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for Transport

TAG Unit A4.2

Distributional Impact Appraisal

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Transport Analysis Guidance (TAG)

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This TAG Unit is guidance for the **Appraisal Practitioner**

This TAG Unit is part of the family **A4 - Social and Distributional Impacts**

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1. Distributional Impact Appraisal

1.1 Introduction

- 1.1.1 Distributional impacts (DIs) consider the variance of transport intervention impacts across different social groups. The analysis of DIs is mandatory in the appraisal process and is a constituent of the Appraisal Summary Table (AST). Both **beneficial and /or adverse** DIs of transport interventions need to be considered, along with the identification of social groups likely to be affected. This TAG Unit provides detailed technical guidance on the assessment of DIs.
- 1.1.2 The DI analyst¹ (if distinct) is expected to work closely with the technical analysts responsible for the appraisal of the eight identified indicators, where DIs may apply. These indicators are: user benefits, noise, air quality, accidents, security, severance, accessibility and personal affordability, with appraisal approaches described in the following sections in this Unit.

1.2 The DI Appraisal Process

- 1.2.1 This section presents an overview of the full appraisal approach to be undertaken for the eight identified DI indicators. Table 1 Overview of the DI appraisal process outlines the three-step approach and expected outputs for each step.

Table 1 Overview of the DI appraisal process

Step number	Step description	Output
1	Screening Process: Identification of likely impacts for each indicator	Screening Proforma
2	Assessment: Confirmation of the area impacted by the transport intervention (impact area); Identification of social groups in the impact area; and Identification of amenities in the impact area.	DIs social groups statistics and amenities affected within the impact area.
3	Appraisal of Impacts: Core analysis of the impacts Full appraisal of DIs and input into AST	Appraisal worksheets and AST Inputs

¹ For the purposes of this guidance the role of a “DI analyst” is assumed, but other arrangements may be appropriate.

1.3 Step 1: Screening Process

- 1.3.1 DI appraisal applies to **all transport interventions**. It can be time and resource intensive. In order to ensure a proportionate approach, each indicator is assessed individually using a **screening proforma** (Appendix A) to determine whether it needs to be appraised further.
- 1.3.2 When undertaking the screening process, consideration needs to be given to whether:
- The transport intervention might have **negative** or **positive** impacts on specific social groups. These may include: children, older people, people with a disability, Black and Minority Ethnic (BME) communities, people without access to a car and people on low incomes;
 - Some/all of the expected negative impacts can be eliminated through some form of amendment/redesign of the initial intervention; and
 - There are any positive impacts and if negative impacts cannot be eliminated, are the impacts sufficiently minor and socially and / or spatially dispersed such that a detailed DI appraisal is disproportionate to the potential impacts. Where impacts are either significant or concentrated, a full appraisal of the impacts should be undertaken.
- 1.3.3 The **screening proforma** should be completed by undertaking the following steps:
- Consider the appraisal output criteria (column a) to determine any potential impact (column b) of the intervention.
- 1.3.4 Due to the nature of the appraisal process much of the data available to screen potential DIs may not be available until a later stage of the overall intervention appraisal. Therefore, it is often difficult for the DI analyst to predict which indicators will need to be assessed until all the information is available. It is important that an appropriate timescale in which to complete the DI appraisal is allowed for before the submission of the AST.
- 1.3.5 **The default will be to proceed to the full appraisal of each impact.** Where the expected impact is **both** marginal in extent and dispersed among social groups or spatially it may be acceptable not to continue to step 2. In these cases, a detailed justification of the decision not to proceed to step 2 needs to be provided and reported in the AST.

1.4 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 1.4.1 Step 1, screening process identifies the likely **broad** impact areas of the transport intervention. Step 2a investigates these spatial impacts in more detail.

It is necessary to confirm the overall geographical area experiencing impacts and consider which specific areas are relevant to the DI appraisal. Robust evidence is required to support the defined impact area or areas for each indicator.

1.4.2 The impact area will vary for each indicator. The largest area will normally be that covered by a transport model or will be the relevant travel to work area (TTWA). The latter is likely to be an important consideration in levels of accessibility to employment.

1.4.3 **For example:** In the case of a new quality bus corridor, the road safety impacts might be limited to the road corridor itself, whilst accessibility impacts could cover a wider area comprising the end to end routes of bus services operating along the corridor. Some impacts tend to be more localised and noise and air quality impacts only affect areas where there are human receptors eg housing. The process of identifying the impact area should be documented to inform the appraisal audit trail for the intervention, particularly as the intervention evolves and appraisals for the DIs are reviewed.

1.4.4 The process of identifying the impact area should be documented to inform the appraisal audit trail for the intervention, particularly as the intervention evolves and appraisals for the DIs are reviewed.

Step 2b: Identification of social groups in the impact area

1.4.5 Step 2b requires analysis of the socio-economic, social and demographic characteristics of:

- The **transport users** that will experience changes in travel generalised costs resulting from the intervention; and
- The **people living in areas** who may experience impacts of the intervention even if they are not users; and
- The **people travelling in areas** identified as likely to be affected by the intervention.

Analysing the characteristics of transport users

1.4.6 Analysis of the **characteristics of the transport users** should be based on good practice in the segmentation of travel demand, as described in [TAG Unit M2 – Variable Demand Modelling](#). Further guidance on this issue can be found in [TAG Unit A1.3 - User and Provider Impacts](#) and Section 9 of this unit on personal affordability impacts.

Analysing the characteristics of people travelling and living in the impact area

- 1.4.7 Analysis of the **characteristics of people in the area** likely to be affected by the intervention should be undertaken through mapping social characteristics of interest at a suitably disaggregate level. Table 2 sets out the groups of people to be identified in the analysis for each indicator. It is advisable to look at the socio-demographic profile for all indicators unless there is a strong case not to.
- 1.4.8 **For example:** If the only in-scope DI is user benefits, it is only necessary to prepare mapping of the distribution of different income groups in the impact area. If accidents have been identified as being an in-scope impact, it is necessary to prepare mapping of the proportions of children, young adults and older people within the impact area.

Table 2 Scope of Socio -Demographic Analyses for DIs (Step 2b)

Dataset / social group (Ticks indicate analysis required for each impact)	User Benefits	Noise	Air quality	Accidents	Security	Severance	Accessibility	Affordability
Income Distribution (see below)	✓	✓	✓				✓	✓
Children: proportion of population aged <16		✓	✓	✓	✓	✓	✓	
Young adults: proportion of population aged 16-25				✓			✓	
Older people: proportion of population aged 70+		✓		✓	✓	✓	✓	
Proportion of population with a disability					✓	✓	✓	
Proportion of population of Black and Minority Ethnic (BME) origin					✓		✓	
Proportion of households without access to a car						✓	✓	
Carers: proportion of households with dependent children							✓	

Datasets for analysis of socio-demographic characteristics

- 1.4.9 Table 3 describes sources of data currently available to calculate the proportions of people in different social groups across the impact area. This list is not exhaustive and other local datasets can be used to develop a more detailed understanding of the specific local issues within the impact area. The most recent data should be used for analysis purposes where available.

- 1.4.10 Whilst the overall intervention appraisal will analyse and use forecasts of volumes of trips and travel conditions for one or more future defined years the socio-demographic profiling will be based on the best and latest available data and/or estimates.
- 1.4.11 The DI analyst should consider if development and regeneration activity is likely to change the future demographic profile of the area. If so, these changes should be taken into account in the analyses within this step. This is likely to require consideration of the time profiles of population change as well as transport changes.
- 1.4.12 The DIs may have to be presented for specific years, so that if land use development increases the number of older people in an area in 2016, separate analyses may be required for the before and after periods in order to present adequate information to decision makers.

Table 3 Datasets for socio demographic analysis (Step 2b)

Data	Source	Availability
Age	Census 2011 Mid-year population estimates published by the Office of National Statistics (ONS) available at lower layer super output area (LSOA) level and ward level.	Free data available to download from the National Statistics website www.statistics.gov.uk
Gender	Census 2011 Local Labour Force/Annual Population Survey available at District level from Nomis. Also mid-year population estimates published by ONS at LSOA and ward level	Free data available to download from the National Statistics website Free data available from the National Statistics official labour market statistics website www.nomisweb.co.uk
Disability	Census 2011 Family Resources Survey Benefits data (Department for Work and Pensions, DWP) Longitudinal Survey of	Census data is provided as free download from the National Statistics website along with benefits
Ethnicity	Disability Census 2011 Local Labour force/Annual Population Survey published by Nomis at District level	Free data available to download from the National Statistics websites
Faith	Census 2011	Free data available to download from the National Statistics website
Household Income (Refer to discussion below)	Nomis Labour Force Survey 2009 Wealth and assets survey Family and Resources Survey	Earnings and not Household income available from Annual Survey of Household Earnings via Nomis at Local Authority level.

	Commercial data sets are available	Most detailed datasets are co-ordinated by private sector companies and therefore a licence is required at a cost.
Economic Activity	Census 2011 Labour Force Survey 2009 Annual Population Survey at District level published by Nomis	Free data available to download from the National Statistics websites
Car Ownership	Census 2011	Free data available to download from the National Statistics website
Deprivation	Index of Multiple Deprivation (IMD) 2007 English Indices of Deprivation (ID) 2010.	Free data available to download from the National Statistics website and from the Department for Communities and Local Government (CLG) website
Households with dependent children	Census 2011	Free data available to download from the National Statistics website
Educational Qualifications	Census 2011 IMD 2007 (Education Domain) School & College achievement & attainment tables	Free data available to download from the National Statistics website Department for Children, Schools and Families (DCSF): GCSE and GNVQ qualifications available from Annual Population Survey (APS) /Labour Force Survey (LFS) via Nomis at District level
Benefit Claimants	DWP (Nomis) 2009 DWP data	Available from Nomis website free of charge DWP website

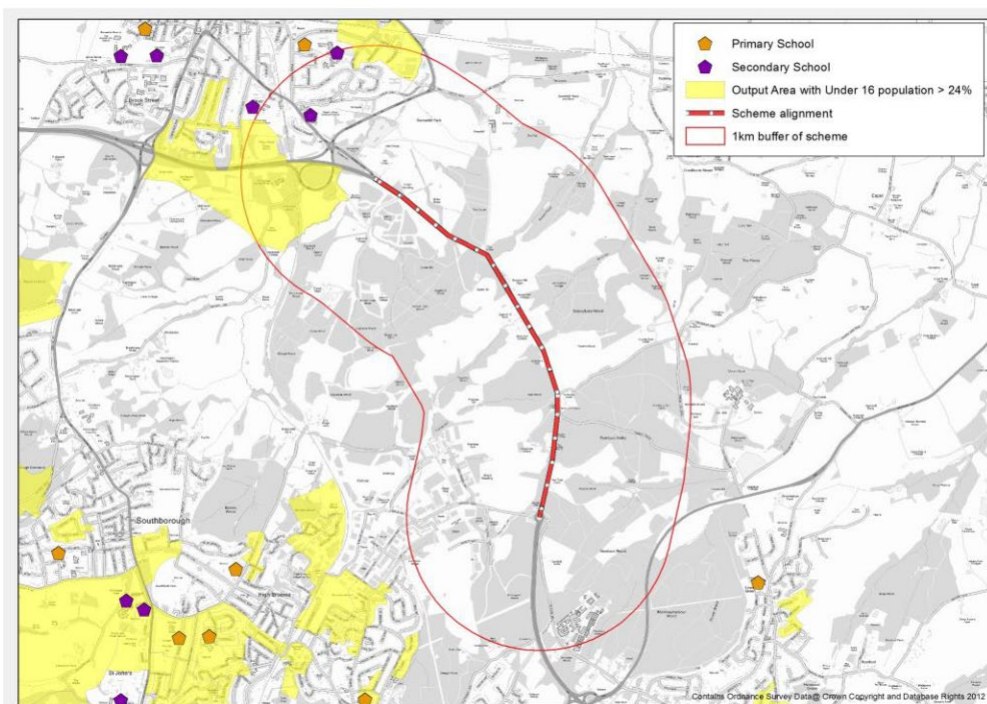
The role of Geographic Information Systems (GIS) in analysis

- 1.4.13 Mapping of the socio-demographic profile is a crucial foundation in DI analysis. It should be undertaken using Geographical Information Systems (GIS) or similar approaches, to provide detailed information on the characteristics of the people travelling or living in the impact area. This clearly presents the distribution of different groups that could be impacted by the transport intervention.
- 1.4.14 Mapping should take place at a disaggregate level to fully capture the impacts at an appropriate level of detail. In general, this should be at Lower Super Output Area level². It should be noted that Output Areas can be diverse, and do not have a uniform distribution of different social groups. Care should therefore be taken in the interpretation of data used in the analyses.

² Output Areas and Lower Super Output Areas are geographical definitions used for mapping of social characteristics. These cover different scales: for example Lower Super Output Areas typically have a resident population of around 1,500.

- 1.4.15 The individual social group proportions identified for each indicator (Table 2) within the impact area need to be assessed against the corresponding local authority average. Any significant differences should be identified. Where an intervention covers more than one local authority, the local authority figures should be merged for presentation in this assessment.
- 1.4.16 This Unit does not identify specific thresholds above which differences are significant. In analysing the socio-demographic mix of the area, and in comparing with corresponding local authority averages, the DI analyst must use judgement in determining if these differences are significant
- 1.4.17 **For example:** An intervention located in a coastal area may have a higher proportion of older people compared with the regional average. An intervention in a city may have higher proportions of people in BME communities.
- 1.4.18 Using GIS, a map highlighting particularly high proportions of these social groups in the impact area (in comparison with corresponding local authority averages) should be produced and analysed.
- 1.4.19 Figure 1 below provides an example of the expected mapping, which shows the proportions of residents aged under 16 in the impact area. The map shows how particular attention would be paid to the potential DIs facing children in areas shaded yellow.

Figure 1 Example of mapping and demographic profiles in the impact area



The specific challenge of measuring income distribution

- 1.4.20 In certain cases, it is appropriate to consider the distribution of household income in DI analysis (highlighted by DfT's Rapid Evidence Assessment, 2004). There are, however, a number of challenges in identifying an income dataset that is suitable for use.
- 1.4.21 At present, information on household income at a small area level is only available commercially. The Department does not require the use of this data in all cases: it is for the scheme promoter to use judgement on whether this could be useful for analysis.
- 1.4.22 One data set that is freely available at a small area level is the Income Deprivation domain of the English Indices of Deprivation (IoD) 2010. Income Deprivation is one of seven domains of deprivation, and its aim is to capture the proportions of the population experiencing income deprivation in an area. Rather than an absolute measure of household income, the domain uses the rate (*percentage of resident population*) of means tested benefit recipients as a proxy for the number of low income households / individuals. It does not therefore reflect actual household income in a given area, nor does it cover the distribution of that income across its resident population.
- 1.4.23 The Income Deprivation domain is therefore an imperfect measure of income distribution. Whilst it effectively captures concentrations of low income households (within the most deprived areas) it does not identify areas of affluence. Instead, it identifies areas of relatively low deprivation, i.e. areas with lower proportions of low income households. It is notable that these areas could still include low income households, but they are likely to be more dispersed.
- 1.4.24 With the above caveats and under the proviso that alternative disaggregate income data is not available at this present time, the IoD income domain can be used as a proxy measure for the most vulnerable groups. By calculating the absolute number of benefit recipients in a Lower Super Output Area (LSOA), and grossing this up to a bottom quintile or (alternative) using any other available data, a representation of the proportion of the population affected by any affordability or user benefits issues can be gained.
- 1.4.25 The DI analyst should ensure that when using IoD income domains, datasets should be documented and text should note that the appraisal has considered 'those living in areas ranked highest in terms of income deprivation' rather than numbers of low income households or population.
- 1.4.26 When using alternative data sources to IoD income data, the DI analyst should use appropriate rationale to identify the most suitable spatial level to assess income levels. This may be at local authority, regional or national level depending on the dataset used.

Step 2c - Identification of amenities in the impact area

- 1.4.27 The concentration of social groups is not only based on resident population but also what trip attractors/amenities are within the impact area. For example, the overall proportion of children in the impact area may not be high, but if there is a

school located within the area then there is likely to be children travelling within the area and thus considered within the assessment. Using desktop analysis, the local amenities which are likely to be used by the identified social groups for each DI indicator should be identified. Amenity data allows qualitative assessments / statements to be made to add value to the DI appraisal and provides a wider assessment than just that of the resident population.

- 1.4.28 The output of step 2 should be summarised and presented in Table 4 (or similar table) in order to provide evidence for the appraisal of impacts in step 3. This is also available as a [worksheet](#). A tick should be inserted into each of the boxes if the listed amenity is identified within the relevant impact area for each of the indicators. Text should be provided to describe the importance of each of the amenities in relation to the indicator and its potential impact.

Table 4 Example step 2 output summary

Social group and amenities indicators		UserBenefits	Noise	Airquality	Accidents	Security	Severance	Accessibility	Affordability	LocalAuthority	England	
Resident population in the impact area	Income distribution quintiles	0-20%	26%	15%	18%				26%	23%	20%	
		20-40%	14%	32%	32%				14%	12%	20%	
		40-60%	35%	21%	18%				35%	20%	20%	
		60-80%	17%	19%	11%				17%	16%	20%	
		80-100%	8%	13%	21%				8%	29%	20%	
		Children(<16)		6%	12%	10%	24%	9%	16%		18%	21%
		Young people			16%	9%			13%		16%	12%
		Older People		14%		16%	14%	15%	19%		19%	14%
		People with a				4%	5%	3%	4%		6%	4%
		Black Minority Ethnic							8%		8%	8%
	No car households						21%	16%		29%	25%	
	Households with							19%		31%	28%	
	Indicator population in impact area	10,000	1,000	3,000	5,000	500	750	15,000	10,000	2,700,000	60,000,000	
Amenities present within the impact area	Schools / nurseries		✓	✓	✓	✓	✓	✓	✓	-	-	
	Playgrounds		✓	✓	✓	✓	✓	✓	✓	-	-	
	Parks and open		✓	✓	✓	-	-	✓	✓	-	-	
	Hospitals		-	-	✓	-	-	✓	-	-	-	
	Care homes / day		-	-	✓	✓	-	✓	✓	-	-	
	Community centre		-	-	✓	-	-	✓	✓	-	-	

1.5 Step 3: Appraisal of Impacts

Step 3 provides an assessment of the impact of the intervention on each indicator's social groups for input into the AST.

Step 3a: Core analysis of impacts

- 1.5.1 The assessment score **should follow the bespoke guidance given for each indicator in later sections of this TAG Unit**, which follows the broad principles set out in Table 5.

Table 5 General system for grading of DIs for each of the identified social groups

Impact	Assessment
Beneficial and the population impacted is significantly greater than the proportion of the group in the total population	Large Beneficial ✓✓✓
Beneficial and the population impacted is broadly in line with the proportion of the group in the total population	Moderate Beneficial ✓✓
Beneficial and the population impacted is smaller than the proportion of the group in the total population	Slight Beneficial ✓
There are no significant benefits or disbenefits experienced by the group for the specified impact	Neutral
Adverse and the population impacted is smaller than the proportion of the population of the group in the total population	Slight Adverse x
Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population	Moderate Adverse xx
Adverse and the population impacted is significantly greater than the proportion of the group in the total population	Large Adverse xxx

- 1.5.2 It should also be noted that when assessing the distribution of impacts across income groups, it is possible for absolute impacts to conceal what is happening to the relative situation. For example, if those in the lowest income group experience a positive absolute impact, whilst those in higher income groups receive a larger absolute impact, then the lower income groups will be relatively worse off. Therefore the distribution over all income groups needs to be considered within the appraisal.

Step 3b: Full appraisal of DIs and input into AST

- 1.5.3 The analysis undertaken in Step 3a provides an assessment score for each indicator and each of the social groups under consideration. In addition, a qualitative assessment should be provided for each indicator to describe the key impacts in each case. These should be summarised in the DI appraisal matrix (Table 6).

- 1.5.4 Table 6 provides an example of a completed matrix. It uses the summary scores determined for each social group from the technical analyses for each of the indicators and in this case has highlighted a series of adverse impacts. This is also available as a [worksheet](#).
- 1.5.5 Different indicators should not be compared directly, as each indicator relies on different scales. However, the matrix can give a detailed picture of the ‘winners’ and ‘losers’ from a transport intervention, and the key issues of relevance.
- 1.5.6 The overall assessment score for each indicator should be recorded in the AST; along with any additional supporting information the appraisal provides, to enable decision-makers to understand the full impacts of the transport intervention on different groups of people. In addition, for accessibility and personal affordability, the overall assessment score, determined in the technical analyses in Sections 8 and 9, should be reported in the ‘qualitative’ column of the AST.
- 1.5.7 Where appropriate, key points may be briefly summarised in the ‘summary of key impacts’ column. The emphasis should be on the provision of essential information to inform the decision-making process.

Table 6 DI appraisal matrix

	Distributional impact of income deprivation					Are the impacts distributed evenly?	Key impacts – Qualitative statements (example below)
	0-20%	20-40%	40-60%	60-80%	80-100%		
User benefits	✓	✓✓	✓✓	✓✓	✓✓✓	No	Although benefits are felt by all income quintiles, the benefits favour those in the least deprived income quintiles. Those in the least deprived income quintile (income quintile 5) experience a considerably higher than expected proportion of benefits, whereas those in the most deprived areas (quintile 1) experience a smaller than expected proportion of benefits.
Noise	***	✓	✓✓✓	✓✓	✓✓✓	No	Noise impacts favour those in the least deprived income quintiles. Those in the most deprived income quintile experience noise disbenefits, whereas all other income quintiles experience benefits of the intervention.
Air quality	✓✓✓	✓✓	✓	**	✓	No	Air quality impacts favour residents in the most deprived income quintiles. Those in the most deprived income quintile (quintile 1) that may be considered to be the most vulnerable experience a considerably higher proportion of air quality benefits than may be expected from an even distribution. Residents living in income quintile 4 experience air quality disbenefits.
Affordability	**	*	**	✓	✓✓	No	Personal affordability benefits favour those in the least deprived income quintiles. Those in income quintiles 4 and 5 experience benefits in terms of affordability, whereas those in the least deprived income quintiles (who may be the most vulnerable) experience disbenefits as a result of the intervention.

Accessibility * * * * * Yes

Accessibility impacts are appraised as slight adverse for all of the income deprivation quintiles and therefore although the impact is adverse the impact is distributed evenly.

AST entry

Impact	Social groups						User groups				Qualitative statement (including any impact on residential population AND identified amenities)
	Children & young people	Older people	Carers	Women	Disabled	BME	Pedestrians	Cyclists	Motor cyclists	Young male drivers	
Noise	**										
Air Quality	✓✓										
Accidents	✓	✓✓✓					✓	✓	✓	✓	
Security	✓✓	✓		✓✓							
Severance	*	*	*		*						
Accessibility	✓	*	*	✓	✓	✓					

2. Distributional Impacts of User Benefits

2.1 Introduction

- 2.1.1 User benefits are experienced in certain areas and by certain groups of people. Whilst it is not possible to attribute social impacts to user benefits, there are distributional impacts that have not, in most cases, been considered previously in the appraisal process. As a matter of course, the analyst should seek to understand the pattern of user benefits and disbenefits generated by an intervention as it develops. However, where the DI analysis of user benefits is showing evidence of the intervention having particularly high benefits or disbenefits to a particular income group, mitigation ought to be considered
- 2.1.2 [TAG Unit A1.3 – User and Provider Impacts](#) sets out calculations for estimating transport user benefits and monetising these benefits, generally using TUBA, the Department's appraisal software.
- 2.1.3 The appraisal described in [TAG Unit A1.3](#) requires benefits to be disaggregated by benefit type (e.g. User Time, User Charge, Vehicle Operating Cost etc.) and mode, between Business, Commuting and other journey purposes, and by size of time savings and trip distance. This section describes additional guidance to incorporate the analysis of DIs.
- 2.1.4 The analysis in this section should be used to inform the distribution of impacts on **non- business journeys**. It is not appropriate to conduct DI analysis of business journeys, because these impacts are experienced by businesses and not individuals.
- 2.1.5 Where a sufficiently detailed income segmentation is available (e.g. three or more income groups), this should be used. Where income segmentation is not available, user benefits have to be disaggregated at a spatial level and then mapped to social groups, as a proxy for the required segmentation.
- 2.1.6 When a transport model is not available a qualitative approach that, as far as possible, parallels the quantitative approach should be used, as described later in this section.
- 2.1.7 If disaggregate income data is not available, it is recommended that the national Indices of Deprivation (IoD) income domain data is used to illustrate the potential distribution of user benefits amongst different income groups. See the discussion from paragraph 1.4.22 for further details and the caveats of its use.

Example: In the case of road interventions, the user benefits are experienced by car owners (and in many cases, people on higher incomes) whilst people without a car do not gain such benefits. In the case of public transport interventions, the benefits will be experienced by a different group of people, many of whom do not have access to a car.

2.2 Step 1: Screening

2.2.1 In the majority of cases, transport interventions have been developed for the very purpose of generating benefits to users. In any appraisal in which the user benefits of interventions have been quantified, a user benefit DI analysis should be undertaken and the [screening proforma](#) completed accordingly. Specifically, this applies where:

- The TUBA user benefit analysis software or an equivalent process has been used in the appraisal; and/or
- The value of user benefits in the Transport Economic Efficiency (TEE) table is non-zero.

2.2.2 In the majority of cases, user benefits will have been quantified through the use of TUBA in conjunction with a spatially disaggregate transport model. If that is not the case the analyst should scope the feasibility of mapping user benefits to either residential catchments or directly to income groups and complete the [screening proforma](#) accordingly.

Example: Two separate interventions that improve the quality of interchange at railway stations. If one intervention is a smaller station serving a distinct local catchment, then the user benefits can reasonably be assumed to be concentrated in this catchment and it will be possible to undertake a DI analysis by mapping to the income profile of that catchment. If the other intervention involves a large station that is both the transport hub for a large urban area and a point of interchange between different train services, then its catchment cannot readily be identified and hence a more qualitative approach will be required.

2.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

2.3.1 The impact area will be defined as the area in which the transport intervention will result in changes to the cost of travel (including both time-based costs and financial costs) for users of the transport network. In most cases, this should be the area represented by the transport model. In some cases, the transport

model will have a much wider area of coverage than the transport intervention itself and the likely area in which user costs change. The DI analyst should therefore undertake tests to establish the area impacted by changes in user costs or consider using a core modelled area.

Step 2b: Identification of social groups in the impact area

- 2.3.2 The DI analyst should use local income data where this is already available, and identify the distribution of incomes in line with the national quintiles for each Census area or model zone within the impact area.
- 2.3.3 Where income segmentation is available within the transport model being used, model zones will be the spatial unit of analysis, in preference to Lower Super Output Areas (LSOAs). In most cases, this will mean a greater detail of analysis, as well as a more robust means of identifying income levels. Where income data has been acquired as a separate dataset, it should be aggregated as closely as possible to match model zones.

Step 2c: Identification of amenities in the impact area

- 2.3.4 Identification of amenities within the impact area is not required for the user benefits DI appraisal. This is due to the appraisal focussing on the impact across income deprivation quintiles only, and the impact area being too large to warrant identification of local attractors.

2.4 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 2.4.1 The core user benefit analysis uses the capability of TUBA to provide benefit outputs disaggregated at a zone to zone (or sector to sector) movement level. This output should be produced during the course of a 'normal' TUBA run: separate TUBA runs should not be required for the purposes of DI appraisal, but the analyst will need to ensure that TUBA is correctly set-up to provide 'Detailed Results' as part of the standard appraisal process. Full details of how to set up TUBA to provide detailed results, and how to interrogate the detailed outputs provided by TUBA, are provided in Section 6.4 of the TUBA manual.
- 2.4.2 Should the model zone resolution be finer than the LSOA level, it is recommended that the analyst uses the 'sectors' feature available in TUBA to aggregate the detailed outputs to a sector system that corresponds as closely as possible to LSOAs, so that direct comparison can be made with IoD data.
- 2.4.3 Alternatively, the model zones may be larger than LSOAs, or the zone and LSOA boundaries may not share a high degree of commonality. In such cases, it will be necessary to convert the model data from the model zone level to LSOA level. It is recommended that the model zones are split by calculating the proportion of the population of each zone that falls within each LSOA, rather

than splitting the zones into LSOAs based purely on geographical area, as this would ignore changes in population density. This can be calculated in a GIS tool, using the zone and LSOA definitions and Codepoint (Postcodes) as an intermediate point dataset. Populations can then be assigned using domestic delivery points as a weight factor, as the analysis is concerned with place of residence.

- 2.4.4 In mapping benefits to social groups through spatial location, assumptions need to be made about place of residence. For example, the home end of a commuting trip is more likely to be the origin in the AM peak and destination in the PM peak. The National Trip End Model (NTEM) dataset gives proportions of trips by journey purpose in both Origin-Destination (O/D) and Production-Attraction (P/A) format that may assist the analyst in doing this. The analyst should use the available data (e.g. any original survey data) or judgement to attribute the benefits or disbenefits from the origin and destination based TUBA results to places of residence. Where data cannot be reasonably assigned to place of residence, user benefit analysis may not be practical.
- 2.4.5 There will be cases where TUBA has not been used for user benefit analysis, but there are, nevertheless, user benefits. This may be the case if the impacts of a transport intervention are very localised. If these localised impacts are within a residential area, then the DI analysis can be undertaken simply by considering the one or two LSOAs affected. The analyst should decide suitable periods or forecast years that would be appropriate for the analysis. If effects are localised within, say, a town centre location, such that residential location of the users cannot easily be determined, then a DI analysis is probably not appropriate or feasible, although promoters could use other approaches (e.g. survey based) to identify town centre users and consider distributional impacts using this data.
- 2.4.6 In some cases where a spatially-disaggregate model is not available; it may be possible to 'manually' assess where the benefits are likely to be accrued, and undertake the DI analysis in the normal way.
- 2.4.7 Some intervention appraisals may involve testing scenarios where there are new housing developments that change the demographic profile of the area, either through gentrification or a net change in average income level through provision of housing for different socio-economic groups than the existing population. In these cases, sensitivity testing should be undertaken to ascertain the impact of assuming different income quintiles to characterise the LSOA. Some attempt should be made to determine how user benefits are attributed between existing and new populations, if there is likely to be a significant difference in the socio-economic characteristics of the two groups. The same issue should be addressed if the IoD data is known to 'hide' significant pockets of deprivation within the LSOA data.

Step 3b: Full appraisal of DIs and input into AST

- 2.4.8 By 'mapping' directly where possible, or via an aggregation or simple disaggregation of model zones to LSOA or postcode level, it is possible to

illustrate the spatial distribution of benefits by income group. This is illustrated in Table 7, which shows an example worksheet from the DI analysis. This is also available as a [worksheet](#).

2.4.9 The output of the analysis compares the proportion of benefits with the proportion of the population, to which they apply, avoiding potential issues arising from comparing zones of different size and therefore different magnitudes of user benefit.

Table 7 Example Output from User Benefits Distributional Analysis

	IMD Income Domains £m					Total
	Most deprived areas		Least deprived areas			
	0%<20%	20%<40%	40%<60%	60%<80%	80%<100%	
LSOA 1	3.6					3.6
LSOA 2				4.2		4.2
LSOA 3					1.2	1.2
LSOA 4		1.7				1.7
.....					
LSOA N		2.3				2.3
Total benefits (∑LSOAs)	40.2	57.8	37.9	77.8	59.8	273.5
Total disbenefits (∑LSOAs)	-	-	-	-	-	0.0
Share of user benefits	15%	21%	14%	28%	22%	100%
Share of user disbenefits	-	-	-	-	-	-
Share of population in the impact area	22%	25%	15%	28%	10%	100%
Assessment	✓	✓✓	✓✓	✓✓	✓✓✓	

Example: The output shows the implied share of the total user benefits conferred upon each LSOA. It is identified as contributing benefits to residents in a particular quintile, and can be simply summed across all LSOAs to enable the total user benefits accruing to each group to be identified. If a group experiences disbenefits when totalled across all LSOAs, this should be reported in the separate Total disbenefits row and a zero value reported under Total Benefits for that group. Therefore a group has only one entry in either of the total rows. In absolute terms, all the quintiles benefit from the intervention as there are no net disbenefits. However, users in the lowest two IMD quintiles would receive a disproportionately small share of the benefits, and are therefore worse off in relative terms.

2.4.10 The DI analysis focuses on the bottom four rows of Table 7: it considers how user benefits are distributed amongst all the income groups, and how this relates to the proportion of users in each income category. The final row provides a summary distributional assessment, using criteria presented in Table 8 which feeds into the DI appraisal matrix.

Table 8 System for Grading of Transport User Benefits DIs for each of the social groups

Beneficial and 5% or more greater than the proportion of the group in the total population	✓✓✓
Beneficial and in line (+/-5%) with the proportion of the group in the total population	✓✓
Beneficial and 5% or more smaller than the proportion of the group in the total population	✓
There are no transport user benefits or disbenefits experienced	Neutral
A disbenefit which is 5% or more smaller than the proportion of the group in the total population	x
A disbenefit which is in line (+/- 5%) with the proportion of the group in the total population	xx
A disbenefit which is 5% or more greater than the proportion of the group in the total population	xxx

2.4.11 The analysis should be summarised for inclusion in the AST, by stating whether the distribution of impacts is even, and providing a qualitative statement to discuss the findings of the appraisal, as shown in Table 6.

2.4.12 Furthermore, a qualitative assessment of the user benefits for the most deprived groups should be provided when the appraisal includes sensitivity testing or other analysis to determine the user benefits attributable to different quintiles in LSOAs housing very different socio-economic groups.

3. Distributional Impacts of Noise

3.1 Introduction

Noise

3.1.1 The World Health Organization identifies environmental noise as the second largest environmental risk to public health in Western Europe³. In addition to the focus on annoyance, which remains an important impact of noise, there is clear

³ World Health Organization, 2011. Burden of disease from environmental noise. http://www.who.int/quantifying_ehimpacts/publications/e94888/en/

evidence of links between environmental noise and health outcomes including cardiovascular disease, cognitive impairment in children and sleep disturbance. Building on this and other evidence, the Department for Environment, Food and Rural Affairs (Defra) have adopted an impact pathway approach to understand the impact of noise on people's lives. These pathways are annoyance / amenity; sleep disturbance; Acute Myocardial Infarction (AMI); and stress and dementia (through increased hypertension).

- 3.1.2 Given that children are identified as a key at-risk group, attention should be paid to the presence of children within the impact area. AMI and stress and dementia are disproportionately experienced by older people and as such a consideration of impacts on this group should also be included. Finally, while there is no clear evidence of differential impact on income groups, those with lower incomes may be less able to make adjustments to changing noise levels (e.g. the installation of insulation or double glazing) than other groups and so should be included in analysis.

3.2 Step 1: Screening

- 3.2.1 Noise impacts are likely to occur where an intervention results in changes to traffic flows or speeds or where the physical gap between people and traffic is altered. This is defined in the Noise Section of [TAG Unit A3 – Environmental Impact Appraisal](#).
- 3.2.2 Consideration should be given to the number and locations of schools in the area as well as other places where children are likely spend time outdoors such as nurseries, playgrounds, parks and other open spaces. Additionally, consideration should be given to the number and locations where older people may spend time.

3.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 3.3.1 The impact area should be defined through the noise analysis, which should be undertaken in accordance with the requirements of [TAG Unit A3](#). It is important to clarify the extent of the impact area with the noise specialist (if separate from the DI analyst) and state this clearly in the appraisal report.

Step 2b: Identification of social groups in the impact area

- 3.3.2 The DI analyst should map, using GIS, variations in income deprivation, through the use of the Index of Deprivation (IoD) income domain at Lower Super Output Area (LSOA) level. More detailed income geographies can be mapped through the use of other data, if this is available. This data will be subsequently used in the analysis of noise impacts experienced by households with different levels of income.

- 3.3.3 The DI analyst should consider social groups living in the area that are vulnerable to changes in noise levels, including **children** and **older people**.

Step 2c – Identification of amenities in the impact area

- 3.3.4 There may be places within the impact area that attract large numbers of people from different income groups. The DI analyst should identify attractors that might experience changes in noise as a result of the intervention, and consider the distribution of potential impacts across different social groups in the population.

3.4 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 3.4.1 The analyst should consider the impacts of the intervention, in accordance with the guidance described in [TAG Unit A3](#).
- 3.4.2 The changes in noise levels in the impact areas should be mapped. The approach taken should reflect the scale of the analysis. Where changes are localised to particular areas, it is sufficient to use simple tools, such as Excel, to attribute the impacts to specific areas. Where the impacts are widespread and complex, it is recommended that the analysis is integrated into a GIS tool, to enable overlay of the socio-demographic profile data.
- 3.4.3 Mapping should be overlaid with income data, in order to estimate in detail the changes experienced by households in different groups.
- 3.4.4 The analyst should examine the changes in noise that are forecast for schools in the impact area and provide comments, since children are a sensitive receptor of noise.
- 3.4.5 The analyst should examine the changes in noise that are forecast for care homes and day centres in the impact area and provide comments, since older people are a sensitive receptor of noise.
- 3.4.6 The analysis should be undertaken on future years. This will be dependent on the assessment undertaken by noise specialists.

Step 3b: Full appraisal of DIs and input into AST

- 3.4.7 The outputs of the noise indicator should be presented in a worksheet showing the change in decibels (dB) that would be experienced per household as a result of the intervention. This is already undertaken as a core part of the analyses, and will not therefore result in additional burden for the analyst.
- 3.4.8 The analysis of distributional impacts should provide, as an output, the relative numbers of households in different income groups experiencing increases

and/or decreases in noise. This will draw on the spatial analysis of socio-demographic data and changes in the impact area.

3.4.9 Table 9 sets out an example of this analysis for the five quintiles in the income domain of Index of Deprivation (IoD). This is also available as a [worksheet](#). It presents the general approach to the grading of DIs for each social group, which is applicable to noise DIs. This system should be applied for each of the five income groups. There is no strict guidance on what constitutes a significant proportion of the population in this case, although 5%, as with other indicators, can be used as a guide.

Table 9 Example of Noise DI Analysis

	IoD Income Domain					Total
	Most deprived	←————→			Least deprived	
	0-20%	20-40%	40-60%	60-80%	80-100%	
Population in each group with increased noise [A]	2,000	1,000	500	1,000	500	5,000
Population in each group with decreased noise [B]	500	2,000	3,000	2,500	2,000	10,000
Population in each group with no change in noise [C]	500	1,000	1,000	500	1,000	4,000
Net no. of winners / losers in each group [D] = [B] – [A]	-1500	1,000	2,500	1,500	1,500	-
Total number of winners / losers across all groups [E] = $\sum [D]$	-	-	-	-	-	5,000
Net winners / losers in each area as percentage of total [F] = [D] / [E]	-30%	20%	50%	30%	30%	100%
Share of total population in the impact area	16%	21%	24%	21%	18%	100%
Assessment	xxx	✓✓	✓✓✓	✓✓✓	✓✓✓	

Example: This shows the significant negative impacts that are experienced, in noise terms, by the households in the lowest income group (comprising areas with the worst income deprivation).

- In contrast, 50% of the net numbers benefiting in noise terms are in the middle group, despite only comprising of 24% of the population in the impact area. This group could therefore be considered to have a **large beneficial** impact. Likewise, the least deprived areas, in income terms, experience high benefits in relation to share of the population (this group has 30% of the overall winners in noise terms but only 18% of the total population).

- The second most deprived quintile has a 21% share of the total population and 20% of the net winners. The proportion of net winners is in line with the proportion of the population as a whole, and it is therefore appropriate to give a score of **moderate beneficial**.
- The 'losers' in the impact area are the most deprived quintile, with 16% share of the total population but 30% of the net losers in terms of increased noise levels. Despite an overall reduction in noise for the population as a whole, this group suffers in both absolute and relative terms and it is therefore appropriate to give a score of **large adverse**.

3.4.10 Note that discrepancies may arise in estimates of population experiencing noise level changes when comparing this methodology with the TAG Noise Valuation Workbook, because noise values in the Workbook are defined for 3dB noise bands and, as a result, the Workbook may exclude some population groups that are still included within DI analysis, such as households that experience noise level changes of less than 3dB.

3.4.11 The analysis described is based on the noise experienced at people's place of residence. However, the highest levels of noise are generally experienced during the day, when many people are away from home (at work, school, carrying out personal business). The analyst should also take into account changes in noise levels that could occur at night and more generally should take into account the nature of the exposure to noise in undertaking the assessment.

3.4.12 Where analysis is required by amenities drawing people in to an area (attractors), the appraisal should report the impacts by LoD income groups and consider the duration of exposure at these locations. It is expected that, in most cases, only a qualitative assessment will be required, unless attractors have long dwell times or profiles of users are significantly affected by income.

3.4.13 The scores for each of the groups under consideration should then be reported in the DI appraisal.

4. Distributional Impacts of Air Quality

4.1 Introduction

Air Quality

4.1.1 The impacts of air quality are primarily spatial. As poor air quality problems are often experienced in areas of deprivation, in which people already suffer relatively poor health, health problems can be exacerbated for such deprived communities.

- 4.1.2 Evidence also suggests that children are at more risk from air pollution due to the fact that they generally spend more time outside and therefore experience more exposure to harmful pollutants that impact on lung development. It is therefore recommended that consideration is given to the changes in air quality that are experienced by children.
- 4.1.3 Air quality has strong distributional impacts. The poor air quality experienced in some areas of low car ownership is a clear issue of social justice as these people experience the impacts of car use, but do not themselves have access to a car. Hence, it is prudent to concentrate the analysis of changes in air quality on the impacts on households in areas of relatively high income deprivation as a proxy.

4.2 Step 1: Screening

- 4.2.1 Air quality impacts are likely to occur where an intervention results in changes to traffic flows or speeds or where the physical gap between people and traffic is altered. This is defined in the main appraisal, following the guidance in the Air Quality Section of [TAG Unit A3 – Environmental Impact Appraisal](#).
- 4.2.2 Consideration should also be given to the number and locations of schools in the area as well as other places where children are likely spend time outdoors such as nurseries, playgrounds, parks and other open spaces. The screening for air quality impacts should also identify if there are any Air Quality Management Areas (AQMAs) within close proximity to the intervention.

4.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 4.3.1 The impact area should be defined through the air quality analysis, which should be undertaken in accordance with the requirements of [TAG Unit A3](#). It is important to clarify the extent of the impact area with the air quality specialist (if separate from the DI analyst) and state this clearly in the appraisal report.

Step 2b: Identification of social groups in the impact area

- 4.3.2 The DI analyst should map, using GIS, variations in income deprivation, through the use of the Index of Deprivation (IoD) income domain at Lower Super Output Area (LSOA) level. More detailed income geographies can be mapped through the use of other data, if this is available. This data will be subsequently used in the analysis of air quality impacts experienced by households with different levels of income.

Step 2c – Identification of amenities in the impact area

- 4.3.3 There may be places within the impact area that attract large numbers of people from different income groups. An example would be clusters of shops in a town

which may be used exclusively or predominantly by low (or high) income groups, in which HDV traffic causes serious problems. The DI analyst should identify attractors that might experience changes in air quality as a result of the intervention, and consider the distribution of potential impacts across different social groups in the population. The locations of schools, nurseries, playgrounds, community centres, parks, open spaces and other facilities used by children, as sensitive receptors, should be mapped. Mapping should also consider the location of care homes and hospitals as those using these facilities have limited or no alternative options to lessen interference from local emissions sources.

4.4 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 4.4.1 The analyst should consider the impacts of the intervention, in accordance with the guidance described in [TAG Unit A3](#).
- 4.4.2 The changes in concentrations of air pollutants (NO₂ and PM_{2.5}) in the impact areas should be mapped. The approach taken should reflect the scale of the analysis. Where changes are localised to particular areas, it is sufficient to use simple tools, such as Excel, to attribute the impacts to specific areas. Where the impacts are widespread and complex, it is recommended that the analysis is integrated into a GIS tool, to enable overlay of the demographic profile data.
- 4.4.3 Mapping should be overlaid with income data, in order to estimate in detail the changes experienced by households in different groups.
- 4.4.4 The analyst should examine the changes in air quality that are forecast for schools in the impact area and provide comments.
- 4.4.5 The analyst should examine the changes in air quality that are forecast in these impact areas, and assess the scale of the change in comparison with the change in air quality experienced by the population as a whole.
- 4.4.6 The analysis should be undertaken on future years. This will be dependent on the assessment undertaken by air quality specialists, but may be one year or fifteen years after opening of the intervention.

Step 3b: Full appraisal of DIs and input into AST

- 4.4.7 The outputs of the air quality indicator should be presented in a worksheet showing the change in concentrations of air pollutants (NO₂ and PM_{2.5}) that amenities, such as schools, would experience as a result of the intervention.
- 4.4.8 The analysis of distributional impacts should provide, as an output, the relative numbers of people in different income groups experiencing improvement, deterioration or no change in air quality. This will draw on the spatial analysis of

socio-demographic data and changes in concentrations of air pollutants in the affected area.

4.4.9 Table 10 sets out an example of this analysis for the five quintiles in the income domain of Index of Deprivation (IoD). This is also available as a [worksheet](#). It presents the general approach to the grading of DIs for each social group, which is applicable to air quality DIs. This system should be applied for each of the five income groups. There is no strict guidance on what constitutes a significant proportion of the population in this case, although 5%, as in User Benefits, can be used as a guide.

Table 10 Example of Air Quality DI Analysis

	IoD Income Domain					Total
	Most deprived	←————→			Least deprived	
	0-20%	20-40%	40-60%	60-80%	80-100%	
Number of properties with improved air quality [A]	400	800	200	0	200	1,600
Number of properties with no change in air quality [B]	300	400	100	200	200	1,200
Number of properties with deteriorating air quality [C]	100	150	150	50	150	600
Number of net winners / losers [D] = [A] – [C]	300	650	50	-50	50	-
Total number of winners / losers across all groups [E] = $\Sigma[D]$	-	-	-	-	-	1,000
Net winners/losers in each area as % of total [F] = [D] / [E]	-30%	65%	5%	-5%	5%	100%
Share of total population in the impact area	24%	40%	13%	7%	16%	100%
Assessment	✓✓✓	✓✓✓	✓		✓	

Example: This shows the significant positive impacts that are experienced, in air quality terms, by the households in the lowest two income groups (comprising areas with the worst income deprivation), with 95% of the net numbers benefiting in air quality terms being in these most deprived income quintiles. It is appropriate to give a score of **large beneficial**.

- The least deprived quintile has a 16% share of the total population in the impact area, but only 5% of the ‘net winners’ in terms of reduced emissions levels. In this case the proportion of net winners is significantly smaller than

the proportion of the population as a whole, and it is appropriate to give a score of **slight beneficial**.

- The 'losers' in the impact area are the second least deprived quintile, with 7% share of the total population, but 5% of the 'net losers' in terms of worsening air quality. Despite an overall improvement in air quality for the population as a whole, this group suffers in both absolute and relative terms and it is therefore appropriate to give a score of **moderate adverse**.

4.4.10 Where analysis is required for amenities that draw people in to an area (attractors), the appraisal should report the impacts by LoD income groups and consider the duration of exposure at these locations. It is expected that, in most cases, only a qualitative assessment will be required, unless attractors have long dwell times or profiles of users are significantly affected by income.

4.4.11 There are usually different results for NO₂ and PM_{2.5}, as there are different speed emission relationships for these pollutants. This would result in two different air quality DI analysis results. The scores for each of the groups under consideration should be reported in the DI appraisal matrix and where necessary the pollutants referenced. A further qualitative statement should be provided if the transport intervention will result in DIs on air quality in an Air Quality Management Area (AQMA).

5. Distributional Impacts of Accidents

5.1 Introduction

5.1.1 Most transport-related accidents, injuries and deaths occur on the road network. Vulnerable groups (in terms of their accident risk) include children and older people (both particularly as pedestrians), young males and motorcyclists. There is also a strong link between deprivation and road accidents: children from social class V are five times more likely to be involved in a fatal road accident than those from social class I. Young males are also relatively vulnerable as drivers, and this group should also be considered if there is evidence that they form a significant proportion of casualties on the road network.

5.1.2 Consideration should also be given to the implications of accidents for users of the public transport network, particularly in terms of falls at bus stops and railway stations. Fatalities are rare, but accidents involving trips and falls for transport users can result in serious injuries, which can often have serious implications for older people. In addition, suicides, whilst rare, are a significant cause of fatalities. Trespass on the railway is a major problem in some areas, which can occasionally result in serious accidents or even fatalities. This issue

should also be considered for other segregated public transport modes, including guided bus.

5.2 Step 1: Screening

- 5.2.1 The screening process for accidents considers any change in alignment of a transport corridor (or road layout) or new transport corridor, that may have positive or negative safety impacts (identified through a qualitative assessment or from accident modelling outputs). In addition, the DI analyst should also consider whether the intervention causes any significant changes (>10%) in vehicle flow, speed, HDV use or a significant change (>10%) in the number of pedestrians, cyclists or motorcyclist using the road network.
- 5.2.2 If the intervention satisfies any of the above, then a full assessment should be undertaken. In many cases, the impact on accidents, vehicle speeds, flow, and HDV use is unknown until the results of the transport model are available. If the screening process is done in advance of any of these outputs being available, it should be assumed that a full assessment is needed until proved otherwise.

5.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 5.3.1 The impact area should be defined through the accidents analysis, in accordance with the requirements of [TAG Unit A4.1](#) (Accident Impacts Section).
- 5.3.2 For the purposes of interventions on the rail network, the primary interest is likely to be accidents occurring at rail stations. Attention should therefore be focused on the rail station itself; accidents on the road network outside the station should be addressed separately.
- 5.3.3 The impact area (as identified in screening and potentially refined through further analysis) should also include a defined band, which should be agreed with the safety analyst, to capture the potential impacts on pedestrians living in the area who need to move around the area on foot.
- 5.3.4 In the case of interventions that result in changes in the numbers of pedestrians and cyclists using the network (including walking and cycling interventions), the impact area should include links on the network on which increased numbers of these groups are forecast.

Step 2b: Identification of social groups in the impact area

- 5.3.5 The DI analyst should consider social groups living in the area that are vulnerable to accidents on the transport network, including **children** and **older people**.
- 5.3.6 In addition, in the case of interventions on the road network, analysis of deprivation statistics should take place, because there is evidence that people

living in more deprived areas are more vulnerable to accidents on the road network. The profile of local transport users should also be considered, including potentially vulnerable groups, for example **pedestrians, cyclists and motorcyclists**. For this indicator **young males (as drivers)** have also been identified as a specific vulnerable group within the area, and it is appropriate to consider the potential impacts on this specific group of road users.

Step 2c: Identification of amenities in the impact area

- 5.3.7 The concentration of vulnerable groups is not only based on resident population but also what attractors are within the impact area. The DI analyst should therefore identify local amenities that will be used by vulnerable groups in the area through a desktop research exercise.

5.4 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 5.4.1 The analyst should consider component parts of the transport intervention and assess the accident impacts of each component and also collectively. The approach should be proportionate.

Example: a local public transport interchange improvement might have limited impact on area-wide traffic volumes and hence accidents over a wide area, but may have the potential to affect local traffic and numbers of vulnerable users at road junctions near the interchange.

Rail Network

- 5.4.2 In the case of interventions on the rail network, primarily rail stations, the analyst should make reference to [TAG Unit A4.1](#), which highlights the legal requirement to ensure health and safety on the railways as far as is reasonably practicable. The analyst should collate data from the infrastructure owner and identify accidents at the station, and if there are any social groups that are vulnerable.

Example: Many of those suffering falls on the rail network are elderly people. When elderly people suffer such injuries, the effects of the injury are often significantly worse than the effects on the average person. In the event that the analyst identifies trips and falls as a problem that needs to be addressed, the groups suffering such injuries should be investigated, and the impacts of the intervention on these groups should be assessed.

- 5.4.3 Where other issues, such as suicide and trespass, are known to be a problem, the analyst should seek data on the groups that are prone to committing suicide

and trespass on the railway. The analyst should then consider the potential impacts of the intervention on these groups.

Road Network

- 5.4.4 In the case of interventions affecting the road network, the analyst should make reference to [TAG Unit A4.1](#) for separate guidance on highway interventions, public transport interventions and walking and cycling interventions. Most impact areas for transport interventions include large numbers of links on the road network and hence an efficient and proportionate approach to appraisal is required. An explanation of the justification for identifying the level of appraisal undertaken should be provided by the appraiser.
- 5.4.5 It is recommended that the analyst makes use of [COBALT](#) (the Department's accident analysis spreadsheet tool) or other analyses (where these have been undertaken) to systematically calculate the impact on accident rates at a link level. Alternatively transport model outputs (where available) should be used with spreadsheet modelling to examine changes in flows and speeds. The available outputs should then be examined together with changes in road layout, to identify the impacts on the numbers of accidents and casualties, initially at link level and then for the network as a whole.
- 5.4.6 Computer analysis does not, however, provide information on the numbers of casualties amongst the potential vulnerable groups of interest for the DIs, and casualty data therefore also needs to be examined.
- 5.4.7 COBALT or transport model outputs should be mapped to identify which links or areas of the road network will be subject to increased vehicle flow, speed or HDV use. STATS19 casualty data⁴ should then be mapped (using GIS) for the area impacted by the intervention and the causes of collisions on the affected road links / network identified.

Qualitative appraisal

- 5.4.8 If the number of casualties on the affected links is not more than 50 over a 5 year period, or suitable COBALT or other accident analysis is not available, a qualitative assessment should be undertaken. STATS19 casualty data should be used to identify the number and proportion of vulnerable group casualties within the impact area / on the affected links. This analysis should identify if these groups form a significant proportion of overall casualties.
- 5.4.9 This information should then be used, together with the findings of the demographic analyses, to identify clusters of potential vulnerable groups that are casualties on the road network, at individual junctions and along individual

⁴ Accidents reported to the police are recorded on a STATS19 form. These are continuously collated and provide detailed statistics about the circumstances of personal injury road accidents, including the types of vehicles involved and the consequent casualties. For more information see <https://www.gov.uk/government/organisations/departement-for-transport/series/road-accidents-and-safety-statistics>

links. This should include, as a minimum, the identification of the potential vulnerable groups described previously (children, older people, young males, motorcyclists, pedestrians and cyclists). If the demographic profiling has identified deprived areas, the analyst should consider if there is any evidence of casualty rates in the deprived areas being higher than national average rates.

- 5.4.10 A qualitative assessment should then be undertaken providing information on the likely impact on vulnerable groups (from demographic analysis and identification of accident clusters) based on the forecast change in accident rates (or assumed changes based on transport model outputs) within the impact area /affected links.
- 5.4.11 Within this qualitative appraisal it is essential to understand the underlying issues inherent in any identified accident problems. This is particularly important when considering the design of non-engineering measures, as the design will be influenced by levels of local deprivation in which the casualties occur.

Detailed appraisal

- 5.4.12 If suitable COBALT or accident modelling data is available, and there are over 50 casualties on each affected link / impact area over 5 years, then a detailed assessment should be undertaken for those links / impact areas.
- 5.4.13 Using the mapped affected links / road network and STATS19 casualty data, casualty hotspots within the impact area should be identified as well as the casualty rate per vulnerable group on each link.
- 5.4.14 Data for the impact area / links should then be compared to average casualty rates for the road type under consideration to identify where there are high casualty rates for the vulnerable groups. Guidance on the average casualty rates can be found in [TAG Unit A4.1](#).
- 5.4.15 These vulnerable casualty rates should then be compared against the forecast changes in accidents for the impact area on the network. It is recommended that the DI analyst uses spreadsheet modelling techniques, using outputs of the changes in total accidents, where there are a large number of links or junctions. The worksheet shown in Table 11 should be used to estimate the benefit to each vulnerable group for each link on the network. This is also available as a [worksheet](#).

Example: If the detailed analysis has demonstrated that the link currently has a high casualty frequency for children and the analysis forecasts an overall 40% reduction in accidents on the link, the assessment for children will be large beneficial.

- 5.4.16 The individual assessments for each potential vulnerable group, for each link, should then be collated and an overall score defined, using the seven-point scale, from large beneficial to large adverse. A qualitative statement should be added to the overall appraisal score, particularly in cases where there are both beneficial and adverse impacts on different links.

- 5.4.17 Within this detailed appraisal it is essential to understand the underlying issues inherent in any identified accident problems. High-level numerical analysis alone is unlikely to reveal the local issues and without such understanding the design of intervention strategies is weakened. This is particularly true when considering the design of non-engineering measures, where the design of such interventions will be highly dependent on whether the casualties occur within a deprived area or live near one.
- 5.4.18 The process should then use the following criteria to determine the overall appraisal score for the intervention:
- A majority vote of overall scores is used to determine the final score;
 - For an equally split number of scores the analyst should choose the more conservative score; and
 - For an equally shared scoring the analyst should choose the midway score.
- 5.4.19 A worked example of this approach for a small intervention is provided in Table 11.

Smaller scale interventions on road network

- 5.4.20 If computer analysis has not been undertaken, for example in the case of smaller interventions on the road network (e.g. an individual road safety intervention or a new pedestrian crossing), the worksheet shown in Table 11 can be used to provide an additional assessment of the impacts on each vulnerable group for each link / junction to provide a check. This check should be based on consideration of changes in physical road layout, changes in traffic flows and speeds and the volume of pedestrian and cyclist activity in the area.

Table 11 Worksheet for assessing accident DIs for smaller interventions

Link Reference: _____
Vulnerable casualty group: _____

	Existing casualty rate for vulnerable users		
	Defined vulnerable casualty group:		
	Low (more than 30% lower than average rate for class of road)	Medium <30% lower to <30% higher than average for class of road	High (more than 30% higher than average rate for class of road)
1. Change in physical layout that could impact on defined vulnerable group			
Significant improvement	Moderate Beneficial	Moderate Beneficial	Large Beneficial
Slight improvement	Slight Beneficial	Slight Beneficial	Moderate Beneficial
Neutral	Neutral	Neutral	Neutral
Slight worsening	Slight Adverse	Slight Adverse	Moderate Adverse
Significant worsening	Moderate Adverse	Moderate Adverse	Large Adverse
2. Change in traffic flow OR speed			
Significant reduction (>15% decrease)	Moderate Beneficial	Moderate Beneficial	Large Beneficial
Slight reduction (>5%, <15% decrease)	Slight Beneficial	Slight Beneficial	Moderate Beneficial
Neutral (<5% increase or decrease)	Neutral	Neutral	Neutral
Slight increase (>5%, <10% increase)	Slight Adverse	Slight Adverse	Moderate Adverse
Significant increase (>10% increase)	Moderate Adverse	Moderate Adverse	Large Adverse

3. Change in numbers of pedestrians, cyclists and motorcyclists

The evidence on the impacts of changes in numbers of pedestrians and cyclists on overall numbers of casualties is not conclusive. Some practitioners consider that increased numbers of cyclists on the road network result in increased visibility for the group, encouraging drivers to modify their behaviour. It is therefore the responsibility of the analyst to consider the implications of changes in the numbers of pedestrians and cyclists and judge the implications for road safety of vulnerable road users accordingly.

Motorcyclists are highly vulnerable users of the road network. Careful consideration should be given to the potential road safety implications of measures that could result in changes to numbers of motorcyclists on the network.

Overall assessment for link, based on criteria 1, 2 and 3 above: _____
Qualitative Commentary: _____

- 5.4.21 The worksheet should be used for each of the potential vulnerable user groups for each of the links/junctions affected by the transport intervention. The approach set out is only intended for smaller interventions in which a small number of links would be affected by physical changes in road layout and modest changes in traffic flows and / or speeds.
- 5.4.22 In these cases, the overall assessment of the impact on each of the defined potential vulnerable groups should then be scored, based on the scores derived from individual links.
- 5.4.23 The process should use the following criteria to determine the overall appraisal score:
- A majority vote of overall scores is used to determine the final score; and
 - For an equally split number of scores the analyst should choose the more conservative score.

Step 3b: Full appraisal of DIs and input into AST

- 5.4.24 The main outputs produced as a result of the road safety appraisal process will be a series of analyses, which should then be used to provide the overall appraisal of the road safety impacts for each social group. The output will vary dependent on the level of assessment undertaken.
- 5.4.25 Table 12 below sets out an example of part of this analysis for vulnerable groups that have been identified for a smaller transport intervention. A similar table would be required to report junction effects if these had been assessed separately to link effects.

Table 12 Example of a summary analysis for a smaller intervention

Link	Vulnerable social groups			Vulnerable network users		
	Children	Older People	Young Males	Peds	Cyclists	M/cyclists
1	Slight Ben.	Mod. Ben.	Neutral	Mod. Ben.	Slight Ben.	Neutral
2	Mod. Ben.	Mod. Ben.	Neutral	Mod. Ben.	Mod. Ben.	Neutral
3	Slight Ben.	Mod. Ben.	Neutral	Mod. Ben.	Slight Ben.	Neutral
4	Slight Ben.	Mod. Ben.	Slight Ben.	Mod. Ben.	Slight Ben.	Mod. Ben.
5	Slight Ben.	Mod. Ben.	Neutral	Mod. Ben.	Slight Ben.	Neutral
6	Neutral	Neutral	Slight Ben.	Neutral	Neutral	Slight Ben.
7	Neutral	Slight Ben.	Neutral	Slight Ben.	Neutral	Neutral
Overall	Slight Ben.	Mod. Ben.	Neutral.	Mod. Ben.	Slight Ben.	Neutral

- 5.4.26 In the case of larger interventions, in which there are potentially large numbers of links, the approach should be automated, for example through the use of spreadsheet tools.
- 5.4.27 The overall scores for each of the vulnerable groups under consideration should then be reported in the DI appraisal matrix, along with a qualitative statement to explain the methodology and findings of the appraisal.

6. Distributional Impacts of Severance

6.1 Introduction

- 6.1.1 Literature has highlighted the groups in society that are potentially vulnerable to the effects of severance as a result of the transport network. Such groups include people without access to a car, older people, and people with disabilities and parents with pushchairs. Children are also considered to be potentially

vulnerable to severance as they are more likely to cross the road at dangerous crossing points, and find it difficult to judge the speed of traffic, hence putting themselves at risk of road accidents. These groups often experience longer journey times, or are often required to use pedestrian routes that are inappropriate and difficult to use. Mitigation measures such as footbridges and underpasses can also cause severance, by creating longer journey times for users, compared with at grade crossings.

6.2 Step 1: Screening

- 6.2.1 Severance is often an unintended consequence of a measure to address other problems. The screening process identifies interventions whereby these measures could impact on vulnerable groups. Screening should identify the introduction or removal of barriers to pedestrian movement either through changes to road crossing provision, or through introduction of new public transport or road corridors. Any areas with significant changes (>10%) in vehicle flow, speed or % HDV content should also be considered for full assessment. The DI analyst should consider these factors and complete the proforma to identify whether or not it necessary to continue to the assessment in step 2.

6.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 6.3.1 The impact area should be defined through the severance analysis, which should be undertaken in accordance with the requirements of [TAG Unit A4.1](#) (Severance Impacts Section).

Step 2b: Identification of social groups in the impact area

- 6.3.2 Particular groups that are vulnerable to the effects of severance include no-car households, older people, children and people with disabilities.
- 6.3.3 In view of the local nature of severance effects, this analysis should take place at Output Area level. The DI analyst should compare the proportions of the population in each area for these vulnerable groups with the regional average, and highlight where there are significant concentrations of these groups.

Step 2c: Identification of amenities in the impact area

- 6.3.4 Building on the mapped concentrations of the potential vulnerable groups within the impact area, the analyst should also undertake desktop research to examine the location of community facilities of importance to such groups, including GP surgeries, community centres, schools, and local shops, places of worship and playgrounds, parks and sports centres.

6.4 Step 3: Appraisal of Impact

Step3a: Core analysis of impacts

- 6.4.1 It is important that the appraisal considers the changes in severance to the local community and considers the axes of movement that are likely to be affected by an increase or decrease in severance following the introduction of a transport intervention. More information on this can be found in the Design Manual for Roads and Bridges (DMRB) LA 112.
- 6.4.2 Where required the analyst should follow the technical guidance in DMRB LA 112 to assess:
- The change in the level of severance;
 - Associated changes in journey length;
 - Existing and alternative routes used; and
 - Possible mitigation measures.
- 6.4.3 The analyst should use judgement in identifying the most appropriate process for assessing the DIs of severance for the transport intervention, ensuring the process is proportionate to the likely impacts of the intervention and concentrations of the identified potential vulnerable groups.

Desktop analysis

- 6.4.4 GIS mapping should be used to plot community facilities identified in step 2c as well as the concentrations of potentially vulnerable groups identified in step 2b and a series of walking distance catchments for the identified facilities.
- 6.4.5 These walking catchments should be based on, where possible, established walking routes used by the community and not 'crow-fly' distances. It should include consideration of up to 800m walk journeys to community facilities and bus stops with a 400m walk. It may also be necessary to consider other significant facilities, including secondary and further education sites if they lie within a 1km walking distance from the community..
- 6.4.6 Furthermore the distances should take account of the needs of the groups who are particularly vulnerable to severance effects and the practical limitations on how far different groups of people can walk. For example, shorter catchments should be used for older people.
- 6.4.7 The DI analyst should then use the existing walking catchments to inform the analysis of impacts as a result of the transport intervention. For example, the introduction of a new footbridge to replace an at grade pedestrian crossing

could potentially add to the effective walking distance to cross the road (taking into account ramps) and will also involve a climb that could affect the effective distance travelled (affecting older people in particular).

- 6.4.8 The analyst should then plot the revised walking distance catchments with the intervention in place. The final stage involves the calculation of the numbers of people in the defined potential vulnerable groups likely to be positively or negatively affected with and without the intervention.

Site visit / audit

- 6.4.9 The analyst is encouraged to visit the impact area to gain insight into the dynamics of the community and highlight any specific severance issues that could impact on the potential vulnerable groups. This information should be fed into the desktop analysis.
- 6.4.10 The audit could take place together with the designer to consider the elements of the intervention that may cause severance and how these could be mitigated. This assessment could consider elements such as signalised crossings, pedestrian guardrails, footbridges and subways.

Primary research

- 6.4.11 Primary research should only be considered in the case of complex interventions that will have significant impacts on severance for a large number of people within potentially vulnerable groups, or for transport interventions which have an explicit objective to reduce severance.
- 6.4.12 This research should be specifically targeted at the potential vulnerable groups identified in the previous steps. Options for primary research include qualitative research, such as focus groups, or quantitative surveys of these groups of people. The analyst should use judgement in determining the most appropriate method to be used, which should be appropriate to the scale of the intervention and the number of potential vulnerable groups identified.
- 6.4.13 This research should identify specific severance concerns and the extent to which people will change their journeys in response to these concerns. The research and evidence gathered from the desktop analysis and site visit/audit described earlier should assist discussions and form the basis for research, for example, difficulties faced by older people when crossing busy roads without pedestrian crossings or refuges.
- 6.4.14 This should include consideration of both diversion and suppression of trips resulting from any increase in severance. Conversely, it should also consider re-routing and 'generation' of trips in a local area resulting from a reduction in severance.
- 6.4.15 The research should systematically consider the local access needs of key facilities of relevance to each group of people. For example, primary schools

should be considered in discussions with parents of young children, while GPs and other community facilities should be discussed with groups from the wider community as a whole.

Step 3b: Full appraisal of DIs and input into AST

- 6.4.16 The statistical outputs of this indicator will identify the approximate proportion of people in potential vulnerable groups that reside or use the area. The mapping of outputs will support the statistical findings by illustrating where the issues exist for the different potential vulnerable groups.
- 6.4.17 A qualitative commentary of the severance issues for the potentially vulnerable groups should also be provided to detail the issues behind the statistics and highlight where measures should be considered to mitigate against the potential severance impacts identified for these groups.
- 6.4.18 The precise content of the analysis will be dependent on the types of services and locations (both existing facilities and alternatives that might instead be used), and the needs of users.
- 6.4.19 The outputs from this appraisal should be converted into a format that can be used to inform the DI analysis. Table 13 provides an example of a completed worksheet that presents the differences in the severance impacts experienced by different groups. It takes into account the locations of community facilities, the population served and the roads that need to be crossed, which is shown in the worksheet as locations a, b, c...n. This is also available as a [worksheet](#).

Table 13 Example of a completed worksheet for the assessment of Severance Distributional Impacts

	All social groups			No-car households			Young people			Older people			People with disabilities		
	Change in severance [A]	No of people affected [B]	Overall effect [A]*[B]	[A]	[B]	[A]*[B]	[A]	[B]	[A]*[B]	[A]	[B]	[A]*[B]	[A]	[B]	[A]*[B]
Location a	Slight +ve. (+1)	500	+500	+1	200	+200	+1	200	+200	+1	200	+200	+1	50	+50
Location b	Mod. +ve (+2)	1000	+2000	+2	500	+1000	+2	300	+600	+2	400	+800	+2	200	+400
Location c	Large. +ve (+3)	400	+1200	+3	250	+750	+3	100	+300	+2	100	+200	+2	80	+160
Location d	Neutral (0)	600	0	0	200	0	0	200	0	0	350	0	0	240	0
Location e	Slight -ve. (-1)	2000	-2000	-1	900	-900	-1	900	-900	-2	700	-1400	-2	630	-1260
Location f	Mod. -ve. (-2)	400	-800	-2	300	-600	-2	150	-300	-3	200	-600	-3	130	-260
Location n	Slight -ve. (-1)	500	-500	-1	100	-100	-1	100	-100	-2	100	-200	-2	180	-360

Reference Source(s): GIS analysis of locations and number of people in potential vulnerable groups likely to be affected by severance as a result of Intervention X - See GIS Plan 001 for locations a, b, c / GIS Plan 002 for locations d, e, f / GIS Plan 005 for location n.

Assessment Score: For 'All social groups' overall (net) score is +400 with a positive impact = Moderate Beneficial. No car households = Moderate Beneficial, Young People = Slight Adverse, Older People = Moderate Adverse, People with Disabilities = Large Adverse:

Qualitative comments: Severance problems identified in location e - include increase in walking distance and slope gradient caused by the new pedestrian foot bridge 'A', which impacts on older people and people with disabilities.

- 6.4.20 The left-hand part of the table shows the overall severance assessment, which has been derived from the core work undertaken using guidance in [TAG Unit A4.1](#). The right-hand part of the table presents the severance assessment for the identified vulnerable groups. The important difference in this case is that the severance assessment, in each location, varies depending on the specific issues that are faced by each social group. When looking at people living in no-car households, it is assumed that their levels of mobility are identical to the wider population, so the severance scores are consistent with the overall scores.
- 6.4.21 However, there are significant differences for older people and people with disabilities due to the specific problems that have been identified on certain parts of the network for these groups. This could, for example, be due to the introduction of a pedestrian bridge with long ramps that significantly add to the distance that must be travelled, which has particularly serious impacts on older people or people in wheelchairs.
- 6.4.22 It can be seen that the summary assessments for each of the social groups are different to the overall severance assessment that is taken forward as the summary score in the AST. It can also be seen that the overall severance assessment is not necessarily equal to the 'sum' of the individual scores for each social group. This is because the individual groups in the table have specific needs and challenges, which are highlighted in much greater detail than the overall severance assessment.
- 6.4.23 The scores for each of the groups under consideration should then be reported in the DI appraisal matrix.

7. Distributional Impacts of Security

7.1 Introduction

7.1.1 Research evidence shows that there are several groups with particular concerns about their personal security. Women, younger people (teenagers), older people, people with disabilities and Black and Minority Ethnic (BME) communities tend to perceive risk more acutely when using public transport. Furthermore, public transport users tend to be from lower income groups. These users may suffer from greater anxiety when using public transport leading to the potential suppression of travel, which could reduce the effective accessibility of the transport system.

7.1.2 There are, therefore, potential social impacts (in personal security terms) from making changes to the transport system and these should consider the specific concerns of women, young people, older people, people with disabilities and BME communities. Distributional impacts could otherwise be considered, in terms of impacts on households in different income bands.

7.2 Step 1: Screening

7.2.1 The measures included in the security assessment are discussed in detail in [TAG Unit A4.1](#), and include consideration of the following:

- Any change in public transport waiting facilities / interchange facilities;
- Changes to pedestrian access;
- Changes to provision of lighting and visibility;
- Changes to landscaping; and
- Changes to formal or informal surveillance.

7.2.2 The screening process should identify the proposed changes and discuss any positive or negative impacts arising from the intervention. Justification should be provided within the [screening proforma](#) (Appendix A) if a security appraisal is not considered necessary for the intervention.

7.2.3 Security appraisal should be considered for all transport interventions (public transport, road, freight, aviation, maritime).

7.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 7.3.1 The impact area is defined through the security analysis, which should be undertaken in accordance with the requirements of [TAG Unit A4.1](#) (Security Impacts Section).
- 7.3.2 In the case of public transport interventions, the impact area will include the specific locations where improvements are being made to personal security, together with the catchment area for walking to the facility. This area will be agreed with the security analyst.
- 7.3.3 It is likely that roadside facilities on the transport network will be used by a range of users from a very wide catchment area. In this case, it is not appropriate to attempt to identify an impact area.

Step 2b: Identification of social groups in the affected area

- 7.3.4 There are certain groups that have particular concerns about their personal security. The DI analyst should analyse the proportions of people within these groups (see paragraph 5.1.1) living in the impact area that could be affected, in terms of personal security, by the proposed transport intervention. This should include older people, children, women, people with disabilities and BME.
- 7.3.5 The DI analyst should compare the proportions of the population in each area from these groups with the local or regional average, and highlight where there are significant concentrations of these groups.

Step 2c: Identification of amenities in the impact area

- 7.3.6 The concentration of vulnerable groups is not only based on resident population but also what attractors are within the impact area. For example, the overall proportion of children in the impact area may not be high, but if there is a school located within the area there is likely to be more children travelling within the impact area that should be considered within the assessment. The DI analyst should therefore identify local amenities in the impact area that could be used by vulnerable groups in the impact area through a desktop research exercise. Amenity data allows qualitative assessments / statements to be made to add value to the appraisal and provides a wider assessment than just that of the resident population which is vital in some places and for some interventions.

7.4 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 7.4.1 The analyst should appraise the collective security impacts of the transport intervention, in accordance with the guidance described in [TAG Unit A4.1](#). This requires an assessment of security impacts (both actual and perceived) of the transport intervention on a number of potential vulnerable groups.
- 7.4.2 Consideration should be given to the typical journeys made by the various potential vulnerable groups and their likely time of travel. For instance older people are unlikely to be travelling for work purposes and hence not travelling during peak commuting times when natural surveillance will be at its highest. Younger people are more likely to travel for social reasons in the evening when perceptions of security are heightened by incidence of anti-social behaviour and potential concerns of users about isolation and travelling alone.
- 7.4.3 The analyst should draw on published research that considers the travel and security issues faced by these different groups of people. In the case of an intervention that has relatively modest impacts on security, this existing research will be adequate in considering these issues.
- 7.4.4 The level of data available on the intervention will determine the level of analysis required. Detailed assessment should be used where comprehensive information on the range and level of security measures and users is available, as detailed below. Where this level of data is not readily available, the analyst should undertake a qualitative appraisal of the impact on personal security as a result of the intervention, with detailed justification for the assessment and scoring given.

Detailed assessment

- 7.4.5 Table 14 shows the [worksheet](#) that should be used to undertake analysis of the DIs of personal security. This provides a worked example, for a hypothetical improvement to a public transport interchange facility, which is used by around 8,000 users per day.

Table 14 Worked example of an Assessment of Personal Security DIs

Security Indicator and element of entire journey	Performance for each security indicator			Relative importance of each indicator [B] (High /Medium /Low) (=3/2/1)				Weighted score for each indicator [C] = [A] * [B]			
	Without scheme	With scheme	Change (0/+1/+2) [A]	All users	Older people	Women	Young people	All users	Older people	Women	Young people
Access on foot from origin to the public transport stop	Moderate	Moderate	0	Medium	Medium	Medium	Medium	0	0	0	0
Site perimeters, entrances and exits	Moderate	Moderate	0	Medium	Medium	Medium	Medium	0	0	0	0
Formal surveillance	Poor	Moderate	+1	Medium	Medium	High	Medium	2	2	3	2
Informal surveillance	Moderate	High	+1	Medium	Medium	Medium	Medium	2	2	2	2
Landscaping	Moderate	Moderate	+1	Medium	Medium	Medium	Medium	0	0	0	0
Lighting and visibility	Poor	High	+2	Medium	Medium	High	Medium	4	4	6	4
Emergency call	Moderate	High	+1	Medium	Medium	High	Medium	2	2	2	2
Staffing of facility	Poor	High	+2	Medium	High	Medium	Low	4	6	4	2
Public transport journey between the boarding and alighting stops	Moderate	Moderate	0	Medium	Medium	Medium	Medium	0	0	0	0
Access on foot from the alighting stop destination	Moderate	Moderate	0	Medium	Medium	Medium	Medium	0	0	0	0
Total security improvement score [D] = [C]								13	15	17	10
No of users affected (<500 users / day is low, >10,000 is high) [E]								8,000	500	3,500	3,000
Overall assessment of security impacts (al users and vulnerable groups)								Mod. Ben.	Slight Ben.	Mod. Ben	Mod. Ben.

- 7.4.6 This worked example is based on the existing approach used for the assessment of security, but has been enhanced to describe the impacts on specific potential vulnerable groups. Column [A] in the worksheet is based on the change in the individual security indicator resulting from the proposed intervention. A score of zero signifies no change (for example, a moderate score in both 'without scheme' and 'with scheme' cases). A score of 1 signifies a slight improvement (for example, from poor to moderate, or moderate to high). A score of 2 signifies a larger improvement (for example, from poor in the 'without-scheme' to high in the 'with-scheme' case). It may be possible to use quantified information on journey quality of safety/ security measures introduced as part of an intervention and researched through use of stated preference surveys.
- 7.4.7 The worksheet applies a scoring system, taking into account the weightings applied by different user groups, to calculate an overall assessment of the impact of the public transport improvement on the population at large and on individual potential vulnerable groups. It can be seen that the score is highest for women (at 17) and lowest for young people (at 10).
- 7.4.8 The overall assessment of security impacts is likely to be large beneficial when the improvement to one of the more important indicators is substantial (i.e. from poor to high) and when the number of users is greater than 10,000. The worksheet shows that there are two important indicators with substantial improvements: lighting and visibility and staffing, which are shaded in the table.
- 7.4.9 There are a total of 8,000 users per day, which gives an overall assessment of **moderate beneficial**. In the case of each potential vulnerable group, it is necessary to make a qualitative assessment, based on the estimated numbers of users and security score for each group. In the case of older people, there are 500 users per day, which triggers a slight beneficial score, whilst the other groups receive a moderate beneficial score.
- 7.4.10 It can be seen that the completion of the worksheet requires judgements, based on the existing evidence on the importance of different elements of security to different potential vulnerable groups using the transport system. In the case of relatively simple interventions, in which there are relatively minor changes to infrastructure, it is adequate to use this desktop-based approach.
- 7.4.11 In the case of a more complex intervention (in which the potential security impacts are not clear), or an intervention that has an explicit objective to improve security, the analyst should consider the need to visit and audit the site of the intervention and undertake primary research with local residents and potential/future users of the intervention as described in the following sections.

The Role of a site visit/audit

- 7.4.12 A site visit/audit is primarily encouraged as part of the process of analysing local severance issues for the DI appraisal in the impact area and could also provide an opportunity to identify security issues in relation to infrastructure when travelling in the local area, including to and from public transport stops. The

analysts responsible for the security and severance appraisals should liaise to ensure that key issues are addressed and findings from the site visit/audit are taken into account in both indicators.

Primary research

- 7.4.13 Primary research should only be considered in the case of complex interventions that will have significant impacts on security for a large number of potentially vulnerable groups, or for transport interventions which have an explicit objective to improve security.
- 7.4.14 This type of research should be specifically targeted at the potential vulnerable groups, identified in the previous steps, to gain information and understanding on how the intervention is likely to affect them. However, this should not preclude the analyst from considering other groups that could be affected in the local area. Options for primary research include qualitative methods (e.g. focus groups) or quantitative surveys. The analyst should use judgement in determining the most suitable approach to be used, which should be appropriate to the scale of the intervention and the number of potentially vulnerable groups identified.
- 7.4.15 This research should identify specific security concerns and the extent to which people will change their journeys in response to these concerns. The research should also be used to identify the relative importance of each personal security indicator to each of the potential vulnerable groups.
- 7.4.16 The primary research should consider the issues as identified in the worksheet (Table 14) during the focus groups, in terms of the current issues, potential improvements with the intervention, and the importance of the issue to the different groups of people. Any other salient impact of the transport intervention on security should also be considered.
- 7.4.17 The data from the desktop analyses, site visit/audit and primary research, if appropriate, should be used to inform the scoring in the appraisal process. It should also be used to identify the scope to improve the design to better tackle particular security concerns amongst the potential vulnerable groups under consideration.
- 7.4.18 The analyst may identify security concerns and interrelated issues that fall outside the initial design remit of the transport intervention. This may require further investigation and involvement from other public sector partners, for example, issues relating to street lighting, which should be discussed with the local highway authority.

Step 3b: Full appraisal of DIs and input into AST

- 7.4.19 The scores for each of the groups under consideration should be reported in the DI appraisal matrix. A qualitative statement should be provided to support the findings of the assessment for entry into the AST.

8. Accessibility Impacts

8.1 Introduction

- 8.1.1 As discussed in [TAG Unit A4.1](#), accessibility impacts of an intervention proposal should be considered throughout the appraisal process, since accessibility is of key importance in the operation of the transport system. This is primarily a distributional issue and hence the methodology to derive an appraisal score for the AST is covered in this TAG Unit.
- 8.1.2 The appraisal of accessibility within this Unit focuses on the **public transport accessibility** aspect of accessing employment, services and social networks. This provides a holistic approach to considering the accessibility needs of different groups of people, taking into a wide range of factors, including journey times to reach key destinations, service frequencies and provision of accessible boarding at stops.
- 8.1.3 This links with severance impacts (see [TAG Unit A4.1](#)), which appraises barriers to accessibility within a local community, focusing on walking to local facilities, including access to the public transport stop. It also links with Security, Personal Affordability, Journey Quality, and Option Values and Non-Use Values impacts (also in [TAG Unit A4.1](#)) and Section 9 on personal affordability impacts, because these impacts and issues themselves can act as barriers to accessibility.
- 8.1.4 The approach also considers the end-to-end journey, which includes the physical access on to and within the public transport system (such as low floor access vehicles, capacity for wheelchairs) and aspects such as audio visual announcements informing passengers that the vehicle is stopping.

8.2 Vulnerable Groups

- 8.2.1 Different social groups have different transport needs and priorities. These complex relationships need to be understood and carefully considered during the examination of the need for intervention, developing and sifting of options, and detailed appraisal of preferred options.
- 8.2.2 Examples of such different needs are given below:
- Good access to healthcare is particularly important for **people with children, older people and those with a long term illness** and these people may place greater value on the availability of routes closer to home, lower priced fares and higher frequency services than other groups;

- **People with disabilities** are less likely to drive and more likely to be dependent on public or community transport that offers door to door usage, or lifts from family and friends;
- In some **rural areas** access to a public transport route can be crucial to maintaining accessibility to essential services such as shopping for food;
- **Women** are less likely than men to have access to a car during the day and are often undertaking more complex trip chains relating to caring responsibilities or school drop offs/pickups; and
- People on low incomes living in households with **no access to a car** are particularly vulnerable to social exclusion in the event that public transport does not provide the accessibility needed to reach key destinations.

8.3 Step 1: Screening

- 8.3.1 Transport interventions will often have differentiated impacts on accessibility as experienced by different groups of people, including young people, older people, disabled people, Black and Minority Ethnic communities and carers. Screening for appraisal of accessibility impacts should consider changes in services, routings or timings of current public transport services within the impact area. In addition changes to waiting facilities (bus stops/rail stations) and rolling stock, or any indirect impacts on accessibility to services (e.g. demolition and re-location of a school) should also be examined. The DI analyst should consider these factors and complete the proforma (Appendix A) to identify whether or not it is necessary to continue to the full assessment in step 2.

8.4 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 8.4.1 For all types of transport intervention defining the impact area should take account of the following:
- Identification of public transport corridors affected by a transport intervention; and
 - Identification of key destinations served by these public transport corridors.

Identification of public transport corridors

- 8.4.2 The public transport corridors likely to be affected by the transport intervention need to be identified. For example, in the case of bus interventions, this will need to include the bus corridor itself and any other bus routes that use the whole or part of the bus corridor. New railway stations should include the station's wider catchment area and in the case of highway interventions, bus services using existing roads being altered should be considered.

Step 2b: Identification of social groups in the impact area

- 8.4.3 There are certain groups that are particularly vulnerable to the effects of poor accessibility. The DI analyst should analyse the proportions of people within these groups living in the impact area that could be made initial reference to any existing local policy documents, such as the Accessibility Strategy (within the Local Transport Plan) and Local Community Strategy, to establish the key accessibility challenges identified for different groups, particularly the potential vulnerable groups within the impact area.
- 8.4.4 It is also advisable to make contact with the Local Authority officer responsible for Accessibility Planning to establish any existing accessibility evidence that may have been collated for the area. This will also provide the analyst a better first-hand understanding and appreciation of the issues faced by residents in the area.
- 8.4.5 In view of the local nature of accessibility effects, this analysis should take place at Output Area level. The DI analyst should compare the proportions of the population in each area from the selected social groups with the local authority average, and highlight where there are significant concentrations of these groups.

Step 2c: Identification of amenities in the impact area

- 8.4.6 Consideration of the key destinations/amenities served by the public transport corridors identified in step 2a above could include town centres, major employment areas, hospitals, centres of higher and further education and secondary schools.
- 8.4.7 The DI analyst should make reference to existing evidence and policy documents in identifying these key destinations, including the Accessibility Strategy (Local Transport Plan). Previous accessibility audits may have been undertaken for the local area and it is therefore appropriate to contact the Accessibility Planning officer for the local authority to be certain of any existing evidence.
- 8.4.8 Consideration should also be given to the potential impacts of an intervention on access to key destinations outside the immediate area of interest, for example within an adjacent local authority area. This will require liaison with the relevant local authority or transport authority to obtain appropriate data. The

identification of destinations should also take into account the destinations that people actually need to reach. The DI analyst should not assume that people wish (or indeed are able) to travel to their nearest facility. Understanding the local accessibility priorities and problems will be a key element of the appraisal.

- 8.4.9 The identification of destinations outside the immediate area could in turn result in the expansion of the area impacted by the proposed intervention defined in step 2a and as such the impact area should be redefined to reflect this.

8.5 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 8.5.1 The core analysis of accessibility DIs consists of two assessments, a **strategic accessibility assessment** to identify changes in opportunity to access services and journey time changes and an **accessibility audit** which provides an assessment of the accessibility of infrastructure associated with the intervention and the access onto and within the public transport network.

Strategic accessibility assessment

- 8.5.2 A strategic accessibility assessment can be undertaken using accessibility mapping using GIS or an accessibility planning software package. Accessibility mapping should be undertaken for the scenarios 'without scheme' and 'with scheme'. The 'with scheme' scenario(s) should reflect changes to the public transport network resulting from the intervention as identified in step 2.
- 8.5.3 It is important to establish what other modes of public transport may become less or more accessible to passengers and to understand the frequency and interchange timings that are relevant for reaching key destinations.
- 8.5.4 Accessibility mapping should provide the analyst with contour maps showing accessibility to the specified destinations within selected time periods appropriate to the intervention under consideration, such as off-peak, evening and/or weekends, and for appropriate catchment time bands, for example 10, 20, 30, 40, 50, 60 minutes. Alternatively in cases where the nearest destination is not always the most suitable (e.g. employment) then a calculation can be performed to identify the number of destinations that are accessible from a set of origins within specified time periods. This will provide an accessibility 'score', with the higher the score denoting the more accessible origin.
- 8.5.5 The analyst should then undertake a series of assessments, using a suitable GIS tool, to calculate the impacts of the intervention on public transport journey times to a series of key destinations, for a series of public transport users and potential vulnerable groups.
- 8.5.6 The outputs of the accessibility analysis are presented in step 3 in a series of **strategic accessibility assessment worksheets**. Table 16 provides an example of a completed worksheet to illustrate this analysis.

Accessibility audit

- 8.5.7 The analyst should identify and consider the other elements of the intervention that will have impacts on accessibility for different users. For example if a quality bus corridor is being proposed the analyst should take into account (but is not limited to) the following:
- Frequency of services – for example is the service every 10 minutes or more during peak and daytime hours?;
 - Boarding and alighting – for example, are there level boarding kerbs, have low-floor buses been proposed to serve the route, and will the bus be able to stop in line with the kerb?;
 - Is there provision for visually impaired people at the bus stops to gain information on route times and also of approaching services?;
 - Are the vehicles to be used fully internally accessible? How easy is it for older people and people with disabilities to access and alight safely and what is the space available for pushchairs?; and
 - Movement within interchanges – is there provision for ease of movement between services and modes, distance that must be walked, access of thoroughfare, ramps or steps and clarity of directions?
- 8.5.8 The analyst should first undertake a desktop analysis of these issues, focusing on the end-to-end journey for the user, and obtain any necessary technical specifications required to give understanding of the proposed provision as part of the intervention.
- 8.5.9 It may also be necessary to undertake a site audit of the impact area; examining the main public transport infrastructure such as stations and waiting facilities and also proposed vehicles. The audit should provide digital images as documented evidence.
- 8.5.10 Any existing problems should be identified, and opportunities taken to assess how these existing barriers can be tackled as part of the design process. The specific impacts of the intervention, both positive and negative, should then be considered. The accessibility audit worksheet (refer to Table 18) is a suitable tool for undertaking the desktop analysis and audit work.
- 8.5.11 A site visit/audit is primarily encouraged as part of the process of analysing local severance issues in the impact area and could also provide an opportunity to identify accessibility issues in relation to infrastructure when travelling in the

local area, including to and from public transport stops. The analysts responsible for the accessibility and severance appraisals should liaise to ensure that key issues are addressed and findings from the site visit/audit are taken into account in both indicators.

Primary research

- 8.5.12 In the event that significant impacts are identified in the desktop analysis, the DI analyst should then consider if it is appropriate to undertake qualitative research through focus groups with the identified groups. In many cases, the potential impacts will be understood from existing research. However, in cases where novel measures are being introduced, where there are complex issues that must be addressed, or where there is an explicit objective to improve accessibility, focus groups should be considered.
- 8.5.13 The primary research should consider the issues identified through the focus groups, in terms of the quality at present, the potential improvements with the intervention, and the importance of the issue to the different groups of people. It is advised that, to add value to the focus groups, the analyst should also consider discussing key issues with stakeholders such as the Accessibility Planning officer in the Local Authority and specific local community groups.
- 8.5.14 The findings from the primary research can be used to establish the importance of different aspects of the intervention in affecting accessibility for different groups of people. The example of the **accessibility audit worksheet** (Table 18) demonstrates how this can be used to inform the analysis for different groups of people.

Step 3b: Full appraisal of DIs and input into AST

- 8.5.15 The main outputs and measurements as a result of the accessibility appraisal will be a combination of statistical and mapping outputs based on the strategic accessibility assessment results and the accessibility audit as well as a series of qualitative assessments.

Strategic Accessibility Assessment

- 8.5.16 The statistical outputs of the accessibility analysis will be dependent on the local journey patterns and key destinations likely to be impacted by the transport intervention. The analyst should determine the most appropriate accessibility analysis and complete the relevant series of **strategic accessibility assessment worksheets**. A worked example is shown in Table 16, which is also available as a [worksheet](#).
- 8.5.17 The accessibility analysis worksheets could include the following, although the analyst should determine and agree the final list with the promoter as the list below only provides a series of suggestions and is not a complete list:

- Population living in car-owning households and non-car-owning households - access to any key destination;
- Population with limiting long term illness accessing healthcare destinations; and
- Jobseeker Allowance Claimants accessing areas of employment opportunity.

8.5.18 The analysis could also include the following key destinations:

- Areas of employment: main centres, business parks, industrial estates, and out of town retail outlets;
- Educational facilities: special educational needs, primary, secondary, further and higher education establishments;
- Health facilities: Hospitals, GPs, health clinics, dentists and pharmacies;
- Recreational and leisure facilities: parks, public sports centres, swimming pools and cinemas;
- Major and Local Shopping Centres: fresh food and retail outlets; and
- Social amenities: community centres and day care facilities.

8.5.19 The appraisal score for each strategic accessibility assessment worksheet will need to be determined using the following scoring criteria, as shown in Table 15. This demonstrates a seven point score, based on the proportion of change (e.g. household numbers) as a result of the intervention.

Table 15 Strategic Accessibility Assessment Appraisal Criteria

Proportionate Changes	Accessibility Analysis Score
> +16%	Large Beneficial
+6% to +15%	Moderate Beneficial
+2% to +5%	Slight Beneficial
-1% to +1%	Neutral
2% to -5%	Slight Adverse
6% to -15%	Moderate Adverse
> -16%	Large Adverse

- 8.5.20 The analyst should combine the various individual scores on each worksheet to provide one overall accessibility analysis score for each amenity. The various total scores for each amenity should also be combined to provide one overall score. It is not advised to add weightings to the various strategic accessibility assessment worksheets.
- 8.5.21 In addition to the worksheets the analyst could also produce accessibility maps for the 'without scheme' and 'with scheme' cases, demonstrating locations that will experience accessibility improvements or adverse impacts as a consequence of the intervention.

Table 16 Example of a Strategic Accessibility Assessment Worksheet

Public Transport accessibility of population in the impact area to nearest Gen. Hospital (07.30 – 09.30) weekday	Without scheme		With Scheme		% Change		Overall Score	
	Car Households	No Car Households	Car Households	No Car Households	Car Households	No Car Households	Car Households	No Car Households
0 – 10 mins	250	300	290	360	16%	20%	Large Beneficial	Large Beneficial
11 - 20 mins	450	600	500	700	11%	17%	Moderate Beneficial	Large Beneficial
21 - 30 mins	850	950	969	1,121	14%	18%	Moderate Beneficial	Large Beneficial
31 – 40 mins	3,500	4,500	4,270	5,625	22%	25%	Large Beneficial	Large Beneficial
41 – 50 mins	5,200	6,500	6,396	8,064	23%	24%	Large Beneficial	Large Beneficial
51 – 60 mins	6,500	6,000	7,930	7,860	22%	31%	Large Beneficial	Large Beneficial
Total Households with 60 mins	16,750	18,850	20,355	23,730				
Impact Area Household Totals	25,200	26,250	25,200	26,250				

Accessibility Assumptions

Journey Purpose: Access to the nearest General Hospital

Travel Time: Travelling on a weekday between 07.30 – 09.30 am (no maximum travel time)

Default Walk Distances: 400m walk to public transport stop from origin/400m walk from public transport stop to destination

Assessment Criteria: Car and No Car Households within study area

Overall Score: Large Beneficial

Qualitative Statement: The transport intervention has a large beneficial affect on both households with and without a car, however the impacts are slightly more beneficial for households without a car. The greatest positive impact is achieved for those living within a no car household and located a 50 – 60 minute journey time of their nearest General Hospital.

Accessibility Audit

- 8.5.22 The strategic accessibility assessment worksheets will be supported by an appraisal of the aspects relating to access onto and within the public transport system as described in the previous accessibility audit section.
- 8.5.23 The analyst will need to consider how the transport intervention impacts on the public transport experience through various elements identified. Each element needs to be scored for each identified journey type to key destinations and where possible by each potential vulnerable group. The following scoring scales should be used:
- -3 to +3 should be used for the impacts of transport intervention for journeys to key destinations (-3 reflecting a large adverse change, 0 reflecting no change, +3 reflecting a large beneficial change); and
 - 0 to +4 should be used for the level of importance given to each element of the journey by the different social groups under consideration.
- 8.5.24 If primary research has been undertaken with different groups in the area then this will have established any problems with the physical aspects of accessibility and the importance that people place on such elements of the public transport system. If this information has been gained from local research then the weightings described above can be applied to each element of the system by different groups.
- 8.5.25 Table 18 demonstrates a worked example for the accessibility audit [worksheet](#), with higher weightings in the table attributed to specific elements of the public transport system for certain vulnerable groups. If primary research has not been undertaken (or other suitable secondary evidence is not available) then the weightings should not be applied.
- 8.5.26 The overall appraisal score for each accessibility audit worksheet should be determined using the scoring criteria as shown in Table 17. This demonstrates a seven point scale based on the overall scores from the scoring system in Table 18.

Table 17 Accessibility Audit Appraisal Criteria

Total Score	Accessibility Audit Appraisal Score
51 to 120	Large Beneficial
31 to 50	Moderate Beneficial
1 to 30	Slight Beneficial
0	Neutral
-1 to -30	Slight Adverse
-30 to -50	Moderate Adverse
-51 to -120	Large Adverse

Datasets

8.5.27 Further discussion of data sets that may be used in accessibility analysis is provided in Appendix B.

Table 18 Example Worksheet for Accessibility Audit

Element of end-to-end journey	Impacts of transport intervention for journeys to key destinations [A]				Level of importance given to each element of the journey by each group [B]					Accessibility score [C] = [A] * [B] for access to the Main centre				
	Main centre	Education Establishments	Healthcare Facilities	Employment areas	No car h/holds	Young people	Older people	Women	Dis. Pple	No car h/holds	Young people	Older people	Women	Dis. pple
Pre-journey info.	0	0	0	0	1	1	1	1	2	0	0	0	0	0
Info. At transport stop	2	2	1	1	2	2	2	2	3	4	4	4	4	6
Seating & protection	2	2	1	1	2	1	2	1	3	4	2	4	2	6
Ability to board vehicle from kerb	3	1	1	1	1	1	4	1	4	3	3	12	3	12
Ticket purchase and welcome from driver	0	0	0	0	1	1	2	1	3	0	0	0	0	0
Ability to navigate inside vehicle	2	1	1	2	1	1	3	1	3	2	2	6	2	6
Comfort of journey	3	2	2	1	1	1	3	1	3	3	3	9	3	9
Information given during journey	2	1	1	1	1	1	2	1	2	2	2	4	2	4
Ability to alight vehicle direct to kerb	3	1	2	1	1	1	3	1	4	3	3	9	3	12
Movement within interchanges	0	0	0	0	2	1	2	1	3	0	0	0	0	0
Total score										21	19	48	19	55
Accessibility Audit Appraisal										Slight ben	Slight ben	Medium ben	Slight ben	Large ben
Overall Accessibility Audit Score										Slight Beneficial				

Combining Accessibility Analysis Score with the Accessibility Audit Score

- 8.5.28 The appraisal of transport interventions requires an overall score for each DI indicator for inclusion in the DI appraisal matrix. It is recognised that these two aspects of accessibility may have different levels of importance in relation to individual interventions. However, for the purpose of consistency between transport appraisals, the weightings between the two aspects of accessibility should be considered equal.
- 8.5.29 To calculate the overall accessibility indicator score the analyst should consider the individual scores for each completed worksheet. Particularly where there are negative impact scores, these must be highlighted in the assessment with a supporting qualitative statement.
- 8.5.30 The process should use the following criteria to score the overall assessment score. A worked example is provided in Table 19.
- A majority vote of overall scores is used to decide the final score;
 - For a split number of scores the analyst should choose the more conservative score; and
 - For an equally shared scoring the analyst should choose the midway score.

Table 19 Example of Overall Accessibility Indicator Score

Criteria (from individual worksheets)	Overall Score
Access to hospitals for older people	Moderate Beneficial
Access to employment for no car households	Slight Beneficial
Access to primary schools for 5 – 11 year olds	Slight Beneficial
Access to main centre for disabled people	Slight Beneficial
Access to employment centres for no car households	Slight Beneficial
Access to main centre for older people	Moderate Beneficial
Overall Assessment Score	Slight Beneficial

9. Personal Affordability Impacts

9.1 Introduction

- 9.1.1 As discussed in [TAG Unit A4.1](#), personal affordability impacts of an intervention proposal should be considered throughout the appraisal process, since affordability is of key importance in the operation of the transport system. This is primarily a distributional issue and hence the methodology to derive an appraisal score for the AST is covered in this TAG Unit.
- 9.1.2 The most significant impacts of the costs of travel are on young and old people, and low-income households, particularly when travelling to employment or education. People with disabilities may also suffer significant disbenefits when faced with higher costs, due to limited transport choices, whilst unemployed adults also have difficulties in accessing services (including training), again due to low incomes.
- 9.1.3 Changes in transport costs could have disproportionate effects where there are few or no travel alternatives, especially where income levels preclude car ownership and use. In such cases and where budgets are constrained, a step change in public transport costs might affect travel to, for example, work, education or access to fresh, affordable food. The latter is particularly pertinent for households with low income, non-car owning and / or elderly members. Food and travel are both discretionary components of household expenditure and increases in travel costs may have a substantial effect on the budget available for food or the destinations that can be accessed within the available travel budget.

9.2 Principles in the Analysis of Personal Affordability

- 9.2.1 The personal affordability assessment is concerned with changes in the monetary cost of travel that form part of the decision making processes for travellers. It mirrors the user benefit appraisal component and can be based on the user charge assessment as considered in the Transport Economic Efficiency analysis, but requires a further qualitative analysis to ensure that all key monetary impacts can be considered by impact group irrespective of their inclusion in formal modelling processes.
- 9.2.2 As the principles are similar to the derivation of transport user benefits and transport user changes, the basic personal affordability assessment can be captured as an output from TUBA, in this case only for '**non-working time**' (which includes travel to and from work). 'Working time' (i.e. travel undertaken in the course of paid employment, but not travel to and from work) benefits or disbenefits are experienced by businesses. Some affordability issues, such as season ticket costs, may apply specifically to commuters. If people are excluded from work by affordability issues then this is an important issue – on a large scale it could actually impact on income distribution in an area.

- 9.2.3 Whilst all personal affordability impacts would ideally be fully reflected in user charges, it is possible that the subtleties of charging systems, both public and private transport, may result in some impacts being neglected in the formal approach underpinning user charge analysis produced by TUBA, principally due to simplifications in the representation of charges in transport models.
- 9.2.4 The DI analyst should identify if an intervention is likely to lead to negative or positive affordability outcomes for low income groups or for vulnerable groups. This can be undertaken by means of a Strategic Personal Affordability Review (see step 1: Screening) of potential changes in modal cost that could occur as a result of the intervention. At the initial stage of the process, this review should be sufficiently comprehensive to ensure that all potential impacts on personal affordability are considered. This is required irrespective of whether these have been fully or partially considered in any available TUBA output. In some cases such outputs may not be available at this stage, which takes place prior to option development. In addition to confirming that the assessment is sufficiently comprehensive, where TUBA outputs are available the review can be used to confirm that the TUBA assessment does not include spurious benefits or disbenefits generated by the simplicity of, for example, public transport fares modelling.

9.3 Step 1: Screening

- 9.3.1 The screening of personal affordability DIs should consider all relevant monetary transport charges. Key areas for consideration include:
- Parking charges (including where changes in the allocation of free or reduced fee spaces may occur);
 - Car fuel and non-fuel operating costs (where, for example, rerouting or changes in journey speeds and congestion occur resulting in changes in costs);
 - Road user charges (including discounts and exemptions for different groups of travellers);
 - Public transport fare changes (where, for example premium fares are set on new or existing modes or where multi-modal discounted travel tickets become available due to new ticketing technologies); and
 - Public transport concession availability (where, for example concession arrangements vary as a result of a move in service provision from bus to light rail or heavy rail, where such concession entitlement is not maintained by the local authority).

- 9.3.2 If there are any changes to the above charges, a personal affordability DI appraisal should be undertaken.
- 9.3.3 Outputs from the User Benefit analysis, described in [TAG Unit A1.3](#), may also provide evidence of changes in user charges, but will need to be treated with some caution by the practitioner, given the aggregate nature of models and simplification in modelling of fares and charges.
- 9.3.4 The screening stage can also be assisted by the Personal Affordability worksheet (as shown in Table 23) if required, to undertake a strategic personal affordability review.

Strategic Personal Affordability Review

- 9.3.5 This worksheet uses a 'checklist' approach to identify where aspects of the intervention may have positive or adverse consequences. It is quite feasible that none of the potential impacts on the checklist will be a feature of the interventions being appraised, or that any possible negative impacts can be eliminated at the design / option development stage, in which case there is no need to undertake further analysis. However, there is a need to provide robust evidence to demonstrate that this is the case. For an intervention where potential positive impacts are identified or where potential negative impacts cannot be eliminated, the analyst is required to undertake a full assessment of DI to estimate the likely scale of the impact on users.
- 9.3.6 A primary area of interest is the change in cost of using each mode, as is the case throughout the appraisal process. However, one aspect that also needs to be considered is the personal affordability impact of shifting between transport modes, in particular if the price of using a new mode is preventing or promoting mode shift, or passengers are in effect forced either to use a different, more expensive mode due to changes in supply, or to discontinue or significantly change their travel, for example where no other affordable or practical travel option exists.
- 9.3.7 Vulnerable social groups may suffer disproportionately where they naturally have less choice available to them. Consider what might happen when a new light rail system is being considered that effectively replaces an existing bus service. Senior Citizens who currently use the bus service will be entitled to free travel under current concessionary arrangements, but an equivalent intervention is not automatically going to be available on the light rail system, as such systems are not covered by the national concession scheme, unless separate arrangements are put in place by the scheme promoter. In such cases, this group would face a material increase in the cost of using public transport at their existing location, or a walk to a more distant stop where buses still operate (which may not be practical). This is a case where mitigation measures could be developed and put in place by the promoter. It is important to identify potential impacts as early as possible so that the option design and development process can take these measures on board, rather than implementing them as an afterthought.

- 9.3.8 These types of impact are not generally identifiable from transport models. For sensible and practical reasons, transport models tend to use average travel costs and do not include extensive social group segmentation. This is, nevertheless, a material impact that currently tends to be overlooked. Therefore, consideration should be given to issues such as concessionary fares and parking charge discounts, the availability of children's and family/group fares, purchase channel and means. As noted, consideration of this might take place before any model is available; this should not deter an early screening to inform the option design and development stage.
- 9.3.9 For example, measures to reduce car use through pricing of car parking, will tend to have most impact on low income motorists. Society as a whole benefits through reduced congestion and emissions, but those whose travel is reduced suffer a welfare loss. However, the analyst should consider whether there are feasible options such as public transport, in which case the welfare loss may be small, or whether the only options are to continue driving (with a potentially large financial impact on a household budget) or to travel to another destination, where the welfare loss may be greater. Consideration needs to be given to the circumstances in which affordability changes take place, as this will help to determine the level of appraisal at step 3.

9.4 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

- 9.4.1 The impact area should be the same as that considered for user benefits analysis, i.e. the area where passengers' cost of travel (in generalised cost terms) is changing as a result of the intervention. This is in general the core modelled area from the transport model.

Step 2b: Identification of social groups in the impact area

- 9.4.2 The primary group of interest in this case is people on low incomes. To ensure consistency of analysis, the same basis for identifying the income profile in the user benefit analysis should also be used for personal affordability. As a minimum this will mean that an approximation of the resident population in each of the income quintiles will have been created using Index of Deprivation (IoD) income domain data for all Lower Super Output Areas (LSOAs) or model zones in the impact area. The area may also be assigned to income bands defined in terms of other income measures where data is available.

Step 2c: Identification of amenities in the impact area

- 9.4.3 Identification of amenities within the impact area is not required for the personal affordability DI appraisal. This is due to the appraisal focussing on the impact across income deprivation quintiles only, and the impact area being too large to warrant identification of local attractors.

9.5 Step 3: Appraisal of Impact

Step 3a: Core analysis of impacts

- 9.5.1 The first part of the analysis is to determine whether the impacts are captured using TUBA. Table 20 below shows a worked example of this assessment based on the potential cost changes identified, demonstrating how this could work for a particular intervention. This table provides a checklist of potential changes to the cost of travel that could result from a transport intervention, classified by mode. This checklist is not exhaustive, but should cover the majority of changes that are likely to occur.
- 9.5.2 To undertake the checklist analysis, the DI analyst will need to undertake a desktop research exercise to establish the current pricing structure for the modes under consideration, covering the modes and aspects covered in the checklist. The DI analyst should then make an assessment of how these are likely to change in the future, both without and with the intervention.
- 9.5.3 Note that the focus is on the types of charge that may apply to different types of travellers. Therefore inflationary effects, which are in any case difficult to forecast, are not of interest; effects that, for example, change the level of discount available to a particular traveller group, are of interest. It is not necessarily the case that the future 'without scheme' charging regime will be 'as now,' although in the majority of cases this is likely to be the most appropriate assumption.
- 9.5.4 In many cases, the level of definition of the intervention may not allow an assessment to be undertaken. For example it might not be possible to state how the charging regime on a new Light Rail system will operate until a preferred bidder has been selected. In such cases, the DI analyst is required to flag **potential** changes to the charging regime to highlight areas where there is a risk of change occurring, be it positive or negative in impact. For example, it may not be clear whether or not a new Light Rail Transit (LRT) intervention will accept concessionary passes: the issue here is that it cannot be assumed that they will, and therefore it should be noted in the appraisal that this risk exists, and that the promoter should consider whether mitigation measures should be considered.
- 9.5.5 As part of this step, the DI analyst should make use of the DI analysis of the user charge element of the distribution of user benefits, where this has been undertaken, to demonstrate where significant changes in public transport (PT) fares, tolls or parking charges could be occurring. The output from this step should be in the form of a change in user charge disaggregated by mode and geographic area (ideally at LSOA level). Changes greater in magnitude than **+/- 10%** should be highlighted as being significant, and these should be noted in the worksheet as having been included in the TUBA analysis.
- 9.5.6 Where changes in the cost of travel have been identified through the screening process, these need to be quantified as far as possible for each Lower Super Output Area (LSOA) in the impact area, although if information is not available

at this refined level it might be necessary to use the larger Mid-Level Super Output Areas (MSOA).

Table 20 Example of the Scope of Potential Changes in the Costs of Travel

Mode	Cost Change	Cost change expected	Change captured in TUBA?	Quantified Impact
Car	Car fuel and non fuel cost	No		
	Road user charges	No		
	Public parking charges – management	Yes	Yes	PV £2.3m
	Other car charge costs	No		
Public Transport	Bus fares	No		
	Rail fares	No		
	Rapid transit fares	No		
	Mode shift between public transport modes due to change in supply	No		
	Ticket / interchange discounts	Yes	No	11m journeys per annum affected. Typical cost penalty 80p/trip
	Concessionary fares	Yes	No	16m journeys per annum affected. Typical cost £1.50 per trip.
	Other public transport charges/costs	No		
Non-motorised Modes	Walking costs (in the vast majority of cases, nil)	No		
	Cycling costs	No		

Quantification of impacts

9.5.7 Monetary ('out of pocket') costs are often simplified within transport models (e.g. concessionary fares, season tickets are rarely modelled explicitly). Only where impacts are fully captured in TUBA should this tool be used in isolation for the assessment of personal affordability impacts. In the majority of cases, the

quantification of impacts will be limited to an indicative assessment of the number of people affected by a cost change and the typical magnitude of that change.

- 9.5.8 It is first necessary to understand the likely per-trip change in the cost of travel. Taking the example of replacing bus services where free concessionary travel is available with an alternative mode where they are not, the change in cost will be the average fare charged on the new system in the impact area.
- 9.5.9 Having determined the size of the per-trip impact, it is necessary to determine the number of people likely to be affected.
- 9.5.10 In many cases, a dataset may be available that can allow direct quantification. Data on the number of trips made on concession passes within the impact area is likely to be available from the local administering authority. Where such data are not available, it should be possible to make an estimate using demographic data to determine the population in each LSOA in the impact area that are in the particular social group affected by the change. For example, for a change in the concessionary fares regime, the number of people could be estimated as the number of people in the relevant age range in the impact area.

Transport model led TUBA assessments

- 9.5.11 In some cases specific monetary impacts may have been fully captured by the transport model, in which case the 'Detailed Outputs' feature in TUBA can be used to provide a quantification of impacts. However, in many cases the range of transport price and cost impacts will not be fully captured by the transport model. In these cases an indicative estimate of the level of impact will be required instead.
- 9.5.12 Generalised cost models may include changes in behaviour that result in an increase in monetary cost, if this is offset by sufficient savings in time. In reality, individuals in low income groups are likely to be especially price sensitive and much less likely to make such trade-offs, so ideally models need to be segmented in such a way that this price sensitivity can be captured⁵. However, apart from those models required to consider income disaggregation (those including charging proposals) many models will not segment by income but may use other segmentations instead. A fully income segmented model would avoid this but may not be proportionate in resource terms.
- 9.5.13 Income segmentation, if available, should be used for the personal affordability analysis. Where this is unavailable, alternative data should be used to disaggregate the user charge data spatially and then assigned to different social groups. Appropriate data sources, with their merits and shortcomings, are described in Table 3. If disaggregate income data is not available, it is

⁵ Minimising generalised costs necessarily assumes a range of travel options. Further analysis is required where the lack of transport options gives rise to wider changes, for example in changes in destinations or enforced changes in household activities.

recommended to use the national Indices of Deprivation (IoD) as a proxy, as described previously.

- 9.5.14 In some cases, the modelled area may contain new developments that would lead to a net change in the socio-economic profile of the LSOA. In these cases, sensitivity testing should be undertaken to ascertain the potential impact from assuming different income characteristics for the area. The analysis should give an indication of the user charges that can be attributed between groups with a significant difference in their socio-economic characteristics, within a small area.
- 9.5.15 The output from this process will be a distributional analysis of user charge impacts of the format shown in Table 21 below. In this example the intervention has led to a beneficial net reduction in user charges of £40.5m (£9.8m plus - £50.3m). All reductions in user charges should be expressed as negatives, and increases in user charges should be expressed as positives. The least deprived income quintile has seen an increase in user charges of £9.8m. As benefits and disbenefits are summed across all LSOAs in that quintile, a group can only have one entry in either the total increase in user charge or total decrease in user charge rows.
- 9.5.16 The assessment for each group is based on whether the intervention generates an overall benefit or disbenefit and the share of the benefit / disbenefit that a group receives in relation to its proportion of the population.

Table 21 Example Output from User Charge Distributional Analysis

£m	IMD Income Domain					Total
	Most deprived areas		↔	Least deprived areas		
	0%<20%	20%<40%	40%<60%	60%<80%	80%<100%	
LSOA 1	3.6				0.6	0.6
LSOA 2			0.7			0.7
LSOA 3				-0.3		-0.3
.....					
LSOA N		-1.3				-1.3
Total Increase in User Charges (∑ LSOAs)	-	-	-	-	9.8	9.8
Total Decrease in User Charges (∑ LSOAs)	-13.2	-22.4	-7.2	-7.5	-	-50.3
Share of User Charge Increase	-	-	-	-	100%	100%
Share of User Charge Decrease	26%	45%	14%	15%	0%	100%
Share of Pop'n	22%	25%	15%	28%	10%	100%
Assessment	✓✓	✓✓✓	✓✓	✓	xxx	

9.5.17 This table is identical in format and is completed using the same scoring criteria as those used to report the distribution of user benefits but is restricted in this case to a particular type of user charge. Separate tables should be generated for charges relating to different modes, to enable these to be reported separately in the Personal Affordability worksheet shown in Table 23. The table(s) can be used to identify the distribution of user charge changes relative to the population distribution, thereby identifying any disproportionate impacts by income segment.

Table 22 System for Grading of Transport personal affordability DIs for each of the social groups

Beneficial and 5% or more greater than the proportion of the group in the total population	✓✓✓
Beneficial and in line (+/-5%) with the proportion of the group in the total population	✓✓
Beneficial and 5% or more smaller than the proportion of the group in the total population	✓
There are no transport user benefits or disbenefits experienced	Neutral
A disbenefit which is 5% or more smaller than the proportion of the group in the total population	x
A disbenefit which is in line (+/- 5%) with the proportion of the group in the total population	xx
A disbenefit which is 5% or more greater (or more) than the proportion of the group in the total population	xxx

9.5.18 In the example shown in Table 21, it can be seen that, in absolute terms, the bottom four quintiles all experience reductions in this type of user charge. However, the least deprived quintile experiences an increase in the user charge, a disproportionate impact, giving an adverse score (x).

9.5.19 The assessment scores assigned are based on scoring methods used throughout DI analysis and are the same as user benefits impacts. This uses the method of comparing the proportion of benefits/ disbenefits realised by a specific group to the proportion of the population made up by that group. In this case, +/-5% may be deemed a significant proportional difference.

Further Analysis for Personal Affordability

9.5.20 The purpose of this additional analysis is to primarily identify the impact of user charges separately, as it feeds into the Personal Affordability analysis described in Section 9.

9.5.21 As part of the 'Detailed Results' facility, TUBA provides user benefits disaggregated to the following categories:

- User Time;

- User Charge (e.g. Fares, Tolls, Parking);
- Vehicle Operating Costs; and
- Indirect Taxes.

9.5.22 Using this feature, it is possible to undertake DI analysis by these separate categories. Although not compulsory, this analysis may provide useful input to the Personal Affordability analysis, by providing evidence of significant changes in User Charges or Vehicle Operating costs that may be a barrier to travel.

Step 3b: Full appraisal of DIs and input into AST

9.5.23 The output from the process is created through the Personal Affordability worksheet, an example of which is provided in Table 23 below. It combines more readily quantifiable output from analysis such as that illustrated in Table 21 with more qualitative assessment by the analyst. All significant affordability issues should be highlighted, even if the user charge output from TUBA cannot be analysed in a disaggregate manner.

Table 23 Example of a completed Personal Affordability Worksheet

Mode	Monetary Modal Cost Change	LSOA group	area 1	area 2	area 3	Area n	Wider areas	Impacts considered in aggregate TUBA assessment?	O/all pers. Aff Score (cross=inc, tick=dec.)	Proportion of population by IMD quintile				
		LSOA group population	2500	2500	3000							22%	25%	15%
		IMD income quintile	0-20%	0-20%	40-60%					Quantifiable impacts by IMD income quintile				
		Core impact								0-20%	20-40%	40-60%	60-80%	80-100%
Car	Car fuel and non-fuel cost	Change due to congestion relief	No impact	No impact	No impact		Negligible mon. impacts	Yes	O					
	Road user charges	No RUC scheme	No impact	No impact	No impact			n/a	O					
	Public parking charges – absolute charges	Increases in long-stay public charges as part of strategy	Adverse impact on low income motorists	Adverse impact on low income motorists	Adverse impact on low income motorists			Yes	Xx	30% xxx	18% X	37% Xxx	12% X	0% ✓✓✓
	Public parking charges - management	smarter choice measures to encourage more equitable workplace parking allocation	As core impact. Minor beneficial	As core impact. Minor beneficial.	As core impact. Minor beneficial.		As core impact	No	✓	✓	✓	0	O	O
	Other car costs	None	n/a	n/a	n/a			n/a	O					
	Bus fares	No change	No impact	No impact	No impact			n/a	O					
Public transport	Rail fares	No change	No impact	Service n/a	Service n/a			n/a	O					
	Rapid transit fares	New system charges premium fares (in return for faster journey times and higher quality). Reduced bus services will	premium fare has adverse impact on user charges	premium fare has adverse impact on user charges	Service n/a		premium fares on rest of network have limited dist. Impacts	Yes	Xx	24% Xx	15% X	41% Xxx	16% X	4% X

Active modes		force some users to pay higher fares on rapid transit														
	Ticket/interchange discounts	Improved ticketing arrangement results in reduced fares for interchange to area 1 and new rapid transit service	Reduced impact of fares for journey involving bus/rail/rapid transit services	Reduced impact of fares for journey involving bus/rail/rapid transit services	n/a	Benefits across network due to improved ticketing arrangements but no specific distributional impacts	No only part represented	✓	✓	✓	✓	✓	✓	✓	✓	
	Concessory fares	Eligibility of concessions on rapid transit service confirmed by scheme promoters	No impact – concessions remain valid on new service with conditions retained	No impact – concessions remain valid on new service with conditions retained	No impact – concessions remain valid on new service with conditions retained	Significant disbenefits if new rapid transit service is not included in conc. Fares arrangements	n/a	○								
	Other PT charges/costs	Smarter choice measures to provide discounted season ticket loans for those on income support	As core impact. Minor beneficial.	As core impact. Minor beneficial.	As core impact. Minor beneficial.	As core impact	No	✓	✓	✓	○	○	○			
	Walking	No monetary impacts	n/a	n/a	n/a		n/a	○								
	Cycling	Smarter choice measures to encourage Cycle to Work scheme to provide discounted cycle purchase costs	No discernable impact on low income groups	No discernable impact on low income groups	No discernable impact on low income groups	No discernable impact on low income groups	n/a	○								
Overall Analyst Assessment							Xx	xx	x	Xx	✓	✓✓				

- 9.5.24 In Table 23, the quantification of benefits by groups has been supplemented by qualitative analysis for a number of user charges by providing a ✓, ✗, or ○ in the overall personal affordability score. For a ✓ or a ✗, the analyst should highlight which individual groups are affected beneficially or adversely, or not at all using a ○.
- 9.5.25 This summarises different affordability impacts by mode against the checklist, both at an overall level, and in particular geographic areas. To consider the impact, these geographic areas are identified in terms of their IoD income domain score. The purpose of this analysis is to identify those areas where there is low average income and therefore greater vulnerability from the impacts of price rises.
- 9.5.26 The 'wider areas' column provides scope for specific qualitative comments to be made, such as possible mitigation measures.
- 9.5.27 As previously mentioned, a column is provided to identify where the changes in the price of travel that individuals must pay have been included in TUBA User Benefit appraisal. Where possible, the monetary impact of the change should be estimated, so that if not included in the TUBA analysis, appropriate adjustments can be made to include the effect.
- 9.5.28 The assessment of personal affordability also needs to be mindful of the fact that whilst infrastructure and service performance may well be relatively tightly defined during the development of options, charging regimes for transport services are generally not committed in advance and are largely set by the commercial market, in particular for non-rail based public transport services outside London. There can therefore be a risk that distributional issues could emerge following implementation that were not expected during the development and appraisal process.
- 9.5.29 In determining the grading for the personal affordability DI the analyst will need to make a judgement on the balance on affordability impacts across the travel modes and user charges for each of the groups considered in the analysis. This judgement should take into account the magnitude of change and modal usage and can be assisted by the user charge distributional analysis generated from TUBA, as shown in the example in Table 21.
- 9.5.30 The assessment will involve distilling and weighing up a number of impacts identified at the detailed level but the analyst should consider whether impacts are widespread or more limited within the IoD Income Domain group. For example, car park charging may affect all road users accessing a town centre, whereas integrated ticketing discounts on the bus network could offer benefits to significantly fewer users.
- 9.5.31 The grading of the overall impacts should be allocated to the seven point scale, translated into the Personal Affordability worksheet.

- 9.5.32 The findings should be summarised for inclusion in the matrix of DIs, and AST by providing a score for each income group, stating whether the distribution of impacts is proportionate, and providing a qualitative statement to discuss the findings of the appraisal, as shown in Table 6.
- 9.5.33 In some limited circumstances, for example major mixed mode packages involving both investment and charging proposals, it may be appropriate for both major adverse and beneficial impacts to be identified and taken forward to the matrix. In this case, a qualitative commentary should be added to explain the basis for the scoring.

10. References

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11. Document Provenance

This Transport Analysis Guidance (TAG) Unit revises guidance published for consultation in July, 2006, originally released in January 2010 and released as definitive guidance in April 2011.

This guidance is based on the original **TAG Unit 3.17 – Detailed guidance on Social and Distributional Impacts of Transport Interventions** and pools together guidance on individual impacts originally as Sections in Units on Transport Benefit Computation (3.5.3), Noise (3.3.2), Air Quality (3.3.3), Accidents (3.4.1), Security (3.4.2) and Severance (3.6.2) and integrates whole guidance Units on Accessibility (3.6.3) and Personal Affordability (3.6.4).

Appendix A: DI Screening Proforma

This proforma is also available as a worksheet: [DI Screening Proforma Worksheet](#)

Scheme description:

Indicator	(a) Appraisal output criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
User Benefits	The TUBA user benefit analysis software or an equivalent process has been used in the appraisal; and/or The value of user benefits Transport Economic Efficiency (TEE) table is non-zero.			
Noise	Any change in alignment of transport corridor or any links with significant changes (>25% or <-20%) in vehicle flow, speed or %HDV content. Also note comment in TAG Unit A3 .			
Air quality	Any change in alignment of transport corridor or any links with significant changes in vehicle flow, speed or %HDV content: <ul style="list-style-type: none"> • Change in 24 hour AADT of 1000 vehicles or more • Change in 24 hour AADT of HDV of 200 HDV vehicles or more • Change in daily average speed of 10kph or more 			

	<ul style="list-style-type: none"> • Change in peak hour speed of 20kph or more • Change in road alignment of 5m or more
Accidents	Any change in alignment of transport corridor (or road layout) that may have positive or negative safety impacts, or any links with significant changes (>10%) in vehicle flow, speed, %HDV content or any significant change (>10%) in the number of pedestrians, cyclists or motorcyclists using road network.
Security	Any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security.
Severance	Introduction or removal of barriers to pedestrian movement, either through changes to road crossing provision, or through introduction of new public transport or road corridors. Any areas with significant changes (>10%) in vehicle flow, speed, %HDV content.
Accessibility	Changes in routings or timings of current public transport services, any changes to public transport provision, including routing, frequencies, waiting facilities (bus stops / rail stations) and rolling stock, or any indirect impacts on accessibility to services (e.g. demolition & relocation of a school).
Affordability	In cases where the following charges would occur; parking charges (including where changes in the allocation of free or reduced fee spaces may occur); Car fuel and non-fuel operating costs (where, for example, rerouting or

changes in journey speeds and congestion occur resulting in changes in costs); Road user charges (including discounts and exemptions for different groups of travellers); Public transport fare changes (where, for example premium fares are set on new or existing modes or where multi-modal discounted travel tickets become available due to new ticketing technologies); or Public transport concession availability (where, for example concession arrangements vary as a result of a move in service provision from bus to light rail or heavy rail, where such concession entitlement is not maintained by the local authority⁶).

⁶ Note – light rail (and heavy rail) are currently outside the scope of the national concessions funding arrangements

Appendix B: Datasets for Accessibility Analysis

- B.1.1 This Appendix provides an overview of the data required to effectively appraise the accessibility impacts of a transport intervention.

Origins and Destinations

- B.1.2 Measuring accessibility by public transport requires the assessment of journey times between designated origin points and destination points.
- B.1.3 For appraisal purposes the origin sets can be made up of equally spaced grid points covering the impact area or can represent the centre (centroid) of a postcode sector. By using postcode data it is possible to weight any socio-demographic data used for the assessment according to the number of households within each postcode area. Postcode data could be taken from the Royal Mail Codepoint file. This is updated every year, and the 'total number of domestic delivery points' for each postcode could be equated to total number of households.
- B.1.4 Destinations can be represented by a geo-referenced point or points depending on the type of service being appraised. For example, the calculation could examine access to a hospital for which a single point may be required, or alternatively it could examine access to the nearest hospital in an area with a number of hospitals. The types of destinations that would be needed for the appraisal are identified in paragraph 8.5.18.

Public Transport Network

- B.1.5 Public transport service information is updated on a weekly basis for Traveline inputs; however the Department for Transport (DfT) prepares a snapshot of public transport services for each local authority in England every October, which is available from DfT through the THALES National Public Transport Data Repository website (<http://data.gov.uk/dataset/nptdr>). The data is available in ATCO CIF format and contains timings of all bus services down to individual stop level.
- B.1.6 Alternatively this information is readily available through TransXchange which has been developed as a successor to ATCO-CIF files, with bus timetable and interchange information contained within an XML file.
- B.1.7 More generic timetable data can be used to prepare a general overview of the public transport network in the study area to show, for example, bus, train and tram service frequencies, the extent of areas covered by high frequency (10

mins) 'turn up and go' services, how frequencies vary by time of day and day of week and community transport availability.

- B.1.8 This data can be overlain against local area data to provide a spatial understanding of local accessibility issues such as travel times from major employers, major shopping centres, health and education facilities and major urban centres.
- B.1.9 If the public transport service or network will be altered by the intervention then the proposed timetables should be analysed, as previously stated, to compare against the existing timings and identify any positive or negative impact.

Socio-Demographic Data

- B.1.10 A list of potential data sets for sourcing relevant socio-demographic information is provided in Table 3 and paragraphs 1.4.9 to 1.4.12.

Local Data Sources

- B.1.11 Other sources of accessibility evidence can be sought from local stakeholders. This may include data that stakeholders use for delivering and prioritising their services or for internal day-to-day performance management. Examples include:
- Adult and Children's Services Departments: local information on disabled people, key day care centre destinations and other community facilities;
 - Children's Services Department (Education): availability of school transport and changes to the education system impacting on travel requirements and school closures / mergers or openings;
 - Planning: new housing and employment developments (e.g. NTEM forecasts);
 - Jobcentre Plus: detailed information on Jobseekers, labour markets and current skill requirements and vacancies in the impact area;
 - Primary Care Trusts and Hospitals: locations of hospitals and other health facilities; services available at each facility, closures/mergers and availability of health transport;

- Public Transport Operators: availability of travel information, types of vehicle used (e.g. wheelchair accessible), reliability, passenger satisfaction, results of their passenger surveys;
- Organisers of Community Buses: details of services;
- Supermarkets/Food Stores: shopping, opening hours and home delivery services; and
- Chambers of Commerce, Industry and Retail Forums and Major Employers: locations of jobs and vacancies; patterns of shift work.