

ODYSSEE-MURE

*First regional meeting of the project “OdysseeMure fit-4-55,
Monitoring the Energy Efficiency Pillar for Climate Neutrality”
24-25 April 2023, Zagreb, Croatia*

Recent energy efficiency trends in the EU

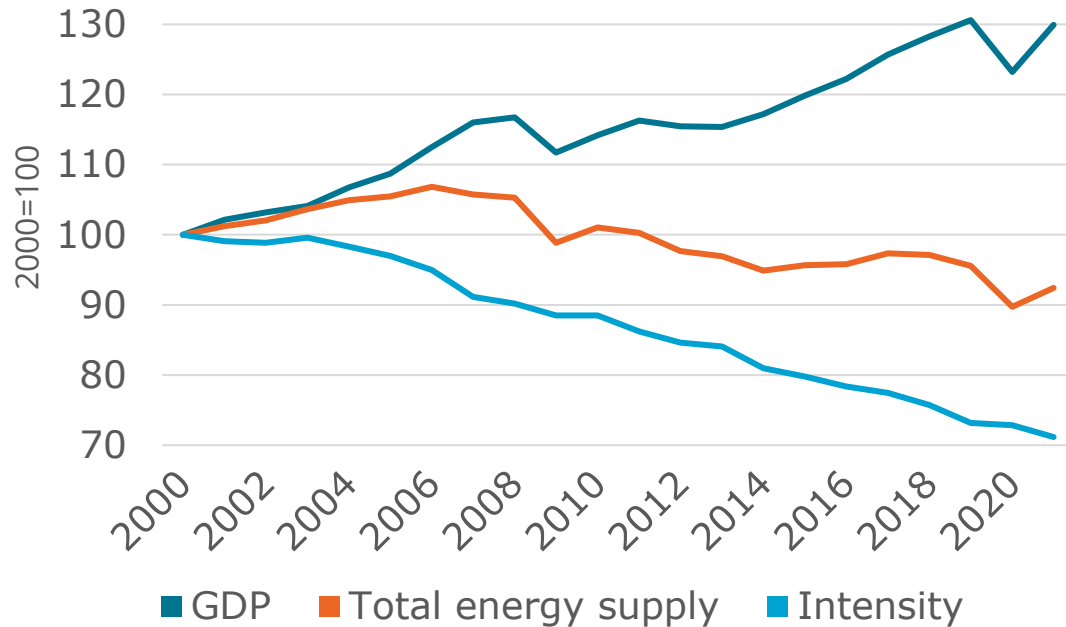
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Laura Sudries, Joseph Bon-Mardion, Bruno Lapillonne,
(Enerdata)*

Outline

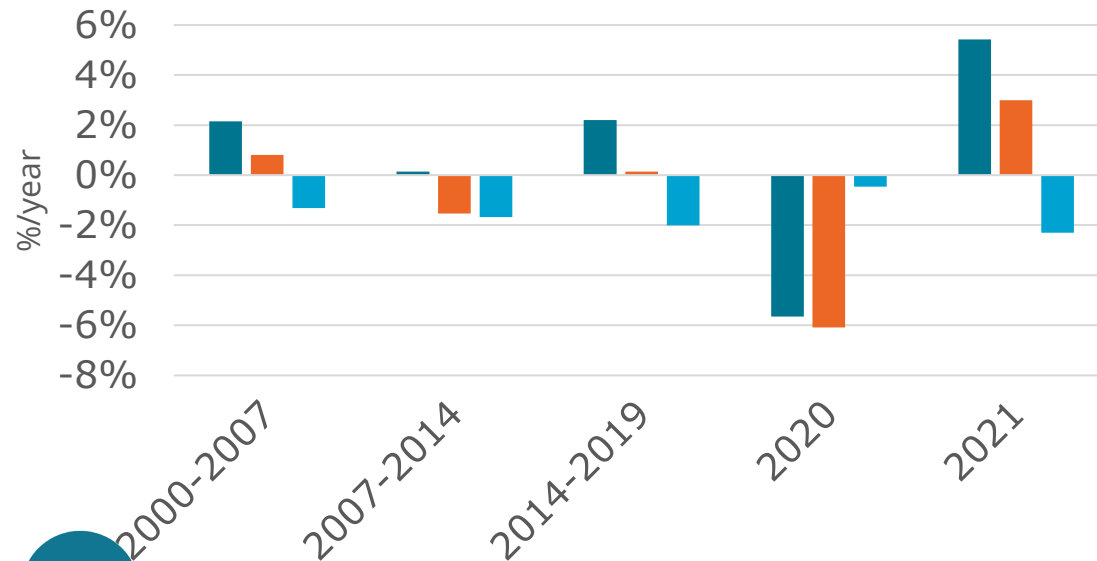
1. **Energy consumption trends**
2. **Energy efficiency trends by end-use**
3. **Energy efficiency trends by sector**
4. **What can we say on energy consumption trends in 2022?**

1. Energy consumption trends up to 2021

Total energy supply and intensity vs GDP

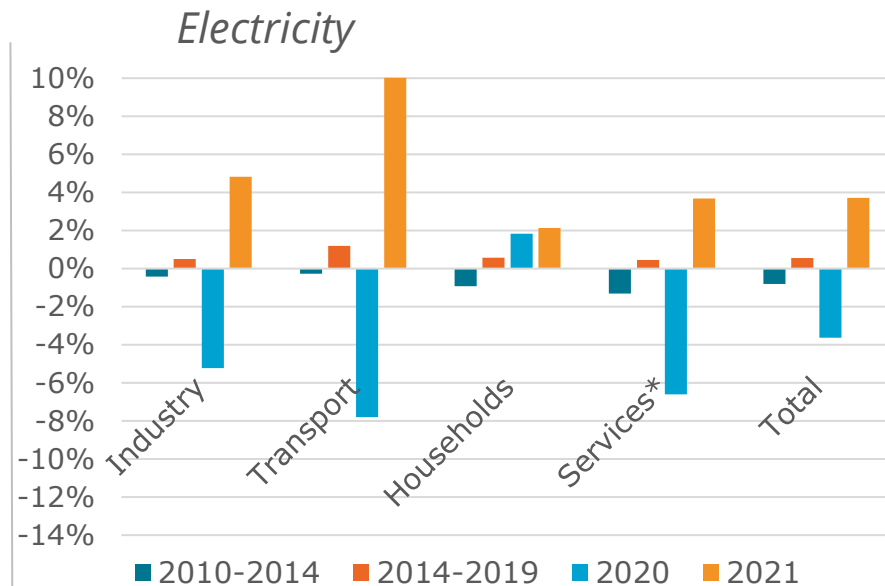
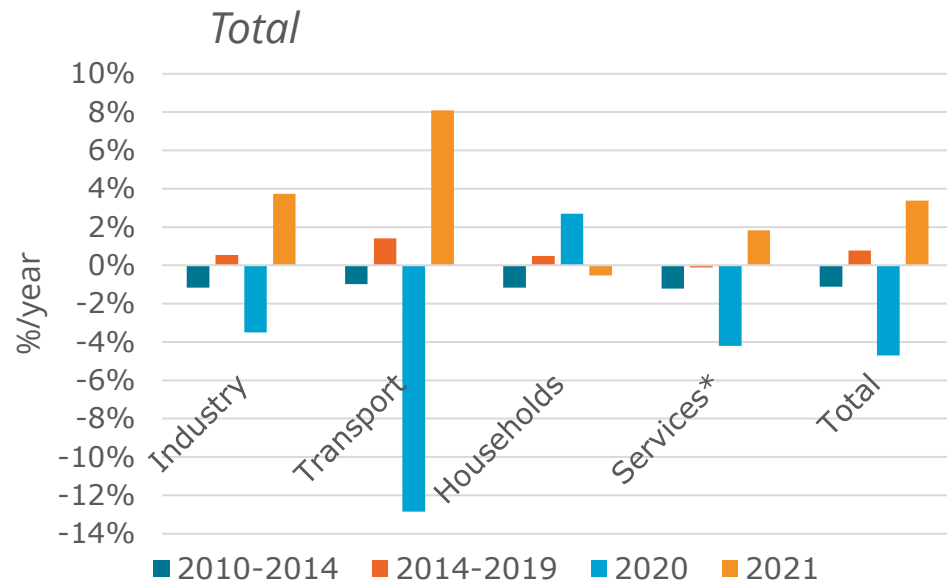


- Rebound of total energy supply by 3% in 2021 after a drop by 6% in 2020.
- Relative stability of EU total energy supply between 2014 and 2019, although GDP increased by 2.2%/year.



- In 2021, the primary energy intensity has returned to its pre-COVID trend (2014-2019) (-2%/yr).

Final energy consumption trends



- **Final energy consumption** has increased by 3.4% in 2021, with a very high growth in transport (8%); it was back to its 2016 level. In all sectors, the progression was much faster than over 2014-2019.
- It decreased by almost 5% in 2020, of which 13% in transport; in 2020 **households** consumption increased by 2.7%.
- **Electricity** consumption increased by 4% in 2021, driven by transport, industry and services.

Total energy supply vs final consumption

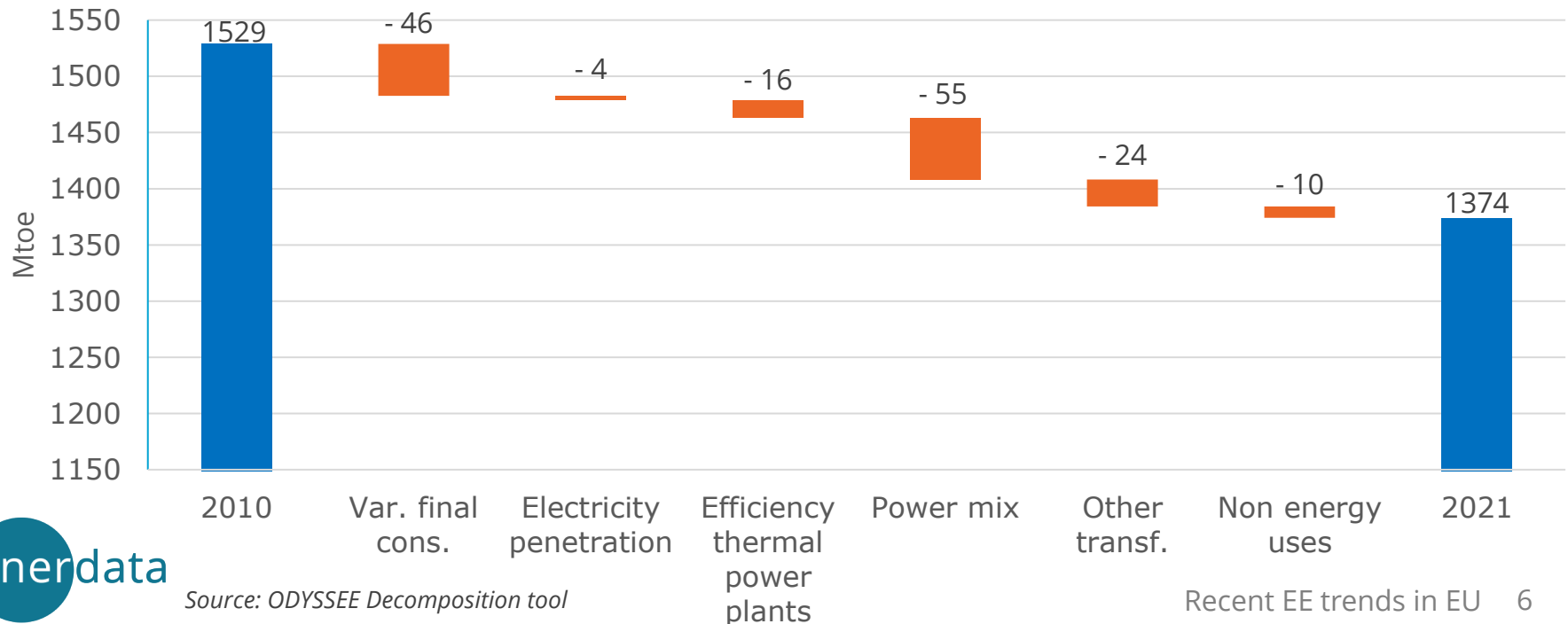
Between 2010 and 2021, total supply decreased 3 times more than final consumption: -155 Mtoe vs -46 Mtoe. Why?

1. Changes in the power mix, with:

- A higher share of renewables (+13 pts) and a lower share of nuclear (-4 pts) and thermal (-9 pts) that reduced total supply by 55 Mtoe.
- An improved efficiency of thermal generation (+2 pts) with a shift from coal to gas, which contributed to a reduction of 16 Mtoe.

2. And a decrease in other transformations losses (-24 Mtoe).

Drivers of total energy supply variation over 2010-2021



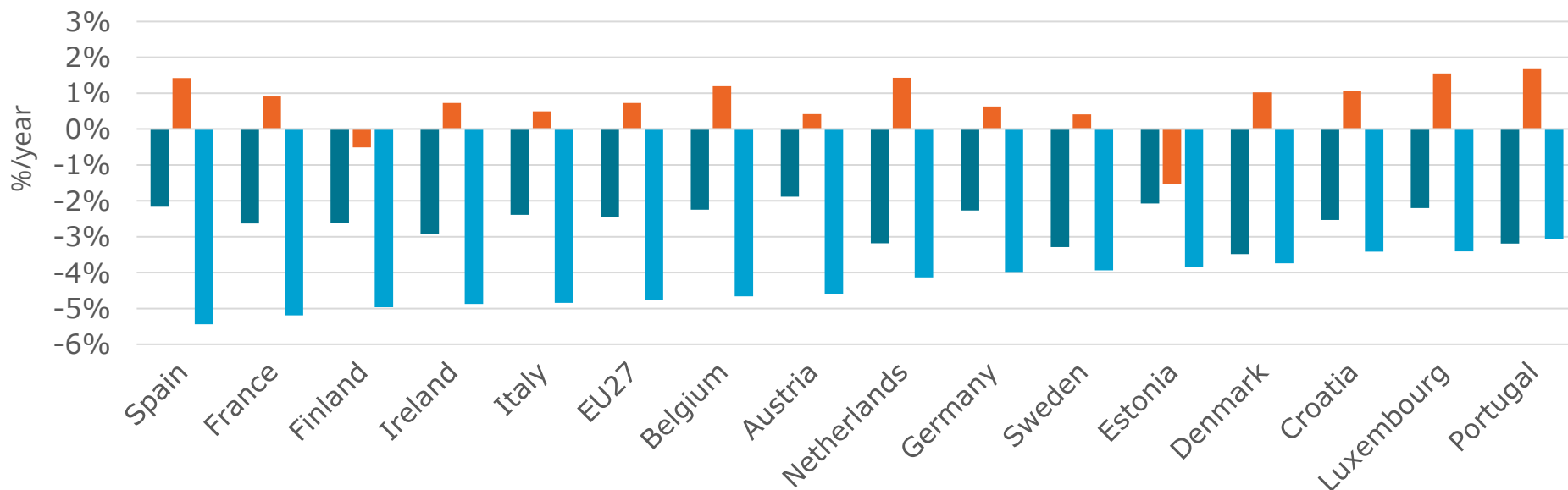
2. Energy efficiency trends by end-use

How is measured energy efficiency progress by end-use in ODYSSEE?

- Energy efficiency progress is measured by end-use or sub sector with various indicators of specific consumption measured in **physical units** selected to be as close to energy efficiency as possible :
 - For transport: l/100 km or koe/pkm for cars, l/100 km and koe/tkm for trucks, etc.
 - For households: toe/m² for heating, kWh/appliance for large appliances, toe/dwelling for cooking or water heating, etc.
 - For industry: toe/ton for energy intensive products (steel, cement, pulp and paper), toe/IPI for other branches.
- More indicators can be found in the **“key indicator tool”** at <https://www.indicators.odyssee-mure.eu/online-indicators.html>

Energy efficiency of new thermal cars (l/100 km)*

- 2019-2021 The average specific consumption has **decreased** significantly. Mainly due to a high increase of the share of **hybrid thermal cars** (from 6 to 25% of new registrations at EU level) and energy efficiency improvements
- 2014-2019 A reverse trend observed in most countries, and a 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%)
- 2000-2014 The specific consumption of new diesel and gasoline cars has **decreased** everywhere

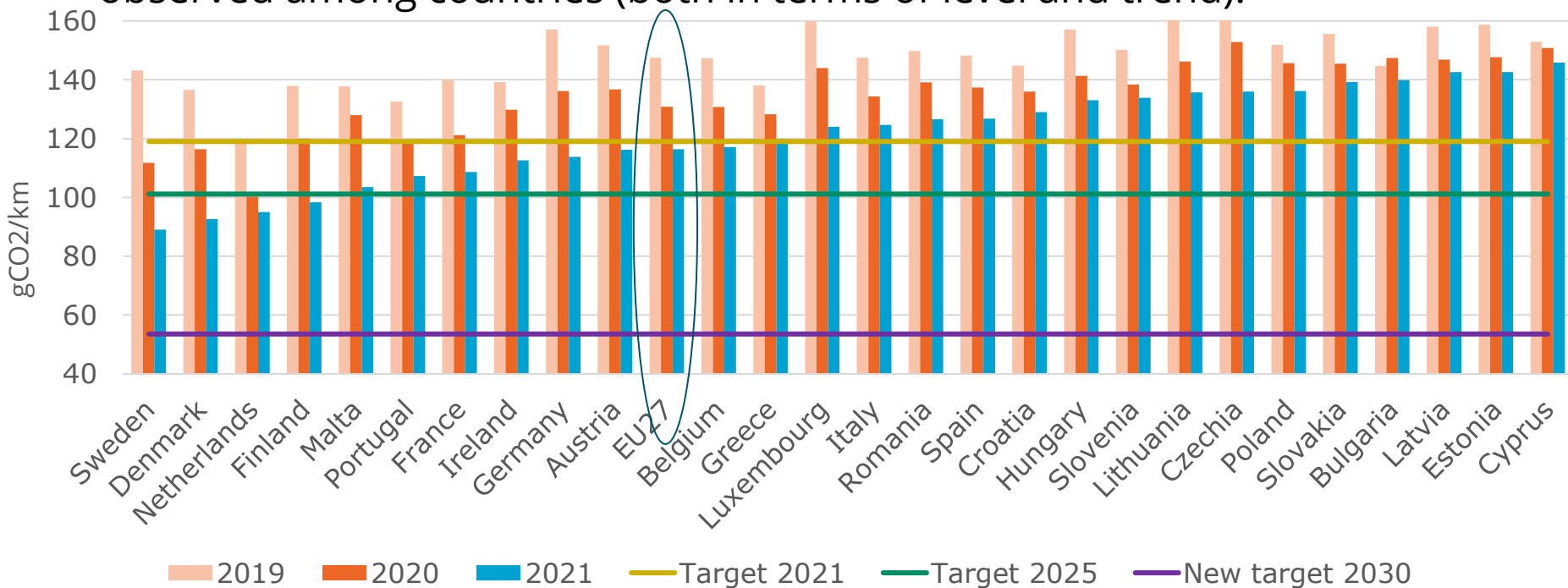


*Test-cycle values for diesel and gasoline cars; only shown countries with data since 2000

Source: ODYSSEE from EEA data

Specific CO₂ emissions of new cars (gCO₂/km)*

- Specific CO₂ emissions of new cars have decreased significantly since 2019 (-11%/yr at EU level):
 - This is due to the penetration of electric cars: from 2 in 2019 to 9% in 2021 for BEV and from 1 to 9% for PHEV.
 - Moreover, all technologies saw declining CO₂ emissions thanks to energy efficiency improvements.
- The target for 2021 was met at EU level, however discrepancies can be observed among countries (both in terms of level and trend).



*Test-cycle values for all cars with WLTP procedure

Source: ODYSSEE from EEA data

3. Overall energy efficiency trends by sector

How is measured energy efficiency progress by sector in ODYSSEE?

From the various energy efficiency indicators of specific consumption by end-use we obtain different trends; for instance, for households in the EU27:

- 2.0%/yr for refrigerators,
- 1.7%/yr for space heating,
- 0.5%/yr for water heating, etc....

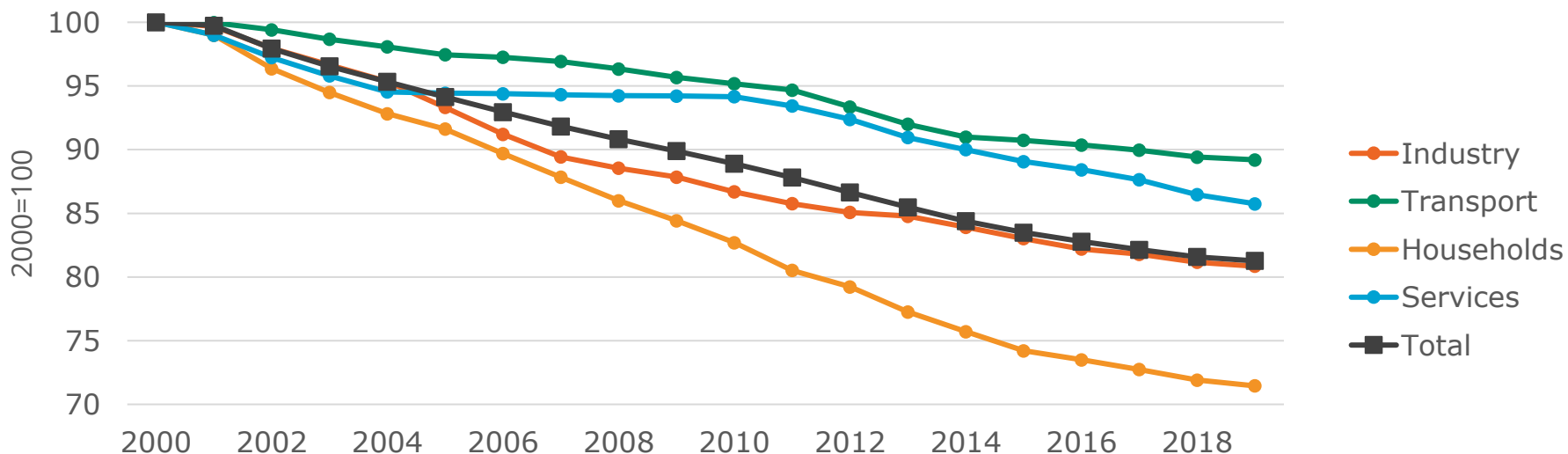
Question: What has been the overall energy efficiency progress at sector level?

- This is the objective of the energy efficiency index, called ODEX, that summarised the trend by sector and for all final consumers
- Trends in ODEX can only be presented up to 2019, as detailed data for 2020 are not yet available (update under progress)
The ODEX for 2020 and 2021 will be presented this autumn.
- With strong economic rebound, an acceleration of energy efficiency improvements can be expected for 2021.

Energy efficiency progress slowdown since 2014

- The energy efficiency progress of final consumers has **slowed down** from **1.2%/yr** over 2000-2014 to **0.7%/yr** since 2014.
- **Households** is the sector with the **greatest progress since 2000**, however with improvements **twice lower since 2014**.
- **Strong slow-down in industry since 2007** (0.8%/yr; down from 1.6%/yr before).
- **Lowest improvements in transport**, with a progress **twice lower since 2014** (0.4%/yr) than over 2007-2014, due to slow progress for cars.

Energy efficiency improvements for final consumers (EU)



Source: ODYSSEE, measured with ODEX (Odyssee Energy Efficiency Index).
ODEX=81.3 in 2019 → 18.7% energy efficiency improvement since 2000

4. What can we say on energy consumption trends in 2022?

What can we say about energy consumption in 2022?

- In 2022, **economic growth** was **3.5%** (5.4% in 2021 and -5.6% in 2020).
- **2022** was marked by strong increase in energy prices⁽¹⁾, which implied some restrictions of household consumers: this may lead to an overestimation of energy efficiency improvements for cars and households uses (mainly heating).
- **2022** was also marked by a warm climate that reduced heating needs (heating degree days 11% lower than in 2021).

(1) *Increase of electricity prices in the EU:*

- +18% for households (2022 compared to 2021)
- +40% for industry (2022 compared to 2021)

Increase of the gas prices in the EU:

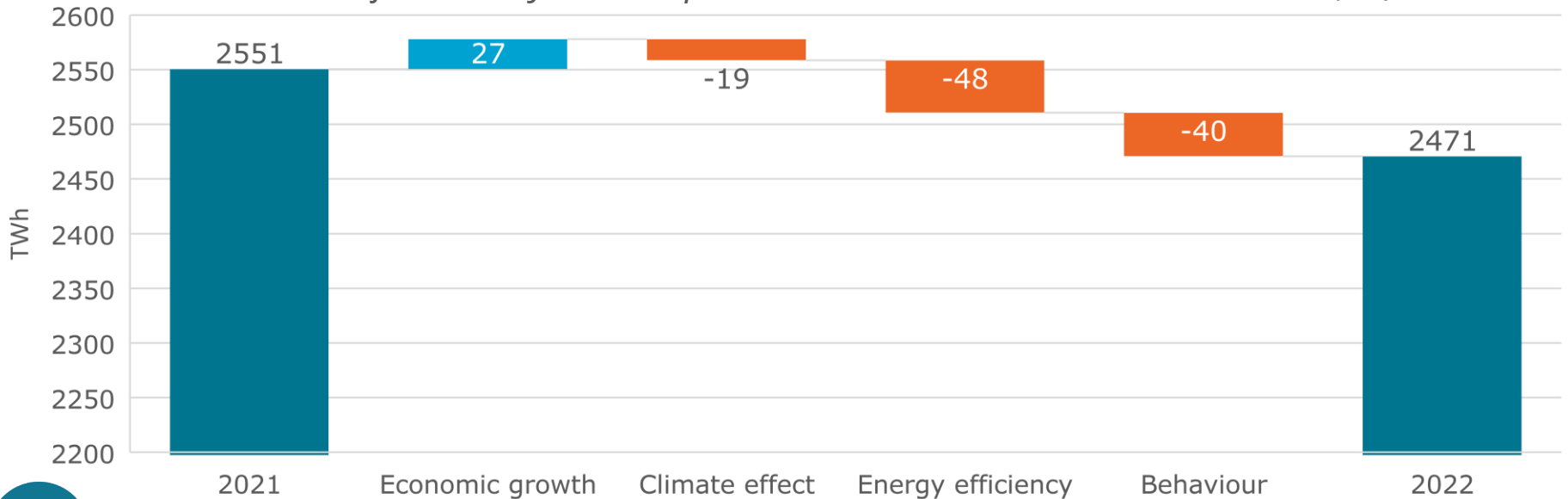
- +45% / +105% for households (S1/S2 2022 compared to S1/S2 2020)
- +120% / +180% for non-households (S1/S2 2022 compared to S1/S2 2020)

Electricity consumption variation at EU level in 2022

Final electricity consumption **decreased by 3%** in 2022 in EU:

- **Warmer winter** has lowered electricity consumption by **19 TWh**.
- **Energy efficiency** improvements have saved around **48 TWh**.
- These savings have been **partially offset by economic growth** contributing to increase electricity consumption by around **27 TWh**.
- Significant **behavioural changes** due to energy prices increase and sufficiency policies have reduced electricity consumption by **40 TWh**.

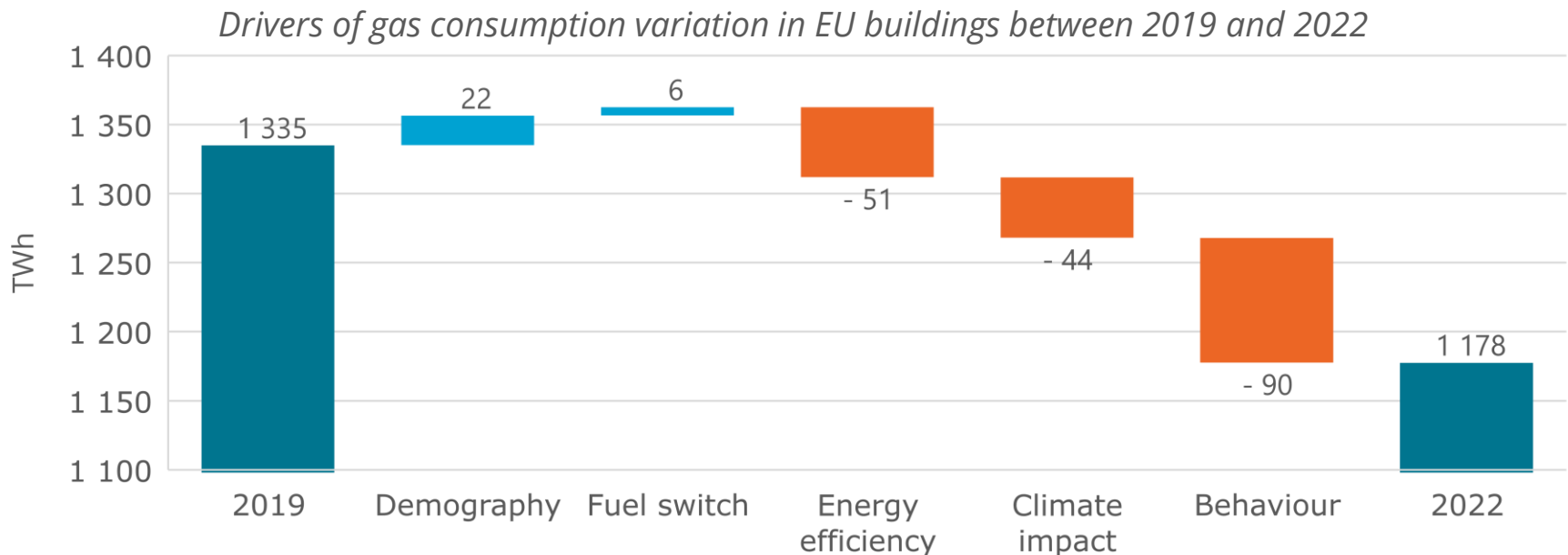
Drivers of electricity consumption variation between 2021 and 2022 (EU)



Interpretation of gas consumption trends in 2022

Based on an analysis conducted by Enerdata at EU level⁽¹⁾:

- Gas consumption in EU buildings **decreased by 12%** between 2019 and 2022.
- **Behaviour changes**, as a result of both prices hikes and voluntary demand reduction, explained about **half of this reduction** (-90 TWh).
- **Energy efficiency** improvements (estimated based on historical trends) contributed for around **25%**, as did the climate impact.



Source: Enerdata calculations from Odyssee (demography, fuel shares, efficiency trends), [Bruegel](#) (2022 demand trend), Eurostat (historical degree-days and consumption)

(1) "Gas supply shock: how EU's final consumers adapted?", Enerdata, February 2023

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About Enerdata:

Enerdata is an energy intelligence and consulting company established in 1991.

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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