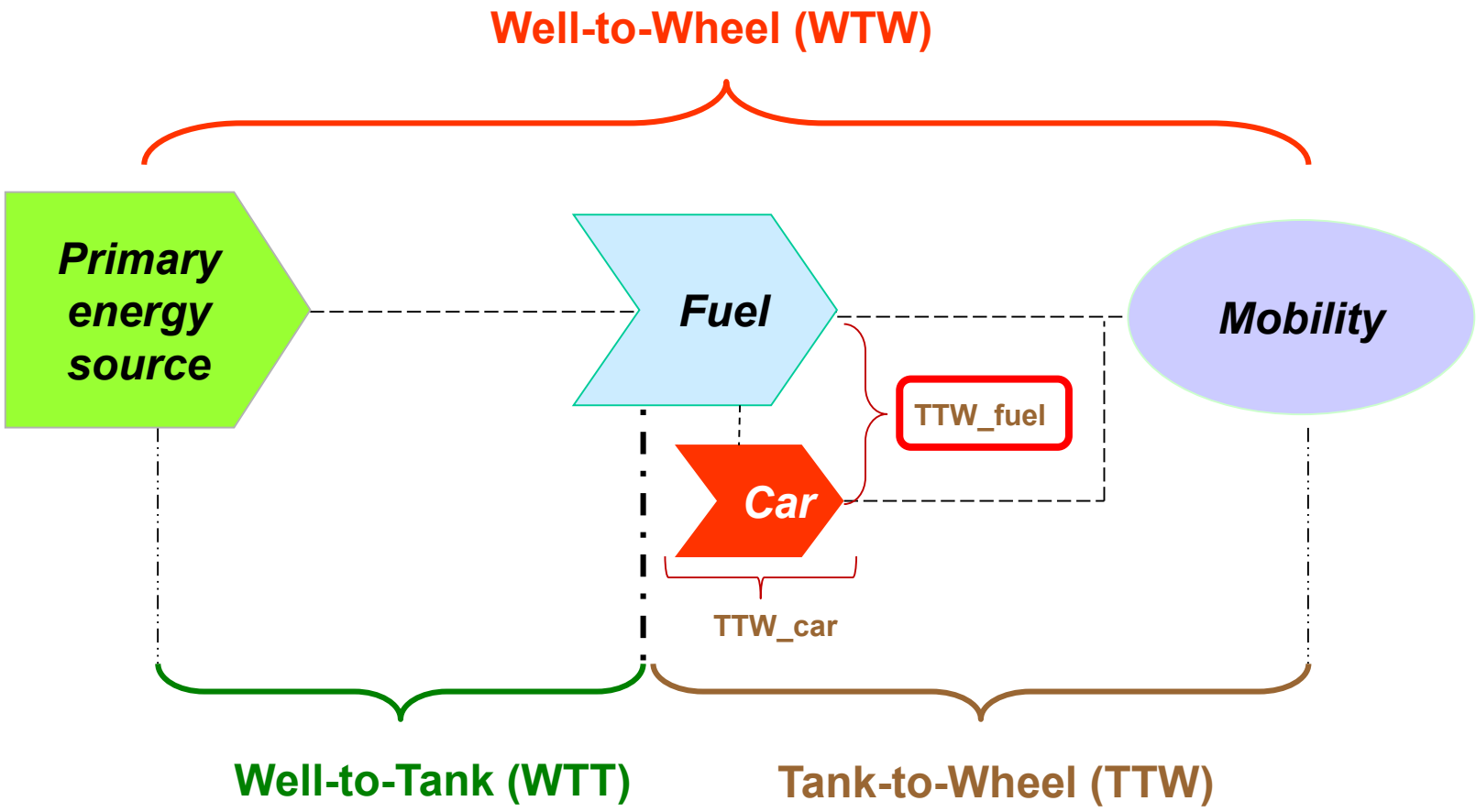
ACEA

Development of the battery pack prices

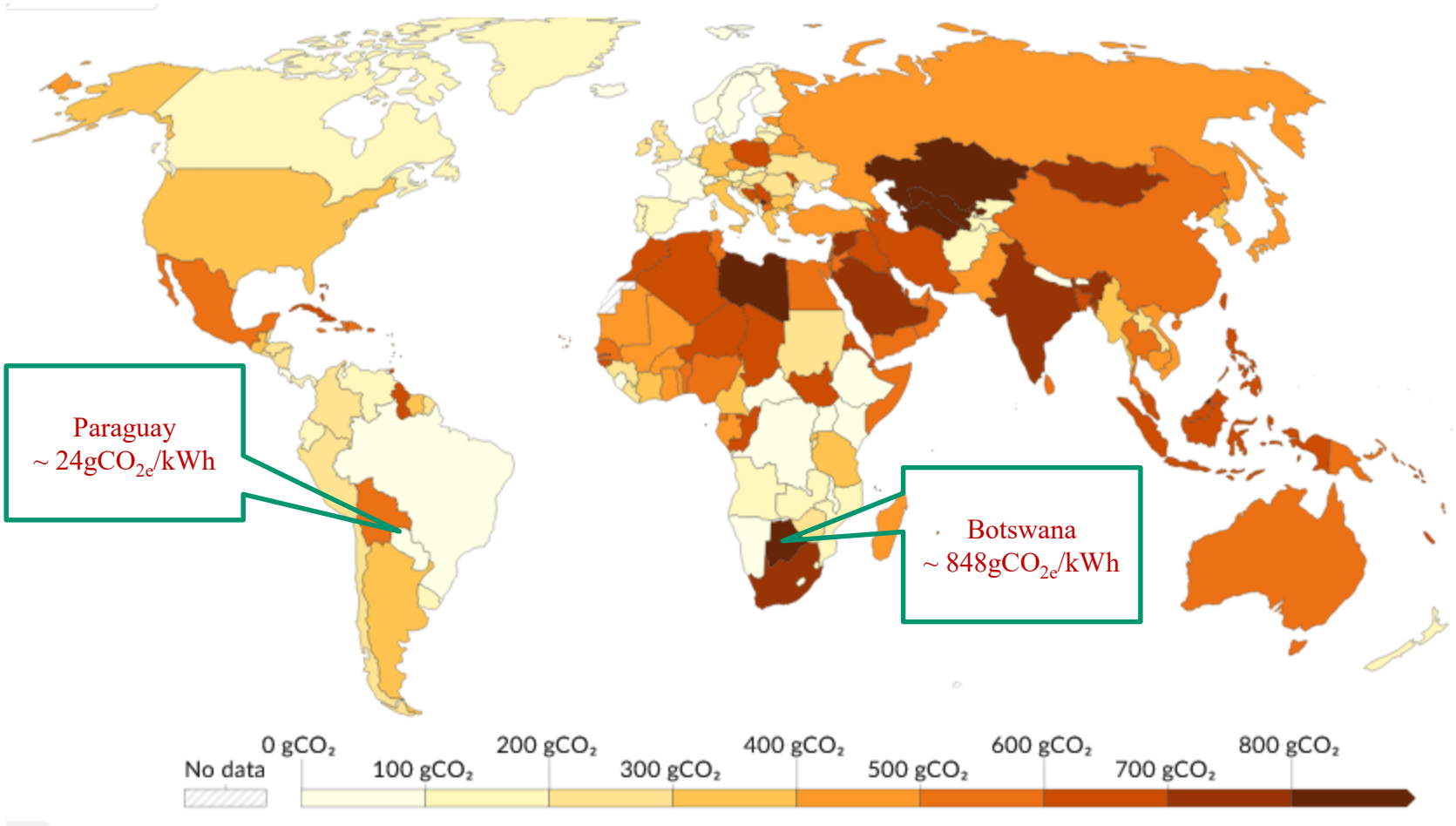




Environmental assessment



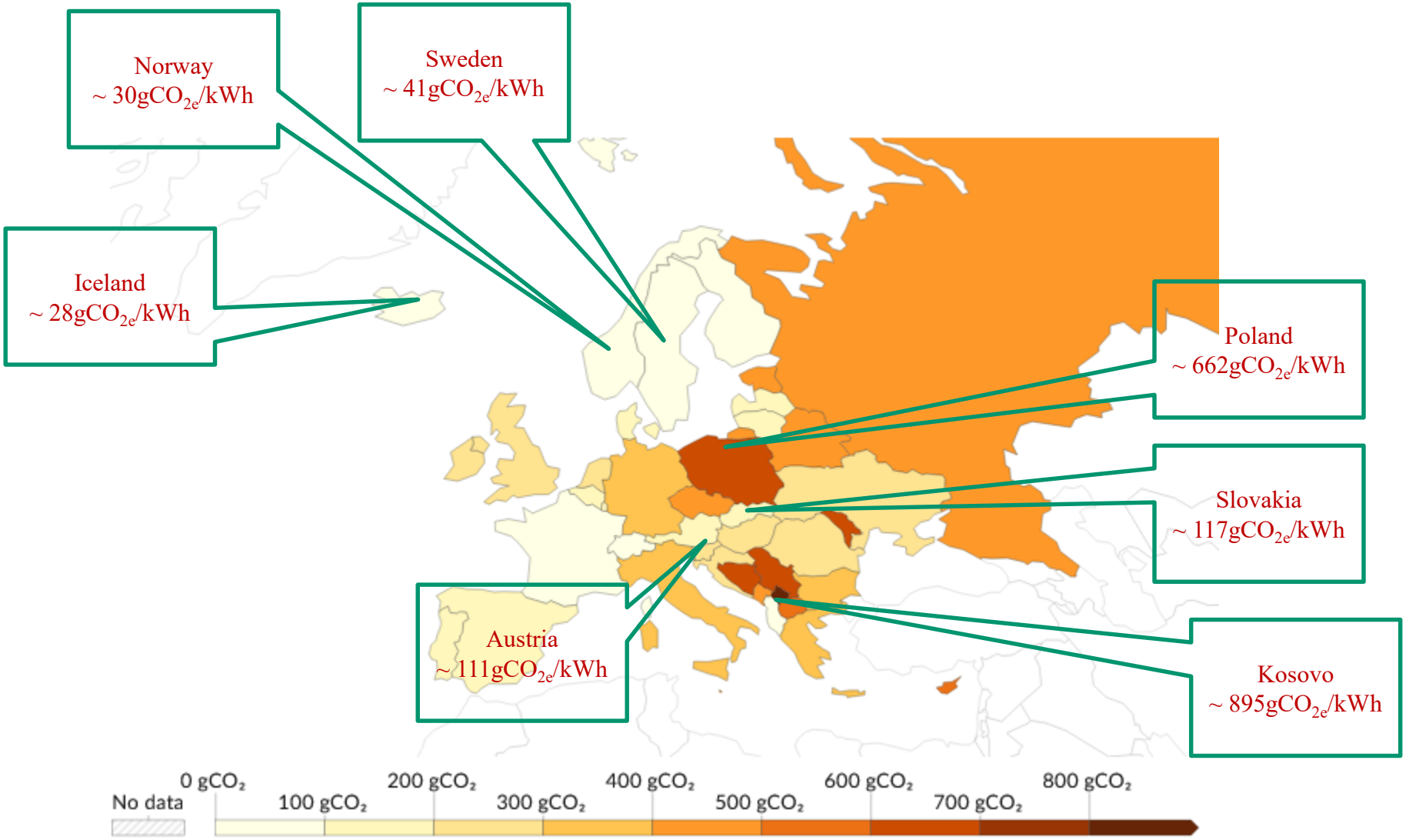
Carbon intensity of electricity, 2023



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

OWiD, 2024

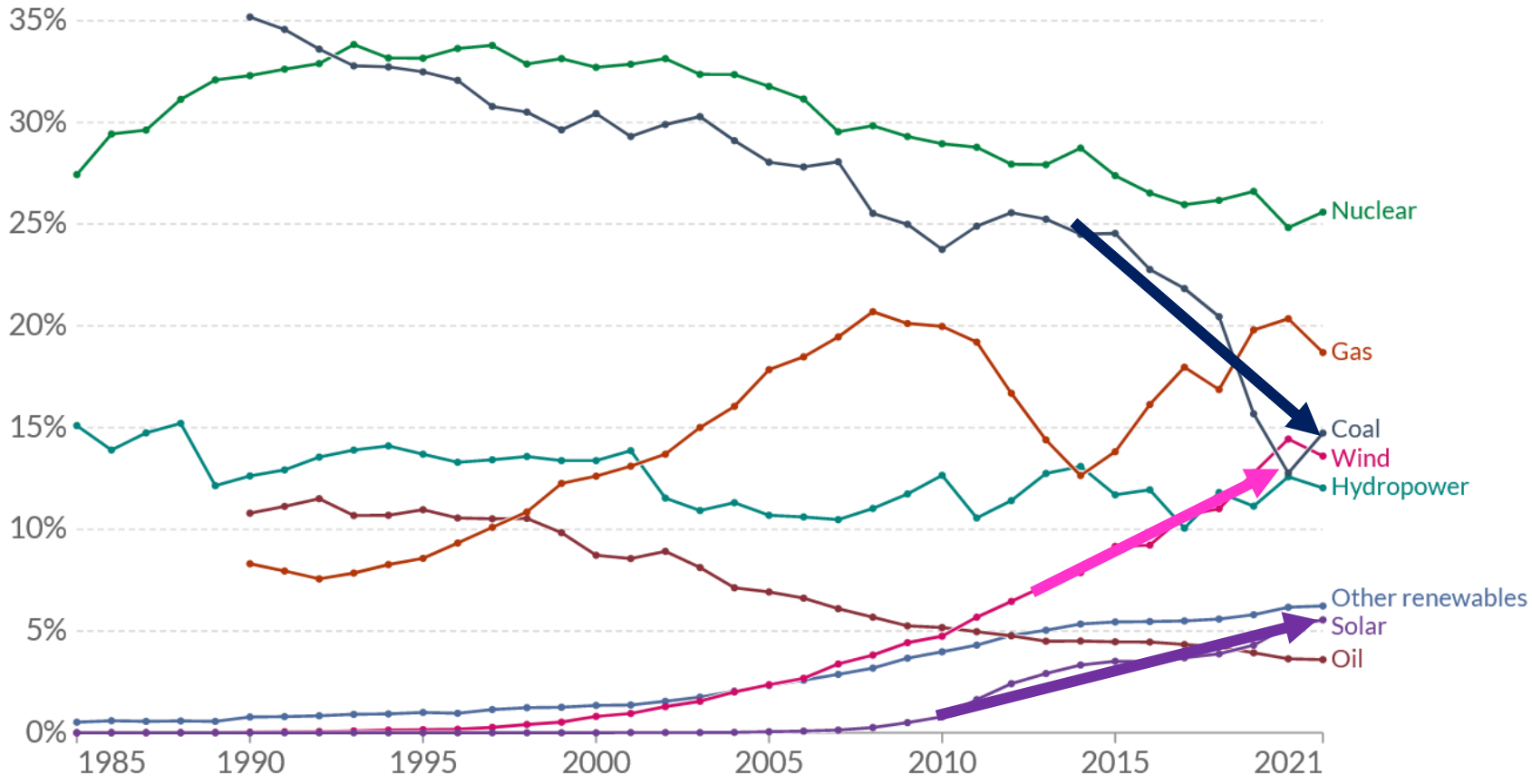
Carbon intensity of electricity, 2023



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

OWiD, 2024

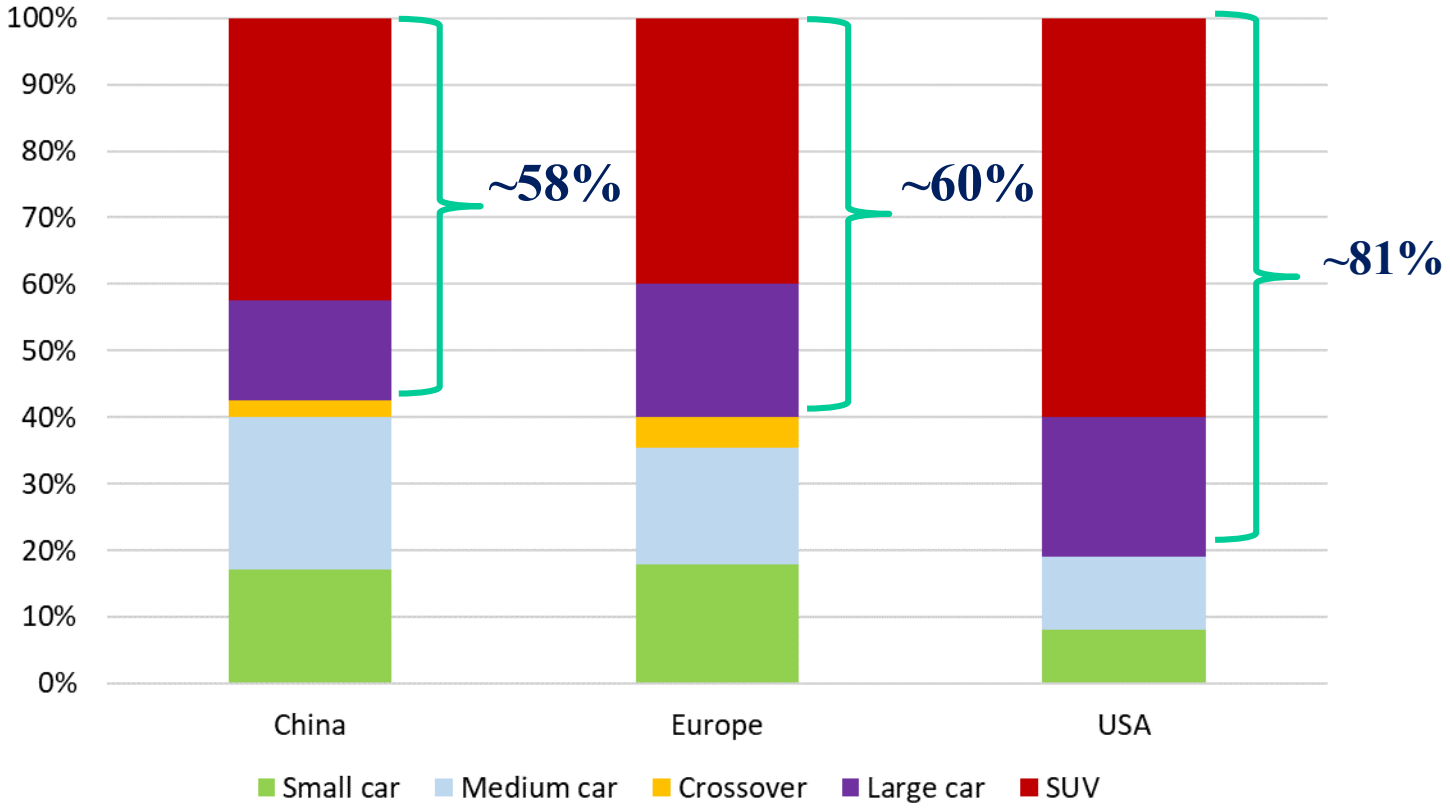
Share of electricity production by source, EU-27



Source: Our World in Data based on BP Statistical Review of World Energy & Ember

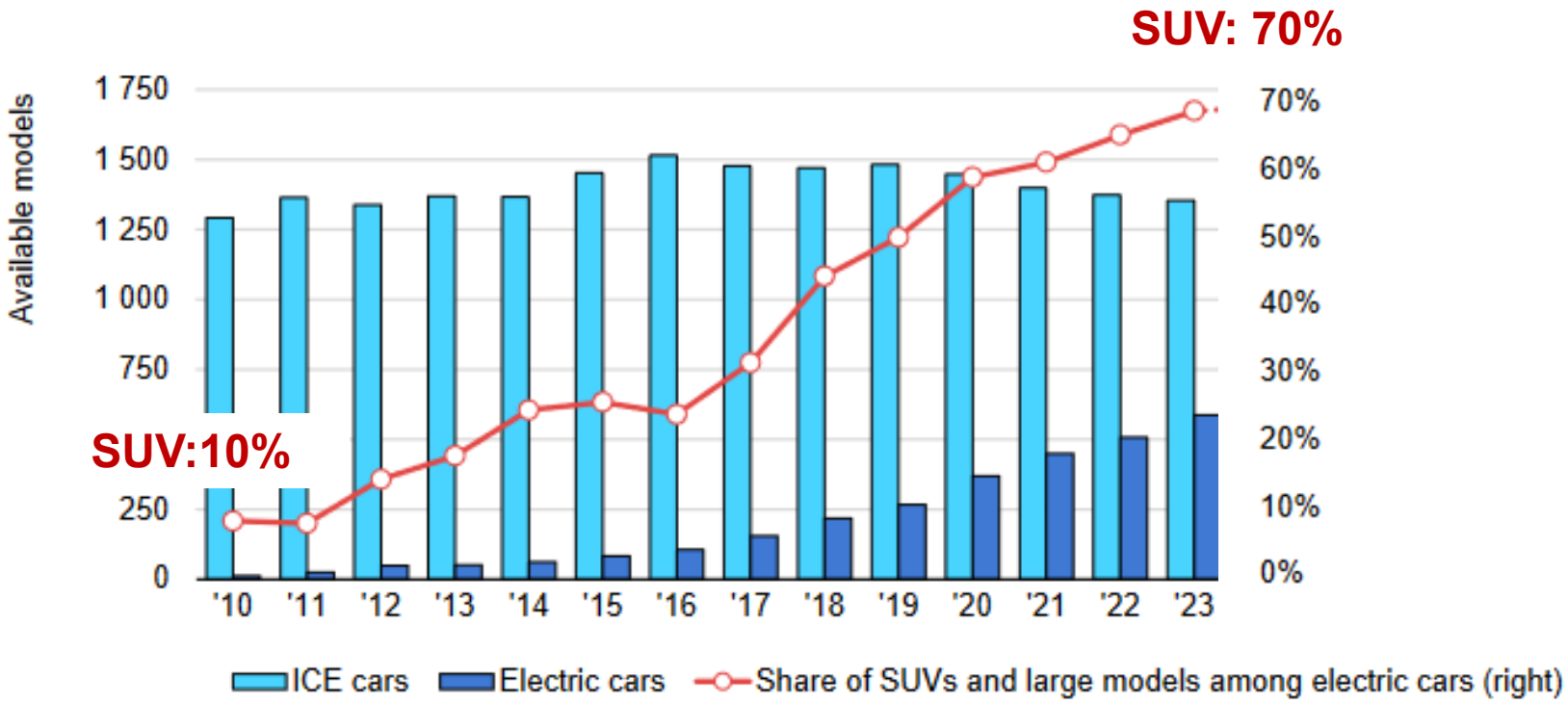
OurWorldInData.org/energy • CC BY

EV models



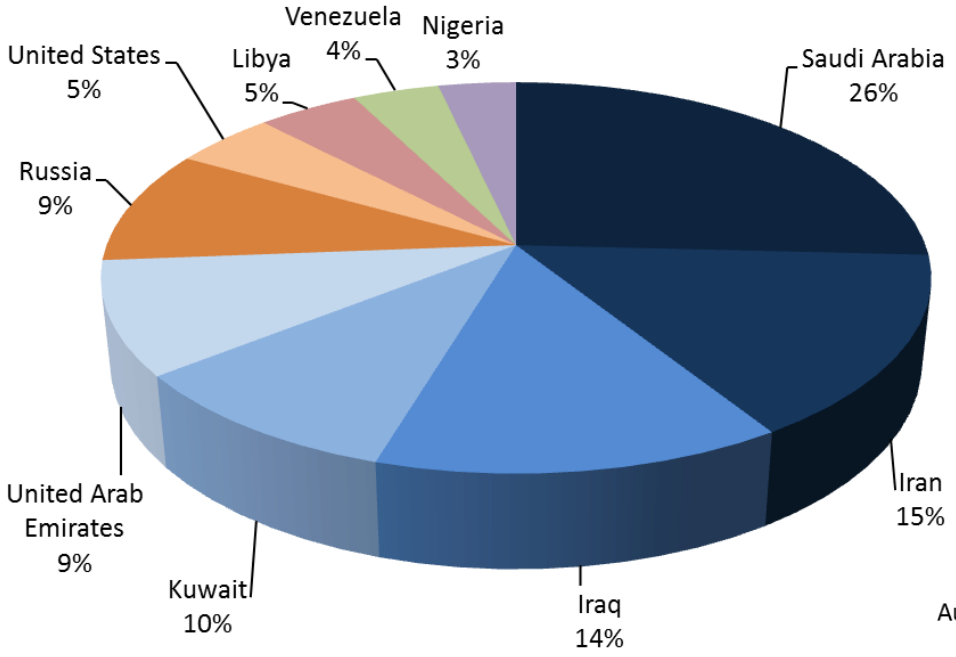
Ajanovic, 2023; IEA, 2023

Car model availability

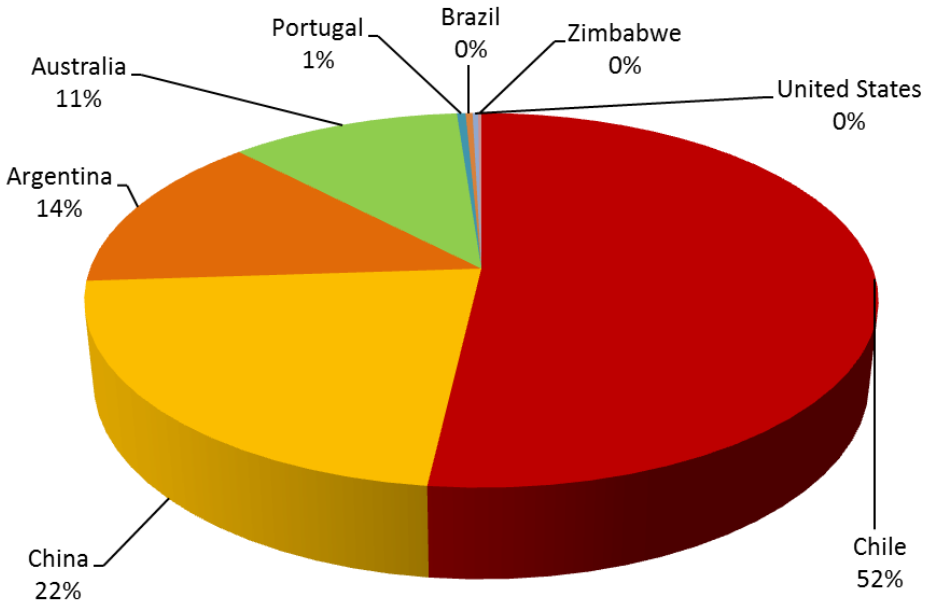


IEA, 2024

Oil and lithium reserves

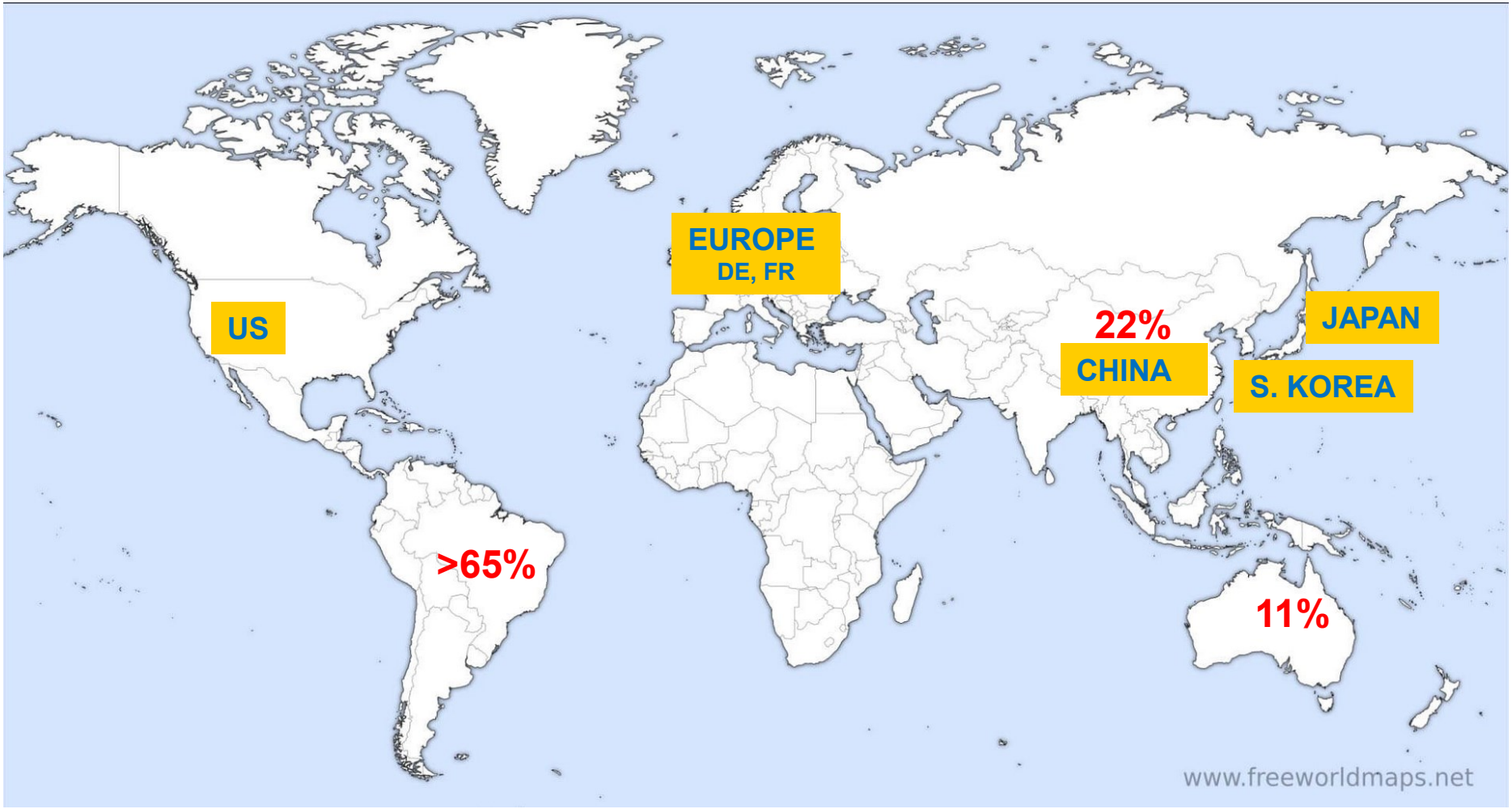


Countries with largest conventional oil reserves



World lithium reserves by country

Main battery cell manufactures

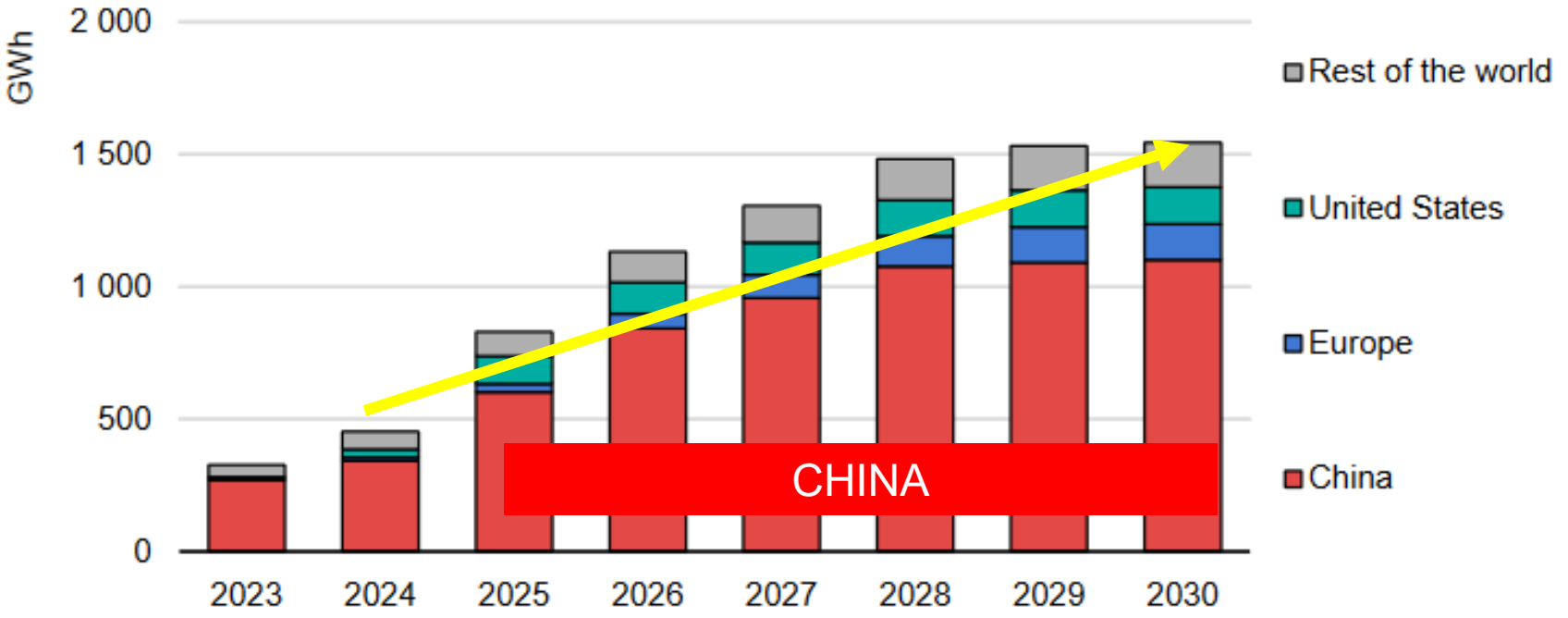


Recycling


Lithium electron battery
Warning
mini speaker
BL-6P

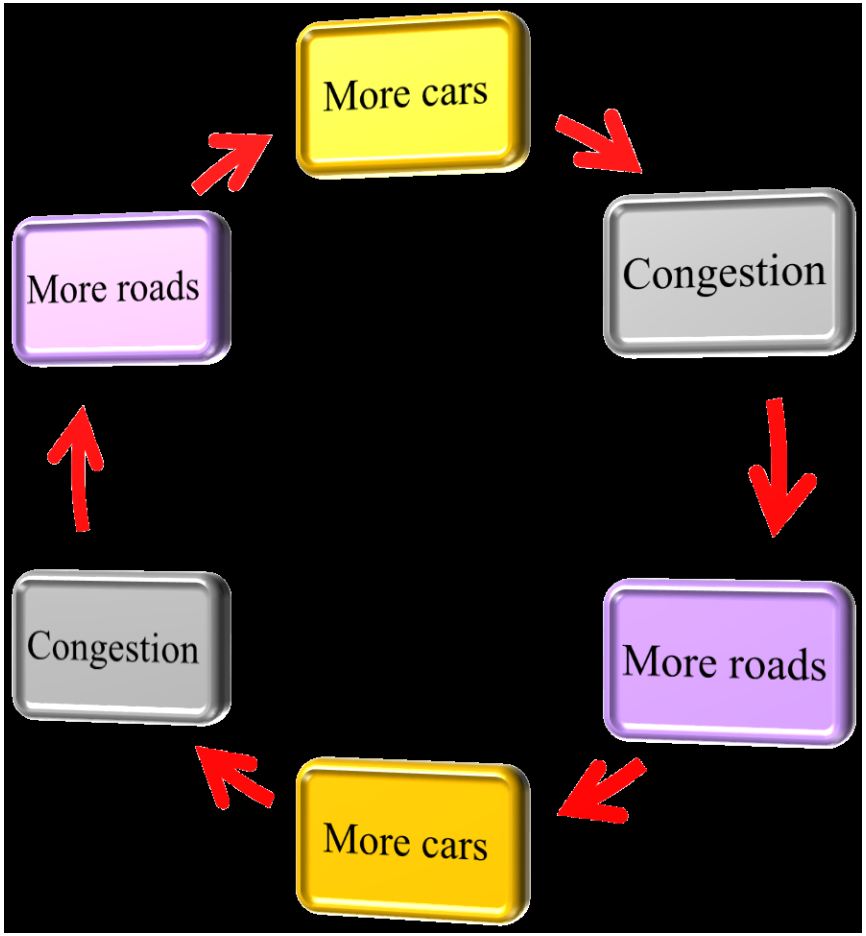

Li-ion
BATTERY
Li-ion
BATTERY

Battery recycling capacity

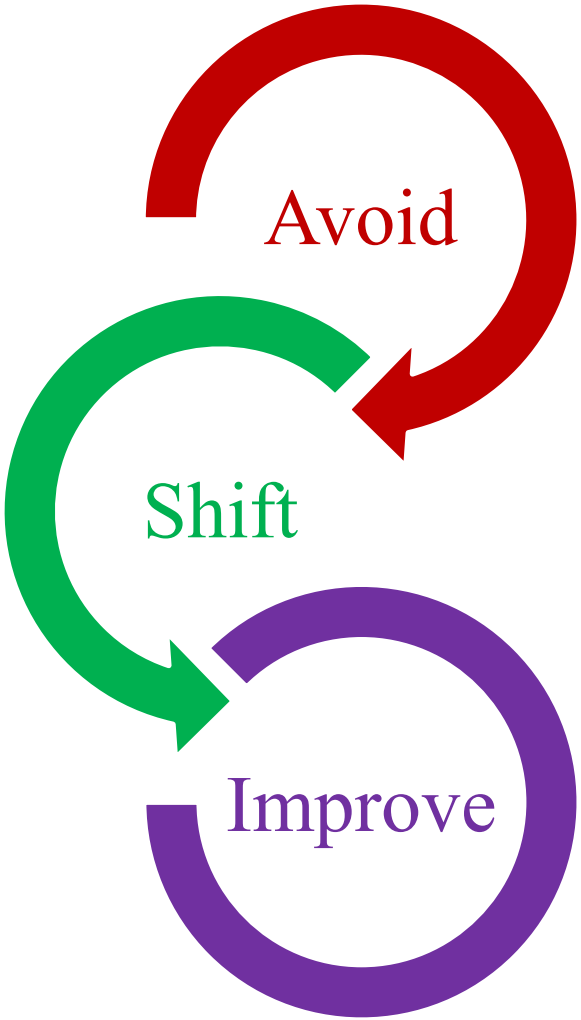


IEA, 2024

Car-oriented mobility



Towards Sustainable Mobility



…unnecessary travel and reduce trip distances

….towards more sustainable modes

…transport practices and technologies

Conclusions

- 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 sustainability of EV supply chain
- New mobility behavior: Avoid – Shift - Improve

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