VOLUME 11 SECTION 3 PART 9
VEHICLE TRAVELLERS

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1. INTRODUCTION

1.1 This part of the Advice Note covers the assessment of impacts on vehicle travellers which are not included in the cost-benefit economic analysis as quantifiable effects. The two impacts covered are view from the road and driver stress.

2. VIEW FROM THE ROAD

2.1 The existence of a new road may enable more people to see the landscape than hitherto. This benefit is assessed under the heading `view from the road', as is any disbenefit which may arise where a road passes through heavily industrialised or other visually unattractive areas.

2.2 In areas of high quality scenic landscapes route selection may allow travellers to appreciate the area and their location in relation to distinctive landscape features, by allowing appropriate views. Views out from the road also provide interest which may help to alleviate driver stress. It may be necessary to balance these benefits to travellers with the road's intrusion characteristics.

2.3 `View from the road' should be assessed taking into assessment wide differences between route options, landscape character and quality and any especially good or bad potential views along the route.

2.4 `View from the road' is defined as the extent to which travellers, including drivers, are exposed to the different types of scenery through which a route passes. Aspects to be considered are:-

(i) the types of scenery or the landscape character as described and assessed for the baseline studies;

(ii) the extent to which travellers may be able to view the scene;

(iii) the quality of the landscape as assessed for the baseline studies;

(iv) features of particular interest or prominence in the view.

2.5 Most routes will pass through landscapes of different character and quality along their length. Where sections provide views of particular interest or quality, these should be noted. It may be necessary to give separate descriptions for the views along the different lengths of a route where this level of detail is considered to be important in the choice between route options.

2.6 The extent to which travellers can perceive the landscape through which they are passing will vary with the relative level of the road and its surrounding ground and vegetation. There are four categories which should be used in assessing travellers' ability to see the surrounding landscape:-

a. No view - road in deep cutting or contained by earth bunds, environmental barriers or adjacent structures.

b. Restricted view - frequent cuttings or structures blocking the view.

c. Intermittent view - road generally at ground level but with shallow cuttings or barriers at intervals.

d. Open view - view extending over many miles, or only restricted by existing landscape features.

2.7 The assessment should note where views will be restricted, making allowance for the growth of trees and shrubs included in any landscaping work. As far as intermittent views are concerned, it is important to note that many people are visually tolerant of minor interruptions to views seen from a vehicle and the interruptions do not detract from their perception of the scene.

3. DRIVER STRESS

3.1 Driver stress is defined for the purposes of environmental assessment as the adverse mental and physiological effects experienced by a driver traversing a road network. Factors influencing the level of stress include road layout and geometry, surface riding characteristics, junction frequency, and speed and flow per lane. Taken together, these factors can induce in drivers the feelings of discomfort, annoyance, frustration or fear culminating in physical and emotional tension that detracts from the value and safety of a journey.

3.2 The extent of stress induced in individual drivers will differ due to variations in their skill, experience, temperament, knowledge of the route, and state of health. Hence professional drivers and commuters, for example, may well feel less stress from a given set of conditions than other drivers.

3.3 In principle, driver stress can be a factor in decisions on the traffic capacity to be provided. Some drivers are known to avoid motorways and there is some evidence that the proportion can exceed 5% on heavily trafficked sections with a high proportion of HGVs. At the other end of the spectrum, drivers will divert to motorways from "stressful" local routes even at the expense of considerable increases in vehicle operating costs. However, in general, drivers will choose the route which they believe to give the shortest reliable journey time, taking account of expected variability, and coping with the associated stress.

3.4 Research undertaken into driver behaviour indicates that with increased driver stress, there is a drop in driving standards. As frustration, annoyance and discomfort increase drivers tend to become more aggressive towards other road users and more inclined to take risks. As driver fatigue increases so the response to visual and other stimuli slows and concentration is diminished. The extent of these changes will vary with the drivers' age, skill and experience.

3.5 Suggestions have been made over the years that physiological indicators could be used to distinguish changes in stress. Possible symptoms include the electrical resistance of the skin, heart-beat rate, and levels of adrenalin in the blood.

However, there is, as yet, no consensus among experts on the correlation between changes in these indicators and changes in driver stress.

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4. ASSESSING DRIVER STRESS

4.1 Driver stress has three main components: frustration, fear of potential accidents, and uncertainty relating to the route being followed.

4.2 Frustration is caused by a driver's inability to drive at a speed consistent with his or her own wishes in relation to the general standard of the road. It increases as speed falls in relation to expectations and may be due to high flow levels, intersections, roadworks, or to difficulties in overtaking slower moving traffic. Congestion can lead to frustration by creating a situation in which the driver does not feel in control, especially when he or she wishes to arrive at a destination by a particular time, but is held up by traffic congestion whose duration cannot be determined.

4.3 The main factors leading to fear are the presence of other vehicles, inadequate sight distances and the likelihood of pedestrians, particularly children, stepping into the road. Other factors include inadequate lighting, narrow roads, roadworks and poorly maintained road surfaces. Fear is highest when speeds, flows and the proportion of heavy vehicles are all high. All these factors become more important in adverse weather conditions. A road scheme may increase driver fear to some extent because it will increase traffic speeds and, by diverting traffic from a number of existing roads, may also increase flows. However, this increased perception of danger is likely to be more than offset in most cases by the superior design standards to which a new scheme is built (for example, longer sight distances, footbridges for pedestrians, good lighting, and a new road surface).

4.4 There is evidence that drivers make a compensatory reduction in their speed where conditions increase the risk of an accident (and, equally, that drivers may sub-consciously drive less safely where external factors reduce accident risk). There is no consensus on the degree of `risk compensation' (Uncertainty and Driver Stress : A Review).

4.5 Route uncertainty is caused primarily by signing that is inadequate for the individual's purposes. It will not normally be possible to assess the size of this factor unless a consensus has already appeared on the adequacy of existing signing practice at a specific site. Good design and layout of signs can go a long way towards eliminating this cause of stress from new road schemes.

4.6 The available research evidence does not permit the use of finely graded assessments of driver stress. A three point descriptive scale - Low, Moderate or High - should, therefore, be used.

4.7 For new or improved routes, designed in accordance with the Department's current standards, the appropriate category will normally be `moderate' or `low' for the whole route. Where the `improved existing route' option is being considered there may be sections where driver stress will be `high' or `moderate'. If so, these should be identified - for example, `low driver stress generally but moderate through the town centre'.

4.8 The more difficult assessments are likely to be those of the `do minimum' or `do nothing' options. In these cases, data on traffic speeds and flows and their inter-relationship are the principle source for assessing driver stress. In many cases these assessments would warrant the use of all 3 categories at different points. Long descriptions should however be avoided and a balanced general picture aimed at, such as a `moderate stress along much of the route with high stress between Sharps Cross and Bellingham roundabout'.

4.9 No reliable correlations have been established between physical factors and driver stress. However, the following tables give guidance on the appropriate category of stress for use in environmental assessments, providing the speeds and flows exist during peak hour flows for at least one kilometre of a route. The assessment should be made for the worst year in the first fifteen after opening.

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TABLE 1

MOTORWAYS

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/hr		
	Under 75	75-95	Over 95
Under 1200	High	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

TABLE 2

DUAL-CARRIAGEWAY ROADS

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/hr		
	Under 60	60-80	Over 80
Under 1200	High[2]	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

TABLE 3

SINGLE-CARRIAGEWAY ROADS

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/hr		
	Under 50	50-70	Over 70
Under 600	High[2]	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

* A car or light van equals one flow unit. A commercial vehicle over 1½ tons unladen weight or a public service vehicle equals 3 flow units.

2 "Moderate" in urban areas.

4.10 The figures given above are for guidance only. The assessment of specific routes can only be made in the light of full knowledge of local conditions.

5. STAGES IN THE ASSESSMENT OF IMPACTS ON VEHICLE TRAVELLERS

5.1 The assessment of view from the road is closely related to the assessment of landscape impacts described in SECTION 3, PART 5. The Design Organisation's landscape architect responsible for a scheme's landscape assessment should also assess the quality of the view from the road, using the criteria and descriptions outlined in CHAPTER 2.

Stage 1

5.2 Generally at this stage assessment of view from the road will not be a significant factor. However in exceptional cases, for example where a study area includes an area of outstanding landscape value, assessment should be undertaken at this stage.

5.3 Driver stress should be assessed, using the methodology described in CHAPTER 4, above, for the existing route network which would be affected by a scheme. A forecast should be made of whether the broadly defined routes as developed by the Design Organisation and agreed with the Overseeing Department's Project Manager would be likely to produce low or moderate driver stress.

5.4 The results at the Stage 1 assessment should be included in the Stage 1 Report.

Stage 2

5.5 The objective at this stage is to undertake sufficient assessment to identify the factors and effects concerning vehicle travellers to be taken into account by the Design Organisation in developing and refining route options in agreement with the Overseeing Department's Project Manager.

5.6 An assessment of view from the road should be made using the methodology described in CHAPTER 2, above, and drawing on the scheme landscape assessment.

5.7 An assessment should be made of driver stress for the route options which are being considered, taking into account any differences in their route design characteristics (for example, junction layouts), respective forecast traffic and any other significant differences between options.

5.8 The results of the Stage 2 assessment should be included in the Stage 2 Report.

Stage 3

5.9 At this stage, the Stage 2 assessment of the view from the road should be updated where necessary to take account of any further landscape assessment, or any modifications to the preferred route.

5.10 The assessment of driver stress made at Stage 2 should also be updated where necessary (for example, to take account of the finalised junction arrangements for the preferred route).

5.11 The results of the Stage 3 assessment should be included in the Environmental Statement.

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6. FURTHER READING

6.1 Uncertainty and Driver Stress: A Review. Oxford University Transport Studies Unit : 1990 Bates, Davies, Goodwin, Kenny, Parkes, Richardson.