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European Energy Network

Evaluating EE policies through energy efficiency indicators (Top down method)
Lesson learnt from the ODYSSEE-MURE project

Workshop on Evaluation of Energy policies

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Outline

1. **Importance of indicators**
2. Energy efficiency indicators: What are they?
3. ODYSSEE main features
4. Conclusions

ADEME

Agence de l'Environnement et de la Maîtrise de l'Energie

Top-down vs bottom-up EE indicators?

- Energy efficiency indicators can be defined at different levels:
  - For individual consumers: building or factory level ("micro level") (e.g. from reporting of designated consumers, surveys or audits); they are usually referred to as "bottom-up" indicators; such indicators are usually used to assess the impact of a specific energy efficiency programme.
  - At national or regional level, based on statistics or data of energy use and activity by sector, sub-sector or end-use representative of the country or region ; in that case, they are referred to as "top-down" indicators.
- Both types of indicators are often expressed in the same unit: for instance kWh/m2 for buildings ➔ only their scope and interpretation differ.

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EE indicators to monitor and measure energy savings?

- Energy efficiency indicators are used to assess the progress in energy efficiency and to measure energy savings.

- They usually relate the energy consumption to an indicator of economic activity measured in physical values (tons, employee, m2) or a consumption unit (dwelling, car, refrigerator) ➔ specific or unit consumption (e.g. kWh/m2, toe/t, kWh/dwelling)

- They can also be indicators of market penetration that can be converted in energy unit: share of solar waters, of public transport…

- At an aggregate level they can also be measured in monetary values in relation to GDP or Value Added ➔ indicators of energy intensities (e.g. kWh/€, toe/€)

- Indicators are corrected to improve their meaningfulness: at normal climate, at constant structure, domestic vehicles ....

EE indicators what are they? The example of ODYSSEE

Type	Level
1. Energy intensities	by sector & sub sector
2. Adjusted intensities	final and industry
3. Specific energy consumption	by sub sector & end-use
4. Benchmarked specific	steel, cement, paper, heating
5. Energy efficiency indices (ODEX)	final and by sector
6. Energy savings	final, by sector and sub sectors
7. Indicators of diffusion	by sector
8. CO_2 intensities	by sector & sub sector
9. Specific CO2 emissions	by sub sector & end-use
10. Fuel poverty	households
11. Sufficiency 12. Short term indicators	by sub sector & end-use

Why do we need so many EE indicators?

- Energy efficiency has different meaning and frontiers (economic versus technical efficiency).
- EE P&Ms are designed and implemented at the level of technologies (ie labels, standards), or end-uses (heating, lighting) or sector (Voluntary agreements, audits etc.). Therefore monitoring each of the P&Ms requires detailed indicators
  - koe/m2 for new building for building codes; KWh per refrigerators for label or standards; Number of led (banishment of incandescent lamps); KWh per electric vehicle for subsidies of electric vehicles; toe per car-km for Bonus-malus
- Interpretation of Indicators is more powerful when combined; for instance:
  - Comparing trend in energy use per household and per m2 will show the impact of change in dwelling size;
  - Depending on the definition used and the target, different indicators may be considered; (e.g. for cars toe/passenger-km, toe/car; l/100 km, l/kg);
  - Comparing trend in energy use per household in final and useful energy will show the impact of fuel substitutions;
  - Comparing the industrial intensity with an intensity at constant structure will show the effect of structural changes;
- Alternative indicators are often necessary to cope with possible data gaps.

EE indicators : What are they used for ?

- Variation in EEI is used to assess energy savings and EE progress.
- The more detailed the indicator, the more accurate will be the evaluation.
- For a given sector, sub-sector or end-use different energy efficiency indicators may be considered depending on the definition and boundaries of energy efficiency.
- Even with detailed indicators, TD methods assess quite well the overall effect of energy efficiency policies but also the resultant of the impacts of other factors (e.g. autonomous trends, international energy prices, others policies, market impacts etc.). However it is difficult to allocate the contribution of EE policies in the total savings. BU evaluation helps for evaluating the contribution of P&Ms.
- TD EEIs include technical and/or behavioral aspect of energy efficiency including in general the rebound effect (when relevant) and the spillover or multiplying effects.
- Double accounting of policies is not an issue for TD methods.

An energy efficiency index (ODEX) to measure energy efficiency progress at sector level

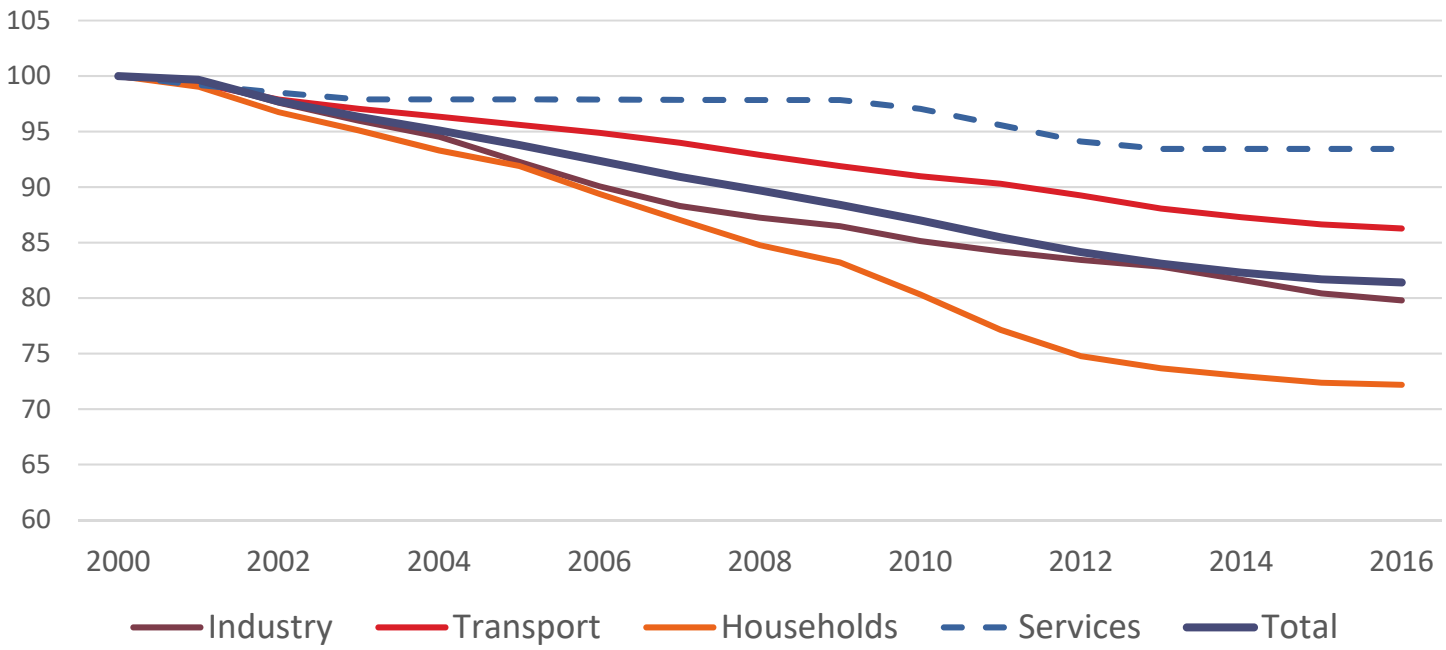
- In ODYSSEE, an energy efficiency index is calculated at sector level (i.e. industry, transport, households) and for all final consumers to assess energy efficiency progress.

- The energy efficiency index by sector combines the trends observed in the various indicators of specific energy consumption by sub-sector or end-use, by weighting indices of specific consumption by sub-sector (or end-use) with the share of each sub-sector in the sector's energy consumption.

- Indices are used to enable to express specific consumption by sub-sector or end-use in different physical units so as to be as close as possible to energy efficiency evaluation (e.g. toe/ton, toe/IPI for industry, toe per pkm or tkm in transport, toe/m2 or kWh/appliance for households).

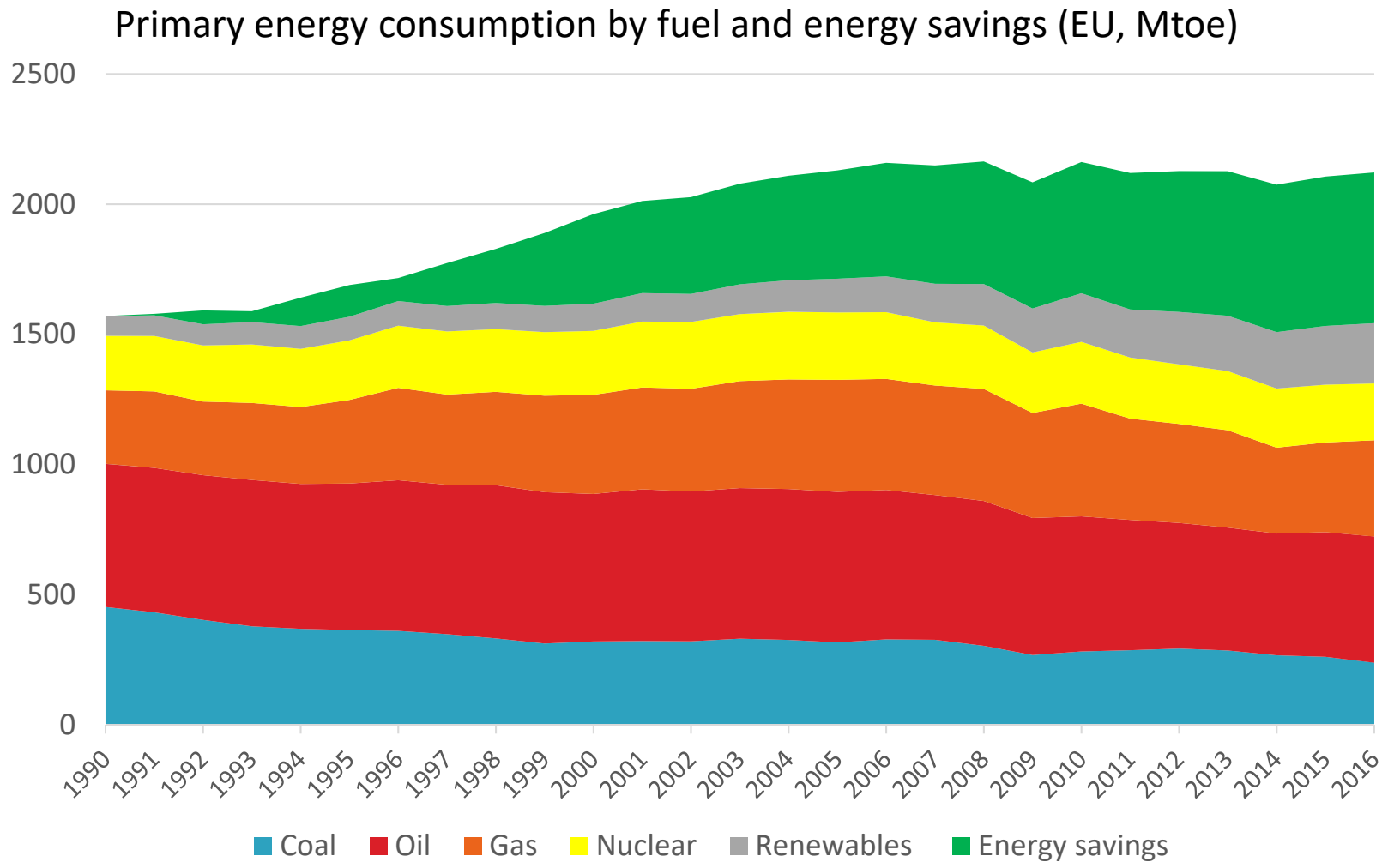
- Energy efficiency of final consumers improved by 1.3%/year between 2000 and 2016 (1.4%/yr before 2007 and between 2010-2014). Significant slow down since 2014 (0.5%/year).
- Larger gains for households (2%/yr since 2000) with a net slow down since 2012 (0.9 %/yr against 2.4%/yr before).
- Rate of improvement almost divided by 2 in industry, since 2007 (-1%/compared to 1.8%/yr before).
- Regular but limited improvement in transport (0.9%/year): greater for cars than for trucks.

Energy efficiency index (ODEX) for final consumers (EU)



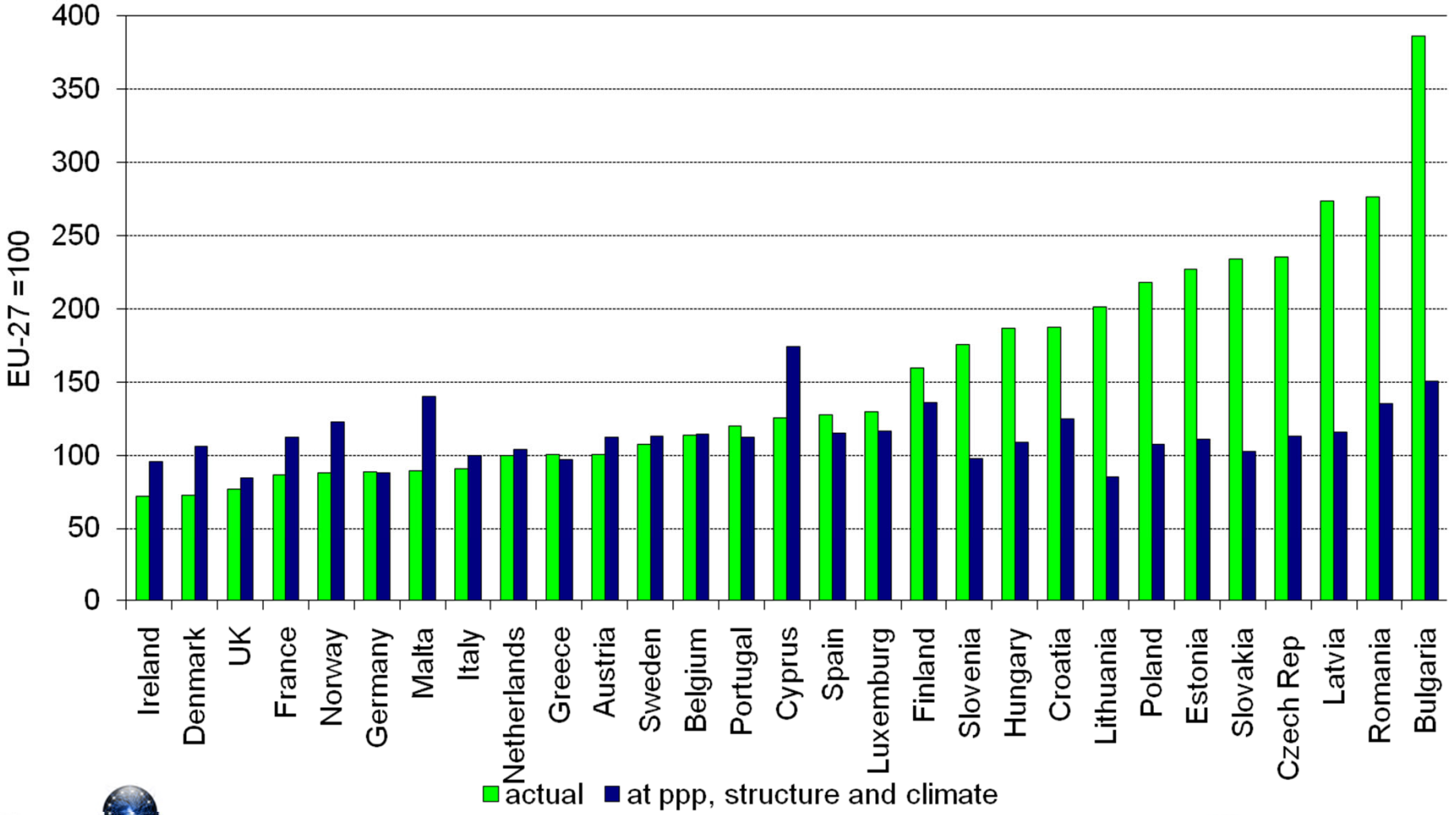
ODEX=81 in 2016 ➔ 19% energy efficiency improvement or 1.3%/yr

Energy savings first fuel over a 25 year period



Adjusted energy intensities: examples

Final energy intensities adjusted for differences in prices (ppp),climate and industry & economic structures narrow difference between countries

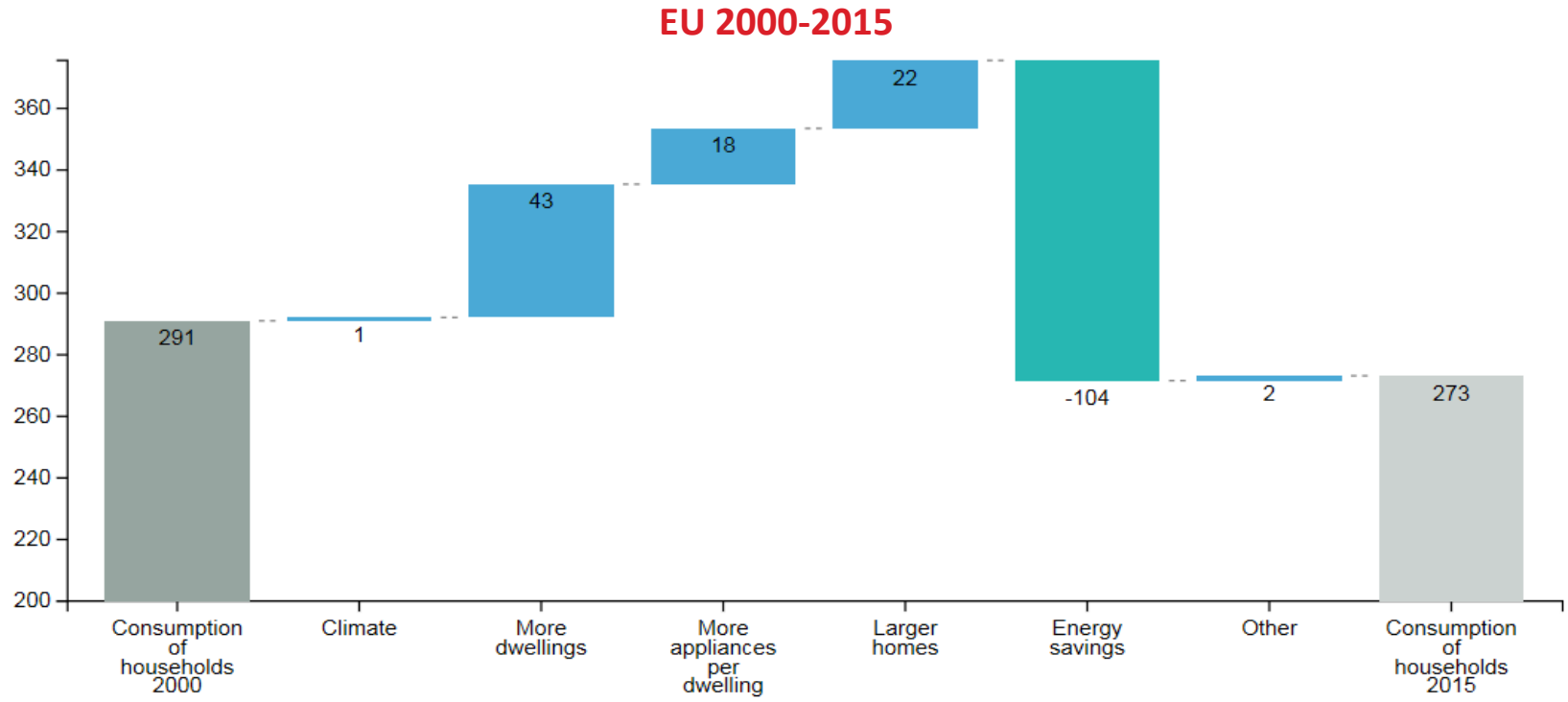


Odyssee

Enerdata

Decomposition of the variation of the energy consumption of households (EU,2000-15)

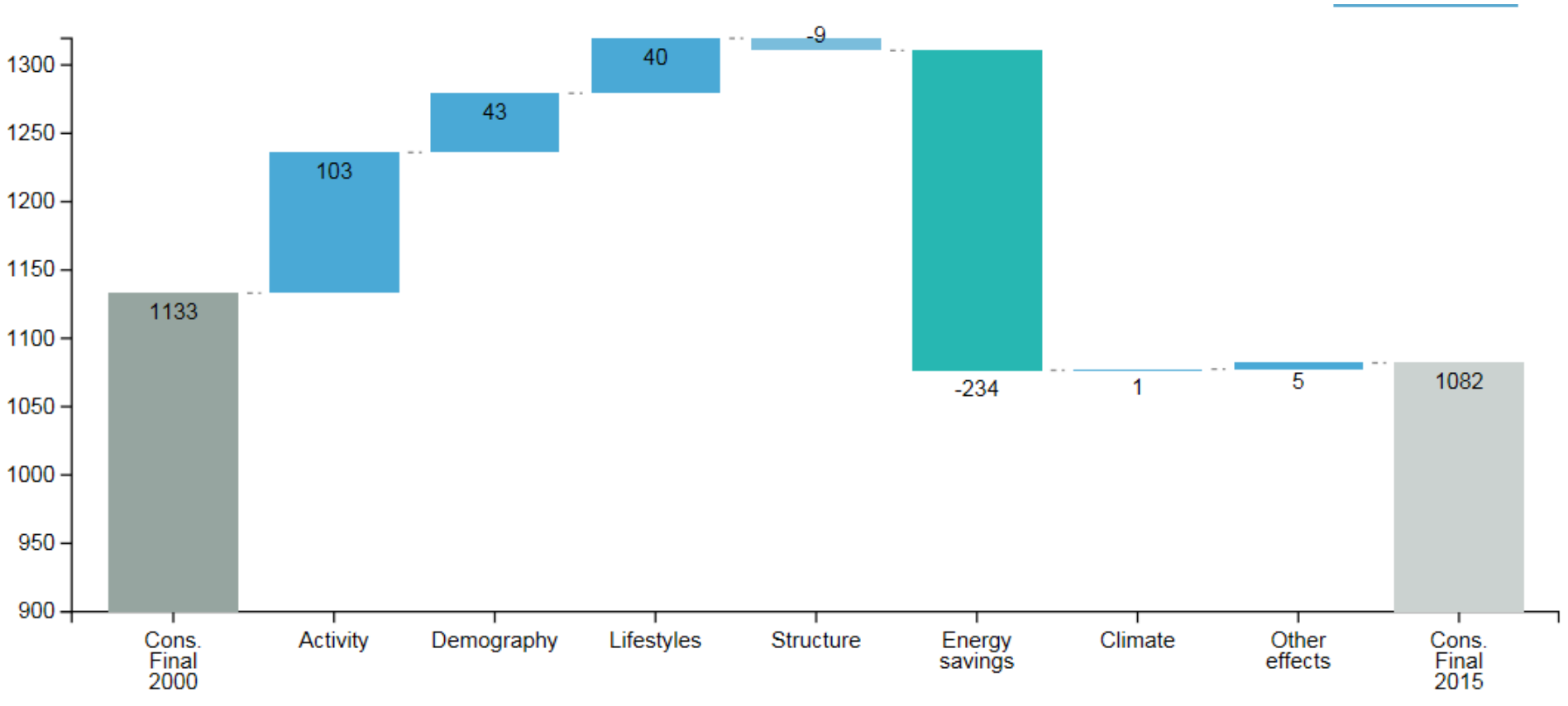
- Two factors contributed to increase the household consumption since 2000:
  - Increasing number of dwellings (43 Mtoe);
  - Growing comfort due to the increase in the number of household appliances and dwelling size (18 and 22 Mtoe, respectively).
- Energy savings (technical) lowered consumption by 104 Mtoe (~7 Mtoe/yr).
- Other effects or behavioural effect are mainly due to the combined effect of price increases and of the economic recession



Decomposition of total final consumption

- The final energy consumption decreased by 51 Mtoe between 2000 and 2015.
- Increase in activity contributed to raise consumption by 103 Mtoe, lifestyles and demography by around 40 Mtoe each.
- Technical energy savings decreased the consumption by 234 Mtoe.

Drivers of final energy consumption variation (Mtoe, EU 2000-2015)



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ODYSSEE data base in brief

- Data base covering:
  - ✓ Energy consumption data by sector and end-use and their drivers (about 1000 data series, of which 600 main data series)
    - ➔ Half energy consumption data and half non energy data
    - ➔ Importance given in the consistency between the definition and coverage of the energy consumption categories and drivers
  - ✓ Energy efficiency and CO2 indicators at macro or sectoral levels (about 180 indicators).
- Period covered: 1990-2016 (from 1980 for most EU-15 countries);
- 33 countries, EU average
- Updates each year
- Available on internet (www.odyssee-indicators.org) with a password

The new proposal 2019-2022): main features

New general topic: "Supporting public authorities to implement the Energy Union/ Supporting the delivery of EED"

- New topical issues : Energy efficiency first fuel, fuel poverty, sufficiency, more updated indicators
- 30 months duration
- Budget (1,7 M€)
- 33 partners (New funded partners : Serbia and Switzerland; Technical coordination : ADEME ; FHG-ISI ; Enerdata; + a steering committee
- Based on the two data bases ODYSSEE & MURE
- New MURE data base software, new facilities (first fuel, industry)?
- 3 updating for ODYSSEE → one additional update to n-1
- Similar dissemination activities (Policy briefs, country profilesectoral profile, news letter etc. webinars
- Management issues: 6 WPs; 3 regional meetings and 5 technical coordination meetings

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3. Overview of indicators from ODYSSEE
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Conclusion: indicators and policies : The European experience (1)

- Policy makers need data and indicators to monitor the impact of their actions, to prepare new policy measures and to assess long–term energy savings potentials.
- TD methods are broadly implemented (more than 70 countries) and consensus exists on methodologies (ie ODYSSEE; IEA; JRC; UN-ECLAC etc.). Differences comes from about the satus of thedata (public vs expert data) and the level of desagragation. ISO 500047 will discuss and display all the methodological issues.
- Because fair benchmarks rely on adjustment, this is still an area of discussion but experience do exist (ODYSSEE-MURE scoreboard; ACEEE scoreboard).
- Data needed are not just merely the usual energy statistics from the energy balance but more detailed data by end-use
- Strategies have to be defined to collect such data ... In a permanent way, by imposing reporting requirements to utilities, equipment manufacturers , utilities ➔ exchange of international experience is very useful in that matter
- Although such indicators can be used to assess the impact of policies, it is seldom that they can measure the impact of a single measure ➔ they measure the impact of packages of measures acting on a given end-use (e.g. new cars, lighting, solar heaters...)

Conclusion: indicators and policies: The European experience (2)

- Greater use of indicators by policy makers increases the quality and quantity of data and indicators;
- Indicators need to be permanently adapted to meet policy requirements (e.g. in EU countries the increasing use of biomass and power production of households);
- **Indicators should be** easy to understand by policy makers...
  - This does not mean that they should be too simple, but that
  - Communication is important
- Indicators should be well updated to be useful for policy makers
  - This is somehow contradictory with the use of detailed indicators, that require detailed data produced with some delays, but means that
  - Updating procedures should be developed to provide preliminary detailed indicators (e.g. on energy savings) by mid year t for year t-1 ➔ under development for ODYSSEE.