

Regional training on indicators « ODYSSEE-MURE »

3. Benchmarking of energy efficiency by sector

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Benchmarking and scoring of energy efficiency performances with indicators

- Benchmarking of energy efficiency at sector level is done in ODYSSEE with comparable indicators at sub-sector level and with “adjusted indicators” at sector level .
- Scoring of energy efficiency performance is done for both levels and trends, through the scoring of selected of indicators by end-use can be done by sector can be done by using adjusted indicators by sector or as in ODYSSEE by using indicators by end-use

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1. Benchmarking at sub-sector or end-use level
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3. Scoring countries of energy efficiency performances





Benchmarking of EEI by sub-sector or end-use

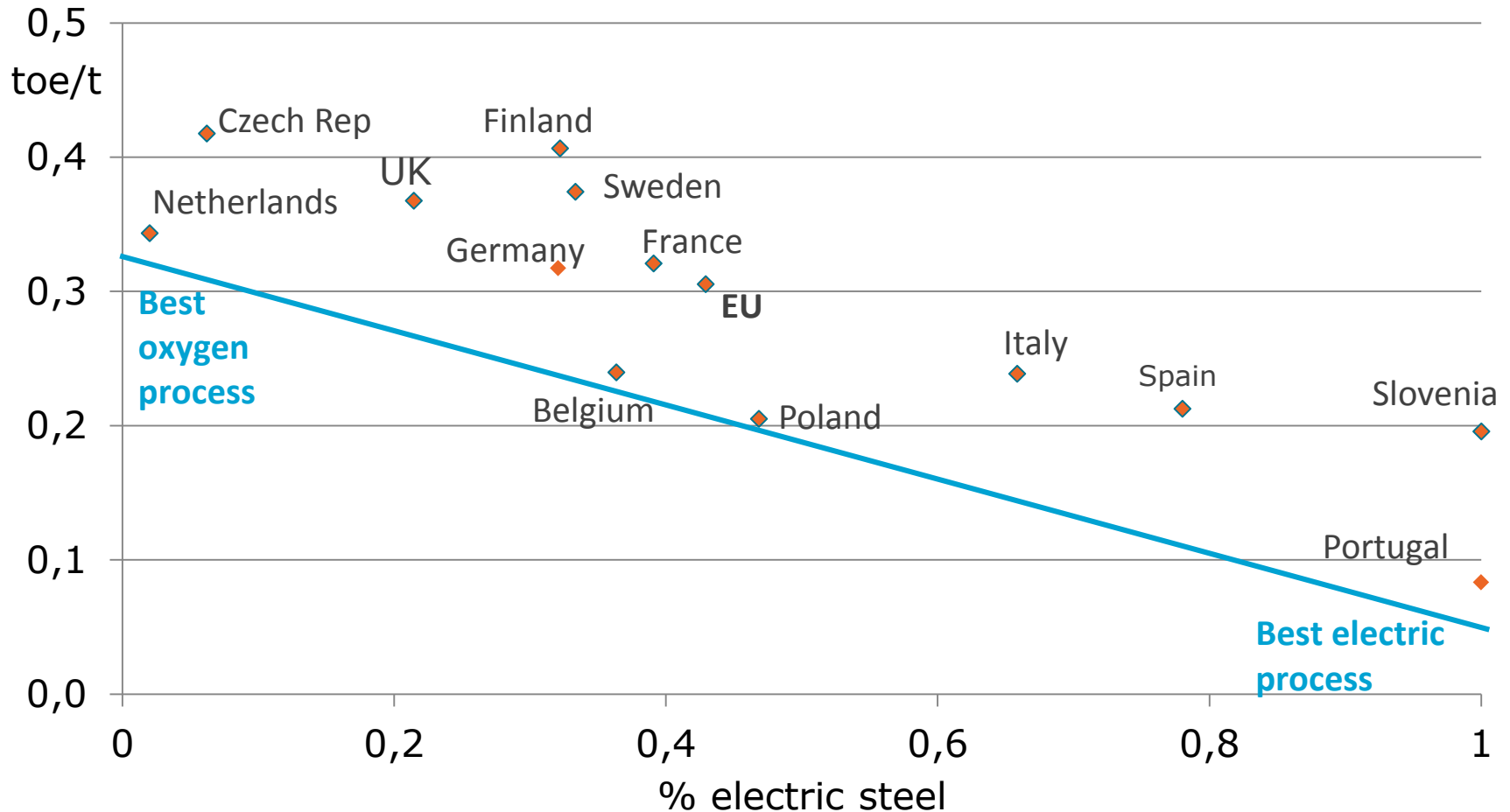
Benchmarking of EEI

- Benchmarking of EEI at end-use or sub sector level should be done by taking into account as much as possible factors of differences that are not linked to energy efficiency:
 - for household heating: differences in terms of climate, fuel mix, dwelling size → heating consumption per m² and degree days in useful energy is more relevant than just comparing heating consumption per household ;
 - for industrial product: differences in process/product mix should be accounted for.
- This is done with specific graphs that show the impact of the most important factors that are not linked to energy efficiency (e.g. comfort for heating, process /product mix in industry)

Difference in specific consumption partly explained by differences in process mix; distance to blue line shows possible potential of energy efficiency gains

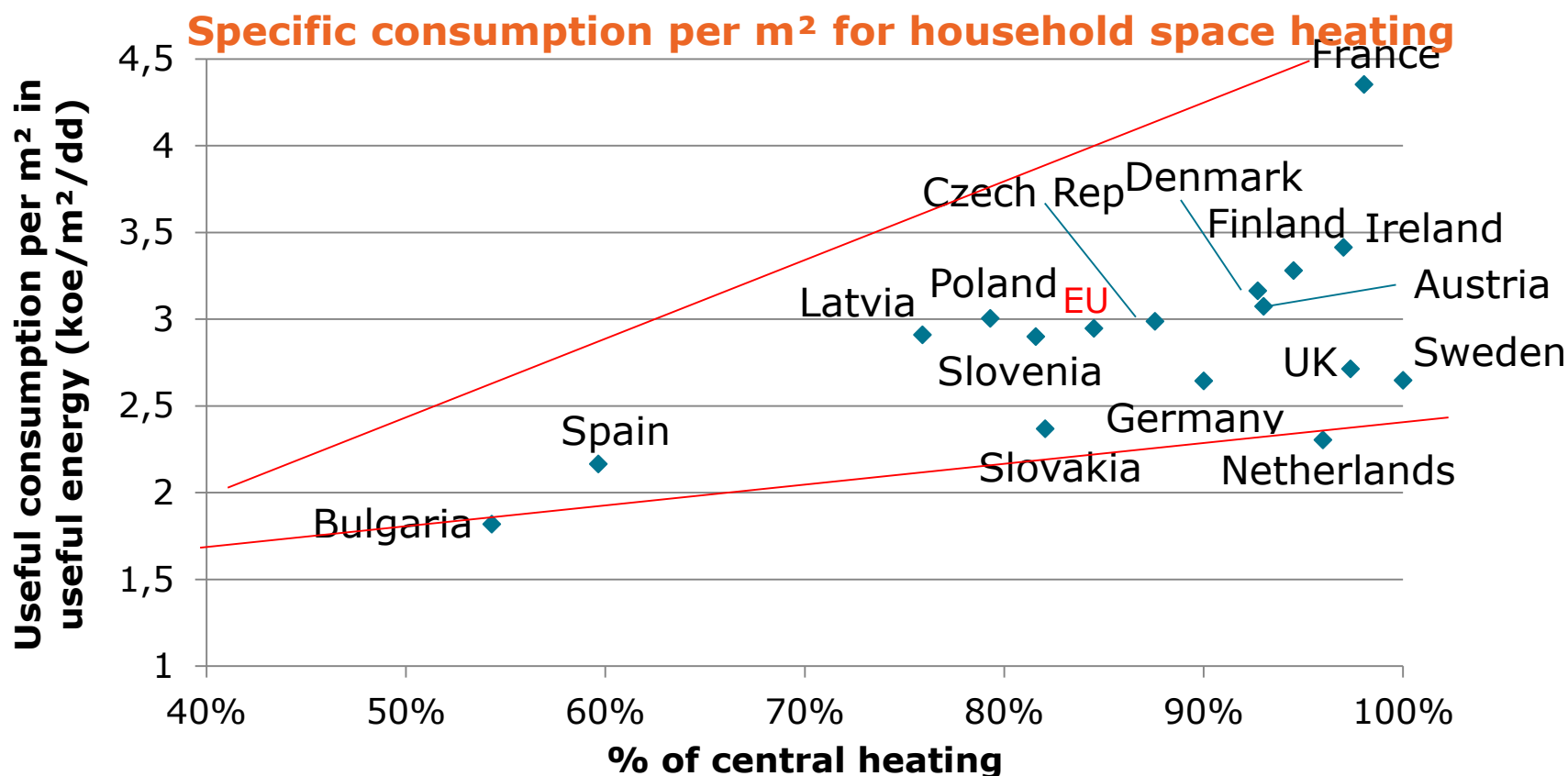


Consumption per tonne of crude steel (2012)



Indicators of benchmarking: space heating

Benchmarking for heating should take into account countries' differences in dwelling size, climate, fuel mix and heating comfort → consumption per m²/ degree-day in useful energy, in relation to central heating penetration → The Netherlands has the best performance among countries well equipped in central heating: 40% better than France.



Central heating includes district and block heating, individual boilers and electric heating (all rooms heated, as opposed to room heating, where a stove provides heat to the main room only.



Benchmarking by sector

Benchmarking at sector level with adjusted indicators in ODYSSEE

- The adjustments made in ODYSSEE take into the following quantifiable differences between countries:
 1. Climate
 2. Fuel mix
 3. Industry structure
 4. Economic structure
- All indicators in monetary terms are measured with purchasing power parities to adjust for differences in general price level.
- A data tool enables to benchmark the countries by doing these adjustments (“ benchmarking tool”) and by showing the impact of each of them individually.

Adjustment to the same climate



- **Climatic differences** are taken into account by calculating an indicator “adjusted” or “scaled” to the **climate** of the **reference country**. The adjustment is done on the heating part of the consumption of the basis of heating degree days.
- The **reference country is the EU** in the ODYSSEE **data base**, the **selected country** in the **benchmarking tool**
- This adjustment is done for:
 - Household consumption per dwelling and per m²
 - Household space heating consumption per dwelling and per m²
 - Service sector energy intensity
 - Final energy intensity adjusted at EU climate: actual and at constant structure
- Adjustements can be done in the same way for air conditioning .

Adjustment to the same fuel mix



- The main sector for which differences in fuel mix have a significant impact on the indicators are the household and power sectors.
- For the household sector, the adjustment is done by calculating a consumption in useful energy and assuming the same fuel mix for each country (that of a reference country*).
- For the primary intensity, the adjustment is done by assuming the same power mix for each country (that of a reference country).

**The reference country is the EU in the ODYSSEE data base and the selected country in the benchmarking tool*



Adjustment to the same industry structure

- Differences in **industry** structure are taken into account by calculating an average industrial intensity with the actual intensity by sub-sector of each country and the same industry structure, that of the reference country* (i.e. share of each industrial branch in total value added).
- The calculation is done in ODYSSEE for:
 - Industry intensity
 - Manufacturing intensity

**The reference country is the EU in the ODYSSEE data base and the selected country in the benchmarking tool*

Adjustment to the same GDP structure

- Differences in GDP structure are taken into account by calculating a final energy intensity with the actual sectorial intensities of each country and the same GDP structure, that of the reference* country (i.e. share of agriculture, industry, services and private consumption in total GDP);
- For industry the industrial intensity used is the adjusted one to also capture the differences in industry structure;
- The calculation is done in ODYSSEE for:
 - Final energy intensity in ppp
 - Final energy intensity in ppp adjusted at EU climate (to combine several adjustments)

**The reference country is the EU in the ODYSSEE data base and the selected country in the benchmarking tool*

Benchmarking tool

ODYSSEE-MURE

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Odyssee

The ODYSSEE indicators are accessible under different data tools: the full data base, the key indicators facility, as well as five specific data facilities that focus on specific issues and provide some interpretation: market diffusion, decomposition, benchmarking, energy saving and indicator scoreboard. The access to the data base is restricted, whereas all other data tools are in public access.

ODYSSEE DATABASE

KEY INDICATORS

MARKET DIFFUSION

DECOMPOSITION

BENCHMARKING

ENERGY SAVING

ENERGY EFFICIENCY INDICATOR SCOREBOARD

Benchmarking facility compares the energy performance of any country with a selection of other countries.



Co-funded by the Intelligent Energy Europe Programme of the European Union

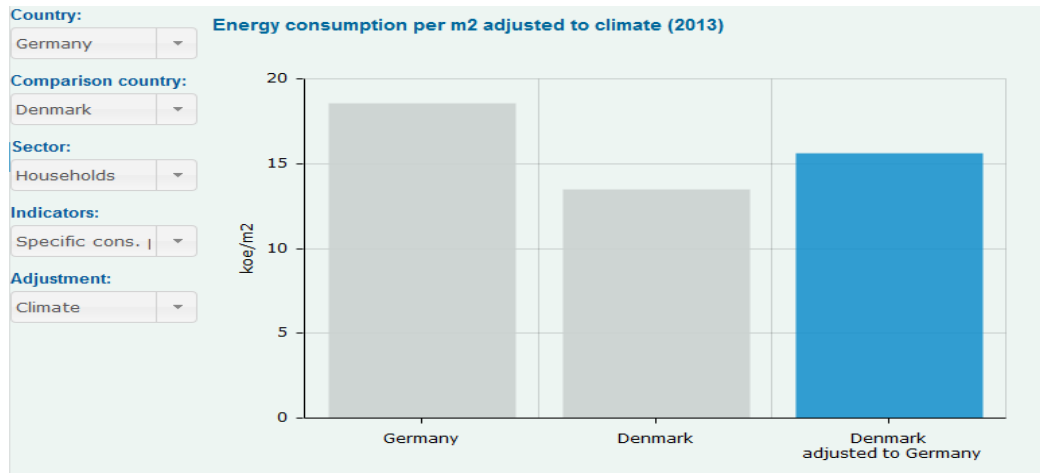


The benchmarking tool: main principles

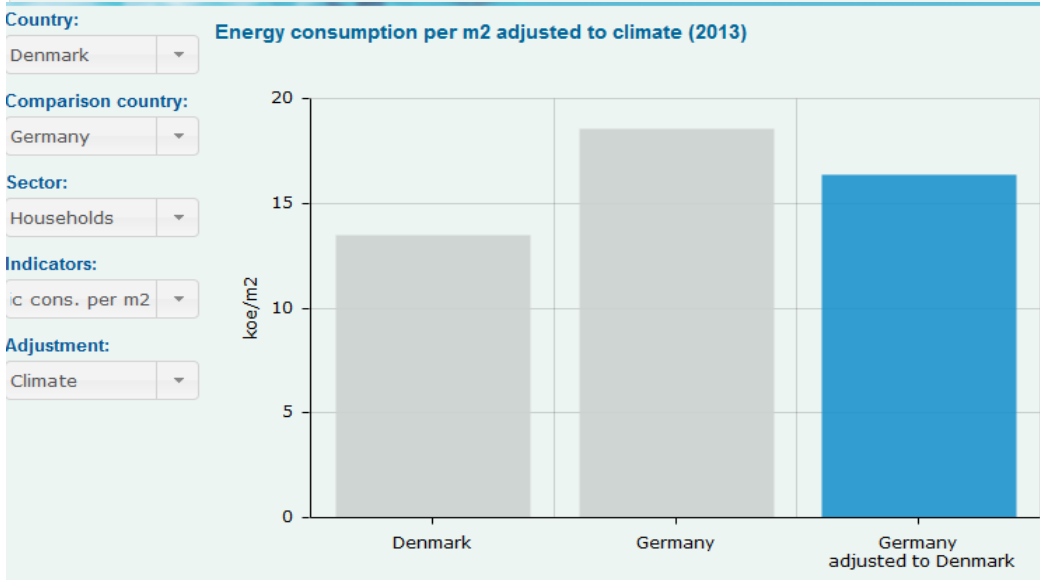


- The objective of this tool is to enable country X to compare with the country(ies) of its choice by adjusting the different indicators to its own characteristics.
- The tool shows for the last year available a graph showing the actual indicator values and the indicator after adjustment to the characteristics of country X.
- The user selects:
 1. the country to benchmark (X),
 2. the countries to which country X will be compared (“**comparison countries**”) (multi-selection available),
 3. the **sector**,
 4. the **indicator** for which the adjustment will be made (selection proposed),
 5. the **type of adjustment** (among a selection proposed).

The benchmarking tool: example



The first graph shows what would be the energy consumption per m2 scaling the household consumption of Denmark to the average climate of Germany.



The second graph shows what would be the energy consumption per m2 scaling the energy consumption of Germany to the climate of Denmark.



Scoring energy efficiency performances

Scoreboard facility on energy efficiency indicators

- Objective : Assess and score the level and progress of countries in energy efficiency, globally and by end-use sector (industry, transport, households, services, total final).
- Energy efficiency is assessed by sector through a selection of indicators:
 - **Indicators of level:** selected indicators e.g. for transport: specific consumption of cars, of goods vehicle, share of public transport...
 - **Indicators of progress :** trends in the previous indicators (e.g. trend in specific consumption of cars and trucks...).
- Both level and trends are combined for scoring and the same weight is given for level and trend (50/50 for each indicator).
- Scoring is done in two ways
 - **Position any country vis a vis 3 references:** the best country, the EU average or any country;
 - **Score all countries by sector and for all sectors,** and showing as an option the position, indicator by indicator.

Scoreboard methodology: calculation of the score for each indicator

- **Scoring methodology based on OECD Composite Indicator** (JRC method) which gives normalized scores across the countries within a range of 0-1.
- Methodology based on minimum and maximum values observed in the sample of countries ;

$$\text{Normalized score calculation} = \frac{\text{Indicator} - \text{min indicator}}{(\text{max indicator} - \text{min indicator}) * \text{direction}} + 0.5*(1 - \text{direction})$$

- Direction: = -1 (decline in the indicator favored) /+1 (increase favored)
- Final normalized score is always in the **range (0,1)**.
- Minimum and maximum: average of the lowest and highest 3 country values.

Scoring methodology: example of specific consumption of cars

Specific consumption of cars l/100km

| | |
|-----|-----|
| aut | 6,6 |
| cro | 7,2 |
| cyp | 9,3 |
| dnk | 8,0 |
| esp | 7,1 |
| fin | 6,2 |
| fra | 6,8 |
| gbr | 5,8 |
| grc | 6,0 |
| hun | 7,9 |
| irl | 6,3 |
| ita | 6,1 |
| lat | 7,8 |
| nld | 7,6 |
| nor | 6,4 |

Average of 3 max indicator: $(9,3 + 8 + 7,9) / 3 = 8,40$

Average of 3 min indicator : $(5,8 + 6,1 + 6,2) / 3 = 6,03$


Direction = -1 (decline in the indicator is favored)

Austria = 6.6

Normalized score based on 3 min-max average =

$$\frac{\text{Indicator} - \text{min indicator}}{(\text{max indicator} - \text{min indicator}) * \text{direction}} + 0.5 * (1 - \text{direction})$$

$$\frac{6.6 - 6.03}{(8,40 - 6,03) * (-1)} + 0,5 * (1 - (-1))$$

Normalized score Austria =  **= 0.76** (where range with min-max method is 0-1)

Scoreboard indicator tool

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KEY INDICATORS



MARKET
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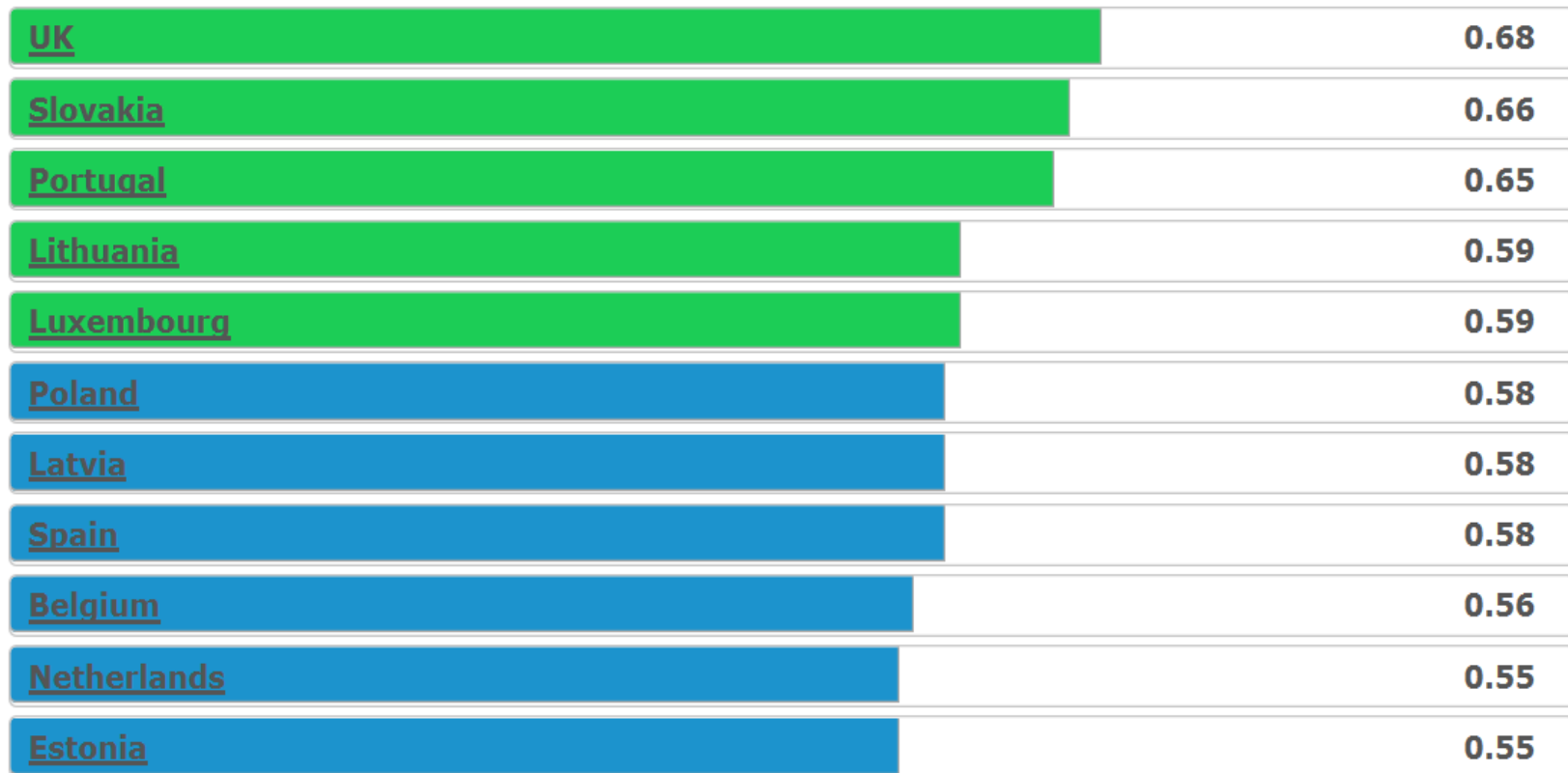
Energy efficiency indicator scoreboard facility maps o
the energy efficiency position of each country, global
and by sector.

Scoreboard: Country ranking (1/2)

Ranking by sector. All countries are displayed with their score: by sector with the possibility to visualise results for **trends and levels** combined or for **trends** or **levels** only.

Possibility to display the ranking by country and indicators (next slide).

Ranking for all sectors (trends and levels)



Scoreboard: Display of the ranking by indicator (2/2)

1 shows the 3 best ranking countries, 2 shows the next ones and so on.

Ranking by indicator: case of transport

| | Car efficiency | | Road freight per tkm | | Air per passenger | | % public transport | | % rail & water (freight) | |
|-------------|----------------|-------|----------------------|-------|-------------------|-------|--------------------|-------|--------------------------|-------|
| | Level | Trend | Level | Trend | Level | Trend | Level | Trend | Level | Trend |
| 1/ Sweden | 7 | ① | 15 | 20 | 5 | 11 | 15 | ③ | ② | 9 |
| 2/ Portugal | 4 | 4 | 14 | ③ | 8 | 7 | 24 | 10 | 22 | 7 |
| 3/ UK | ① | ① | 22 | 19 | 25 | 20 | 23 | ① | 21 | 5 |

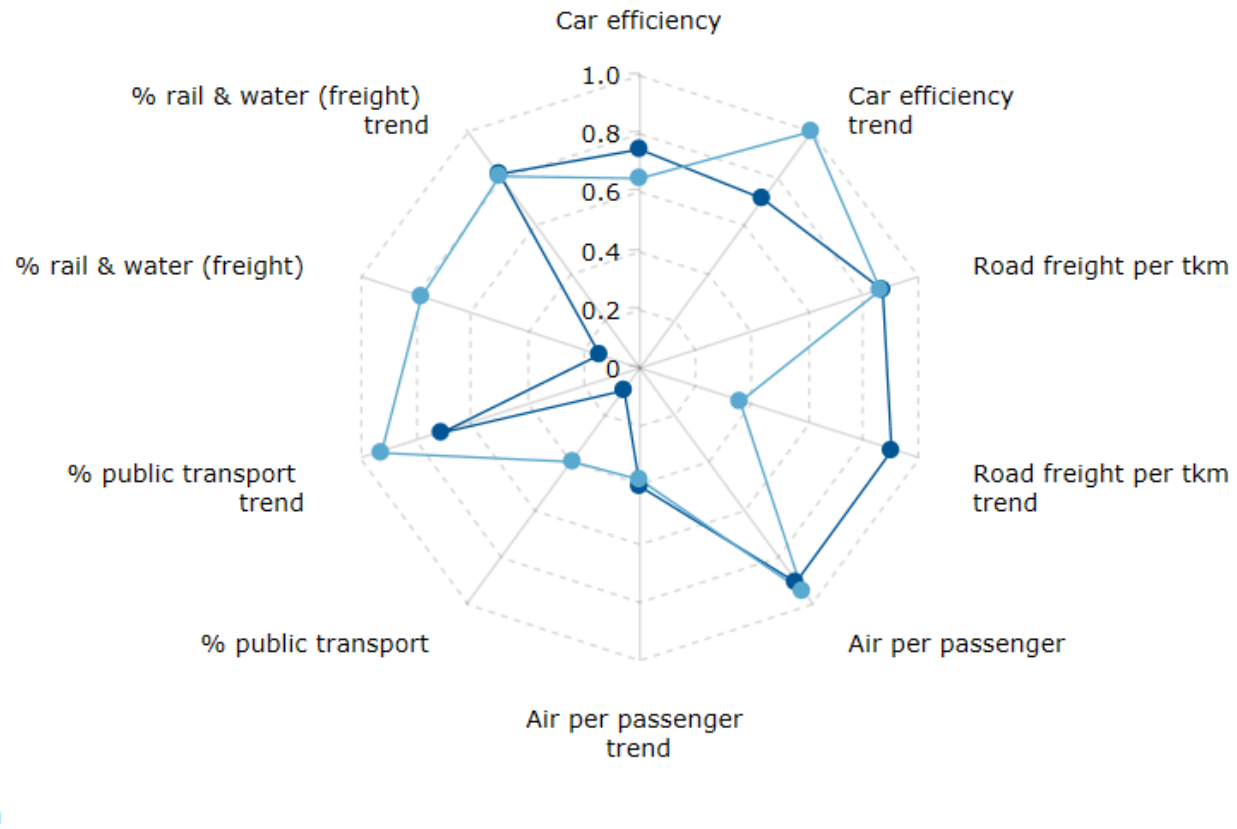
Indicator scoreboard: new developments

- The **weighting by end-use** for households, transport and services, initially based on the same weight for all countries will be based on the **actual average share over the last 3 years** in each country's consumption.
- The **indicator scores for level**, initially based on the last year available, will be calculated as an **average of the last 3 years**, to avoid fluctuations in the score from one year to another (e.g. due to data revisions).
- The **indicators score**, initially calculated with the best 3 countries at 1 will be calculated with **only the best country to 1** to better spread the scores.
- To harmonise with the policy score, where the best country by sector is equal to 1, which never happened for the indicators scores as they are based on different indicators with no country having 1, **the sectoral score and total score will be normalized** so as to score **the best country at 1**).

Scoreboard: Country positioning

- The objective is to display the position of a given country vis a vis : the best country (or any country or EU average);

Position of Portugal vis a vis the best country for transport (level & trend)



Score scale between 0-1 with 1 corresponding to the 3 best countries and 0 to the 3 countries with the lowest performance.