CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Car dependency index (TRA_CC_CD1)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Car Centrality**	
IMPACT	**Car dependency** *Reducing the dependency on private cars*	**TRA_CC**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Car dependency refers to the extent to which individuals must rely on private cars for their daily transportation needs due to the lack of viable alternative modes. High car dependency and, therefore, high numbers of car trips, lead to several urban challenges, including air and noise pollution and sedentarism. It also impacts urban planning as roads and parking take up valuable space that could otherwise be used for public amenities, green spaces, or pedestrian-friendly infrastructure. Car dependency can be tackled through the provision of quality public transport and sharing mobility options, which introduces alternative modes to the private car for trips in urban areas.

This indicator provides a measure of the dependency of personal mobility on private cars. **It is a relevant indicator when the policy action is aimed at increasing the availability and/or the effectiveness of mobility solutions alternative to private cars. A successful action is reflected in a LOWER value of the indicator.**

DESCRIPTION

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

- **Public Transport availability**
- **Public Transport connectivity**
- **Public Transport reliability**
- **Public Transport affordability**
- **Public Transport speed**
- **Shared mobility availability**

The rationale is that improving one or more of these dimensions of the urban transport system means providing citizens with better alternatives to private car.

This indicator measures the **modification of car dependency provided by the experiment** rather than the dependency 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 a meaningful indicator to measure the dependency 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 on other indicators	Significance: **0.50** 
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) **TRA_PT_PTAn.** Value of the **Indicator of public transport availability** in the before-experiment case, in the BAU case and in the after-experiment case**.** Within the TRA_PT domain there are two alternatives for this indicator.
b) **TRA_PT_PTCn**. Value of the **Indicator of public transport connectivity** in the before-experiment case, in the BAU case and in the after-experiment case**.** Within the TRA_PT domain there are seven alternatives for this indicator.
c) **TRA_PT_RL**. Value of the **Indicator of public transport reliability** 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.
d) **SOC_EQ_AFn**. Value of the **Indicator of public transport affordability** in the before-experiment case, in the BAU case and in the after-experiment case**.** Within the SOC_EQ domain there are two alternatives for this indicator.
e) **TRA_PT_PTS.** Value of the **Indicator of public transport speed** 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.
f) **TRA_SH_AVn.** Value of the **Indicator of shared mobility availability** in the before-experiment case, in the BAU case and in the after-experiment case**.** Within the TRA_SH domain there are three alternatives for this indicator

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 those indicators *I* reflecting a successful action by means of a LOWER value (**TRA_PT_RL** and **SOC_EQ_AFn).**

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

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 those indicators *I* reflecting a successful action by means of a HIGHER value (**TRA_PT_PTAn, TRA_PT_PTCn, TRA_PT_PTS, TRA_SH_AVn**):

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

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

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

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

$$\boldsymbol{CarDepIndex} = \sum_{I} \left({}^{\boldsymbol{I}}\boldsymbol{AEBAUChng} * {}^{\boldsymbol{I}}\boldsymbol{CarDepWhgt} \right)$$

$$\boldsymbol{CarDepIndex} = \sum_{I} \left({}^{\boldsymbol{I}}\boldsymbol{AEBEChng} * {}^{\boldsymbol{I}}\boldsymbol{CarDepWhgt} \right)$$

Where:

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

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

$^{<TRA\_PT\_PTAn>}AEBAUChng$ = 0.25

$^{<TRA\_PT\_PTCn>}AEBAUChng$ = 0.20

$^{<TRA\_PT\_RL>}AEBAUChng$ = 0.15

$^{<SOC\_EQ\_AFn>}AEBAUChng$ = 0.25

$^{<TRA\_PT\_PTS>}AEBAUChng$ = 0.10

$^{<TRA\_SH\_AVn>}AEBAUChng$ = 0.05

ALTERNATIVE INDICATORS

This indicator measures the extent to which personal mobility depends on private cars. It is calculated using a combination of other indicators included in this Framework that relate to public transport availability, connectivity, reliability, affordability, speed, and the availability of shared mobility services. If these underlying indicators are already part of the assessment, this indicator can be easily obtained through the supporting tool with no additional effort. It is important to note that this indicator captures only some dimensions of car dependency, which are not necessarily exhaustive of what contributes to this phenomenon: the indicator indirectly assesses car dependency by evaluating the supply of public transport and shared mobility options. Therefore, its significance is only moderate.

Alternative indicator **TRA_CC_CD2** measures car dependency using survey data, that is by asking respondents what percentage of their trips in the pilot area have no viable alternative to driving. Asking respondents a direct question on car dependency makes this indicator more significant than TRA_CC_CD1.

The choice between these two alternative indicators may also depend on data availability: TRA_CC_CD1 uses transport supply underlying indicators, while TRA_CC_CD2 requires conducting a sample survey. Conducting a survey may demand a substantial effort, but if a sample survey in the pilot area is already envisaged to collect information needed for other indicators, adding one question regarding car dependency would be basically effortless. Lastly, TRA_CC_CD1 only allows to assess the change between the after-experiment case and the BAU or before case, as it is not a meaningful indicator to measure car dependency in absolute terms. On the contrary, TRA_CC_CD2 can be used in absolute term, too: this indicator is a share, thus ranging between 0 and 100%, with 0% meaning that for any trip in the experiment area there exist an alternative to driving, i.e., no car dependency at all. As such, it allows comparisons across pilots.

For a focus on people's perception of transport alternatives, **TRA_CC_PCD** measures perceived car dependency in the experiment area. Perceived car dependency reflects social norms and personal habits rather than the actual provision of non-car alternatives.