CIVITAS indicators

Bike-reserved paths connectivity index – Version 4 (TRA_BK_CN4)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC

Bicycle	
Connectivity of bike network *Improving the connectivity of bike-reserved paths network*	**TRA_BK**

IMPACT

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Cycling is an environmentally and socially sustainable alternative to motorized private transport. Well-connected bike networks provide safe, direct routes that encourage more people to cycle, lowering carbon emissions. They support an efficient use of public space, as they reduce the need for extensive car parking infrastructure, and they foster public health by integrating physical activity and transportation. Bike networks can also bridge gaps in public transportation, improving access to transit hubs, workplaces and services. It is therefore desirable to develop well-connected urban bike networks to improve sustainability, accessibility, and health in urban environments.

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

DESCRIPTION

This indicator is an index obtained as ratio between the **number of origin-destination pairs within the whole experiment city for which a bike route entirely on reserved paths exists** and the total number of origin-destination pairs in the experiment city. 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 bike reserved paths	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 bike reserved paths in the experiment city
 	
The experiment would result in a modification of the map of bike reserved paths in the experiment city (additional sections).		

METHOD OF CALCULATION		

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

- **Definition of 500-metre-sided cells covering the entire territory of the city.**

- **Quantification of the total number of origin-destination pairs between the 500-metre-sided cells in the experiment city.** This number can be easily calculated from the total number of cells defined in the first step (see equations below).

- **Quantification, for each cell, of the number of other cells that can be reached using bike travelling entirely on bike reserved paths.** This number can be obtained overlapping the map of bike reserved paths on the map of the experiment city.

- **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 500-metre-sided cells covering the territory of the experiment city 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:

$$BkConnIndex = \frac{\sum_c {}^cResBkPDest}{TotOD}$$

Where:

${}^cResBkPDest$ = number of other cells that can be reached using bike travelling entirely on bike reserved paths from cell c

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

ALTERNATIVE INDICATORS

This indicator assesses the connectivity of the bike-reserved network in a whole experiment city by considering the ratio of number of OD pairs between 500m cells that can be travelled cycling entirely on bike-reserved paths and total number of OD pairs in the experiment city.

While this indicator assesses whole city interventions, **TRA_BK_CN4** can be used to analyse local experiments. This alternative indicator uses smaller cell grids (250m x 250m).

Simpler, albeit less significant versions of this indicator are **TRA_BK_CN1** and **TRA_BK_CN2**. They consider the ratio between the total length of bike paths in the area and the total length of roads in the experiment area (local experiment or whole city). This approach requires less complex input data and processing, but has lower significance, since it does not account for network continuity.

	TRA_BK_CN1	TRA_BK_CN2	TRA_BK_CN3 (local) and TRA_BK_CN4 (whole city)
Complexity	▮▯▯▯	▮▮▯▯	▮▮▮▮
Significance	▮▯▯▯	▮▮▯▯	▮▮▮▮

It should also be noted that bike connectivity is one of the three components of **TRA_FC_AC1**. This indicator combines public transport connectivity, bike connectivity and road congestion to assess overall accessibility. The online tool automatically computes **TRA_FC_AC1** if the three sub-indicators have been calculated.