CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Energy supplied at fuelling/recharging stations (ENG_EF_ED3)

DOMAIN

Transport	Environment	**Energy**	Society	Economy

TOPIC	**Energy efficiency**	
IMPACT	**Transport energy demand** *Reducing the energy demanded for mobility*	**ENG_EF**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Transport activity is a source of polluting and greenhouse gas emissions. Emissions are a consequence of energy use. Therefore, their volume depends on two main elements: the amount of energy used, and the sources of the energy used. Improving the sustainability of urban transport implies that either the amount of energy used is reduced or that the role of renewable energy is increased or both.

This indicator is the quantity of fuel supplied at public refuelling/recharging stations. **It is a relevant indicator when the policy action is aimed at reducing the amount of energy used for mobility and transport. A successful action is reflected in a LOWER value of the indicator.**

It should be noted that **this indicator provides a partial measure of the energy demanded** as it does not cover domestic recharge of electric vehicles.

DESCRIPTION

The indicator is the set of values providing the amount of energy demanded in the experiment area for each fuel type. Therefore, the indicator is **multidimensional**, made of **several values**.

The indicator is expressed in **various units of measurement**, depending on the fuel type:

- Gasoline, Diesel, Biodiesel, Bioethanol: 1000 litres
- LPG, CNG, Biomethane, Hydrogen: 1000 kilograms
- Electricity: 1000 Kwh

Not all the fuel types are necessarily included in the indicator; if some fuel type is not relevant in the experiment context, it can be skipped.

METHOD OF CALCULATION AND INPUTS

The indicator should be computed exogenously, by collecting data from refuelling stations and energy operators and then coded in the supporting tool.

Method 1

Energy supplied collected from refuelling stations and energy operators	Significance: **0.50** 

INPUTS

The following information is needed to compute the indicator:

a) **The amount of energy sold in a period of four weeks** for each fuel type. The fuel types to be considered are the followings:
   - **Gasoline**
   - **Diesel**
   - **Biodiesel**
   - **Bioethanol**
   - **LPG**
   - **CNG**
   - **Biomethane**

- **Hydrogen**
- **Electricity**

If some of these fuel types are not relevant in the experiment area (e.g., there are not refuelling stations for biofuels or hydrogen) **they are excluded from the indicator** and from the data collection.
The amount of energy supplied should be collected from refuelling stations and, as far as electricity is concerned, operators providing recharging facilities.
The number of energy operators providing recharging facilities for electric vehicles in one urban area, is generally limited; it should be feasible contacting all operators and collecting data for all charging points.
The number of refuelling stations for LPG, CNG and, where existing, hydrogen should also be small; again, it should be feasible collecting data from all stations.
For gasoline and diesel, the number of refuelling stations is larger and collecting data from all stations could be hardly feasible. **At least 20 stations supplying gasoline and diesel should be monitored**. The selection should be made aiming at a representative sample in terms of coverage of the whole territory of the urban area and size of the stations.

The experiment would result in a modification of the amount of energy supplied in the monitored refuelling/recharging stations in a period of four weeks.

METHOD OF CALCULATION

The indicator should be computed **exogenously** according to the following steps:

- **Identification of the existing refuelling/recharging stations.**
- **Identification of the operators managing recharging facilities for electric vehicles**.
- **Definition of a sample of refuelling stations supplying gasoline and diesel** if their total number is too large for collecting data from all of them.
- **Collection of data from the operators and the refuelling stations**
- **Estimation of total amount of gasoline and diesel supplied** in case the data is collected from a sample of stations (see equation below).
- **Definition of the vector of energy demand** in the monitored period for all fuel types

EQUATIONS

If the amount of gasoline and diesel is collected from a sample of refuelling stations, the total value of energy supplied for these two fuel types should be estimated according to the following equation:

$$\boldsymbol{EngSupl^{e}} = \frac{\sum_{s} \boldsymbol{EngSupl_{s}^{e}}}{\boldsymbol{n}} * \boldsymbol{N}$$

Where:

$EngSupl_{s}^{e}$ = Amount of fuel type *e* supplied by sampled refuelling station *s* in the monitored four weeks

n = Number of sampled refuelling stations

N = Total number of refuelling stations supplying fuel type e in the urban area

NORMALISED VARIATION INDEX

This indicator is made of several values. In order to derive the contribution of this indicator to the overall change induced on the domain "Energy", an **"average"** value is required. The average, **computed within the supporting tool without the need for any input**, consists of total amount of energy supplied expressed in terms of tonnes of oil equivalent (toe), according to the following equation.

$$TotEngSupl = \sum_{e} (EngSupl^{e} * ConvFact^{e})$$

A successful experiment corresponds to a lower value of this "average".

A "normalised variation index" can be used to compute the summary impact of the pilot in the domain "Energy". For this purpose, it is required that the value index becomes larger as the pilot is successful. The index respecting this requirement is obtained **within the supporting tool without the need for any input** as:

$$NMIEngSupl = \left(2 - \frac{TotEngSupl[AE]}{TotEngSupl[BAU]}\right) * 100$$

Where:

$TotEngSupl[AE]$ = Value of the total energy supplied in the After-experiment condition

$TotEngSupl[BAU]$ = Value of the total energy supplied in the BAU condition

ALTERNATIVE INDICATORS

This indicator deals with the demand of energy for transport activity in the urban area. It is an indicator based on observed data; therefore, it provides an objective measure. On the other hand, it does not include the energy used for recharging electric vehicles at home, which is currently a significant share of total energy used for vehicle recharging.

An alternative indicator is ENG_EF_ED1, which is an estimated measure building on exogenous parameters and on transport activity which can be modelled or, again, estimated on parameters. This alternative indicator is less significant than the indicator described in this factsheet, but its computation is much simpler.

Another alternative indicator is ENG_EF_ED2, which is a modelled measure. So, again is not an observed value, but in principle it includes the whole demand, including energy used for recharging electric vehicles at home and, if an urban transport model exists, its computation is simpler compared to the indicator described in this factsheet.