








## CIVITAS indicators

Share of zero or low emissions technologies on new registered road vehicles (ENV\_PL\_PF1)

### DOMAIN

				
Transport	Environment	Energy	Society	Economy

### TOPIC

Pollution

### IMPACT

Transport pollutant emissions

*Reducing the pollutant emissions of urban mobility*

ENV\_PL

### Category

Key indicator	Supplementary indicator	State indicator
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## CONTEXT AND RELEVANCE

Transport activity is a major contributor to pollution, significantly impacting air quality, human health, and climate change. A substantial portion of transport activity takes place in urban areas, where high population density and concentrated economic activity lead to high travel demand. The reliance on motorized vehicles powered by fossil fuels exacerbates pollution levels by emitting particulate matter, nitrogen oxides and volatile organic compounds. These emissions contribute to respiratory diseases and environmental degradation. By addressing urban transport emissions, cities can enhance air quality, reduce carbon footprints, and create healthier, more sustainable environments for residents.

This indicator is an estimation of the share of zero or low emissions out of new registered vehicles in the pilot area. **It is a relevant indicator when the policy action is aimed at promoting the registration of a higher share of cleaner vehicles. A successful action is reflected in a HIGHER value of the indicator.**



## DESCRIPTION

The indicator is weighted share. Being a percentage it is **dimensionless**.

## METHOD OF CALCULATION AND INPUTS

There are two alternative methods for the calculation of this indicator. The difference between the two is the source of the data regarding the new registrations of vehicles. The first method is based on the availability of the data on new registered vehicles by vehicle type and fuel type **in the pilot area**. The last specification is relevant as registers of vehicles often do not provide very spatially detailed data. New registered vehicles might not be available at municipality level. If data exists, the first method is more significant and allows to consider different vehicle types. The second method estimates the shares of different technologies in new registered vehicles using responses from a sample survey. This method can be applied even if data from vehicle register is unavailable. However, it is more approximated and consider only private cars and, maybe, two-wheelers.

For both methods, **the calculation is managed endogenously within the supporting tool** upon the provision of the required input related to the composition of the new registered vehicles. The estimation process is explained below.

METHOD 1	METHOD 2
<b>Share of zero or low emission vehicles using vehicles register data</b>	<b>Share of zero or low emission vehicles using responses to a sample survey</b>
It is an estimation based on observed registrations shares.	It is an estimation only for cars and based on estimated registrations shares.
Complexity 	Complexity 

Significance



Significance



## Method 1

Share of zero or low emission vehicles using vehicles register data

Significance: 1.00



### METHOD OF CALCULATION

The indicator is computed **within the supporting tool** according to the following steps:

- **Estimation of the share of each technology** out of new registered vehicles (see equation below)
- **Estimation of the weighted share of zero or low emission vehicles** (see equation below)

### INPUTS

The following information is needed to compute the indicator:

- a) **The number of new registrations of road vehicles** for each relevant technology.

The technologies to be considered are the followings:

- **Gasoline**
- **Gasoline non-plug-in hybrid**
- **Gasoline plug-in hybrid**
- **Diesel**
- **Diesel non-plug-in hybrid**
- **Diesel plug-in hybrid**
- **LPG**
- **CNG**
- **Battery electric / Trolley**
- **Fuel cell**

**If some of these technologies are not relevant in the pilot area, they can be excluded.**

In principle, the data should consider different road vehicle types: two-wheelers, cars, Light Duty Vehicles and buses. The minimum requirement is that at least cars are considered.

The experiment would result in a modification of the estimated share.

### EQUATIONS

The share of each technology out of new registered vehicles is computed according to the following equation:

$$RegShr^g = \frac{RegVeh^g}{\sum_g RegVeh^g}$$

Where:

$RegVeh^g$  = Number of new registered vehicles of technology  $g$

The weighted share of zero or low emission vehicles is computed by means of the following equation:

$$ZeLoEmisShr = \sum_g (RegShr^g * TechWgh^g)$$

Where:

$RegShr^g$  = Share of new registered vehicles of technology  $g$

$TechWgh^g$  = Weight associated to technology  $g$

The weights associated to the technologies are pre-defined values. The following values are used:

Technology	Weight
Gasoline	0.00
Gasoline non-plug-in hybrid	0.10
Gasoline plug-in hybrid	0.20
Diesel	0.00
Diesel non-plug-in hybrid	0.05
Diesel plug-in hybrid	0.10
LPG	0.00
CNG	0.00
Battery electric / Trolley	1.00
Fuel cell	1.00

## Method 2

### Share of zero or low emission vehicles using responses to a sample survey

Significance: **0.75**



### METHOD OF CALCULATION

The indicator is computed **within the supporting tool** according to the following steps:

- **Estimation of the weighted share of zero or low emission vehicles** (see equation below)

### INPUTS

The input required is the share of each technology out of new registered vehicles. These shares should be computed using the results of a sample survey where respondents are asked whether they have registered a new vehicle in the last months (see guidelines for the surveys for suggestions on the formulation of the question). Given the responses collected from the survey, the shares should be computed as follows:

$$SRegShr^g = \frac{SRegVeh^g}{\sum_g SRegVeh^g}$$

Where:

$SRegVeh^g$  = Number of reported new registered vehicles of technology  $g$  in the sample.

Note that if correction factors are associated to the respondents in order to re-balance the composition of the sample, these correction factors should be applied in the equation above. For instance, if one respondent is associated to a correction factor of 0.7 and reports the registration of one vehicle, that vehicle should be counted as  $1 \times 0.7 = 0.7$  in the equation above.

Since the survey would involve only households, the responses collected would likely refer only to cars and, maybe, two-wheelers.

### EQUATIONS

The equations **used within the supporting tool** to calculate the indicator is:

$$ZeLoSEmisShr = \sum_g (SRegShr^g * TechWgh^g)$$

Where:

$TechWgh^g$  = Weight associated to technology  $g$

The weights associated to the technologies are the same pre-defined values specified for the method 1

## ALTERNATIVE INDICATORS

This indicator refers to the penetration of zero or low emission vehicles in the new registrations. An alternative indicator is **ENV\_PL\_PF2**, which has the same form but refers to the whole fleet rather than on the new registrations only. The indicator described in this factsheet can be considered more focused on the effect of the measures experimented in the pilot, as they can only affect new registrations and not the existing fleet. On the other hand, the alternative indicator ENV\_PL\_PF2 can be considered a more representative picture of how relevant zero or low emission vehicles are in the pilot area. In an extreme situation, where just one new electric car is registered and added to a vehicle fleet without neither electric nor hybrid cars, the indicator described in this factsheet would get value = 1, while the alternative indicator would be very close to zero. The two indicators are of the same complexity; the significance depends essentially on what should be measured.

It should also be noted that the share of newly registered zero or low emissions road vehicles is one of the three components of **ENV\_US\_EL1**. This indicator combines the share of zero or low emissions road vehicles, the noise level in the experiment area and periods and the share of vehicles irregularly parked or the share of urban surface dedicated to vehicle parking to assess overall urban liveability. The online tool automatically computes ENV\_US\_EL1 if the three sub-indicators have been calculated.

If the focus is on carbon emissions instead of air pollution, indicators **ENV\_DC\_EF1** and **ENV\_DC\_EF2** can be used. These measure the average CO2 emissions per kilometre travelled of newly registered vehicles and of the overall fleet, respectively, offering insight into the fleet's contribution to greenhouse gases emissions.