



## Deliverable 5.4

# A “TRANSPORT SERVICES QUALITY AND ACCESSIBILITY EVALUATION MANUAL”

*Publishable summary*

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## Summary details

This deliverable detailed the methodological steps needed to carry out an assessment exercise of a traveller experience by appropriately selecting a subset of rating questions from the METPEX survey tools and computing the related indicators. Moreover, all the indicators defined in the project are presented with the description of the items composing them. A comparison of the results obtained when computing the indicators for each test sites, i.e. the 8 cities plus the FIA network, is proposed too.

## Purpose

The purpose of this Deliverable is to give stakeholders a manual on the use of the METPEX tool through the computation of a set of indicators defined during the project. By following the approach described here, the reader will be able to do the following:

- 1) To choose the set of indicators that is needed to measure the perceived quality for the specific evaluation perspective of interest,
- 2) To identify the list of satisfaction rating questions related to such set of indicators,
- 3) To use the METPEX survey tool for eliciting answers for the above list of questions,
- 4) To compute the indicators on the basis of the results of the survey,
- 5) To benchmark the results against those obtained in the test sites during the project.

Some examples are proposed in the deliverable in order to show clearly and practically the work to be done.

## Method

The first step in the procedure aims at helping stakeholders identify which indicators are relevant for the problem under consideration. Various possible evaluation frameworks are then presented and for each one the related list of indicators is reported. Four different cases are envisaged:

- 1) The analyst might wish to measure the perceived quality of a specific transport service. In this case, several different indicators are proposed according to the travel means under investigation.
- 2) If the focus of the evaluation is on specific groups of travellers, indicators specific to each of the following user groups are available: women, commuters, travellers over 65, travellers under 24, low income travellers, visitors, rural dwellers, travelling with children, mobility restricted, communication impaired.
- 3) One of the distinguishing ideas of the METPEX approach is that of journey experience, as opposed to the somewhat more limited notion of trip. A journey is in fact made up of different phases, from the pre-trip part related to the information acquisition to the arrival at the final destination. Indicators focussing on specific journey phases are provided too.
- 4) Several different indicators are grouped in 14 different sets according to the specific quality issue one is wishing to investigate, following the classification proposed in Deliverable 5.3. Such sets are called Super Quality Indicators (SQI) followed by a number ranging from 1 to 14.

After having identified the set of indicators relevant for the specific case under consideration, it is possible to search for the indicators needed in the manual and to check the list of variables that are needed to compute each of them. Thus, the following step would be to involve a sample of specific users and to implement a survey made up of the variables composing the indicators selected. Then, it is possible to compute the indicators chosen on the basis of the answers obtained from those satisfaction ratings, following the example provided in the deliverable.

The outcome of the computation is a mean score for each indicator, ranging from 1 (minimum satisfaction level) to 5 (maximum satisfaction level). If the analyst wishes so, these scores can be compared with those obtained from the METPEX test sites, which are reported for most indicators in the deliverable. If the number of observations was too low to report the city-specific score, it is in any case possible to benchmark the results against those obtained across all METPEX test sites.

As an example of possible use of the METPEX tool, the deliverable presents some profiling of the METPEX test sites through radar graphs that report the values of all indicators appertaining to different travel modes, users groups, journey phases or quality issues. This is an example of an effective way of communicating to stakeholders and policy makers the main areas where the investigated service performs relatively well or relatively badly.

Finally, the reader is strongly encouraged to carefully review the indications contained in the “Final recommendations” in order to fully understand the

context and limitations due to analytical framework under which the indicators were developed, and therefore make an appropriate and more informed use of the indicators here proposed, eventually amending them to better fit the needs of the evaluation exercise.

## Example of selection of relevant indicators

In this example, the goal is to assess quality issues of passengers travelling by bus. As first step, it is apparent that a mode-specific evaluation exercise is appropriate. Thus, we search for the section of the manual which groups indicators according to travel modes and we select “Bus service”. The relevant indicators are “BUS1: Reliability”, “BUS2: Ticketing and other issues” and “BUS3: Comfort on board”.

The next step involves the check of the list of variables that are needed to compute each of the indicators. So, the 3 indicators selected previously must be chosen among the 92 indicators presented in alphabetic order:

<b>BUS1</b>	<b>Reliability</b>	<b>C<sub>i</sub></b>
v62	Reliability of services	0.223
v57	Punctuality	0.233
u18	Time the journey took was as promised	0.263
v61	Reliability at off peak times	0.197
u19	Transport availability was adequate for my needs	0.170
v48	Notification on timetabling changes	0.147
u11	The quality of pre-trip information before I started my journey was good	0.155
u8	Provision of information on arrivals and departures was adequate for my needs	0.122
u10	The quality of travel information available during journey was good	0.111
v73	Value for money of services was good	0.125

Table 1 Indicator BUS1: List of variables and components scores coefficients

<b>BUS2</b>	<b>Ticketing and other issues</b>	<b>C<sub>i</sub></b>
v1	Ability to buy one ticket which covers different forms of transport	0.354
v29	Easiness of connections with other modes of transport	0.239
v23	Comprehensibility of ticketing structure	0.184
v60	Range of fares offered	0.161
u61	Provision of public transport only lanes	0.182
u17	Ticket purchasing process was easy to follow	0.159
u3	Design of transport stops was adequate for my needs	0.124
u15	Support for intermodal (e.g. different forms of transport during same journey) travel was provided	0.088

Table 2 Indicator BUS2: List of variables and components scores coefficients

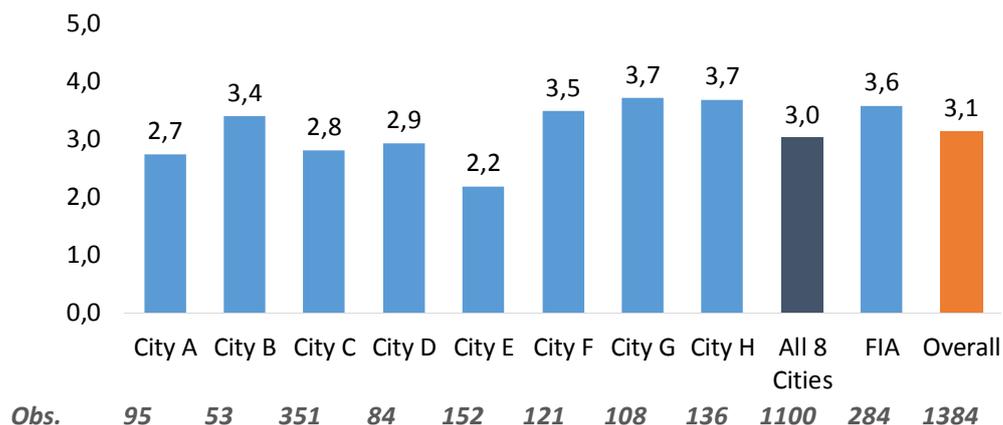
BUS3	Comfort on board	C <sub>i</sub>
v44	Level of noise	0.365
v43	Level of crowding	0.303
v8	Air temperature and ventilation inside vehicles	0.209
v20	Cleanliness of vehicles	0.200
v70	Speeding and driving behaviour	0.168
v68	Shelter provided from weather	0.142
v38	Helpfulness of customer facing staff	0.120

Table 3 Indicator BUS3: List of variables and components scores coefficients

Looking at the previous tables, we find a list of 10 variables needed for BUS1, 8 variables for BUS2 and 7 variables for BUS3. Thus, the satisfaction survey would comprise 25 questions in total, following a 5-point satisfaction rating format. The following step would be to implement the survey involving a sample of bus riders and to compute the three indicators on the basis of the answers obtained to those 25 satisfaction ratings. An example of this computation is provided in the deliverable, explaining how the coefficients of the last column of the tables are used.

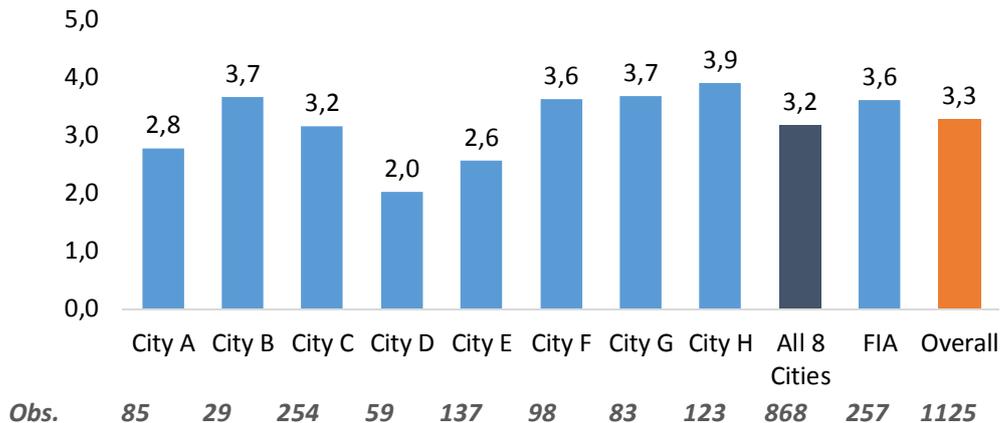
## Benchmarking values of indicators

The outcome of this computation is a mean score for each indicator, ranging from 1 (minimum satisfaction level) to 5 (maximum satisfaction level). In the deliverable, the results obtained from the METPEX test sites are reported for most indicators through bar charts.



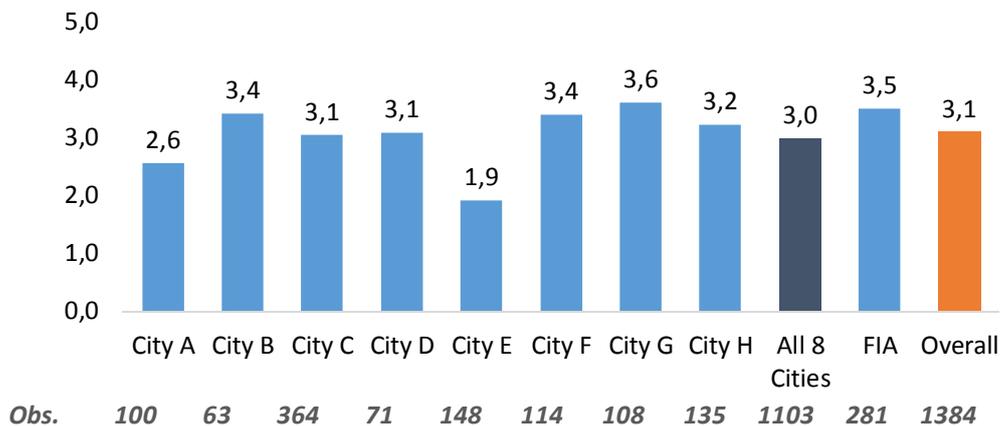
\* The indicator is not shown for samples inferior to 10 observations

Figure 1 Indicator BUS1: Benchmarking values



\* The indicator is not shown for samples inferior to 10 observations

Figure 2 Indicator BUS2: Benchmarking values



\* The indicator is not shown for samples inferior to 10 observations

Figure 3 Indicator BUS3: Benchmarking values

If the analyst wishes so, the scores coming from his/her analysis can be compared with those obtained from the METPEX test sites, as those seen in the previous figures. The first 8 light blue bars in each chart refer to the 8 test sites, anonymised and called City A, City B,..., while the dark blue bar collects the mean of the specific indicator values over all these cities. Then, the mean value of the observations referring to the FIA network of motorists are shown (10th bar). Finally, the orange bar is the overall mean value considering all the observations from the 8 cities plus the FIA network. The number of observations composing the sample of each city for that particular indicator is reported at the bottom of the figure. The y-axis of the plots goes from 1 to 5, like the scores given by the users to the evaluated items, higher values being associated with higher overall satisfaction ratings. It must finally be said that the mean value of the indicator for a given city is showed only if the relative sample is made up of at least 10 observations.

## City quality profiles

In the deliverable, a further example of possible use of the METPEX tool is provided. In fact, the profiling of the METPEX test sites through radar graphs that report the values of all indicators pertaining to different travel modes, users groups, journey phases or quality issues is presented. Five radar charts are produced, each one grouping together some or all indicators pertaining to a specific evaluation dimension. In each figure, the mean values of the indicators computed in each specific city are connected through blue areas creating a coloured polygon. The orange line represents the mean value of the indicators for the observations of all dataset.

For example, these are the results obtained for the indicator computed for one of the cities:

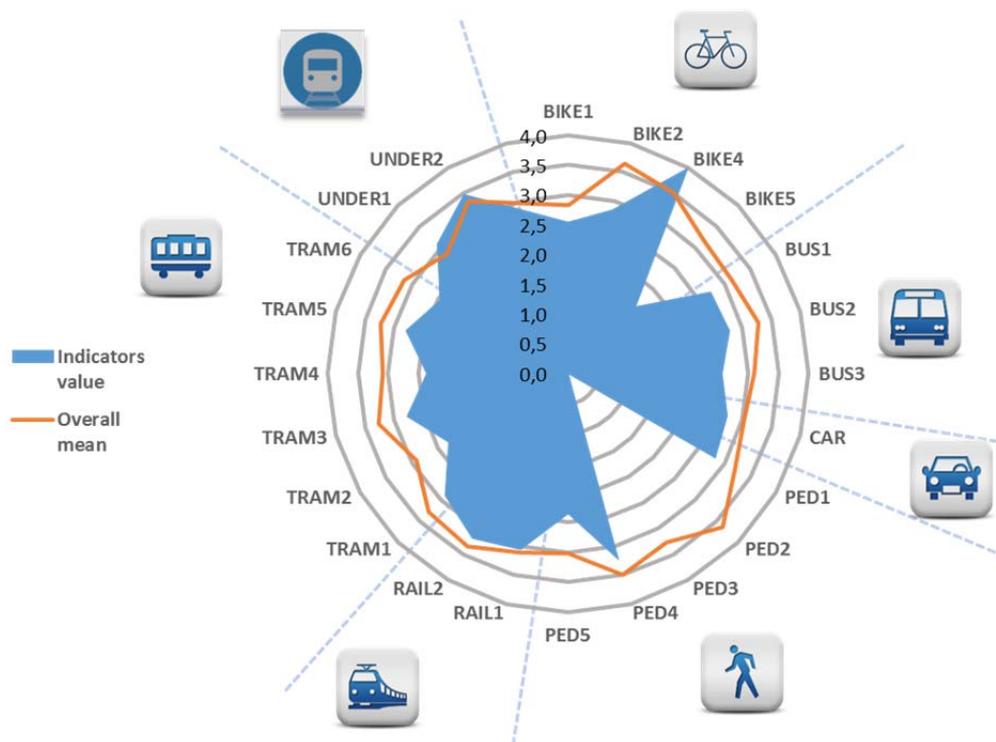


Figure 4 Modes Overview for City A

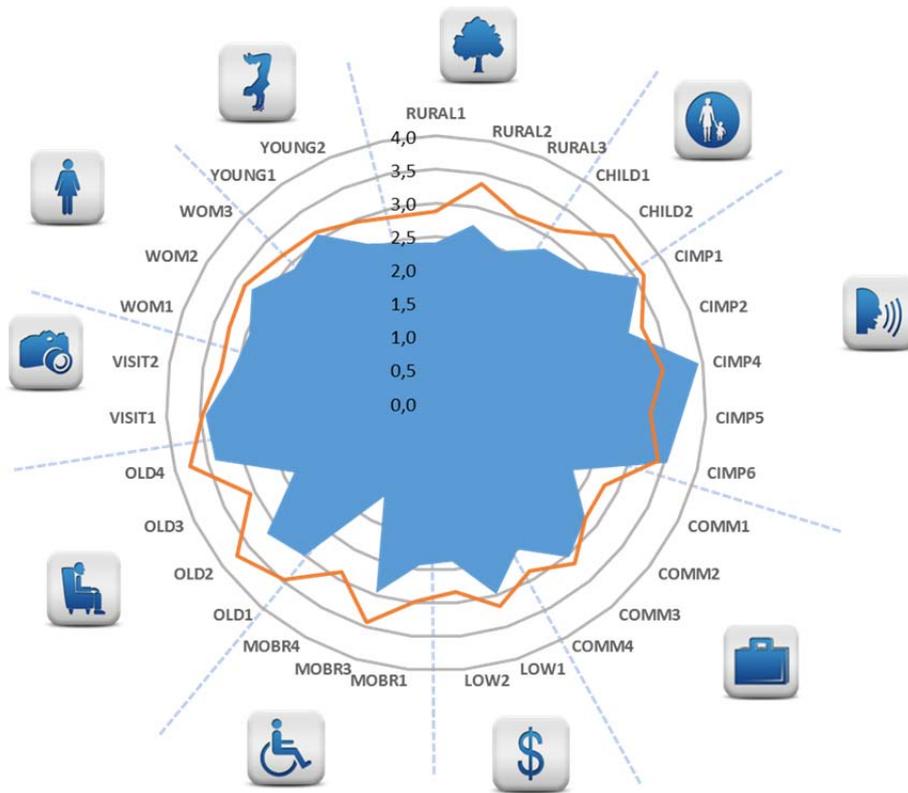
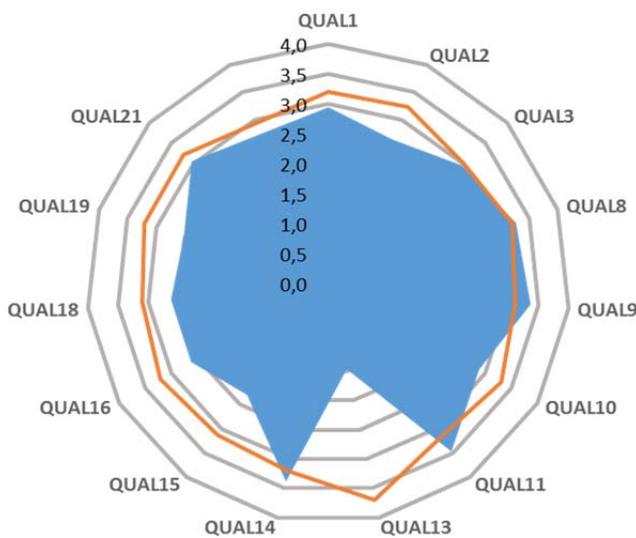
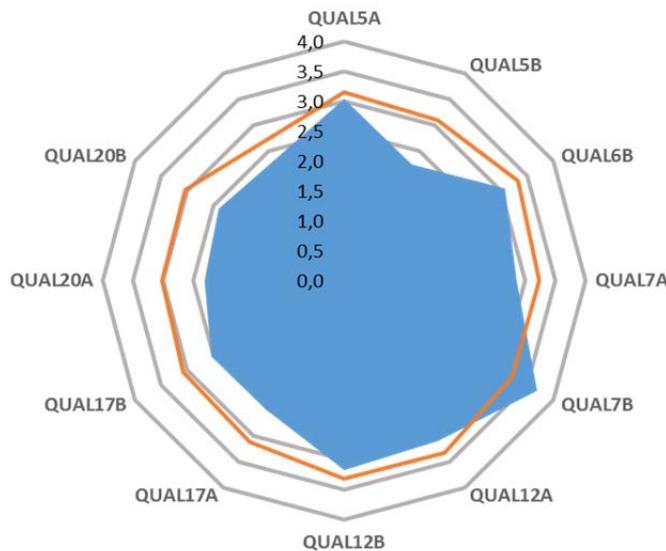


Figure 5 Users Groups Overview for City A



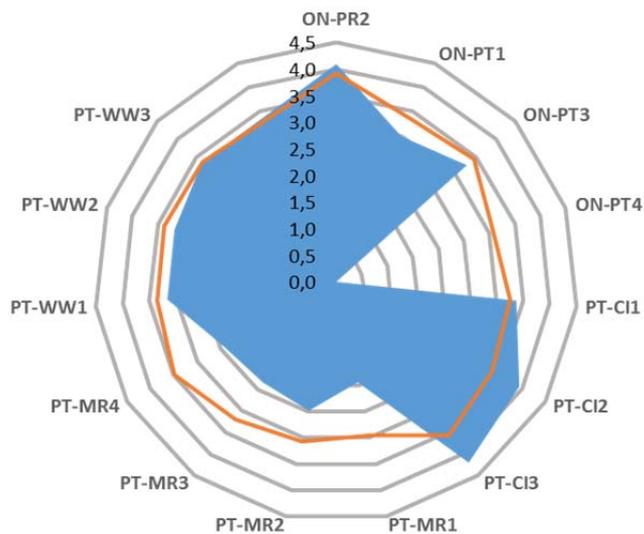
- QUAL1: Design of transport stations
- QUAL2: Design of transport interchanges
- QUAL3: Design of transport stops
- QUAL8: Provision of information on arrivals and departures
- QUAL9: Public Transport Staff
- QUAL10: Quality of travel information during journey
- QUAL11: Quality of pre-trip information before the journey
- QUAL13: Quality of ride
- QUAL14: Safety and security while travelling
- QUAL15: Support for intermodal travels
- QUAL16: Motorised vehicle users' needs
- QUAL18: Reliability and on-time performance
- QUAL19: Service availability
- QUAL21: Value for money of services

Figure 6 Quality indicators overview (Part I) for City A



QUAL5A: Quality of crossings  
 QUAL5B: Physical interactions among modes  
 QUAL6B: Non-discriminatory service and protection of data  
 QUAL7A: Accessibility for different user groups  
 QUAL7B: Social dimension of services  
 QUAL12A: Overall quality of transport infrastructure  
 QUAL12B: Vandalism and graffiti  
 QUAL17A: Tickets regulations and flexibility  
 QUAL17B: Practical aspects related to ticketing  
 QUAL20A: Ergonomy  
 QUAL20B: Design for specific user groups

Figure 7 Quality indicators overview (Part II) for City A



ON-PR2: Trip-specific aspects  
 ON-PT1: Staff behaviour  
 ON-PT3: Trip-specific aspects  
 ON-PT4: Service operations characteristics  
 PT-CI1: Communication aspects  
 PT-CI2: Information design  
 PT-CI3: Punctuality and reliability  
 PT-MR1: Infrastructural design  
 PT-MR2: Relevant features for mobility restricted  
 PT-MR3: Service operations  
 PT-MR4: Ticketing and other issues  
 PT-WW1: Infrastructures design  
 PT-WW2: Trip-specific aspects  
 PT-WW3: Safety and security

Figure 8 Journey phases overview for City A

This is an example of an effective way of communicating to stakeholders and policy makers the main areas where the investigated service performs relatively well or relatively badly.

## Results

According to the stability analysis results, when the number of observations available in the test site is sufficiently large, the definition and the structure of the factors coming out from a city are comparable with those from the total dataset. This is a very important result, since the identification and definition of the indicators here proposed can be considered valid also beyond the

dataset that was used to generate them, despite the fact that the Principal Component Analysis is a completely empirical and data-driven exploratory analysis technique, as previously mentioned.

In the comparison of the indicators definitions according to PCAs from the test sites and from the total dataset conducted in Deliverable D5.3, however, some differences have been still noticeable. The variability of the cities due to elements such as the geographical position, the dimensions, the number of inhabitants or the transports provision, which is one of the strength of the METPEX project, certainly influences the identification of the indicators when considering only specific test sites. Anyway, as the results showed, some variables come to be a sort of common baseline in the composition of the indicators, irrespective of the portion of dataset under consideration.

## Conclusion & Opportunities for Further Research

On the basis of the extensive testing of the above reported indicators, we can therefore conclude that the indicators here proposed can give a sound initial assessment of the perceived quality of different transport services, according to the perspectives of different users groups, or focusing on specific quality components or phases of the journey experience. Furthermore, such assessment can be matched against the results that were found for the different METPEX test sites. A more advanced approach would imply running a confirmatory factor analysis to amend some of these indicators or to make them more fit to specific evaluation instances, on the basis of some expert judgment. However, also if such additional work is needed, results here presented can give a useful input for the initial specification of the improved measurement model.