CIVITAS indicators

Share of services delayed more than 20% headway (TRA_PT_RL)

DOMAIN

Transport	Environment	Energy	Society	Economy

TOPIC	**Public transport**	
IMPACT	**Public transport travel reliability** *Improving the reliability of public transport*	**TRA_PT**

Category

Key indicator	Supplementary indicator	State indicator

CONTEXT AND RELEVANCE

Public transport is generally more environmental-friendly than motorised private transport because it facilitates the efficient use of resources by transporting a larger number of passengers in a single vehicle, thereby reducing overall energy consumption and emissions per person compared to individual private vehicles. It is therefore desirable that public transport is widely used. A requirement for the use of public transport is that the service is reliable in terms of scheduled timetable: if service is unreliable, public transport cannot be an attractive or even feasible option for personal urban trips.

This indicator provides a measure of the frequency of delays of public transport in the experiment area. **It is a relevant indicator when the policy action is aimed at improving the regularity of public transport services. A successful action is reflected in a LOWER value of the indicator.**

DESCRIPTION

The indicator is a measure of the **share of public transport departures arriving at selected stops with a delay greater than 5 minutes (or 20% of the headway when the headway is less than 30 minutes)**. The reference to the headway is used to take into account that even a 5 minutes delay is not acceptable when services are frequent.

The indicator is expressed in **%** so it is **dimensionless**.

METHOD OF CALCULATION AND INPUTS

The calculation method refers to the process used to derive the share of departures arriving delayed at stops building on the available information. There are two alternative methods of calculation available. The two methods use the same formulation and the same data type but distinguish for the number and variety of data. Therefore, they present different levels of complexity and significance.

METHOD 1	METHOD 2
Share of delays estimated by observing a sample of departures	**Share of delays estimated by observing a wider sample of departures**
It is based on observation in a limited number of circumstances.	It is based on observation in a wider number of circumstances.
Complexity	Complexity
Significance	Significance

Method 1

Share of delays estimated by observing a sample of departures	Significance: **0.50**

METHOD OF CALCULATION

Using Method 1, **for each route involved in the experiment, the share of departures arriving in delay should be directly measured on a sample of departures and stops**. Then, for each route, the average share should be computed. Adopting this method of calculation there are limited requirements about the number of measurements and on when they should be made (see inputs below).

Once the average time for each route is provided, together the other required inputs, the indicator is computed (**within the supporting tool**) according to the following steps:

- Estimation of the average delay share across all routes involved in the experiment weighting each route according to its length (the lengthier the route, the more relevant its contribution to the average.

INPUTS

The following information should be coded in the supporting tool to compute the indicator according to method 1:

a) ${}^{r}RouLnght$. **distance between initial and last stop in the experiment area for route *r*.** (If the experiment area is the whole city, it is the length of the route). It should be obtained from the transport operator or measured on map.

b) ${}^{r}DelayShr$. **Share of departures of route *r* arrived at reference stop with a delay > 5 minutes or > 20% of the headway when the headway is less than 30 minutes.** It should be computed building on observations made on a sample of N departures for all routes involved in the experiment. For each route, the observations should be made at **one meaningful stop.** A **minimum number of 8 observations for each route in one working day** should be collected. A stop is meaningful when it is located after part of route's path where, before the experiment, the running of public transport may be hindered by some contingency (e.g., a stop located very close to the origin of the route and reached travelling entirely on reserved lane would not be meaningful).

Once the observations are made, the delay share should be computed according to the equation:

$$ {}^{r}DelayShr = \frac{Delayed\ N}{N} $$

Where:

$Delayed\ N$ = number of departures for the route *r* observed with a delay > 5 minutes or > 20% of the headway when the headway is less than 30 minutes

N = total number of observations for the route *r*.

The experiment would be reflected in the indicator by repeating the observations before and after the experiment. The stops where observations are made, the number of observations per route as well as their distribution between peak and off-peak periods should be the same before and after the experiment.

EQUATIONS

The equations **used within the supporting tool** to manage the calculation steps are the followings:

Estimation of the average delay across all routes involved in the experiment (indicator value):

$$\boldsymbol{AvDelayShr} = \sum_{r} {}^{r}\boldsymbol{DelayShr} * \frac{{}^{r}\boldsymbol{RouLnght}}{\sum_{r} {}^{r}\boldsymbol{RouLnght}}$$

Method 2

Share of delays estimated by observing a wider sample of departures	Significance: **0.75**

METHOD OF CALCULATION

Using Method 2, **for each route involved in the experiment, the share of departures arriving in delay should be directly measured on a sample of departures and stops**. Then, for each route, the average share should be computed. Adopting this method of calculation there are some requirements about the number of measurements and on when they should be made (see inputs below).

Once the average time for each route is provided, together the other required inputs, the indicator is computed (**within the supporting tool**) according to the following steps:

- Estimation of the average delay share across all routes involved in the experiment weighting each route according to its length (the lengthier the route, the more relevant its contribution to the average.

INPUTS

The following information should be coded in the supporting tool to compute the indicator according to method 1:

a) $^{r}RouLnght$. **distance between initial and last stop in the experiment area for route *r*.** (If the experiment area is the whole city, it is the length of the route). It should be obtained from the transport operator or measured on map.

b) $^{r}DelayShr$. **Share of departures of route *r* arrived at reference stop with a delay > 5 minutes or > 20% of the headway when the headway is less than 30 minutes.** It should be computed building on observations made on a sample of N departures for all routes involved in the experiment. For each route, the observations should be made at **one meaningful stop.** A **minimum number of 15 observations for each route in at least two working days** should be collected. At least 8 observations in each day should be made in peak time. A stop is meaningful when it is located after part of route's path where, before the experiment, the running of public transport may be hindered by some contingency (e.g., a stop located very close to the origin of the route and reached travelling entirely on reserved lane would not be meaningful)

Once the observations are made, the delay share should be computed according to the equation:

$$^{r}DelayShr = \frac{Delayed\ N}{N}$$

Where:

$Delayed\ N$ = number of departures for the route *r* observed with a delay > 5 minutes or > 20% of the headway when the headway is less than 30 minutes

N = total number of observations for the route *r*.

The experiment would be reflected in the indicator by repeating the observations before and after the experiment. The stops where observations are made, the number of observations per route as well as their distribution between days and between peak and off-peak periods should be the same before and after the experiment.

EQUATIONS

The equations **used within the supporting tool** to manage the calculation steps are the followings:

Estimation of the average travel time across all routes:

$$AvPTTime = \sum_r \frac{{}^{r}PTTime}{60} * \frac{{}^{r}RouLnght}{\sum_r {}^{r}RouLnght}$$

Estimation of the average length of the routes:

$$AvRouLnght = \frac{\sum_r {}^{r}RouLnght}{R}$$

Estimation of the average speed (indicator value):

$$\boldsymbol{PTSpeed = \frac{AvRouLnght}{AvPTTime}}$$