6.5 Public transport

6.5.1 For most public transport journeys, the existence of timetabled arrival times means that it is usual to consider reliability in terms of lateness, defined as the difference between travellers' actual and timetabled arrival times. Adopting this definition means that arrival before the timetabled arrival time is usually ignored. Two measures of lateness must be considered: average lateness; and the variability of lateness, measured by the standard deviation of lateness.

6.5.2 Therefore, the reliability ratio for public transport is defined as the ratio of the value of the standard deviation of lateness to the value of average lateness, where the value of average lateness is a factor of the value of travel time savings:

Reliability Ratio = Value of SD of lateness / Value of average lateness

Value of average lateness = factor * value of travel time

6.5.3 Based on evidence from the PDFH[18] the value of average lateness for public transport is 2.5 times the value of in-vehicle time. A reliability ratio of 1.4 is recommended for all purposes for all public transport modes.

6.5.4 Therefore both the mean lateness and the standard deviation of lateness should ideally be modelled. However, in many cases the information required to calculate the standard deviation of lateness will not be available. Bates et al (2001) suggested that it is the “pure” lateness effect which tends to dominate, because the effect of variability is less important given that rail passengers have already made some “compromises” in selecting arrival or departure time of their preferred scheduled train.

6.5.5 For rail, the PDFH recommendations on performance given in Table 1 of [TAG Unit M4 – Forecasting and Uncertainty] should be followed. The lateness factors in PDFH vary by flow type. For other public transport schemes, in the absence of better evidence, an uplift of 20% can applied to the value of wait time (2.0), giving a lateness factor of 2.4.

6.5.6 Bates et al recommend that early arrival is given the same weight as late arrival but with the opposite sign. However, early arrivals are not included in rail Public Performance Measure (PPM) data so it is recommended that early rail arrivals are treated as on time and excluded from calculations of the mean and standard deviation of delay.

6.5.7 Rail performance data distinguishes between ‘punctuality’, services arriving on time, and ‘reliability’, services being cancelled. Both factors contribute to journey time variability and should be included in assessment of reliability impacts. When a train is cancelled, the service interval (which is the delay for the passenger) should be multiplied by 1.5 to represent the greater disutility associated with waiting rather than being in the vehicle. This value should then be multiplied by the late time multiplier (for the given flow) as outlined in PDFH.

7 Impacts on transport providers

Public transport provider revenues

7.1.1 The change in transport provider revenues is given by the following equation for both work and non-work trips:

$$(M^1 - M^0) = \sum_{ij} T^1_{ij}\ M^1_{ij} - T^0_{ij}\ M^0_{ij}$$

[18] PDFH is a technical document, summarizing research on the various factors affecting forecasts of demand for passenger rail services, published by the Passenger Demand Forecasting Council. It is not a public document and is only available on subscription from the Association of Train Operating Companies.

7.1.2 where M^S is total revenue (with the S superscript representing the scenario); and M^S_{ij} is the revenue per trip, and T^S_{ij} the number of trips, between i and j. As businesses, transport providers perceive changes in revenue in factor costs so they should be converted to the market price unit of account.

Bus and rail operating costs

7.1.3 Formulations for public transport operating costs are less well established than for private vehicles (cars and goods vehicles) and may differ from study to study. In a simple highway appraisal, buses are treated as part of the traffic flow, and the operating cost formulae described in section 5 are applied, using the appropriate parameter values for PSVs. However, in a multi-modal study different options may result in the need for more or different levels and patterns of bus service provision.

7.1.4 TAG Unit A1.2 provides guidance on the factors that should be included in public transport operating costs. Care should be taken to ensure that operating costs, investment costs and subsidies are treated separately and correctly reported.

7.1.5 Costs should exclude VAT, which is recoverable by the operator, but should be multiplied by (1+t) to convert them to the market prices unit of account.

8 Impacts on indirect tax revenue

8.1.1 Indirect tax revenues accrue to the government which perceives those revenues in the factor cost unit of account. Therefore indirect tax revenues should be converted to the market price unit of account by multiplying by (1+t), the indirect tax correction factor. This conversion to market prices is included in the detailed equations for calculating the indirect tax impacts of work and non-work trips in Appendix A.5.

9 Annualisation

9.1.1 Transport models typically model periods of the day so that benefits estimated from model outputs have to be expanded to cover the whole day and then a full year. This might mean expanding benefits from a modelled hour to cover a longer period (e.g. expanding the weekday AM peak hour to cover a 3-hour weekday AM peak period for a whole year) but could also include estimating benefits in non-modelled periods from the modelled results (e.g. estimating off-peak or weekend benefits from a modelled inter-peak hour).

9.1.2 Separate annualisation factors should be used for each modelled period and should account for differences in flows, modes used and mix of journey purposes in the period modelled and the period that benefits are being expanded to cover.

9.1.3 Different annualisation factors may also be needed for vehicle flows, public transport patronage and revenues, mode shift and congestion relief benefits as the relationship between demand and congestion relief benefits is non-linear. In cases where there is significant congestion, benefits will increase more than proportionately with the level of demand. Where congestion is less of an issue, single annualisation factors may be appropriate.

9.1.4 The data sources used, and assumptions and calculations made, in deriving annualisation factors should be clearly documented and explained. It is particularly important to explain where different factors have been used (e.g. for public transport patronage and revenues and congestion relief benefits) and, where applicable, how annualisation factors have been derived for non-modelled periods.

10 Impacts during construction and maintenance

10.1.1 Costs to existing transport users due to the construction of a project and costs (or benefits) to users arising during future maintenance should be recorded in the TEE tables where they are likely to be significant.