

# HOW IS THE TRANSITION TO LESS CARBON- INTENSIVE TRANSPORT PROGRESSING IN EUROPE?

Webinar

April 13<sup>th</sup> 2021

# About this presentation

- The objective of this presentation is to see **how the transition to less carbon-intensive transport is progressing in Europe\*** and to highlight the best practices.
- It is generally considered that this decarbonization will rely on 4 complementary levers ranked according to their difficulty of implementation:
  - **Energy efficiency**
  - **Fuel substitution**
  - **Modal shift**
  - **Transport demand**
- The monitoring of this transition and the identification of good practices will rely on information, **mainly developed in the ODYSSEE MURE project\*\*** on indicators but also on **policies and measures** implemented both at the EU and national level.

\*\* <https://www.odyssee-mure.eu> ; other main data source: Enerdata [Global Energy and CO<sub>2</sub> database](#).

# Main levers of decarbonization in transport

**Energy Efficiency**

Reduction in **koe/pkm** or **koe/tkm**, reflecting technological improvements, driving behaviour, fuel mix and load factors.

**Fuel Substitution**

Substitution to decarbonised fuels with the penetration of biofuels and electric modes using decarbonized electricity

**Modal shift**

Shift from cars to public modes for **passengers** and from road to rail and navigation for **freight**

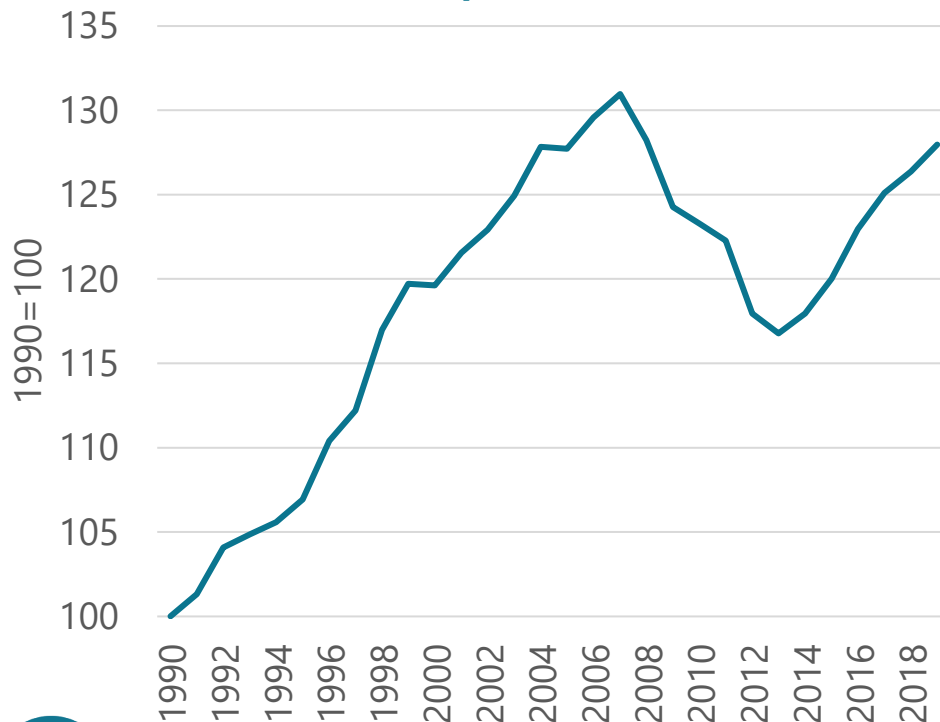
**Transport demand**

Reduction in passenger mobility (number of km per capita by **motorized mode**) and decorrelation between **freight** traffic and economic activity

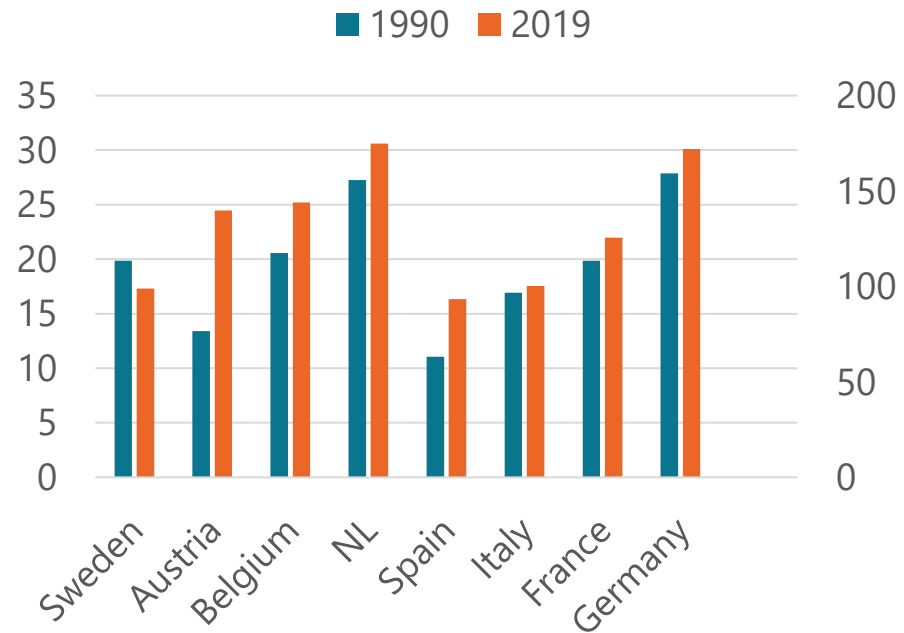
# CO2 emissions trends

- **Rapid increase** between 1990 and 2008 and since 2014, with the economic recovery, almost at the same rhythm as before 2008.
- Cars represent 56% of these emissions, followed by trucks and LDV\* with 34%; both modes explain 90% of the increase since 2014.
- 9 countries are responsible for **~80%** of EU transport emissions → focus on these countries, plus some non EU countries, with interesting situations.

### EU-27 transport emissions



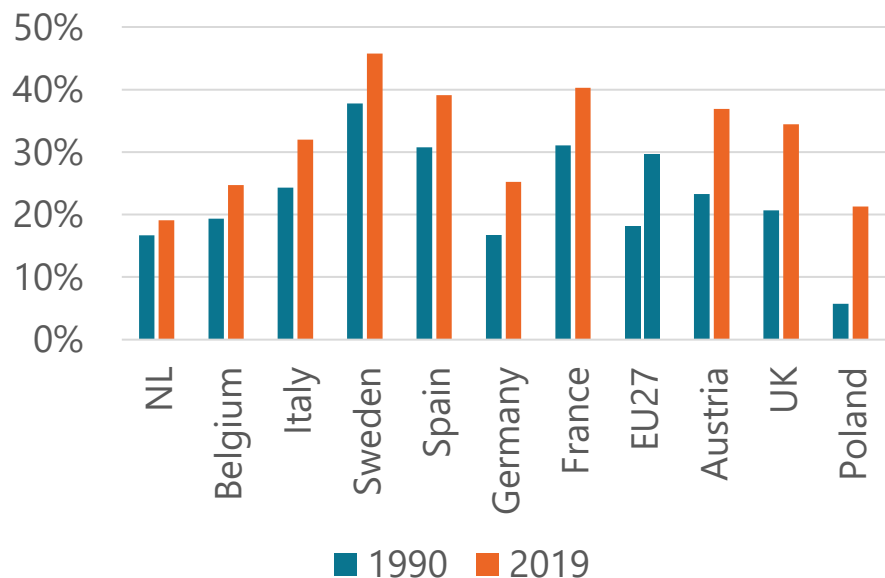
### CO2 emissions of transport (MtCO2)



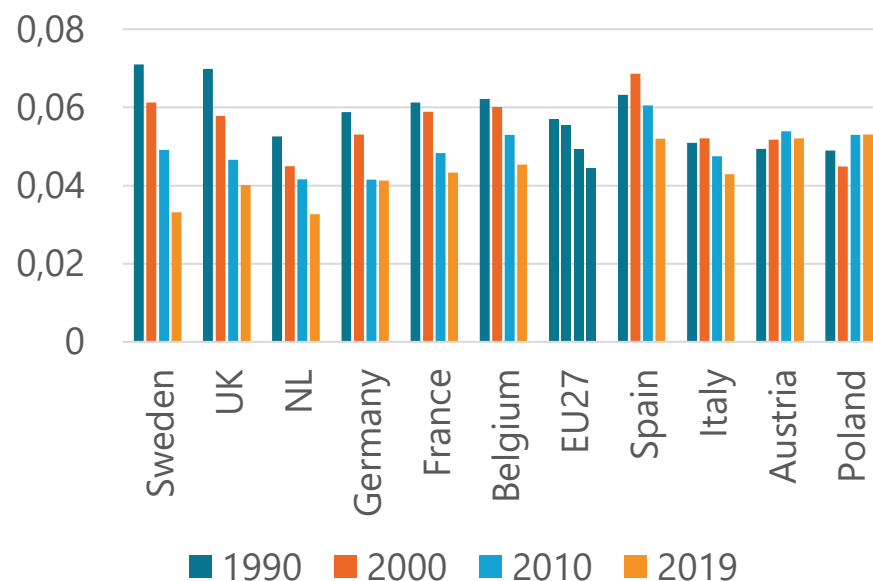
# CO<sub>2</sub> emissions in transport and economic growth

- In most EU countries, the share of transport in total CO<sub>2</sub> emissions has greatly increased since 1990 (+11 points at EU average), as CO<sub>2</sub> emissions in transport grew **more rapidly** than in other sectors.
- These **emissions have however increased slower than GDP** (i.e. decrease of **CO<sub>2</sub> intensity of transport by 1%/year**).
- Sweden experiences the most rapid decrease with **2.6%/yr**, followed by the Netherlands (NL). Both countries are performing much better than the EU average.

## Share of transport in CO<sub>2</sub> emissions



## CO<sub>2</sub> intensity of transport\*



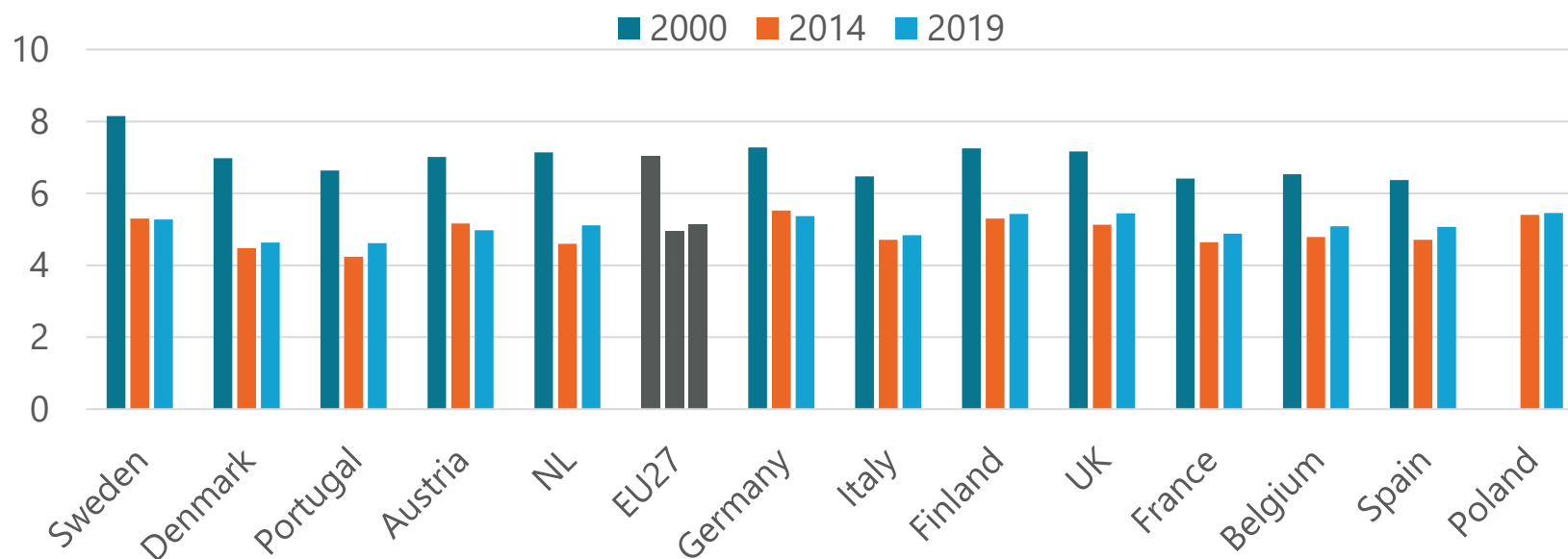
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# Specific consumption of new cars

- Reduction in the specific consumption of new diesel and gasoline cars until 2014.
- Reverse trend since then in most countries and net slowdown in the others, due to two main factors: a decrease in diesel shares (from 56% in 2012 to 34% in 2019 at EU level) and a growing share of SUV (from 25% to ~40%).
- Trend leaders are Sweden and Denmark (~-35%), Portugal, Austria and The Netherlands (~-30%).
- Most EU countries rely on fiscal measures based on emission bands.

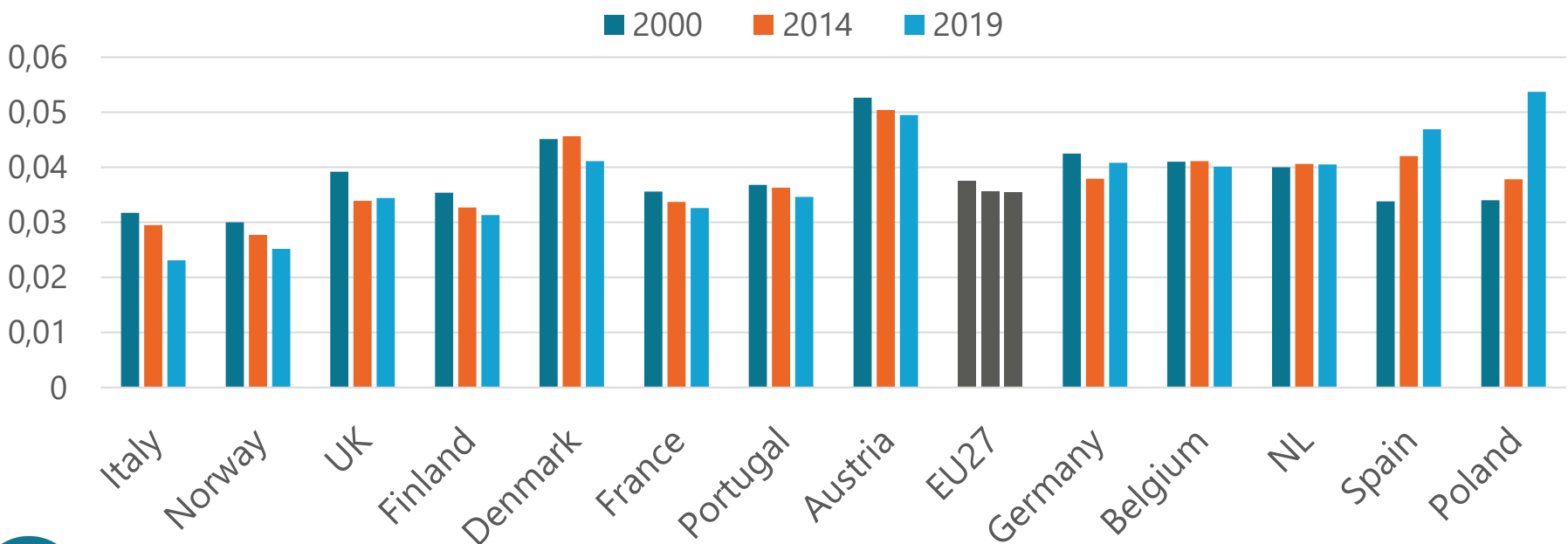
Test-cycle specific consumption of new gasoline & diesel cars (l/100 km)



# Unit consumption of car stock

- No significant reduction in the average efficiency of the car stock, that takes into account the **l/100km** in real driving conditions, the actual fuel mix and the **occupancy rate** of cars → minor effect of progress for new cars.
- Italy and Norway lead in both trend (**-27%** and **-16%**) and level (**~35% below** EU average).
- Share of EVs in Norway **~16%** of the fleet and high occupancy rate in Italy and Norway(**~2**).

Unit consumption of car stock (koe/pkm)

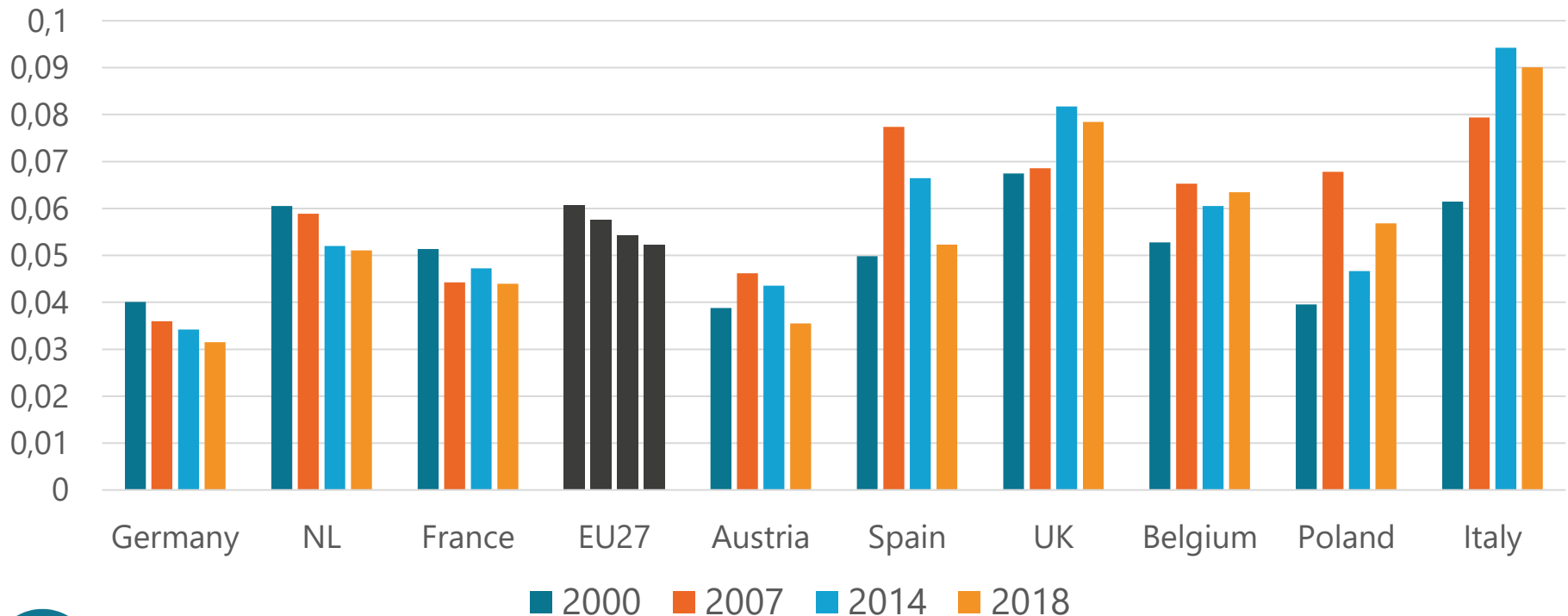




# Unit consumption of freight road transport

- **Above the EU average:** Germany, The Netherlands and France have reduced the unit consumption of road freight
- Increase in some cases due to a **fall in activity following the financial crisis** that resulted in **less efficient operations** (less loaded trucks, increased empty running).

Unit consumption of freight road transport (koe/tkm)

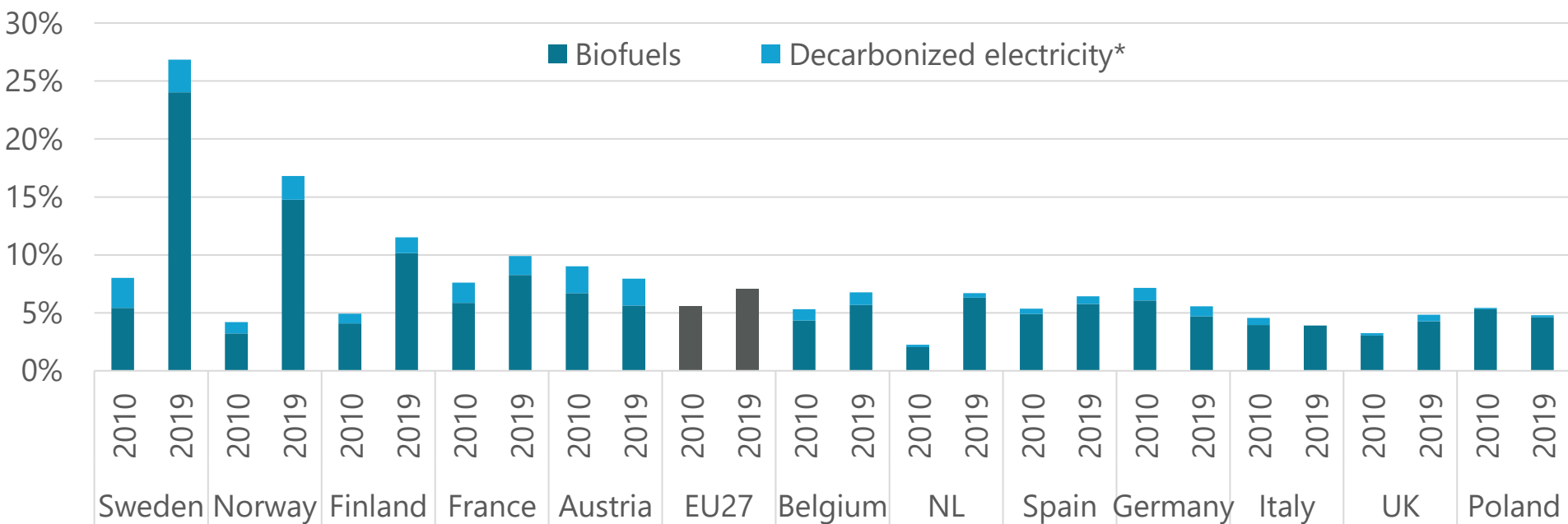


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# Fuel substitution

# Share of decarbonized energy sources in transport (%)

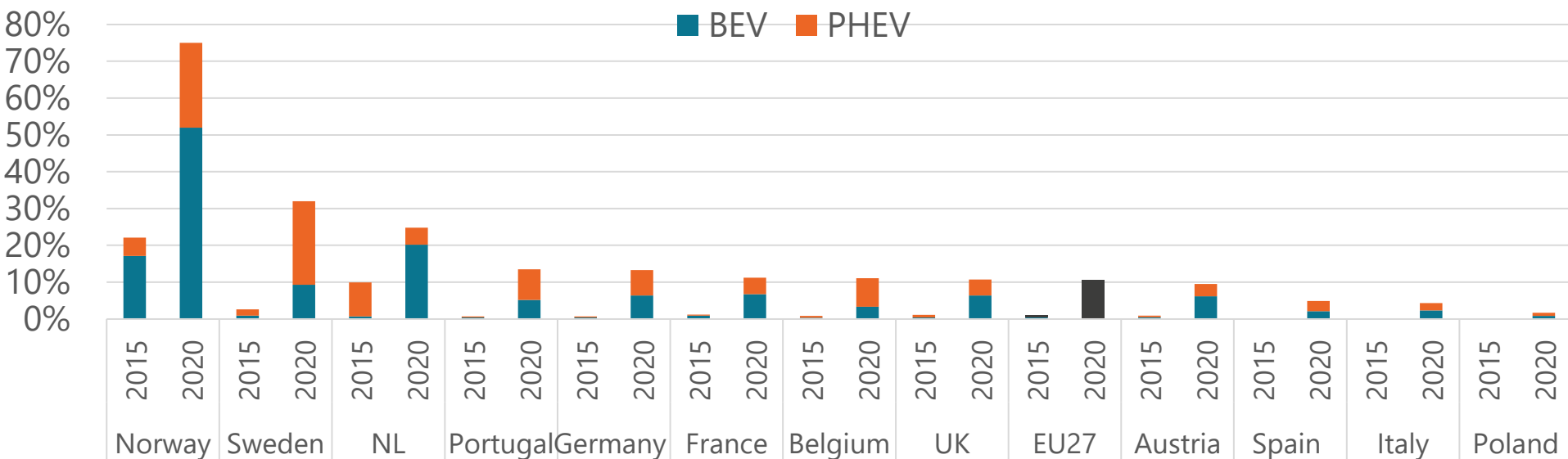
- Share of decarbonized sources in transport: **+1.3 points since 2010** (biofuel **+1.3 point**, decarbonized electricity **+0.2 points**)
- Biofuel:** Sweden (**24%**) second in the world behind **Brazil (28%)**, followed by Norway (**15%**) and Finland (**10%**)
- 2009 Renewable Energy Directive (RED) set a **2020 target of 10% in EU average**
- REDII (2018) revised the objective for **2030**: binding target of **14%** of renewables (advanced biofuels 3.5%, **cap of 7%** for food-based biofuels)
- Decarbonized electricity:** Sweden (**2.8%**) and Austria (**2.3%**) have the highest shares and Norway leads in trend (**+1.1 points**); mainly rail transport; contribution of cars still low.



# Share of PHEV and BEV in total new registrations

- Increase since 2010, **accelerating since 2015**.
- EVs in Norway represent **75%** of 2020 sales (**+53 points in 5 years**).
- Among the EU: Sweden and the Netherlands are leading the transition with respectively **32%** and **25%** of new registrations.
- Share of EVs in car fleet still negligible for most countries. Only Norway has reached a significant level (**~16%**) followed by Sweden and the Netherlands (**~3.5%**), far from the EU average (**~0.9%**)

Share of electric and plug-in hybrid vehicles in new registrations



BEV : Battery Electric Vehicle

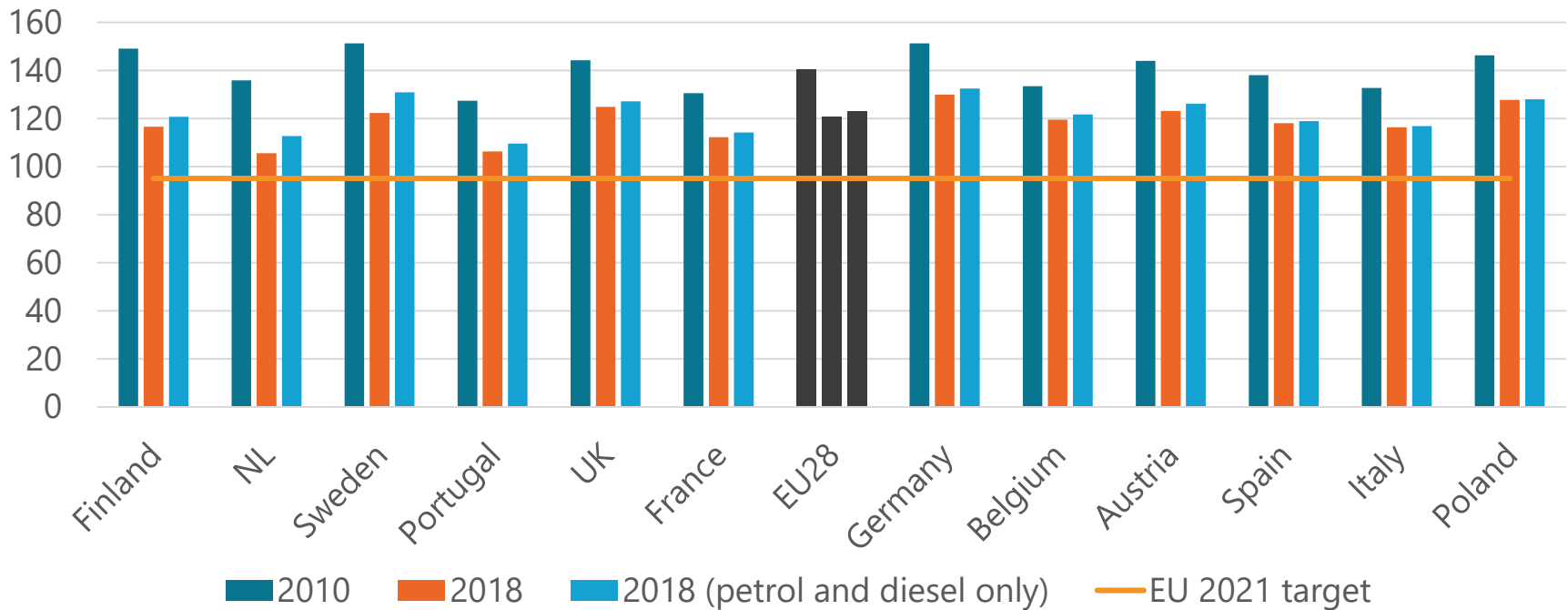
PHEV : Plug-in Hybrid Electric Vehicle

# Combined effects of energy efficiency and fuel substitution

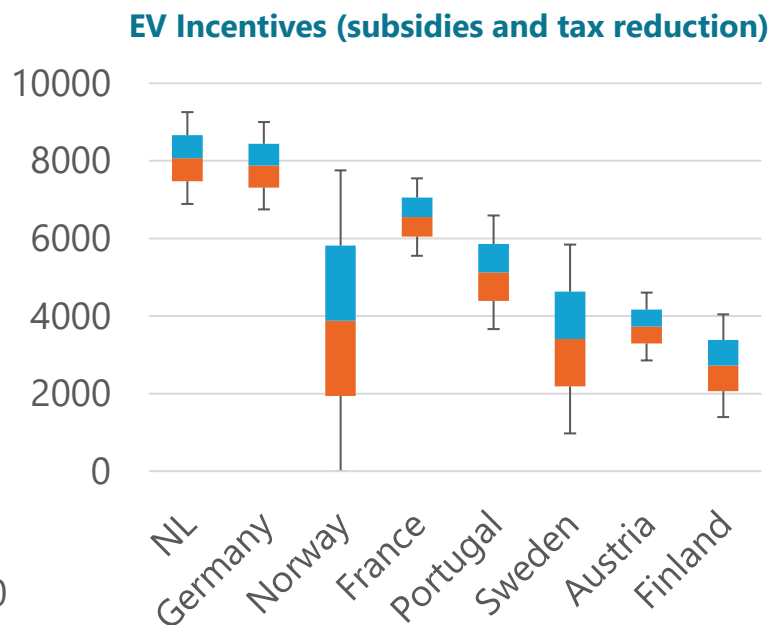
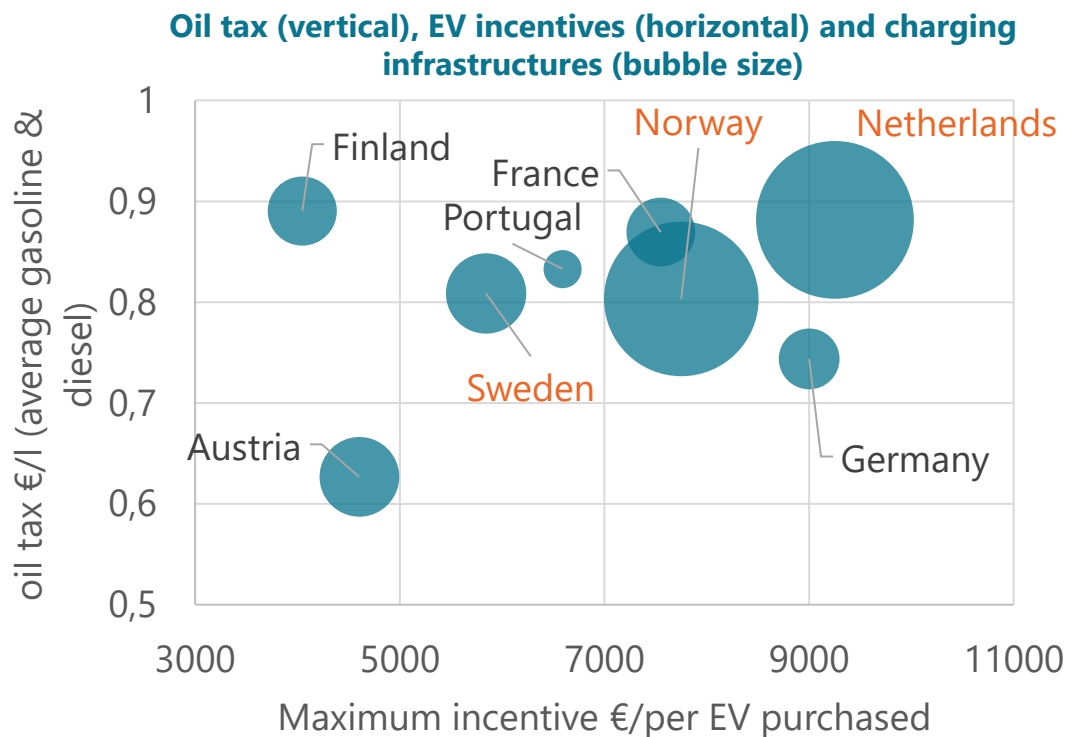
# CO<sub>2</sub> emissions of new cars (gCO<sub>2</sub>/km)

- CO<sub>2</sub> emissions were mainly reduced through **purely energy efficiency** measures since 2010. According to DG CLIMA, mandatory standards & labels for new cars are responsible for **~ 2/3** of this reduction since their introduction in 2009.
- In the Netherlands and Sweden, **the increasing share of electric and hybrid** vehicles in sales has contributed to this emission reduction (**~7%**).

Specific emissions of new cars (gCO<sub>2</sub>/km)



# Financial and fiscal measures of leading countries on energy efficiency and fuel substitution



- Leading countries have strong fiscal measures with CO<sub>2</sub>-based taxes
  - Sweden has the **highest carbon tax (118€/tCO<sub>2</sub>)**, followed by Finland (**54€/tCO<sub>2</sub>**)
  - **Finland, NL and France: high oil taxes (average gasoline and diesel)**
- Leading countries have **high incentives as well** (tax reduction and purchase subsidies). Norway and Sweden have differentiated taxes for BEVs and PHEVs, in favor of BEVs.
- Highest incentives do not directly result in highest EV market shares. The most advanced countries have also supported the transition by deploying charging infrastructures (NL, Norway **~3.5/1000**)

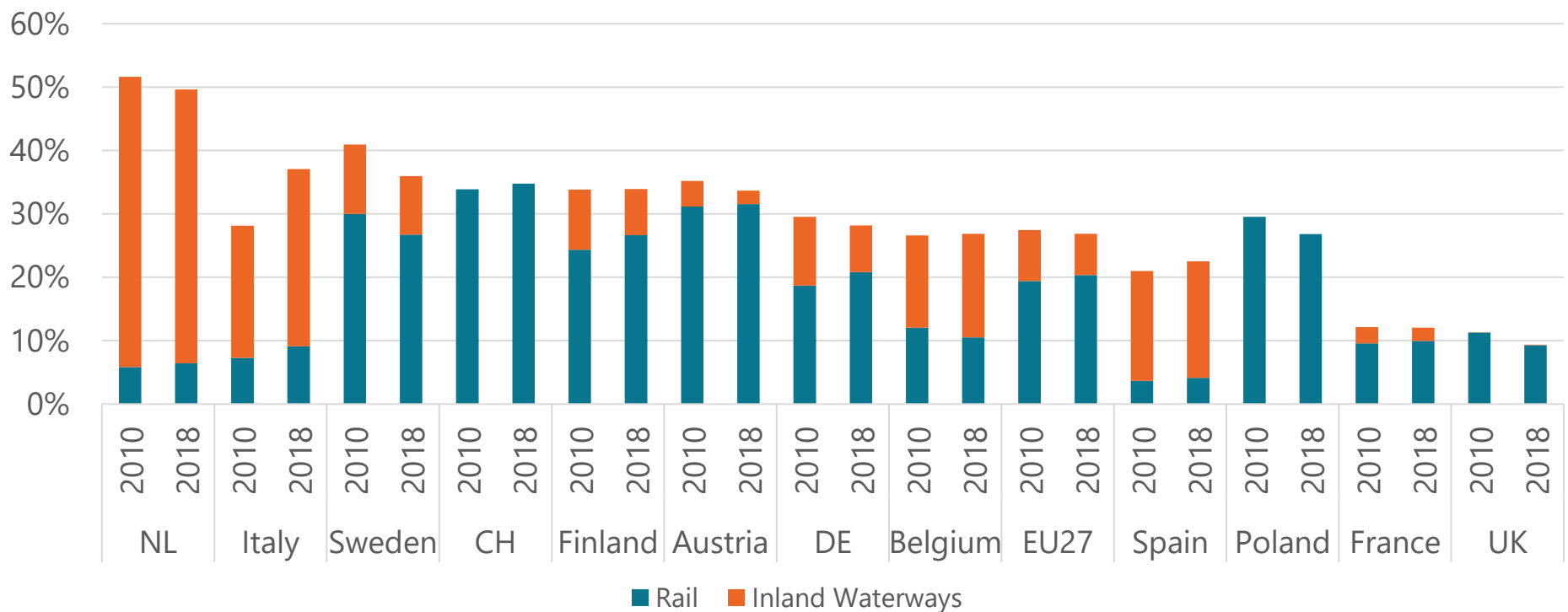
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# Modal shift



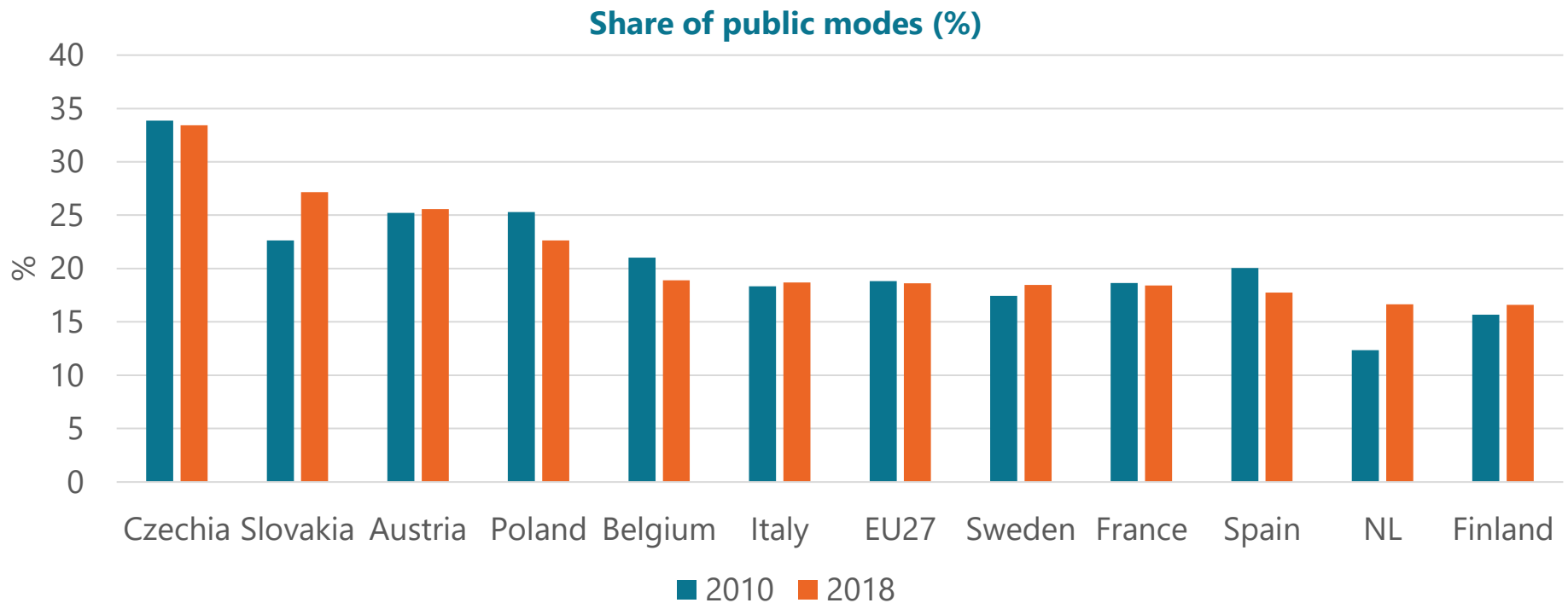
# Share of rail and inland waterways in freight traffic (%)

- No significant change in the past decade at EU level
- Significant modal shift from road to other modes in Italy (+13,6 points) due to European project [Motorways of the Sea](#) (2001): competitive alternative to land transport
- The Netherlands is leading in terms of level ~49% : €2.5 billion invested to create good quality rail lines seaports and their hinterland as well as integrating the Dutch network into European routes.



# Share of public transport in passenger traffic\* (%)

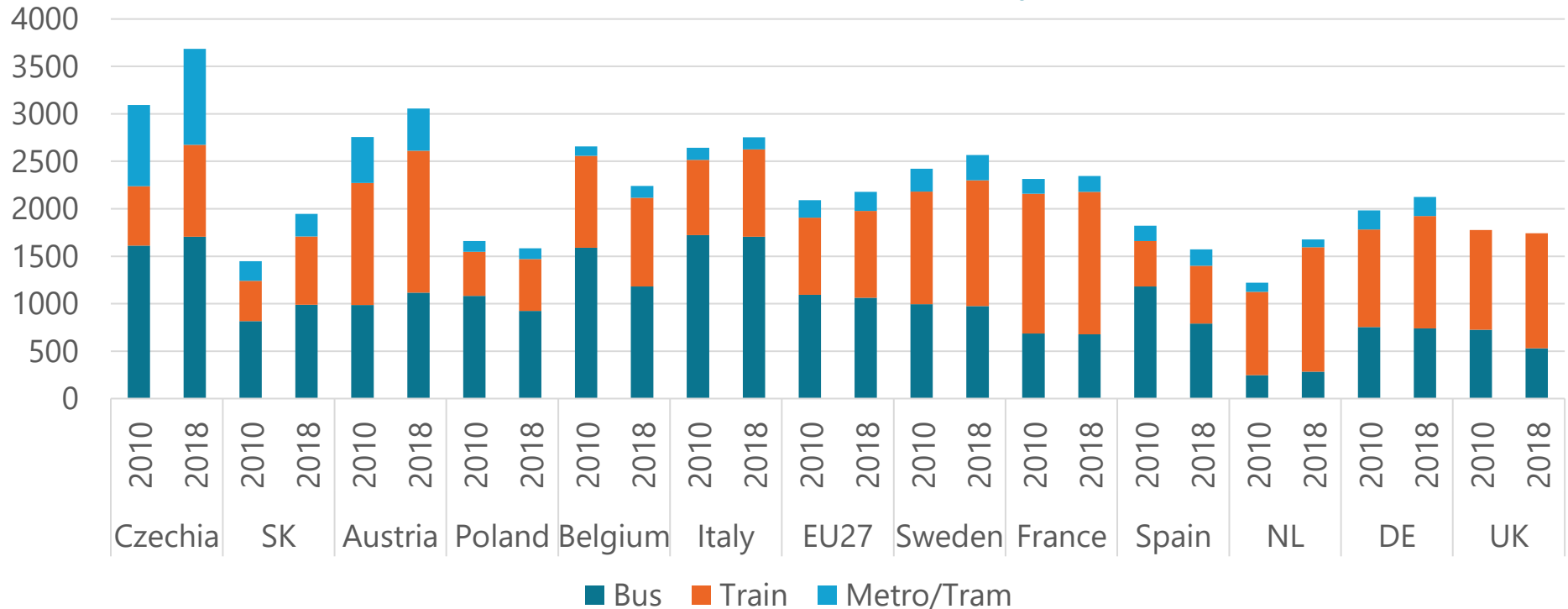
- No significant shift observed since 2010 in average
- Significant modal shift in Slovakia (+4,5 points) and the Netherlands (+4,3 points).
- Slovakia set several financial support schemes to purchase new trains (2014), and modernize railway lines (2007).
- Czechia (33%) Slovakia (27%) and Austria (26%) lead in terms of total share in 2018.



# Mobility in public transport per capita (km/capita/year)

- In most EU countries, mobility in public transport has **slightly increased**.
- **Highest mobility in Czechia (~3600km) and Austria (~3000km), still below Japan (~4000 km).**
- The share of each mode has mostly stayed the same.
- Slovakia, Austria, the UK and the Netherlands have **significantly increased the share of rail** in passenger transport.

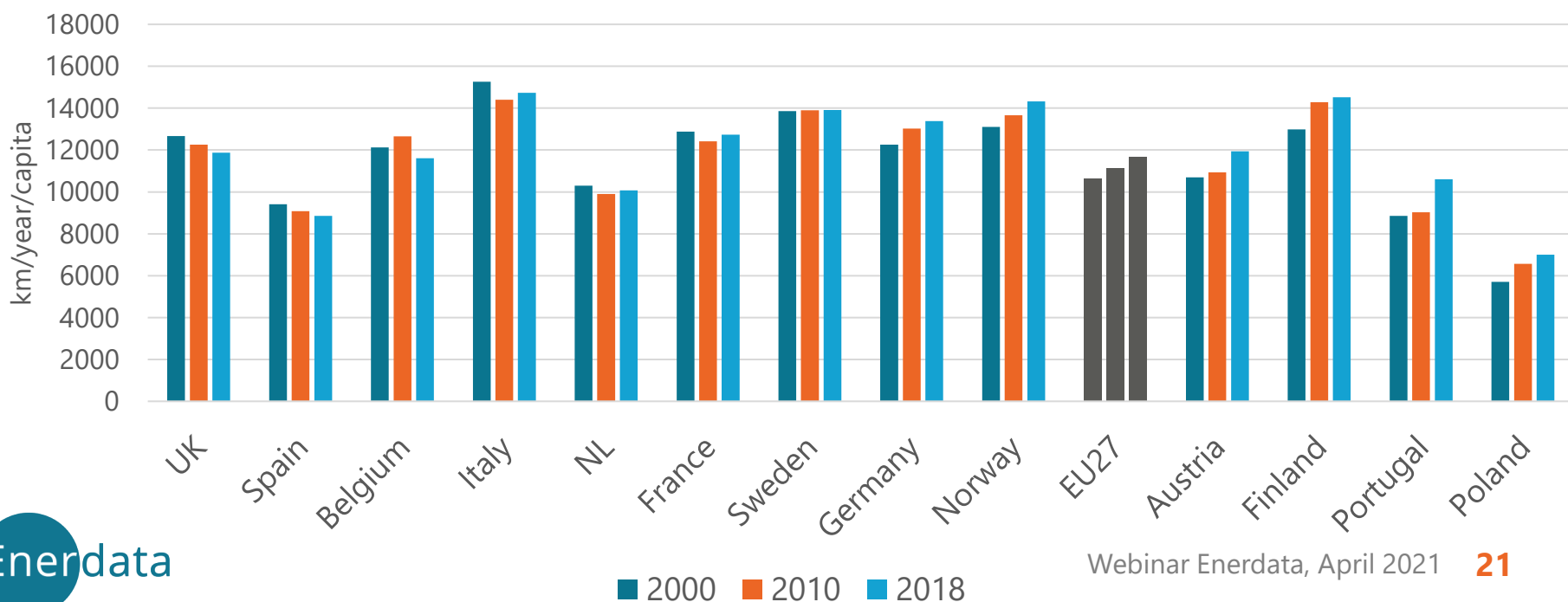
km in public modes km/capita/yr



# Transport demand

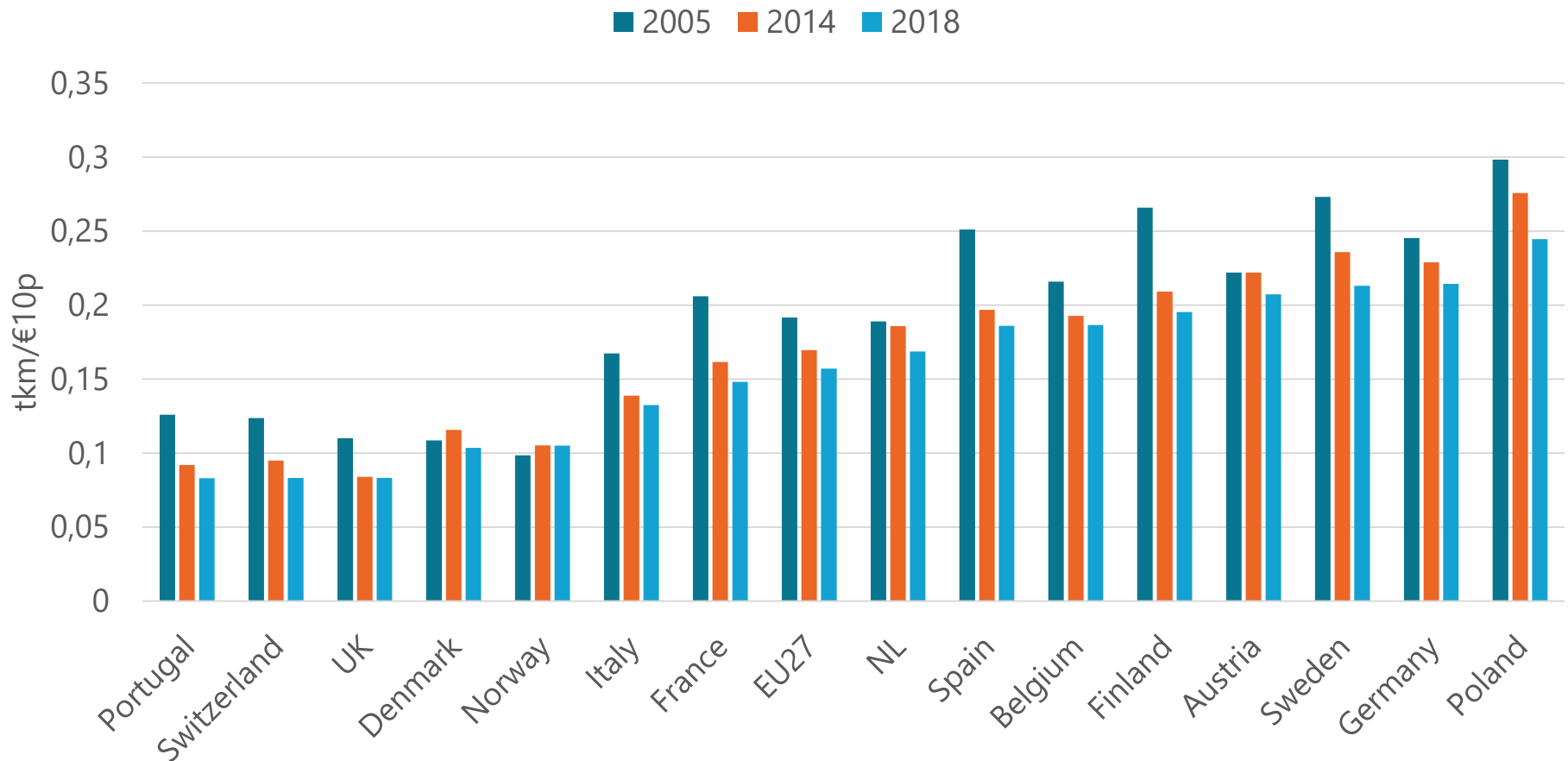
# Mobility per capita (km/capita/year)

- Motorised mobility per capita has slightly **decreased** in the UK, Spain, Belgium, and the Netherlands.
- In all other European countries it has either **increased** or **not significantly changed since 2000**.
- In the UK and Belgium, there is a **decoupling** between passenger mobility and household incomes, as income was respectively 20% and 10% higher in 2018 than in 2000.
- Among the richest EU countries, mobility is the lowest in the Netherlands.



# Goods traffic per unit of GDP

- Most European countries have decoupled road traffic of goods and GDP. However, progress seems to have **frozen after 2010** for the UK, Spain, Belgium and the Netherlands.



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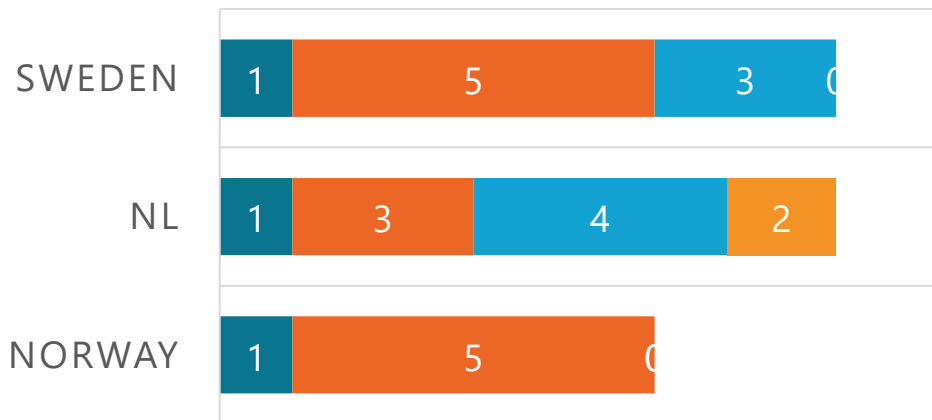
# Synthesis : ranking of countries

# Ranking of countries

- On each indicator, we can rank countries on both trend and level.
- The first five countries get a grade from 5 to 1.
- This gives an average grade per lever, and then for the 4 levers combined.

## RANKING

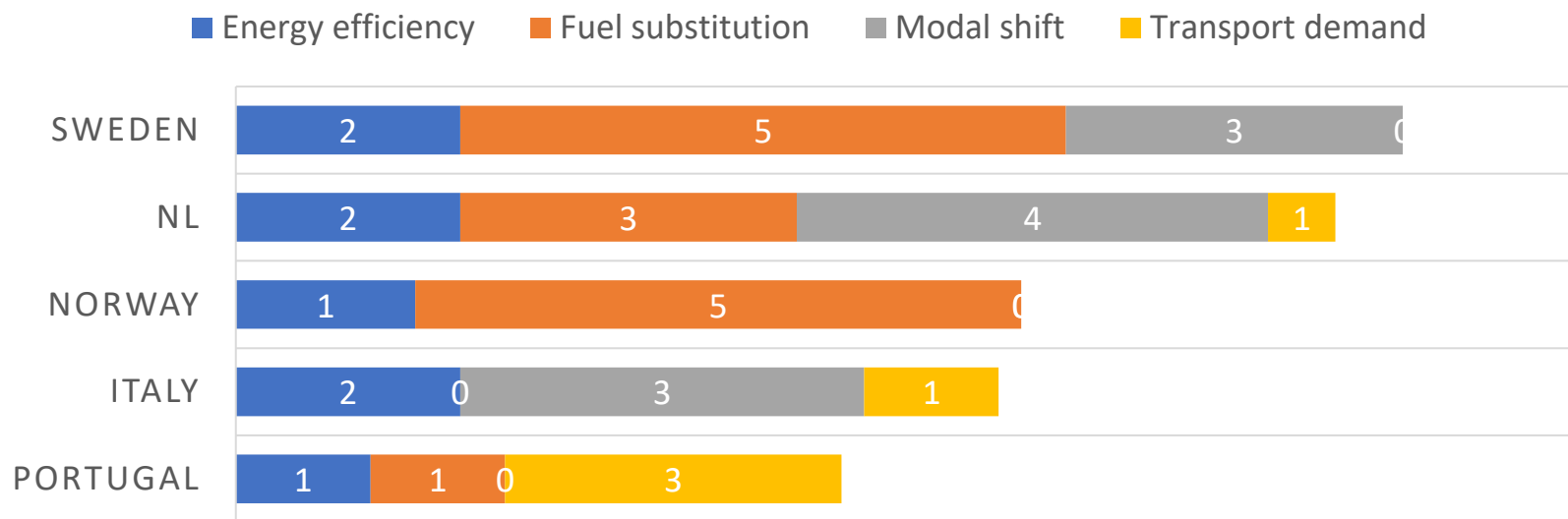
- Energy efficiency
- Fuel substitution
- Modal shift
- Transport demand



- Efforts on **energy efficiency** and no significant difference among leading countries
- Leading countries on **fuel substitution** are far ahead the others (Sweden for biofuels, Norway for EV penetration)
- **Modal shift**, uncommon and mostly in freight transport (NL)
- **Transport demand** not often addressed but significant decorrelation between traffic and GDP



# Synthesis – Ranking by trend



Energy efficiency effort in all countries.

1. **Sweden**: high + increasing share of **decarbonized fuels**, rapid increase in **electric and hybrid** vehicle sales and moderate efforts to **shift from road to rail** for both passengers and goods.
2. **NL**: only country performing on every lever; accelerating shift towards **electric and hybrid** vehicles, significant **shift from road to rail and inland waterways** for goods, substantial investments in charging and multimodality infrastructures, slight **decrease in mobility**.
3. **Norway**: focus on **technical levers**, far ahead in EV penetration, most decarbonized electric mix but lacks modal shift and transport demand measures
4. **Italy**: leader on **freight modal shift** and average performance on the other levers.
5. **Portugal**: lacks measures on modal shift but **efforts on technical levers** and managed to increase GDP while decreasing freight traffic since 2000.

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# Conclusions

# Conclusions: how far is the transition in Europe?

- **Energy efficiency** of thermal cars has **stopped progressing** for new vehicles and will continue with a lag for the whole stock.
- **Biofuels penetration** has reached high level in some countries but is progressing slower in recent years.
- The **transition in terms of efficiency** and fuel substitution will really depend on the penetration of electric vehicles, which apart from Norway is still low.
- Tracking the transition to electricity is still not visible, both as the consumption of electric vehicles is still modest\*, but also because statistics are not yet adapted to catch it.
- According to Enerdata's **new supply and demand projections, Enerfuture 2021**, the share of electric cars could reach between 23 and 45% in 2030 in the EU\*\*.
- The last two levers, which represent the largest long-term potential for the transition to low carbon transport, are still not on the right tracks.

\* ~3,5 TWh in 2019, i.e. equivalent to 5% of electricity consumption of transport

\*\*<https://www.enerdata.net/research/forecast-enerfuture.html> (2021 projections forthcoming)

# Conclusions: further developements

- Ranking countries is always a bit conventional : the method presented here was just a first attempt. It could be further developed as done for scoring countries in terms of energy efficiency performance in the [ODYSSEE MURE](#) project\* .
- Only European countries have ben considered so far, as they are the most advanced:
  - in all levers of this transition,
  - in terms of policy commitments and measures
  - and finally in terms of monitoring, ie access to data and indicators.
- Some non European countries may be in a good position in one of these levers, mainly fuel substitution, such as Brazil for biofuels and China for electricity), and modal shift (e.g. Japan) and are being incorporated in an extension of our data monitoring in the [EnerDemand](#) services\*\*.

\*<https://www.odyssee-mure.eu/data-tools/scoring-efficiency-countries.html>

\*\*<https://www.enerdata.net/research/world-energy-efficiency-demand-database.html>

## Contact:

Bruno Lapillonne

Scientific director, energy  
efficiency and demand expert

[Bruno.lapillonne@enerdata.net](mailto:Bruno.lapillonne@enerdata.net)

## About Enerdata:

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Our experts will help you tackle key energy and climate issues and make sound strategic and business decisions.

We provide research, solutions, consulting and training to key energy players worldwide.

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Thank you for your attention!

More details can be found in a  
forthcoming report.