The IEA work on data and methodologies for Energy Efficiency Indicators

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Developing energy efficiency indicators: why and how?
The huge potential of energy efficiency

Figure ES.2 The “first fuel”: avoided energy use from energy efficiency in 11 IEA member countries

Notes: TFC = total final consumption. The 11 countries are Australia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, the United Kingdom and the United States, those for which sufficient data is available to undertake analysis. “Other” includes biofuels plus heat from geothermal, solar, co-generation and district heating. Co-generation refers to the combined production of heat and power.

Source: IEA indicators database.
Energy efficiency: a huge opportunity going unrealised in emerging and developing countries

Energy efficiency potential used by sector in non-OECD countries in the New Policies Scenario

Two-thirds of the economic potential to improve energy efficiency remains untapped in the period to 2035
...but what do we mean by energy efficiency?

“...Using less energy to provide the same service...”

So, how can we monitor energy efficiency?
A starting point: how can energy balances help us?

Energy balances provide aggregated information on the country energy use...

Definition of Total Primary Energy Supply (TPES)

Efficiencies of transformation sector

Shares of energy consumption by sector

Basis for aggregated indicators
Aggregated indicators: energy intensity

Energy intensity of the economy: TPES/GDP
Driven by many factors... not only energy efficiency
However, balances do not provide enough information to monitor energy efficiency.

### Residential:
- No breakdown by end use
  - space heating
  - space cooling
  - water heating
  - lighting
  - cooking
  - appliances

### Transport:
- No breakdown by segment
  - passenger / freight
  - Light duty vehicles / trucks, ....

### Services:
- No breakdown by end use
  - space heating
  - space cooling
  - water heating
  - lighting
  - other equipment
Different end-uses drive sectoral consumption

Figure 4.4 • Breakdown of residential consumption by end use in 2010 for 20 selected OECD countries

Note: The breakdown into individual appliances is available only for 14 countries.
Choosing appropriate metrics to convey sharp messages

Index: 1990=1. Data for IEA18 (Australia, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Slovakia, Spain, Sweden, Switzerland, UK, USA). Source: IEA energy efficiency indicators database. TC: Temperature Corrected.
The need to collect more disaggregated data

Aggregated Indicators

energy balances

TPES/GDP
TFC/Population
....
Not only energy data, but also activity data are necessary.
What detail do we need across consumption sectors?
The IEA effort towards energy efficiency monitoring: data collection

As an answer to a request from IEA Ministers in 2009, the IEA designed a template to collect data for energy efficiency indicators.

<table>
<thead>
<tr>
<th>Draft Energy Efficiency Indicators Template</th>
</tr>
</thead>
<tbody>
<tr>
<td>country name</td>
</tr>
</tbody>
</table>

COUNTRY DATA SECTION (to be reviewed and updated)

- **MACRO ECONOMIC DATA**: Macro economic and activity data
- **COMMODITIES**: Production outputs from selected energy-consuming industries
- **INDUSTRY**: Energy consumption by ISIC categories
- **SERVICES**: Energy consumption by end-uses in the services sector
- **RESIDENTIAL**: Household energy consumption by end-uses and selected appliances data
- **TRANSPORT**: Energy and activity data for passenger and freight transport

IEA DATA and AGGREGATE INDICATORS

- **ELECTRICITY GENERATION**: Electricity generation from combustible fuels and efficiencies
- **BASIC INDICATORS**: Predetermined set of aggregate energy and activity indicators

SUPPORT TOOLS

- **USER REMARKS**: To incorporate comments associated to the data from the individual sheets
- **DATA COVERAGE**: Generates a graphical summary of data coverage (completed vs. expected)
- **SINGLE INDICATOR GRAPHS**: To generate a graph for one energy indicator
- **MULTIPLE INDICATORS GRAPHS**: To generate a graph comparing trends from multiple indicators
- **CONSISTENCY CHECKS**: To run the integrated consistency checks
The IEA effort towards energy efficiency monitoring: methodological framework

In response to requests from countries, and in parallel with a manual on indicators analysis
An overview of the statistics manual
Fundamentals on Statistics: Table of Contents

Introduction - Why a manual?
What are energy efficiency indicators?
How to collect the date for indicators?
Collecting: what and how for the Residential sector
Collecting: what and how for the Services sector
Collecting: what and how for the Industry sector
Collecting: what and how for the Transport sector
Validating the data
Disseminating the data

Annexes

Focus on four sectors and their end uses
Collecting What and How for the Residential Sector

1. What does the residential sector mean and cover?

According to the United Nations International Recommendations on Energy Statistics (UNRES), a household is defined as "a group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food." The residential sector, also known as the households sector, is therefore, a collective pool of all the households in a country.

More concretely in terms of energy consumption, the residential sector includes all energy-using activities (i.e. heating, cooking, appliances, etc.) related to a private dwelling where one or more persons reside. A wide range of dwellings would qualify ranging from a modern multi-storied apartment building in the center of a megalopolis to a nomad tent in the middle of the desert.

It is important to note that the energy consumption associated with personal transport related to households should be reported in the transport sector. Therefore, daily commuting to and from work or to any other place in personal vehicles or in public transport should be captured under the transport sector and not in the residential sector.

Questions and Answers:

Q1. Is there a difference between dwellings and households?

Something to be added on the difference between dwellings and households since we often use one or the other in the text.

Q2. What should be included in "total dwellings"?

Total dwellings: includes all dwellings in the residential sector: primary and secondary residences, regardless if they are occupied or not. However, dwellings under construction are excluded.

Total occupied dwellings: Only primary residences are covered; unoccupied dwellings and secondary residences such as vacation homes and country houses are excluded.
Describing all end uses for each sector

Description of sector-specific end uses:

- **H** - Heating
- **C** - Cooling
- **W** - Water Heating
- **L** - Lighting
- **A** - Appliances
Presenting a set of indicators for each end use

For each end use:
Indicators pyramid
1 – general
2 – detailed
3 – very detailed

A smiley face indicates the recommended indicator
Summarizing energy and activity data needed

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Coverage</th>
<th>Energy data</th>
<th>Activity data</th>
<th>Code</th>
<th>Recommended indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating consumption per floor area</td>
<td>Overall</td>
<td>Total heating consumption</td>
<td>Total floor area</td>
<td>H2b</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By dwelling type</td>
<td>Heating consumption of dwellings type X</td>
<td>Floor area of dwellings type X</td>
<td>H3a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>Total heating consumption</td>
<td>Total number of dwellings</td>
<td>H2a</td>
<td></td>
</tr>
<tr>
<td>Heating consumption per dwelling</td>
<td>Overall</td>
<td>Heating consumption of dwellings with system Y</td>
<td>Number of dwellings with heating system Y</td>
<td>H3b</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By heating system</td>
<td>Heating consumption of dwellings with system Y</td>
<td>Number of dwellings with fuel Y</td>
<td>H3c</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By type of fuel</td>
<td>Heating consumption of dwellings with fuel Z</td>
<td>Number of dwellings with fuel Z</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling consumption per dwelling</td>
<td>Overall</td>
<td>Total cooling consumption</td>
<td>Total number of dwellings with A/C</td>
<td>C2a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By type of cooling equipment</td>
<td>Cooling consumption of dwelling with a/c system X</td>
<td>Number of dwellings with a/c system X</td>
<td>C3a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By energy source</td>
<td>Cooling consumption of dwelling on energy source Y</td>
<td>Number of dwellings on energy source Y</td>
<td>C3b</td>
<td></td>
</tr>
<tr>
<td>Cooling consumption per floor area</td>
<td>Overall</td>
<td>Total cooling consumption</td>
<td>Total floor area of dwellings with A/C</td>
<td>C2b</td>
<td></td>
</tr>
<tr>
<td>DHW consumption per capita</td>
<td>Overall</td>
<td>Total energy consumption for domestic hot water</td>
<td>Total population</td>
<td>W2a</td>
<td></td>
</tr>
<tr>
<td>DHW energy consumption per dwelling</td>
<td>Overall</td>
<td>Total energy consumption for domestic hot water</td>
<td>Total number of dwellings</td>
<td>W2b</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By type of DHW system</td>
<td>DHW energy consumption produced by DHW system X</td>
<td>Total number of dwellings with DHW system X</td>
<td>W3a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By type of energy source</td>
<td>DHW energy consumption produced by energy source Z</td>
<td>Total number of dwellings with DHW source Z</td>
<td>W3b</td>
<td></td>
</tr>
</tbody>
</table>

Systematic summary tables: indicators, energy and activity data by end-use
How do countries collect data?

Four main types of practices:

- Administrative sources
- Survey
- Measuring
- Modeling
How to get data for indicators?

- Administrative sources
- Surveys
- Metering and measuring
- Modelling
The Annex: an essential part of the Manual

160 country practices presented one by one grouped by sector by methodology

Background
Institution
Purpose ...

Technical information:
Sample
Frequency
Data collected...

Comments:
Challenges
Tips
Documents
Links...
(e.version)

<table>
<thead>
<tr>
<th>Country</th>
<th>Austria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation</td>
<td>Statistics Austria</td>
</tr>
</tbody>
</table>

Survey purpose
- To determine total household energy consumption
- To determine household appliance energy consumption
- To collect household energy expenditure
- To collect dwelling physical characteristics
- To collect household occupant characteristics

Sample design
Stratified random sampling approach

Sample sources
List of addresses, list of telephone numbers, labour force survey.

Collection methods
- Computer assisted personal interview (CAPI)
- Computer assisted telephone interview (CATI)

Sample/Population size
14 000 / 3 429 720

Response rate
55%

Frequency
Every two years

Last time surveyed
2010

Time to complete survey
10 minutes

Mandatory
No

Incentive
None

Survey respondents
Households

Elements collected
- Dwelling type
- Dwelling floor area
- Building age
- Household occupancy
- Energy-related renovations
- Household energy consumption and related expenditures

End-uses collected
- Space cooling
- Space heating
- Domestic hot water
- Other cooking

Main challenges
- Inconsistent responses
- Response quality

Possible improvements
A new approach to data control compared with previous surveys was taken for the first time in 2004 and continued in the follow-up survey runs. Up to and including the 2000 survey, only the individual energy sources themselves were checked for plausibility, any missing data were calculated (quantity-value pairs) and substitutions were made if necessary. Such routines of course continue to be used, with the additional step that the total of the reported energy consumption is then related to a calculated (fictional) overall consumption. This fictional overall consumption by the household is calculated from the data for that household, on the one hand (floor space, number of people in household) and pre-set parameters for the individual types of use (space heating, water heating, cooking, other purposes), on the other hand. Calculating the total reported energy consumption per household in this way involves some quite complicated plausibility routines, because one or more alternative quantities have to be calculated if the quantity-value pairs do not match and these alternative quantities then, when applied, lead to a number of different calculated overall energy consumption figures. The fictional standard value is then used to select the quantity-value pairs that appear most probable.

Notes and comments
Available. Surveying Methodology and Questionnaire
From data to analysis: Essentials for Policy Making

Both manuals available online next week!
The three sides of Energy Efficiency

Objectives: a Better Understanding

- Why it is important for policy makers to have relevant indicators
- Which indicators analysts should build and use
- How to collect the proper end-use energy and activity data
- Gaps, barriers and solutions
- Benefits of harmonisation and role of organisations
The broader IEA effort to help countries develop Energy Efficiency Indicators

Improve clarity and user-friendliness of the template

Strengthen communication with each other

Provide guidance through Manuals (also available in different languages)

Organise training on statistics and on energy efficiency data
Thank you

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