CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Measured noise level (ENV_NS_NE1)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Noise**	
IMPACT	**Transport noise emissions** *Reducing the level of noise generated by transport*	**ENV_NS**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Motorized vehicles are a major source of transport-related noise pollution in urban areas. Reducing noise pollution is crucial for public health and well-being, as chronic exposure can lead to increased stress, heart disease, sleep disturbances, and mental health issues. It also affects cognitive function, productivity, and overall quality of life. Beyond health impacts, traffic noise disrupts social interactions, lowers property values, and it can exacerbate social disparities between affluent and lower-income communities. Addressing this issue enhances urban livability and supports sustainable development.

This indicator provides a measure of the level of noise in the roads of the pilot area. **It is a relevant indicator when the policy action is aimed at reducing the annoyance and the damages to health resulting from the noise generated by urban transport. A successful action is reflected in a LOWER value of the indicator.**

DESCRIPTION

The indicator is the average of different measures of the noise level (namely, Equivalent Sound Level – LAeq) in a sample of roads in the pilot area.

The indicator is expressed in **decibels (dB)**.

METHOD OF CALCULATION AND INPUTS

The indicator should be computed exogenously, by applying one of the two methods described, and then coded in the supporting tool.

There are two alternative methods of calculation available for this indicator. The two methods distinguish for the number and the length of the periods when measures are made. One method is simpler, but therefore provides less significant results; the other method is more complex and therefore provides more significant results.

METHOD 1	METHOD 2
Noise measured in a smaller sample of periods	**Noise measured 24 hours in a larger sample of periods**
Complexity 	Complexity 
Significance 	Significance 

Method 1

Noise estimated in a sample of roads in three 2-hours periods of three working days

Significance: **0.75**

INPUTS

The following information is needed to compute the indicator:

a) **The measures of noise (Equivalent Sound Level – LAeq) in the pilot area**. According to this method, the measures should be made:
   - **In one or more spots (up to 10 spots)** in the pilot area, depending on its size (e.g., in small pilot areas one spot is sufficient, if the pilot involves the whole city it is recommended to identify 10 spots). A spot is a specific location on one road where transport noise level is significant before the experiment or could become relevant when the pilot is implemented (e.g., because a multimodal hub is opened). Locations where non-transport noise sources can affect measures should be avoided.
   - **In three different working days** (unless there are specific reasons why transport noise is expected to be higher in non-working days).
   - **In three 2-hours periods** – morning peak; afternoon off-peak; night).

The experiment would result in a modification of the measured level of noise in the same locations and in equivalent periods.

METHOD OF CALCULATION

Using Method 1, the indicator should be computed **exogenously** according to the following steps:

- **Collection of noise measures for all spots in each sampled day**.
- **Estimation of the average noise level in each spot of each sampled day.** The average is computed considering the three 2-hours periods as independent observations (see equation below).
- **Estimation of the average noise level in each sampled day.** The average is computed considering each spot as independent observations (see equation below).
- **Estimation of the index** by computing the average noise level of the three sampled days (see equation below).

EQUATIONS

The average noise in one spot in one day can be computed as:

$$ {}_{d}LAeq_{r} = \frac{\sum_{t} {}_{d}^{t}LAeq_{r}}{3} $$

Where:

${}^{t}_{d}LAeq_r$ = Equivalent sound level measured in the period *t,* in the spot *r*, in the day *d*

The division by 3 is because measures are made in 3 different periods.

The average noise in one day should be computed as:

$$ {}_{d}LAeq = \frac{\sum_r {}_{d}LAeq_r}{R} $$

Where:

R = Number of spots where noise has been measured.

Building on the calculations above, the indicator should be computed as:

$$ \boldsymbol{NoiseLev} = \frac{\sum_d {}_{d}\boldsymbol{LAeq}}{\boldsymbol{3}} $$

The division by 3 is because measures are made in 3 different days.

Method 2

Noise measured for 24 hours in a sample of roads in five working days

Significance: **1.00**

INPUTS

The following information is needed to compute the indicator:

b) **The measures of noise (Equivalent Sound Level – LAeq) in the pilot area**. According to this method, the measures should be made:

- **In one or more spots (up to 10 spots)** in the pilot area, depending on its size (e.g., in small pilot areas one spot is sufficient, if the pilot involves the whole city it is recommended to identify 10 hot spots). A spot is a specific location on one road where transport noise level is significant before the experiment. Locations where non-transport noise sources can affect measures should be avoided.
- **In five different working days** (unless there are specific reasons why transport noise is expected to be higher in non-working days).
- **For the whole day (24 hours)**.

The experiment would result in a modification of the measured level of noise in the same locations and in equivalent periods.

METHOD OF CALCULATION

Using Method 2, the indicator should be computed **exogenously** according to the following steps:

- **Collection of noise measures for all spots in each sampled day**.
- **Estimation of the average noise level in each sampled day.** The average is computed considering each spot as independent observations (see equation below).
- **Estimation of the index** by computing the average noise level of the five sampled days (see equation below).

EQUATIONS

The average noise in one day should be computed as:

$$_dLAeq = \frac{\sum_r {}_dLAeq_r}{R}$$

Where:

R = Number of spots where noise has been measured.

Building on the calculations above, the indicator should be computed as:

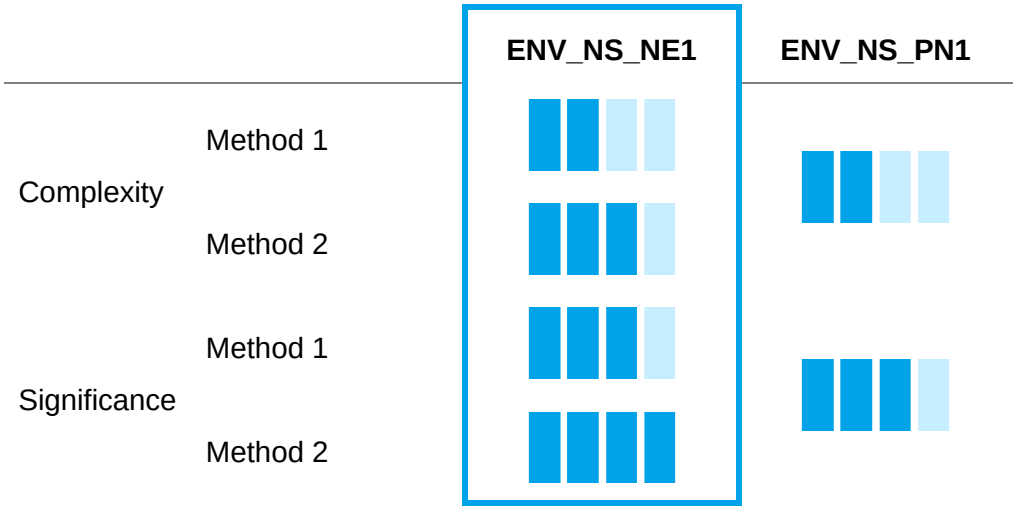
$$\boldsymbol{NoiseLev = \frac{\sum_d {}_d LAeq}{5}}$$

The division by 5 is because measures are made in 5 different days.

ALTERNATIVE INDICATORS

This indicator consists of the measured level of noise in some sample locations. Since it is based on observations, its significance is high. On the other hand, its calculation requires a specific on-site measurement campaign with dedicated equipment and specialised operators for its correct installation.

An alternative indicator is **ENV_NS_PN1**, which is based on the annoyance reported by a sample of inhabitants of the pilot area. This alternative indicator is less significant than the one described in this factsheet, because it is based on qualitative and subjective evaluation. Nevertheless, the estimation of this alternative indicator could be less complex, especially if a sample survey in the pilot area is already envisaged to collect information needed for other indicators. In that case, adding one question regarding noise would be basically effortless.



It should also be noted that the noise level in the pilot area 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.