CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Pedestrian network connectivity index – Version 3 (TRA_WK_CN3)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Walking**	
IMPACT	**Connectivity of pedestrian network** *Improving the connectivity of pedestrian network*	**TRA_WK**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Walkability is an important component of sustainable urban mobility, contributing to healthier, more accessible, and more liveable cities. Developing well-connected pedestrian networks encourages more trips to be made on foot, reducing reliance on motorized transport, and lowering carbon emissions. Furthermore, increased walkability creates public health benefits, promoting physical activity and reducing risks associated with sedentary lifestyles. Well-designed pedestrian networks also ensure accessibility for all users, including individuals with reduced mobility, by incorporating features such as wide footpaths and safe crossings. By prioritizing walkability, cities can make more efficient use of limited urban space, creating vibrant, people-centred environments that foster sustainability and inclusivity.

This indicator provides a measure of the connectivity of the pedestrian network. **It is a relevant indicator when the policy action is aimed at increasing the number of origin-destination pairs within a specific area of the city for which a pedestrian route entirely on reserved paths exists. A successful action is reflected in a HIGHER value of the indicator.**

DESCRIPTION

This indicator is an index obtained as ratio between the **number of origin-destination pairs within the experiment area for which a pedestrian route entirely on reserved paths exists** and the total number of origin-destination pairs within the experiment area. The indicator is **dimensionless**.

METHOD OF CALCULATION AND INPUTS

The indicator should be computed exogenously, by applying the method described and then coded in the supporting tool.

Method	
Calculation of the index based on the map of pedestrian areas and the map of roads	Significance: **1.00** 

INPUTS

The following information is needed to compute the indicator:

a) A map of the roads on in the experiment area
b) A map of the pedestrian areas in the experiment area

The experiment would add new sections to the pedestrian-reserved network, resulting in a modification of the map of pedestrian areas in the experiment area.

METHOD OF CALCULATION

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

- **Definition of 100-metre-sided cells covering the entire territory of the experiment area**.
- **Quantification of the total number of origin-destination pairs between the 100-metre-sided cells in the experiment area**. This number can be easily calculated from the total number of cells defined in the first step (see equation below).
- **Quantification, for each cell, of the number of other cells that can be reached on foot travelling entirely on pedestrian-reserved paths**. This number can be obtained overlapping the map of pedestrian-reserved paths on the map of the experiment area.
- **Estimation of the index** by computing the ratio between the number of cells quantified in the third step and the total number of origin-destination pairs quantified in the second step.

EQUATIONS

If the number of 100-metre-sided cells covering the territory of the experiment area is N, the total number of origin-destination pairs between these cells is:

$$TotOD = 2 * \sum_{k=1}^{N-1} k$$

For instance, if N = 7, the number of origin-destination pairs is 2 * (1+2+3+4+5+6) = 42

The equation computing the index (last step of the method of calculation) is the following:

$$\boldsymbol{WkConnIndex} = \frac{\sum_c {}^{c}\boldsymbol{ResPedDest}}{\boldsymbol{TotOD}}$$

Where:

${}^{c}ResPedDest$ = number of other cells that can be reached on foot travelling entirely on pedestrian-reserved paths from cell *c*

$TotOD$= Total number of origin-destination pairs between cells

ALTERNATIVE INDICATORS

This indicator assesses the connectivity of the pedestrian-reserved network in an experiment area by considering the ratio of number of OD pairs between 100m cells that can be travelled walking entirely on pedestrian-reserved paths and total number of OD pairs in the experiment area.

While this indicator assesses local interventions, **TRA_WK_CN4** can be used to analyse whole city experiments. This alternative indicator uses larger cell grids (250m x 250m).

Simpler, albeit less significant versions of this indicator are **TRA_WK_CN1** and **TRA_WK_CN2**. They consider the ratio between the total length or area of pedestrian-reserved paths in the area

and the total length of roads or non-built-up area in the experiment area (local experiment or whole city). These approaches require less complex input data and processing, but they have lower significance, since they do not account for network continuity.

	TRA_WK_CN1	TRA_WK_CN2	TRA_WK_CN3 (local) and TRA_WK_CN4 (whole city)
Complexity			
Significance