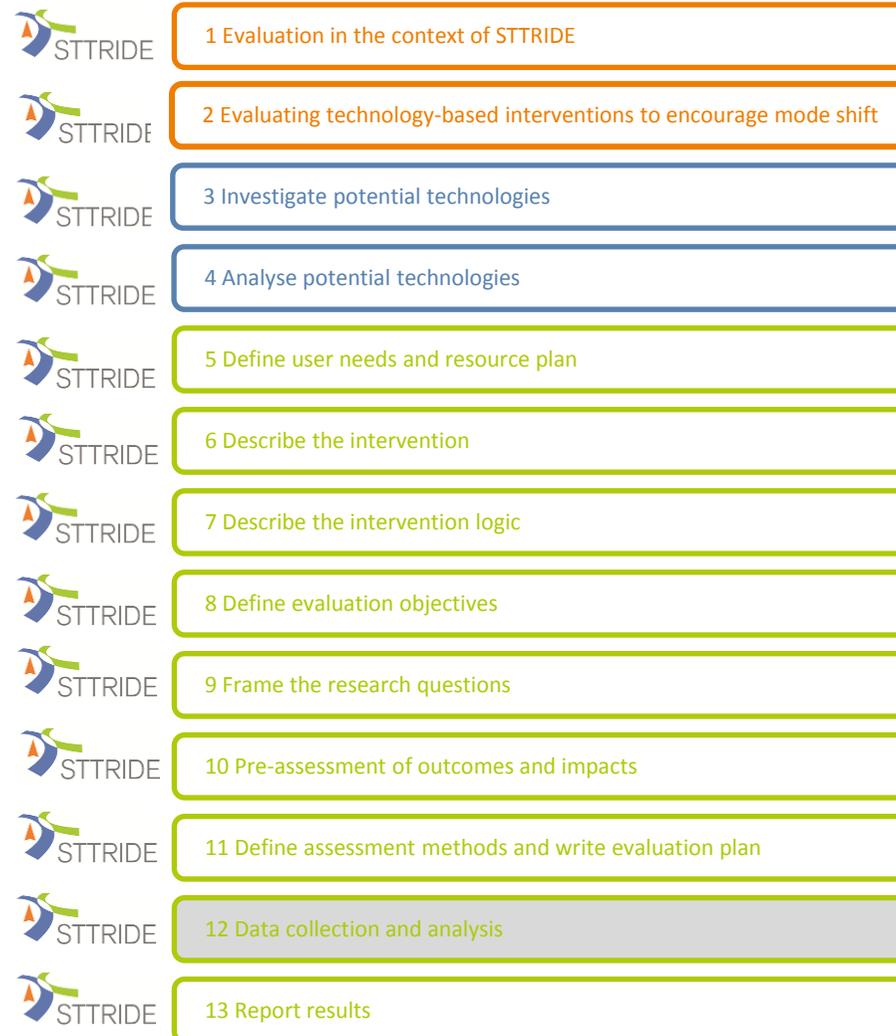


## 12 Data Collection and Analysis

Figure 12.1: Data Collection and Analysis within the STTRIDE Evaluation Process



## 12. Data Collection and Analysis

### Data

The main considerations for planning data collection and analysis are summarised here. These cover:

- Collecting baseline data
- Checking and analysing baseline data
- Collecting data after the intervention has been implemented
- Checking and analysing the 'after' data and comparing with the baseline in order to answer the research questions.

The design and implementation of data collection are specialist activities which need careful specification and will often involve skills that need to be bought in from external organisations; procurement specialists will provide guidance to the evaluation team at this stage. For the detailed planning of statistical aspects of data analysis, it is recommended that a statistician is involved in the evaluation team.

### 12.1 Collect baseline data

The baseline data collection should be of a scale, scope and level of detail necessary to assess the changes resulting from the new technology in a statistically robust manner where at all possible. Thus it should provide data on all of the indicators defined in the evaluation plan, following the statistical methods and measurement conditions set out there.

It is helpful to document any special events or unusual activities that take place while the baseline data collection is taking place that may influence the comparison with the situation after the intervention; for example large scale events, road works, weather-related incidents or service disruptions.

Considering the long term nature of the impacts of some new technologies, the baseline data may also need to cover a time period that makes it possible to make predictions of the 'business as usual' scenario. This will enable the changes following the intervention which are attributable to the intervention to be separated from other changes that would have happened as a result of other trends.

As mentioned earlier, the baseline data collection will involve a combination of pulling together data from existing sources and carrying out surveys and observations designed in the evaluation plan.

A pilot test of the data collection methods is useful to identify any problems and to ensure that any questionnaires used are understood correctly before the main baseline data collection is carried out. This pilot is also an opportunity to check the quality of the data and ensure that the training and supervision for data collection are sufficient.

## 12. Data Collection and Analysis

Ideally the baseline data collection should take place early enough to enable the data analysis to be carried out before the intervention is implemented, so that there is a chance to fill any gaps in the baseline data that become apparent during the analysis, before the implementation.

### 12.2 Analyse baseline data

The initial analysis of the baseline data is designed primarily to check that the data collection methods have been successful in obtaining the planned scale, scope and detail necessary to provide a robust baseline, against which the data collected after implementation of the intervention can be compared. The following types of check are recommended to identify errors in data collection and recording:

- Sample sizes are as planned, ensuring statistical validity of results
- Missing data
- Composition of samples – population characteristics, vehicle characteristics etc.
- Maximum and minimum values on each indicator are within reasonable values
- Unexpected 'clusters' of values for indicators
- Range of dates and times covered.

These checks will involve both internal comparisons within the data and comparisons with relevant comparator data such as population data and automatic traffic monitoring data.

Any adjustments or estimations to fill gaps in the data should be carefully documented; this information will be needed when comparing with data collected after the intervention.

### 12.3 Collect data after the intervention has been implemented

The data collection after the intervention has been implemented should be of a scale, duration, scope and level of detail necessary to assess the changes resulting from the new technology in a statistically robust manner where at all possible. Thus it should provide data on all of the indicators defined in the evaluation plan, following the statistical methods and measurement conditions set out there. Where the data is designed for comparison with the baseline, it should be gathered under the same measurement conditions as the baseline data collection.

As for the baseline, the 'after' data collection will involve a combination of pulling together data from existing sources and carrying out the surveys and observations set out in the evaluation plan. Again, a record of any special events or unusual activities should be maintained to inform the comparisons with the baseline data.

Considering the long term nature of the impacts of some new technologies, the 'after' data collection may need to take place in more than one 'wave', spread out over time in order to capture both the immediate outcomes and the short and longer term impacts.

## 12. Data Collection and Analysis

If any additional data collection is carried out that does not match baseline data, a pilot test of the data collection methods is useful to identify any problems and to check the quality of the data.

### 12.4 Data analysis

Before carrying out the data analysis, it is important to carry out systematic checks on the data quality, as noted for the baseline data in the 'Define Assessment Methods and write Evaluation Plan' module on the [STTRIDE web site](#). Any missing data or sources of bias or error in the data that are identified should be controlled or corrected in a 'data cleaning' phase before the analysis begins; any such cleaning and correction should be documented. Figure 12.2 summarises the stages in the analysis process.

Further checks should be carried out during the analysis as the results are being interpreted, to question and investigate unexpected results and to ensure that the design and analysis has not been compromised, for example by the influence of confounding factors or the spread of the sample data collected being greater than expected.

The data analysis should be designed to provide answers to the research questions ('Frame the Research Questions' module on the [STTRIDE web site](#)) and test the hypotheses posed in the evaluation plan ([Module 11](#)). Targeting the analysis in this way ensures a focused investigation and avoids wasting time on interesting avenues of analysis that do not inform these questions.

Three main types of analysis are likely to be needed in STTRIDE evaluations:

- Descriptive data – primarily for performance assessment and user acceptance assessment
- Assessment of scale and nature of change – primarily for impact assessment, socio-economic evaluation and financial assessment
- Attribution of change to the intervention including statistical comparison of outputs and outcomes.

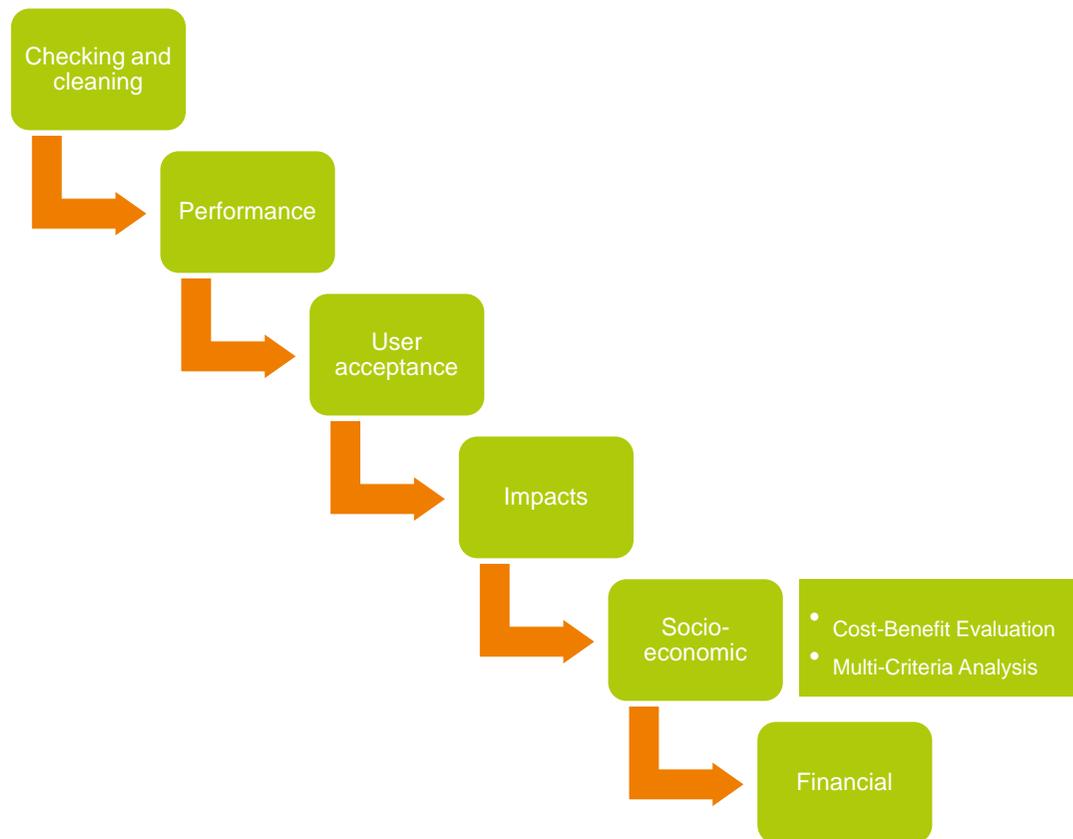
In addition, some evaluations may also need further analysis to understand:

- Mechanisms to explain impacts
- Distribution of impacts.

The statistical methods used depend on the type of data and probability distribution; it is recommended that a statistician is involved in selecting the appropriate statistical techniques and overseeing the analysis.

It is recommended that the analysis is carried out in stages corresponding with the types of assessment, because the results of each stage will inform the next. Also, if the results of the first stages do not identify significant impacts, it may not be considered worthwhile to carry out socio-economic and financial assessment.

**Figure 12.2** Stages in the analysis process



Apart from the socio-economic assessment, the analysis undertaken in each stage is outlined in the research questions as set out in the 'Frame Research Questions' module on the [STTRIDE web site](#). In the case of socio-economic assessment, two different types of analysis may be carried out:

- Cost-Benefit evaluation in which the impacts are all given a monetary value and the ratio of benefits to costs is calculated over a defined future period, discounting future costs to present values using an appropriate discount rate (often defined in national guidance on appraisal of schemes). Note that different countries use their own standard values for the monetisation of impacts on factors such as safety, travel time and emissions.
- Multi-Criteria Analysis, in which some impacts (or criteria) cannot be given a monetary value but quantitative indicators can be defined and if appropriate combined into an overall index.