CIVITAS
Sustainable and smart mobility for all
2030

CIVITAS indicators

Average load factor of motorised vehicles used for B2B deliveries (TRA_FR_EFB)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Freight**	
IMPACT	**Urban freight transport efficiency** *Increasing the average load of freight vehicles*	**TRA_FR**

Category

Key indicator	**Supplementary indicator**	State indicator

CONTEXT AND RELEVANCE

Urban freight transport can be a significant part of daily traffic in urban areas. Vehicles used for freight transport are larger than average passenger cars; thus, they contribute to energy consumption, polluting emissions, noise and space occupancy more than proportionally to their share of trips. Furthermore, the number of freight vehicles circulating in urban areas has increased in recent years as effect of logistics models and of online shopping. As urban freight delivery serves a number of independent clients with different needs in terms quantity of goods transported, frequency of delivery, period of delivery and so on, the result can be a large number of vehicles loaded only partially and/or travelling long distances in the urban area.

This indicator provides a measure of the average load factor of light and medium motorised vehicles used to deliver goods to shops in the experiment area. **It is a relevant indicator when the policy action is aimed at increasing the efficiency in using motorised road freight vehicles to transport urban goods. A successful action is reflected in a HIGHER value of the indicator.**

DESCRIPTION

The indicator is a measure of the **average load factor** of light and medium motorised vehicles used to deliver goods to shops within the experiment area. Separate values are provided for light vehicles (< 3.5 tonnes) and medium trucks (3.5 – 7 tonnes). So, the indicator is made of **two values**.

The indicator is expressed in **percentage,** therefore 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 1

Load factors estimated on data collected from a sample of delivery tours	Significance: **0.50** 

The following information is needed to compute the indicator:

a) **The average load factors of light vehicles used to deliver different categories of freight to shops of the experiment area**. Light vehicles are those with load < 3.5 tonnes. The different categories of freight that should be considered are the followings:

- **Fresh/frozen food**
- **Other food**
- **Textile/leather**
- **Detergents and cleansers**
- **Drugs and cosmetics**
- **Small manufactured articles (e.g., glasses, smartphones)**

The average load factor for each of these categories should be quantified by interviewing a sample of freight vehicles drivers. Drivers should be contacted at retail shops (preferably shops specialised just in one of the categories above) during their delivery tours. The interview should be very simple to minimise the risk of refusal and

not responses. Basically, only three elements should be asked. The first two elements are just for define eligibility: whether the load consisted of the same freight category or of more categories, and whether their tour included only retailers or some consumers as well. The eligible cases are those where only one freight category is delivered and only to retailers. To eligible drivers, it should be asked the load rate of the vehicle at the beginning of the tour. The rate should be demand in terms of percentage (e.g. 90%, 75%, 35%). At least 10 responses for each category of goods should be collected.

b) **The average load factors of medium vehicles used to deliver different categories of freight to shops of the experiment area.** Medium vehicles are those with load between 3.5 and 7 tonnes**.**
This information should be obtained with the same method mentioned above, approaching drivers of medium vehicles at retail shops during their delivery tour. At least 7 responses for each category of goods should be collected.

c) **The relative share of shops for each of the six freight categories**. The number of activities by category is normally available from municipalities or chambers of commerce.

The experiment would result in a modification of the average load factors.

METHOD OF CALCULATION

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

- **Organisation of the on-field interviews.**
- **Data collection through the interviews**.
- **Estimation of the average load factors (indicator).** The average load factor should be computed for both light vehicles (<3.5 tonnes) and medium vehicles (3.5 – 7 tonnes). The average factor is the average of the load percentages collected where each one is weighted according to the relative share of each category of freight (see equation below).

EQUATIONS

The average load factor (indicator value) should be computed according to the following equation for both light vehicles (<3.5 tonnes) and medium vehicles (3.5 – 7 tonnes):

$$\boldsymbol{B2BLoadFact} = \frac{\sum_f \sum_v \left({}^{f}\boldsymbol{LoadRt_v} * {}^{f}\boldsymbol{FrCarShr} \right)}{\boldsymbol{F} * \boldsymbol{V}}$$

Where:

${}^{f}LoadRt_v$ = Load rate (percentage of loading) for sampled vehicle *v* transporting freight category *f*

${}^{f}FrCarShr$ = Relative share of shops for freight category *f*

F = Number of freight categories

V = total number of sampled vehicles

NORMALISED VARIATION INDEX

This indicator is made of two 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 simple mean of the two values, according to the following equation.

$$AvB2BLoadFact = \frac{B2BLoadFact[Light] + B2BLoadFact[Medium]}{2}$$

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:

$$NMIB2BLoadFact = \frac{AvB2BLoadFact[AE]}{AvB2BLoadFact[BAU]} * 100$$

Where:

$AvB2BLoadFact[AE]$ = Value of the "average" load factor in the After-experiment condition

$AvB2BLoadFact[BAU]$ = Value of the "average" load factor in the BAU condition

ALTERNATIVE INDICATORS

This indicator deals with the efficiency of urban freight delivery to economic activities (B2B) made by means of conventional freight vehicles (vans, trucks). If the interest is in the efficiency of urban freight delivery to private households and offices (B2C) there is a specific indicator TRA_FR_EFC. If the interest is in the alternative to conventional vehicles (e.g. electric vehicles, cargo-bikes) there are specific indicators: TRA_FR_ADB1; TRA_FR_ADB2; TRA_FR_ADB3.