CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Modal shares – Version 1 (TRA_CC_MS1)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Car centrality**	
IMPACT	**Modal shares** *Increasing the role of public transport and active modes*	**TRA_CC**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Modal shares refer to the adoption of different transportation modes within an area, such as private cars, public transport, cycling, and walking. This indicator helps assess the effectiveness of policies promoting sustainable modes, particularly public transport and active mobility. Public transport is an environmentally and socially sustainable mode because it can carry a large number of passengers in a single vehicle, thereby reducing energy consumption, emissions per person and road space usage compared to individual private vehicles. Similarly, active mobility (like cycling and walking) promotes physical health, reduces emissions, and requires less infrastructure compared to motorized transport. Increasing the adoption of public transport and active modes in urban areas is crucial for reducing car trips and addressing urban challenges like congestion, pollution, road safety, and inefficient use of public space.

This indicator provides a measure of the role of transport modes in the mobility of the experiment area. **It is a relevant indicator when the policy action is aimed at shifting trips from private cars to public transport and/or active modes. A successful action is reflected in a LOWER modal share of car compared to the BAU case.**

DESCRIPTION

This indicator consists of the modal shares of each available mode of transport in the experiment area **based on the number of trips**. The indicator is based on trips rather than on passengers-km for two reasons. First, for sake of simplicity as measuring trips is easier than measuring passengers-km. Second, because passengers-km can be affected by spurious effects like, for example, a re-routing of car trips to avoid pedestrian areas leading to longer distances and so more passengers-km.

The transport modes considered are predefined for sake of comparability. Own and shared vehicles are NOT distinguished because the goal of the indicator is measuring if mobility is shifted from car towards more sustainable modes, not measuring if shared mobility is extended. There are specific indicators devoted to shared mobility.

The indicator is a multidimensional one, made of several values. All values are ratios; therefore, are **dimensionless**.

METHOD OF CALCULATION AND INPUTS

There are two alternative methods available to calculate this indicator, differing in the sources used to determine modal shares. The two approaches vary in both complexity and significance. In both cases, the calculation is performed **exogenously**, and the resulting value is then entered into the tool.

The methods of calculation refer especially to the after-experiment and the BAU conditions. The modal shares in the before-experiment condition can be already known from some existing study (e.g. an urban plan). **If so, they should not be calculated using one of the available methods, but just reported in the supporting tool**. Nevertheless, if before-experiment modal shares are unknown, one of the methods can be applied.

METHOD 1	METHOD 2
Modal shares extracted from an urban transport model	**Modal shares estimated from a sample survey**
Based on a theoretical calculation rather than on observation	Based on self-declared behaviour
Complexity 	Complexity 
Significance 	Significance 

Method 1

Modal shares extracted from an urban transport model

Significance: **0.50** 

INPUTS

The input needed to compute this indicator is:

a) An urban transport model representing all relevant modes.

The experiment would be reflected in the modification of some exogenous variables of the urban transport model. The modification would be the translation in terms of modelling inputs of one or more interventions included in the experiment.

METHOD OF CALCULATION

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

- **Identification of model inputs that can be used to simulate the experiment**. Given the structure of the model, there will be elements that can be changed exogenously to interpret the content of measures included in the experiment. For instance, the definition of a pedestrian area can be modelled by closing some network links to motorised modes. Most likely, not all measures can be handled within a transport model. For instance, the provision of parking space for bicycles is probably not in the scope of a transport network model. In some cases, measures can be handled indirectly, by assuming the modification induced on model variables. For instance, the introduction of tradable mobility permits could be modelled in terms of modification of transport costs.

- **Quantification of model inputs**. Definition of the size of the changes applied to the exogenous model inputs (e.g. modification of travel costs).

- **Simulation of the experiment**. Application of the transport model with the inputs defined in the previous steps.

- **Extractions of modal shares**. Modal shares based on trips can be a pre-defined output provided by the model or can be computed by extracting model outputs (e.g. modal origin-destination matrices)

EQUATIONS

If the transport model does not directly provide modal shares but only trips by mode for different demand segments, modal shares should be computed according to the equation:

$$ModShr_m = \frac{\sum_d {}^dTrips_m}{\sum_m \sum_d {}^dTrips_m}$$

Where:

${}^dTrips_m$ = Number of modelled trips by transport mode *m* for demand segment *d*

In case the model output is the number of trips by mode and by origin-destination, the equation above applies to the summation of trips across all origin-destination pairs between urban zones.

Method 2

Modal shares estimated from a sample survey

Significance: **1.00**

INPUTS

The input needed to compute this indicator is:

a) Answers from a sample of individuals to questions about the transport mode used for their urban trips.

The experiment would be reflected in the modification of the experience of the citizens and in the consequent modification of their answers.

METHOD OF CALCULATION

The indicator should be computed **exogenously** taking **results from a sample survey**. See the document **"Suggestions and recommendations for sample surveys"** for general indications on how a survey should be organised (sample selection, sample size, administration, etc.). As regard of the estimation of modal shares, the following specific methodological aspects apply:

- The transport modes used for urban trips should be requested referring to one specific day (e.g., the day before, the last working day if the day before was a holiday).
- The transport modes used for all urban trips made in the reference day should be requested.
- The format of the questions made to collect the transport modes used can change depending on the scope of the survey (which can be used to collect other information) and on the platform used to administer the questionnaire. In general terms, it can be asked to provide the following information for each trip made in the reference day.

Trip purpose	Main transport mode	Other transport mode(s)
Commuting	Walk	Bike (private or shared)
Other working	Bike (private or shared)	Scooter (private or shared)
Education	Scooter (private or shared)	Motorbike/Moped (private or shared)
Escorting	Motorbike/Moped (private or shared)	Car (private or shared) as passenger
Visit to parents/relatives	Car (private or shared) as driver	Bus
Shopping	Car (private or shared) as passenger	Tram/Metro/Train
Personal business	Bus	
Leisure	Tram/Metro/Train	
Other		

- Main transport mode should be explained as the mode used for the longest (in distance terms) part of the trip.
- Other transport mode(s) should be explained as mode(s) used to reach the main transport mode from the origin of the trip (e.g., to reach the metro station) and/or to reach the final destination. Walking or car as driver are not considered among "other transport modes" as some walk is almost always required while car is hardly driven to reach other modes of urban trips. Other transport modes **are not used** to estimate modal shares but provide information on intermodality.
- It is preferable to pre-define the lists of trip purposes and transport modes to make the elaboration easier.
- For estimating modal shares, it is preferable not to distinguish between private and shared transport means. However, in case the survey is used to estimate other indicators related to shared mobility, the distinction should be introduced in the pre-defined list.

The answers to the survey would provide the number of trips by mode on which modal shares can be easily computed (see equations).

EQUATIONS

Using answers, modal shares should be computed according to the equation:

$$ModShr_m = \frac{\sum_p {}^pTrips_m}{\sum_m \sum_p {}^pTrips_m}$$

Where:

${}^pTrips_m$ = Number of trips by **main** transport mode *m* for trip purpose *p*

NORMALISED VARIATION INDEX

This indicator is made of several values. In order to derive the contribution of this indicator to the overall change induced on the domain "Transport", an **"average"** value is required. The average,

computed within the supporting tool without the need for any input, consists of the sum of modal shares of sustainable modes of transport, according to the following equation.

$$ModShrSI = \sum_{m} ModShr_m \quad m \neq car\ as\ driver; car\ as\ passenger; motorbike/moped$$

A successful experiment corresponds to a higher value of this "average". Therefore, the "normalised variation index" that can be used to compute the summary impact of the experiment in the domain "Transport" is obtained **within the supporting tool without the need for any input** as:

$$NMIModShr = \frac{ModShrSI[AE]}{ModShrSI[BAU]} * 100$$

Where:

$ModShrSI[AE]$ = Value of the "average" value of the indicator in the After-experiment condition

$ModShrSI[BAU]$ = Value of the "average" value of the indicator in the BAU condition

ALTERNATIVE INDICATORS

This indicator describes the modal share in the experiment area using traffic modelling or surveys. If the focus is solely on commuting trips, **TRA_CC_MSC** evaluates the modal share of commuting trips specifically.

As an alternative to this indicator, **TRA_CC_MS2** assesses the modal share on a selected sample of roads, relying on traffic counts and on-vehicle counts for public transport. TRA_CC_MS2 is a simpler option to assess changes in modal share since it does not require a traffic model. Relying on traffic counts on a sample of roads in the experiment area, however, it may not accurately represent overall travel behaviour beyond the surveyed roads. Therefore, TRA_CC_MS2 is useful for cases where a traffic model is unavailable. It is also best suited for cases where the experiment area is relatively small, or if the study focuses on a specific corridor—two conditions that minimize concerns about representativeness. This alternative indicator is also particularly convenient if the city already conducts routine traffic and on-vehicle counts, as the resource-intensive part of data collection is already in place.