CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Accessibility index – Version 1 (TRA_FC_AC1)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Functionality of the transport system**	
IMPACT	**Accessibility** *Increasing the accessibility in the urban area*	**TRA_FC**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Accessibility in urban areas refers to how easily individuals can reach services, amenities, and opportunities. Achieving accessibility requires well-designed infrastructure, efficient transportation systems, and inclusive public spaces that support all modes of urban mobility. By prioritizing accessibility, cities foster inclusivity and equity, ensuring residents can fully participate in urban life—whether accessing jobs, education, services, or recreation. Additionally, improved accessibility strengthens community bonds and reduces social isolation.

This indicator provides a measure of the level of accessibility in the experiment area. **It is a relevant indicator when the policy action is aimed at improving the role of the transport system as support of trips needed for individual activities. A successful action is reflected in a HIGHER value of the indicator.**

DESCRIPTION

This indicator is a **dimensionless** index obtained as combination of other indicators, namely:

- **Public Transport connectivity**
- **Connectivity of bike-reserved network**
- **Congestion**

The rationale is that improving one or more of these dimensions of the urban transport system means improving the chance of citizens to move in the city for their activities.

This indicator measures the **modification of accessibility provided by the experiment** rather than the accessibility in absolute term. It is therefore **a meaningful indicator when comparing the after-experiment case to the BAU case** (or to the before-experiment case) while **it is NOT meaningful indicator to measure the accessibility level in one specific condition or when comparing different experiment sites**.

METHOD OF CALCULATION AND INPUTS

The indicator is calculated by means of a mathematical equation, **within the supporting tool, building on a set of required inputs**.

Method	
Calculation of the index based other indicators	Significance: **0.25** 
METHOD OF CALCULATION	

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

- **Calculation of other indicators for the before-experiment case**. For the method of calculation of the required indicators (see inputs below), make reference to the dedicated indicator templates.
- **Calculation of other indicators for the BAU case**. For the method of calculation of the required indicators (see inputs below), make reference to the dedicated indicator templates.
- **Calculation of other indicators for the before-experiment case**. For the method of calculation of the required indicators (see inputs below), make reference to the dedicated indicator templates.
- **Calculation of the change of indicators** in the after-experiment case relative to the before-experiment case and relative to the BAU case.
- **Estimation of the index**.

INPUTS

The following information should exist in the supporting tool to compute the indicator. Note that when it is chosen to compute the indicators mentioned below, their values are found directly within the supporting tool. Therefore, **there is no need to code them manually**. If some of the indicators mentioned below are not available, this indicator cannot be computed.

a) Values of **one of the indicators of public transport connectivity** in the before-experiment case, in the BAU case and in the after-experiment case**.**
b) Values of the **one of the indicators of connectivity of bike-reserved network**. in the before-experiment case, in the BAU case and in the after-experiment case**.** Within the TRA_PT domain there is one alternative for this indicator.
c) Values of the **one of the indicators of congestion** in the before-experiment case, in the BAU case and in the after-experiment case**.**

The experiment would be reflected in the modification of one or more of these indicators as result of one or more interventions affecting the features of the urban transport system measured by each indicator.

EQUATIONS

The equations used **within the supporting tool** to manage the calculation, building on the needed inputs, are the following:

Calculation of the relative change of the indicator in the after-experiment case relative to the before-experiment case, for the indicators reflecting a successful action by means of a LOWER value (for instance some of the congestion indicators**).**

$$^{I}AEBEChng = \frac{I[BE]}{I[AE]}$$

Where:

$I[BE]$ = Value of the indicator *I* in the before-experiment case

$I[AE]$ = Value of the indicator *I* in the after-experiment case

For instance:

$$^{<TRA\_PT\_RL>}AEBEChng = \frac{TRA\_PT\_RL[BE]}{TRA\_PT\_RL[AE]}$$

Calculation of the relative change of the indicator in the after-experiment case relative to the before-experiment case, for the indicators reflecting a successful action by means of a HIGHER value (for instance, connectivity of public transport indicators):

$$^{I}AEBEChng = \frac{I[AE]}{I[BE]}$$

Calculation of the relative change of the indicator in the after-experiment case relative to the BAU case, for the indicators reflecting a successful action by means of a LOWER value:

$$^{I}AEBAUChng = \frac{I[BAU]}{I[AE]}$$

Calculation of the relative change of the indicator in the after-experiment case relative to the BAU case, for the indicators reflecting a successful action by means of a HIGHER value:

$$^{I}AEBAUChng = \frac{I[AE]}{I[BAU]}$$

Estimation of the accessibility index (indicator value) with respect to the BAU and with respect to the before-experiment case:

$$\boldsymbol{AccIndex} = \sum_{\boldsymbol{I}} \left({}^{\boldsymbol{I}}\boldsymbol{AEBAUChng} * {}^{\boldsymbol{I}}\boldsymbol{AccWhgt} \right)$$

$$\boldsymbol{AccIndex} = \sum_{\boldsymbol{I}} \left({}^{\boldsymbol{I}}\boldsymbol{AEBEChng} * {}^{\boldsymbol{I}}\boldsymbol{AccWhgt} \right)$$

Where:

$^{I}AccWhgt$ = Weighting factor associated to the indicator *I*.

The weighting factors are **predefined within the supporting tool** as follows:

$^{<TRA\_PT\_PTCn>}AEBAUChng$ = 0.45

$^{<TRA\_BK\_CNn>}AEBAUChng$ = 0.20

$^{<TRA\_FC\_CNn>}AEBAUChng$ = 0.35

ALTERNATIVE INDICATORS

This indicator, which combines public transport connectivity, bike lane connectivity, and congestion levels, primarily assesses transport accessibility. If computing these other indicators is already envisaged as part of the assessment, it is straightforward computing this indicator. If the calculation of the other indicators is not envisaged, the indicator described in this factsheet requires some work. Furthermore, this indicator covers only some dimensions, which are not necessarily exhaustive of what contributes to accessibility. Therefore, even if it is based on objective measures, its significance is limited. For example, the indicator does not consider the broader urban environment or the availability of essential services, potentially overlooking areas where transportation is sufficient, but the provision of city functions is inadequate.

TRA_FC_AC2 is a more significant alternative that assesses accessibility in an experiment area by evaluating the attractiveness of different zones and the effort required to travel between them. The attractiveness of each zone is based on the availability of key city functions, such as housing, schools, offices, healthcare, grocery stores, and recreational facilities. The effort to travel between two zones is measured using a generalized cost function, which combines out-of-pocket expenses with the monetary equivalent of travel time, and accounting for driving, public transport, and bicycle travel. By considering both zone attractiveness and the effort required to move between them, **TRA_FC_AC2** offers a comprehensive view of accessibility, since it captures not only transport infrastructure and transport supply but also the spatial distribution of services and the costs associated with different travel modes, including travel time. However, this indicator is more complex to calculate, as it requires detailed data on the spatial distribution of services and transport costs for each mode of transport.