

## CONGESTION

*This document has been prepared by a group of experts under the “European Urban Mobility Observatory and Support” contract. It does not reflect or anticipate the position of the Commission. It does not constitute a legal proposal. The purpose of this document is to outline the indicators and the data required to calculate them, which the experts consider to be most appropriate for urban nodes to measure in the respective area. This document is intended to serve as a basis for reflection and further work on relevant indicators required by the TEN-T Regulation.*

### Data requirements

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
D1	11. Total <b>urban population</b> [# inhabitants]	Data on the size of the total urban population on January 1 <sup>st</sup>	City, Offices for national or local statistics	n/a	Data collected every year	<b>Survey:</b> 93 city, 4 FUA, 113 both city and FUA 210 total at city and/or FUA level (98% of respondents) 1 does not know (0.5% of respondents)
D2	12. Total <b>road network</b> [# km]	Length of all roads in the urban area to be used by cars, bicycles, and public transport.	City, Offices for national or local statistics	GIS calculation Data from the INSPIRE and MTIS databases	Data updated every year	<b>Survey:</b> <u>total road length mixed traffic:</u> 116 city, 1 FUA, 47 both city and FUA 164 total at city and/or FUA level (76% of respondents) 10 do not know (5% of respondents) <u>usage of GIS:</u> 112 city, 3 FUA, 67 both city and FUA 182 total at city and/or FUA level (85% of respondents) 5 do not know (2% of respondents) The INSPIRE and MTIS databases provide also data on the total network length of the road network.

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
D3	O1. <b>Satisfaction</b> with the <b>cycling network</b> [# value of satisfaction]	Dataset based on a survey of the inhabitants of the city/FUA asking inhabitants whether they are satisfied with the <b>cycling/public transport/car</b> network in the city/FUA (e.g. scoring 1 to 10 in relation to their level of satisfaction: 1= 'not satisfied' up to 10='very satisfied')	City, Offices for national or local statistics	Survey	Data collected every 3 years	<b>Survey:</b> Satisfaction not specifically asked about in the survey. <u>use of mobility surveys:</u> 99 city, 5 FUA, 64 both city and FUA 168 total at city and/or FUA level (78% of respondents) 6 do not know (3% of respondents) <u>use of road-traffic surveys:</u> 96 city, 1 FUA, 49 both city and FUA 146 total at city and/or FUA level (68% of respondents) 19 do not know (9% of respondents)
	O2. <b>Satisfaction</b> with the <b>public transport network</b> [# value of satisfaction]					
	O3. <b>Satisfaction</b> with the <b>car network</b> [# value of satisfaction]					
D4	O4. Average <b>measured time to travel 3 km</b> by <b>bicycle</b> on the whole network during <b>peak hour</b> in the city/FUA [min]	Dataset based on processing of collected movement data across the whole network of persons cycling in the city.	Cities, Statistical companies	Collection and processing location data vehicles and persons	Data collected every year	<b>Survey:</b> <u>peak and/or off-peak:</u> 33 city, 4 FUA, 17 both city and FUA 54 total at city and/or FUA level (25% of respondents) 26 do not know (12% of respondents) <i>Reported responses are for peak and/or off-peak</i> <u>availability mobile phone data:</u> 47 city, 4 FUA, 24 both city and FUA 75 total at city and/or FUA level (35% of respondents) 28 do not know (13% of respondents)
D5	O5. Average <b>measured time to travel 3 km</b> by <b>public transport</b> on the <b>whole network</b> during	Dataset based on processing of the public transport control system.	Cities, Statistical companies	Collection and processing location data	Data collected every year	<b>Survey:</b> <u>peak and/or off-peak:</u> 43 city, 6 FUA, 38 both city and FUA

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
	<b>peak hour</b> in the city/FUA [min]			vehicles and persons		87 total at city and/or FUA level (40% of respondents) 25 do not know (12% of respondents) <i>Reported responses are for peak and/or off-peak</i> <u>data availability from PT providers:</u> 112 city, 4 FUA, 69 both city and FUA 185 total at city and/or FUA level (86% of respondents) 6 do not know (3% of respondents)
D6	O6. Average <b>measured time to travel 3 km by car</b> on the <b>whole network</b> during <b>peak hour</b> in the city/FUA [min]	Dataset based on floating car data e.g. TomTom	Cities, Statistical companies	Collection and processing location data vehicles and persons	Data collected every year	TomTom recently changed their reporting method: In the past: <b>extra time during rush hour</b> (separately morning and evening) <b>per 30 min trip</b> (compared to the off-peak situation) or <b>% extra time for a trip</b> . Now: <b>time to travel 10 km during rush hour</b> . <b>Survey:</b> <u>peak and/or off-peak:</u> 37 city, 5 FUA, 29 both city and FUA 71 total at city and/or FUA level (33% of respondents) 25 do not know (12% of respondents) <i>Reported responses are for peak and/or off-peak</i> <u>availability floating car data:</u> 54 city, 2 FUA, 35 both city and FUA 91 total at city and/or FUA level (42% of respondents) 37 do not know (17% of respondents)

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
D7	O7. Average <b>measured time to travel 3 km by bicycle</b> on the <b>whole network</b> during <b>off-peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on processing of collected movement data of persons cycling in the city.	Cities, Statistical companies	Collection and processing location data vehicles and persons	Data collected every year	<b>Survey:</b> idem O13/D15
D8	O8. Average <b>measured time to travel 3 km by public transport</b> on the <b>whole network</b> during <b>off-peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on processing of the public transport control system.	Cities, Statistical companies	Collection and processing location data vehicles and persons	Data collected every year	<b>Survey:</b> idem O14/D16
D9	O9. Average <b>measured time to travel 3 km by car</b> on the <b>whole network</b> during <b>off-peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on floating car data e.g. TomTom	Cities, Statistical companies	Collection and processing location data vehicles and persons	Data collected every year	<b>Survey:</b> idem O15/D17
D10	O10. Average <b>measured time to travel 3 km by bicycle</b> on <b>representative routes</b> through the city/FUA during <b>peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on measurements of the time of trips by <b>bicycle</b> between 10 pairs of origin and destinations during <b>peak hour</b> in the city/FUA, which are representative for the trips made in the city/FUA.	City, Local statistic organisation  City, Local statistic organisation	Measurements can be made by making a number of real trips between the origin and destination points or using automatically recorded movement data of cyclists.	Data collected every 3 years Data collected every 3 years	<i>Recent efforts are being made to collect and process new sets of movement data, e.g. <a href="https://datapartnership.org/%20updates/find-population-movement-data-for-your-country/">https://datapartnership.org/%20updates/find-population-movement-data-for-your-country/</a></i>  <b>Survey (peak and/or off-peak):</b> 60 city, 4 FUA, 19 both city and FUA 83 total at city and/or FUA level (39% of respondents) 31 do not know (14% of respondents) <i>Reported responses are for peak and/or off-peak</i>

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
D11	O11. Average <b>measured time to travel 3 km by public transport on representative routes</b> through the city/FUA during <b>peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on measurements of the time of trips with public transport between 10 pairs of origin and destinations during peak hour in the city/FUA, which are representative for the trips made in the city/FUA.	City, Local statistic organisation	Measurements can be made by making a number of real trips during peak hour between the origin and destination points or using data of the public transport control systems.		<p><b>Survey:</b>  <u>peak and/or off-peak:</u>  70 city, 13 FUA, 40 both city and FUA  123 total at city and/or FUA level (57% of respondents)  25 do not know (12% of respondents)  <i>Reported responses are for peak and/or off-peak</i></p> <p><u>data availability from PT providers:</u>  112 city, 4 FUA, 69 both city and FUA  185 total at city and/or FUA level (86% of respondents)  6 do not know (3% of respondents)</p>
D12	O12. Average <b>measured time to travel 3 km by car on representative routes</b> through the city/FUA during <b>peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on measurements of the time of trips with the car between 10 pairs of origin and destinations during peak hour in the city/FUA, which are representative for the trips made in the city/FUA.	City, Local statistic organisation	Measurements can be made by making a number of real trips during peak hour between the origin and destination points or using floating vehicle data.		<p><b>Survey:</b>  <u>peak and/or off-peak:</u>  77 city, 8 FUA, 34 both city and FUA  119 total at city and/or FUA level (55% of respondents)  23 do not know (11% of respondents)  <i>Reported responses are for peak and/or off-peak</i></p> <p><u>availability floating car data:</u>  54 city, 2 FUA, 35 both city and FUA  91 total at city and/or FUA level (42% of respondents)  37 do not know (17% of respondents)</p>
D13	O13. Average <b>measured time to travel 3 km by bicycle on representative routes</b> through the	Dataset based on measurements of the time of trips by <b>bicycle</b> between 10 pairs of origin and destinations during <b>peak hour</b> in the city/FUA, which are	City, Local statistic organisation	Measurements can be made by making a number of real	Data collected every 3 years	<p><b>Survey (peak and/or off-peak):</b>  60 city, 4 FUA, 19 both city and FUA  83 total at city and/or FUA level (39% of respondents)</p>

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
	city/FUA during <b>off-peak hour</b> in the city/FUA [ <i>min</i> ]	representative for the trips made in the city/FUA.	City, Local statistic organisation	trips between the origin and destination points or using automatically recorded movement data of cyclists.	Data collected every 3 years	31 do not know (14% of respondents) <i>Reported responses are for peak and/or off-peak</i>
D14	O14. Average <b>measured time to travel 3 km by public transport on representative routes</b> through the city/FUA during <b>off-peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on measurements of the time of trips with public transport between 10 pairs of origin and destinations during peak hour in the city/FUA, which are representative for the trips made in the city/FUA.	City, Local statistic organisation	Measurements can be made by making a number of real trips during peak hour between the origin and destination points or using data of the public transport control systems.		<b>Survey:</b> <u>peak and/or off-peak:</u> 70 city, 13 FUA, 40 both city and FUA 123 total at city and/or FUA level (57% of respondents) 25 do not know (12% of respondents) <i>Reported responses are for peak and/or off-peak</i> <u>data availability from PT providers:</u> 112 city, 4 FUA, 69 both city and FUA 185 total at city and/or FUA level (86% of respondents) 6 do not know (3% of respondents)
D15	O15. Average <b>measured time to travel 3 km by car on representative routes</b> through the city/FUA during <b>off-peak hour</b> in the city/FUA [ <i>min</i> ]	Dataset based on measurements of the time of trips with the car between 10 pairs of origin and destinations during peak hour in the city/FUA, which are representative for the trips made in the city/FUA.	City, Local statistic organisation	Measurements can be made by making a number of real trips during peak hour between the origin and destination		<b>Survey:</b> <u>peak and/or off-peak:</u> 77 city, 8 FUA, 34 both city and FUA 119 total at city and/or FUA level (55% of respondents) 23 do not know (11% of respondents) <i>Reported responses are for peak and/or off-peak</i>

#	Indicator	Dataset	Owner	(Possible) collection methods	Timing & frequency of collection	Comments on data availability
				points or using floating vehicle data.		<u>availability floating car data:</u> 54 city, 2 FUA, 35 both city and FUA 91 total at city and/or FUA level (42% of respondents) 37 do not know (17% of respondents)

## Overview and analysis of data availability

Based on the analysis of responses to the urban mobility data and indicators survey, which was carried out in August-October 2023 and which collected responses from 215 urban nodes out of 430, the following considerations have been drawn for each dataset required for the indicators described above.

### Summary and conclusions

Data availability for average measured time to travel 3km on representative routes (39% by bicycle, 57% by public transport, 55% by car) is higher than on the whole network (25% by bicycle, 40% by public transport, 33% by car), and low to medium overall. However, there is potential for data collection to increase, given the increasing availability of floating car and bicycle data, broad access to public transport provider data, and the increasing availability of mobile phone data to monitor average travel times.

Since most respondents report organizing mobility surveys (78%) and road-traffic surveys (68%), questions on available on “Satisfaction on the cycling/public transport/car network” and “Perceived time to travel 3 km when travelling by bicycle/public transport/car” can easily be added, if not already done.

### Detailed analysis

*Please note that the figures provided do not always add up across questions, for example, in some cases respondents have replied only to the first of two related questions, or only to the second of two questions.*

#### **D1. (I1) Total urban population [# inhabitants]**

##### Survey results

- 210 respondents reported collection of/access to data on “total number of inhabitants”:
  - 98% of respondents
  - 93 at city level only, 4 at FUA level only, 113 at both city and FUA level

**D2. (I2) Total road network [# km]**

Survey results

- 164 respondents reported collection of/access to data on “total road length mixed traffic”:
  - 76% of respondents
  - 116 at city level only, 1 at FUA level only, 47 at both city and FUA level
- 182 respondents reported that they use GIS:
  - 85% of respondents
  - 112 at city level only, 3 at FUA level only, 67 at both city and FUA level

Comments

- The survey doesn’t give information on the general total length of the road network, asking only for roads with “mixed traffic” which means that motorways but probably also roads with separated bicycle lanes are excluded in the understanding of the respondents.
- A high number of respondents (76%) have the “total road length mixed traffic” at city and/or FUA level available, probably they also have the general total length of the road network.
- The INSPIRE and MTIS databases provide also data on the total network length of the road network.

**D3. (O1) Satisfaction on the cycling network [# value of satisfaction]**

**(O2) Satisfaction on public transport network [# value of satisfaction]**

**(O3) Satisfaction on the car network [# value of satisfaction]**

Survey results

- 168 cities reported that they use mobility survey data:
  - 78% of respondents
  - 99 at city level only, 5 at FUA level only, 64 at both city and FUA level
- 146 cities reported that they use road-traffic survey data:
  - 68% of respondents
  - 96 at city level only, 1 at FUA level only, 49 at both city and FUA level

Comments

- No specific questions were asked in the survey on whether urban nodes have data available on “Satisfaction on the cycling/public transport/car network”, nor “Perceived time to travel 3 km when travelling by bicycle/public transport/car”; however, there were questions on the collection of mobility survey and road-traffic survey data.

**D4. (O4) Average measured time to travel 3 km by bicycle on the whole network during peak hour in the city/FUA [min]**



**D7. (O7) Average measured time to travel 3 km by bicycle in the whole network during off-peak hour in the city/FUA [min]**

Survey results

- Peak and/or off-peak: 54 cities reported collection of/access to data on the average time needed to travel 3 km by bicycle:
  - 25% of respondents
  - 33 at city level only, 4 at FUA level only, 17 at both city and FUA level
  - *The numbers reported here combine responses for peak and off-peak (in some cases cities may only collect one or other); they may therefore slightly overestimate data availability for the calculation of increases in time to travel 10km in the city/FUA during peak hours compared to off-peak hours.*
- 75 cities reported that they use mobile phone data:
  - 35% of respondents
  - 47 at city level only, 4 at FUA level only, 24 at both city and FUA level

Comments

- Data availability is low, the average time needed to travel 3 km by bicycle is only collected by 25% of the respondents. This share is lower than the monitoring of the measured time to travel 3 km on representative routes (39% (see O10,O13)). Also the availability of mobile phone data offering new technics to monitor the average cycling time in the city, is still low, limiting the current potential to have an increase of the positive reactions. However also the availability of such data is expected to increase.

**D5. (O5) Average measured time to travel 3 km by public transport on the whole network during peak hour in the city/FUA [min]**

**D8. (O8) Average measured time to travel 3 km by public transport on the whole network during off-peak hour in the city/FUA [min]**

Survey results

- Peak and/or off-peak: 87 cities reported collection of/access to data on the average time needed to travel 3 km by road-based public transport:
  - 40% of respondents
  - 43 at city level only, 6 at FUA level only, 38 at both city and FUA level
  - *The numbers reported here combine responses for peak and off-peak (in some cases cities may only collect one or other); they may therefore slightly overestimate data availability for the calculation of increases in time to travel 10km in the city/FUA during peak hours compared to off-peak hours.*
- 185 cities reported that they use data from public transport providers:
  - 86% of respondents
  - 112 at city level only, 4 at FUA level only, 69 at both city and FUA level

Comments

- Data availability is low, this data is only collected by 40% of the respondents. This share is lower than the monitoring of the measured travel time on representative routes (57% (see O11, O14)). Also most respondents indicate they have access to data of the PT providers, showing the potential to reach higher positive reactions.

**D6. (O6) Average measured time to travel 3 km by car on the whole network during peak hour in the city/FUA [min]**

**D9. (O9) Average measured time to travel 3 km by car on the whole network during off-peak hour in the city/FUA [min]**

Survey results

- Peak and/or off-peak: 71 cities reported collection of/access to data on the average time needed to travel 3 km by car and commercial:
  - 33% of respondents
  - 37 at city level only, 5 at FUA level only, 29 at both city and FUA level
  - *The numbers reported here combine responses for peak and off-peak (in some cases cities may only collect one or other); they may therefore slightly overestimate data availability for the calculation of increases in time to travel 10km in the city/FUA during peak hours compared to off-peak hours.*
- 91 cities reported that they use “floating car data, e.g. Google, TomTom, Inrix, etc.”:
  - 42% of respondents
  - 54 at city level only, 2 at FUA level only, 35 at both city and FUA level

Survey: open-ended feedback

- Respondents report in the survey that they derive these data from their traffic model (every 3-5 years) .
- Some respondents report that this indicator is collected as part of the analysis in the SUMP process.
- Respondents report in the survey that they also use data from floating car data e.g. TomTom.

Comments

- Data availability is low, this data is only collected by 33% of the respondents. This share is lower than for monitoring of the measured travel time on representative routes (55% (see O12, O15)). Taking into account the increasing availability of floating car data, there is potential for travel time data availability to increase.
- TomTom recently changed their reporting method: In the past, they showed ‘Extra time during rush hour’ (separately morning and evening) per 30-minute trip (compared with the off-peak situation /free flow situation, or % extra time for a trip. Now they show ‘Time to travel 10 km during rush hour’.

**D10. (O10) Average measured time to travel 3 km by bicycle on representative routes through the city/FUA during peak hour in the city/FUA [min]**

**D13. (O13) Average measured time to travel 3 km by bicycle on representative routes through the city/FUA during off-peak hour in the city/FUA [min]**

Survey results

- Peak and/or off-peak: 83 cities reported collection of/access to data on travel times for bicycles on representative routes:
  - 39% of respondents
  - 60 at city level only, 4 at FUA level only, 19 at both city and FUA level
  - *The numbers reported here combine responses for peak and off-peak (in some cases cities may only collect one or other); they may therefore slightly overestimate data availability for the calculation of increases in time to travel 10km in the city/FUA during peak hours compared to off-peak hours.*

Survey: open-ended feedback

- Respondents report in the survey also the use of new technological ways to register travel times by bicycle e.g. Talking Bikes.

Comments

- Based on the survey the average measured travel time on representative routes for cycling is only collected by 39% of the respondents. However, this share is higher than for the monitoring of average travel time on the whole network (25% (see O4, O7)). An increase in monitoring efforts is expected, including using new technologies, since there is a strong increase in cycling and attention to cycling in most EU cities.
- Recent efforts have been made by urban nodes to collect and process new sets of travel data, but also to set up data-partnerships with private providers.

**D11. (O11) Average measured time to travel 3 km by public transport on representative routes through the city/FUA during peak hour in the city/FUA**  
[min]

**D14. (O14) Average measured time to travel 3 km by public transport on representative routes through the city/FUA during off-peak hour in the city/FUA**  
[min]

Survey results

- Peak and/or off-peak: 123 cities reported collection of/access to data on travel times for road-based public transport on representative routes:
  - 57% of respondents
  - 70 at city level only, 13 at FUA level only, 40 at both city and FUA level
  - *The numbers reported here combine responses for peak and off-peak (in some cases cities may only collect one or other); they may therefore slightly overestimate data availability for the calculation of increases in time to travel 10km in the city/FUA during peak hours compared to off-peak hours.*
- 185 cities reported that they use data from public transport providers:
  - 86% of respondents
  - 112 at city level only, 4 at FUA level only, 69 at both city and FUA level

Survey: open-ended feedback

- Respondents report that these data are collected from the PT operators but some respondents mention difficulties to get these data.

### Comments

- Data availability is medium; it is collected by 57% of the respondents. However this share is significantly higher than the monitoring of the average time to travel 3 km in the whole network (40% (see O5, O8)). Also most respondents indicate they have access to data of the PT providers, showing the potential to reach higher positive reactions.

**D12. (O12) Average measured time to travel 3 km by car on representative routes through the city/FUA during peak hour in the city/FUA [min]**

**D15. (O15) Average measured time to travel 3 km by car on representative routes through the city/FUA during off-peak hour in the city/FUA [min]**

### Survey results

- Peak and/or off-peak: 119 cities report collection of/access to data on travel times for cars and commercial vehicles on representative routes:
  - 55% of respondents
  - 77 at city level only, 8 at FUA level only, 34 at both city and FUA level
  - *The numbers reported here combine responses for peak and off-peak (in some cases cities may only collect one or other); they may therefore slightly overestimate data availability for the calculation of increases in time to travel 10km in the city/FUA during peak hours compared to off-peak hours.*
- 91 cities reported that they use “floating car data, e.g. Google, TomTom, Inrix, etc.”:
  - 42% of respondents
  - 54 at city level only, 2 at FUA level only, 35 at both city and FUA level

### Survey: open-ended feedback

- Respondents report in the survey that they derive these data from their traffic model (every 3-5 years)
- Some respondents report that this indicator is collected as part of the analysis in the SUMP process.
- Respondents report in the survey also they use floating car data e.g. TomTom, Google Maps and Waze, allowing them to monitor travel times on representative routes.
- Some respondents also indicate that they have inductive loop data indicating waiting times and queue lengths. However, this data does not enable calculation of the average time to travel 3 km on a whole route.

### Comments

- Data availability is medium; it is collected by 42% of the respondents. The availability is higher than the share for monitoring of average time to travel 3 km on the whole network (33% (see O6, O9)). The reactions of the respondents that they use a range of new data sources show potential for a strong increase of data availability.

## Indicators

Number	Indicator	To be calculated by:
<i>Input indicators</i>		
I1	Total population of the city/FUA [# inhabitants]	Urban node
I2	Total road network [# km]	Urban node
<i>Output indicators</i>		
O1	Satisfaction with the cycling network [# value of satisfaction]	Urban node
O2	Satisfaction with the public transport network [# value of satisfaction]	Urban node
O3	Satisfaction with the car network [# value of satisfaction]	Urban node
O4	Average measured time to travel 3 km by bicycle (on the whole network) during peak hour in the city/FUA [min]	Urban node
O5	Average measured time to travel 3 km by public transport (on the whole network) during peak hour in the city/FUA [min]	Urban node
O6	Average measured time to travel 3 km by car (on the whole network) during peak hour in the city/FUA [min]	Urban node
O7	Average measured time to travel 3 km by bicycle (on the whole network) during off-peak hour in the city/FUA [min]	Urban node
O8	Average measured time to travel 3 km by public transport (on the whole network) during off-peak hour in the city/FUA [min]	Urban node
O9	Average measured time to travel 3 km by car (on the whole network) during off-peak hour in the city/FUA [min]	Urban node
O10	Average measured time to travel 3 km by bicycle on representative routes through the city/FUA during peak hour [min]	Urban node
O11	Average measured time to travel 3 km by public transport on representative routes through the city/FUA during peak hour [min]	Urban node
O12	Average measured time to travel 3 km by car on representative routes through the city/FUA during peak hour [min]	Urban node
O13	Average measured time to travel 3 km by bicycle on representative routes through the city/FUA during off-peak hour [min]	Urban node
O14	Average measured time to travel 3 km by public transport on representative routes through the city/FUA during off-peak hour [min]	Urban node
O15	Average measured time to travel 3 km by car on representative routes through the city/FUA during off-peak hour in the city/FUA [min]	Urban node
<i>Result indicators</i>		
R1	Increase in average time to travel 3 km by bicycle in the city/FUA during peak hour compared to off-peak [min]	EC
R2	Increase in average time to travel 3 km by public transport in the city/FUA during peak hour compared to off-peak [min]	EC
R3	Increase in average time to travel 3 km by car in the city/FUA during peak hour compared to off-peak [min]	EC

R4	Increase in average time to travel 3 km by bicycle on representative routes in the city/FUA during peak hour compared to off-peak [ <i>min</i> ]	EC
R5	Increase in average time to travel 3 km by public transport on representative routes in the city/FUA during peak hour compared to off-peak [ <i>min</i> ]	EC
R6	Increase in average time to travel 3 km by car on representative routes in the city/FUA during peak hour compared to off-peak [ <i>min</i> ]	EC
R7	Increase in average time to travel 3 km by bicycle in the city/FUA during peak hour compared to off-peak [%]	EC
R8	Increase in average time needed to travel 3 km by public transport in the city/FUA during peak hour compared to off-peak [%]	EC
R9	Increase in average time needed to travel 3 km by car in the city/FUA during peak hour compared to off-peak [%]	EC
R10	Increase in average time needed to travel 3 km by bicycle on representative routes in the city/FUA during peak hour compared to off-peak [%]	EC
R11	Increase in average time needed to travel 3 km by public transport on representative routes in the city/FUA during peak hour compared to off-peak [%]	EC
R12	Increase in average time needed to travel 3 km by car on representative routes in the city/FUA during peak hour compared to off-peak [%]	EC

### Method of calculation of result indicators

Please note that the equations below could be applied centrally at European level to calculate the values of the result indicators based on input and output data provided by the urban nodes under the input and output indicators.

#	Method name (component of indicator)	Indicator(s)	Equation	Variables
M1	Increase in average time (min) to travel 3 km in the city/FUA in the peak compared to off-peak	R1,R2,R3	$In_{av}(\text{mode } i) = t_{\text{peak}_{av}}(\text{mode } i) - t_{\text{offpeak}_{av}}(\text{mode } i) \text{ [min]}$	<ul style="list-style-type: none"> <li>- <math>In_{av}(\text{mode } i) = R10, R11, R12</math></li> <li>- <math>t_{\text{peak}_{av}}(\text{mode } i) = O13, O14, O15</math></li> <li>- <math>t_{\text{offpeak}_{av}}(\text{mode } i) = O16, O17, O18</math></li> </ul>
M2	Increase in average time (min) to travel 3 km on representative routes	R4,R5,R6	$In_{c}(\text{mode } i) = t_{\text{peak}_{c}}(\text{mode } i) - t_{\text{offpeak}_{c}}(\text{mode } i) \text{ [min]}$	<ul style="list-style-type: none"> <li>- <math>In_{c}(\text{mode } i) = R7, R8, R9</math></li> <li>- <math>t_{\text{peak}_{c}}(\text{mode } i) = O7, O8, O9</math></li> </ul>

#	Method name (component of indicator)	Indicator(s)	Equation	Variables
	for city/FUA in the peak compared to off-peak			- t_offpeak_c(mode i) = O10, O11, O12
M3	Increase in average time (%) to travel 3 km in the city/FUA in the peak compared to off-peak	R7,R8,R9	$\text{In\_av}(\text{mode } i) = (\text{t\_peak\_av}(\text{mode } i) / \text{t\_offpeak\_av}(\text{mode } i) - 1) * 100 [\%]$	- In_av (mode i) = R4, R5, R6 - t_peak_av (mode i) = O13, O14, O15 - t_offpeak_av (mode i) = O16, O17, O18
M4	Increase in average time (%) to travel 3 km on representative routes for city/FUA in the peak compared to off-peak	R10,R11,R12	$\text{In\_c}(\text{mode } i) = (\text{t\_peak\_c}(\text{mode } i) / \text{t\_offpeak\_c}(\text{mode } i) - 1) * 100 [\%]$	- In_c(mode i) = R1, R2, R3 - t_peak_c(mode i) = O7, O8, O9 - t_offpeak_c(mode i) = O10, O11, O12

#### Definitions of terms and acronyms used

Term	Definition	Source(s)
Bicycle	A road vehicle which has two or more wheels and is generally propelled by the muscular energy of the persons on that vehicle, in particular by means of a pedal system, lever or handle (e.g. bicycles, tricycles, quadricycles and invalid carriages). Included are bicycles with electric pedal assistance (pedelecs).	- Eurostat Glossary for transport statistics, page 37 (5th edition, 2019): <a href="https://ec.europa.eu/eurostat/documents/3859598/10013293/KS-GQ-19-004-EN-N.pdf/b89e58d3-72ca-49e0-a353-b4ea0dc8988f">https://ec.europa.eu/eurostat/documents/3859598/10013293/KS-GQ-19-004-EN-N.pdf/b89e58d3-72ca-49e0-a353-b4ea0dc8988f</a>
Car	A vehicle used for carriage of passengers, comprising not more than eight seats in addition to the driver's (UNECE category M1).	- UNECE Consolidated Resolution on the Construction of Vehicles (R.E.3), Rev. 6, page 6: <a href="https://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29resolutions/ECE-TRANS-WP.29-78r6e.pdf">https://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29resolutions/ECE-TRANS-WP.29-78r6e.pdf</a>
City	A city is a local administrative unit where at least 50 % of the population lives in one or more urban centres (i.e., a cluster of contiguous grid cells of 1 km <sup>2</sup> - excluding diagonals - with a population density of at least 1,500 inhabitants per km <sup>2</sup> and collectively a minimum population of 50,000 inhabitants after gap-filling).	- Eurostat glossary (webpage): <a href="https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Category:Regions_and_cities_glossary">https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Category:Regions_and_cities_glossary</a>

Term	Definition	Source(s)
Cycling	The act of riding a bicycle, i.e., a road vehicle which has two or more wheels and generally propelled by the muscular energy of the persons on that vehicle, in particular by means of a pedal system, lever or handle (e.g. bicycles, tricycles, quadricycles and invalid carriages). Included are bicycles with electric pedal assistance up to 25km/h (pedelecs).	- Eurostat Glossary for transport statistics (5th edition, 2019): <a href="https://ec.europa.eu/eurostat/documents/3859598/10013293/KS-GQ-19-004-EN-N.pdf/b89e58d3-72ca-49e0-a353-b4ea0dc8988f">https://ec.europa.eu/eurostat/documents/3859598/10013293/KS-GQ-19-004-EN-N.pdf/b89e58d3-72ca-49e0-a353-b4ea0dc8988f</a>
Functional urban area (FUA)	A functional urban area consists of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city (OECD, 2012).	- Eurostat glossary (webpage): <a href="https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Category:Regions_and_cities_glossary">https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Category:Regions_and_cities_glossary</a>
Off-peak hour	The hours during the day where a relatively low number of people are travelling (i.e. outside of peak hours). Often this is measured during the night, but this may not be the most relevant time period, as vehicles also tend to speed more at night and this would therefore not represent a realistic measurement. It is therefore recommended to measure off-peak travel time for at least one hour in the middle of the morning period, or at least one hour in the middle of the afternoon.	
Peak hour	The hours during a regular weekday (not a holiday day) with the highest number of people travelling in the city/FUA – including at least one hour in the morning and one hour in the evening. The exact hours for a given city/FUA depend on local habits e.g. common working and school hours and leisure activities.	
Public transport (PT)	Service to a transport service user provided or planned/organized by public authorities for the transport of passengers from an origin to a destination. Here it includes the following modes: buses, trolleybuses, coaches, trams, light rail, metros, trains, water buses.	- ISO 14083:2023. Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations, Chapter 3.1.31: <a href="https://www.iso.org/obp/ui/#iso:std:78864:en">https://www.iso.org/obp/ui/#iso:std:78864:en</a>
Total population	The total number of inhabitants (usual resident population) of a given area (Functional Urban Area or city): the number of inhabitants on 1 <sup>st</sup> January of the year in question (or, in some cases, on 31 <sup>st</sup> December of the previous year).	- Eurostat glossary (webpage): <a href="https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Population_figure">https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Population_figure</a>