



# *est!*

## **e**nvironmentally **s**ustainable **t**ransport

### ISSUES PAPER

#### Soft measures and transport behaviour

Prepared for a workshop entitled  
"Communicating Environmentally Sustainable Transport—The role of soft  
measures in achieving EST"  
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TABLE OF CONTENTS

Chapter 1. Definition of terms; scope and purpose of this paper .....	3
Chapter 2. The EST visions and their importance.....	7
2.1. Overview of the EST project; visions and conclusions.....	7
2.2. Scale of challenges involved in achieving EST .....	10
2.3. Soft measures identified during the EST project .....	11
2.4. Barriers to attainment of EST .....	12
2.5. Conclusions from the EST project concerning implementation .....	12
Chapter 3. Key factors in the movement of people.....	14
3.1. The importance of car ownership.....	15
3.2. Economic factors .....	16
3.3. Settlement density .....	18
3.4. Transport facilities .....	19
Chapter 4. Other factors in transport behaviour.....	21
4.1. Views about human behaviour.....	21
4.2. Societal factors.....	22
4.3. Individual factors .....	23
4.4. Attitudes and behaviour .....	26
4.5. Acceptability .....	27
Chapter 5. Roles of advertising.....	31
Chapter 6. Quick review of some research on the effectiveness of soft measures.....	34
6.1. Some negative assessments.....	34
6.2. Some more positive assessments .....	34
6.3. Enhanced soft measures .....	38
Chapter 7. Conclusions concerning the use of soft measures .....	41
Chapter 8. A step beyond soft measures: environmental supports for desired transport behaviour .....	42
Chapter 9. Draft workshop recommendations.....	44
Appendix A: Workshop programme .....	45
Appendix B: Five approaches to explaining human behaviour.....	47
End Notes.....	50

## CHAPTER 1. DEFINITION OF TERMS; SCOPE AND PURPOSE OF THIS PAPER

It's easier to understand the term *soft measures* by first considering its complement, *hard measures*. A *hard measure* is an action taken by government to change behaviour that involves the use of taxes (or incentives) or the use of regulations or the provision of infrastructure or transport supply. Examples of hard measures designed to change transport behaviour are:

**taxes:** high fuel taxes are imposed in part to discourage excessive vehicle use

**regulations:** speed limits are imposed to reduce dangerous driving or fuel use

**infrastructure:** bicycle paths are introduced to encourage cycling.

*Soft measures* are other actions taken by government to change behaviour. They usually involve the provision of factual information or the linking of behaviour with positive or negative outcomes. Examples of soft measures are:

**factual information:** provision of information about a new bus service to increase bus use

**positive association:** portraying bicycle use as conducive to good physical health

**negative association:** portraying car use as a contributor to poor air quality.

Other terms used to characterize soft measures include attitude change, education, and persuasion. Soft measures can be directed at communities rather than individuals. A program designed to raise a community's awareness of the health consequences of traffic noise, and perhaps even stimulate political action, is an example of the use of soft measures.

Some authors have used the term 'hard measures' to refer to changes in vehicle fleet or infrastructure, or both, and use 'soft measures' to refer to other means of securing a change in transport activity or transport's impacts. According to this usage, taxes and regulations could be soft measures.<sup>1†</sup> Thus, care should be taken to note what is being meant when the term *soft measures* is used.

In the usage of the present paper, **a distinctive feature of soft measures is that they are non-coercive and relatively low in cost**; i.e., they do *not* include taxes, regulations or major investments in infrastructure.<sup>2</sup>

**This paper's focus is on the use of soft measures to change transport behaviour towards Environmentally Sustainable Transport (EST).** The OECD has developed a formal definition of EST:

An environmentally sustainable transport system is one that does not endanger public health or ecosystems and meets needs for access consistent with (a) use of renewable resources at below their rates of regeneration, and (b) use of non-renewable resources at below the rates of development of renewable substitutes.<sup>3</sup>

The OECD's work on EST and the need to make progress towards EST are discussed further in Chapter 2 of this report.

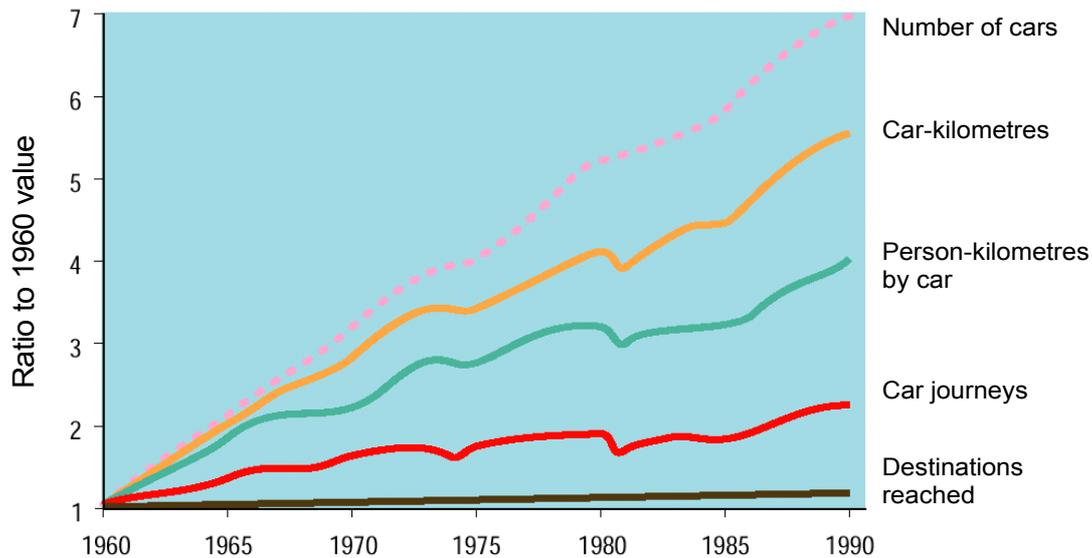
*Access* is a key concept in the definition of EST. It refers to acceptable levels of availability of social and business contacts, goods and services, realisable with or without travel or other physical movement. An aspect of access is availability of destinations, which has been estimated

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<sup>†</sup> Superscript numbers refer to End Notes that begin on Page 50.

for west Germany for 1960-1990—a period of extraordinarily rapid motorisation—as shown in Figure 1.<sup>4</sup> While the number of cars rose more than sevenfold, the number of destinations reached hardly changed at all. Data from two recent major surveys of urban travel support the finding of increased mobility without much increase in access; they show that in the 1990s trips by car replaced walking and public transport trips with hardly any increase in the overall number of trips made.<sup>5</sup>

Figure 1. Mobility in west Germany, 1960-1990



*Transport behaviour* includes anything that people do that is related to the movement of people or the movement of freight. Hard and soft measures are mostly used to change the transport behaviour of individuals and communities. They can also be used to change what vehicle manufacturers and infrastructure providers do. This kind of behaviour is not discussed here.

Changes in transport behaviour that represent progress towards EST include the following:

#### **Movement of people**

- More careful driving
- Higher occupancy; car-pooling
- Downsizing cars
- Shifting from the car to public transport
- Shifting within public transport from air and bus to rail
- Shifting from motorised to non-motorised modes
- Reducing travel; replacing it with electronic communications

#### **Movement of freight**

- More careful driving of vehicles
- More complete loading
- Shifting from air and road to rail
- Reducing material flows; replacing them with electronic communications

Although the movement of freight can have comparable environment effects to the movement of people (see Figure 3 and Figure 4 below), this paper focuses much more on the movement of people. This is done because of data availability and also because soft measures are usually thought of as acting on travellers rather than on shippers or carriers of goods. However, soft

measures may have as much application in the movement of freight as in the movement of people.<sup>6</sup> Figure 2 provides an example of changing behaviour with respect to freight transport.<sup>7</sup>

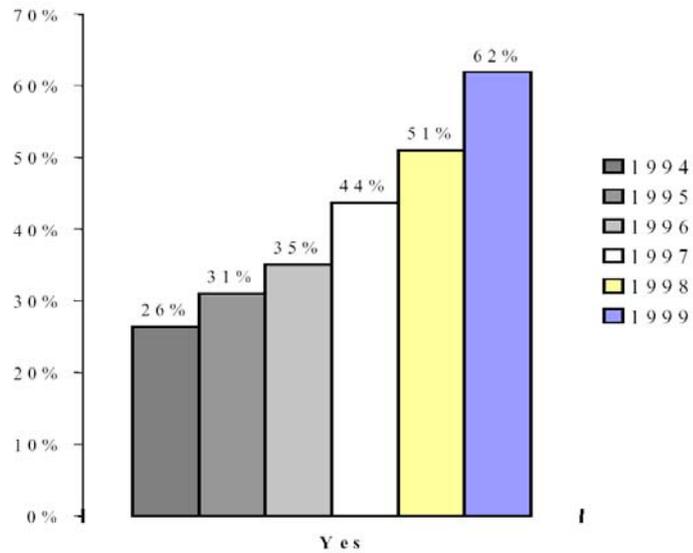
**The purpose of this paper** is to help guide and even provoke discussion at the workshop to be held in Berlin on 5-6 December, 2002, entitled *Communicating Environmentally Sustainable Transport—The roles of soft measures in achieving EST*. In places, the paper errs on the side of pessimism as to the opportunities provided by soft measures. This has been done in the hope that workshop participants will be stimulated to contradict what is in

the paper and bring forward important evidence of soft measures' positive effects. Moreover, the paper presents a point of view that favours management of transport behaviour through manipulation of its consequences. This is seen by some as antagonistic to the view that information and persuasion can play strong roles in changing behaviour, and thus may help further to provoke discussion.

The elaboration of the OECD's work on EST in Chapter 2 includes some justification for using soft measures as an alternative or complement to hard measures. Chapter 3 sets out some the key factors in car ownership and use. Chapter 4 discusses other factors, including social and individual factors, attitudes and acceptability, as they may be relevant to transport behaviour. Chapter 5 comprises a discussion of advertising in relation to car ownership and use. Chapter 6 provides an overview of some research on the effectiveness of soft measures. Chapter 7 draws some conclusions concerning the use of soft measures, and Chapter 8 provides additional discussion as to how transport behaviour can be shaped in desired directions by changing its context. Finally, Chapter 9 sets out draft recommendations for consideration by the workshop.

**At several points in this paper, questions are posed for workshop participants** as in the example below. These are brought together in Table 1 arranged by the session in which each question might best be considered. The workshop programme appears here as Appendix A.

Figure 2. Environmental demands by Swedish customers for freight transport services



Question 1. What is an appropriate definition of 'soft measures'?

SOFT MEASURES AND TRANSPORT BEHAVIOUR

Table 1. Questions posed for the workshop panellists,

Sessions in which questions are to be addressed	QUESTIONS	Page of this document where question is found
All sessions	Question 1. What is an appropriate definition of 'soft measures'?	Page 5
Session 2	Question 2. What maintains unsustainable transport behaviour?	Page 14
	Question 3. Can the strategies involving soft measures designed to reduce car use also be applied to reducing car ownership?	Page 15
	Question 4. If increasing settlement density is an appropriate way to address some transport issues, how might soft measures be used to help achieve denser patterns of land use?	Page 19
Session 3	Question 6. How can soft measures be used to give additional value to sustainable transport behaviour?	Page 22
	Question 8. Is some transport behaviour—e.g., non-habitual transport behaviour—more amenable to influence by soft measures?	Page 26
	Question 14. To what extent are soft measures effective in changing transport behaviour?	Page 40
	Question 15. Can soft measures be used to facilitate the effects of 'hard' measures designed to make transport behaviour more sustainable?	Page 40
Session 4	Question 5. When appropriate facilities are available, what are the best ways to use soft measures to influence mode choice in favour of public transport, walking, and cycling?	Page 20
	Question 7. How can young adults be induced to <i>not</i> consider car ownership as an important goal?	Page 23
	Question 10. To what extent is acceptance of measures a necessary or sufficient requirement for their effectiveness?	Page 30
	Question 11. How could soft measures be used to increase the acceptance of measures that have been introduced?	Page 30
	Question 16. How can soft measures best be used to achieve sustainable transportation?	Page 40
Session 5	Question 12. How does advertising support unsustainable transport behaviour, and how could it be used to make transport behaviour more sustainable?	Page 33
	Question 13. Are counter-advertising and denormalisation plausible strategies for reducing car ownership and use?	Page 33
Session 6	Question 9. What causes decision-makers to underestimate public support for environmental friendly transport modes, and how could soft measures be used to correct such underestimates?	Page 27
	Question 17. Is interest in soft measures a way of avoiding unpalatable use of hard measures?	Page 41

## CHAPTER 2. THE EST VISIONS AND THEIR IMPORTANCE

### 2.1. Overview of the EST project; visions and conclusions

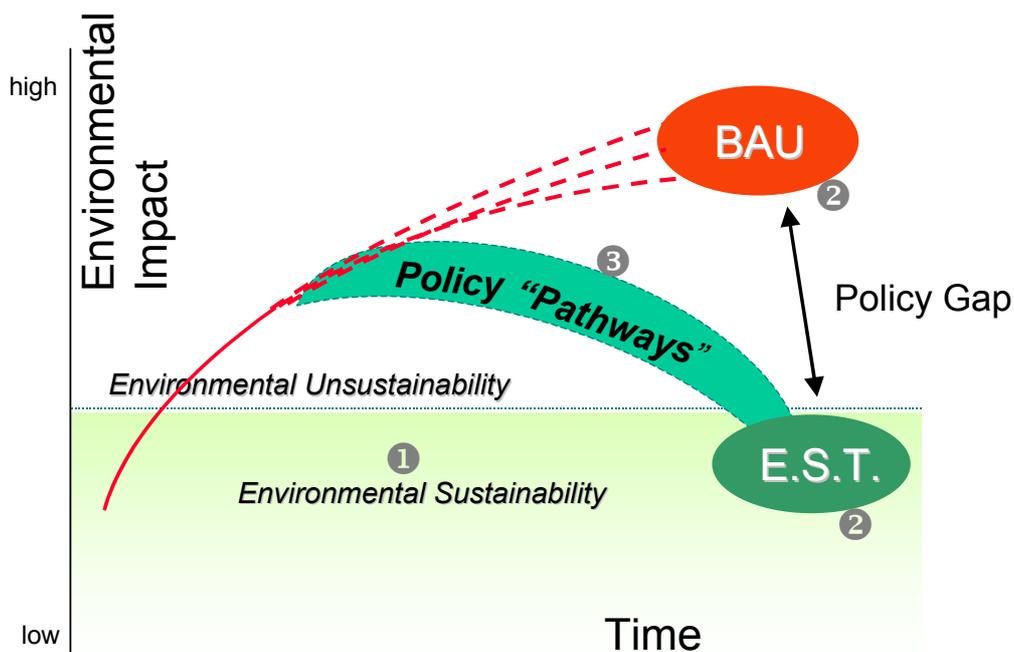
Concerned that current policy frameworks seemed unlikely to be able to move transport systems towards sustainability, OECD's Environment Directorate initiated a project on Environmentally Sustainable Transport (EST) in the mid-1990s. It aimed to give some precision to the concept of EST by defining it in terms of quantifiable, environmentally significant criteria. More important, it aimed to help determine how EST could best be attained. At the core of the EST project were nine national case studies, although a total of 25 OECD Member and other countries were involved in different aspects of the project. The project was completed early in 2002.<sup>8</sup>

The criteria used to characterise EST were derived from existing international goals, guidelines, and standards relevant to local, regional, and global concerns, notably land use, local noise and air quality, regional acidification and eutrophication, and tropospheric ozone and global climate change. The six EST criteria are set out in Table 2 on the next page, together with a brief indication of the derivation of each criterion in the notes below the table.<sup>9</sup>

The central concept in the EST project was that of *backcasting*. A desirable transport future (EST) was envisioned, as was a future in which 'business as usual' (BAU) prevailed. Working back (backcasting) from the desirable future to the present, alternative policy pathways were identified consistent with attainment of EST rather than BAU. The process is illustrated in Figure 3, which shows the three critical backcasting steps: (1) defining the environmental dimension of EST; (2) developing a vision for EST in 2030 and comparing it with likely trends; and (3) elaborating possible policy pathways, policies and strategies for achieving EST.

The backcasting approach is driven by the need for attainment of specific goals (the EST criteria) within a designated time period, i.e., by 2030. Present policy, by contrast, is driven more by what are considered to be feasible improvements over current arrangements. The goal-driven

Figure 3. The EST concept and approach



driven nature of the backcasting approach helped ensure that policies and the measures used to implement them were appropriate to attainment of EST.

Figure 4 on the next page portrays significant outcomes of transport activity in the 1990s and as projected for 2020 with ‘business as usual’ on the one hand, and with adoption of the EST concept and approach on the other hand.<sup>10</sup> In this chart, attainment of EST—and corresponding objectives for other relevant activity—is set at 100, with larger numbers representing exceedances.

**Table 2. Summary of criteria for Environmentally Sustainable Transport**

<p><b>CO<sub>2</sub></b> Climate change is prevented by reducing carbon dioxide emissions so that atmospheric concentrations of CO<sub>2</sub> from transport are stabilised at or below their 1990 levels. Accordingly, total emissions of CO<sub>2</sub> from transport should not exceed 20-50% of such emissions in 1990, depending on specific national conditions.<sup>a</sup></p>	<p><b>NO<sub>x</sub></b> Damage from ambient NO<sub>2</sub> and ozone levels and nitrogen deposition is greatly reduced by meeting WHO Air Quality Guidelines for human health and eco-toxicity. This implies that total emissions of NO<sub>x</sub> from transport should not exceed 10% of such emissions in 1990.<sup>b</sup></p>
<p><b>VOCs</b> Damage from carcinogenic VOCs and ozone is greatly reduced by meeting WHO Air Quality Guidelines for human health and ecosystem protection. Total emissions of transport-related VOCs should not exceed 10% of such emissions in 1990 (less for extremely toxic VOCs).<sup>b</sup></p>	<p><b>Particulates</b> Harmful ambient air levels are avoided by reducing emissions of fine particulates (especially those less than 10 microns in diameter). Depending on local and regional conditions, this may entail a reduction of 55% to 99% of fine particulate (PM<sub>10</sub>) emissions from transport, compared with 1990 levels.<sup>c</sup></p>
<p><b>Noise</b> Noise from transport no longer results in outdoor noise levels that present a health concern or serious nuisance. Depending on local and regional conditions, this may entail a reduction of transport noise to no more than a maximum of 55 dB(A) during the day and 45 dB(A) at night and outdoors.<sup>d</sup></p>	<p><b>Land use/Land take</b> Land-use and infrastructure for the movement, maintenance, and storage of transport vehicles is developed in such a way that local and regional objectives for air, water, biodiversity, and ecosystem protection are met. Compared to 1990 levels, transport activity will likely entail the restoration and expansion of green spaces in built-up areas.<sup>e</sup></p>

<sup>a</sup> The Second Assessment Report of the Intergovernmental Panel on Climate Change (1996) maintains that, in order to stabilise atmospheric CO<sub>2</sub> concentrations at near current levels, world-wide CO<sub>2</sub> emissions would need to be reduced by 50% to 70% with further reductions thereafter (IPCC, *Second Assessment Report*, page xi, Intergovernmental Panel on Climate Change, 1996). However, in order to allow for increases in emissions in developing countries, OECD countries should reduce their emissions by 80% or more so that a global reduction of 50% may be attained (OECD, *Environmental Criteria for Sustainable Transport*, OECD Environment Directorate, Paris, France, 1996). A reduction target of 50% might be more appropriate for certain countries that benefit from a favourable (e.g., a more environmentally friendly) modal split, as was suggested by the EST pilot study for the countries of the Central and Eastern European region.

<sup>b</sup> These criteria are set in line with the WHO guidelines for human health regarding NO<sub>x</sub>, VOCs, and ozone (WHO, 1996) and the UNECE protocols under the Convention on Long-Range Transboundary Air Pollution for ecosystem protection regarding critical loads for nitrogen deposition and critical levels of ozone (UNECE, LRTAP Convention, 1999)

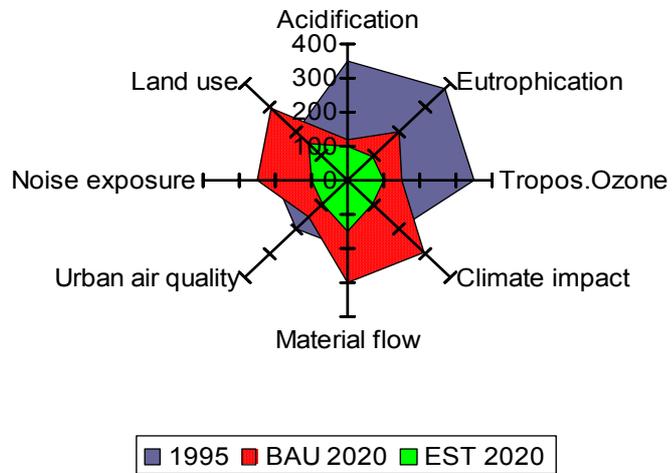
<sup>c</sup> WHO advises that there is no ambient level of fine particulate matter (smaller than PM<sub>10</sub>) and ultrafine particles (smaller than PM<sub>2.5</sub>) below which health effects (including cancer) do not occur. Countries should set targets based on dose-effect considerations. The targets set here are preliminary due to the ongoing research on the health effects from ultrafine particulate matter (WHO, Air Quality Guidelines, World Health Organization Regional Office for Europe, Copenhagen, Denmark, 1998).

<sup>d</sup> This criterion is based on the former WHO recommendation on noise that has been recently updated in the WHO Guidelines for Community Noise (WHO, Guidelines for Community Noise, World Health Organization, Geneva, 1999).

<sup>e</sup> The quantification of the land-use criterion will require further research.

Figure 4 suggests that ‘business as usual’ will result in improvements in some areas (urban air quality, acidification, eutrophication, and levels of tropospheric ozone) but not others (land use, noise, material flow, and climate impact). But even where there will be improvements, they will usually not be sufficient to result in attainment of the respective EST criteria.

Figure 4. Recent impacts, and impacts with ‘business as usual’ and with EST



The quantified EST criteria provided the formal characterisation of EST, but the project also generated *visions* of what EST would be like. These included the following:

- A significant change in the type of passenger transport provided. Many passenger cars would have more fuel-efficient conventional engines, hybrid-electric engines, electric engines (e.g., powered by fuel cells). There would be much greater use of non-motorised means for short distance trips together with supporting infrastructure.
- Public transport, including new forms of integrated public and individual transport such as ‘public cars’, would increasingly provide integrated mobility services.
- Significantly more efficient longer-distance freight movements due to increasing load factors, better logistics, and more use of rail-based modes. Hydrogen would be used as a fuel both directly and in fuel cells.
- Almost all rail transport would be electric, with increased use of high speed modes, especially for freight.
- More efficient and less polluting inland and coastal shipping vessels would be used; hydrogen may also be used as a fuel.
- Long-distance air travel for business purposes would be largely obsolete, with information technology used for communication instead. Multi-modal freight logistics would be used for air cargo. Aircraft in use would be much more fuel efficient, conventional types, and rigid airships may be used for specific purposes.

Additional policies and measures in other sectors of the economy would support and accompany the shift towards more environmentally sustainable transport, while not necessarily decreasing economic and social welfare. They could include the following:

- Electric power for transport would be generated with much greater efficiency than at present, using a high proportion of renewable fuels.
- Relatively small changes in the form of settlements would have been implemented to reduce the need for movement of people and freight.
- Greater use of telecommunications would help avoid both passenger travel and the movement of goods.
- Regionalisation of production would help avoid long-distance freight movement, and there would be a greater focus on service provision.

Similar visions have been generated in other exercises.<sup>11</sup>

## 2.2. Scale of challenges involved in achieving EST

Figure 5 shows the scale of the changes in transport activity required for attainment of EST, for both passenger and freight transport.<sup>12</sup> Compared with BAU, there would be increases in the use of more environmentally friendly modes (public transport, rail freight) and decreases in the use of less environmentally friendly modes (aviation, cars, lorries). Overall transport activity would increase, more for the movement of freight than for the movement of people.

Compared with BAU, the changes to be made for attainment of EST concerning the movement of *people* are these:

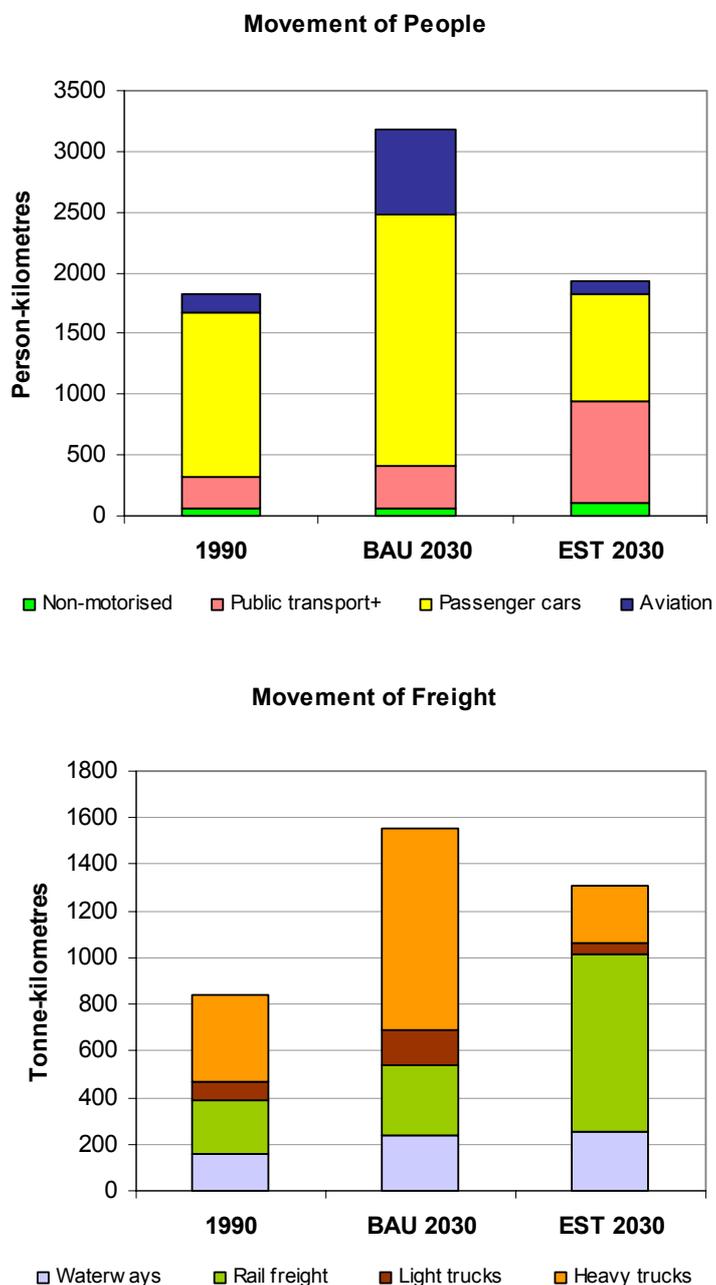
- *increase* in the use of public transport by 139 per cent (+3.5 per cent annually)
- *increase* in the use of non-motorized modes by 82 per cent (+2.4 per cent annually)
- *decrease* in the use of cars 57 per cent (-3.3 per cent annually)
- *decrease* in aviation activity by 85 per cent (-7.3 per cent annually)

Compared with BAU, the changes to be made for attainment of EST concerning the movement of *freight* are these:

- *increase* in the use of rail freight by 151 per cent (+3.7 per cent annually)
- *increase* in the use of waterways by 8 per cent (+0.3 per cent annually)
- *decrease* in the use of road freight by 71 per cent (-3.7 per cent annually)

The indicated changes are large overall, although ready attainment of the indicated annual rates—based on a 25-year implementation period—seems feasible except perhaps for aviation.

Figure 5. Comparison of changes from 1990 to BAU and EST in 2030



### 2.3. Soft measures identified during the EST project

Overall, only eight per cent of the instruments developed by the EST project teams came under the category ‘Education and hortatory’. They are listed in Table 3, organised by the intended effect of their use.

Although the number of such instruments was numerically few over all, they were accorded considerable importance by some of the teams. The difference among the teams is represented in Figure 6, which suggests that the project teams struck similar although not identical balances

**Table 3. Soft measures identified during the EST project, by intended effect**

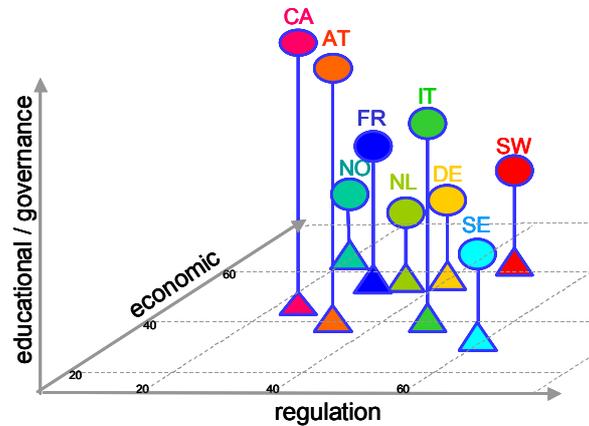
<p><b>Reduce the impacts of motorised transport activity on the global environment by specific measures</b></p> <ul style="list-style-type: none"> <li>➤ Fuel-efficient driving training</li> <li>➤ Provision of consumer information about CO<sub>2</sub>-efficient cars</li> <li>➤ Voluntary agreements to improve environmental performance</li> <li>➤ Education: Training drivers in eco-efficient driving</li> <li>➤ Strict control of speeds and driving times of heavy-duty vehicles</li> <li>➤ Promote use of biofuels in the public sector</li> <li>➤ Voluntary CO<sub>2</sub> emission level standards for passenger cars</li> <li>➤ Consumer information on CO<sub>2</sub>-efficient cars</li> </ul> <p><b>Reduce the impacts of motorised transport activity on the regional and local environment by specific measures</b></p> <ul style="list-style-type: none"> <li>➤ Promote penetration of alternative fuels</li> <li>➤ Develop a Memorandum of Understanding with vehicle manufacturers for development of a new generation of vehicles</li> <li>➤ Address cold-start issue with voluntary requirement for pre-heaters</li> </ul> <p><b>Improve the environmental performance of motorised transport activity by mode shifts</b></p> <ul style="list-style-type: none"> <li>➤ Mobility management for enterprises: pilot actions, then promotional programmes and incentives, then potential mandatory implementation</li> <li>➤ Implementation of a nation-wide travel information system</li> <li>➤ Establishment of mobility management centres: pilot actions, then potential implementation on a large scale</li> <li>➤ Encourage employer sponsored trip-reduction programs</li> <li>➤ Implementation of a nation-wide travel information system</li> </ul> <p><b>Minimize overall motorised transport activity by increasing occupancy or otherwise improving logistics</b></p> <ul style="list-style-type: none"> <li>➤ Freight consolidation</li> </ul> <p><b>Minimize overall motorised transport activity by favouring non-motorised alternatives</b></p> <ul style="list-style-type: none"> <li>➤ Implement walking school bus programs unilaterally</li> </ul> <p><b>Make land use or economic arrangements more conducive to sustainable transportation</b></p> <ul style="list-style-type: none"> <li>➤ Campaigning and marketing for preference changes in housing and land use</li> <li>➤ Land use: promote housing and town development</li> <li>➤ Land use: promote compact urban development</li> </ul> <p><b>Other types of effect including changing attitudes, culture, ways of living, and acceptance of strong measures</b></p> <ul style="list-style-type: none"> <li>➤ Raising public awareness of traffic-related environmental impacts</li> <li>➤ Incorporation of environment impact and sustainable mobility into teaching materials, methods, and lessons from kindergarten to university: pilot actions, then potential implementation on a large scale</li> <li>➤ Establishing a database impacts of transport on environment</li> <li>➤ Public participation in transport planning: pilot action, then potential implementation on a large scale</li> <li>➤ Require EST instruction in schools</li> <li>➤ Implement nationwide awareness programme</li> <li>➤ Recognize community "champions"</li> <li>➤ Education/information (especially with respect to CO<sub>2</sub> tradeable permits)</li> <li>➤ Implement nationwide awareness programme</li> <li>➤ Education and information programmes</li> <li>➤ Public awareness raising for traffic-related environmental impacts</li> <li>➤ Car-free day initiatives</li> <li>➤ Introduction of environment impacts and sustainable mobility into teaching materials, methods, and lessons</li> </ul>
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between economic and regulatory instruments, but differed more in their use of educational and governance instruments.<sup>13</sup>

Figure 6. Typology of principal policy instruments in the EST project

#### 2.4. Barriers to attainment of EST

During the course of the EST project several barriers to attainment of EST were identified, in three categories. **Societal barriers** were said to concern human behaviour “more from perspective of societal organisation than from the view of an individual in a physical and social world”. They comprised the following: political factors, institutional barriers, ongoing societal trends, urban form, methodological barriers, and professional barriers. Some of these barriers are discussed below in Section 3.3 (settlement density) and in Section 4.2.



**Individual barriers** were said to concern “how human nature and people’s perceptions can impede changes towards sustainable practices in transport activity”. They comprised the following: lack of awareness of the need for change, cognitive dissonance, lack of concern for future generations, fear of change, and thus resistance to change, attractiveness of present transport modes, absence of transport alternatives, resistance to collective alternatives, car ownership, and lack of adequate professional advice. Some of these barriers are discussed below in Section 3.1 (car ownership) and in Section 4.3.

**Technological barriers** were said to be associated with the significant component of the effort towards attainment of EST that will have to come from improvements in technology. Some of the contributing factors are as much human factors as those contributing to the other two types of barrier—e.g., investment in technology and resistance to the adoption of new practices—but are more logically considered with technological issues. Technological barriers that were identified comprised the following: Four types or sources of barrier were identified in the EST project: costs and lead times for development of appropriate technology, lack of common standards, inappropriate safety requirements, and barriers associated with telecommunications.

#### 2.5. Conclusions from the EST project concerning implementation

The significant conclusions of the EST project can be summarised as follows:

- EST could be attainable, although only with a concerted *commitment* involving many sectors of society.
- A wide range of strategies could be used for moving towards EST. The most important challenges lie in the *acceptability* of the need for EST strategies and of their component measures for moving towards EST. Aside from considerations of acceptability, the effectiveness of the measures themselves is often not in question.
- Present transport practices have a formidable momentum that has deep psychological, social, and technological characteristics. Lack of relevant knowledge about human behaviour and societal organisation that could help policy-makers secure needed changes is a major barrier to attainment of EST. Three things are required. One is a better understanding of how to make the welfare of future generations relevant to present circumstances

## SOFT MEASURES AND TRANSPORT BEHAVIOUR

(*intergenerational equity*). Another is a more appealing *vision* of sustainable transportation. The third, following from the first two, is greater *interest* among the public generally, and transport industries in particular, in moving towards sustainable transportation.

These highlighted words attest to the potential importance of soft measures, which may be required to secure *commitment* and *acceptability*, promote a *vision* of EST and *interest* in attaining it, and, perhaps above all, secure greater *intergenerational equity*.

Several conclusions were drawn from the EST project as to the kinds of strategies that will be required. One key point was that *packages* of measures will be required, mostly involving well-balanced mixes of fiscal, regulatory, and other measures, including soft measures. Another key point was that implementation would be phased, partly to avoid the need for dramatic change (see Section 2.2) and partly so that earlier stages can prepare the way for later stages.

Soft measures were thought to be of special value during the early stages of implementation. They would be used to secure understanding and acceptance of and even commitment to the need for EST. As well, they would help prepare for the use of effective hard measures such as market-based rationing and restrictions on the use of road vehicles.

The conclusions were captured in a set of ten guidelines developed to help policymakers working towards attainment of EST. They are listed in Table 4.

**Table 4. The EST Guidelines**

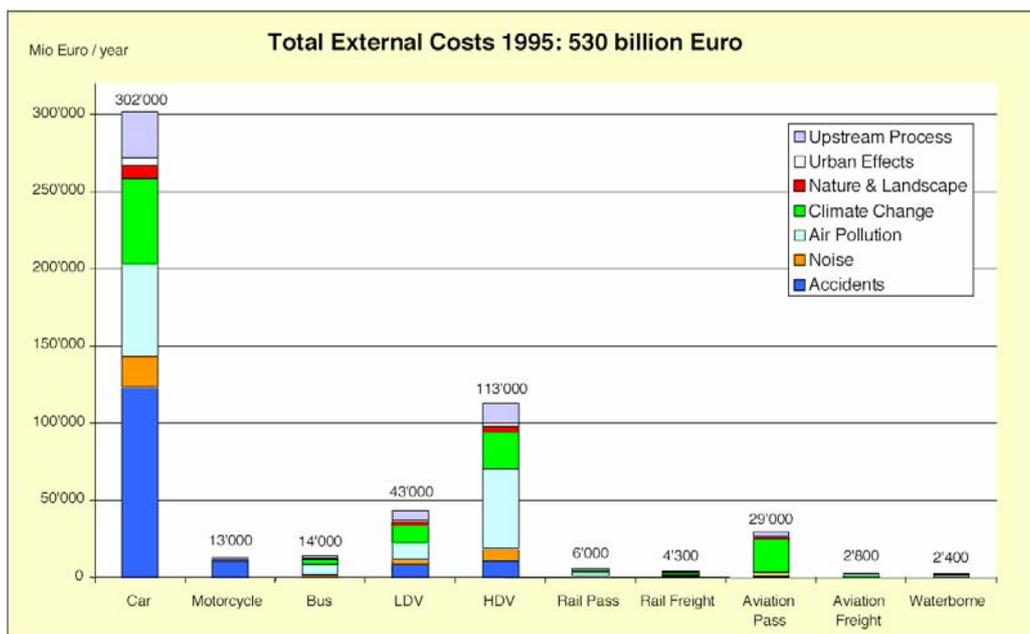
1. Develop a long-term vision of a desirable transport future that is sustainable for environment and health and provides the benefits of mobility and access.
2. Assess long-term transport trends, considering all aspects of transport, their health and environmental impacts, and the economic and social implications of continuing with 'business as usual'.
3. Define health and environmental quality objectives based on health and environmental criteria, standards, and sustainability requirements.
4. Set quantified, sector-specific targets derived from the environmental and health quality objectives, and set target dates and milestones.
5. Identify strategies to achieve EST and combinations of measures to ensure technological enhancement and changes in transport activity.
6. Assess the social and economic implications of the vision, and ensure that they are consistent with social and economic sustainability.
7. Construct packages of measures and instruments for reaching the milestones and targets of EST. Highlight 'win-win' strategies incorporating, in particular, technology policy, infrastructure investment, pricing, transport demand and traffic management, improvement of public transport, and encouragement of walking and cycling; capture synergies (e.g., those contributing to improved road safety) and avoid counteracting effects among instruments.
8. Develop an implementation plan that involves the well-phased application of packages of instruments capable of achieving EST taking into account local, regional, and national circumstances. Set a clear timetable and assign responsibilities for implementation. Assess whether proposed policies, plans, and programmes contribute to or counteract EST in transport and associated sectors using tools such as Strategic Environmental Assessment (SEA).
9. Set provisions for monitoring implementation and for public reporting on the EST strategy; use consistent, well-defined sustainable transport indicators to communicate the results; ensure follow-up action to adapt the strategy according to inputs received and new scientific evidence.
10. Build broad support and co-operation for implementing EST; involve concerned parties, ensure their active support and commitment, and enable broad public participation; raise public awareness and provide education programmes. Ensure that all actions are consistent with global responsibility for sustainable development.

### CHAPTER 3. KEY FACTORS IN THE MOVEMENT OF PEOPLE

Present transport trends in the OECD Member countries that participated in the EST project are clearly unsustainable. Their trends in activity are indicated in the ‘1990’ and ‘2030 BAU’ columns in Figure 5. Anticipated trends in *impacts* are illustrated in Figure 4. Present transport trends in other OECD countries are also unsustainable.<sup>14</sup>

This chapter discusses what may be the three key factors that contribute to the motorised movement of people and thus to the unsustainability of present transport trends: car ownership, economic factors, and settlement density. The next chapter concerns factors such as attitudes that may be seen as being more obviously relevant to human behaviour in transport situations and thus to the use of soft measures. However, the present chapter is equally about aspects of human behaviour. It is about the purchase and continued ownership of cars, about their use and non-use, and about settlement practices.

Figure 7. External costs of transport by mode, 17 Western European countries



The focus here is on car use because **the central issues in the sustainable movement of people concern the use of cars**. Notwithstanding improvements in energy efficiency and emissions control relative to other modes, car use is responsible for the largest part of transport’s adverse impacts. This is exemplified in Figure 7, which shows that car use (including vans, SUVs, etc.) was responsible for by far the largest share of external costs in western Europe in 1995 (57 per cent of the total; 48 per cent if accidents are excluded).<sup>15</sup> The EST project teams saw attainment of EST as requiring not only reductions in car use below expected values but also substantial reductions—approaching 50 per cent—below 1990 use levels (see Figure 5).

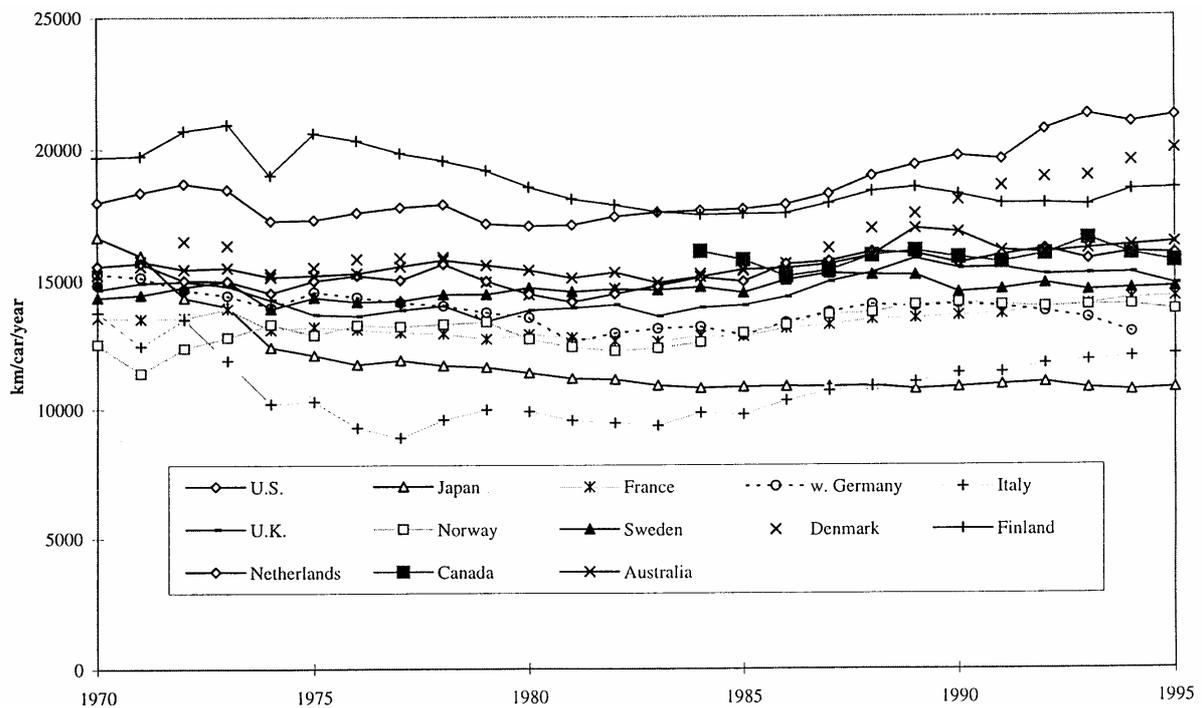
This paper focuses on the movement of people rather than the movement of freight. This is done partly for space reasons, partly because there are fewer good data and poorer understanding generally about freight transport, and partly because there is less certainty about the roles soft measures might play in the movement of freight than in the movement of people.<sup>16</sup>

Question 2. What maintains unsustainable transport behaviour?

### 3.1. The importance of car ownership

**A key factor in the use of cars is ownership of them.** In one sense this is a trivial observation; a car must be available before it is used. But the relative constancy of the relationship between ownership and use across time suggests something more profound: that *cars are used because they are owned*. The constancy is illustrated in Figure 8, where it can be seen that within a country the distance travelled per car changes very little from year to year even across decades.<sup>17</sup> If, say, 10 per cent more cars are owned, close to 10 per cent more kilometres will be driven, and vice versa. This leads to the conclusion that **car ownership is a major determinant—perhaps the strongest determinant—of car use.**<sup>18</sup>

Figure 8. Annual distance travelled per car, 13 countries, 1970-1995



Even though the relationship between ownership and use seems strong, research and policy initiatives tend to focus on how car use can be reduced, without giving much consideration to reducing ownership. Indeed, ownership without use often appears to be a desired outcome of policy prescriptions.<sup>19</sup>

Car use rather than car ownership is evidently the major immediate cause of transport's unsustainability. However, the position taken here is that understanding of car use above all requires understanding of car ownership. Moreover, the most effective restraints on car use may be those that seek to reduce car ownership.<sup>20</sup> Thus, **in what follows there is a stronger-than-usual focus on assessment of the factors involved in car ownership**, as well as consideration of car use. Reviews of what contributes to car ownership usually focus on economic factors, and these are considered next.<sup>21</sup>

Question 3. Can the strategies involving soft measures designed to reduce car use also be applied to reducing car ownership?

3.2. Economic factors

Car ownership in a country rises with growth in its per-capita wealth, as is illustrated in Figure 9.<sup>22</sup> However, straightforward comparisons among countries on the basis of wealth may not be useful because of large differences in the costs of car ownership and use. These costs are allowed for in Figure 10, which relates car ownership to travel costs by car in 52 affluent urban regions, including ownership and operating costs.<sup>23</sup> Cost per car trip rather than cost per kilometre serves as an indicator to allow for the different geographic sizes of the regions. A negative correlation between ownership and cost can be noted, but the correlation is evidently not strong.<sup>24</sup>

Surprisingly little publicly available work has been done on how car purchasing changes with purchase price. One study estimated the short-term price elasticity of demand for new vehicles in the U.S. to be -1.07, meaning that for every 10-per cent increase in overall price, overall purchases of new vehicles would decline by 10.7 per cent. The long-term elasticity was estimated to be -0.36, suggesting relative insensitivity of demand to purchase price except soon after a price increase.<sup>25</sup> More recent studies have confirmed that the short-term price elasticity is near 1.00, but there appears to be no new evidence one way or the other as to the longer-term effect of price increases.

Research has focused more on what impels purchase of one car model rather than another. A recent survey of over 30,000 owners of new vehicles in the U.S. produced a hierarchy of reasons for *not* purchasing particular models, shown in Table 5 on the next page.<sup>26</sup>

Figure 9. Car ownership and per-capita income, eight countries, 1970-1995

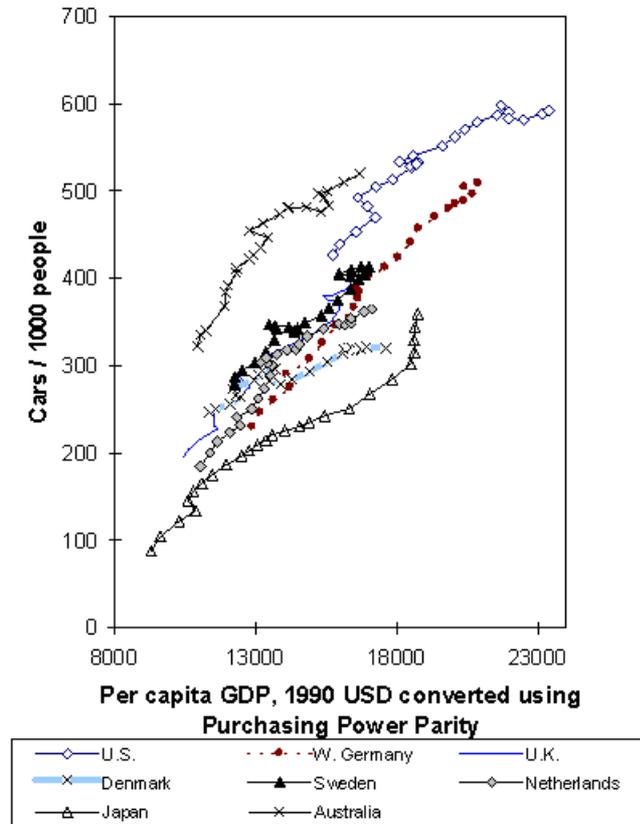


Figure 10. Car ownership rates and user costs of car trips, 52 affluent urban regions, 1995

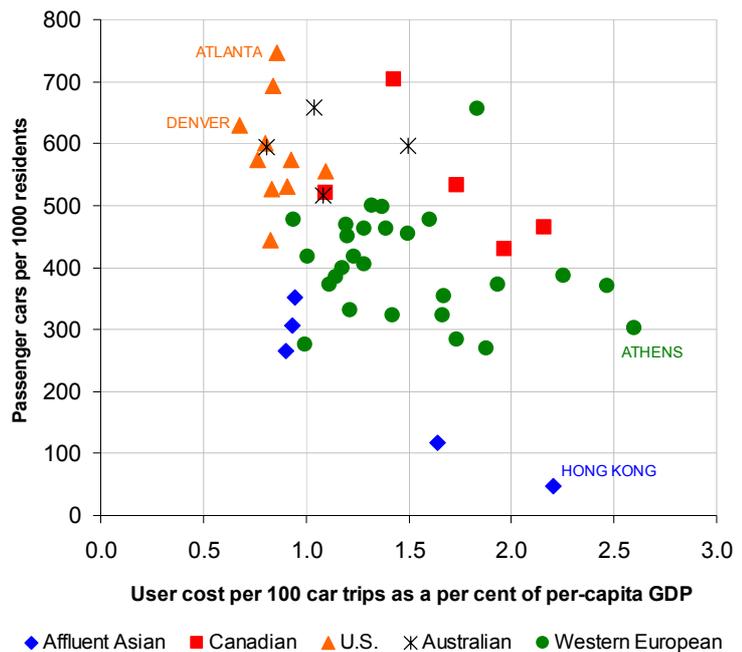


Table 5. Reasons for not buying a particular model of car

1. Total price too high	6. Was not available with rebates/incentives
2. Total monthly payment too high	7. Didn't like look/design of interior
3. Didn't like style/design of exterior	8. Concerned about reliability
4. Limited availability on dealer lots	9. Was not available with low-interest financing
5. Salespeople didn't act professionally	10. Vehicle was too small

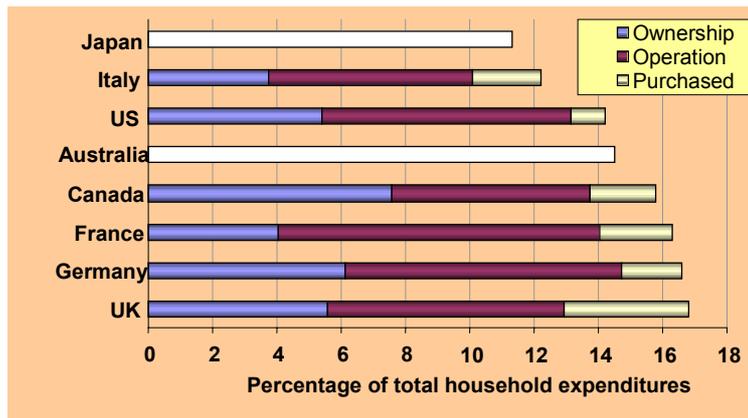
To the extent that the statements in Table 5 reflect effective aspects of respondents' purchasing behaviour, it can be concluded that economic factors—Nos. 1, 2, 6, and 9 in the table—are important determinants of which car model is purchased.

**Thus, economic factors may strongly affect which car model is purchased, and indeed in the short term whether a car is purchased at all; but in the longer term economic factors may be relatively less important.**

What may be the most discussed in terms of impacts on car *use* is the price of fuel. A recent review of work on the elasticities of car travel in relation to changes in fuel price concluded that the short-term elasticity is about -0.15 and the longer-term elasticity is about -0.30.<sup>27</sup> Elasticities of demand for fuel appear to be negatively larger in each case, meaning that when prices change fuel use changes more than car use. This suggests that one effect of raising fuel prices is more efficient use of fuel. The higher longer-term elasticities may reflect the purchase of more fuel-efficient vehicles in response to fuel-price increases, or even foregone ownership.

The findings that car travel is relatively insensitive to fuel price, even in the longer term, are consistent with the importance of ownership as a factor in car use.

Figure 11. Household spending on transport, eight countries, mid-1990s.

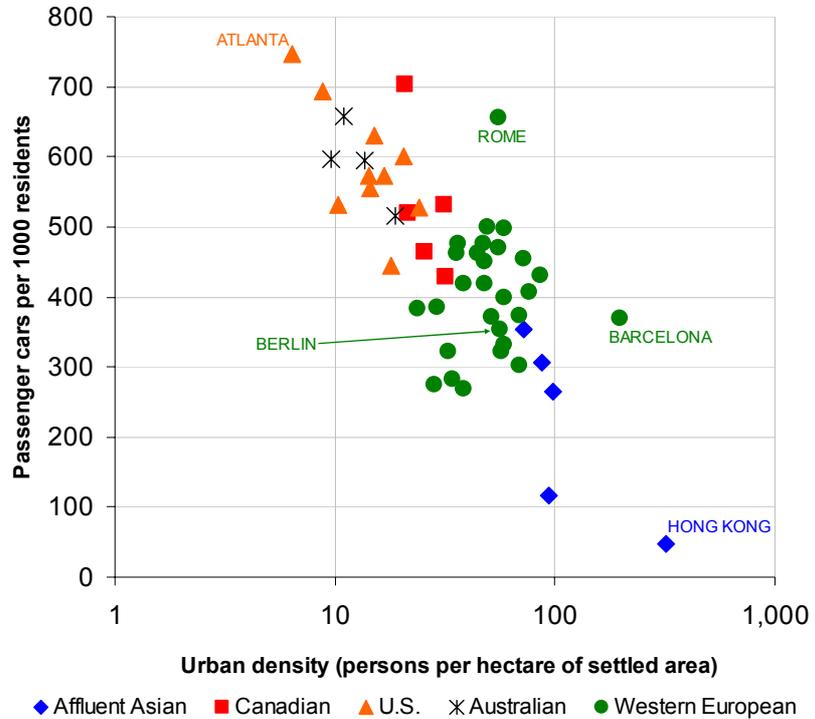


To add to the picture of economic factors in car ownership and use, Figure 11 shows data on household spending. Proportions of total after-tax spending going to the ownership and operation of private vehicles are shown together with spending on purchased transport (e.g., travel by public transport, taxi, intercity rail and bus, and air).<sup>28</sup> Of the countries for which breakdowns are shown—by car ownership, car operation (i.e., use), and purchased transport—only in Canada was spending higher on car ownership than on car use. The generally higher spending on car use suggests there may be scope for reducing car use by increasing the costs of ownership.

### 3.3. Settlement density

Figure 12 suggests that, at least among urban regions, settlement density could be an important factor in determining car ownership in that there is a strong negative correlation between the two variables.<sup>29</sup> However, other factors are at play, as suggested by a comparison of Rome and Berlin. These two urban regions both have settlement densities of 56 persons per hectare, but quite different rates of car ownership (655 vs. 354 cars per 1000 persons). GDP per capita was similar (Rome, US\$26,125; Berlin, US\$23,462), as was the cost of 100 car trips as a per cent of per-capita GDP (Rome 1.8 per cent; Berlin 1.7 per cent); thus, these two economic factors would seem not to account for the differences in car ownership.<sup>30</sup>

Figure 12. Car ownership in relation to settlement density, 52 affluent urban regions, 1995



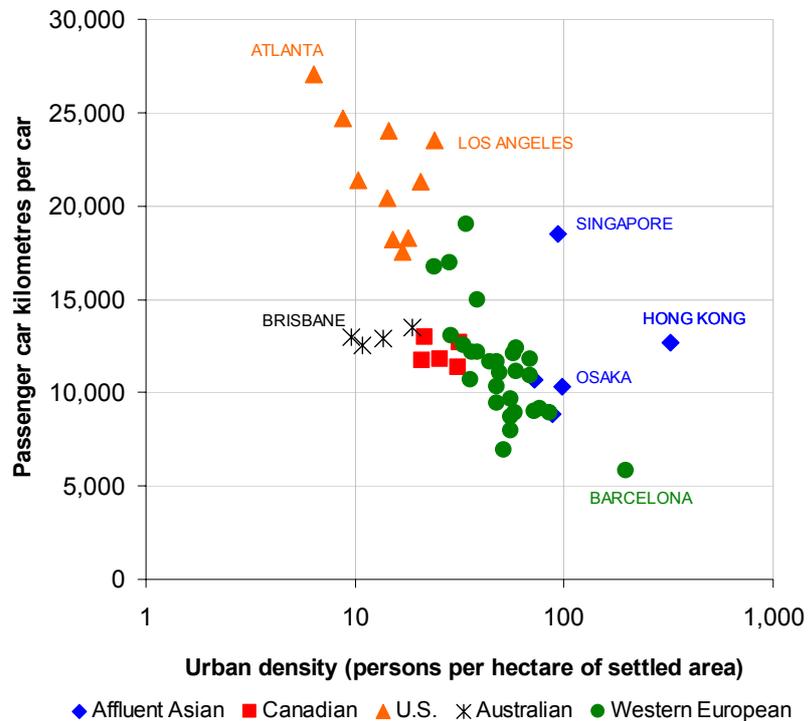
Distance travelled per car also has a strong negative correlation with settlement density, as is illustrated in Figure 13 on the next page.<sup>31</sup> Nevertheless, there are urban regions with similar settlement densities that differ considerably in average distance driven per car. For example, the Los Angeles region has a similar density to that of the five Canadian urban regions, but each Los Angeles car is driven almost twice as far on average. One explanation could be that the Los Angeles region is three or more times larger than any of the Canadian urban regions; thus, people on average have farther to travel. However, this kind of explanation would not apply to the difference between Singapore and Osaka, where cars in the smaller urban region are driven much more. Also, there are instances where similar amounts are driven even though densities differ greatly, as in the case of Hong Kong in comparison with Brisbane and the other Australian urban regions.

Even with these anomalies, which deserve explanation, it appears that **settlement density is a potentially important determinant not only of car ownership but also of the extent to which an owned car is driven.**

Indeed, settlement density may be an important moderating influence on the relationship between car ownership and use, and may account for some of the national differences evident in Figure 8. Higher densities may suppress ownership and may suppress use at a given level of ownership.

The thrust of the foregoing is that perhaps the two key factors in the determination of transport activity are the interrelated matters of car ownership and settlement density. Thus, changes in transport behaviour may well require changes in one or the other or both of these factors, although it is clear that other factors could well play a role. The primary challenge for the present exercise may thus be that of figuring out how soft measures can help reduce car ownership or increase settlement density, or both.

Figure 13. Distance travelled per car in relation to settlement density, 52 affluent urban regions, 1995



Question 4. If increasing settlement density is an appropriate way to address some transport issues, how might soft measures be used to help achieve denser patterns of land use?

### 3.4. Transport facilities

In order for particular transport activity to occur, there must be opportunity to perform the activity. Even walking has some environmental requirements: a reasonably safe and level path and absence of barriers. Other modes more clearly require appropriate facilities, such as bicycle paths and bus services. In the discussion of car ownership, the case was made that availability of a car strongly contributes to car use. The present section concerns whether such strong determination exists in respect of other means of transport. Does, for example, availability of public transport services increase use of public transport?

The issue as to whether provision of facilities induces particular transport activity has perhaps been most discussed in relation to the phenomenon of induced traffic. Available evidence suggests both that roadway expansion can increase the overall amount of traffic and that reductions in road capacity can reduce it.<sup>32</sup> However, merely adding or subtracting road capacity—for example, in a remote location—will not induce or reduce traffic; an unused road to nowhere will remain an unused road to nowhere; removing it would accordingly have little impact. For traffic to be increased by additions of road capacity, other factors may have to be driving an increase in traffic that lack of road capacity was preventing. Similarly, a capacity reduction may result in reduced traffic only when the reduction constitutes a constraint on traffic. The phenomenon of

## SOFT MEASURES AND TRANSPORT BEHAVIOUR

induced traffic seems well established, but further analysis of the relevant mechanisms is required.

Equally, adding public transport capacity may not in itself increase use of public transport unless there are other factors impelling an increase that lack of capacity was constraining.<sup>33</sup> Equally too, analysis of the mechanisms whereby public transport capacity can increase use of public transport needs further attention. Similar considerations may apply to walking and cycling.

Thus, a question for the present endeavour could concern the potential roles of soft measures in ensuring that 'other factors' are in place that cause increases in use when opportunity for increased use is or becomes available.

*Question 5. When appropriate facilities are available, what are the best ways to use soft measures to influence mode choice in favour of public transport, walking, and cycling?*

## CHAPTER 4. OTHER FACTORS IN TRANSPORT BEHAVIOUR

This chapter concerns societal and individual factors in car use and ownership, the relationships between attitudes and behaviour, and what is meant by acceptability. In spite of the topics, this chapter is no more about human behaviour than the previous chapter. Because discussion of the kind of topic addressed in this chapter is often influenced by views held about human behaviour, this matter is discussed first.

### 4.1. Views about human behaviour

What is it that sustains unsustainable transport behaviour? First it may be useful to consider what sustains any human behaviour.

**There are almost as many views about how human behaviour is maintained and how it changes as there are people who hold the views. The views can be organised into five approaches, set out in Appendix B.** Each approach likely contains some of the truth. Researchers and others concerned about human behaviour tend to prefer one or sometimes two or even three of the approaches over the others.

The preference in this paper is for the fifth approach: human behaviour is mostly maintained by its consequences, which are mostly found in the milieu (environment) in which the behaviour occurs. This approach is economical, objective, and productive of insights into what maintains behaviour and what makes it change, but there is evident merit in the other approaches. The author's preference is stated at this point to caution readers about the possibility of bias rather than to persuade them of the merits of the fifth approach.

More to the point, **the approach preferred here implies that the best way to change transport behaviour may be to change the milieu or context within which it occurs.** Careful examination of the relationships between the behaviour and its milieu could reveal the critical features of the milieu that sustain the behaviour, and changing these features could change the behaviour. Commuting is above all sustained by the consequence of timely arrival at work or home (or avoidance of the consequences of untimely arrival), but *mode* of commuting could be sustained by a host of consequences that feature cost, privacy, stress, and many others, all interacting with parts of the long chain of behaviour that comprises a journey.

One role of soft measures could be to give additional value to outcomes of desired behaviour. Taking public transport reduces pollution and congestion, but these consequences do not occur in ways that can maintain the behaviour. If colleagues praised using public transport and disapproved of car use, then taking the bus could perhaps be maintained. Viewed in this way, a key challenge becomes that of changing the nature of some of the social chit-chat at the workplace rather than that of persuading people to take public transport.

Another role of soft measures could be to give information about (to signal) the availability of outcomes. Providing information about an improved bus service would come into this category, as would information about the relative costs and comfort of public transport and the time investment required.

The point being made here is that what maintains unsustainable transport behaviour is its consequences, supported by information about these consequences, and perhaps by information about the consequences of alternative behaviour. The most economical approach to changing behaviour involves changing its consequences. Ensuring change may well require the use of hard measures, but soft measures could also have a role.

The focus here is on what it takes to produce the desired behaviour. Changing what people say about the desired behaviour may be a useful step towards getting them to perform the desired behaviour. However, what people say is *not* the desired behaviour and should not be confused with it. The desired behaviour involves transport activity, not talking about transport activity.

**Question 6. How can soft measures be used to give additional value to sustainable transport behaviour?**

#### 4.2. Societal factors

‘Societal factors’ refer here to aspects of society and culture that sustain car ownership and use, ranging from the pervasive influences of ‘car culture’ to the political practices that support widespread automobilisation.

During Phase 3 of the EST project, such factors were discussed in terms of potential or actual barriers to attainment of EST. The project teams identified several ‘societal barriers’. One of these—urban form—has already been covered in the discussion of settlement density in Section 3.3. (Urban form was included as a societal barrier because it fitted more comfortably there than in one of the other two categories of barrier: ‘individual barriers’ and ‘technological barriers’.) Other noted categories of societal barrier included:

- **Political barriers.** These were taken to include the lobbying weight of vested interests and the world outlook of decision-makers, who may be inclined to have strong personal commitments to individual transport. Also significant may be the composition of electorates in democracies, which mostly comprise people who are dependent on their cars to cope with life as they know it.<sup>34</sup>
- **Institutional barriers.** These included the quest for common standards, which may stifle innovation, and perverse subsidies and pricing.
- **Methodological barriers.** Here the focus was on the lack of appropriate performance indicators relevant to sustainable transport, the use of perverse indicators of well-being, and the absence of full-cost accounting procedures.<sup>35</sup>

Extreme characterisations of societal factors can be found in the academic literature. For example, a recent review concluded that the use of cars is deeply embedded in the maintenance of global power structures, as expressed in capital accumulation, economic globalisation, and war-making capacities. National governments, it was said, have served themselves by promoting the ‘car economy’ in four ways. They have built roads, downgraded public transport and non-motorised transport, subsidised car use, and in some cases colluded with the automotive industry to remove competitor modes of transport to the car.<sup>36</sup>

Discussion of such factors is challenging because of the lack of clear indication as to their effects. Nevertheless, the implied accounts of causation of unsustainable transport activity may have some plausibility and may be useful in developing strategies involving the use of soft measures, such as ‘denormalisation’ through counter-advertising described in Chapter 5.

What may be of special value is the examination of social and physical circumstances where car ownership and use are not the norm. Such places are found in the central parts of affluent regions, even in North America, where New York City is the most obvious example.<sup>37</sup> The lowest rate of ownership across a large affluent urban region is found in Hong Kong, where there only

55 personal vehicles per 1000 residents.<sup>38</sup> It may be contrasted with the large urban region with the highest rate—Atlanta, Georgia—where there are more than 750 personal vehicles for every 1000 residents. Residential density appears to be the main contributing factor (see Section 3.3, and especially Figure 12). There are no restrictions on car ownership in Hong Kong, although the relative costs of car ownership and use are relatively high (see Figure 10).

North Americans in particular can notice the different transport culture when they arrive in Hong Kong. There are no car rental facilities at the airport, only a wide range of opportunities to use public transport, notably a fast train to the central area that is immediately across from the baggage area.

How are young people in Hong Kong acculturated to forego what seems to be a near-universal demand for car ownership? This kind of question has received too little investigation. One recent study asked undergraduate students in Hong Kong about their car-owning status and intentions. Only one per cent of respondents owned a car; only 15 per cent of their families owned a car; 92 per cent of respondents lived with their families. Only 35 per cent of respondents showed some interest in early purchase of a car (within five years), including 46 per cent of men and 27 per cent of women. The author concluded that if public transport is of a high quality and inexpensive it can suppress car ownership. However, there appears to “quite a substantial latent demand for a car, particular among male students ... [therefore] penalties to car ownership may need to be introduced to deter them further.”<sup>39</sup>

**Question 7. How can young adults be induced to *not* consider car ownership as an important goal?**

#### 4.3. Individual factors

‘Individual factors’ here refer to factors that contribute to the maintenance of and to changes in the transport behaviour of individuals. The distinction from societal factors is not always clear, especially because in their actual operation societal factors are individual factors and many individual factors have a strong societal influence.

##### *Individual barriers identified in the EST project*

In the EST project, several ‘individual barriers’ to attainment of EST were identified, including widespread car ownership, already discussed in Section 3.1. Other identified individual barriers included:

- **Lack of awareness of the need for change.** The report on the EST project asserted that “for individual behaviour to change ... there has to be individual awareness of the need for change.”<sup>40</sup> This seems to be common sense, although at least one study has raised doubts about the importance of problem awareness in changing environmentally related behaviour.<sup>41</sup> Problem awareness does seem to be related to the amount people drive and their use of public transport. Car owners who achieve high scores on tests of awareness of problems of car use tended to use their cars less than other car owners and to use public transport more often.<sup>42</sup> But the direction of causality, if any, is not clear. The obvious potential link is that awareness affects transport behaviour. But, it is possible that level of awareness is determined by transport behaviour, i.e., people become aware of transport problems by using public transport more. It is also possible that the association between the two variables is accidental: i.e., neither one causes the other.
- **Cognitive dissonance.** This is a complicating factor in analysis of the importance of problem

awareness. When people learn about the adverse consequences of using their cars, they are as likely to minimise the adverse consequences of this use as they are to use their cars less.<sup>43</sup> This may happen because people grow up in an environment in which consistency between what they do and what they say is prized, and because ‘denial’ of the adverse consequences may be an easier way of achieving consistency than reducing car use.

- **Lack of concern for future generations.** Contemporary ‘Western’ culture may favour immediate over longer term concerns, thereby disposing individual behaviour to be maintained more by immediate outcomes than, for example, by progress towards avoiding climate change. In North America, a contrast is sometimes made with the ‘seven generations’ approach of aboriginal peoples.<sup>44</sup>
- **Attractiveness of present transport modes.** Here is what was written on this topic in one of the reports on the EST project:

“The car-based life can be extraordinarily rewarding. Those who live it travel with comfort, convenience, and privacy unknown in times past even to royalty. Provision of society-wide personal transportation has been a remarkable accomplishment that is for the most part highly appreciated. The evident problems of mass motorisation—notably road congestion, land take, and habitat destruction—can appear trivial in comparison with the apparent benefits. Modern aviation is similarly appreciated; it enables large numbers of people to traverse great distances with ease and comfort that could hardly be imagined even a century ago. Relinquishing what are now regarded as the commonplace benefits of aviation and personal vehicle ownership, however extraordinary they may have once seemed, could be considered to be as unthinkable as dispensing with the written word or other such products of human ingenuity. The only painless way of breaching this barrier may be to provide even better—and sustainable—alternatives. A special challenge in this respect lies in the many functions of the private car, which may be owned as much for its ability to carry shopping, luggage, infants’ requirements, sports equipment, and other items as to move people from place to place. Well-managed local freight and delivery services could ensure that these things are transported. But, however excellent such services may be, and however well integrated with good public transport, the combination is unlikely to surpass the private car in overall convenience and general utility.”<sup>45</sup>

- **Distaste for collective alternatives.** As with other ‘individual barriers’, this can reflect a societal disposition, specifically that of favouring individual rather than collective solutions to challenges. It is perhaps exemplified in former UK Prime Minister Margaret Thatcher’s often-quoted statement, “There is no society, only individuals and families”.<sup>46</sup> In some places there is outright prejudice against collective transport alternatives, as in the North American characterisation of buses as ‘loser-cruisers’.<sup>47</sup>

### *‘Psychological’ and other factors*

The present chapter began by noting that the factors discussed in the previous chapter—car ownership, economics, settlement density—are as to do with human behaviour as those discussed here; i.e., transport behaviour is human behaviour and, in that psychology is the science of such behaviour, all the factors are psychological. Nevertheless, a distinction is sometimes made between ‘psychological’ and other factors in car ownership and use. One commentator said, for example, “... many people, about 30 per cent, travel not to arrive somewhere, but to escape from where they are. ... Almost a third, then, travel for purely psychological reasons”.<sup>48</sup> The basic observation here, that travel may have reinforcing attributes separate from those of the objects of travel, may be apt, but characterising one set of factors that maintain transport behaviour as ‘psychological’ and the others as not may impede useful analysis of the behaviour.

### *Other ways of grouping determinants of transport behaviour*

A different kind of distinction concerns *motives* for car use, which have been described as *instrumentally-reasoned*, on the one hand, or *symbolically-affective*, on the other hand.<sup>49</sup> The former are associated with behaving ‘rationally’, e.g., using the car because of its “flexibility, independence, availability, speed, reliability, safety, carrying capacity, and comfort”. The latter are associated with “deeper” attributes of car use, such as “privacy, status, control, power, independence, and freedom”. The authors of this distinction suggested that policy measures based on “instrumentally-reasoned research models” are not very effective, and that car advertising tends to be associated with the symbolically-affective aspects of car use.

A more complex classification of determinants speaks first to *external conditions*, e.g., locations of homes and work places, weather, and road conditions, on the one hand, and *individual characteristics*, which include attitudes, habits, income, and gender, on the other hand.<sup>50</sup> Second, there is a distinction between *volitional* and *non-volitional* determinants, the latter including all external and some internal conditions. Habits, gender, and economic means were noted as non-volitional internal determinants. Third, there are *proximal* and *distal* determinants, with the latter noted as including background characteristics, lifestyles, and values.

### *Habitual transport behaviour*

The paper in which this more complex classification is set out concludes that it is difficult to change people’s travel behaviour because it is largely ‘habitual’, i.e., it is non-volitional or at least not evidently the result of a decision-making process. That paper, like most of the literature on the topic, presents conclusions based on an analysis of responses to a questionnaire, in this case given repeatedly by telephone to a large sample of Danish ‘consumers’. Such research can assume that a person’s words on the telephone to a stranger and the person’s transport behaviour are somehow related, or at least that analysis of the former can provide insights incidents and determinants of the latter.

That paper also assumes that transport behaviour, other than habitual transport behaviour, is the product of a partially autonomous decision-making device or construct located within the traveller. Habitual transport behaviour, however, was said to be the norm. At least one other author has noted the prevalence of habitual transport behaviour—“so that ... minds are freed for other tasks”.<sup>51</sup>

Another expression of the role of habit has been this: “... when habit is weak, there is a significant link between intention and behaviour. That is, when someone says they will do something they will do it. However, when habit is strong, the power of intention to predict future behaviour becomes diminished.”<sup>52</sup> Intention is essentially verbal behaviour that, like all verbal behaviour, is influenced by mostly social outcomes. Transport behaviour is mostly non-verbal behaviour influenced by what may be a different set of outcomes. The two may have more scope for alignment when neither is strongly reinforced. Moreover, alignment (i.e., truthfulness or consistency) itself may be reinforced. To go beyond this and to say that the verbal behaviour is somehow causing the transport behaviour is perhaps to overlook the features of the environment that are actually maintaining the transport behaviour.

### *Unnecessary constructs*

Such classifications and constructs—whether decision-making processes, minds, attitudes or intentions—are unnecessarily complex.<sup>53</sup> Moreover, they may cause researchers who use them to miss the essential features of what is happening. One essential feature could be that behaviour does not change—it is described as habitual—when the consequences of behaviour continue unchanged; but, when the pattern of consequences changes, the behaviour changes to match the

new pattern. Behaviour is expedient, adjusting to match what its surroundings provide, much as the average neck length of a species changes across generations as the height of available vegetation changes. If peers start praising quiet smoothness in a car rather than noisy power, a young owner may change his driving behaviour promptly, and perhaps even his car. His statements about what is responsible for his actions may be mostly irrelevant.

**Question 8. Is some transport behaviour—e.g., non-habitual transport behaviour—more amenable to influence by soft measures?**

#### 4.4. Attitudes and behaviour

The individual factor given the most attention is attitude. A commonly used **definition of attitude** in the social psychology literature is this: a tendency to evaluate an entity with some degree of favour or disfavour, ordinarily expressed in cognitive, affective, and behavioural responses.<sup>54</sup> Attitudes are thus essentially expressions of liking or not liking something, where the ‘something’ (entity) may be a person, a group of people, a concept, a type of food, and much else. The terms ‘attitude’ and ‘intention’ are sometimes used interchangeably, although the former should perhaps be reserved for more general statements about behaviour and the latter for statements about specific future behaviour.

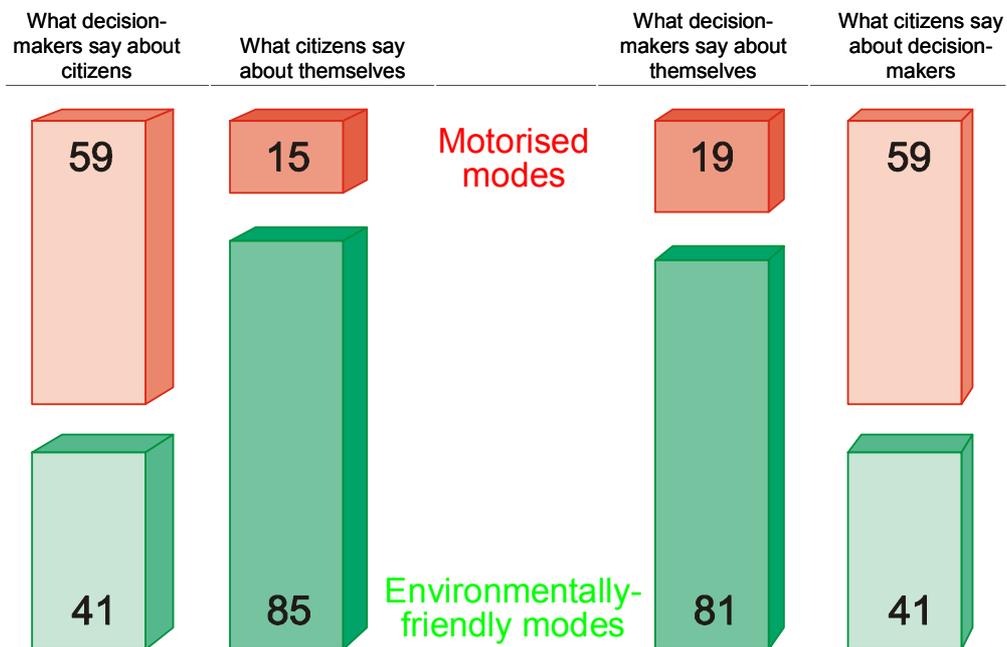
A common view is that changing attitudes is a necessary condition for changing transport behaviour. This could mean that people must say they like using public transport before they actually use it more frequently. A more extreme view is that changing attitudes is a sufficient condition for changing transport behaviour. If you can induce people to say they like using public transport they will use it more.

The research on attitudes and behaviour does not support either position. The most extensive review found that attitudes only sometimes predict behaviour.<sup>55</sup> There is a strong link between attitudes and behaviour only when specific criteria are met: the attitude has to be strongly expressed, specific to particular behaviour, and close in time to the behaviour.<sup>56</sup> Thus, voting intentions on the day before an election are much more likely to predict voting behaviour than attitudes toward public transport are likely to predict public transport use.<sup>57</sup>

A particular caution concerns attitudes that are socially desirable, i.e., expressing them is susceptible to favourable comment. Answers to questions about future behaviour related to socially desirable attitudes tend to overpredict the occurrence of the behaviour. For example, people are more likely to say they will donate to a charity than they are to donate. Similarly, questions related to socially undesirable behaviour lead to underprediction. People say they do not drink and drive, but nevertheless do drive and drive. An interesting complication of these findings is that expressing the prediction seems to change behaviour towards the prediction. Thus, people who are asked about their intention to donate are more likely to say they will donate than to donate, but they are nevertheless more likely to donate than people who are not asked.<sup>58</sup>

Other evidence of the unreliability of verbal behaviour comes from research on the pervasiveness of deception in everyday life. For example, a recent study that used undergraduate students as subjects—as do many such studies—produced results suggesting that lying could be prevalent in everyday conversation, especially when people are trying to appear likable or competent. Men and women were found to lie with similar frequency, but women were more likely to lie to make the person they are speaking to feel good whereas men lied more to make themselves feel good.<sup>59</sup>

Figure 14. Misperceptions of acceptance of environmentally friendly transport modes



In short, what people say is often not reliable and is mostly not a good predictor of what they will do.

In spite of the uncertainty about the importance of attitudes, *perceptions* of attitudes may be an important factor in decision-making about transport. Anticipation of an angry electorate may deter decisions towards attainment of sustainable transport. However, as attitudes may be unreliable so may perceptions of attitudes.

The unreliability of perceptions of others' attitudes is evident from the results of a recent survey conducted across the European Union. Decision-makers and ordinary citizens were asked whether they were more supportive of environmentally friendly transport modes (public transport, walking, bicycling) than regular motorised modes (cars, vans, motorcycles), or vice versa, and also what the other group thought. Figure 14 shows that each group was strongly supportive of environmentally friendly transport modes but thought the other group was not.

Question 9. What causes decision-makers to underestimate public support for environmental friendly transport modes, and how could soft measures be used to correct such underestimates?

#### 4.5. Acceptability

According to the EST project teams, a key issue is the *acceptability* of hard measures, or the *acceptance* of them by travellers and providers of freight services. *Acceptable* and *unacceptable* are hard to construe in behavioural terms. The key feature of unacceptability may be that the measure is ignored or resisted. Normally, such rule-breaking and protest are kept at low levels by adverse consequences, and perhaps too by lack a prospect of positive consequences. Actual

levels depend on numerous factors, including media interest, political structure, and overall conflict level. In times of war and other emergencies, stronger measures can be applied with less protest and rule-breaking. The penalties for non-conformity may be higher, but so also may be the rewards for conforming.

There could be two kinds of practical reason for securing acceptance of hard measures before they are applied. One is that popular acceptance of the measures could mean that they are more likely to be introduced, i.e., politicians are more likely to act if they see their proposed decisions as popular. The other is that accepted measures are less likely to be resisted and may thus be more effective in producing results.

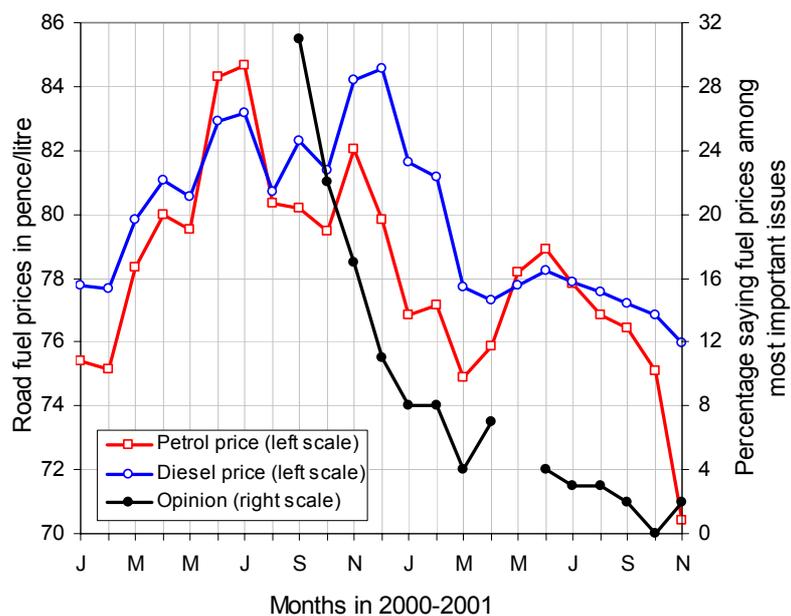
However, some measures may be considered necessary for progress towards sustainability even though they could never be popular. If their unpopularity prevents their introduction, there will no progress. Experience of the measure may be best route to acceptance of the measure.

An example could be the introduction of road pricing in Oslo, Norway (the Oslo Toll Ring). This was introduced in 1990 when about 65 per cent of residents opposed it (70 per cent in the previous year). By 1997, opposition had lessened; just over 50 per cent opposed the road pricing scheme.<sup>60</sup> More recently the level of opposition to the scheme has increased.

Also instructive is the way in which concern about high fuel prices in the UK increased dramatically in September 2000 and then fell rapidly. Protests against the high cost of diesel fuel by farmers and lorry drivers in that month blocked roads around refineries and caused 90 per cent of petrol stations to have shortages or run out. The protest was specifically against the high fuel tax regime, among the world’s most onerous, even though the 2000 increase in fuel taxes had been the lowest for eight years and the immediate cause of high prices was high crude oil prices. Moreover, farmers—among the most prominent protesters—paid and pay almost no fuel tax for off-road uses and had experienced no increase. As a result of the protests, 33 per cent of respondents to the regular MORI opinion poll said fuel prices were among the most important issues, whereas previously it had not featured in this group (see Figure 15).<sup>61</sup>

Perhaps ironically, the price of petrol—used by most poll respondents—was already declining in September 2000, while the price of diesel fuel—used by most protesters—continued to increase. The government’s only response was a small temporary cut in the tax on petrol, introduced in March 2001 when few people reported high fuel prices as being among the most important issues (see Figure 15). The protests resulted in what was described as the governing Labour Party’s “most severe opinion poll wobble since 1992”, but the

Figure 15. UK fuel prices and public opinion, 2000-2001



Party was re-elected in the June 2001 election with almost no decline in support.<sup>62</sup>

There seems little doubt that high fuel taxes in the UK were and continue to be ‘unacceptable’, in that consumers would prefer not to pay them. Moreover, it also seems that interruption of vehicle fuel supplies by protesters against high fuel taxes can cause people to say that high fuel taxes are an important issue, at least for a short while. But the important point about what happened in the UK may be that a regime of high fuel taxes, gradually introduced by successive governments over several years, had become accepted to the point that substantial concern about it did not damage the government’s popularity, except briefly.

The Oslo Toll Ring and the 2000 fuel price issue in the UK (and elsewhere in Europe) provide some support for the argument that **providing experience of a measure may be the best way to help ensure acceptance of it**. To say that road pricing or high fuel prices became accepted, however, would be misleading. A majority is evidently opposed to the Oslo Toll Ring, and probably to high fuel taxes in the UK.

The issue becomes that of the roles and responsibilities of decision-makers in a democracy. One researcher phrased the issue in this way: “Since the bulk of person transport is made by individuals as private consumers, and since their dual capacity as consumers and voters makes it virtually impossible to effectively force people to change their transport behavior, much more insight is needed into how people can be persuaded to accept more environment-friendly transport solutions.”<sup>63</sup>

What is meant here by ‘forcing people to change their transport behaviour’? It probably means achieving change by using hard measures, including taxes on unwanted transport behaviour and regulations that prevent unwanted behaviour. When a government uses these measures, what it is in effect doing is changing the consequences of both unwanted and wanted behaviour. Unwanted behaviour incurs higher costs and perhaps other penalties; at the same time, the consequences of wanted behaviour (e.g., public transport) become relatively more favourable. However, use of such measures makes governments unpopular and may arouse overt and even frightening opposition to the measures.

Implementing ‘more environment-friendly solutions’ may also involve changing the consequences of behaviour, and thus the application of hard measures. The essential difference between ‘forcing people to change their behaviour’ and persuading them ‘to accept more environment-friendly transport solutions’ may be that in the latter case there is no overt opposition to the hard measures.

The difference can be compared with rules that require smokers to leave a building to smoke. They are *forced* to leave the building, but they *accept* the rule, meaning they do not protest. Imposition of such a rule 30 years ago would have resulted in protest. What has changed? First, there would be less support for protest now. Second, and perhaps more important, smoking inside the building would have adverse social consequences as well as whatever might be the formal outcome of breaking the no-smoking rule. The no-smoking rule’s strongest effect may be its creation of an environment in which building occupants are likely to punish smoking with unfavourable comments.

Why do the building occupants punish smoking? They are mostly non-smokers and find proximity to tobacco smoke to be unpleasant or believe it to be unhealthful, or both. Thirty years ago, objectors to tobacco were fewer, and suffered in silence and without their licence to complain, i.e., the no-smoking rule.

What are the implications for transport? The first could be that quite severe measures can be implemented if the implementation is gradual and if politicians are prepared to wait for any opposition to the measures subside. The second is that the social support may be more important for the effective continuation of the measures rather than for their introduction.

Thus, **the issue becomes not that of ensuring acceptance of measures before they are introduced but of facilitating the process whereby acceptance of a measure increases with experience of it.** In other words, governments should act—prudently, of course—and then seek to ensure that the actions become more accepted.

Question 10. To what extent is acceptance of measures a necessary or sufficient requirement for their effectiveness?

Question 11. How could soft measures be used to increase the acceptance of measures that have been introduced?

## CHAPTER 5. ROLES OF ADVERTISING

In what way does advertising a product determine the use of the product? The debate has been fought mostly over tobacco use. The tobacco industry argues that the main purpose and effect of advertising is to maintain brand loyalty and achieve brand switching. Public health agencies argue that tobacco advertising influences the overall consumption of tobacco, in part by helping recruit new smokers.<sup>64</sup> A recent, relatively impartial review suggested that “there is a significant empirical literature that finds little or no effect of tobacco advertising on smoking”. However, the report suggested too “that a comprehensive set of tobacco advertising bans can reduce consumption”.<sup>65</sup>

Another area of controversy is alcohol use, with the present position being captured well in the following quote,

“The large volume of research on the advertising of alcohol beverages has produced inconclusive results. There are not sufficient grounds for claiming that advertising either does or does not affect alcohol consumption. ... virtually all the research on the impact of advertising suffers from certain key limitations. First, since advertising is only one of many factors that may influence alcohol consumption, even if it did have an impact its influence would likely be small compared with other factors such as price and disposable income. ... Second, advertising is usually targeted at particular groups, whereas the research on its effects is not. Thus the impact of advertising on youth or other target groups might fail to appear in the research findings. Finally, research has looked only at the very short-term impacts of advertising. It is possible that the most important consequences of advertising are cumulative effects that could be detected only by using long-term research designs.”<sup>66</sup>

As do tobacco manufacturers, manufacturers of alcoholic beverages claim that the main purpose and effect of advertising is to maintain brand loyalty and achieve brand switching. As with tobacco products, there is empirical support for the claim that advertising affects only which beverages are sold not how much alcohol is consumed.<sup>67</sup>

Much less research has been done on advertising’s roles in stimulating car ownership and sprawl. Indeed, not one readily available source on these topics could be identified. Had the research been done, a review could well produce conclusions similar to those concerning alcohol use: its overall impact would be found to be small or negligible, its impact on target audiences could be larger, and its long-term effects would be unknown. The research could nevertheless show that advertising can have a strong effect on *which* car models are purchased, or which homes.

Cars are among the most heavily advertised of products. For example, General Motors, the largest manufacturer, became the leading advertiser in the U.S. in 1997, replacing Proctor & Gamble, which has been the leader for many years. In the first half of 2002, General Motors was still the leader, with Ford and DaimlerChrysler in fifth and sixth places.<sup>68</sup> However, as a percentage of sales value, expenditure on automobile advertising ranks relatively low; at less than two per cent it far behind the U.S. leaders in this respect, which are over-the-counter drugs (about 20 per cent) and perfumes and cosmetics (about 15 per cent).<sup>69</sup>

The U.S. accounts for just under half of all advertising expenditures worldwide, about US\$200 billion out of a total of about US\$418 billion in 1998. Just under half of advertising expenditures in the U.S. involve media advertising (television, radio, newspapers, and magazines); of this, spending by the car manufacturers and dealers comprised about 15 per cent of the total.<sup>70</sup>

Expenditures on car advertising as a proportion of sales volume have risen substantially over the last three decades. For example, advertising in the U.S. by the three major U.S. manufacturers rose from 0.5 to 1.4 per cent of sales over the period 1970-1994. Actual advertising expenditures grew eightfold, while the dollar value of overall sales grew threefold, both in real terms.<sup>71</sup> On the face of it, the large increase in advertising could have driven the increase in sales, but the opposite may have been equally possible; advertising expenditures may be as much a *result* of high overall sales levels as a *cause* of them. Causal relationships, if any, are hard to discern from the available data.

Advertising that might encourage sprawl (e.g., for new homes on ‘greenfield’ sites) appears to be negligible compared with advertising by the automotive sector.

Even though there is uncertainty as to the extent of the contribution of advertising to car ownership and use, there are suggestions in the literature that counter-advertising could result in reductions in ownership and use. Counter-advertising appears to have had some effectiveness in reducing use of tobacco and alcohol products.<sup>72</sup>

There is controversy in Canada as to whether counter-advertising in respect of tobacco is more effective if it is polite rather than forceful. Interested organizations in Canada claim the government’s antismoking advertising is too “lame and tame”. They have urged a change in strategy: “drop the preachiness and go into full attack mode against cigarette makers”. The government is part way into a five-year, C\$190-million media campaign to reduce tobacco-related disease and death. It has been urged to adopt the “tobacco industry denormalisation” strategies of the U.S. states of California, Florida, and Massachusetts.<sup>73</sup> Meanwhile, a tobacco industry executive in Canada has suggested that it may be appropriate to “denormalise” the fast-food, alcohol, gambling, and automotive industries.<sup>74</sup>

According to a Government of Canada document, denormalisation of smoking includes:

- Deglamorizing the use of tobacco products;
- Combatting myths about tobacco products (for example, that light and mild products are safer or can help you quit);
- Drawing attention to the size and impact of tobacco industry advertising budgets, and the nature of their promotional activities.
- Drawing attention to the role of other industries and organizations in supporting the promotion and sale of tobacco.<sup>75</sup>

California, Florida, and Massachusetts have introduced aggressive media campaigns as part of comprehensive programmes designed to reduce the incidence of smoking, particularly among young people. A recent thorough assessment of the effectiveness of these programmes, and those of the states of Arizona and Oregon, concluded that they had produced declines in per-capita cigarette consumption and the prevalence of smoking in adults and youths, and that the anti-smoking media campaigns were the central and most critical components of the programmes.<sup>76</sup>

Thus, there seems more certainty, for smoking at least, that advertising may be more effective in reducing the incidence of targetted behaviour (counter-advertising) than in increasing the incidence (regular advertising). Applied to transport, this could mean that counter-advertising designed to reduce car use could be more effective than regular advertising designed to increase the use of public transport or other modes.

Question 12. How does advertising support unsustainable transport behaviour, and how could it be used to make transport behaviour more sustainable?

Question 13. Are counter-advertising and denormalisation plausible strategies for reducing car ownership and use?

## CHAPTER 6. QUICK REVIEW OF SOME RESEARCH ON THE EFFECTIVENESS OF SOFT MEASURES

### 6.1. Some negative assessments

A new transport journal was launched in 1998, the sixth of a family of journals with the title *Transportation Research*. The new journal has the sub-title *Part F: Psychology and Behavior*. Its opening editorial surveyed the field of traffic psychology and behaviour, including work on public information campaigns. This section began with the word, “Despite their obvious popularity among practitioners, there is very little evidence that public information campaigns are effective.”<sup>77</sup>

The kind of information campaigns of primary interest to readers of this journal may be those that reduce the incidence of accidents, improve driving skills in the elderly, and generally increase the amount of car driving. Thus, the rather negative conclusion in the editorial may not apply with such force to sustainability issues, where the challenge is often that of *reducing* the amount of driving. Moreover, the overview highlighted the success of “teaching programmes that ... proved very effective in installing safe road crossing behaviour” in young children, raising the hope that such programmes could be developed that would help promote the use of environmentally benevolent forms of transport.

A recent review of the impact of traveller information systems for the UK Department of Transport stress the general lack of evidence of an impact. However, the review also noted “significant measurable impacts” of information services on Ile-de-France motorways, including mode shifts as well as changed routes and departure times. The review noted the inadequacy of stated preference research techniques, arguing for “intervention in real life”. Such intervention could involve direct provision of information to selected individuals, with tracking of outcomes. It could also involve building of a prototype information provision system and assessing its impact.<sup>78</sup>

Part of the Government of Canada’s Climate Change Process has concerned evaluation of the potential for action resulting from public outreach. The panel concerned with this matter concluded that “a variety of studies have established that enhancing knowledge and creating supportive attitudes often have little or no impact on behaviour. ... The failure of information-intensive campaigns to foster behaviour change is due to an underestimation of the difficulty of changing behaviour”.<sup>79</sup>

The panel proposed use of a process known as ‘community-based social marketing’. It is described here Section 6.3.

### 6.2. Some more positive assessments

INPHORMM (Information and Publicity Helping the Objective of Reducing Motorised Mobility) was a European Commission-funded project that sought to investigate “how investigating how transport information and publicity campaigns can influence people’s awareness, attitudes, and travel behaviour—and encourage cycling, walking, and use of public transport”.<sup>80</sup> The work included examination of more than 30 case studies from Europe, the U.S.A., and Australia. Here are some of the results of the review:

- The **primary objective of the campaigns** was to achieve modal shift in favour of alternatives to the car.

## SOFT MEASURES AND TRANSPORT BEHAVIOUR

- The **second objectives of the campaigns** included environmental, economic, health, social, and community-development objectives as well as improving public relations, creating a better corporate image, and “preparing the public for traffic restraint measures or explaining the introduction of new legislation or measures to encourage a reduction in car use”.
- There has been a **trend over time towards more focused campaigns** targeting key settings such as schools, businesses, and defined geographic areas, and even towards individualised campaigns targeting households or individual travellers.
- Another trend has been to **move from a focus on the problems of traffic growth to positive messages** presenting solutions, providing practical advice, and associating reduced car use with enhanced ways of living.
- The **monitoring and evaluation of information and publicity/marketing campaigns is in its infancy**. Nevertheless, there were examples in the case studies of several outcomes of campaigns, including the following:
  - Changes in politicians’ views of the need for sustainable transport policies and targets.
  - Introduction of cycling, walking, and integrated transport strategies.
  - Increased acceptance by businesses of their role in promoting alternatives to the car.
  - Increased media coverage and positive reporting of programmes to reduce car use.
  - Increased levels of cycling, walking, and specific public transport services.

The conclusions of the INPHORMM project included the following:

- Public awareness of the problems caused by motorised mobility and the creation of an ‘environmentally-friendly transport climate’ are prerequisites for widespread sustained behaviour change.
- Complementary coercive measures may also be required.
- Changing cultural norms is a long-term process.

Another recent review assessed the impact of the whole range of local transport policy instruments, as applied in the UK, in terms of their impacts on transport supply and demand and on environmental and other factors.<sup>81</sup> A section of the review concerned soft measures. It assessed three types of intervention: (i) company transport plans are packages of measures designed to cause a shift away from car use for the journey to work; (ii) travel awareness plans concern all journeys but may be implemented via the workplace; and (iii) school travel plans concern the journey to school.

The assessment found that quantifying the demand effects of the three types of intervention is difficult. Nevertheless, it was said that there have been positive results from each type, although details of changes in transport behaviour were given only for several company transport plans.

In development of the preferred strategy for enhancement of transport between north west England and the West Midlands, the UK Government Office for the West Midlands evaluated the likely impact of several soft measures in early 2002 and concluded the following:

- e-commerce, internet shopping, car clubs, improved interchanges, land use policies, local sourcing and new technology would have negligible short term effects on travel activity;
- school travel plans and promotion of walking and cycling would have small effects;
- teleworking; videoconferencing; company travel plans; public transport fares, marketing ticketing initiatives; and bus quality partnerships would have larger effects;

- all soft measures could have a maximum impact of reducing traffic levels by just over four per cent during peak hours and by just over one per cent over the day, although these may well be over estimates.<sup>82</sup>

The OECD held a workshop in January 2001 with the title “Information and consumer decision-making for sustainable consumption” as part of its Programme on Sustainable Consumption. The workshop concluded the following:

- Information can be a powerful tool for promoting more sustainable household consumption. However, it is often hard to target and its impact is unpredictable and difficult to measure.
- There is little information available on the cost-effectiveness of information-based instruments for helping households reduce their environmental impacts.<sup>83</sup>

The TAPESTRY project—subtitled “Campaign Solutions for Transport—is a major three-year exercise that began in November 2000 and is being conducted under the auspices of the European Commission. Its overall aim is “to increase knowledge and understanding of how to develop effective communication programmes to support sustainable transport policies in Europe”. The main product will be the development, conduct, and assessment of “16 travel awareness, communication, education and publicity case study campaigns, based on a combination of best practice and local needs across Europe”.<sup>84</sup>

The second deliverable of the TAPESTRY project was a “State-of-the-Art Review” conducted “to provide a common understanding to all TAPESTRY partners about behavioural and attitudinal concepts, the factors affecting them and the relationships between theory and practice”. The conclusions of the review, other than those concerning monitoring and assessment, are summarised in Table 6 on the next page.<sup>85</sup>

Table 6 is a mixture of summaries of research conclusions and prescriptions for information campaigns. The research basis for many of the statements made is thin at best. Indeed, it is hard to provide solid support for any of the statements.

In respect of the essential matters of monitoring and assessment, the TAPESTRY review concluded that “In the majority of campaigns identified so far, monitoring and assessment activities are missing, or at best inadequate.” The review urged that “Monitoring and assessment need to be built into the project design from its inception, and to be carried out to the highest possible scientific standards.” The review proposed the following guidelines:

- define the objectives of the campaign
- derive more specific and realistic targets
- establish an assessment plan for the campaign, including what will be measured, why, when, and by whom
- define likely impacts from a more extensive list of all potential impacts
- develop indicators to match the list of likely impacts
- identify data sources and collection methods for each of the indicators
- estimate likely impacts (changes)
- consider the use of a control group or region
- collect “before” measurements in intervention area and control if used
- run the campaign and monitor its progress e.g., press coverage, take up of publicity material

Table 6. Summary of conclusions from the TAPESTRY review

<p><b>On the link between attitudes and behaviour</b></p> <ul style="list-style-type: none"> <li>➤ The barriers that people perceive when considering changing mode are among the most important predictors of behaviour, therefore, campaigns aiming to change behaviour have to address how these barriers can be overcome.</li> <li>➤ Habit is also a very strong determinant in predicting behaviour. Campaigns to change behaviour should therefore also take this into account and look at opportunities for intervention when habits can be easily broken (new home, new job, changes in family circumstances etc.)</li> <li>➤ Changing attitudes to car use may not lead to a change in actual car use: if people change their attitude to car use and still drive, it leads to “cognitive dissonance”. To avoid this, attitudes to car use are likely to remain positive.</li> <li>➤ Simple categorisation of people as “car drivers” or “public transport users” is not an effective way to determine the potential for change in travel behaviour.</li> <li>➤ Socio-economic and demographic criteria are not a useful way to predict people’s awareness, attitudes and intention to change their travel behaviour.</li> <li>➤ Looking at people’s attitudes to transport-related measures may be a more useful way to “segment the market”, when designing campaigns.</li> </ul> <p><b>On the process of changing travel behaviour</b></p> <ul style="list-style-type: none"> <li>➤ Many factors can influence the potential for change. These may be under the direct influence of the person concerned or in the world around them. They can be objective or subjective (perceived). It is important to be aware of these factors when developing campaigns and to try to address the misconceptions that prevent people from making changes towards more sustainable modes.</li> <li>➤ People undergo a process of change. Changing behaviour is not possible until they have passed through the preparatory stages of awareness/ arousal and acceptance.</li> <li>➤ Encouraging a change in behaviour is not enough to ensure a long-term shift.</li> <li>➤ Communication strategies need also to build in support mechanisms for maintaining that change.</li> <li>➤ Different stages in the process of change require different sorts of campaign techniques.</li> <li>➤ Changing attitudes alone may be a valid outcome of a campaign.</li> </ul> <p><b>On planning campaigns</b></p> <ul style="list-style-type: none"> <li>➤ Campaigns are most effective when linked to physical or “hard” measures, e.g., new transport plan, new cycle lanes.</li> <li>➤ Ensure that you know about current public opinion prior to planning a campaign—use market research if necessary.</li> <li>➤ A step-by-step communications programme is more likely to result in changes in behaviour. Public awareness campaigns should be followed up by more targeted and perhaps individualised campaigns to change attitudes and encourage a shift in behaviour.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Consider whether you are using just one or combining different communications strategies (“power”, “reinforcing”, and “persuasive”).</li> </ul> <p><b>On defining target groups</b></p> <ul style="list-style-type: none"> <li>➤ Prior research is essential to define target groups effectively.</li> <li>➤ Target groups for site based campaigns focus on all those who travel to that site.</li> <li>➤ Target car-dependent journeys as opposed to car dependent people.</li> <li>➤ Target those who want to change their transport behaviour and expect that they can first.</li> <li>➤ For individualised campaigns, focus on those who are interested and motivated to take part.</li> <li>➤ Consider targeting people at times of change in their lives, e.g. moving house, job, starting a family etc.</li> </ul> <p><b>On messages and message givers</b></p> <ul style="list-style-type: none"> <li>➤ Use arguments on which most people agree.</li> <li>➤ Make the desired behaviour special in some way.</li> <li>➤ Use positive messages and a non-authoritative tone.</li> <li>➤ For site-based campaigns, use messages relevant to the main concerns of that site (e.g., child health and safety for schools or employee health and better “productivity” for companies).</li> <li>➤ For individualised campaigns, stress how small changes can make a big overall impact.</li> <li>➤ Message should “get Attention, hold Interest, arouse Desire and obtain Action”.</li> <li>➤ Effective message givers can be respected celebrities, fictional or cartoon characters.</li> <li>➤ Messages must be pre-tested with the target audience to ensure effectiveness.</li> <li>➤ Consider collaborating with respected voluntary or community organisations.</li> </ul> <p><b>On incentives</b></p> <ul style="list-style-type: none"> <li>➤ Incentives should be directly targeted at encouraging the desired behaviour.</li> <li>➤ Consider combining incentives with disincentives.</li> <li>➤ Ensure that any incentives you put in place are not counteracted by existing policies that favour car use (e.g. company car policies).</li> <li>➤ Use promotional material that is mutually reinforcing, e.g., posters with leaflets.</li> <li>➤ Pre-test all materials for both format and content with all your target groups.</li> <li>➤ Don’t give free tickets to existing public transport users!</li> </ul> <p><b>On partnerships</b></p> <ul style="list-style-type: none"> <li>➤ Consider other policy areas that are related to your campaign and explore whether these need to be a direct focus or indirectly addressed.</li> <li>➤ When planning a campaign, bring together all possible interested parties.</li> <li>➤ “Campaigning for a campaign” to gain positive support of all levels of the organisations involved is an important pre-condition for success.</li> <li>➤ Strong partnerships make for more effective lobbying.</li> </ul>
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## SOFT MEASURES AND TRANSPORT BEHAVIOUR

- collect ‘after’ measurements in intervention area and control if used
- collate and analyse results.

### 6.3. Enhanced soft measures

A process known as ‘community-based social marketing’ was advocated in the course of the Government of Canada’s climate change work discussed in Section 6.1. Its core feature is the use of tools for fostering behaviour change. In brief, these are:

- securing **commitment** to change behaviour increases the likelihood of change
- providing **prompts** helps predisposed people remember to act
- establishing **norms**—the socially ‘right-thing-to-do’—facilitates desired behaviour
- providing **incentives** (and disincentives) for desired (and undesired) behaviour
- engaging in good **communications** to support the other tools, with these qualities: relevant to audience, vivid, delivered by credible person, clear and specific, memorable, informative as to desired actions, and made through personal contact.

The panel’s report included assessment of seven implementations of soft measures in Canada that had an evaluation component (only one concerned transport-related behaviour). The assessments are summarised in Table 7.<sup>86</sup> They were used to support the general approach of the panel that provision of information alone is ineffective, but that provision of information supported by extensive and often face-to-face contact can be effective.<sup>87</sup>

The first application in Table 7 concerned tobacco use. One report cautioned that there are key differences between health-related and transport-related behaviour. “Changing health behaviour brings almost immediate benefits to the individual concerned. This is not the case for transport. More often than not, the benefits of changing travel behaviour will only be visible if many people at once decide to reduce their car use and if the benefits are seen to be greater than the

**Table 7. Summary of evaluations of use of soft measures in Canada**

Program name	Program goal	Primary method	Measured direct effect
Tobacco Demand Reduction Strategy	Reduce smoking	Wide variety of approaches	None
Seat Belt Education Campaign	Increase seat belt use	Media advertising	None
Federal Energy Conservation Information Campaign	Increase understanding of need for energy conservation; reduce energy use	Media advertising, community programmes, corporate challenges	Increased understanding of need for conservation. Reduced energy use
Ontario Green communities	Reduce energy use in homes	Home visits providing one-on-one advice	Reduced energy use in homes.
Pro-trucker	Encourage fuel-efficient driving	Training, advertising	Programme participants’ fuel use lower
Energuide	Use of more energy-efficient home appliances	Labelling; training	Reduced energy use by appliances
R-2000	Reduce energy use in low-rise dwellings	Education of home-builders, etc.; certification	Reduced in-building energy use

perceived disadvantages of making that change.”<sup>88</sup> Nonetheless, the intervention with respect to tobacco use was considered to have been unsuccessful.

Many of the successful interventions listed in Table 7 concern energy use. A comprehensive assessment of 51 interventions concerning energy use in Europe under the European Commission’s SAVE II programme resulted in a set of guidelines for securing behaviour change in the direction of energy conservation.<sup>89</sup>

The overriding principles articulated in the guidelines are (i) ‘begin at the end’, i.e., first define the desired outcome, i.e., which behaviour of which people is to change, (ii) identify what is sustaining present behaviour (predisposing, enabling, reinforcing factors) and what is available to sustain the desired behaviour; (iii) only then design and implement the intervention; and (iv) evaluate what was done, above all its effectiveness.

The assessment of the 51 interventions (12 concerned transport-related behaviour) had resulted in the following conclusions:

- **Behaviour change projects work**; three quarters of the interventions showed significant positive results; however, there was “very significant decay in any behaviour change achieved”.
- **Few interventions were rooted in theory or even previous practice**; thus there was no building on knowledge, or contribution to general principles.
- **Market segmentation was rare**; those that did were more successful and cost-effective.
- **Prior diagnosis was rare**; there was little assessment of initial positions, making evaluation of performance difficult, often a consequence of no or late involvement of behaviour change professionals.
- **Behavioural evaluation and assessment rare**; almost four fifths of the projects had some form of evaluation, but fewer than half noted what change in *behaviour* had occurred (as opposed, say, to change in energy-saving items purchased).
- **Most projects did not lead to further activity**; two thirds were one-off, stand-alone actions.
- **There was little transfer of learning among projects**; this was the result of weak evaluation, lack of prior desk research, and absence of networking.

The guidelines also addressed the question of cost-effectiveness of interventions, to be assessed in terms of impact, the product of reach and effect. An example of such an analysis is provided

**Table 8. Illustrative monetary costs and benefits of interventions designed to reduce energy use in 600,000 households**

<b>Intervention</b>	<b>Reach</b> (how many affected)	<b>Effect</b> (how much change in those affected)	<b>Impact</b> (product of reach and effect)	<b>Cost of intervention per person</b> (in €)	<b>Total cost of intervention</b> (in 1000 €)	<b>3-year saving in energy costs</b> (in 1000 €)	<b>Net outcome</b> (saving less total cost, in 1000 €)
No intervention	33%	3%	1%	0.00	0	3,564	3,564
Mass media campaign	80%	4%	3%	0.50	240	7,956	7,716
Self-help guide	80%	10%	8%	6.50	3,120	25,236	22,116
Tailored information	80%	20%	16%	18.00	8,640	54,036	45,396
Individual advice	50%	28%	14%	182.00	54,600	46,836	-7,764

## SOFT MEASURES AND TRANSPORT BEHAVIOUR

in Table 8.<sup>90</sup> The analysis suggests that the largest effect is achieved by interventions involving tailored information, e.g., via the Internet. However, the largest proportionate return on the amount invested is from intervention by a mass media campaign, e.g., use of folders or posters. An investment of 240,000 € produces a return of 7,716,000 €, i.e., more than 32 times the investment.

The application of a technique known as individualised marketing in Perth, Australia, has been reported as reversing the decline in walking, cycling, and public transport use, and curbing the growth in automobile use. Individualised marketing has been described as “informing people of their travel choices and encouraging self help. It is not about telling people which trips to change or what modes to use. The design of the technique allows the information and dialogue to be related to each individual’s or household’s unique situation. The information provided tailors the information, especially about public transport, to each person’s unique situation. This is opposite to a system wide approach to providing public transport information, which is also essential”<sup>91</sup>.

*Question 14. To what extent are soft measures effective in changing transport behaviour?*

*Question 15. Can soft measures be used to facilitate the effects of 'hard' measures designed to make transport behaviour more sustainable?*

*Question 16. How can soft measures best be used to achieve sustainable transportation?*

## CHAPTER 7. CONCLUSIONS CONCERNING THE USE OF SOFT MEASURES

The basic conclusion concerning soft measures is that it is hard to be conclusive about their effects. It's hard to conclude that soft measures have had much of an effect on transport-related behaviour by themselves. It's also hard to conclude that soft measures have contributed much towards the effectiveness of hard measures.

Assertions that for transport behaviour to change there must be prior changes in attitude, development of problem awareness, and intention to change seem plausible, but they are not well supported in practice. Favourable attitudes may be as much shaped by experience of changed behaviour as by statements designed to change the behaviour.

Hard measures may change behaviour because they change the consequences of behaviour. Soft measures could have the ability to change the consequences of behaviour—by adding positive or negative value to outcomes of the behaviour—but they do not seem to have been used in this way. The effectiveness of hard measures is consistent with the view that the key determinants of transport behaviour are in the milieu in which it occurs rather than within the travellers whose behaviour is to be changed.

Some techniques involving soft measures do seem to have been effective. Counter-advertising—as opposed to regular advertising—may be effective in reducing the incidence of unwanted behaviour. What are described here as 'soft measures plus' may be effective in increasing wanted behaviour. Soft measures plus include community-based social marketing, tailored information, individualised marketing, and other intensive processes that seek to engage individuals in face-to-face or individualised settings.

A major exercise concerning the effectiveness of soft measures in transport behaviour is under way in Europe. The TAPESTRY project is to be completed at the end of 2003. It could resolve several of the uncertainties that have been identified here.

One matter that may not be resolved by the TAPESTRY project is the way in which decisions are made with respect to sustainable transport. Politicians and other decision-makers prefer to implement measures that are accepted. This is understandable both because it is more consistent with democratic principles and because enacting acceptable measures is more consistent with re-election and continued office.

Most of the measures required for attainment of sustainable transport may never become accepted before implementation and perhaps not after implementation. They may nevertheless be essential for the continued functioning of society. The issue may thus become that of providing decision-makers with a sufficient degree of comfort that their unacceptable actions will not have adverse political consequences. How this can be done requires further attention.

In the meantime, it may be reasonable to venture the position that preoccupation with soft measures may impede rather than facilitate progress towards use of the hard measures required for attainment of environmentally sustainable transport.

**Question 17. Is interest in soft measures a way of avoiding unpalatable use of hard measures?**

## CHAPTER 8. A STEP BEYOND SOFT MEASURES: ENVIRONMENTAL SUPPORTS FOR DESIRED TRANSPORT BEHAVIOUR

The opening words of this paper characterised soft measures for changing transport behaviour as measures other than the use of taxes (or incentives), the use of regulations, and the provision of infrastructure or transport supply. Soft measures are “non-coercive and relatively low in cost”. This chapter helps frame the limits of soft measures by describing an approach to the management of transport behaviour that is also mostly non-coercive and relatively low in cost but involves regulations and in some cases the provision of infrastructure or transport supply.

The approach is to guide the planning of urban regions with the principle that in every part of the region—or in as many parts as may be practicable—it should be as advantageous to live without a car as with a car. Put another way, a goal of land-use and other urban planning should be that car ownership is behaviour of the minority rather than the majority. The principle has been dubbed the EANO principle, i.e., Equal Advantage for Non-Ownership.<sup>92</sup>

At an experts’ meeting on “Sustainable Consumption and Individual Travel Behaviour” held at OECD Headquarters in January 1997, “support for [a version of this principle] was so strong that three quarters of meeting participants chose it as the most significant policy recommendation to emerge from the two days of discussion”.<sup>93</sup>

The EANO principle is rooted in the considerations set out here in Section 3.1, which illustrated the importance of car ownership as a determinant of car use. It is also rooted in what was discussed in Section 4.2, where it was noted that circumstances are such that car ownership is minority behaviour in parts or all of several affluent urban regions, even parts of urban regions in North America. The basic idea is that urban environments exist where residents are more likely to not own a car as to own a car—in other language, they choose not to own a car—and thus other places can be created or re-created to produce the same result.

In practice, application of the EANO principle is hardly different from much of what is regarded as good town planning practice: e.g., compact pedestrian-oriented development, mixing of uses, readily accessible public transport, etc.<sup>94</sup> But, there is one key difference. Application of the EANO principle would require assessing each location and asking whether, on balance, living there without a car would be at least as advantageous as living there with a car. The ‘proof’, of course, would be that a majority of households are carless, but at the planning stage this can only be anticipated.

Some of the amenities and services that support living without a car are these:

- schools, stores, and recreational and cultural facilities within a walk, a bicycle ride or a short public transport journey.
- safe and enticing routes along which to walk or ride a bicycle.
- good public transport, which in lower-density areas could include demand-driven service to the door or to nearby pick-up and set-down points.
- ready access to places of employment and to the services that support home-based employment.
- car-sharing services for longer or special trips.
- delivery services for the carriage of purchased goods and for other purposes.
- excellent information about all of the above.

However, availability of these amenities and services, together with the relatively high cost of car ownership (see Figure 11), may not be sufficient to offset the inherent attractions of the car (see the long quote in Section 4.3 on Page 24) and thus to tip the balance against majority car ownership. Something may be required to offset the car's enormous convenience.

In high-density areas this 'something' is often the difficulty or cost—or both—of nearby parking. Thus, one way of discouraging car ownership may be to design neighbourhoods so that parking spaces are not near homes, so that they are at least as far as the distance to the nearest public transport stop.<sup>95</sup>

The regulations and enforcement of them that would support such a design requirement, particularly in lower-density areas, are beyond the strict definition of soft measures. They go beyond provision of information, persuasion, changing attitudes, and so on, as may some of the measures listed above, e.g., provision of "safe and enticing routes along which to walk or ride a bicycle". The requirement nevertheless exemplifies a key message of this paper: that transport behaviour is determined by its milieu and that the way to change transport behaviour is to change the milieu in which it occurs.

**Question 18. How can soft measures best contribute to the creation of human environments in which car ownership and use are not the norm?**

## CHAPTER 9. DRAFT WORKSHOP RECOMMENDATIONS

The following recommendations have been developed through dialogue among workshop panelists (who individually may or may not agree with the result of the dialogue). The recommendations are proposed here for possible adoption at the workshop, with or without amendments that may be considered appropriate by workshop participants.

1. Use soft measures to publicise a vision of EST and promote the benefits of EST, and to disseminate information about best practices towards EST.
2. Set national targets concerning transport behaviour that are consistent with the vision, e.g., 20-per-cent reductions by 2012 in the number of person-kilometres travelled by car, and in the number of tonne-kilometres moved by road. Set early milestones that are easy to achieve.
3. Ensure that these reductions are accompanied by increases in access to the objects of mobility by providing more public transport and opportunities for walking and bicycling, ensuring that origins are closer to destinations, substituting teleservices for transport, increasing local production or reducing material consumption, or by use of two or more of these strategies.
4. To achieve the foregoing, work with soft and hard measures to ensure that car use and movement of freight by road are less appealing than their alternatives. Employ every available means: counter-advertising, interventions in schools, etc. Focus especially on people whose life circumstances are changing. Coordinate all of these efforts.
5. Using soft and hard measures, construct environments in which there evident gains *to individuals* who behave in ways consistent with progress towards EST.
6. Use soft measures to support the effectiveness of hard measures. Select target groups carefully—with opinion leaders and decision makers as prime targets—and fashion strategies accordingly; Use soft measures to provide comfort that support for sustainability is wide-spread.
7. Note that soft measures can be as effective as hard measures. Apply them gradually and patiently, aiming for small, cumulative changes.
8. Facilitate transfer of knowledge about sustainable transport across disciplines, particularly from disciplines at the fringe of transport studies, including social scientists.
9. Evaluate, evaluate, evaluate, and publish the results widely. Ensure that there is good understanding of the effectiveness of particular soft and hard measures in relation to the circumstances in which they are applied. Make use of this good understanding in designing strategies to change behaviour.
10. Prepare policy statements and design organisational structures to implement the foregoing in effective ways.

APPENDIX A: WORKSHOP PROGRAMME

OECD-UBA Workshop on

COMMUNICATING ENVIRONMENTALLY SUSTAINABLE TRANSPORT  
– THE ROLES OF SOFT MEASURES IN ACHIEVING EST

Berlin, 5-6 December, 2002

**5 December, 2002**

**Session 1. 09:30-10:30 Soft Measures for EST? – What will be required for EST?**

This session will introduce the workshop, set out its context and purposes, explain what is meant by soft measures and by EST, summarise the issues paper prepared for the workshop, and describe in a general way how use of soft measures could help secure attainment of EST.

*Chair:* Reinhard **Kaiser**, Federal Ministry of Environment, Berlin

Axel **Friedrich**, Federal Environmental Agency, Berlin

Peter **Wiederkehr**, OECD Environment Directorate, Paris

Richard **Gilbert**, Centre for Sustainable Transportation, Toronto

**Session 2. 11:00-12:30 Present transport behaviour and what maintains it**

This session will show how present transport is unsustainable and project the consequences of continuing with present trends. It will discuss what contributes to present trends, including individual and societal factors, and the barriers to change.

*Moderator:* John **Adams**, University College London

Herbert **Kemming**, ILS, Dortmund

Ellen **Matthies**, University of Bochum

Charles **Vlek**, University of Groningen

**Session 3. 14:00-15:30 Roles of soft measures in changing transport and other behaviour**

This session will overview research on the effectiveness of soft measures in transport and other sectors. The importance of associated factors such as acceptance and attitude change will be highlighted. Consideration will be given to relevant cultural and other differences (e.g., OECD vs. non-OECD countries).

*Moderator:* Udo **Becker**, University of Technology, Dresden

John **Whitelegg**, John Moores University, Liverpool

Tony **Weggemans**, AYIT Consultancy, Tilburg

Hermann **Knoflacher**, University of Technology, Vienna

/continued on next page

**Session 4. 16:00-18:00 How soft measures could be used to achieve EST**

This session will focus on identifying the best roles for soft measures in making progress towards EST, both alone and in combination with hard measures, both in securing understanding of the need for EST; and in changing behaviour towards EST. The session will end with a review of the day's proceedings.

*Moderator:* Martin **Kroon**, Ministry of Environment, The Hague

Peter **Jones**, University of Westminster, London

Jens **Schade**, University of Technology, Dresden

Anders **Berndtsson**, National Road Administration, Stockholm

**6 December, 2002**

**Session 5. 9:30-11:00 Special focus on the media, advertising, and marketing**

This session will examine how present trends are sustained by marketing practices, advertising, and representations in the media, and how these could all be used to help achieve progress towards EST.

*Moderator:* Axel **Friedrich**, Federal Environmental Agency, Berlin

Werner **Brög**, SOCIALDATA, Munich

Detlef M. **Hug**, Frankfurter Rundschau

Claudia **Schury**, Climate Alliance, Frankfurt

**Session 6. 11:30-13:00 Developing advice for policymakers on the use of soft measures**

This session will develop recommendations directed towards changing awareness of policymakers about the need for EST and helping policymakers work towards attainment of EST. The recommendations will concern information provision and education at all levels, the use of media and advertising, and the use of other techniques involving soft measures alone and in combination with hard measures.

*Moderator:* Robert **Thaler**, Federal Ministry of Environment, Vienna

David **Banister**, University College London

Joerg **Beckman**, European Federation for Transport & Environment, Brussels

Werner **Reh**, BUND, Berlin

## APPENDIX B: FIVE APPROACHES TO EXPLAINING HUMAN BEHAVIOUR

### *Interior constructs*

Everyday explanations of behaviour and those of many researchers invoke ‘mind’ or another interior construct as a cause of behaviour. Sophisticated versions of this model speak of an interior decision-maker that makes choices that result in behaviour. However, the notion of ‘mind’ may not be far away. Consider the following,

“A decision is only an intention or commitment to behave. Reflecting that preferences may be inconsistent over time, the decision maker sometimes changes his mind and chooses not to carry out the behaviour. Under what circumstances does this occur? In other words, when it is possible to predict people’s behaviour from their stated choices? ... A frequently repeated behaviour (such as commuting by automobile) is not necessarily preceded by deliberate decisions. Such behaviours performed automatically”<sup>96</sup>

What can be imagined here is something inside the person that chooses a course of action from among many and then chooses whether or not to implement the course of action. Implementation involves causing the person to behave in a certain way.

Knowledge about what the interior construct is doing comes from asking the person questions. The responses—the ‘stated choices’ in the above quotation—are believed to reflect the condition of the interior construct. They can be compared with the ‘revealed choices’ that are the actual behaviour of the person.

There are at least two problems with this ‘interior construct’ approach. One is that the problem of explaining behaviour of the person becomes the possibly more difficult problem of explaining the behaviour of the interior construct, and we may be no farther ahead. The other problem with the interior construct approach is independent information about the condition of the interior construct comes only from another kind of behaviour of the person, i.e., verbal behaviour, known to be notoriously unreliable.<sup>97</sup>

Another kind of interior construct is consciousness, an attribute of humans and perhaps other species and some computers. Like mind, it is somehow inside the body. Consciousness may be a cause of behaviour or a correlate of behaviour, or it may even be a special kind of behaviour. As a cause of behaviour it seems particularly elusive. It is observable in others only by inference and often exhibits only a loose connection to behaviour of interest.

### *Brain activity*

A recent OECD report included the following: “Techniques such as functional neuro-imaging, including both functional Magnetic Resonance Imaging (fMRI) and Positron Emission Tomography (PET), together with Transcranial Magnetic Stimulation (TMS) and Near Infrared Spectroscopy (NIRS), are enabling scientists to understand more clearly the workings of the brain and the nature of mind”.<sup>98</sup>

Brain is undoubtedly something to do with behaviour; just as a ball’s molecular structure is something to do with how the ball moves when it is hit. However, the interesting determinants of a ball’s trajectory are usually outside the ball, and certainly no explanation of how a ball moves could ignore external factors such as the force of the strike and direction of the wind. Similarly, there is no doubt that brain is involved in behaviour, but the interesting determinants may lie elsewhere.

A difference between brain and mind is that parts of the brain can be stimulated and depressed, and even removed, and behaviour changes. There is no such equivalent for mind. We can see a person's brain, even when it is functioning, but not a mind. It is certainly of interest to map the brain and to understand the neural correlates of behaviour. But there seems little chance that the organizing principles of behaviour will be revealed in this way, just as molecular biology contributes little to our understanding of evolution. (Molecular biology helps us understand how members of a species vary, but not the actual process of natural selection, i.e., the favouring by a particular environment of one variant rather than another.)

A neurologist wrote recently, "At the start of the new millennium, it is apparent that one question towers above all others in the life sciences: How does the set of processes we call mind emerge from the activity of the organ we call brain? ... Recently the question has preoccupied both the experts and others who wonder about the origin of the mind, specifically the conscious mind."<sup>99</sup>

Such a focus on brain may miss an essential feature of consciousness: its interactions and even dependence on the world outside the person. Much of what we characterise as consciousness appears to be sub-vocal verbal behaviour, which we know to be intimately tied to the milieu of like-language speakers and to the framework of consequences of behaviour known as culture. In other words, consciousness—like most human phenomena—may be a product of the exquisitely complex interactions people have with their environments from the moment they are born, and even before.

### *Heredity*

Somewhat separate from the appeals to mind and brain as explanations of human behaviour have been appeals to heredity. A recent polemic against full-scale environmental determinism of behaviour suggested that genetic factors can be at the root of quite specific behaviour. Examples given were both members of a pair of identical twins reared apart "who liked to keep elastic bands around their wrists and pretend to sneeze in crowded elevators". The author's conclusion was more restrained: overall, 40-50 per cent of the variation in human behaviour can be attributed to genes and 50-60 per cent to environment.<sup>100</sup>

The key issues are not *whether* heredity plays a role in determining behaviour—it would be astonishing if it did not—but *how* it plays a role. There seem to be three kinds of contribution of heredity. One is what might be called 'hard-wired' responses to specific stimuli, sometimes called instinctive responses. These responses usually have a tight link to survival, as in the case of the pigeon that flees from the silhouette of a hawk.

The second kind of contribution is the endowment of an effective adaptive mechanism that provides for the repetition or other strengthening of behaviour that produces specific outcomes.

The third kind of contribution of heredity to human behaviour is that it determines which outcomes have the ability strengthen behaviour. The core set of outcomes meet physiological requirements, including reproduction, but a part of the 'effective adaptive mechanism' confers this ability on relatively neutral events (e.g., money can strengthen behaviour that secures it).

The fourth kind of contribution is that heredity determines what can and what cannot be done. For example, an important reason why chimpanzees do not speak may be their lack of an appropriate tongue and larynx. Whether a human speaks, however, depends not only on having an adequate body, including an adequate brain, but also on having vocalisations selected and fashioned by an adequate social environment.

### *Antecedent external causes*

The other two views about behaviour look to outside causes. One type of outside cause consists of things that happen *before* the behaviour being explained. Advertising is said to cause the purchase of cars and perhaps even the high-speed driving of them. Suburbia is said to cause car-dependence. The challenge here is explaining why car advertising should cause purchase of cars rather than earplugs and suburbia should cause dependence on cars rather than on bicycles.

As noted in connection with the previous view, tight links between environmental stimuli and responses can be 'hard-wired' during evolution. Compared with other species, humans seem to have less of this 'hard-wiring'.

### *Consequences of behaviour*

The fifth view about behaviour is that it is maintained by its consequences, more precisely the history of its consequences. The close analogy with evolution has already been noted. A species evolves to fit a particular environment. Behaviour changes to fit a particular environment. If the environment is constant, species and behaviour can equally remain fixed. If the environment changes, species and behaviour change to fit the new circumstances. For behaviour, the critical changes are its consequences.<sup>101</sup> If commuting by car becomes tiresome, expensive, time-consuming or socially unacceptable, this behaviour could decline. Whether it would be replaced by other behaviour, e.g., commuting by bus, could depend on what is possible and on what would be the consequences of commuting by bus.

The point is not to explain commuting in such a simplistic manner but to suggest that **the most important determining features of transport-related behaviour lie in the circumstances of the behaviour**. Consideration of what may be going on inside the heads of commuters could be a distraction.

The criticisms of such radical behaviourism are basically of two kinds. One is that interior events such as are called mind and consciousness appear to be universal human experiences with connections to how humans behave. Full descriptions of human behaviour may well include accounts of these phenomena, but scientific parsimony requires that we first go as far as with the simplest of explanations.<sup>102</sup>

The second criticism is that human behaviour is complex and requires a much more sophisticated approach than mere regard for its consequences, and perhaps for events that have been associated with the consequences. Again, it is possible to appeal to natural selection, a simple process that more-or-less explains the diversity of life and much else.

Natural selection is still resisted as a sufficient explanation of human existence.<sup>103</sup> Even more, behavioural variation and the selection by environmental consequences of particular variants is resisted as a sufficient explanation of human behaviour. The reasoning is similar in both cases. Humans are too complex to be explained by such simple processes. There has to be something else: perhaps God's Guiding Hand, in the case of the evolution of the human species and Mind in the case of human behaviour.

The inclination here is to rely on such a simple process to account for transport activity. People do what they do because doing it has had favourable consequences. Circumstances change. Behaviour varies, and in the changed circumstances new behaviour may be favoured.

Soft measures can help both to help generate new behaviour and to help ensure that it is favoured and therefore prevails.

## END NOTES

- <sup>1</sup> This broader interpretation of soft measures, to include taxes and regulations, is that of the Asia Development Bank. See <http://www.adb.org/vehicle-emissions/General/Transport-tdm.asp>. Accessed 25 September, 2002.
- <sup>2</sup> The use of the term soft measures here is identical to that of the head of Berlin's Senate Department for Urban Transport. See Kalendar U, *Creating a public private partnership for the multi-modal traveller information centre in Berlin*. Presentation at the annual conference of Polis (European Cities and Regions Networking for New Transport Solutions), Rome, November 2001, available at the first URL below. The use of soft measures has been equated to the increasingly popular process in Europe of 'mobility management', also described as "getting the best out of transport hardware" (see the second URL below).  
<http://www.polis-online.org/docs/rome2001/t29s3kalendar.doc>. Accessed 25 September, 2002.  
<http://mo.st/public/mm.html>. Accessed 25 September, 2002.
- <sup>3</sup> The definition of EST was developed in the report on Phase 1 of the OECD's EST project, entitled *Environmental Criteria for Environmentally Sustainable Transport*, and available at the URL below. A more comprehensive definition of sustainable transport has been developed by the Centre for Sustainable Transportation (Toronto). A slightly amended version of the Centre's definition was adopted as a working definition of sustainable transport by the ministers of transport and communications of the 15 European Union (EU) countries at their meeting in Luxembourg in April 2001, as follows:  
"A sustainable transport system [is] defined as one that: (i) allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations; (ii) is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development; (iii) limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes while minimising the impact on the use of land and the generation of noise."  
<http://www.oecd.org/env/ccst/est>. Accessed 11 September, 2002.
- <sup>4</sup> Figure 1 was part of a presentation by Ernst-Ulrich von Weizsäcker at the OECD International Conference held in Vienna, Austria, 4-6 October, 2000, entitled *est! Futures, Strategies, and Best Practices*. The report on the conference is available at [http://www.olis.oecd.org/olis/2001doc.nsf/LinkTo/env-epoc-wpnep-t\(2001\)8-final](http://www.olis.oecd.org/olis/2001doc.nsf/LinkTo/env-epoc-wpnep-t(2001)8-final). Accessed 29 September, 2002.
- <sup>5</sup> The two surveys were conducted as part of the Urban Travel and Sustainable Development programme of the European conference of Ministers of Transport (ECMT) and the OECD. According to a presentation on the survey by Jack Short, ECMT Secretary-General, at a conference organized by the Union Internationale des Transports Publics held in Lodz, Poland, in October 2002, during the 1990s, daily car trips per person increased by 11.3% in the surveyed cities while daily walking and public transport trips fell by 9.3% and 9.4%, for an overall increase in trips by 1.4%. See the URL below.  
<http://www1.oecd.org/cem/online/speeches/JSlodz02.pdf>. Accessed 28 October, 2002.
- <sup>6</sup> For example, soft measures may contribute to the need for improved logistics in freight transport to reduce energy consumption and environmental impacts has been emphasized on both sides of the Atlantic. See McKinnon AC, Logistics and the environment, in Hensher D, Button K (eds.) *Handbook of Transport and the Environment*, Elsevier, Amsterdam (forthcoming, 2003). See also Vanek FM, Morlok EK, Improving the energy efficiency of freight in the United States through commodity-based analysis: justification and implementation. *Transportation Research Part D*, 5, 11-29 (2000).
- <sup>7</sup> Figure 2 was part of a presentation by Magnus Swahn of GreenCargo (a Swedish rail company) at the OECD Conference held in Eskilstuna, Sweden, 25-26 October, 2001, entitled *Environmentally Sustainable Transport: Is Rail on Track?*
- <sup>8</sup> For information about the OECD's EST project, see the numerous reports available at the URL in Note 3.
- <sup>9</sup> Table 2 is from the report on Phase 3 of the EST project, *Scenarios for Environmentally Sustainable Transport: Volume 1, Synthesis Report*. Organisation for Economic Cooperation and Development, Paris, 1999. It is available at the URL in Note 3.

- <sup>10</sup> Figure 4 is from the source detailed in Note 9. The estimates in Figure 4 represent all sources of environmental impact; however, transport is usually the major or a major impact.
- <sup>11</sup> See, for example, Topp HH, Traffic 2042—mosaic of a vision. *Transport Policy*, 9, 1-7 (2002). See also some alternatives in the commentaries on this paper: Wachs M, A different kind of vision: a comment on Harmut Topp's "Traffic 2042—a mosaic of a vision". *Transport Policy*, 9, 9-10 (2002); and Kenworthy J, Traffic 2042—a more global perspective. *Transport Policy*, 9, 11-15 (2002).
- <sup>12</sup> Figure 5 and the percentage changes given in the text are based on projections made during the EST project in respect of the nine participating countries: Austria, Canada, France, Germany, Italy, The Netherlands, Norway, Sweden, and Switzerland.
- <sup>13</sup> Figure 6 is from the source detailed in Note 9.
- <sup>14</sup> For example, transport in the UK was described as unsustainable in the UK Government's 1998 White Paper, *A New Deal for Transport: Better for Everyone*. Department of Environment, Transport and the Regions, available at the URL below. For a discussion of the White Paper, see Goodwin P, Transformation of transport policy in Great Britain. *Transportation Research Part A*, 33, 655-669 (1999) <http://www.dft.gov.uk/itwp/paper/>. Accessed 11 September 2002.
- <sup>15</sup> Figure 7 is from the IWW-INFRAS report *External costs of Transport* prepared for the International Union of Railways (March 2002). A summary of the report is available at the URL below. Note that the external costs of transport-related air pollution may have been greatly underestimated in the IWW-INFRAS report. According to an article published at about the same time (Künzil N et al., Public-health impact of outdoor and traffic-related air pollution: a European assessment. *The Lancet*, 356, 795-801, September 2, 2000), air pollution by motorised traffic accounts for about 20,000 deaths a year in Austria, France, and Switzerland. This is more than twice the number of fatalities from road accidents (*Trends in the Transport Sector 1979-2000*, European Conference of Ministers of Transport, Paris, 2002). <http://infras.domainserver.ch/htdocs/downloads/z-620e.pdf>. Accessed 28 October, 2002.
- <sup>16</sup> For sources on freight transport, see Note 6.
- <sup>17</sup> Figure 8 is from a presentation made by Lee Schipper of the International Energy Agency to a workshop on *Fuel Taxation* held by Transport Canada, Ottawa, March 4-5, 1999.
- <sup>18</sup> The causation of use by ownership seems the most plausible account of the remarkable constancy of the relationship. However, the assumption that ownership causes use may be unjustified. Use—determined by other factors—could cause the amount ownership required to support the use given the circumstances of the country. Alternatively, there could be no causal link between use and ownership. Whatever the causal link, if any, the constancy of the relationship between ownership and use deserves more investigation.
- <sup>19</sup> An example of advocacy of car ownership without use is the 18th report of the UK Royal Commission on Environmental Pollution, *Transport and the Environment*. HMSO, London, UK, 1994. The UK government has been said to echo this advocacy in that it believes "car ownership is good and car use is bad—or at least to be discouraged" (Adams J, Letter to the editor of *The Times*, 3 July, 1998). One researcher has provided a rationale for ownership without use: "owning a car *per se* leads to few environmental problems: A gas guzzler sitting in a garage pollutes and congests less than an efficient car driven several hours per day." (Schipper L, Determinants of automobile use and energy consumption in OECD countries. In *Annual Review of Energy and Environment*, 20, 325-386 (1995).)
- <sup>20</sup> It should be noted that there are contrary views and assessments. For example, the UK Institute for Fiscal Studies estimated that a abolition of the annual car licence fee (a tax on ownership) with a compensatory increase in fuel taxes would reduce car use by eight per cent in one year. This estimate is cited in Bolton P, Seely A, Hough J, *Road fuel prices and taxation*, Research Paper 01/52, House of Commons Library, London, UK (May 2001), available at the URL below. The same source notes political support in the UK for taxing use rather than ownership, especially to enable people living in rural areas to own a car. <http://www.parliament.uk/commons/lib/research/rp2001/rp01-052.pdf>. Accessed August 24, 2002.

- <sup>21</sup> For a recent review of the determinants of passenger mobility that gives priority to economic factors as determinants of car ownership, see Breugem RMH, van Vuuren DP, van Wee B, *Comparison of global passenger transport models and available literature*. RIVM report No. 461502025, RIVM, Bilthoven, The Netherlands (2002), available at <http://www.rivm.nl/bibliotheek/rapporten/461502025.pdf>. Accessed September 12, 2002.
- <sup>22</sup> Figure 9 is from Schipper L, Marie-Lilliu C, Lewis-Davis G, *Rapid motorization in the largest countries in Asia: Implication for oil, carbon dioxide, and transportation*. International Energy Agency (1998), available at <http://www.iea.org/pubs/free/articles/schipper/rapmot.htm>. Accessed September 13, 2002.
- <sup>23</sup> Figure 10 is based on data in Kenworthy J, Laube F, *The Millennium Cities Database for Sustainable Transport*, Union Internationale des transports publics (UITP), Brussels, Belgium, 2001 (CD-ROM). Of the 60 affluent urban regions represented in the *Database* (i.e., with regional GDP greater than US\$10,000 per capita in 1995), only 52 were used here, the other eight having insufficient data or a population of less than 500,000. Correlation coefficients based on 52 pairs of values are considered significant at the 5% and 1% levels if their absolute value (i.e., without its sign) is respectively greater than 0.27 and 0.36 (Quenouille MH, *Rapid Statistical Calculations*, London, UK: Griffin, 1959).
- <sup>24</sup> The correlation between car ownership rate and relative cost per trip is -0.29, i.e., there is a significant but not particularly strong negative correlation between the two variables (see Note 23 for the significance of the correlation coefficient).
- <sup>25</sup> See Hymans S, *Consumer durable spending: explanation and prediction*. Brookings Papers on Economic Activity, No. 2, 1970.
- <sup>26</sup> The survey was conducted by J.D. Power and Associates and is entitled “The 2002 Escaped Shopper and Owner Loyalty Study”. A partial report is available at [http://www.jdpa.com/studies\\_jdpower/pressrelease.asp?StudyID=651&CatID=1](http://www.jdpa.com/studies_jdpower/pressrelease.asp?StudyID=651&CatID=1). Accessed 12 September, 2002.
- <sup>27</sup> See Glaister S, Graham D, *The effect of fuel prices on motorists*. Automobile Association, London, UK (September 2000), available at [http://195.167.162.28/policyviews/pdf/effect\\_fuel\\_prices.pdf](http://195.167.162.28/policyviews/pdf/effect_fuel_prices.pdf). Accessed 17 September 17, 2002.
- <sup>28</sup> Figure 11 is taken from Gilbert R, *Sustainable mobility in the city*. Presentation to URBAN 21, Global Conference on the Urban Future, Berlin, Germany, July 2000, available with detailed sources at: <http://www.cstctd.org/CSTadobefiles/sustainablemobility.pdf>. Accessed 16 September 2002.
- <sup>29</sup> The data on which Figure 12 is based are from the source detailed in Note 23. The correlation between car ownership rate and urban density is -0.64, i.e., there is a strong negative correlation between these two variables (see Note 23 for the significance of the correlation coefficient).
- <sup>30</sup> Mention should be made of work suggesting that attitudes about urban life may be a more important factor than residential density in determining travel behaviour. It is Kitamura R, Mokhtarian PL, Laidet L, A micro-analysis of land use and travel in five neighbourhoods in the San Francisco Bay Area. *Transportation*, 24, 125-158 (1997). The authors concluded that “land use policies promoting higher densities and mixtures may not alter travel demand materially unless residents’ attitudes are also changed”. A problem in interpreting this study is the lack of specific information about settlement densities and possible misclassification. One of the three areas described as “high” density (Pleasant Hill) appeared to have more in common with the two areas described as “low” density (Concord, San Jose).
- <sup>31</sup> The data on which Figure 13 is based are from the source detailed in Note 23. The correlation between car ownership rate and urban density is -0.40, i.e., there is a strong negative correlation between these two variables (see Note 23 for the significance of the correlation coefficient).
- <sup>32</sup> For evidence concerning induced traffic, see Noland RB, Lem LL, A review of the evidence for induced travel and changes in transportation and environmental policy in the US and the UK, *Transportation Research Part D*, 7, 1-26 (2002); also Fulton LM, et al, A statistical analysis of induced travel effects in the U.S. mid-Atlantic Region, *Journal of Transportation and Statistics*, vol. 3(1), 2000, pp. 1-14. For a somewhat contrary conclusion, see Mokhtarian PL, Samaniego FJ, Shumway RH, Willits NH, Revisiting the notion of induced traffic through a matched pairs study, *Transportation*, 29, 193-220 (2002). For evidence that *reducing* highway capacity does not increase congestion, see Cairns S,

Hass-Klau C, Goodwin P, *Traffic impact of highway capacity reductions: assessment of the evidence*. (Report for the UK Department of the Environment, Transport and the Regions), Landor Publishing, London (UK), 1998.

- <sup>33</sup> For example, analysis of the particular success in the 1980s of the Houston and San Diego public transport systems compared with the rest of the in the U.S. pointed not only to “large service increases” but also to fare reductions and growth in employment and population. See Kan J, Liu Z, Secrets of success: assessing the large increases in transit ridership achieved by Houston and San Diego transit providers, *Transportation Research, Part A*, 33(7/8), 601-625 (1999).
- <sup>34</sup> The consumer politics of car use is discussed further in Thøgersen J, *Structural and psychological determinants of the use of public transport*. Presentation at a colloquium organized by the Copenhagen-based Centre for Transport Research on environment and health Impacts and Policy (TRIP), Hørsholm, Denmark, November 2001, available at [www.akf.dk/trip/publications/papers/jt\\_public\\_tr.doc](http://www.akf.dk/trip/publications/papers/jt_public_tr.doc). Accessed September 18, 2002.
- <sup>35</sup> For information about Phase 3 of the EST project, including the identification of societal and individual barriers to attainment of EST, see the URL in Note 3.
- <sup>36</sup> Paterson M, Car culture and global environmental politics. *Review of International Studies*, 26, 253-270 (2000).
- <sup>37</sup> For example, in 2000 more than half of the three million households in New York City did not own a car. In the most densely populated borough, Manhattan, where median household incomes are above both the New York City and the national averages, only 23% of households owned a car. For car ownership rates see the first URL below. For household incomes, see the second and third URLs below. <http://www.rightofway.org/research/5borocars2000.htm>. Accessed October 25, 2002. <http://www.newsday.com/news/ny-census-nycincome.htmlstory>. Accessed October 25, 2002. <http://www.whitehouse.gov/fsbr/income.html>. Accessed October 25, 2002.
- <sup>38</sup> For a recent review of transport in Hong Kong, and how it could be made even more sustainable, see Gilbert R, *Electrifying Hong Kong: Making transport sustainable*, Civic Exchange, Hong Kong, February 2002, available at the first URL below. See also Barron W, Ng SK, Loh C, Gilbert R, *Sustainable transport in Hong Kong: Directions and Opportunities*. Civic Exchange, Hong Kong, and Asia-Pacific Foundation, June 2002, available at the second URL below. <http://www.civic-exchange.org/publications/2002/Hong%20Kong%20paper%205.pdf>. Accessed November 6, 2002. [http://www.civic-exchange.org/03publication/ST\\_HK\\_book.pdf](http://www.civic-exchange.org/03publication/ST_HK_book.pdf). Accessed November 6, 2002.
- <sup>39</sup> The study of Hong Kong students is Cullinane S, The relation between car ownership and public transport provision: a case study of Hong Kong. *Transport Policy*, 9, 29-39 (2002). In his introduction to the paper, the author suggests that stated intentions to use improved public transport and actual use differ because “the type of improvements envisaged [by survey respondents] are of a much greater magnitude than those actually put in place (such as isolated park and ride schemes)”. He noted that large increase in patronage have occurred when *the whole system* has been improved. High quality service as in Hong Kong is above “a threshold level at which is becomes more viable not to have a car”. On the matter of youth culture, another recent article, written from a UK perspective, suggested that sociology generally “has barely noticed the car, which is somewhat surprising given its impact on social life”. It is Carrabine E, Longhurst B, Consuming the car: anticipation, use and meaning in contemporary youth culture. *The Sociological Review*, 50(2), 181-196 (2002).
- <sup>40</sup> The quote is from Section 4.1 of the report on Phase 3 of the EST project (see the URL in Note 3).
- <sup>41</sup> Staats HJ, Wit AP, Midden CYH, Communicating the greenhouse effect to the public: Evaluation of a mass media campaign from a social dilemma perspective. *Journal of Environmental Management*, 45, 189-203 (1996).
- <sup>42</sup> Steg L, Sievers I, Cultural theory and individual perceptions of environmental risks. *Environment and Behavior*, 32(2), 250-269 (2000).
- <sup>43</sup> Tertoolen, G, van Kreveld, D, Verstraten B, Psychological resistance against attempts to reduce private car use. *Transportation Research - A*, 32(3), 171-181 (1998).

- <sup>44</sup> The approach of many of Canada's First Nations peoples is reflected in the title of the five-volume final report of the federal Royal Commission on Aboriginal Peoples, *For Seven Generations*. Depository Services Program, Canadian Government Publishing, CD-ROM (1997). The report's title appears to come from the Kaianerekowa—or Great Law of Peace—of the Haudenosaunee (Iroquois) Confederacy, as noted in Volume 2 of the report (Chapter 3, Section 1.2), which included the following: "The lawmakers, in weighing any decision, must cast their minds seven generations ahead, to consider its effects on the coming faces. The lawmakers must consider the effects of each decision on the natural world."  
<http://www.tc.gc.ca/envaffairs/english/SDStrategy/final%20SD%20Strategy%20-%20eng.pdf>. Accessed August 26, 2002.
- <sup>45</sup> The quote is from Chapter 4 of the report on Phase 3 of the EST project, available at the source detailed in Note 3.
- <sup>46</sup> Margaret Thatcher's statement is quoted in Gamarnikow E, Green AG, The Third Way and social Capital: Education Action Zones and a new agenda for education, parents and community? *International Studies in Sociology of Education*, 9(1), 3-22 (1999).
- <sup>47</sup> These are the opening words of a recent column in a U.S. newspaper: "Roaring Brook Road, normally a quiet country thoroughfare in Westchester County, becomes a frustratingly long line of cars, minivans and SUVs on school mornings, as hundreds of cars snake down a steep hill on their way to the local high school, which has barely 1,000 students. The bright yellow school buses, meanwhile, arrive practically empty, carrying mostly ninth-graders. No older student would be caught dead in the 'loser cruiser'. Anyone who wants to understand America's urgent energy challenge should watch this morning ritual, repeated in hundreds of suburban and rural communities across the country. With only limited public transportation, scarce sidewalks, few bike lanes, and 'uncool' school buses, it's all about cars. (Harris DA, Waste not, depend not. *New York Times* (3 March, 2002), available at <http://www.ajc.org/InTheMedia/OpinionsDetail.asp?did=202&pid=1130>. Accessed 20 September 2002.
- <sup>48</sup> The statement was reported to be that of Frederic Vester of the Munich-based Studiengruppe für Biologie und Umwelt GmbH (Study Group for Biology and Environment Ltd.), reported in Guntram U, Systems thinking and the environment: An interview with Frederic Vester. *The MacKinsey Quarterly*, 2, 153-169 (1993).
- <sup>49</sup> Steg L, Vlek C, Slotegraaf G, Instrumental-reasoned and symbolic-affective motives for using a motor car. *Transportation Research Part F*, 4, 141-169 (2001).
- <sup>50</sup> This classification is from the source detailed in Note 34.
- <sup>51</sup> Gärling T, Fujii S, Boe O, Empirical tests of a model of determinants of script-based driving choice. *Transportation Research Part F*, 4, 89-102 (2001).
- <sup>52</sup> The quote is from *Deliverable 2: State-of-the-Art Review* (Version 2). TAPESTRY project, European Commission (November 2001), available at the URL below. It is in reference to an account of the following report: Verplanken B, Aarts H, van Knippenberg A, Moonen A, Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology*, 37, 111-128 (1998).  
[http://www.eu-tapestry.org/p\\_dwl/tap\\_d2.pdf](http://www.eu-tapestry.org/p_dwl/tap_d2.pdf). Accessed September 29, 2002.
- <sup>53</sup> They violate what is known as the Principle of Parsimony, articulated most famously by mediaeval philosopher William of Ockam, who wrote (in Latin) that "entities should not be multiplied beyond necessity". This advice to slice out constructs became known as Ockam's razor. See <http://www.britannica.com/eb/article?eu=58133>. Accessed 19 September, 2002.
- <sup>54</sup> The definition of attitude is from Eagly AF, Chaiken S, *The psychology of attitudes*. Harcourt Brace Jovanovich, Fort Worth, Texas (1993).
- <sup>55</sup> The review of the effect of attitudes is Krause SJ, Attitudes and the prediction of behaviour: A meta-analysis of the empirical literature. *Personality and Social Psychology Bulletin*, 21, 58-75 (1995).
- <sup>56</sup> Mention should also be made of a more positive view of the link between attitudes and behaviour associated with the 'theory of planned behaviour' developed by Icek Ajzen. "According to the theory, the primary antecedent of any behavior ... is the intention to perform the behavior in question. The intention, in turn, is a joint function of three factors: attitude toward the behavior, which is the degree of

positive or negative evaluation associated with performing it; subjective norm, or the perceived social pressure to perform the behavior; and perceived behavioral control, which refers to the perceived ease or difficulty of performing the behavior.” The quote is from Ajzen I, Brown TC, Rosenthal LH, Information Bias in Contingent Valuation: Effects of Personal Relevance, Quality of Information, and Motivational Orientation. *Journal of Environmental Economics and Management*, 30, 43-57 (1996). The theory of planned behaviour grew of the ‘theory of reasoned action’ also associated with the name of Icek Ajzen. The problem with such theories may be that they invoke what is being explained, and thus have little explanatory or predictive value.

- <sup>57</sup> Pre-election voter-intention polls can be remarkably accurate. Polls reporting a few days before the September 2002 election of members of the German lower house of parliament (Bundestag) anticipated the actual votes for the two larger parties within a few percentage points, and the votes for the smaller parties within about 20 per cent. (For the pre-election poll results, see Erlanger S, Germans vote in tight election in which Bush, Hitler and Israel became key issues. *New York Times*, 22 September, 2002.)
- <sup>58</sup> These points are discussed and examined in Fitzsimons GJ, Williams P, Asking questions can change choice behavior: Does it do so automatically or effortfully? *Journal of Experimental Psychology: Applied*, 6(3), 195-206 (2000).
- <sup>59</sup> The study of lying is Feldman RS, Forrest JA, Happ BR, Self-presentation and verbal deception: do self-presenters lie more? *Basic and Applied Social Psychology*, 24(2), 163-170 (2002). See also, DePaulo BM, Kashy DA, Kirkendol SE, Wyer, M, Epstein JA, Lying in every day life. *Journal of Personality and Social Psychology*, 70(5), 979-995 (1996). This study also found everyday social interaction to involve much lying, with more self-centred lies being told to men and more other-oriented lies being told to women.
- <sup>60</sup> For a description of the Oslo experience, see Tretvik T, *Urban road pricing in Norway: Public acceptability and travel behaviour*. Presentation at a conference entitled “Acceptability of pricing strategies” held in Dresden, Germany by MC ICAM (May 2002), available at the first URL below. <http://www.mcam.net>. Accessed 20 September, 2002. <http://data.vatt.fi/afford/reports/deliverable-2c.pdf>. Accessed 20 September, 2002.
- <sup>61</sup> The fuel price data in Figure 15 are from the first URL below; the opinion poll results are from MORI’s Web site at the second URL below [http://www.dti.gov.uk/energy/inform/energy\\_prices/2002/august02/table\\_411.xls](http://www.dti.gov.uk/energy/inform/energy_prices/2002/august02/table_411.xls). Accessed 27 October, 2002. <http://www.mori.com>. Accessed 27 October, 2002.
- <sup>62</sup> Information about the protests and the election, and the ‘poll wobble’ quote, are from the BBC Web site at the first URL below, supplemented by information from the on-line archives of the *Guardian* newspaper at the second URL below. <http://news.bbc.co.uk>. Accessed 27 October, 2002. <http://www.guardian.co.uk>. Accessed 27 October, 2002.
- <sup>63</sup> The quote is from the source detailed in Note 34.
- <sup>64</sup> For the views of one health agency on the purposes and effect of tobacco advertising, see U.S. Department of Health and Human Services. *Reducing Tobacco Use: A Report of the Surgeon General*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health (2000), available at [http://www.cdc.gov/tobacco/sgr/sgr\\_2000/FullReport.pdf](http://www.cdc.gov/tobacco/sgr/sgr_2000/FullReport.pdf). Accessed 14 September, 2002.
- <sup>65</sup> Saffer H, Tobacco advertising and promotion. In (Jha P, Chaloupka F eds.) *Tobacco Control in Developing Countries*, World Bank, Washington DC, pp. 215-236 (2000), available at <http://www1.worldbank.org/tobacco/tcdc.asp>. Accessed September 14, 2002.
- <sup>66</sup> The quote is from Page 26 of Eliany M, Rush B, *How effective are alcohol and other drug prevention and treatment programs? A review of evaluation studies*. Health and Welfare Canada, Ottawa (1992).
- <sup>67</sup> See for example, Gius MP, Using panel data to determine the effect of advertising on brand-level distilled spirits. *Journal of Studies on Alcohol*, 57, 73-76 (1996).

- <sup>68</sup> For advertising expenditures, see the article “Advertising” in *Encyclopedia Britannica*, available (for a fee) at the first URL below. See also *Ad Expenditures Drop Only 0.2 Percent in First Half of 2002*, CMR Data and Analysis (26 August, 2002), at the second URL.  
<http://www.britannica.com/eb/article?eu=136245>. Accessed 15 September, 2002.  
<http://www.cmr.com/news/2002/082602.html>. Accessed 15 September, 2002.
- <sup>69</sup> Bittlingmayer G, Advertising. In *The Concise Encyclopedia of Economics*, available at:  
<http://www.econlib.org/library/Enc/Advertising.html>. Accessed 15 September, 2002.
- <sup>70</sup> The advertising data in this paragraph are for 1998 or 1999 and are from CMR Data and Analysis (29 March, 2000) at  
[http://www.cmr.com/news/2000/032900\\_2.html](http://www.cmr.com/news/2000/032900_2.html). Accessed September 15, 2002.
- <sup>71</sup> Advertising and sales data are from Greuner MR, Kamerschen DR, Klein PG, The competitive effects of advertising in the US automobile industry, 1970-1994. *International Journal of the Economics of Business*, 7(3) 245-261 (2000).
- <sup>72</sup> For counter-advertising against tobacco use, see *The Use of Counter-Advertising As a Tobacco Use Deterrent*, The Advocacy Institute, Washington DC, at the first URL below. For counter-advertising against alcohol use, see Saffer H, Alcohol advertising and youth. *Journal of Studies on Alcohol*, Supplement No. 14, 173-181 (2002), available at the second URL below. For examples of counter-advertising that is not product-specific see the third URL below.  
<http://www.advocacy.org/publications/mtc/counterads.htm>. Accessed 16 September, 2002.  
<http://www.collegedrinkingprevention.gov/reports/Journal/173-Saffer.pdf>. Accessed 16 September, 2002.  
<http://adbusters.org/uncommercials/>. Accessed 28 September, 2002.
- <sup>73</sup> The quotes and information in this paragraph are from two articles in the *Globe & Mail* (Toronto) on 19 August, 2002. One was an article by André Picard entitled “Antismoking campaign ‘ineffective’”. The other was an open letter to the federal Minister of Health signed by 14 organizations, including the Canadian Medical Association.
- <sup>74</sup> The tobacco industry executive is John Wildgust, director of corporate affairs for Montreal-based JTI-Macdonald Corporation, in Bashing big tobacco’s a nasty habit. *Globe & Mail* (Toronto), 17 September, 2002.
- <sup>75</sup> These points are taken from Appendix C of *New Directions for Tobacco Control in Canada—A National Strategy*. Health Canada, Ottawa (1999), available at:  
[http://www.hc-sc.gc.ca/hecs-sesc/tobacco/policy/new\\_directions/appendix\\_c.html](http://www.hc-sc.gc.ca/hecs-sesc/tobacco/policy/new_directions/appendix_c.html). Accessed 17 September 2002.
- <sup>76</sup> Siegel M, The effectiveness of state-level tobacco control interventions: A review of program implementation and behavioral outcomes. *Annual Review of Public Health*, 23, 45-71 (2002), at  
<http://pubhealth.annualreviews.org/cgi/reprint/23/1/45.pdf>. Accessed 17 September, 2002.
- <sup>77</sup> Groeger JA, Rothengatter JA, Traffic psychology and behaviour. *Transportation Research Part F*, 1, 1-9 (1998).
- <sup>78</sup> See *Traveller Information Systems Research: A Review and Recommendations for Transport Direct*. Department of Transport, UK Government (September 2001), available at:  
<http://www.local-transport.dft.gov.uk/travinfo/index.htm>. Accessed September 24, 2002.
- <sup>79</sup> The quotes are from *Public Outreach on Climate Change: Foundation Paper*. Public Education and Outreach Issue Table. National Climate Change Secretariat, Government of Canada (October 1998), at  
[http://www.nccp.ca/NCCP/pdf/public\\_found.pdf](http://www.nccp.ca/NCCP/pdf/public_found.pdf). Accessed 24 September, 2002.
- <sup>80</sup> The quote and other information about INPHORMM is from the final summary report on the project available at  
<http://www.cordis.lu/transport/src/inphormmrep.htm>. Accessed 25 September, 2002.
- <sup>81</sup> The review is Grant-Muller S (ed.), *Assessing the Impact of Local Transport Policy Options*, Working Paper 549, Institute for Transport Studies, University of Leeds, UK (April 2000), available at  
<http://www.its.leeds.ac.uk/projects/detr/advice16.pdf>. Accessed September 25, 2002.
- <sup>82</sup> The work on the West Midlands to north west England corridor is summarized at  
<http://www.m6corridor.com/Reports/MIDMAN%20pn2%2024jan.pdf>. Accessed 25 September, 2002.

- <sup>83</sup> See *Report of the OECD workshop on Information and Consumer Decision-making for Sustainable Consumption*. Document ENV/EPOC/WPNEP(2001)16/FINAL, environment Directorate, Organisation for Economic Cooperation and Development, Paris, March 2002.
- <sup>84</sup> The quotes are from the TAPESTRY Web site, at [http://www.eu-TAPESTRY.org/p\\_aim1.shtml](http://www.eu-TAPESTRY.org/p_aim1.shtml). Accessed 29 September, 2002.
- <sup>85</sup> The TAPESTRY review is available at the first URL below. It is also detailed in Note 52. The review has two annexes, available at the second and third URLs. Annex A is a review of recent relevant EU research projects. Annex B overviews activities within EU member countries. The quote is from Page 2 of the review. Table 6 is based on Section 2.6 of the review.  
[http://www.eu-tapestry.org/p\\_dwl/tap\\_d2.pdf](http://www.eu-tapestry.org/p_dwl/tap_d2.pdf). Accessed 29 September, 2002.  
[http://www.eu-tapestry.org/p\\_dwl/tap\\_d2\\_a.pdf](http://www.eu-tapestry.org/p_dwl/tap_d2_a.pdf). Accessed 29 September, 2002.  
[http://www.eu-tapestry.org/p\\_dwl/tap\\_d2\\_b.pdf](http://www.eu-tapestry.org/p_dwl/tap_d2_b.pdf). Accessed 29 September, 2002.
- <sup>86</sup> Table 7 is based on Table 4.1 of the source detailed in Note 79.
- <sup>87</sup> Community-based social marketing has become a focus of part of the Government of Canada's climate change work. For example, the applications concerning transportation to the Public Education and Outreach programme of the Climate Change Action Fund are expected to have a community based social marketing approach, as specified in the URL below. The term 'social marketing' appears to have been used first in the following paper: Kolter P, Zaltman G, Social marketing: an approach to planned social change. *Journal of Marketing*, 35, 3-12 (1971).  
[http://climatechange.gc.ca/english/actions/action\\_fund/AppGuide\\_CGP.shtml](http://climatechange.gc.ca/english/actions/action_fund/AppGuide_CGP.shtml). Accessed October 29, 2002.
- <sup>88</sup> The quote is from the TAPESTRY report detailed in Notes 52 and 85. It is in reference to Fergusson M, Davis, Skinner I, *Delivering changes in travel behaviour*. Institute for European Environmental Policy, London UK (1999).
- <sup>89</sup> The energy conservation guidelines are in Greer H et al, *The guide to change energy-related behaviour*. Aeneas Technical Publishers, Best, The Netherlands (2000).
- <sup>90</sup> Note that the assumptions underlying the numbers in Table 8 are the same as those in Table 5.1 of the document detailed in Note 89, but the numbers are different. The numbers have been recalculated. Note particularly that the 'no-intervention result' has been subtracted from the '3-year saving in energy costs' for the four interventions, as this amount cannot be legitimately regarded as a saving resulting from the interventions.
- <sup>91</sup> Information about the technique of individualized marketing is at the first URL below. Data on the application of individualized marketing are at the second URL.  
[http://www.travelmart.transport.wa.gov.au/pdfs/present\\_infra.pdf](http://www.travelmart.transport.wa.gov.au/pdfs/present_infra.pdf). Accessed September 25, 2002.  
<http://www.vicfit.com.au/walk/DocLib/Pub/DocLibDownload.asp?IngDocLibID=9&Filename=BruceJamesPaper.pdf>. Accessed 25 September 2002.
- <sup>92</sup> The EANO principle is discussed more fully in Gilbert R, Reducing automobile use in urban areas by reducing automobile ownership: the EANO principle. In Andan O, Faivre D'Arcier B, Lee-Gosselin M (eds.), *L'Avenir des Déplacements en Ville: The Future of Urban Travel*. Laboratoire d'Economie des Transports, Lyon, France. Vol. 2, pp. 31-47. It was also discussed in a keynote presentation made at URBAN 21, Global Conference on the Urban Future, the proceedings of which are at the first URL below. The full paper is at the second URL below.  
<http://www.urban21.de>. Accessed 28 October, 2002.  
<http://www.cstctd.org/CSTadobefiles/sustainablemobility.pdf>. Accessed 28 October, 2002.
- <sup>93</sup> The quote is from the official report on the experts' meeting, which can be found at the URL below.  
[http://www.olis.oecd.org/olis/1997doc.nsf/LinkTo/ocde-gd\(97\)144](http://www.olis.oecd.org/olis/1997doc.nsf/LinkTo/ocde-gd(97)144). Accessed 28 October, 2002.
- <sup>94</sup> These features can be found, for example, in *Transit-Supportive Land Use Planning Guidelines*, prepared by Toronto's IBI Group and published in 1992 by the Ministries of Municipal Affairs and Transportation of Canada's Province of Ontario, and available at the URL below.  
<http://www.mah.gov.on.ca/business/transuppguid/transuppguid-e.pdf>. Accessed 28 October, 2002.
- <sup>95</sup> This is the design feature proposed by Hermann Knoflacher, Technical University of Vienna, at an OECD-ECMT workshop entitled *Land-use Planning for Sustainable Urban Transport*, Linz, Austria, September 1998. For an available version of a similar paper, see the URL below.

[http://www.kouvola.fi/domino/webbi/sis.nsf/ab3345b59555029442256a93002cb836/09371d200f0e31f942256adf002cd482/\\$FILE/abstractKnoflacher.doc](http://www.kouvola.fi/domino/webbi/sis.nsf/ab3345b59555029442256a93002cb836/09371d200f0e31f942256adf002cd482/$FILE/abstractKnoflacher.doc). Accessed 27 October, 2002

- <sup>96</sup> Gärling T, Behavioural assumptions overlooked in travel-choice modelling. In Ortúzar J de D et al. (eds.) *Travel Behaviour Research: Updating the State of Play*. Elsevier: Oxford, UK, pp. 3-18 (1998)
- <sup>97</sup> See the source detailed in Note 59.
- <sup>98</sup> The quote is from Page 27 of *Understanding the brain: Towards a new learning science*, Organisation for Economic Cooperation and Development, Paris (2002). ‘Mind’ is not in the glossary of this document, although it is part of the definition of the following terms: “**Cognition**. Operation of the mind which includes all aspects of perceiving, thinking, learning, and remembering. **Cognitive neuroscience**. Study and development of mind and brain research aimed at investigating the psychological, computational, and neuroscientific bases of cognition. **Cognitive science**. Study of the mind. An interdisciplinary science that draws upon many fields including neuroscience, psychology, philosophy, computer science, artificial intelligence, and linguistics. The purpose of cognitive science is to develop models that help explain human cognition – perception, thinking, and learning. **Cognitive vitality**. Refers to the active strength or force of mind throughout the life-span.”
- <sup>99</sup> Damasio AR, How the brain creates the mind. In *The Hidden Mind*, special edition of *Scientific American*, 2002.
- <sup>100</sup> The polemic against environmental determinism is Pinker S, *The Blank Slate: The Modern Denial of Human Nature*, Viking, New York (2002). The quote is from Page 73. The estimates of the contributions to variation in human behaviour are on Page 380-381.
- <sup>101</sup> For an elaboration of the analogy between evolution and behaviour see, for example, Gilbert RM, Variation and selection of behavior. In Gilbert RM, Millenson JR (eds.), *Reinforcement: Behavioral Analyses*, Academic press, New York, pp. 263-276 (1972). For a topical discussion of ‘Universal Darwinism’ see Wynne CDL, Universal Plotkinism: A review of Henry Plotkin’s *Darwin Machines and the Nature of Knowledge*. *Journal of the Experimental Analysis of Behavior*, 76, 351-361 (2001).
- <sup>102</sup> Neurophysiology may be helping identify the covert behaviour that comprises thinking and even ‘mind’. See especially Nicoletis MAL, Actions from thoughts. *Nature*, 409, 403-407 (2001).
- <sup>103</sup> For information about creationism, see the first URL below. For a contrary view, see Steering Committee on Science and Creationism, *Science and Creationism: A View from the National Academy of Sciences, Second Edition*. National Academy of Sciences, Washington DC (1999), available at the second URL below.  
<http://www.creationism.org>. Accessed September 11, 2002.  
<http://www.nap.edu/books/0309064066/html>. Accessed 11 September, 2002.