Chapter 17 Environmental Management

17.1 Introduction

It is now recognised that many towns and cities cannot provide the amounts of road–space necessary to accommodate unrestricted traffic growth. Consequently, the need to manage the demand for travel is more widely accepted (see Chapter 21). Moreover, there is widespread public concern with the global, as well as local, damage caused to the environment by vehicular traffic. The transport policy implications of this are discussed in Chapters 1 and 6.

Traffic management has an important role to play in managing the environmental impact of vehicular traffic. Environmental management schemes are employed in town centres and residential areas to limit the more apparent and potentially damaging effects of vehicular traffic on vulnerable road–users and residents. The schemes are usually very localised and generally discourage the use of vehicles, either by banning them or by making their use more costly or difficult. However, these measures may have other impacts, which are not immediately apparent and which may even be damaging to the environment in other ways. Accordingly, the total environmental impact needs consideration and proposed schemes should not be assessed in isolation or in terms of just the local area.

The effects on the environment must also be considered in the development of all traffic management or transport improvement schemes. Any scheme which changes traffic patterns will have an effect on the environment, even if not specifically designed to do so. Practitioners need to be aware of the total impact of their actions, particularly where options are being evaluated, to ensure that the outcome contributes to the global objectives of achieving sustainability, as well as addressing the local dimension (see Chapter 3).

17.2 Objectives of Environmental Management

Many of the techniques examined in this chapter have commonly been labelled 'environmental management' and concentrate on alleviating local problems. Many local environmental management schemes promote the key recommendations in the 17th Report of the Royal Commission on Environmental Pollution (RCEP, 1994) and, in particular, the recommendation to '...improve the quality of life, particularly in towns and cities, by reducing the dominance of cars and lorries and providing alternative means of access'.

However, in its wider context, environmental management should examine all aspects of sustainability. Environmental management ultimately deals with wider issues, including strategic transportation policy, by, for example, the promotion of walking, cycling and public transport, together with improved air quality. Consequently, environmental management should be a key mechanism for achieving a sustainable environment, whilst providing acceptable levels of accessibility for all users, in the context of global, national and local guidelines.

17.3 Framework for Environmental Management Schemes

Global and National Guidelines

Agenda 21 defines in detail the global strategy for moving towards a sustainable future in the 21st Century, as set down by the Rio Earth Summit in 1992 (UNCED, 1992b).

The European Commission's strategy is set out in the EC Fifth Action Programme on the Environment (EC, 1992), which proposed a strategy to reduce transport needs, improve network coordination, support environmentally–friendly modes, integrate public transport modes and reduce the use of cars. The EC policy on sustainable mobility was detailed further in an EC White Paper published in 1993 (EC, 1993), which supplements the programmes in the Fifth Action Programme.

UK national policy planning guidance is set out in the White Paper 'This Common Inheritance' (DOE, 1990 to 1996), which introduced the concept of stewardship of the environment and which applies directly to transportation planning and traffic management. This is reviewed on an annual basis. Sustainable Development – the UK Strategy (DOE, 1994) set out the British Government's approach and recognised

the importance of developing indicators by which progress towards sustainability can be judged. The Government has produced a preliminary set of indicators of sustainable development (HMG, 1996a).

PPG13 (DOE/DOT, 1994) [NIa] [Sa] is the principal source of guidance to local authorities on the content of, and the integration between, transportation plans and land–use policies. The guidance emphasises three main aims:

- ❑ to reduce growth in both the length and number of motorised journeys;
- ❑ to encourage alternative means of travel which have less environmental impact; and
- ❑ to reduce reliance on the private car.

PPG6 (HMG, 1996b) [Sb] on Town Centres and Retail Developments sees fostering development in town centres as having an important role in reducing the need to travel and the reliance on cars. PPG6 [Sb], like PPG13 [Sa], advises against development which is likely to add significantly to the overall number and lengths of car trips.

In 1995, the Government published its strategic policies for air quality management, Air Quality – Meeting the Challenge (DOE *et al*, 1995), which sets out conclusions on the policies needed to prevent the UK's air quality from deteriorating. The Environment Act 1995 (Part IV) (HMG, 1995) sets terms for a National Air Quality Strategy to be developed by the Government (DOE, 1996) and places a duty on local authorities to address air quality problems and to produce Action Plans for 'Environmental Management Areas' where needed.

Local Guidelines

One of the key elements of the Development Plan process, involving Unitary Development Plans (UDP) [NIb], Structure Plans or Local Plans, as indicated in PPG13 [Sa], is to ensure integration between transport considerations and land–use policies. Taken together, the plans should cover various aspects, from strategic transportation issues through to more detailed policies on traffic and transport, which reflect the underlying philosophy both of national advice on sustainable development and local priorities as reflected in Transport Plans. They should also contain a wide range of environmental policies, on topics such as air quality, visual impact, impact on heritage features, landscape considerations and noise (see also Chapter 3).

Transport Plans identify the priorities for action on the measures required to encourage alternatives to private cars and to restrain their use. The creation of targets, against which progress can be monitored, can be an important part of the process and can include environmental management targets (see also Chapter 6).

The concept of Local Agenda 21 (LA21) (UNCED, 1992a and 1992b) is a community–based approach to setting the agenda for sustainable development. More than half of the actions identified in Agenda 21 are the responsibility of, or are significantly influenced by, local government. In the UK, the Local Government Management Board (LGMB) is co–ordinating work on LA21 and had aimed at establishing, by the end of 1996, local agendas to promote sustainable development within communities. One aspect of their work is the development of 'sustainability indicators', which includes the theme that '...access to facilities, services, goods and other people is not achieved at the expense of the environment or limited to those with cars'. A number of indicators reflecting this theme are identified in the Framework for Local Sustainability (LGMB, 1993).

17.4 The Role and Purposes of Targets

Establishing targets can be a useful tool in policy development and evaluation and is stressed by the Royal Commission on Environmental Pollution's (RCEP) report on Transport and the Environment (RCEP, 1994). Target–setting can have considerable value as an objectives–based approach towards environmental management, so long as the full economic implications of achieving each target level are understood. Moreover, they must be practical and achievable.

National and Local Target–Setting

A number of individual national targets have been adopted following international agreement at the Earth Summit (1992) or via European Commission Directives (for example, those concerning limits on 'greenhouse' gas emissions). The Royal Commission on Environmental Pollution (RCEP, 1994) suggested a series of targets concerning transport policy and local planning authorities are encouraged to develop their own targets, covering areas such as the overall need to travel, location of development, modal shift, accessibility and safety (SCC, 1995).

Types of Target

A distinction can be made between two different types of targets and how they are developed. On the macro scale, targets can be set at the international or national level, such as carbon dioxide emission standards set at the Rio Earth Summit (UNCED,

1992b). 'Top–down' planning systems can then translate these into local authority targets, for example in Transport Plans and local Agenda 21s. Although individual schemes may make only a marginal contribution to the overall international target, the cumulative effect can have a marked impact. At the same time, local conditions can be improved and good practice established.

The reverse process can also be followed, with targets set locally, possibly through public participation. These targets can be scheme–specific, varying within the limits of absolute targets defined in the Transport Plans or local Agenda 21s. This process can loosely be seen as 'bottom–up' planning. Environmental management schemes have traditionally followed this route.

The Value Of Targets

The Local Government Management Board (LGMB, 1993) identified the benefits from setting targets, as follows:

- ❑ targets can articulate a vision and can begin to move perceptions towards it. For example, if targets were expressed to reduce overall levels of car mileage or car dependence, this could help to move perceptions towards more sustainable transport habits;
- ❑ targets can initiate and focus a debate. For example, the Government's target for recycling 25% of domestic waste generated a wide debate among local authorities and waste management companies. Thus, the actual process of setting targets helps to focus on the likely outcome or policies; and
- ❑ targets can encourage technological change and give an incentive to private industry to research and develop the means of achievement. For example, the Government's declaration of the target of increasing energy efficiency by 20% caused an upsurge in industrial investment in energy–efficiency technologies in the early 1980s.

The use of targets means that performance can be monitored by both professionals and the general public. Monitoring can have substantial time and resource implications, especially if targets are complex and/or numerous. Nevertheless, targets can provide a basis for driving projects and actions, for evaluating the environmental impact of schemes and for highlighting how individual items relate to the overall plan and to each other.

Limitations on the Effectiveness of Targets

It is vital that targets are realistic and achievable. Targets that are unlikely to be met run the risk of losing credibility and commitment. It may be argued that target–setting is inappropriate, on the basis that achieving a number of small changes is more important than reaching a specific level on one particular dimension. Moreover, devoting resources to the pursuit of one target is likely to be at the expense of pursuing others. Without estimating the marginal economic return from achieving each target separately, it is almost impossible to allocate limited resources to several different targets in an efficient way. For this reason, targets need to be re–evaluated regularly and, where appropriate, progressively increased from low initial levels towards an optimum rather than an ideal.

Examples of national and local targets are set out below:

National Targets:

- ❑ a recommendation by RCEP to reduce emissions of carbon dioxide from surface transport by the year 2000 to the 1990 level (RCEP, 1994);
- ❑ a recommendation by RCEP to reduce daytime exposure to road and rail noise to not more than 65dBA (18h L_{10}) at one metre from the facades of houses (RCEP, 1994); and
- ❑ approved Government policy to reduce total road casualties by the year 2000 by 30% from the annual average between 1981 and 1985.

Local Targets:

- ❑ to halve the number of child casualties by the year 2000 (A Transport Strategy For Lothian);
- ❑ to reduce the number of residents subjected to daytime road traffic noise, over a level defined in 1996, by 1% by 2006 (A New Transport Plan for Surrey); and
- ❑ a doubling, to five percent, by the year 2011, of the 1991 proportion of residents travelling to work by bicycle (Buckinghamshire County Council – Draft Integrated Transport Strategy).

17.5 Environmental Management Measures

Schemes such as pedestrianisation, park–and–ride and area–wide traffic management have been the basis of many environmental management schemes. The assessment has generally focused on the original objectives and, therefore, concentrated on the immediate benefits in terms of both location and time. However, studies which have examined the wider and longer term implications of such schemes have shown that the short–term local benefits have, in certain circumstances, been undermined by other unforeseen disbenefits. Therefore, when assessing the environmental impact of a specific scheme, consideration should not be confined to just the

immediate area and the short term but the effects should also be evaluated over a wider area and for the longer term. The significance of individual impacts will vary according to the location, the time and for other reasons; for example, air quality in areas of high pedestrian activity, visual intrusion in conservation areas and night–time noise in residential areas. Such variations in sensitivity should be considered in the evaluation of measures.

When evaluating schemes on this broader basis, the process and the issues can become complex. Traffic noise is an example. It is perceived as more of an intrusion where a low ambient noise level is interrupted by high peaks. Whilst diverted traffic will create the same amount of noise at similar speeds, it will not be so apparent or considered such an intrusion if it is displaced onto a road with higher ambient noise levels.

With the requirement for local authorities to examine the air quality in their area (HMG, 1995), environmental management measures can be air–quality led, thus defining new objectives. However, to achieve an overall improvement in air quality, everything else being equal, a reduction in the total volume of pollutants being discharged into the air is required. A scheme which diverts traffic to an already congested road may improve conditions in the immediate 'calmed' area but, if it adds to the congestion on the alternative route, overall, more pollutants may be discharged into the atmosphere. Therefore, overall improvement in air quality can only be achieved in the short–term by a reduction in vehicle mileage or by reducing delays. Other factors must also be considered. If, by reducing delays, additional traffic is induced, the net effect on vehicular delays could be negative. Conversely, an increase in delays to vehicles, caused by the provision of facilities for pedestrians, cyclists or public transport, may increase pollution in the short–term but, in the long–term, if it were to achieve a modal shift, could have a positive net effect.

The above examples illustrate the complexity of evaluating the consequences of applying environmental management measures and that the task of setting targets and monitoring their effects can be complicated. It also shows that remote effects are important and should be assessed as part of the value of a local scheme.

Environmental Factors

Environmental management should be concerned with the whole picture of sustainability. When consulting on quality of life issues in a neighbourhood, some recurrent themes are found. Some of these relate to specific local impacts arising from any proposed scheme and are briefly described below. Further information can be found in The Design Manual For Roads And Bridges – Volume 11 (DOT, 1993).

Noise

Traffic noise comes from the interaction of tyres with the road surface; from engines, exhausts, brakes and unsecured loads; and, in respect of goods vehicles, from vibration and body–rattle. Noise is accentuated by braking and acceleration, by high speed and by travelling in low gears. Situations where there are noticeable peaks against a low ambient background noise are perceived as a particular problem. Vehicle maintenance, driver behaviour and road surface conditions all have an additional influence.

Vibration

There are two forms of vibration; air–borne vibration caused by low frequency sound waves and ground vibration caused by the contact of the vehicle with the ground. Vehicle design, engine speed, road surface condition and the underlying ground strata all have an influence.

Air Quality

Vehicular traffic emits a mixture of chemicals that can damage the environment and may be harmful to health. They include oxides of carbon, oxides of nitrogen, sulphur dioxide, hydrocarbons (including benzene), 1,3–butadiene and fine particles. Under the Environment Act 1995 (HMG, 1995), local authorities are responsible for local air quality management within the framework of the National Air Quality Strategy (DOE, 1996). Traffic management measures may change vehicle flows and operating conditions in such a way that emissions are increased or decreased (DOT, 1996) [Sc].

Visual intrusion

Visual intrusion is a subjective factor and difficult to measure. It relates to traffic (composition, volume, whether parked or moving) and to the quality of the built environment (street furniture including traffic signs, materials, lighting source) both in terms of quality and volume.

Accident–Risk

Actual accident–risk is an important aspect of a good quality environment. Personal injury accidents are recorded but consideration should also be given to damage–only crashes, to the high percentage of unreported accidents and to vulnerable road–users (see also Chapter 16).

Severance

Heavily–trafficked roads through a community can

divide that community and change the social behaviour of the people affected. In particular, it can affect the way in which people choose to make trips, particularly where the road is seen to be a barrier to safe walking and cycling and a cause of detours and delays. The introduction of safe facilities for pedestrians, such as signal–controlled crossings or traffic–calming measures, which slow the speed of traffic, can reduce community severance.

Parked Vehicles

Inconsiderate parking causes danger and nuisance and reduces pedestrians' amenity. When parked on footways, vehicles inconvenience and endanger pedestrians and damage the fabric of the environment. Heavy goods vehicles' activity can result in visual intrusion and excessive noise and pollution. This is most disturbing during unsocial hours (see Chapter 19).

Intimidation.

The perception of accident–risk and the fear and intimidation caused by large fast–moving vehicles are detrimental to the quality of life. The situation is made worse where footways are narrow and heavily used.

Practical Application

The importance and weighting given to particular factors will be for individual authorities to determine,given their local objectives and targets, together with the more global objectives and targets that may be set out in their Transport Plan. The success or otherwise of a scheme is determined by assessing the performance of the scheme against global, national and local targets relating to the factors listed.

The following examples in Table 17.1 indicate some of the environmental benefits (+) and disbenefits (–) resulting from introducing typical environmental management techniques. They are an indication of the complex issues involved in assessing a scheme and are not intended to be exhaustive.

17.6 Monitoring and Review of Environmental Measures

As with traffic management, environmental measures need to be reviewed to assess their effectiveness. The review process should identify where further studies or modifications may be needed following the initial implementation of environmental measures. The approach could be based on the application of evaluation criteria, the use of guidelines, consultation, public participation and environmental monitoring systems. This information may be published as part of a review report, stating clearly the objectives or targets against which the effectiveness was measured and whether the implemented measures are still effective and appropriate. This process may be used as a tool for the measurement of a scheme's sustainability by:

- ❑ assessing the effectiveness of environmental measures against objectives or targets, by comparing original estimates with the performance once the measure becomes operational;
- ❑ detecting adverse effects of measures at an early stage, so that remedial action can be taken before changes becomes a serious problem requiring time–consuming and expensive mitigating action; and
- ❑ using information obtained to add to knowledge and to encourage best environmental practice.

The review and monitoring process itself should be evaluated, from time to time, to ensure that it continues to meet appropriate objectives. Resource constraints may require monitoring of environmental measures to be selective, concentrating on those aspects that give rise to the most concern and for which tried and tested techniques are available. The use of readily–available data as a proxy may be considered in appropriate cases, for example traffic flow and composition by engine–type as an indicator of local air quality. Results from the review and monitoring process may help to improve methodologies for appraising schemes prior to their introduction.

Table 17.1: Positive and negative outcomes of environmental measures.

Factors	Positive Outcomes (+)	Negative Outcomes (–)
(a) Traffic Calming (see also Chapter 20 and photographs 17.1 and 17.2)		
Noise	❑ Where traffic volumes are reduced without an increase in speed. ❑ Where traffic is displaced to roads with already high noise levels (unless noise is increased to an unacceptable level). ❑ Where traffic speeds are reduced	❑ Where vehicles are caused to accelerate and decelerate ❑ Where vehicles are caused to use a low gear ❑ Where insecure vehicle loads are displaced.
Vibration	❑ Where the weight and volume of vehicular traffic are reduced. ❑ Where the location of road humps avoid proximity to residential properties.	Ground borne: ❑ Where ramp gradients are too steep ❑ Where road humps are located close to properties on soft soils Air borne: ❑ Where vehicles are caused to travel in low gear ❑ Where vehicles are caused to accelerate and decelerate
Air Quality	❑ Where a scheme achieves a modal shift ❑ Where traffic volumes are reduced without detrimental change in speed	❑ Where vehicles are caused to travel in low gear ❑ Where vehicles are caused to accelerate and decelerate ❑ Where vehicles are diverted onto an already congested road ❑ Where total vehicle mileage is increased
Visual intrusion	❑ Where traffic volumes are reduced	❑ Design of schemes can be intrusive
Accident Risk	❑ Has been shown to reduce accidents by up to 70%	
Severance	❑ Where safe crossing points are provided ❑ Where traffic volumes are reduced	
Parked Vehicles	❑ Where parking is regulated	
Intimidation	❑ Where speed is reduced ❑ Where traffic volumes are reduced	
(b) Pedestrianisation (see also Chapter 22 and photographs 17.3 and 17.4)		
Noise	❑ Within pedestrianised area ❑ Where traffic is diverted to major traffic routes	❑ Where displaced traffic creates additional noise on alternative routes
Air Quality	❑ In the immediate area.	❑ Where alternative routes are longer and/or more congested ❑ Adds to already near congested route
Visual intrusion	❑ Where vehicular traffic is substantially reduced or eliminated	❑ Where more people are affected along the diverted route ❑ Where buses and heavy good vehicles are concentrated on particular routes
Accident Risk	❑ Where the accident rate on the diverted route is lower, especially for pedestrians and cyclists	❑ Where cyclists are forced onto heavily trafficked peripheral roads
Severance	❑ Where vehicular traffic is substantially reduced or eliminated	❑ Where the diversion route is longer and more people are affected ❑ Where traffic is diverted past schools or other sensitive land uses ❑ Where cyclists have a more circuitous route ❑ Where cyclists access to shops and services is reduced

Factors	Positive Outcomes (+)	Negative Outcomes (–)
Parked Vehicles	❑ Easier access for delivery vehicles and disabled vehicles	❑ Where parking problems are created in surrounding roads
Intimidation	❑ Where vehicular traffic is substantially reduced or eliminated	❑ Where diverted traffic uses residential roads or other sensitive routes
Note: The positive outcomes of pedestrianisation may be offset if access by buses and service vehicles is increased.		
(c) Park & Ride (see also Chapter 24 and photograph 17.5)		
Noise	❑ Where traffic volumes in town centres are reduced	❑ Where bus traffic is increased
Vibration	❑ Where traffic volumes in town centres are reduced	❑ Where bus traffic is increased
Air Quality	❑ Where overall vehicle mileage is reduced and congestion in the central area is reduced	❑ Where additional car trips are generated as a result of easier parking ❑ Where bus traffic is increased ❑ Where traffic queues occur
Visual intrusion	❑ Where traffic volumes in town centres are reduced ❑ Where associated priority measures allow buses a smoother journey	❑ Poor design of park and ride car park
Accident Risk	❑ Where vehicle mileage is reduced ❑ For cyclists and pedestrians where traffic volumes are reduced	❑ Where new accesses to car parks create danger particularly for pedestrians and cyclists
Severance	❑ Where traffic volumes in town centres are reduced	
(d) HGV Controls (see also Chapter 25 and Photographs 17.6 and 17.7)		
Noise	❑ Where HGVs are diverted from sensitive areas	❑ Where displaced traffic creates additional problems on alternative routes
Vibration	❑ Where HGVs are diverted from sensitive areas	❑ Where vehicles are forced to accelerate and decelerate ❑ Where vehicles are forced to use low gear
Air Quality	❑ Where volumes of HGVs are removed from sensitive areas	❑ Where vehicles are forced to accelerate and decelerate ❑ Where vehicles are forced to use low gear
Visual intrusion	❑ Where volumes of HGVs are removed from sensitive areas	❑ Where overnight parking is banned
Severance	❑ Where overnight parking is banned	
Intimidation	❑ Where HGVs are removed from sensitive areas	
(e) Landscaping (see Photograph 17.8)		
Noise	❑ Where it provides a barrier to noise (real or perceived)	
Air quality	❑ Appropriate planting may trap or absorb pollutants	
Visual intrusion	❑ Where good design is used and visual appearance is enhanced	
Accident Risk	❑ Where visibility is improved and drivers adopt lower speeds	❑ Where visibility is obstructed

Table 17.1 continued.

Factors	Positive Outcomes (+)	Negative Outcomes (–)
Severance	❑ Where used to segregate pedestrians and cyclists from other traffic and give them priority	
Parked Vehicles	❑ Where parking is removed or controlled ❑ Where used to provide modest barriers to noise pollution and shade for parked vehicles	
Intimation	❑ Acts as barrier to vehicles and protects pedestrians	
(f) Direction Signing (see Chapter 15 and Photograph 17.9)		
Noise	❑ Where journey lengths are reduced	❑ Where traffic along some routes is increased
Air Quality	❑ Where journey lengths are reduced	❑ Where traffic along some routes is increased
Visual Intrusion		❑ Where size and number of signs are increased and views of the townscape obscured
Accident Risk	❑ Where they provide positive advice and guidance for drivers and reduce uncertainty	
Severance	❑ Where traffic is diverted from sensitive areas	❑ Where diverted traffic aggravates existing severance
(g) Parking Controls (see Chapter 19 and Photographs 17.10 and 17.11)		
Noise	❑ Where on-street parking is reduced	❑ Inconsiderate drivers and passengers (door slamming, radio, excited voices)
Air Quality	❑ Where parking information reduces journey length or encourages modal shift	❑ Where journeys are lengthened by drivers searching for parking places
Visual intrusion	❑ Where on–street parking is removed or limited	❑ Where the number of signs and carriageway markings are increased
Accident Risk	❑ Where parking is restricted to safe locations	❑ Where an increase in speed is encouraged
Severance	❑ Where areas free of parked vehicles are provided for pedestrians and cyclists	
Parked Vehicles	❑ Where footway parking is controlled	
(h) Traffic Signals (see Chapter 40 and Photograph 17.12)		
Noise	❑ Where co–ordinated signals promote free flow	❑ Where there is an increase in acceleration, deceleration and idling, (reving engines)
Vibration		❑ Where low frequency vibration is generated by large vehicles accelerating and idling
Air Quality	❑ Where co–ordinated signals promote free flow ❑ Reduced emissions (compared with priority junctions)	❑ Where there is an increase in acceleration and deceleration ❑ Where traffic is required to queue ❑ Where additional traffic is induced by increasing capacity
Visual Intrusion		❑ Where additional street furniture is provided
Accident risk	❑ Should be reduced	
Severance	❑ Where signal timings are used to reduce traffic volume at priority junctions ❑ Where pedestrian crossings and cycle facilities are provided	
Parked vehicles	❑ Where parking is banned in the vicinity of junctions	

Table 17.1 continued.

Photograph 17.1: Traffic calming in a village street.

Photograph 17.2: Traffic calming: entry treatment.

Photograph 17.3: Pedestrianisation of a high street.

Photograph 17.4: Pedestrianisation of a side street.

Photograph 17.5: Park & Ride.

Photograph 17.6: HGV controls.

Photograph 17.7: HGV control using width restriction.

Photograph 17.8: Visual and noise barriers under construction.

Photograph 17.9: Direction signing – size can be intrusive.

Photograph 17.10: Parking control in an historic centre.

Photograph 17.11: Parking control in an outer suburb.

Photograph 17.12: Traffic signals in a rural location.

17.7 References

DOE (1990 to 1996) UK Annual Report 'This Common Inheritance', Stationery Office.

DOE (1994) CM2426 'Sustainable Development: the UK Strategy', Stationery Office [Sa] [Wa].

DOE *et al* (1995) Department of the Environment: Welsh Office, The Scottish Office, Department of Environment (NI) and Department of Transport 'Air Quality: Meeting the Challenge – The Government's Strategic Policies for Air Quality Management', Stationery Office.

DOE (1996) 'UK National Air Quality Strategy: Consultation Draft' Stationery Office.

DOE/DOT (1994) Planning Policy Guidance Note 13 'Transport', Stationery Office.

DOT (1993) Design Manual for Roads and Bridges Volume 11 – 'Environmental Assessment', Stationery Office.

DOT (1996) TAU Traffic Advisory Leaflet 4/96 'Traffic Management and Emissions', DOT [Sc].

EC (1992) Commission of the EC 'Towards Sustainability: A European Community Programme of Policies and Action in relation to the Environment and Sustainable Development' The EC Fifth Environmental Action Programme, Official Publication of the EC (COM (92) 23/11 Final).

EC (1993) Commission of European Communities (1993) 'The Future Development of the Common Transport Policy: a global approach to the construction of a Community framework for sustainable development', EC White Paper.

HMG (1995) 'The Environment Act', Stationery Office.

HMG (1996a) 'Indicators of Sustainable Development for the UK', Stationery Office.

HMG (1996b) Planning Policy Guidance Note 6 'Town Centres and Retail Developments', Stationery Office [Sb] [Wa].

LGMB (1993) 'A Framework for Local Sustainability', Local Government Management Board.

RCEP (1994) Royal Commission on Environmental Pollution 'Transport and the Environment', Stationery Office.

SCC (1995) 'A New Transport Plan for Surrey', Surrey County Council.

UNCED (1992a) 'Agenda 21 – Action plan for the next century', UNCED.

UNCED (1992b) 'Agenda 21 – Rio Earth Summit', endorsed at UNCED.

17.8 Further Information

Buchanan, C *et al* (1963) 'Traffic in Towns', Stationery Office.

Civic Trust 'Caring for our Towns and Cities', CT.

CSS (1995) 'Sustainable Transport Indicators and Transport', County Surveyors' Society (February).

DOE (1988) Circular 15/88 (WO23/88) 'Environmental Assessment', DOE.

DOE (1994a) Planning Policy Guidance Note 23 'Planning and Pollution Control', Stationery Office [Sd] [Wa].

DOE (1994b) Planning Policy Guidance Note 24 'Planning and Noise', Stationery Office.

DOE/DOT (1992) Departments of the Environment and Transport to the Royal Commission on Environmental

Pollution 'Transport and the Environment', DOE/DOT.

DOT (1993) Department of Transport: Design Manual for Roads and Bridges Volume 10 'The Good Roads Guide', Stationery Office.

DOT (1996a) Traffic Advisory Leaflet 6/96 'Traffic Calming: Traffic and Vehicle Noise', DOT [Sc].

DOT (1996b) Traffic Advisory Leaflet 12/96 'Road Humps and Ground–borne Vibrations', DOT [Sc].

Dutch MOT (1990) Netherlands Ministry of Transport. Public Works & Water Management, 'Second Structure Plan', Den Haag,

EC (1985) Council Directive 85/337/EEC of 27 June 1985 on 'The assessment of the effects of certain public and private projects on the environment', EC.

EC (1990) Commission of the European Communities (1990) Green Paper on 'The Urban Environment', EC.

EC (1992a) Commission of European Communities (1992) Green Paper on the 'Impact of Transport on the Environment. A Community Strategy for 'Sustainable mobility' COM (92) 494.

ECMT (1990) European Conference of Ministers of Transport: 'Transport Policy and Environment' ECMT Ministerial Session, OECD.

Harman R (1993) 'Transport Planning Practice in Other European Regions, Manual of Information', Surrey County Council.

Harman R (1995) 'New Directions: a manual of European best practice in transport planning', Transport 2000.

HMG (1988a) 'Town and County Planning (Assessment of Environmental Effects) Regulations 1988', Stationery Office [Sf].

HMG (1988b) SI No. 1241 'The Highways (Assessment of Environmental Effects) Regulations 1988', Stationery Office [Sf].

HMG (1991) Royal Commission on Environmental Pollution '15th Report on Emissions from Heavy Duty Diesel Vehicles', Stationery Office.

SACTRA (1986) 'Urban Road Appraisal', Stationery Office.

SACTRA (1992) 'Assessing the Environmental Impact of Road Schemes', Stationery Office.

Stringer B (1994) 'Setting targets for transport: policy making by numbers?', Local Transport Today (17 August).

TRL (1995a) Project Report 103 'Vehicle and Traffic Noise Surveys Alongside Speed Control Cushions in York', TRL.

TRL (1995b) Report 174 'The Environmental Assessment of Traffic Management Schemes: A Literature Review', TRL.

TRL (1996a) Report 180 'Traffic Calming: Vehicle Noise Emissions Alongside Speed Control Cushions and Road Humps', TRL.

TRL (1996b) Report 235 'Traffic Calming: Vehicle Generated Ground–borne vibrations alongside Speed Cushions and Road Humps', TRL.

UNCED (1987) World Commissions on Environment and Development 'Our Common Future', Oxford University Press.