CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Pedestrian network connectivity index – Version 4 (TRA_WK_CN4)

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 the whole 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 whole city for which a pedestrian route entirely on reserved paths exists and whose distance is less than 1.5 km** and the total number of origin-destination pairs within the whole city distant less than 1.5 km from each other. The 1.5 km upper limit on distances is set to exclude O-D pairs that are too distant from each other to be comfortably reached on foot by the average person.

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 experiment city b) A map of the pedestrian areas in the experiment city The experiment would add new sections to the pedestrian-reserved network, resulting in a modification of the map of pedestrian areas in the experiment city.	
METHOD OF CALCULATION	

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

- **Definition of 250-metre-sided cells covering the entire territory of the city**. Use a GIS software to overlay a grid of 250m-sided cells onto the city's spatial extent. The grid should cover all urbanized and potentially accessible areas.
- **Quantification of the total number of origin-destination pairs between the 250-metre-sided cells distant less than 1.5 km**. Use GIS to compute the Euclidian (straight-line) distance between the centroids of all cell pairs. Select and count the pairs where the distance is less than 1.5km.
- **Quantification, for each cell, of the number of other cells that can be reached on foot travelling entirely on pedestrian-reserved paths and distant less than 1.5 km**. Use pedestrian areas data and count the number of cell pairs that are connected by pedestrian-reserved paths and whose distance between centroids is less than 1.5 km.
- **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

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* and whose distance from cell *c* is less than 1.5 km

$TotOD$= Total number of origin-destination pairs between cells that are distant less than 1.5 km from each other

ALTERNATIVE INDICATORS

This indicator assesses the connectivity of the pedestrian-reserved network in an experiment area by considering the ratio between the number of OD pairs between 250-metre-sided cells distant less than 1.5 km from each other that can be travelled walking entirely on pedestrian-reserved paths and total number of OD pairs in the experiment city distant less than 1.5 km from each other.

While this indicator assesses whole city interventions, **TRA_WK_CN3** can be used to analyse local experiments. This alternative indicator uses smaller cell grids (100m x 100m).

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