Core Theme 1 special session: Update on current ISO work on energy savings calculations

ISO 50049

Calculation methods for energy efficiency and energy consumption variations at country, region and city levels: relation to energy savings and other factors

ADEME

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

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1. ISO 50049 at a glance
2. Scope
3. The process
4. Overview of ISO 50049
5. Review of the comments
6. Lessons for EED monitoring

Main scope(s) of the ISO 50049

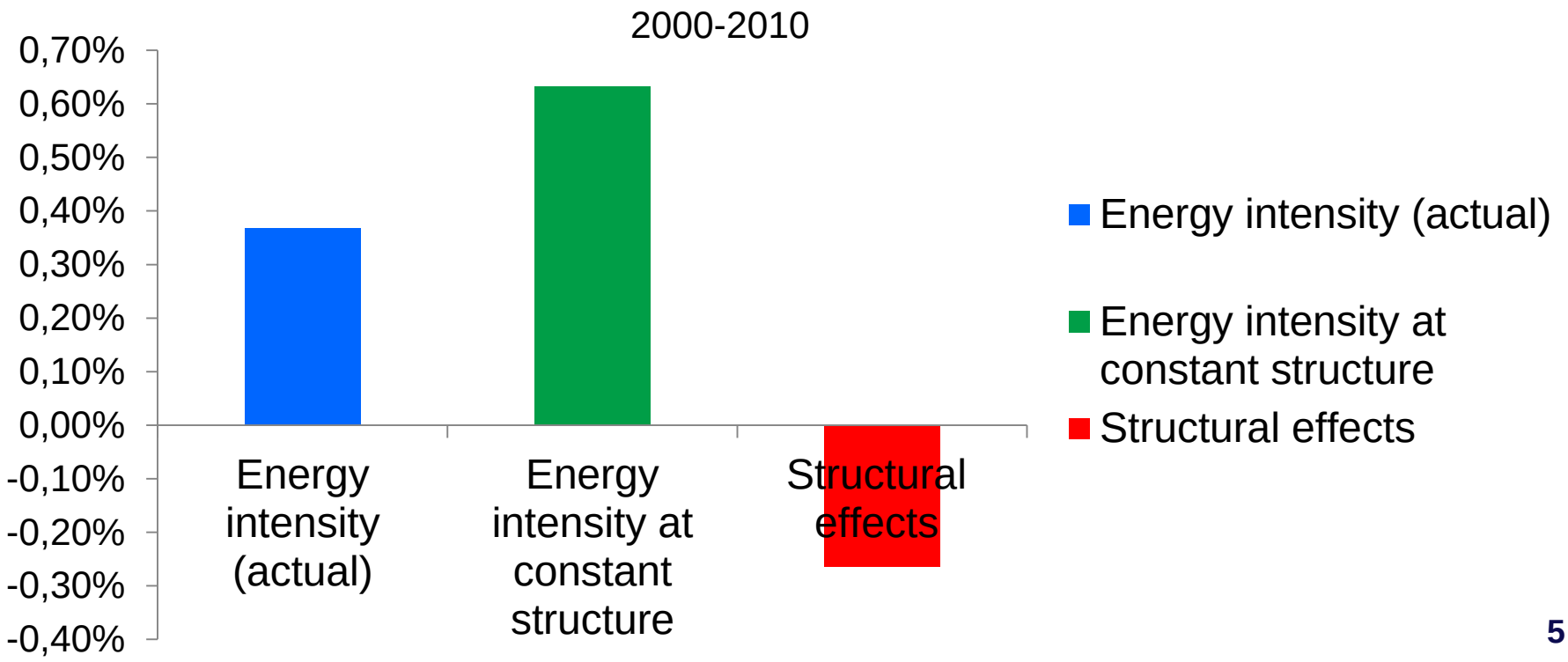
1. To complement ISO 257 WG2 standard with a standard on energy demand changes decomposition which includes energy savings currently calculated in WG2. This approach is already broadly implemented (ex EU; IEA etc?)
2. To translate energy savings in an agregated index as an alternative of energy intensity trend (applied in Europe as ODEX)
3. To calcule the structural effect of the energy intensity in order to clean out these effects in the energy intensity to get a better proxy of the energy intensity

ISO 500049 Process

1. NWIP accepted 1st April 2015 (15 countries)
2. Powerpoint presentation at Tehran (Sept 2015)
3. Sending a first working draft to WG2 members 14thy January 2016 for comments
4. Processing of comments and presentation of the results at TC 257 March 3rd 2016 (Birmingham) : 6 countries
5. Implementation of accepted comments for the committee draft (end of March 2016)
6. Launch of 2 months committee draft vote
7. Processing of comments and presentation of the results at TC 301 June 2016 (Stockholm) (8 countries)
8. DIS voting procedure (Until February 2017)

Impact of structural changes on manufacturing energy intensity: case of Brazil

Structural changes towards less intensive branches contributed to limit around 50% of the intensity increase



This is coherent with the ISO 17742

- The energy savings per indicator are calculated from the change in indicator value times the driver quantity in the year of calculation:

$$ESPI = [(IND(t0) - IND(t))] \times DV(t)$$

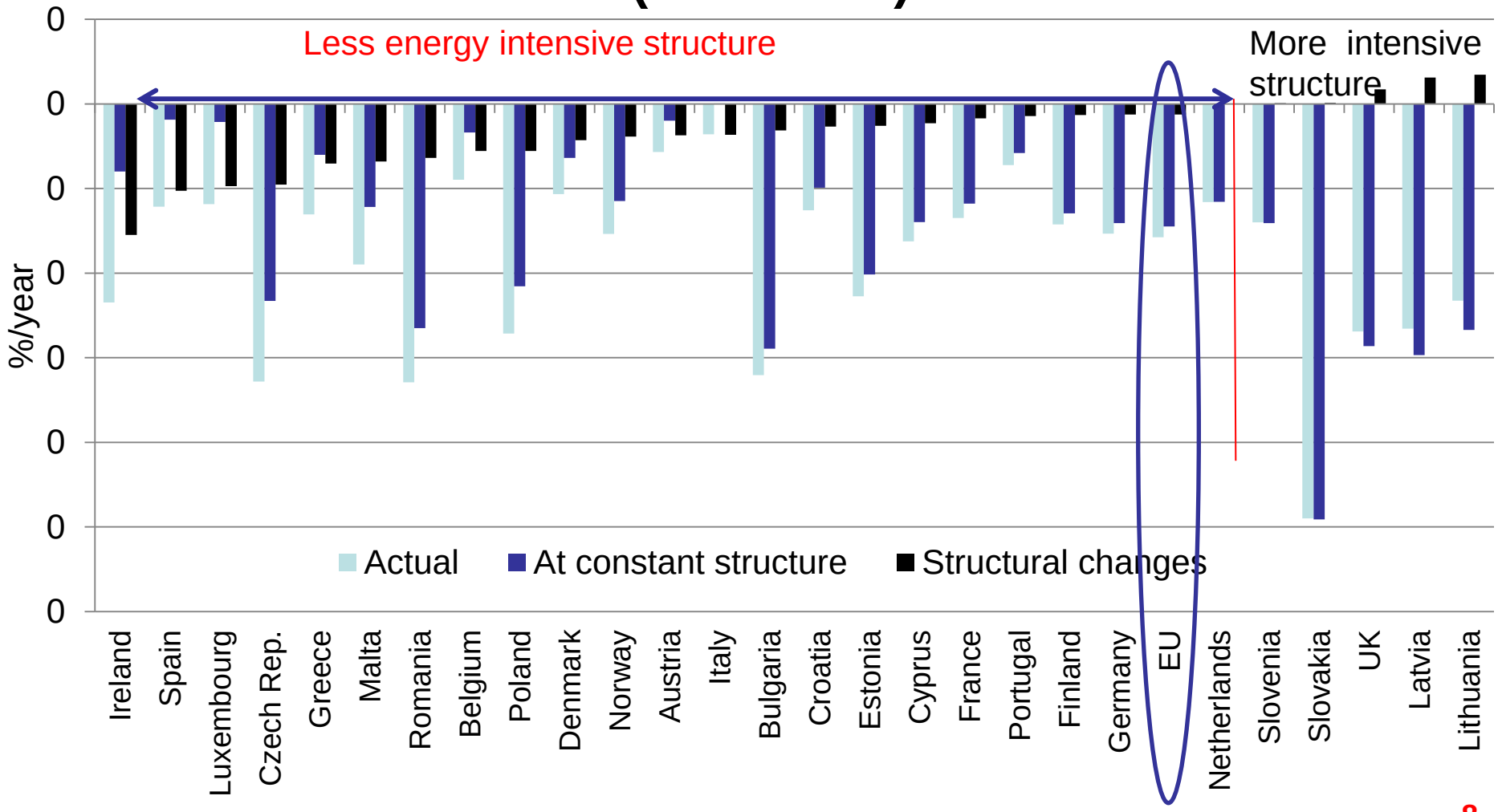
Where ESPI is energy savings per indicator;
IND is indicator value;
DV is quantity for driver ;
t_0 is base year;
t is year of calculation.

- For example, the energy savings for cement production at year *t* are derived from the change in mean energy consumption per tonne of cement between year t and a reference year *t0*. This quantity in GJ/tonne is multiplied by the total production of cement in year *t*.

ISO 50049 : Introduction

- 1 Scope
- 2 Normative references
- 3 Terms and definitions
- 4 Factors to be calculated
  - *4.1 General*
  - *4.1.1 Overview of methods included in the standard*
  - *4.1.2 Purpose of calculations*
  - *4.1.3 Types of explanatory factors to be calculated*
  - *4.2 Indicators, methods and applications*
  - *4.2.1 Indicators*
  - *4.2.2 Types of data used*
  - *4.2.3 Structure effects*
  - *4.2.4 Indicator choice for energy efficiency and energy savings calculation*
  - *4.2.5 Adjustment of energy consumption for weather*

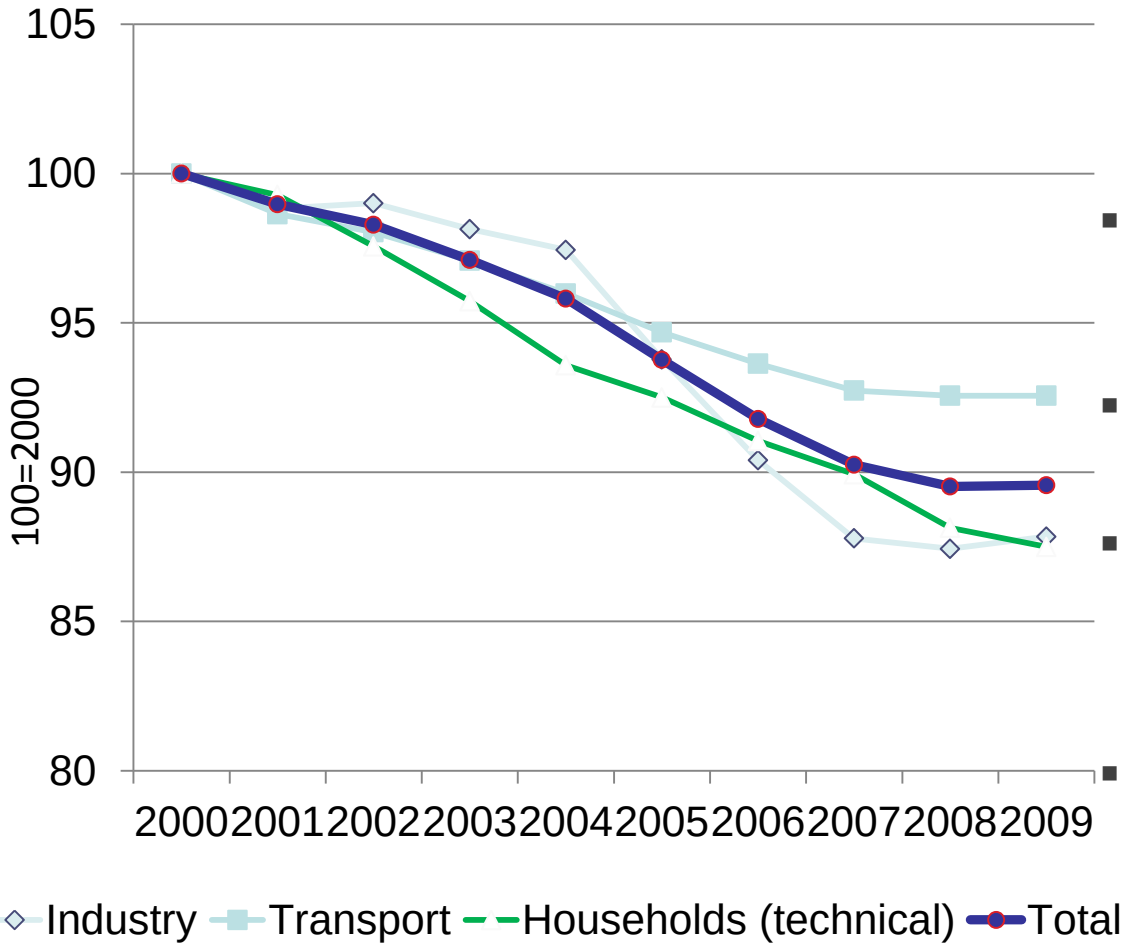
Impact of structural changes on the final energy intensity (2000-2013)



ISO 50049 : Energy intensity and structural effect

- 5.1 General
- 5.2 Calculation methods
  - *5.2.1 Introduction to the calculation of structural effect*
  - *5.2.2 Decomposition of the energy intensity variation with the Divisia method*
- 5.3 Calculation issues related to structure effects
  - *5.3.1 Options of calculation of the Divisia decomposition*
  - *5.3.2 Disaggregation level*
  - *5.3.3 Chained or unchained calculation*

Energy efficiency index for final consumers (EU)



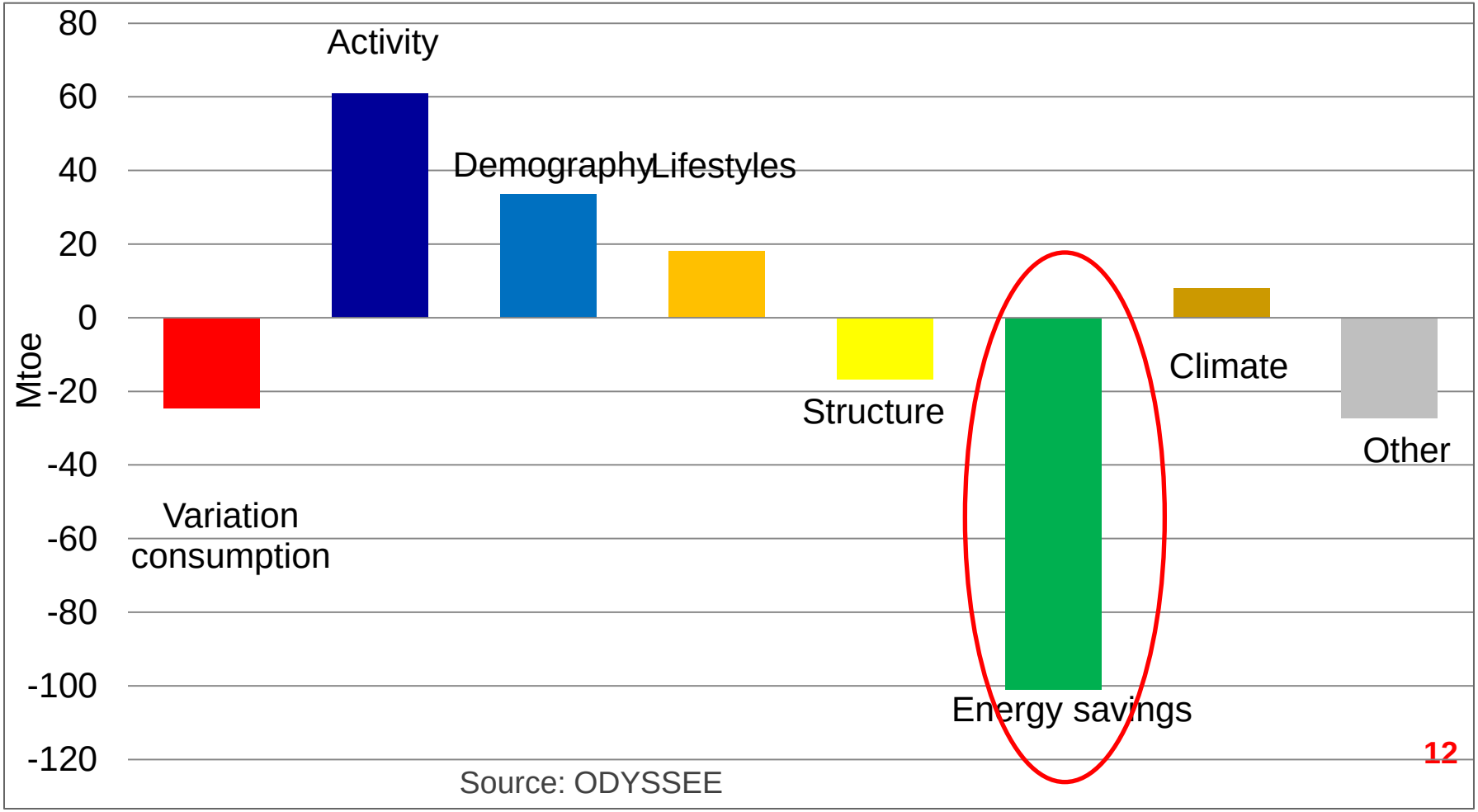
- ODEX= 90 in 2009 ➔ 10% energy efficiency improvement between 2000 and 2009 (or 1.2%/year).
- No real progress since 2007, because of transport and industry.
- Larger gains for industry until 2007
- Over 2000-2009, similar achievements for households (and industry (~1.5%/year).
- Lower progress for transport (0.9%/year)

ODEX is calculated as a 3 years moving average to avoid short term fluctuations (imperfect climatic corrections, behavioural factors, business cycles)….

ISO 50049 : Energy efficiency indices

- 6.1 Objective and overview of calculation
- 6.2 General calculation
  - *6.2.1 Step 1: Selection of sub-sectors or energy uses*
  - *6.2.2 Step 2: Choice of indicator types*
  - *6.2.3 Step 3: Calculation of indicator values*
  - *6.2.4 Step 4: Calculation of indicator trends*
  - *6.2.5 Step 5: Calculation of weights*
  - *6.2.6 Step 6: Calculation of energy efficiency indices by sector*
  - *6.2.7 Step 7: Calculation of an overall energy efficiency index*
- 6.3 Computational issues in the calculation of the EE indices
  - *6.3.1 General*
  - *6.3.2 Options of calculation*
  - *6.3.3 Indicators resulting in negative energy efficiency improvement*
- 6.4 Reliability of energy efficiency indices
  - *6.4.1 General*
  - *6.4.2 Status of data sources*
  - *6.4.3 The appropriateness of the indicator*

Decomposition of the final energy demand changes in Europe through explanatory factors (2000-2009)



Decomposition analysis of energy demand changes in the households

Variation of consumption could be decomposed into 3 or 5 effects:

- **Climate effect**;
- **A demographic effect**, due to the increasing number of dwellings,
- **A lifestyle effect**, due to the increase in the number of households equipment and to larger homes;
- **Energy savings** (as measured in ISO 17742)s
- **Behavioural effect**

Decomposition analysis of energy demand
Main methodological issues

1. Definition of technico-economic effects (sector dependant)
2. Type of indicators used for each of the effect
3. Calculation method
4. Level of desegregation
5. Order of calculation

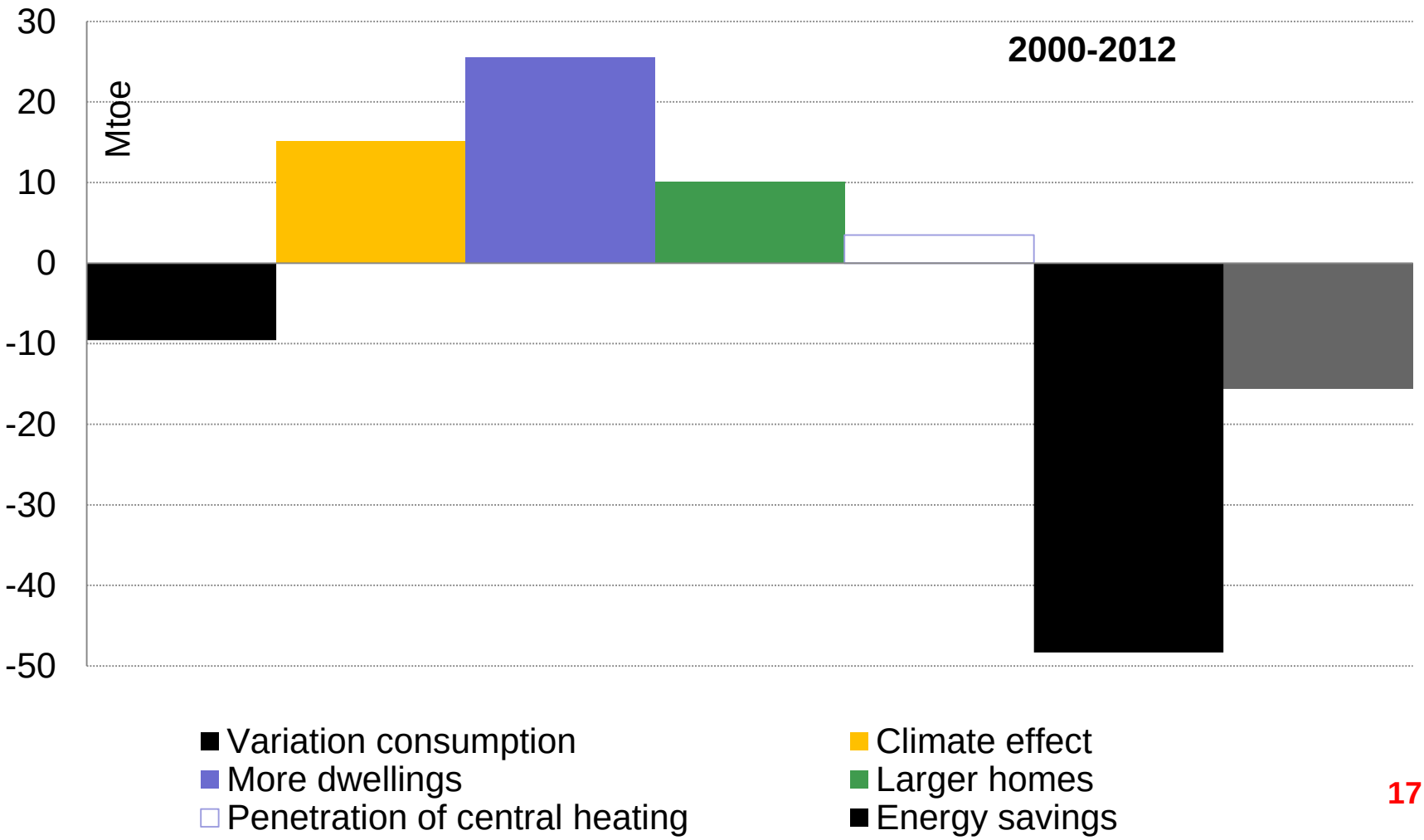
ISO 50049 :Decomposition analysis of energy consumption

- 7.1 Objective and overview of calculation
- 7.2 General calculation
  - *7.2.1 Definition of explanatory factors*
  - *7.2.2 Calculation of activity factor*
  - *7.2.3 Calculation of the energy savings factor*
  - *7.2.4 Calculation of structure effects*
  - *7.2.5 Calculation of other factors*
- 7.3 Other issues related to the decomposition of the energy consumption variations
  - *7.3.1 General*
  - *7.3.2 Calculation over a period*
  - *7.3.3 Indicators resulting in negative energy efficiency improvement*

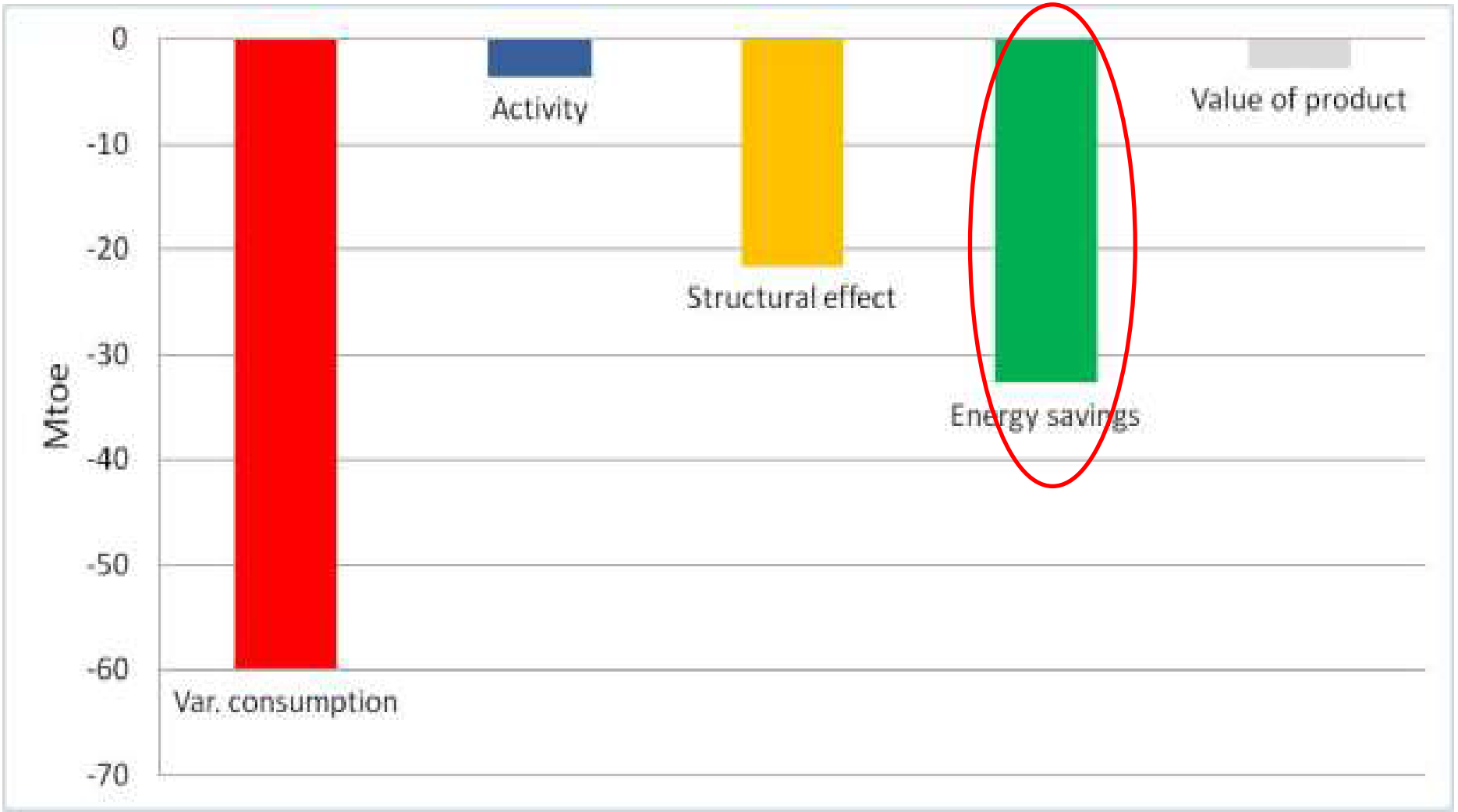
ISO 50049 :Annex B (informative) Examples of EE Indicators

- B.1 Introduction
- B.2 Indicators for Residential
  - *B.2.1 Space heating*
  - *B.2.2 Water heating*
  - *B.2.3 Cooking*
  - *B.2.4 Large appliances*
  - *B.2.5 Lighting*
- B.3 Indicators for industry
  - *B.3.1 Indicators for energy-intensive industries*
  - *B.3.2 Other industrial branches*
- B.4 Indicators for transport
  - *B.4.1 Cars*
  - *B.4.2 Buses and motorcycles*
  - *B.4.3 Freight transport and rail and air transport of passengers*

Drivers of the variation in heating consumption per dwelling



Decomposition of the energy consumption changes in industry (EU 2000-2009)



ISO 50049 : Annex C (informative)
Examples of explanatory factors

- C.1 Introduction
- C.2 Activity factor
  - *C.2.1 Industry*
  - *C.2.2 Transport*
  - *C.2.3 Households*
  - *C.2.4 Services*
- C.3 Structural effects
  - *C.3.1 Industry*
  - *C.3.2 Transport*
- C.4 Other factors

Processing of the 120 comments

1. Main challenge : the structure of the standards gathering three complementary methods
2. Simplification of the title (still to be improved)
3. Not flexible enough (US States)
4. To complicated for emerging economies
5. Very few comments and changes on terminology (except energy saving definition still, structural effect)
6. Improvement with the coherence of ISO 17442
7. Decomposition (causing or attributing or analysing)
8. Very few comments and changes on calculation methods
9. Use of Divisia for all the three calculations (IEA inputs)
10. Need of quantitative examples (1 or several)

ISO 50049 future development

1. Voting procedure DIS November 2016
2. Depending on the voting output, WG to proceed DIS comments (June 2017 (China)

ISO 50049 : the link with the EED (1/2)

Decomposition analysis :

(Annex XIV, part 1) EED: "In sectors where energy consumption remains stable or is growing, Member States shall analyse the reasons for it and attach their appraisal to the estimates.).

- Currently there is no robust and harmonised methodology proposed by the Commission to fullfill this requirement.
- No European standard is available on that matter
- The ODYSSEE project has implemented this methodology for all MS and EU (2014 and provisional for 2015)
- IEA publishes the results (energy efficiency market report), The methodology is not published and not really discussed with the countries
- Many national good practices from BR, CN, DE, JP, SA etc.

ISO 50049 : the link with the EED (2/2)

Energy intensity not directly usefull for CAEED but extensively used (generally without adjustement of the economic structure) for tracking targets for instance by the governments.

However in some countries there is an obligation to produce EE indicators (energy transition law in Mexico) and to make benchmarks. Energy intensity corected from structural change is one of them

Energy effiicency Index is not directly requested by EED but mentionned in the ESD (ODEX).

It is possible to calculate ”topdown” energy saving reported in the NEAAP using ODEX (simply in multiplying the Index by the energy consumption). Currently the ”top down” calculation recommended by the Commission is an ”a la carte” methodology . ISO provides an basis for energy saving index and bencmark

Conclusion : Participate to the ISO design and voting

- ISO 50049 provides tranparent methodology for advanced top down energy saving calculation which is valid for all countries world wild
- ISO 50049 is a good basis to eleborate good national practices and benchmarks
- ISO 50049 incorportates the European know how on TD calculation
- ISO 50049 has allowed a reconciliation between IEA and ODYSSEE methodologies (ie Divisia approach for decomposition analysis)
- ISO 50049 is in its final development but still room of improvment do exist . More participants from Europe are more than welcome.
- The voting procedure will allow the EU MS through their national standardisation body to be part of the process of acceptance
- The ISO 50049 convenor and negociation group is ready to take on board all comments and suggestions to improve the ISO standard.

The collaborative process

Participation	Comments
BRAZIL CHINA FRANCE IEA INDIA JAPAN KOREA SWEDEN USA	CHINA FRANCE IEA INDIA JAPAN KOREA SWEDEN USA