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Needless Road, Perth, Scotland. © Scott Lyall. We are grateful to Jean-Paul Bardou, on whose website a similar image is posted... http://home.tiscali.dk/8x070493/traffic/enuk_2.htm

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WTPP has a commitment to sustainable transport which embraces the urgent need to cut global emissions of carbon dioxide, to reduce the amount of new infrastructure of all kinds and to highlight the importance of future generations, the poor, those who live in degraded environments and those deprived of human rights by planning systems that put a higher importance on economic objectives than on the environment and social justice.

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Contents

- 3 Abstracts & Keywords
 - 4 Editorial
 - 5 Sustainability & Road User Charging in UK Cities
Ben Winterton & William Sheate
 - 21 Speed Elasticity of Mileage Demand
Rudolf Pfleiderer & Martin Dieterich
 - 28 Gender equality & transport policy in Sweden
Merritt Polk
 - 34 Petroleum culture *versus* Earth living – The fallacy of the technofix
Jan Lundberg
 - 37 Author & Title Index to Volume 9, 2003
 - 39 RoadPeace Announcement
 - 40 Notes for contributors
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Sustainability & Road User Charging in UK Cities*Ben Winterton & William Sheate*

There has been no published study to date concerning the wider sustainability issues surrounding road user charging in the UK, although numerous authors have discussed the economic and political feasibility of road user charging and the implications of charging. This research examines the environmental, social, legal, economic and political (sustainability) issues surrounding road user charging, in six local authorities using an in-depth case-study protocol. Interviews were conducted and documentary material collected with senior local authority strategic transport planners, business representatives, environmental co-ordinators and Passenger Transport Executives in those local authorities which intended to take up, were considering, or had ruled out charging as a means of combating congestion. Based on the case study findings to produce a rudimentary sustainability framework and by suggesting a range of issues that need to be addressed before charging is introduced, conclusions were drawn and recommendations were made which will help to facilitate the implementation of road user charging schemes in the future. This framework could also contribute to the production of a set of national best-practice guidelines for road user charging implementation.

Keywords

road user charging, workplace parking levy, congestion charge, case studies, sustainability framework.

Speed Elasticity of Mileage Demand*Rudolf Pfleiderer & Martin Dieterich*

In the political discussion relating to transportation policy, surprisingly little attention is paid to the increase in distance travelled as a result of improved infrastructure. For passenger transport empirical data indicate that the speed elasticity of mileage demand is approximately 1. This means that the distances travelled increase proportionally to the travel speed. Using elasticity functions that are well known from economics, we derive a general formula to calculate traffic induced by the improvement of infrastructure.

The realistic consideration of induced traffic is a precondition for the assessment of environmental effects (fuel consumption and emissions). Acceleration of traffic by improved infrastructure is identified as a major reason for traffic growth. The most efficient means of transportation demand management is to decelerate traffic.

We derive how fuel consumption and emissions are to be calculated for arbitrary numerical values of the speed elasticity.

Keywords

cost-benefit analysis, induced traffic, new traffic, speed elasticity, travel time elasticity.

Gender equality & transport policy in Sweden*Merritt Polk*

In 2001, the Swedish parliament made gender equality a goal of transport policy. The aim of this paper is to evaluate the effects of this process. The results show that, in general, policy documents simply equate gender equality with women, and measures for attaining more gender equality with public transport. This suggests that without both conceptual and structural changes, gender mainstreaming is an ineffectual strategy for promoting gender equality in the transportation sector in Sweden.

Keywords

gender mainstreaming, gender equality, transport policy

Petroleum culture versus Earth living – The fallacy of the technofix

Jan Lundberg

In this essay, the author discusses our dependence on oil – even if we become fossil-fuel ‘independent’; the many technofixes being offered are just as oil-dependent. We are deluding ourselves if we think we can use technology to stem the forthcoming ecological crisis.

Keywords

Petroleum, sustainability, transport, future generations, technology.

This issue coincides with the first anniversary of congestion charging in London. This transport initiative is probably the most significant transport policy innovation we have ever seen in Europe. It has been a major success with significant reductions in car traffic in the charging zone, a tripling of cycling and much improved bus-running times. Receipts from the charge have been less than expected but still enough to provide resources for new bus routes and services.

A full report on the results of the London congestion charge can be found at:

http://www.tfl.gov.uk/tfl/cc_london/cc_intro.shtml

The charge shows that it is possible to act to reduce car use and to do this with widespread public support. A similar scheme is now planned for Stockholm and other cities around the world are considering similar projects.

In this issue Winterton and Sheate look at road user charging and its links with sustainability. This is timely. Sustainability is about far more than improving the environment, as important as that is. Sustainability means getting the prices right or as Weizsäcker at the Wuppertal Institute in Germany once said 'making prices tell the ecological truth'. Ecological truth very neatly encapsulates the polluter pays principle and the idea that our choices (especially transport choices) should be made within a clear framework of prices that reflect impacts. Driving 2-3 km in a city to take a child to school in a car is very costly in terms of greenhouse gases, pollution, noise, road safety hazards and damage to the child's health (especially obesity). It would be very helpful if these costs were 'loaded' on to the driver so that a well informed decision could be made that would then lead to more walking and cycling. Congestion charging is not the universal answer to every urban transport problem but it shows that bold action can be taken and that the dominance of the car can be challenged within a democratic society taking a broad view of the needs of

all residents and all transport users. This is a significant breakthrough.

Also in this issue we return to the central issue of new roads generating new traffic. Pfleiderer and Dieterich show once again that this is a powerful 'rebound' effect and; in spite of the powerful information on this effect from many parts of the world, public administrations continue to behave as though the effect is totally absent. This is very much the case in Glasgow where a long running fetish for ridiculous and damaging urban motorway construction at great public expense is still alive and well. The excellent work carried out by the new London administration on congestion charging is more than cancelled out by the appallingly poor standards of intelligence and analysis displayed by the Scottish Executive, the devolved administration for Scotland. The UK has the best and worst examples of transport policy in Europe both going ahead at the same time.

Transport policy (as in Scotland) still works very well for the male car driver but shows poor results for children, women and the elderly. In this issue Polk shows just how difficult a concept this is and even in Sweden with a clearer focus on gender issues there are still problems in getting transport policy right.

Finally Lundberg takes us back to the central dilemma of technology and sustainability. We have often argued in this journal for a modest, people-centred transport policy that can brighten the lives of ordinary citizens everywhere and nurture healthy communities. We rarely see this action and in the main we get expensive, technology-centred projects that nurture the false hopes pinned on mobility, speed and distance. Lundberg makes it very clear that this is a delusion. It does not work and it will not work and we will reap the whirlwind.

John Whitelegg
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World Transport Policy & Practice

Sustainability & Road User Charging in UK Cities

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Abstract

There has been no published study to date concerning the wider sustainability issues surrounding road user charging in the UK, although numerous authors have discussed the economic and political feasibility of road user charging and the implications of charging. This research examines the environmental, social, legal, economic and political (sustainability) issues surrounding road user charging, in six local authorities using an in-depth case-study protocol. Interviews were conducted and documentary material collected with senior local authority strategic transport planners, business representatives, environmental co-ordinators and Passenger Transport Executives in those local authorities which intended to take up, were considering, or had ruled out charging as a means of combating congestion. Based on the case study findings to produce a rudimentary sustainability framework and by suggesting a range of issues that need to be addressed before charging is introduced, conclusions were drawn and recommendations were made which will help to facilitate the implementation of road user charging schemes in the future. This framework could also contribute to the production of a set of national best-practice guidelines for road user charging implementation.

Keywords

road user charging, workplace parking levy, congestion charge, case studies, sustainability framework.

Introduction & Background

UK urban traffic levels continue to rise and there is a consensus by local and national government that 'do nothing' is no longer an option (Cheese & Klein, 1999). The associated environmental, social and economic effects of traffic congestion were addressed in the Government's White Paper (DETR, 1998a) which incorporated 22 multi-modal studies and was intended to reduce congestion, but has so far had limited impact. The UK has the most congested roads in Europe as a result of

- increased prosperity;
- household car availability (DfT, 2003);

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- the number of miles travelled by car per annum (CfIT, 2003a);
- the total road length in Great Britain (DfT, 2002c); and
- the relatively low cost of motoring.

Road user charging has been offered as a viable solution to congestion. There are only two road user charging schemes currently operational in the UK, e.g. in Durham and London; but it remains to be seen how effective these schemes will be. Other international schemes such as in Melbourne, Singapore, Toronto and Trondheim have all been successful, and it enabled Trondheim to finance a better transport infrastructure. However, does charging for road use essentially deter drivers from making unnecessary and unsustainable journeys? Or are drivers forced on to other 'payment free' roads, thus causing problems in these areas? Political and economic imperatives tend to govern these schemes, and other sustainability issues surrounding road user charging are often overlooked or dismissed as inconsequential.

Government policy on road user charging is unclear, although the independent Commission for Integrated Transport has called for a nationwide scheme covering peak periods, similar to the one now in force in central London (CfIT, 2002). They also warned that the busiest roads could become 25% worse over the next 7 years, but said more charging would cut the figure by as much as 19%. Confusion still exists about whether the government perceives charging for road use as a legitimate solution to congestion.

Environment

Over the last 25 years, the Royal Commission on Environmental Pollution has reiterated its concerns that

'the unrelenting growth of transport had become possibly the greatest environmental threat facing the UK and one of the greatest obstacles to achieving sustainable development' (RCEP, 1971; RCEP, 1994).

In addition, it suggested that road pricing could reduce the dominance of the motor vehicle if local authorities were given power to introduce charging (Poole, 1999).

Vehicles are the main source of several airborne pollutants (DETR, 2000a), which have a variety of

effects on buildings, flora and fauna (Wallace *et al.*, 1996). Research shows strong correlations between adverse health effects and many transport-related air pollutants (New Scientist, 1994; Howes *et al.*, 1997; FoE, 2001). Economic damage caused indirectly by transport in the form of acid rain, smogs and particulates is difficult to quantify (FoE, 2002). Estimates of the environmental costs of road transport vary considerably from £15 billion to £37 billion (ENDS, 2001b).

The most problematic greenhouse gas associated with motor vehicles is CO₂ (CfIT, 2003c). The government's ten-year transport plan (ENDS, 2000c) was aimed at substantially reducing CO₂ emissions from vehicles. However, the Secretary of State for Transport, Alistair Darling, stated that traffic in 2000 had been greater than originally anticipated and that the plan had 'almost certainly underestimated the future levels of congestion' (ENDS, 2003a). This was reiterated when Sir Jonathan Porritt warned that the UK needed major policy changes to reduce car use (FoE, 2003b). The House of Commons Transport Select Committee warned that alarming increases in CO₂ emissions and congestion are inevitable unless the government introduces road user charging on road networks (ENDS, 2003b).

Although many stakeholders believe that road user charging is the answer to congestion problems, the issue is not as clear-cut as it seems. UK congestion charging schemes are aimed at reducing congestion, but whether they contribute to lower emissions of CO₂ and other substances is debatable. These schemes could result in drivers moving into other areas, travelling further for longer periods of time and contributing to emissions and congestion in other areas, merely to ensure that they 'avoid paying' road charges. However, Transport for London (TfL) stressed that the objective of the London scheme is to reduce congestion and not improve air quality, which by implication ignores the environmental effects of congestion (Transport Select Committee, 2003).

Social

The average commuter wastes the equivalent of 10 working days stuck in traffic, and commuting time for motorists has risen by 18% (The Guardian, 2003a). This issue needs to be addressed, but it is debatable whether congestion charging schemes are the most egalitarian means of dealing with this, affecting individuals from different social classes in different ways (DTLR, 2001a; Rajé, 2002; CfIT, 2003d). The DfT has acknowledged this as an issue (Secretary of State for Transport, 2002), but has so far paid only lip service to it. However, research on road user charging in the USA indicated that less wealthy people still value their time and are willing to pay extra for faster, more

reliable journeys (CfIT, 2003d).

A number of public consultations have been undertaken to assess public attitude and perception to road user charging and congestion (DETR, 1998b; DTLR, 2001b; DfT, 2002b). Conclusions drawn from the research were that congestion imposes considerable direct costs on drivers, businesses and public service providers through longer journey times (The Guardian, 2003a), and frustration, discomfort and increased fuel consumption (DfT, 2002b). Participants in the research were unsupportive or pessimistic about the likelihood of any scheme being effective in tackling or reducing congestion (DTLR, 2001a), and road pricing was viewed with hostility and as a direct burden on the motorist (DTLR, 2001b). However, a survey of public opinion (MORI, 2002) and a stakeholder consultation revealed that six times as many stakeholders supported the introduction of the London Congestion Charge as opposed it.

Some groups are exempt and are allowed discounts from paying the Congestion Charge (TfL, 2003a), but perhaps other groups of people should also be exempt? The Transport Select Committee (2003) highlighted concerns about the impact of the London charge on those who work unsocial hours for low wages and currently rely on cars to get to work. Local authorities have wide discretion in developing their charging systems and in deciding exemptions as they see fit (DETR, 2000b; DTLR, 2001a).

Road user charging could have severe knock-on effects on public transport and most people worry that transport improvements need to be made prior to its introduction (DETR, 2000b). If the government wishes to tackle social exclusion then it must face up to the difficult policy decisions that are needed to rebalance the cost attractiveness of public and private transport (MORI, 2002; Secretary of State for Transport, 2002). The DETR tried to address some of these issues by developing the New Approach to Appraisal and Guidance on Multi-Modal Studies in order to establish a common approach to appraisal of potential road user charging schemes (TTR, 2000).

Legislation

The proposed primary legislation contained within the Government's 1998 White Paper was aimed at allowing local authorities to charge road users to reduce congestion. It was part of a range of measures in Local Transport Plans that would ultimately lead to improvements in public transport (DETR, 1998a). The *Greater London Authority Act, 1999*, was introduced to provide the legal framework necessary to facilitate a more rapid implementation of charging in London.

The powers proposed in the White Paper, for local authorities to introduce Road User Charging and Workplace Parking Levies were legally formalised in

Table 1. Local Authorities originally participating in the Charging Development Partnership

Bath & North East Somerset Council	Birmingham City MBC	Bolton MBC
Bristol City Council	Bury MBC	Cambridgeshire County Council
Cheshire County Council	Cumbria County Council	Derby City Council
Derbyshire County Council	Dudley MBC	Durham County Council
Hampshire County Council	Isle of Wight Council	Leeds City Council
Leicester City Council	Manchester MBC	Milton Keynes Borough Council
Nottingham City Council	Oldham MBC	Reading Borough Council
Rochdale MBC	Salford MBC	Sandwell MBC
South Gloucestershire County Council	Southampton City Council	Staffordshire County Council
Stockport MBC	Surrey County Council	Tameside MBC
Trafford MBC	Warwickshire County Council	Wigan MBC
Wolverhampton MBC	York City Council	

Source: Transport Select Committee, 2003

the *Transport Act, 2000*. The main provisions of the Act are

- 1) local authorities are granted powers to introduce charging to tackle congestion;
- 2) local authorities can only introduce schemes provided they help to achieve the aims of the authorities' Local Transport Plan and are justified in terms of costs and benefits. Any local authority intent on using these powers must submit details of the timetable for introducing the charging scheme, the estimated revenues and the objectives they expect to achieve through expenditure of hypothecated revenue (Transport Select Committee, 2003);
- 3) all community stakeholder groups in the charging zone must be consulted;
- 4) funds may be hypothecated to transport projects contained in the local authority's Local Transport Plan for ten years (ENDS, 2000a);
- 5) at the request of the local authority, the Secretary of State can introduce charges on trunk road bridges and tunnels at least 600 metres in length, to make investment more affordable and to complement a local authority charging scheme (DETR, 2000c). However, it was suggested that there 'is a strong presumption against allowing both urban road user charging and workplace parking levies to be utilised in the same area at the same time' (Transport Select Committee, 2003); and
- 6) the Secretary of State has the power to scrutinise and approve individual local authority schemes, including expenditure plans.

Initially, 24 local authorities expressed interest in pursuing the new powers (Table 1), but they have been slow to take them up as they are waiting to assess the success of the London scheme in reducing congestion and

generating additional revenue. The Government established the Charging Development Partnership in 2000 and held a series of meetings, where local authorities could meet and discuss ideas and experiences, and develop pioneering schemes to tackle congestion (DfT, 2002a).

The *Transport Act, 2000*, detailing hypothecation of the revenues for local transport initiatives is crucial to the scheme's success. However, previous publications (DETR, 1998a; ENDS, 1998b) suggested the government had backtracked on this idea and proposed that local transport improvements should merely have the first call on the proceeds from charging (DETR, 1998b; ENDS, 1998b) and the legislation would provide powers to require a proportion of the revenue to be paid to central government. In the end, it was decided that local authorities were to receive exclusive use of all monies retrieved from road user charging for ten years. Nevertheless, two fundamental concerns remain: first, the Act requires that councils consult extensively before imposing charges, i.e. authorities may have less than 8 years worth of remuneration from their schemes (ENDS, 2001a). Second, it is not clear what will happen when the 10-year term has elapsed and who will ultimately receive the revenues generated. Lord Dixon Smith (Conservative) has argued that funds should be 'ring-fenced' indefinitely to local authorities (ENDS, 2001a), as in Scotland (ENDS, 2000b).

Economic

Road pricing is not a new phenomenon; indeed many authors believe that drivers ought to be charged for the delays that they impose on each other (Smeed, 1964; Gibbons & O'Mahony, 2002). The government intended to invest £179.7 billion in private and public

transport infrastructure from 2001 to 2011, of which approximately £2.7 billion was to come from revenues generated from charging schemes (Secretary of State for Transport, 2002). However, it recently revised the projected contribution to £1.3 billion, as the level of take up was initially anticipated to have been higher.

Nationally, the Nottingham parking levy is expected to raise over £100m in 10 years (CfIT, 2003b; City of Nottingham, 2003). The Bristol road user charging scheme is expected to be introduced in 2006/2007 with a charge of £1–£2, rising to £4–£5 in later years (Transport Select Committee, 2003). The Durham scheme is expected to raise £120,000 per year. The Birmingham M6 toll scheme places vehicles into different categories and charges relate to the size of the vehicle and the travel time (ranging from £0.50 to £11) (*The Guardian*, 2003b; Midland Expressway Limited, 2003).

The London scheme involves a charge of £5 per day to enter into Zone 1 of the city. It was anticipated that this scheme would cost £30–£50 million to operate, administer and enforce (DTLR, 2001a) and could raise between £260 million and £320 million per year (ROCOL, 2000). However, the scheme cost £200 million to set up and is now projected to raise approximately £130 million in net revenue (ENDS, 2002) and offer net economic benefits of £250m a year for investment in other areas, e.g. London Underground (Glaister, 2000). However, implementing and operating costs have escalated and it is now expected to generate less than half the revenue originally anticipated; TfL predicted a £450m profit over 5 years whereas now the figure is estimated to be £193 million. If the scheme is not profitable it cannot deliver promised outcomes and there will be the temptation to increase the Charge in an attempt to increase the revenue (AA, 2003). For all UK city schemes there are additional 'late' and 'unpaid' penalties, which increase depending on the delay in paying between the Charge and the payment date.

The costs of congestion to business range from £3.2 billion (BRF, 1986) to £19.1 billion a year (Poole, 1999) and at the extreme end are estimated to be of the order of £37 billion per year (DETR, 1998a; ENDS, 2001b) due to time wasting and fuel inefficiency (Midland Expressway Limited, 2003; Transport 2000, 2003). Conversely, although congestion is often said to have a negative effect on business, its effect on business competitiveness has never been studied in detail (Transport Select Committee, 2003).

In general, the Confederation of British Industry (CBI), London First, and the London Chamber of Commerce and Industry support the principle of congestion charging (Transport 2000, 2003b). Nevertheless, some retailers claim that 12% fewer

Table 2. M6 Toll road price summary

Guide	Day	Night
	(06:00 - 23:00)	(23:00 - 06:00)
Motor Bike	£2	£1.50
Car	£3	£2
Van	£6	£5
HGV	£11	£10

These are the standard charges for using the entire toll road. It excludes introductory offers, special discounts, etc.

people are visiting central London stores compared with 2002, and that the Congestion Charge will only exacerbate this trend. However, a representative for the Royal Institute of Chartered Surveyors said that a snapshot survey indicated that in its first day the Congestion Charge had little adverse effect on London business (Epolitix News, 2003). Both the Federation of Small Businesses, and the British Retail Consortium are opposed to the charge. They see it as an added tax burden on business, which many small retailers will be unable to bear. The CBI and Institute of Directors are vehemently opposed to workplace parking levies and have condemned it as a 'blunt instrument' (ENDS, 1998a & ENDS, 1998b). The British Chamber of Commerce added that

'the introduction of workplace parking levies would force businessmen to act as 'unpaid' tax collectors and would cause friction between employers and staff' (*The Times*, 1999).

A key debate focuses on whether road user charging is an efficient way to re-allocate road space. On the one hand, it is argued that motoring costs are subject to substantial tax burdens e.g. petrol tax and Vehicle Excise Duty and there should not be a need for additional road user charging. A proportion of this tax may already be seen as an attempt to internalise many of the externalities associated with running a vehicle such as congestion and pollution (Blow *et al.*, 2003). The Committee for Integrated Transport (CfIT) commissioned a report to model different alternatives to current motoring taxes without increasing overall motoring costs. The results indicate that shifting from a system of taxation to one of charges will deliver significant congestion reduction benefits to many road users without increasing the overall cost paid to drive. The research suggests that congestion would be reduced by 44%; most roads having no charges at all, while others would have a fee based on their amount of congestion. Motorists, therefore, could choose between individual journeys that are either cheaper or shorter. All revenue raised would be returned to the road user by reducing the existing taxes (CfIT, 2002).

Political

The main fear of the government is of course, an electoral one. Initially the government was very effective at distancing itself from any responsibility for implementing charging, stressing that decisions on whether schemes were employed lay solely with the specific local authority or Mayor of London. In addition, the Secretary of State argued that this is why local authorities have been granted powers to introduce road user charging as a means of tackling local congestion. However, local authorities may also be driven by political arithmetic (Transport Select Committee, 2003).

Road user charging is politically unpopular and the political viability of schemes will be driven primarily by local issues and will be sold on the basis that they represent the most complete solution to growing congestion problems. Voters will also need to be convinced and informed of how they will benefit from the charges (Cheese & Klein, 1999). Congestion is a pressing issue and the government must either support road user charging or refute it (Hansard, 2000). The government has identified the need to contain and reduce congestion, the most recent solution being a £7 billion plan to widen roads in severely congested parts of the UK, particularly on parts of the M25 motorway around London. The question is whether it has the political nerve to support road user charging. Charging schemes will not produce quick political wins and can only be expected to deliver congestion improvements as part of a package of transport improvements. It must offer more than sole powers to local authorities for road user charging but should also be willing to support – and provide political backing to – those local authorities which actively take up charging schemes (Transport Select Committee, 2003).

It was initially intimated that the government had 'gone cool' on congestion charging (ENDS, 2002; FoE, 2003a). Mr Darling denied this, saying it 'would be grossly irresponsible for any government not to show a lead'. He admitted that the government has no detailed plan for convincing the public of the case for charging, but this will be developed in the future. However, he continuously declined to endorse the London Congestion Charge, stating that he supported charging as part of a wider strategy (ENDS, 2002).

Environmental groups, in delivering a 'Congestion Charge award for cowardice' to Alistair Darling, are clearly not satisfied with the government's stance on road user charging and its lack of political commitment (FoE, 2003a). The Secretary of State interjected that the government's position on congestion charging was determined by technological factors, rather than political cowardice. However, the Government decided five years ago to enable the Greater London

Authority and other local authorities to implement charging schemes and commissioned studies with respect to low technology charging schemes (Transport Select Committee, 2003). The Government now appears to be moving towards considering a possible national charging scheme while still appearing reluctant to support the London scheme wholeheartedly; the Prime Minister having stated

'As I have said before, that is a decision not for us but for the Mayor. Since we have given the power to local government to charge for congestion, we should let it do so if that is what it wishes to do. (Hansard, 2003).

Local authorities are monitoring the London scheme with interest to see what will emerge. Their judgment of the political feasibility of such charging schemes is likely to be dictated by the result of the mayor's re-election campaign in May 2004.

Methodology

A mixed methodology was chosen, involving in the first stage a survey of all county, metropolitan and unitary council local authorities, seeking their attitudes to road user charging. In addition, environmental groups (such as Friends of the Earth, Greenpeace and Transport 2000), Passenger Transport Executives, government departments, business organisations and other interested stakeholders were contacted. In the second stage, six in-depth case studies were conducted with a variety of stakeholders in selected local authorities. The local authorities included those which intended to take up, were considering or had ruled out charging as a means of combating congestion. In total, 117 local authorities were identified and approached by letter, of which 63 responded, representing a gross response rate of 54%. This provided the background from which the case studies were selected.

Case studies

Six local authorities were selected for in-depth study on the basis of the analysis of the content of documentary material received (Table 3). These groups were chosen on theoretical grounds to examine any contrasts and similarities that may arise given their different attitudes to road user charging (Gill & Johnson, 1997). Since the subject matter was viewed as extremely controversial, the case studies (other than London) were assigned fictitious names to personalise them and maintain levels of confidentiality and anonymity.

Due to the nature of the questions being explored, a 'multiple embedded case study' design was used. The cross-case analysis sought to explain convergence and divergence between cases in terms of the *a priori* predictions and theories. In order to carry out cross-case analysis, compare data and make general conclusions,

Table 3. Case studies

	<i>Weatherfield</i>	<i>Springfield</i>	<i>London</i>	<i>Brookfield</i>	<i>Holby</i>	<i>Aidensfield</i>
Location	North	Central	South	North	South	North
Population	2,581,135	5,300,000	7,000,000	452,450	500,000	727,500
Area	128,615 Ha	899 Km2	1,580 Km2	11,276 ha	10,954 ha	55,175 ha

a topic guide for semi-structured interviews was designed. The semi-structured format was also chosen to maintain consistency, facilitate cross-case analysis, permit subsequent comparative analyses, provide latitude for further probing, and thus enter into a dialogue with the interviewee.

Interviews were conducted and case study notes written around the areas explored in the topic guide. A 'snowball sampling' approach was adopted, whereby the primary contact in the local authority was asked to provide details of others who would have knowledge of the issues being explored. The same topic guide was utilised to maintain objectivity and produce a larger range and breadth of perspectives on each of the sustainability issues surrounding road user charging. In total 16 individuals were interviewed from a range of organisations and a further three individuals provided documentation that was used in the final analysis. Two individuals refused to participate. Some individuals (notably Aidensfield) stressed that many answers provided were often personal and did not reflect the overall view of their organisations. The discussion below reports the findings from the interviews and compares the findings across the case studies under the key sustainability headings.

Cross case analysis & discussion

Environment

According to the literature, key environmental impacts associated with transport include air pollution and its effects on people's health, and on flora and fauna. However, all stakeholders in London (the environmental co-ordinator, the business representative and the local authority representative) believed that the Congestion Charge would not have a significant effect on air quality or the environment.

Local authority/Passenger Transport Executive representatives in all case studies believed that air quality was the fundamental environmental issue relating to road user charging in their areas; and all except those in Weatherfield and London felt a reduction in city centre congestion would improve air quality. The local authority representative in London reported that 'the scheme will not contribute significantly to any changes in overall air quality', as the principal aim of the Congestion Charge is to reduce congestion. However, there has already been a 2%

decrease in the amount of fuel consumed, which will indirectly facilitate reductions in air pollution. This was consistent with the environmental co-ordinator and the business representative in London who argued that environmental effects are 'dubious'. Conversely, business representative 'A' in Weatherfield believed that 'there is a chance for local authorities to reduce congestion and pollution simultaneously'.

Local authority/Passenger Transport Executive representatives in Weatherfield, London and Aidensfield also discussed the local environmental impacts of traffic displacement, e.g. noise and air pollution at the edge of the charging zone from diverted traffic compared with levels inside the zone. The environmental co-ordinator in Weatherfield stated that 'there are 12–24,000 premature deaths due to air pollution', consistent with other authors (*New Scientist*, 1994; Howes *et al*, 1997; FoE, 2001).

Respondents raised a number of socio-environmental issues. Local authority/Passenger Transport Executive representatives in London and Aidensfield felt noise was an issue, which was consistent with the RCEP (1971) findings; business representative 'A' in Springfield agreed, stating that 'noise, fumes and risks to pedestrians' are the main issues. The environmental co-ordinators in Weatherfield and London expressed concerns about quality of life impacts, e.g. difficulty in crossing roads, using a bicycle, and motorists sitting for hours in traffic jams, whereas the environmental co-ordinator in London completely disagreed and said the Congestion Charge 'may increase danger to people as it increases traffic speeds'.

The various estimates of the environmental costs of congestion were not known by respondents. Stakeholders focused on health, noise and pollution rather than financial costs of congestion. Surprisingly, the local authority/Passenger Transport Executive representatives 'B' and 'C' in Weatherfield believed that 'congestion is not really a large problem in Weatherfield, outside peak times'. The environmental co-ordinator in Weatherfield however, completely disagreed and argued that 'roads are extremely congested and polluted and road user charging would not solve these problems'.

The majority of stakeholders in Springfield felt that environmental issues were given a high priority in their area. However, the majority in Weatherfield

believed the contrary i.e. the environment took 'a back seat' to economic issues and the three respondents in London all had different opinions. The local authority/Passenger Transport Executive representative in Brookfield thought that 'there is an underlying schizophrenia concerning regeneration and environmental issues' and nothing must be done to jeopardise economic regeneration:

'Environmental issues are given a back seat to economic issues and the general consensus is do a bit of environment at the end... many individuals in the city lack a 'sophisticated view' and do not see that a good environment equals good business' (Springfield environmental co-ordinator).

The three local authority/Passenger Transport Executive representatives in Weatherfield at times contradicted one another. The business representative in London felt that 'the environment has an increasingly high priority' and his organisation:

'supports sustainable development, but the balance is not right, and is too concerned with environmental protection and not economic growth; it is better to have a worse environment and better economic growth. *Environmental issues take a back seat to economic issues, and that is the way it should be.*' (Emphasis added)

The majority of stakeholders in Springfield and London believed that road user charging would reduce the negative environmental impacts associated with transport. The local authority representative in London reported 'charging is expected to change the patterns and volumes of traffic in and around the charging zone, affecting vehicle emissions, which will affect concentrations of pollutants in the atmosphere, but changes in local pollutant concentrations resulting directly from the scheme are likely to be small. After three months, traffic inside the charging zone has decreased by 16%. The local authority/Passenger Transport Executive representative in Holby agreed and said 'modelling suggests there will be improvements in air quality in the area covered by the scheme due to the reduction in traffic'. Business representative 'A' in Weatherfield stated that the 'negative environmental impacts could possibly be reduced depending on where the road user charging scheme was placed within the region', and any scheme should be 'based on road usage at peak times... and a fair system needs to be adopted to encompass who and when roads are being utilised to ensure that it does not impact more heavily on business'. The business representative in London felt that road user charging would not result in negative impacts being reduced 'unless people were completely removed from the roads'.

The majority of stakeholders in London thought

that exemptions for less polluting vehicles were a good idea. The local authority/Passenger Transport Executive representative 'A' in Weatherfield felt 'exemptions would occur initially on a temporary basis, which would then change to a discount as a result of the lesser environmental costs associated with less polluting vehicles' but did not think 'there would be blanket restrictions... a cost assessment of each vehicle type could be prepared'. The business representative in London felt that 'it depends on how many exemptions there are. If congestion charging is successful there will be a decrease in hypothecated revenues to public transport improvements and therefore exemption criteria may need to be tightened'. However, the local authority/Passenger Transport Executive representative 'C' in Weatherfield and environmental co-ordinator in Springfield thought that vehicles 'should not be liable to reductions since road user charging is meant to reduce congestion and not pollution'. The local authority representative in London said 'this discount has very strict criteria; it only applies to the 'cleanest of the clean' vehicles, which may improve the city's air quality without compromising the central objective of reducing congestion'. Both business representatives 'B' in Weatherfield and Springfield agreed that although 'hypothetically they should be exempt... these vehicles are more expensive to business'.

Social

The main social impacts associated with road user charging raised in the literature concerned time wasting and social exclusion (DTLR, 2001a; Secretary of State for Transport, 2002) and respondents in all cases, mentioned social exclusion as the key social issue. All but one local authority/Passenger Transport Executive representative felt that social exclusion could result from road user charging and they believed this 'could possibly occur' and 'that further study was required'. All business representatives believed that road user charging would have a negative effect on poorer members of society, which was consistent with the opinion of the CfIT (2003d). The local authority representative in London said 'it was accepted that the Congestion Charge would affect all city dwellers to some degree... and extensive consultations were undertaken to identify those groups that might experience significant impacts'.

The local authority/Passenger Transport Executive representatives 'B' and 'C' and business representative 'B' in Weatherfield believed that 'ability to pay and potential consequent social exclusion were the major issues'. The local authority/Passenger Transport Executive representative 'A' thought that 'channelling hypothecated revenues into local public transport initiatives is key to its success', and that the type of charge introduced could have varying social

effects. Business representative 'B' in Springfield stated that:

'there is a general feeling that we pay too much for road tax and the social issues are related to lack of choices, we cannot just 'lift and drop', because we do not have the choice... There is a reluctance by the public to give up the car... as buses are regarded as second class modes of transport and unsafe due to crime'.

The local authority/Passenger Transport Executive representative 'C' and business representative 'A' in Weatherfield and the local authority/Passenger Transport Executive representatives in Springfield, London and Aidensfield discussed repercussions for those who work unsociable hours, such as teachers and health workers who rely entirely on their own vehicles to travel to work, where there are no realistic public transport alternatives. However, the local authority representative in London argued the Mayor had made, or is in the process of making, adequate provisions for these groups, via monitoring programmes which allow new discounts to be considered as they arise.

Most local authority/Passenger Transport Executive representatives and business representatives thought that the 'equity issue' was key to the road user charging debate, i.e. poor people find it difficult to pay the charge. Springfield's business representative 'A' said 'those that can afford it have a choice, but those that cannot afford it, do not have a choice'. However, local authority/Passenger Transport Executive representatives in Springfield and Brookfield believed that 'this should not be the case if the scheme has been planned properly with adequate pricing and charging policies'. The London local authority/Passenger Transport Executive representative emphasised that 'the majority of low-income individuals are reliant on public transport to travel around the city, less than half of the poorest households have access to a car and 86% of them say they never travel into the zone during charging hours' and 'public transport improvement from the scheme has created an overall positive effect on lower income groups, since the hypothecated revenues are used for public transport infrastructure improvements'. The environmental co-ordinators in London, Springfield and the local authority/Passenger Transport Executive representative in Holby shared this view reporting 'the poorest groups are more affected by traffic danger, pollution and noise. These impacts are reduced by the charge and poor people benefit from the scheme'. The environmental co-ordinator in London also argued that 'road user charging on a national scale would actually benefit social exclusion'.

In Weatherfield, only half of the respondents felt

they could comment on stakeholder perceptions of road user charging; both business representatives believed that the business community opposed road user charging, but the environmental co-ordinator maintained that 'reducing traffic would make business suffer was a myth, because people prefer to shop in less polluted areas with fewer cars'. In Springfield, the majority were aware of stakeholder views, but their perceptions differed. In London, both the environmental co-ordinator and the local authority representative believed that the majority of the public, businesses and environmental groups support the charge, whereas the business representative thought the business community was divided. The local authority/Passenger Transport Executive representative 'B' in Weatherfield felt 'stakeholders are nervous about road user charging and it is essential that two fundamental conditions are met before charging schemes are implemented: that there are high quality public transport alternatives in place and all ten districts are behind it'. This view was shared by the local authority/Passenger Transport Executive representative 'C' and CPRE in Weatherfield, the environmental co-ordinator in London and the local authority/Passenger Transport Executive representative in Holby.

A London stakeholder consultation found 56% of respondents supported road user charging. The environmental co-ordinator in London felt that 'the reason why the Congestion Charge was introduced rather than workplace parking levies is that the business community was prepared to accept it... the Charge is definitely more popular now and stakeholders are generally in favour of it'. According to the local authority/Passenger Transport Executive representative in Springfield 'at the higher level in business, the strategic thinkers... generally support the principle of road user charging, as they can see the potential benefits it could bring', yet 'in other parts of the region that rely on manufacturing... road hauliers are vehemently opposed to it' while 'environmental groups are strongly in favour of it'. Business representative 'A' in Springfield favoured the principle of road user charging, as long as it did not detrimentally affect business, and business representative 'B' in Springfield said that 'there is a definite anger regarding the charges proposed on the new toll road in the region, especially since business already has to pay large amounts of road tax for fleets' and 'costs would have to be passed on to somebody else'. The local authority/Passenger Transport Executive representatives in Brookfield and Aidensfield believed that in general public opinion is negative to road user charging from Local Transport Plan research and previous surveys. The local authority/Passenger Transport Executive

representative in Aidsfield reported that although 'there is some support for road user charging from business in terms of charging that will result in reduced congestion, some businesses previously contacted the local authority to enquire about the boundary as they were keen to locate outside the charging area'.

The majority of stakeholders in Weatherfield thought that road user charging would not go ahead if there was significant opposition. The local authority/Passenger Transport Executive representative in Brookfield added 'there would have to be a very strong case indeed in terms of environmental and social reasons for the region to implement road user charging and it will probably not be something that is utilised in the very near future'. Whereas in Springfield most took a contrary view, for example business representative 'A' thought road user charging could 'deter investment in the future'. The business representatives 'B' in Weatherfield & Springfield also felt that 'the region would implement road user charging regardless of opposition, as it can see the revenue raising opportunities that could result e.g. from London'. The business representative in London said 'nationally it depends on the money the local authority is able to keep'. The local authority/Passenger Transport Executive representative in Holby said:

'Research to date demonstrates that the majority of people support road user charging if the alternatives are in place and the revenues are ring-fenced for transport improvements. Whilst we expect opposition to increase if a real scheme is introduced, it is anticipated that through a structured awareness campaign 'hearts and minds' can be won'.

A key issue, which emerged in all stakeholder groups, is that it is necessary to have public transport alternatives available when road user charging is implemented for those people who are switching from private to public transport. Consistent with the opinions of the DETR (2000b) and the Transport Select Committee (2003), the environmental co-ordinator and business representative 'A' in Weatherfield felt that they:

'would have to operate a region-wide initiative, but would only consider congestion charging or workplace parking levies when there was significant increases in public transport, after extensive stakeholder consultation and when a 'level playing field' was reached, but...there are major concerns with economic development and regeneration' (Weatherfield business representative 'A').

The majority of respondents felt that increased public support would not result from independent

scrutiny by an external body, as recommended by the Transport Select Committee (2003). In addition, opinion was often split in individual cases such as Weatherfield. The Weatherfield local authority/Passenger Transport Executive representative 'A' argued that 'neither businesses nor the public have faith in external bodies' and business representative 'B' in Weatherfield said that 'it does not matter what is said or who is saying the information, as people still have to pay the charge regardless of this'. The local authority/Passenger Transport Executive representatives in Aidsfield, Brookfield and Springfield felt people 'do not want to pay extra to use roads on top of road tax' and that 'additional technical expertise would not lead to extra public support for a scheme'.

Conversely, the local authority/Passenger Transport Executive representative 'C', environmental co-ordinator and business representative 'A' in Weatherfield and business representative 'B' in Springfield believed that public support would increase from scrutiny by an independent body. The local authority/Passenger Transport Executive representative 'C' stated that 'due to the polycentric nature of the region, there are often political tensions between towns and an independent body could remove this'. The environmental co-ordinator in Weatherfield thought...

'people are increasingly mistrusting of politicians, as they are used to the government dressing up the truth, and reports by the local authority are regarded with caution. An independent body would therefore provide an extra part of the picture that people take note of.'

Legal

Stakeholders were not confident when responding to questions about legal issues. The business representatives 'A' in Weatherfield and Springfield, local authority/Passenger Transport Executive representatives in London, Holby and Aidsfield stated that policing may be a major issue, especially across local authority and police force boundaries. The environmental co-ordinator in London thought that 'there is a high proportion of untaxed, unlicensed and unregistered vehicles on the road, which are impossible to trace... and avoid paying the charge'. The local authority/Passenger Transport Executive representative 'B' in Weatherfield felt judicial review of decisions to charge was the major legislative issue. The local authority/Passenger Transport Executive representative in London said prior to the introduction of the Charge, a legal challenge was made by an adjacent city council and residents from another local area: 'The judicial review related to whether there was a necessity for an EIA, a public

review and human rights issues. The organisation was vindicated and won the case because of the extensive consultation and sound analysis that had been carried out'. An EIA was found to be legally unnecessary because the environmental impacts of the scheme were negligible.

Other legal concerns included synergy between all local authorities within regions, civil issues and data protection. The environmental co-ordinator in Weatherfield stated that 'there were no more challenging legal issues than with any other planning scheme and road user charging is very positive in legal terms, e.g. stopping people with no tax,' and the environmental co-ordinator in Springfield added... 'and if you are doing nothing wrong there is nothing to be worried about'.

The majority of respondents in London believed the powers contained within the *Transport Act, 2000*, to be sufficient, but the environmental co-ordinator in London thought 'local authorities should have the power to remove workplace parking levies', the business representative in London felt that 'if the government wants the local authorities to be the decision makers then they will need more powers' and the local authority representative in London explained that 'authorities seeking to introduce workplace parking levies will also require enabling legislation'. In addition, the environmental co-ordinator in Weatherfield said that 'improvements to the legislation should allow control at a local rather than a national level'.

The majority of stakeholders in Weatherfield and London felt that approval from the Secretary of State was beneficial, before a local authority can introduce a charging scheme. The local authority/Passenger Transport Executive representatives in Springfield and Brookfield believed that this indirectly proves that the government supports these initiatives, and this can be used to the advantage of local authorities. There may however, 'be future problems if the government in office does not back road user charging'. The local authority/Passenger Transport Executive representative in Aidsfield felt that approval 'makes sense to ensure consistency of schemes'. Business representative 'A' in Weatherfield felt that 'it is extremely important that the government is involved to ensure that the scheme does not interfere with any other initiatives, such as the Neighbourhood Renewal Fund, as not all initiatives are at the local authority level'. Whereas business representative 'B' in Weatherfield believed that without Secretary of State approval 'schemes could happen by default, for economic reasons whereby local authorities implement road user charging as a revenue raising exercise and not as a congestion combatant'. The business representative in London felt 'government direction is required, to

avoid 'the worst case scenario' of many local authorities employing road user charging, utilising an array of schemes in a variety of ways'.

The local authority/Passenger Transport Executive representative 'C' and environmental co-ordinator in Weatherfield, and the business representative 'B' in Springfield were of the view that there is no need for any central control of road user charging and that this would militate against the devolution of power to give regions 'voices', emphasising 'subsidiarity'. The DETR tried to develop a New Approach to Appraisal and Guidance on Multi-Modal Studies in order to generate a common approach to appraisal of potential road user charging schemes (TTR, 2000). However, the local authority/Passenger Transport Executive representative in Holby felt that 'New Approach to Appraisal requirements mean the assessments are weighted towards traditional economic analysis of transport projects'.

The majority of case study local authority/Passenger Transport Executive representatives, environmental co-ordinators and business representatives in Weatherfield and Springfield did not believe that the DfT should have the power to decide which projects received the hypothecated revenues, as 'the DfT is not the custodian of sustainable transport issues' (Weatherfield local authority/Passenger Transport Executive representative 'C'). Furthermore 'this should not be the case since it is the local authorities that are taking the political and public grief for implementing the scheme. Therefore they should be allowed to utilise the revenue as they see fit. Local authority risk should equate to local authority gain' (Springfield local authority/Passenger Transport Executive representative). Those in favour of DfT decision making cited reasons such as to verify revenues were being spent effectively (Weatherfield local authority/Passenger Transport Executive representative 'A') and to resolve conflicting decisions between adjacent local authorities (London business representative).

Economic

All stakeholders in London and the majority in Springfield discussed economic vitality and its effects on business. The local authority/Passenger Transport Executive representatives in Brookfield and Springfield agreed that 'there has been a great uphill struggle to attract investment into city centres, and it is essential to avoid damaging this' (Springfield local authority/Passenger Transport Executive representative). The local authority/Passenger Transport Executive representatives in London and Aidsfield both had financial concerns and discussed cost-benefit analysis and start-up costs.

The local authority representative in London raised the issue of unnecessary trips by freight and fleet vehicles. 'Through trips currently made by commercial and business vehicles within the charging zone are unnecessary and it is consistent with the primary objective of congestion charging that they be deterred'. He added that 'it is impractical to distinguish between 'essential' and 'non-essential' journeys of vehicles for the purpose of exemptions', and therefore an exemption or discount cannot be applied to freight vehicles.

Local authority/Passenger Transport Executive representatives in London and Holby, business representatives 'A' in Weatherfield and Springfield and the environmental co-ordinator in London discussed the need to maintain the economic vitality of city centres and possible repercussions on business. The local authority/Passenger Transport Executive representative in London explained that small businesses, dependent on passing trade, were concerned about the impact of road user charging on their future economic viability. Although, he stressed that there was no evidence that business has suffered to date, he felt that it was too early to determine whether the charge has had a negative impact on business. However, a survey undertaken by the London Chamber of Commerce and Industry, revealed that three-quarters of respondents (predominantly small to medium-sized enterprises) had suffered a fall in year on year sales, just under half of these believed that that the Congestion Charge was 'all or mostly' to blame and over a quarter of respondents were considering moving outside the charging zone (Winsor-Cundell, 2003). The business representative in London agreed and the environmental co-ordinator in London admitted that small retail businesses are evidently suffering, but said 'time will show that there has been an improvement in environment, pedestrians and cyclists, which is inevitably better for business, despite a few small retailers that may have suffered'. Business representative 'A' in Springfield was concerned about whether road user charging would be a 'direct cost to business' and business representative 'B' in Springfield felt that additional costs will be passed to other parties and could damage competitiveness.

The majority of respondents in Weatherfield believed that it may be difficult to maintain town centre sustainability if road user charging was implemented, giving reasons such as 'people will be pushed into other areas where they do not have to pay a charge... and retail activity is very sensitive to this' (Weatherfield local authority/Passenger Transport Executive representative 'A') and if 'one major city in the region adopts road user charging and a neighbour does not there could be an issue of sustainability' (Weatherfield local authority/Passenger Transport

Executive representative 'C' and business representative 'A'). Conversely, local authority/Passenger Transport Executive representatives in Holby and Aidsfield, the environmental co-ordinator in Weatherfield, business representative 'A' in Springfield and all London stakeholders were of the opposite opinion. The local authority representative in London explained that 'reports from Singapore and Trondheim where road charging was introduced in 1975 and 1991, respectively, portray no measurable difference in retail activity'. The environmental co-ordinator in London agreed and said 'there is much research that shows how certain low levels of traffic are seen to be good for economic vitality and there is no effect on the sustainability of town centres' and the local authority/Passenger Transport Executive representative in Holby said that 'there will be economic issues if we do not do anything about congestion'. The environmental co-ordinator in Weatherfield maintained that 'experience shows that a better environment is good for business'.

According to the literature, the costs of congestion vary from £15 billion to £37 billion per year (ENDS, 2001b). The majority of stakeholders in London and all in Springfield had some perception of the costs of congestion in their areas, but most respondents in Weatherfield did not. The local authority/Passenger Transport Executive representative 'B' in Weatherfield thought 'the science on this is very blunt edged, almost everything you see in the media about the 'costs of congestion' are little better than made up'. The local authority representative in London stated that 'one week without the Congestion Charge costs London business £2m in lost revenue and £4 m in transport benefits'.

Road user charging supporters argued that schemes would generate greater public support, if the revenues were ploughed back into improving public transport indefinitely (ENDS, 1998b). The majority of stakeholders in Weatherfield and London agreed, whereas opinion was split in Springfield. The local authority/Passenger Transport Executive representative in Holby said 'we have not worked on the basis of anything past 10 years', and he thought '10 years plus should be at the discretion of the government, as it really depends if significant alternatives have been implemented'. The business representative in London stated that '10 years is a long time in itself and one can never say 'forever', as long as we see improvements'. Business representative 'B' in Springfield believed that the 10-year idea 'was a very smart move' for the government to 'dangle the carrot' and encourage local authorities to take up road user charging.

The local authority/Passenger Transport Executive representative 'A' in Weatherfield believed that 10

years 'is useful for a minimum standard, but that ring fencing the revenues indefinitely would be a larger incentive and easier to promote schemes'. Local authority/Passenger Transport Executive representatives in Springfield thought that since the local authorities have 'had to face the grief generated by such schemes', they should be entitled to the money indefinitely and feared that 'the treasury may look at the scheme for 10 years and then see possible extra remuneration for the government's own use'. The local authority/Passenger Transport Executive representatives in Weatherfield, Springfield and Aidensfield argued that 'ten years was insufficient'. 'For instance the timescale for planning a light rail scheme is usually at least ten years from planning to opening – even more for rail schemes. Ten years is a short time in transport planning' (Springfield local authority/Passenger Transport Executive representative). Environmental co-ordinators and the local authority/Passenger Transport Executive representative in Springfield felt that

'indefinite hypothecation of revenues is a good idea, provided transport grants are not reduced by the same amount as the revenue generated by charging' (London environmental co-ordinator).

The local authority representative in London stated that the latest projected revenues (£66m per year) were substantially less than initially predicted (£130m), since the scheme had been such a success that it had reduced traffic volumes in the city to lower levels than predicted. Stakeholders raised a number of economic alternatives to road user charging. Local authority/Passenger Transport Executive representatives in London, Brookfield and Aidensfield and the local authority/Passenger Transport Executive representative 'C' in Weatherfield said alternatives were already being implemented in their regions to reallocate road space and discussed higher parking charges and demand management as economic alternatives. Business representative 'B' in Springfield believed that the region could combat congestion by building more roads; whereas the local authority/Passenger Transport Executive representative 'B' in Weatherfield advocated 'do nothing – congestion is generally self-limiting – you get what is known as 'peak spreading' – congestion during the peak does not get any worse, but the peak lasts for longer'.

According to Cheese and Klein (1999), revenues generated can vary enormously depending on the technologies utilised. However, the majority of stakeholders in Weatherfield and Springfield believed that technology was not a key factor in terms of the economic feasibility of road user charging schemes, whereas stakeholders in London believed that it was. The local authority representative in

London felt road user charging technology is developing and 'any such scheme must be interoperable with other schemes in the UK and may be linked to an overall wider government technology'. Business representative 'A' in Springfield thought that 'technology is the largest factor... if a foolproof, efficient and reliable system could be implemented with minimal costs, then half of the opposition to road user charging would disappear'. Business representative 'B' in Weatherfield felt that 'it is not really a big issue and the UK does not have the technology for GPS, but will do soon'.

Political

The majority of stakeholders in Weatherfield and London agreed with the literature that the key political issues were concerned with re-election and party politics. The local authority/Passenger Transport Executive representative in Springfield explained that road user charging is an extremely sensitive political issue 'therefore no one wants to do anything over the next year which could jeopardise their chances of maintaining political control'. The environmental co-ordinator in Springfield believed that the answer was for 'a national system' to be introduced and this would be 'much more palatable and equitable than different local authorities doing different things at different times'. The local authority representative in London reported that the politics of road user charging was the single largest issue facing local authorities implementing a charge. The local authority representative in London and business representative 'B' in Weatherfield believed 'that areas thinking of implementing road user charging need strong politics and a strong person, as introducing road user charging is a big gamble and the less government interference the better'. According to the local authority/Passenger Transport Executive representative in Holby 'we are a hung council and unfortunately we do not know if there is commitment to introduce road user charging or not'. The local authority/Passenger Transport Executive representative in Aidensfield also understood the 'difficulty of selling charging to the voters' and agreed with the local authority/Passenger Transport Executive representatives in London and Holby that a 'short time frame of political tenure can make it difficult to introduce a scheme, and that you need a strong political champion for the success of such a scheme'.

The majority of respondents in Weatherfield and Springfield believed that the area was considering or was undecided about road user charging. According to local authority/Passenger Transport Executive representatives in Weatherfield and Brookfield, their regions have decided not to take up road user charging because of economic concerns. Business representative

'A' in Weatherfield stated that the region 'is not keen; they have not said 'yes' nor have they said 'no'...' but believed that 'the Charging Development Partnership is essential to ensure that the region receives information about road user charging, but this is a political game in which no-one wants to upset the government'. Business representative 'B' in Weatherfield agreed, explaining that 'road user charging is now on the agenda... and people are seeing the level of income generated and congestion improving, and they will probably go for it for the extra funds'. The environmental co-ordinator in Weatherfield thought that 'a decision to take it up has not been made yet, which may equate to not doing it yet, i.e. a lack of joined up thinking'. However, business representative 'B' in Springfield said his organisation sees road user charging as inevitable and 'may as well be at the front of its development and make the best of the situation', although 'there is neither a lack of political will nor the 'bottle' for the debate'.

The majority of respondents in Weatherfield, Springfield and London believed that a set of government guidelines would be beneficial for local authorities wishing to implement road user charging, as suggested in ENDS (2002). The local authority/Passenger Transport Executive representative 'A' in Weatherfield said 'there's always a role for 'best practice guidelines', but the government is often not able to offer guidelines on strategy, i.e. how to win over the general public and businesses and effectively market this type of solution to those who oppose it' and business representative 'B' in Weatherfield felt fundamental requirements should be met before implementation thus avoiding a hotchpotch of different systems. The environmental co-ordinator in Springfield believed that a framework, which could be tweaked for individual local authority needs would encourage more local authorities to introduce charging. The environmental co-ordinator in Weatherfield added that the 'government should take the most positive feasible attitude and use all resources to assist local authorities to make decisions in the public interest'.

It was initially intimated that the government had 'gone cool' on congestion charging (ENDS, 2002; FoE, 2003a). However, the majority of respondents in Weatherfield and Springfield felt that the government was backing road user charging, although the London stakeholders were not as convinced. Many stakeholders felt the government had changed from a hostile to a more open-minded approach. The government 'is now much more proactively considering charging on the inter-urban network' (Springfield local authority/Passenger Transport Executive representative), but there is still no real leadership

for local authorities – it being very much a local political decision. The Holby local authority/Passenger Transport Executive representative agreed 'that HGV charging will be introduced and the statements from DfT seem to indicate that a national scheme is on the cards. They have also been making stronger noises about guidelines for cities that wish to introduce schemes'. The Weatherfield business representative 'A' thought that 'the government liked the idea of charging for road use, but would like to be re-elected more'. The government needs to examine charging in Europe and learn lessons from those that are further along the track (Springfield business representative 'B').

The local authority/Passenger Transport Executive representative 'B' in Weatherfield argued 'it is very clear from statements before the London scheme started that they wanted to have their cake and eat it; they would not back the specific scheme (in case it failed), but are now taking credit for having introduced the legislation in the first place. Weatherfield is unlikely to introduce a scheme unless there is specific backing from Ministers – they would not want to go through the mill like those in London'. Whereas business representative 'A' in Springfield was adamant that the 'issue is not 'should we' or 'shouldn't we', but will be organised around who pays, at what times, whether it will be locally or nationally based and is the burden going to be on business?' The business representative in London felt that congestion charging had worked in the city, but that there is no suggestion that the government will repeat it elsewhere. 'The jury is still out nationally, with the government acknowledging the transport problems of the UK; if its latest attempt of road building to solve the problems fails, national charging will be more attractive'.

Conclusions

Stakeholders identified the key environmental issues related to road user charging as air pollution, traffic displacement, socio-environmental effects, noise, air vibration, quality of the environment, transportation of goods and vehicles and environmental health. There was disagreement over the type of schemes that should be implemented and no acknowledgement of the links to wider global problems such as climate change.

The main social impact associated with road user charging was social exclusion of low-income workers who work unsociable hours, and car dependent groups, e.g. the disabled. Some respondents thought that social consequences could be reduced with adequate pricing policies. General opinion was that road user charging on a national scale could combat social exclusion. The key concern was the need for public transport alternatives when road user charging is

Table 4. A simple sustainability framework for implementing Road user charging.

<i>Environmental</i>	<i>Social</i>	<i>Legal</i>	<i>Economic</i>	<i>Political</i>	<i>General issues</i>
Link the environmental costs of congestion to wider global policies to demonstrate to motorists that their decision to drive has wider environmental implications.	Extensive stakeholder consultations e.g. workshops must be undertaken to develop strategies to address any foreseeable problems.	A lighter touch role by the DfT to verify effective spending would be welcomed.	Other viable economic alternatives to Road user charging should be thoroughly investigated before embarking on an Road user charging scheme.	The government and LAs must formally voice their support or opposition to Road user charging, to avoid resource wastage and lack of joined up thinking by stakeholders and employees.	Road user charging must not be introduced purely as a revenue raising exercise. A marketing campaign to get local media on side and create ownership of the scheme.
Establish exemptions for less polluting vehicles using e.g. band 4 of powershift register, with constant monitoring and steps to ensure business is not adversely affected.	Awareness of social exclusion issues should be demonstrated by constant monitoring of different social groups and the Road user charging should be sufficiently flexible to allow discounts to be amended when they arise.	The Transport Act 2000 should be amended and updated to encompass the role of business, hypothecation extensions, enforcement and Workplace parking levy enabling legislation.	Revenues should be hypothecated indefinitely for the use of the LA exclusively for transport improvements. Transport grants must not be reduced by the same amount as the revenues generated by charging.	Strategic guidelines to assist LAs with the implementation of Road user charging should be provided by the government to facilitate coherent Road user charging schemes, which can be replicated nationwide.	Adequate local transport infrastructure improvements to support increasing demand. LAs must ensure that the correct types of public transport improvements are made.
A reduction in vehicle numbers will contribute to lower fuel consumption and benefit the wider environment, which needs to be emphasised to the public when promoting Road user charging.		Secretary of State approval for schemes should be sought to facilitate more effective, consistent and compatible scheme designs, to avoid conflict with other local initiatives.	Extensive consultations with business using representative bodies such as CBI and Chamber of Commerce to develop strategies to resolve any Road user charging related issues.		Road user charging on a national scale would be preferential – UK compatible schemes. Road user charging technology needs to be researched extensively before schemes are implemented.

implemented, especially for those people who are switching from private to public transport.

Many stakeholders were unsure of the legal issues surrounding road user charging. However, issues such as enforcement and policing, judicial review, civil issues, data protection and privacy were raised. Stakeholders felt improvements to existing road user charging legislation could involve taking account of the role of business, hypothecation extensions, addressing enforcement issues, providing workplace parking levy enabling legislation and devolving more power to a local level. Most stakeholders thought that local authorities having to seek approval from the Secretary of State before implementing road user charging was a good idea, but felt the DfT should not have the power to decide which projects received the

hypothecated revenues.

Respondents raised a variety of economic issues such as the effects on investment, regeneration, cost-benefit analysis, town centre sustainability, start up costs and impacts on business. Local authority/Passenger Transport Executive representatives believed that hypothecated revenues from road user charging should be available for the local authority to use indefinitely and environmental co-ordinators were concerned that transport grants should not be reduced by the equivalent amount of revenue generated by charging. Stakeholders disagreed about threats to town centre sustainability because of charging. There is a need to develop inter-operable technologies to facilitate compatibility between UK schemes, with links to overall wider government technology, which could

make schemes more operable and less administratively burdensome.

Re-election and party politics were the main political concerns and stakeholders discussed the controversial nature of road user charging, short time frames, election cycles and the advantages of national charging schemes. The majority of stakeholders thought that guidelines for implementation of road user charging from the government are required, but some respondents raised concerns about the possible lack of strategic dimensions to any future government guidelines.

From the analysis above a number of key issues that need to be considered in any future road user charging schemes were identified under each of the sustainability headings, which together form a rudimentary sustainability framework to help facilitate the implementation of schemes (Table 4). Once these schemes are in place they must be monitored, evaluated and modified to adapt to both specific local circumstances and a dynamic transport environment.

The research could be developed in a number of ways, assuming more time and resources were available. The framework needs to be tested, monitored, evaluated and adapted to take account of changes in transport infrastructure and environmental pressures. This process will produce a 'pool of knowledge', which will form the basis of a set of best-practice guidelines for road user charging implementation – although this could take several years. An in-depth study of more local authorities would be likely to produce a better analysis, facilitating the identification of a more robust sustainability framework. Global charging technologies need to be investigated in greater depth to ascertain which work most effectively, and would be most appropriate for the UK. The economic effects of road user charging on business and the impact of road user charging on cities outside London, which do not have such well developed transport systems, need to be investigated further. This research largely presupposed public funding of road user charging schemes, though the current Government's preference for public-private partnerships to fund transport investment suggests this might be a fruitful area for future research.

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Speed Elasticity of Mileage Demand

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Abstract

In the political discussion relating to transportation policy, surprisingly little attention is paid to the increase in distance travelled as a result of improved infrastructure. For passenger transport empirical data indicate that the speed elasticity of mileage demand is approximately 1. This means that the distances travelled increase proportionally to the travel speed. Using elasticity functions that are well known from economics, we derive a general formula to calculate traffic induced by the improvement of infrastructure. The realistic consideration of induced traffic is a precondition for the assessment of environmental effects (fuel consumption and emissions). Acceleration of traffic by improved infrastructure is identified as a major reason for traffic growth. The most efficient means of transportation demand management is to decelerate traffic.

We derive how fuel consumption and emissions are to be calculated for arbitrary numerical values of the speed elasticity.

Keywords

cost-benefit analysis, induced traffic, new traffic, speed elasticity, travel time elasticity.

Introduction

Vast public funds are invested to improve traffic infrastructure. Hence, it might be assumed that the effect of new roads on traffic volume (traffic demand) would be well documented and properly addressed in traffic forecasts and cost/benefit analyses. Unfortunately, this assumption is incorrect. Roads and other projects that improve traffic infrastructure are still evaluated using models that ignore the basic law of supply and demand.

The most important parameter determining the attractiveness of roads and other traffic infrastructure is the speed they permit. The relationship between average speed V and vehicle mileage N is described by the speed elasticity \mathcal{E}_v of mileage demand (negative travel time elasticity \mathcal{E}_t of mileage demand).

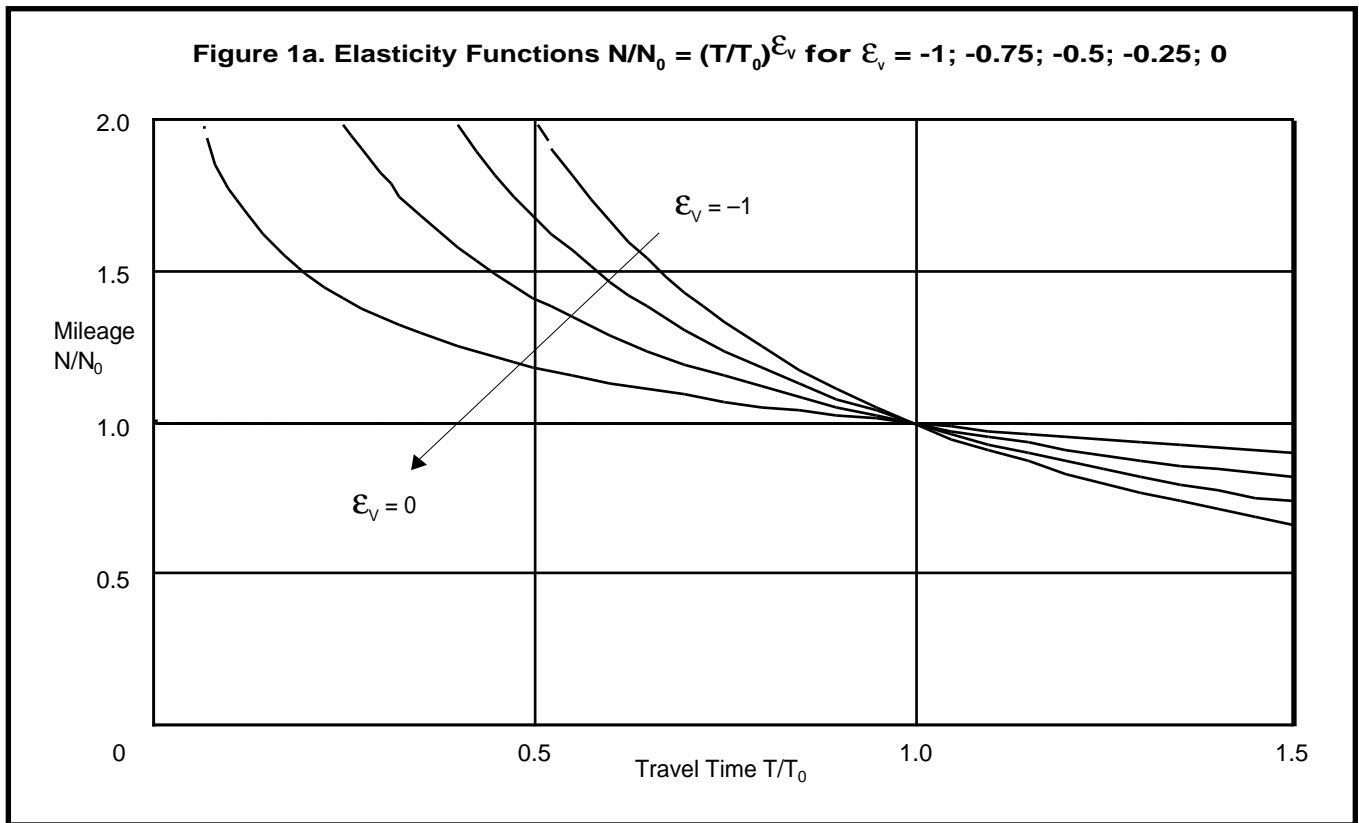
In economics, price elasticities measure the effect of a change in price on the quantity of a good demanded

(demand). Price elasticities, and thus the effects of (fuel) cost on vehicle use, dominate the discussion on transport policy. Price is perceived as the most efficient means to steer transportation demand and modal choice. Price changes considered in such discussions usually are too small to subject voters' travel budgets to monetary restrictions. A possible exception is the London Congestion Charge system which started in February, 2003. This levies a charge of £5 on a fraction of the motorists driving in central London between 7.00 am and 6.30 pm.

Surprisingly little attention is paid to the important speed elasticity of mileage demand \mathcal{E}_v . It has frequently been reported that people tend to budget a fixed amount of time each day for travel (SACTRA, 1994; Goodwin, 1995; Noland, 2003). Improved transport infrastructure that allows for increased travel speed does not result in less time spent travelling. Rather, improved traffic infrastructure yields increased travel distance. A constant travel time budget amounts to $\mathcal{E}_v = 1$.

For $\mathcal{E}_v < 1$, road or other traffic infrastructure allowing for higher travel speed would yield a reduction in the travel time budget. Such a reduction has never been documented. Rather, all available information indicates that for passenger traffic, the speed elasticity of mileage demand is $\mathcal{E}_v \approx 1$.

The speed elasticity component is still widely ignored in models predicting effects from improved transport infrastructure. In this contribution we show that in modelling the effects of improved road infrastructure, the values chosen for the constant \mathcal{E}_v will significantly impact predictions of fuel consumption, emissions, cost/benefit ratio and other effects. Selecting a correct value for the speed elasticity of mileage demand therefore is an important precondition for any proper forecast of the effects of improved traffic infrastructure. Predictions and cost/benefit analyses ignoring the appropriate speed elasticity component are severely deficient and produce erroneous results.



Definition of elasticity

Elasticity is a measure widely used in economics to show the responsiveness of an economic variable to a change in an associated variable (see Gowdy *et al.*, 1995). In a more formal way, an elasticity ϵ_Q is defined as the relative change in demand (consumption of a good) $\Delta D/D$ divided by the relative change of the determinant $\Delta Q/Q$ inducing that change:

$$\epsilon_Q = \frac{(\Delta D/D)}{(\Delta Q/Q)} \quad (1)$$

In economics price is considered the most important determinant (independent variable) for demand (dependent variable). If, for example, a price increase of 2% causes demand to fall by 1% then the price elasticity of demand amounts to $\epsilon_p = -0.5$. Elasticity values are negative, if quantities associated with the demand are negatively correlated to the determinant, they are positive if this correlation is positive.

Typically the determinant Q is the price. But it can also be another quantity specifying the quality of a good. It can also be the reciprocal price.

If the elasticity ϵ_Q is assumed to be constant for each value of Q , then the relationship between determinant Q and demand D is given by:

$$D/D_0 = (Q/Q_0)^{\epsilon_Q} \quad (2)$$

where

D_0 and Q_0 describe the state prior to a measure being instigated (reference state)

Travel time elasticity & speed elasticity of mileage demand

When translating the economic model into transportation science, traffic demand is expressed as mileage N covered, while the travel time T is the determinant. T is the travel time between origin and destination and must not be confused with the travel time budget TB (see below).

Accordingly, from Equation (1):

$$\epsilon_T = \frac{(\Delta N/N)}{(\Delta T/T)} \quad (3)$$

where

ϵ_T is the travel time elasticity of mileage demand.

Instead with the travel time T it is likewise possible to operate with the average speed V and, thus, with the speed elasticity of mileage demand:

$$\epsilon_V = \frac{(\Delta N/N)}{(\Delta V/V)} = -\epsilon_T \quad (4)$$

Accordingly, from Equation (2):

$$N/N_0 = (T/T_0)^{\epsilon_T} \quad (5a)$$

or

$$N/N_0 = (V/V_0)^{\epsilon_V} \quad (5b)$$

Figure 1a illustrates the relationship (5a) for the following values of the travel time elasticity of mileage demand: $\epsilon_T = 0, -0.25, -0.5, -0.75$ and -1 .

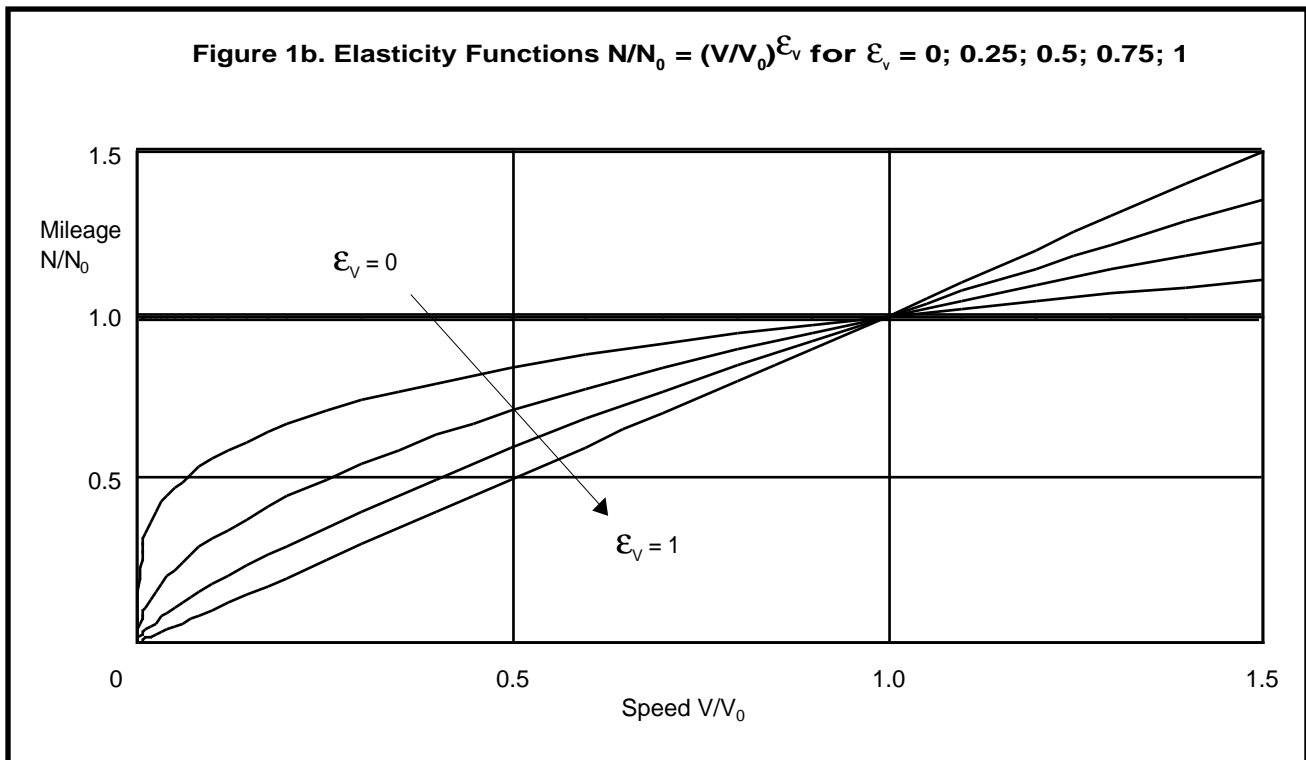


Figure 1b illustrates the relationship (5b) for the following values of the speed elasticity of mileage demand: $\epsilon_v = 0, 0.25, 0.5, 0.75$ and 1.

The functions illustrated in Figure 1a and Figure 1b are reciprocal. Figure 1a corresponds to the usual demand function of economists. Figure 1b has the advantage, that the elasticity has positive numerical values. The important case $\epsilon_v = 1$ is a straight line through the origin.

According to basic theory in economics, a price reduction will induce extra purchase of goods via two effects:

- a) *the income effect* (rate of consumption of the good that has become cheaper increases because a customer can now afford more) and
- b) *the substitution effect* (changes in demand occur as a result of the substitution of a good whose price has not changed by a good that has become cheaper).

Correspondingly, an increase in speed as a result of road improvements can induce extra vehicle mileage through

- a) an increase in mileage within the given mode (additional trips or longer trips) and
- b) by substituting slower modes with the newly available, more rapid mode of transportation (changes in the modal split).

The speed elasticity in this paper only covers case (a), additional or longer journeys. Substitution (modal split) effects are not considered. In terms of induced vehicle mileage, it therefore tends to underestimate the real effects from improved infrastructure.

Paradigms in transportation science

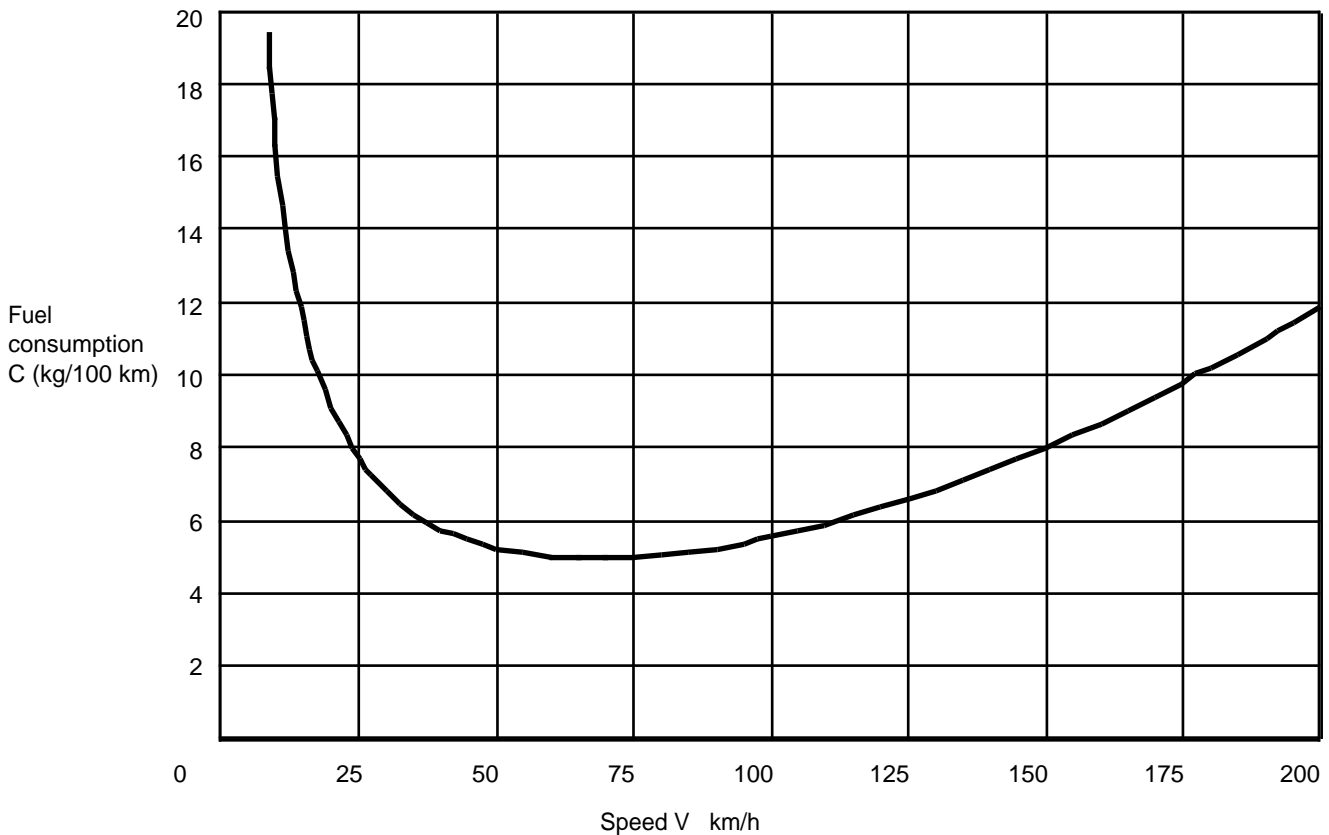
For motorised road traffic, the conservative transportation science assumes that the speed elasticity of mileage demand equals zero ($\epsilon_v = 0$), i.e. improved infrastructure does not induce additional traffic. As a consequence virtually all traffic forecasts relating to major road construction projects in Germany, in particular the German Federal Transportation Plan, have ignored induced traffic. Rather, predictions related to construction projects are based on fixed origin-destination relationships, i.e. relationships that are independent of speed and, thus, travel time.

Ironically, traffic forecasts concerning public transport in Germany generally assume a value of one for the speed elasticity of mileage demand ($\epsilon_v = 1$), i.e. increased speed induces a proportional increase in demand (economists will call this unit-elastic demand). Thus, transportation science supposes that in the case of public transport, doubling of speed will double passenger volume, while in the case of road traffic, higher speed resulting from improved infrastructure is supposed to not affect traffic volume at all ($\epsilon_v = 0$, no elasticity). This discrepancy has never been discussed. The huge impact of speed elasticity on road traffic volume has not been recognised in the scientific literature. Textbooks generally lack a section on the speed elasticity of mileage demand.

Traffic becomes faster, yet we don't save time

For passenger traffic, available data, statements of many transportation experts and common sense indicate that in the long run, $\epsilon_v \approx 1$ (SACTRA, 1994; Goodwin,

Figure 2. Fuel consumption per kilometre ($\epsilon_v = 0$) of a typical motor car (Otto engine)



1995). Before the means for convenient and rapid transportation were invented, people tended to live within 5 km of their place of work. Today it is not unusual for people to commute 50 km each day, but still they spend about the same amount of time commuting. Certainly, the model of a fixed origin-destination relationship is unrealistic. More distance can and will be covered as speed of transportation increases. A tenfold increase in the distance travelled is closely linked to a tenfold increase in travel speed.

As a result of improved traffic infrastructure, travellers will initially save time. However, time savings sooner or later are reinvested into the transportation system. Goodwin (1981) states: 'If there is a constant time budget,¹ then any increase in speed will generate exactly that amount of extra travel which ... will use up all the initial time saving on extra travel. Therefore, on average travellers have saved no time'. Thus, the value of the speed elasticity of mileage demand $\epsilon_v = 1$.

A simple calculation illustrates that the assumption $\epsilon_v = 0$ does not correspond to past development. Over the past century, average travel speed has approximately increased by a factor of 10. Associated time savings can be calculated as:

¹ It would be more accurate if 'constant time budget' were replaced by 'speed independent time budget'.

$$TB/TB_0 = \frac{(N/N_0)}{(V/V_0)} \tag{6}$$

From Equation (5b) we get:

$$TB/TB_0 = (V/V_0)^{\epsilon_v - 1} \tag{7}$$

where

TB_0 is the travel time budget (time spent in traffic) at the beginning of the 20th century,

TB is the travel time budget (time spent in traffic) today,

V_0 is the average speed at the beginning of the 20th century,

V is the average speed today,

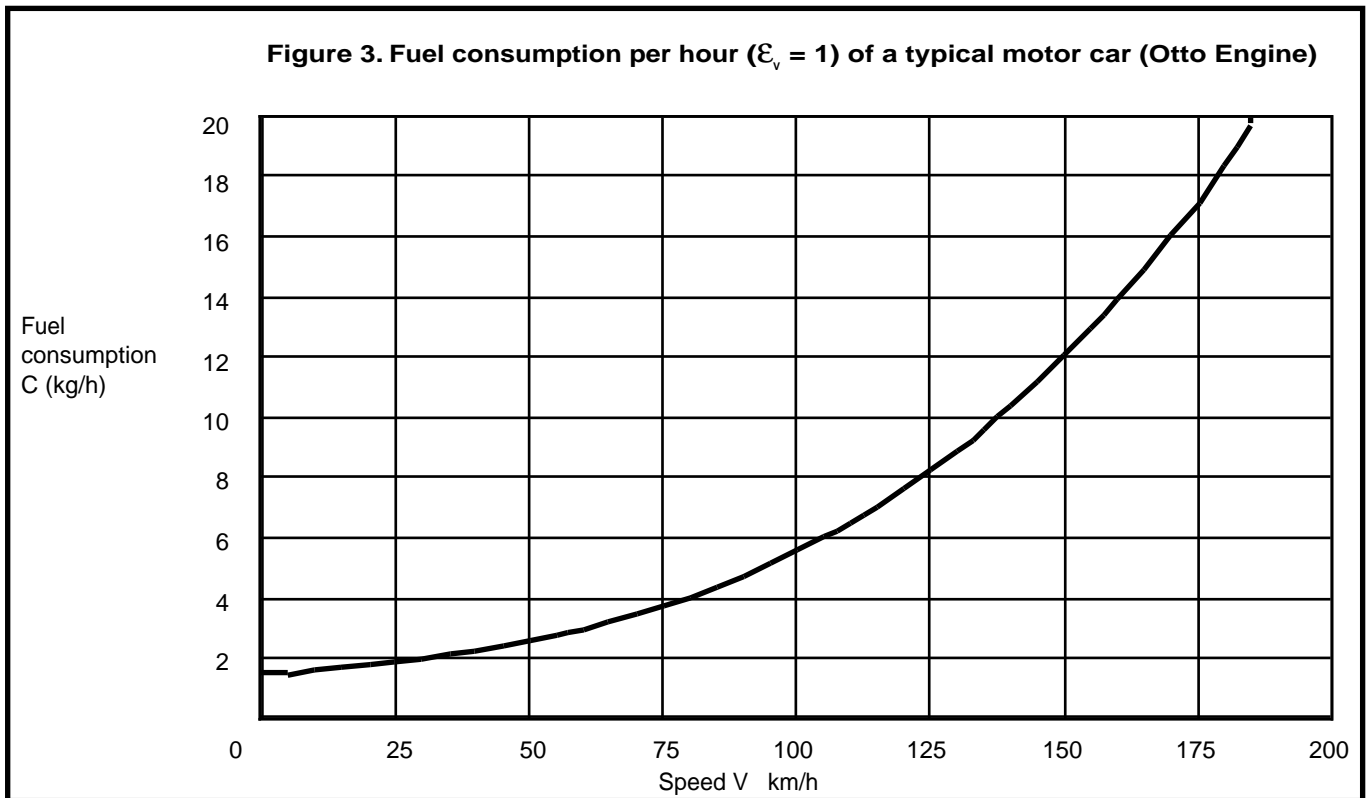
N_0 is the mileage (distance covered) at the beginning of the 20th century, and

N is the mileage (distance covered) today.

Given that in Equation (7), $V/V_0 = 10$ and $\epsilon_v = 0$ this implies that

$$TB/TB_0 = 10^{\epsilon_v - 1} \tag{8}$$

It can be assumed that at the turn of 19th century workers typically allocated $TB_0 = 60$ minutes to travelling each day. Assuming $\epsilon_v = 0$ in Equation (8) this implies that today's journey length would average just $TB = 6$ minutes allocated to transportation



each day. This simple calculation shows, that setting the speed elasticity of mileage demand $\epsilon_v = 0$ is simply absurd. Values in the order of $\epsilon_v = 0.75$ have been published (Thomson 1974). According to (7) this would yield a present value of $TB = 34$ minutes allocated to commuting each day. A more realistic value, but still a gross underestimate.

Time allocated to travelling has increased during the past decades. According to Goodwin (1995) between 1952 and 1992 the average time spent travelling has increased from 49 minutes to 63 minutes per day. It is not known to what extent this is a result of increased leisure time or whether this means that the speed elasticity of mileage demand $\epsilon_v > 1$. We conservatively assume, that this significant increase (28.57%) in the travel time budget results from the increased leisure time and not from improved infrastructure and thus, rather ironically and counter-intuitively, from the increased speed (improved traffic infrastructure).

Fuel Consumption as a Function of Speed

According to FGSV (1997) the fuel consumption per distance C_d of a typical car (Otto) engine as a function of travel speed V is

$$C_d = c_0 + c_1V^2 + c_2/V \tag{9}$$

with

- $c_0 = 17.8 \text{ g/km}$;
- $c_1 = 0.00236 \text{ g/h}^2/\text{km}^3$;
- $c_2 = 1462 \text{ g/h}$

Figure 2 illustrates this function. Consumption is

lowest at about 70 kmh. At higher or lower speeds fuel consumption increases. There are similar functions to describe emissions. It is frequently concluded from this diagram that low speeds have to be avoided (after all, consumption is infinite at $V = 0$) and that congestion has to be eliminated, because it causes a waste of fuel and contributes to environmental pollution.

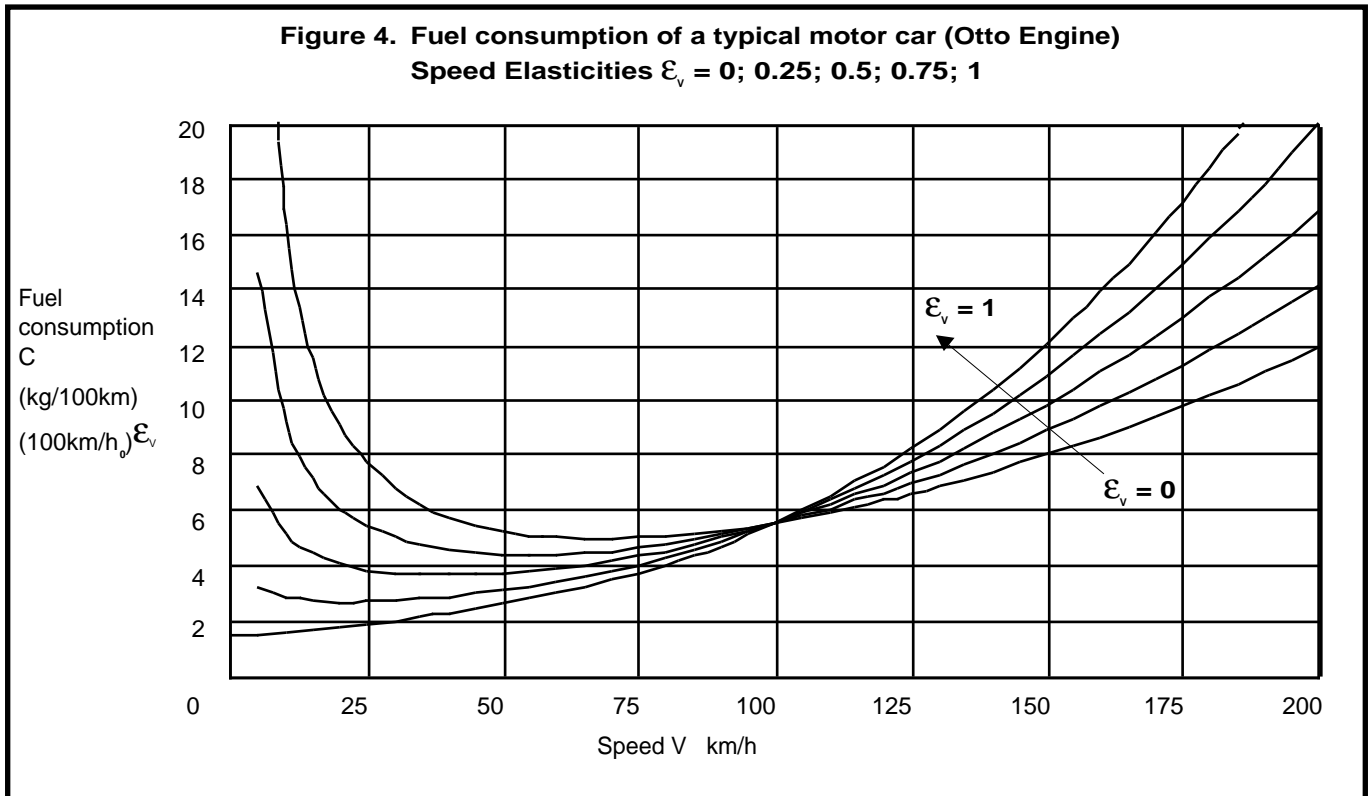
This commonly used diagram is flawed in several respects, including the basic framing of the diagram which does not allow for the speed elasticity of mileage demand to be considered, i.e. measuring consumption relative to a fixed distance intrinsically assumes $\epsilon_v = 0$. As illustrated in the previous section speed strongly influences the mileage travelled. Motorists increase their mileage as travel speed increases. Therefore, more appropriate traffic forecasts would have to be based on the fuel consumption per time C_t . This function is derived from (9) by multiplication with the speed V .

$$C_1 = C_dV = c_0V + c_1V^3 + c_2 \tag{10}$$

Figure 3 illustrates this function.

In Figure 3 fuel consumption is lowest at a travel speed of 0 kmh. Any acceleration of traffic increases fuel consumption – even at low speeds. The effects of increases and decreases in traffic speed on fuel consumption are greatest at higher speeds.

Figure 2 is based on the unrealistic assumption of a constant origin-destination relationship. The speed elasticity $\epsilon_v = 0$. Figure 3 is based on the more realistic assumption of a constant (speed independent) travel



time budget. The speed elasticity $\epsilon_v = 1$. Time related measures are more appropriate than distance related measures to link travel speed V to fuel consumption C and thus pollution.

Using the parameter ϵ_v allows for the interpolation of the functions (9) and (10) yielding the 'general' consumption C (without suffix). Equation (11) is derived from (9) by multiplying it by the travel speed raised to the power of the speed elasticity of mileage demand, V^{ϵ_v} .

$$C = C_d V^{\epsilon_v} = c_0 V^{\epsilon_v} + c_1 (V^{\epsilon_v})^2 + c_2 / V^{\epsilon_v} \quad (11)$$

Figure 4 illustrates this function for $\epsilon_v = 0, 0.25, 0.5, 0.75$ and 1 . $\epsilon_v = 0$ is the special case already illustrated in Figure 2; $\epsilon_v = 1$ is the special case already illustrated in Figure 3.

Apparently fuel consumption functions differ largely depending on the value chosen for the speed elasticity of mileage demand ϵ_v . If, for example, speed is increased from 25 kmh to 75 kmh as the result of a road construction project, then fuel consumption will drop significantly if the speed elasticity of mileage demand is assumed to be $\epsilon_v = 0$. However, if the speed elasticity of mileage demand is set at $\epsilon_v = 1$ (which is closer to reality) then fuel consumption will increase significantly. Depending on the value chosen for the speed elasticity of mileage demand, a traffic forecast and the resulting cost-benefit analysis can produce opposite results when evaluating a project.

Speed elasticity in discussions on traffic policy

There is a vast amount of empirical data indicating

that new roads generate new traffic and that, conversely, traffic vanishes when road capacity is reduced (SACTRA, 1994; Purnell *et al.*, 1999; Schneider *et al.*, 2002). However, such observations have not been placed into an appropriate context. The speed elasticity of mileage demand provides such a conceptual framework that allows one to forecast responses in traffic volume as a result of changes in traffic infrastructure.

According to Morris (1977) transportation demand reacts elastically to infrastructure supply and quality: "There is a clear relationship between the capacity of a system and the demand for the use of that system – capacity controls demand. Predictions of flood tides of vehicles overwhelming a road system do not, in ordinary circumstances, come true." Morris (1977) concludes: "Further, it should be seen that new highways in major urban areas often tend to be self-defeating. Rather than alleviate congestion and help to bring more people into the centre city, they generally work in a reverse manner: The new roads generate new trips, most of which will be oriented away from the concentrated centre, toward the periphery, and thereby contribute to the sprawl that threatens the centre city's vitality." Morris' important contribution seems to have been forgotten and there is as yet no model in use which allows one to calculate or even consider the effects he describes.

The SACTRA (1994) report specifically addresses traffic induced by improved road infrastructure. Short-term travel time elasticity of mileage demand is estimated at about $\epsilon_T = -0.5$, while it is suggested that

long-term elasticity is in the order of $\epsilon_T = -1.0$. These estimates represent the current state of transportation science.

A number of surveys on transportation elasticities and induced traffic have been published more recently (e.g. Jong *et al.*, 2001; Noland, 2002; VTPI, 2003). Most papers address price elasticities, however some also address time elasticities. Many findings agree roughly with the figures given above. But the data are neither discussed nor compared with each other or placed in a context that would allow for a general and plausible explanation.

Schneider *et al.* (2002) concluded that the frequently repeated statements about the negative ecological and economic effects of congestion issued by the road construction pressure groups are wrong, but they fail to provide an explanation for such erroneous statements.

For the revised German Federal Transportation Plan, average speed elasticity of mileage demand is set at $\epsilon_V \approx 0.077$ for car traffic. Or more accurately: for 7.7% of the traffic (mainly recreational purposes) it is set at $\epsilon_V = 1$, while for 92.3% of the traffic it is set at $\epsilon_V = 0$. For freight traffic the speed elasticity of mileage demand is set at $\epsilon_V = 0$. No reference to empirical findings and thus no justification for the use of these constants is provided (STASA, 2000).

Conclusion

While research is still needed to establish a robust speed elasticity of mileage demand for freight traffic, the impact of speed on average car mileage (passenger traffic) has been sufficiently investigated. However, available findings and results are not being used in cost-benefit analysis to more accurately predict the effects of road construction. Whoever assumes $\epsilon_V < 1$ in traffic forecasts that are related to infrastructure improvements should explain, why the time allocated to transportation has not steadily decreased over the past decades, but has increased instead.

In a society that considers unlimited travel as a basic freedom the political sensitivity of measures that would restrict travel frequency or distance is obvious. Therefore measures aimed at reducing traffic demand (frequency and average distance of trips), are peripheral in discussions on transport policy. However, political correctness does not justify the neglect of key factors in predictive models on the (environmental) effects of improved traffic infrastructure.

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Gender equality & transport policy in Sweden

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Abstract

In 2001, the Swedish parliament made gender equality a goal of transport policy. The aim of this paper is to evaluate the effects of this process. The results show that, in general, policy documents simply equate gender equality with women, and measures for attaining more gender equality with public transport. This suggests that without both conceptual and structural changes, gender mainstreaming is an ineffectual strategy for promoting gender equality in the transportation sector in Sweden.

Keywords

gender mainstreaming, gender equality, transport policy

Introduction

Gender mainstreaming has become the strategy of choice for attaining more gender-equal societies, internationally within the United Nations, as well as within the European Union. The transportation sector is no exception to this development. In 2001, the Swedish government made gender equality the sixth goal of transport policy (Proposition 2001/02:20). In this context, the question regarding the efficacy of this strategy for attaining a more gender-equal transportation system arises. The aim of this paper is to answer this question by evaluating how policy makers have applied gender equality in Swedish transport policy documents. The analysis outlines how policy makers defined their use of gender equality and it traces the path of gender equality in the transportation sector from 1997 through 2002. It concludes with a discussion of the efficacy of gender mainstreaming as a political strategy for attaining a more gender-equal transportation system.

Conceptual framework & analytical approach

Before beginning, it is important to understand the contours of the gender equality debate. What is it that is being integrated into transport policy? Gender refers to socially constructed differences between women and men, but is not limited to sex. It also works through and within other social categories such as age, education, social group, and ethnicity. Specific examples are found in traditional stereotypes surrounding definitions of masculinity and femininity as well as in the roles women and men have in the home, in how the

media portrays women and men, in who does what jobs, and in who holds power in the private and public sectors. Gender is used as an analytical tool to study how different social factors and processes such as individual behaviour, structural organisation, and the meanings and symbols manifest in everyday life, result in the subordination of women or men.

What then is gender mainstreaming? It is 'efforts to scrutinise and reinvent processes of policy formation and implementation across all issue areas to address and rectify persistent and emerging disparities between men and women' (True & Mintrom, 2001, 28). In the Swedish context, gender mainstreaming translates literally as 'gender equality integration' and occurs within the well-developed political tradition surrounding gender equality legislation. The most recently formulated goals for gender equality include social structures and institutions that enable both women and men to successfully attain economic independence, individual fulfilment and security, and where both women and men have freedom from gender-based power structures, sexual violence, and discrimination based on sex (Skrivelse 1999/2000:24, 6).

Given this breadth, a gender analysis of transport policy must consequently encompass many different processes and factors. To do this, the present study includes three analytical areas:

- the individual,
- the structural, and
- the symbolic.

On the individual level, the focus is upon how differences in women and men's behaviour, in mobility patterns and in attitudes and values towards transportation technologies, the environment, and safety, are included in the documents. This is an important area of analysis given the differences in travel patterns and attitudes that have been shown in research dealing with travel issues (Polk, 2003). On the next level, structural characteristics of organisation such as gender-segregated occupations, and women and men's participation and influence in decision-making, planning, and policy are the focus. Given that the transportation sector is a male dominated realm, it is important to query why this is the case, what influence this has on attaining a more

Table 1. Integrating gender equality in transport policy & planning in Sweden – a chronology

Year	Steps in applying a gender perspective to transport policy	Government Publications (Swedish titles)
November 1994	All governmental committees must show the consequences of their proposals on gender equality.	Dir. 1994:124 Direktiv till samtliga kommittéer.
March 1997	A chapter on gender equality is included in the background report that deals with the development of transport policy in Sweden.	SOU 1997:35 Ny kurs i Trafikpolitiken. Slutbetänkande av Kommunikationskommittén.
March 1998	The government proposes a council to investigate the connections between gender equality and transportation (Jämit).	Prop. 1997/98:56 Transportpolitik för en hållbar utveckling. Regeringens Proposition.
October 1999	The Gender Equality Council on transportation (and IT) is established. Its main tasks are to collect background information, suggest measures that would increase gender equality, and outline possible ways of financing its suggestions.	Dir. 1999:83 Kommittédirektiv: Rådet för jämställdhetsfrågor som rör transport- och IT-tjänster.
June 2001	The Gender Equality Council on transportation and IT presents its final report.	SOU 2001:44 Jämställdhet – transporter och IT. Slutbetänkande från Jämit – Jämställdhetsrådet för transporter och IT.
October 2001	A parliamentary decision adds gender equality as the sixth goal of transport policy.	Prop. 2001/02:20 Infrastruktur för ett långsiktigt hållbart transportsystem.
December 2001	A governmental directive requires that the committee for public transportation work from a perspective of gender equality, following the results of the Jämit report. It presents its preliminary report.	SOU 2001:106 Kollektivtrafik med människan i centrum. Delbetänkande från Kollektivtrafikkommittén.
January 2002	The preliminary report for Stockholm region's transport planning is presented following the latest proposition with gender equality as the sixth goal.	SOU 2002:11 Långsiktiga utvecklingsstrategier för transportsystemet i Stockholm – Mälardalsregionen. Delbetänkande av Stockholmsberedningen.

All of the above texts are available at <http://www.regeringen.se>.

gender-equal transportation system, and how this situation can change. The symbolic level overlaps the other two by focusing on the gendered meanings connected to individual behaviour, as well as on how gender-based power relationships have influenced what is considered appropriate for women and men within the sector. Do meanings and values connected to concepts such as freedom, status, power, and control over technology influence women and men's various roles within the transportation sector? Are transportation technologies gendered male or female? Do the policy documents address such questions?

Early mainstreaming efforts

The first use of gender equality in transport policy occurred in the 1997 committee proposal for Swedish national transport policy entitled *A new course in transport policy* (SOU 1997:35). The goal of integrating gender equality follows the guidelines of 1996 gender equality legislation as 'equal rights, responsibilities, and possibilities within all areas of life' (Skrivelse 1996/97:41). The topic that receives the most emphasis in the 1997 document is travel patterns. The report presents the differences in women and men's travel patterns and explains them by stating that differences in travel patterns mirror women and men's different

social roles, and that women work predominantly within certain occupations (care and office related) that demand fewer business trips, earn less money, work shorter hours, and have more responsibility in the home (SOU 1997:35). The report also states that 'women have greater responsibility for the household, which means that they work closer to home' (SOU 1997:35, 444). Unfortunately, background factors such as hours worked per week and the presence of children have no correlation with gender differences in travel patterns (Krantz, 2000; Polk, 1998). Stereotypical gender roles do not explain differences in women and men's travel patterns, as this report suggests.

The second largest section in this report deals with decision-making and planning. The report notes the representation of women as being low within the entire sector, but especially with regard to leadership roles within public transport, and traffic planning. There is no explanation given for this male dominance. An increase of women in the transportation sector appears as a way to attain better environmental policy, since women have more environmentally benign travel patterns and are more environmentally concerned. Solutions to attaining a more gender-equal transportation system include measures that improve

public transport, bike and pedestrian traffic, access of handicapped individuals, better planning and more research. Though only cursorily mentioned, the authors also note that women's travel patterns are more favourable for adaptation to a more sustainable transportation system.

Overall, the 1997 document is a good first start at integrating gender equality in transport policy. Many important issues are noted, albeit briefly. More in-depth discussions occur regarding differences in travel patterns and representation where the emphasis is on quantifiable differences between women and men. However, explanations for these differences are either ignored or incorrect. From the very beginning of this mainstreaming process a recurring problem is oversimplification, namely that 'gender equality' often equals 'women' and nothing more.

Following the above background report, in March 1998 the government proposed the establishment of a Gender Equality Council to investigate the connections between gender equality and the communication sector (Proposition 1997/98:56). The topics to be covered were physical planning, traffic planning, strategies for the environment, safety and the use of transportation technologies, as well as competence and recruiting within the sector. The report resulting from this council, *Gender equality – transportation and IT*, is thus far the most thorough application of gender equality in transport policy (SOU 2001:44).

The topics that receive the most attention on the individual level are travel patterns and attitudes towards transportation modes. This report brings up three main points regarding women and men's attitudes towards transportation. First, women were more positive to public transport (SOU 2001:44, 47). Second, women's travel patterns are more environmental (*ibid.*). Third, the car is more connected to masculine identity than it is to a feminine one (*ibid.*). Outside of these points, evaluative aspects receive minimal attention. 'Women and men's values' is a phrase that is repeated throughout the entire report, but it is never defined nor discussed in depth.

The areas that have been most thoroughly covered in this report deal with the structural level of analysis such as decision-making and planning processes within the state, municipalities, counties and the private sector. Here governmental responsibility includes how socio-economic modelling, public bidding, and political representation and decision-making in all of the various parts of the sector, including those outside of the political realm such as business interests, could best implement or even enforce gender equality (*ibid.*, 67). Some of the suggestions given include the gender equality labelling of products and services, and the use of public bidding

Table 2. Sweden's transport policy goals

accessibility	a good environment
effectivity	regional development
safety	gender equality

to promote specific social goals (*ibid.*, 66). Besides the addition of gender equality as a sixth policy goal, this report also proposes the establishment of a new governmental authority to deal specifically with gender equality (*ibid.*, 7). Other proposals include setting up specific target goals for transport policy in general and for security and safety issues in particular, and fiats whereby concerned authorities would draw up action plans that outline how to integrate gender equality into the urban planning process (*ibid.*).

Overall, the Gender Equality Council report presents a very thorough analysis regarding both individual behaviour and decision-making and representation on the structural level. The report defines gender equality in a very encompassing fashion. However, discussions of the reasons that underlie how and why gender has had and still has such an influence in the transportation sector both with regard to behaviour and representation is lacking. This may also explain why the report gives so little attention to the evaluative and symbolic level of gender analysis, to what cars, movement and mobility mean to women and men and to Swedish society in general, for it is here that such issues arise.

Efforts to apply the sixth goal

A gender-equal transportation is defined as 'one where both women's and men's travel needs are satisfied; where women and men have similar influence upon the design, formation and administration of the transportation system; and where women's and men's values receive equal consideration' (Proposition 2001/02:20). Has gender mainstreaming led to the attainment of this goal? To answer this question, I will discuss two additional committee reports.

The first example of a report completed after the sixth goal, *Public transportation with people in focus*, was published in December 2001 (SOU 2001:106). In it the government specifically requested that they base their work on the results of the Gender Equality Council report. This report does note that public transport can play a key role in attaining an equal as well as a gender-equal transportation system, (*ibid.*, 10). However, it still integrates women rather superficially into its long-term vision for public transport (*ibid.*). Gender equality is once again used to predominantly discuss travel behaviour and representation. 'Women' is used to represent 'gender equality', and 'gender equality' is equated with public

transport, suggesting that improving public transport equals a more gender-equal transportation system and society. There is one problem with this line of reasoning. Isn't public transport often experienced as being inferior to car use because it is more time consuming and inconvenient? As far as safety and the complexity of trips is concerned, the private car is more flexible and reduces waiting at bus stops after dark and walking home alone through pedestrian tunnels. The car could thus represent a way of increasing women's mobility and feelings of security, instead of public transport as noted in the point raised above. An increase in women's car use is not suggested in any of the documents as a way to increase gender equality.

The Public Transportation report also notes gender equality in the section on goal formulations. It sees the goal of gender equality as part of a basic societal goal. As a shared good, public transport should fulfil the needs of as many members of the population as possible (*ibid.*, 48). In relation to this, the report also mentions that women are under-represented in the planning and decision-making processes within public transport. Since women are a majority of users, women need equal representation in order to incorporate 'women's values' into public transport facilities (*ibid.*, 51). The report's vision for the future notes that more women should work within public transport, and public transport should contribute to more growth, equality, gender equality, and justice (*ibid.*, 59, 61). Exactly how this can be achieved is not addressed.

The second example of a report after the sixth goal, *Long-term Development Strategy for the Transportation System in the Stockholm Region*, was published in January 2002 (SOU 2002:11). I will refer to it as the Stockholm Committee report. The main mandate of this report is to increase the capacity and efficiency of rail, road, and air traffic (including public transport) in the Stockholm region, reduce the negative impacts of car use, and improve transportation for the establishment of more residential and work areas in the region. The report notes gender equality as a goal of transport planning.

One finds a clear discrepancy between the level of analysis that the Gender Equality report presents and that contained in this report. Even though this committee was advised to follow the results of the Gender Equality report, this does not happen. 'Gender equality' appears in approximately 4 places in the 76-pages. The report notes the sixth goal in the introduction. It also mentions women as being over-represented among public transport users, along with children, young people, and the elderly (*ibid.*, 75). In the section dealing with attaining the goals of transport policy, gender equality – with the term 'gender' conspicuously referring to 'women' – receives one sentence: 'Public transport is good from a gender

perspective since women use public transport more than men, and it also increases access and mobility for young people and the elderly who have less access to cars' (*ibid.*, 44). Overall, the Stockholm Committee report refers to gender equality by noting that it increases with better public transport. This report has not incorporated the results of the Gender Equality Council's report, even though it was clearly stated as being part of the task at hand in the committee directive (Dir. 2000:96).

Many questions can be raised that deal specifically with Stockholm and the unique impact gender might have on transportation issues in that area. Such topics were not covered. For example, it would be interesting to see if the differences in women and men's travel patterns are the same in Stockholm as they are on the national level. Are they perhaps more, or less? Are men more positive to subways than they are to other forms of public transport such as trams, or commuter trains? Given the significant congestion in and around the Stockholm area, do women and men have similar attitudes towards increasing the capacity of the road system? As can be seen from the examples given here, there is not a large difference in how gender equality is dealt with after the establishment of the sixth goal. While there is an increase in the number of times women and gender equality are mentioned in the documents (see SOU:2001:106), there is no increase in the scope or depth of the analysis.

Discussion

The results above show that gender mainstreaming is thus far not an overly successful political strategy for attaining a more gender-equal transportation system in Sweden. This raises a number of interesting questions. First, why has the integration of gender equality followed the trajectory outlined above instead of a more progressive, efficacious path? One can also wonder why the results of the Gender Equality Council's report have not had more of an impact on subsequent policy work in the sector. Has a lack of interest from policy makers created this failure? Finally, how do we induce change; what types of new approaches would result in a more gender-equal transportation system?

The answers to these questions lie in a number of factors, both analytical and structural. The first reason for the failure of gender mainstreaming is the inefficient use of gender as an analytical tool. The simplified use of gender equality does not address the issues at hand, and furthermore frames the problem in an inaccurate and misleading way. If gender mainstreaming is not inclusive of a sufficient definition of gender, it cannot result in an efficient strategy for change. Because gender equality is an analytical tool that subsumes a broad theoretical framework, it is a

problematic area for policy implementation in and of itself. Policy goals by definition must be measurable and thereby quantifiable. Gender equality does not fit into such confines. As outlined briefly above, gender inundates almost every corner of social life. It is part of the core of how social relations are organised and constructed. Gender is visible, in the inequalities that exist between women and men. It is also invisible because it so inundates the fabric of social relations that it becomes undetectable, making it a challenge to apply to any sector.

A second reason for the failure of gender mainstreaming is structural barriers. Such barriers include seeing men as the norm, as fulfilling the role of experts and decision makers, and as the primary and/or prototype users. Such structural barriers may explain why the work done by the Gender Equality Council in 2001 has had such a limited impact thus far in policy documents. Given the over-representation of men in the sector and the difficulties surrounding how policy makers apply gender equality, it is understandable that a complicated issue which demands another type of engagement is ignored or dealt with cursorily. Policy makers are dealing with five other transport policy goals on an already limited time-frame. Within such a context, there is little or no place for reformulations of issues that policy-makers feel they have already solved within other frames of

references such as safety, accessibility and cost efficiency. Consequently, there is no consensus regarding what a gender-equal transportation system is composed of, and no strategy for attaining such consensus. The few attempts by governmental agencies have thus far proved themselves very inadequate.

To attain success, it is vital that the work done regarding gender equality embrace a more analytical definition of gender that is used to formulate concrete guidelines and methods for dealing with gender equality. One such guideline must include a clear definition of what a gender-equal transportation system entails in practice, and furthermore motivate why this is necessary. Change can only occur by engaging and motivating planners and decision-makers that gender equality is an important issue which warrants attention. More research on topics regarding the travel needs of women and men, the gendered meanings embedded in transport technologies, experiences and road system preferences, and attitudes towards environmental impact can help create a framework for such guidelines and methods. However, research is not enough. There must also be concrete structural changes in the transportation sector that result in both equal representation in decision-making and planning processes, and in concrete ways to ensure the integration of women's values and experiences in all levels of policy, planning and implementation.

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Petroleum culture *versus* Earth living – The fallacy of the technofix

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Abstract

In this essay, the author discusses our dependence on oil – even if we become fossil-fuel ‘independent’; the many technofixes being offered are just as oil-dependent. We are deluding ourselves if we think we can use technology to stem the forthcoming ecological crisis.

Keywords

Petroleum, sustainability, transport, future generations, technology.

Introduction

We may contemplate the stubbornness of the polluting habits of consumers and snarl at the motives of leaders of ecological destruction. But our exasperation is rarely vented, because of the pointlessness of having to oppose almost every member of society. There seems to be no chance of a peaceful mass crusade, let alone a civil war, when everyone is participating as the enemy.

‘No one wins/It’s a war of man,’ sang Neil Young. And, as the Pogo cartoon by Walt Kelly revealed, ‘We have met the enemy and he is us.’¹

Some of us are trying to live petroleum-free, but it’s almost impossible unless we cut ourselves off from modern products and forms of communication. Yet, the movement to ‘get back to the land’ which popped up in the late 1960s is still alive and well. The technical means of doing so, ironically, is improving constantly – wireless internet and all that jazz.

With each generation’s increased self-removal from Earth-based living (relying on manual methods and do-it-yourself/mutual-assistance survival), transitioning to sustainability is more doubtful. Cell phones in the countryside and newer trucks made with computer components – that can’t be repaired – don’t help us in the long run. Bring back the work animals, as long as they are well treated.

¹ This shows 2 anthropomorphic characters walking in a wood; one complains about his sore feet from walking on rubbish and remarks that ‘We have met the enemy and he is us’. It can be seen in various places on the internet; search for “whmte.jpg”.³

Personal cost of petroleum culture

Petroleum culture has a high personal cost beyond the health aspects. Along with the go-go-go pace of using cheap energy and going long distances so fast, the connection between loved ones diminishes. ‘I-me-mine’ is convenient and habit forming when everything one appears to need is available from petroleum products or products/services facilitated by petroleum. Alienation between family members, partners or best friends is a terribly common condition traceable to one’s not feeling the need for close co-operation and support. When a person has his or her own ‘pile’ there is little need, apparently, for love, loyalty, devotion or time with family.

There are two kinds of consumers participating in ‘petroleum living’: the unconscious and the deliberate. Or, the willing and the murderous – if we agree that driving species to extinction and warming the climate ought to be serious crimes. The unconscious/willing petroleum consumers burn and spill petroleum at lower levels than the deliberate and ‘murderous’. After the ‘shock and awe’ of destruction of Iraq, directed at seizing oil and keeping the US dollar as the international currency of choice, does an oil user deserve the war-criminal label when we consider thousands of civilian casualties and deformed babies on both sides?

There is much to do... no end of reforms and efficiencies to employ. A huge stack of Worldwatch Institute policy-options would be marvellous to be acted on by governments. But, regardless of the inaction on deliberate energy waste and pollution – which feeds the fat cats – fundamental change now approaches us all. It will hit us at the top of the Richter scale due to our cultural shortsightedness.

Today rail-shipped goods use one-eighth of the energy trucks use, but it is too late to remake the transportation system before it collapses from fiscal pressures and the lack of abundant oil – at low prices – within a few years perhaps.

Renewable energy’s shortcomings

The renewable energy technofix camp thinks of itself as beyond petroleum. If one includes their

passive supporters, it is huge. It has its beneficiaries and enforcers. Those who question the renewable energy utopia are marginalised or dismissed as belonging to the George W Bush camp of fossil fools. The credulity of the technofixer can be typified in statements by the popular visionary, Saint Bucky:

'We are blessed with technology that would be indescribable to our forefathers. We have the wherewithal, the know-it-all, to feed everybody, clothe everybody, give every human on earth a chance [without damaging the integrity of the planet]' – R. Buckminster Fuller.²

Fuller is ultimately old fashioned, and fails at transforming the techno-man in us into a hero. And, how many billions of humans is 'everybody?' Fullerism may be so technofreaky that a new age of sustainability must do without this out-of-date vision. Fuller's famous 'trim tab factor' that compares a massive freighter's mini-rudder effect to a subtle influence within a social movement is clever and hopeful, but may be just techno-religion at work. We don't need to think in terms of huge freighters forever linking bioregions that don't need each other's invasive species.

This is not to say that e-mail and websites don't help spread the word on peaceful resistance to the war machine (a.k.a. U.S. Society). But when environmental activists say they love e-mail and the web, some of us question whether they know what they are really up against as defenders of the Earth. Are they unaware of the embedded energy in their high tech gadgetry, of the 10,000 litres of deionised water needed to manufacture the silicon chip in a computer, of the rare metals – such as Tantalum – used to make capacitors for their communication equipment? The ongoing civil war in the Democratic Republic of Congo is being fought in part for the country's reserves of Tantalum.³

One paradox in the renewable energy dream-world as manifested thus far is that it is so petroleum-dependent. The embedded energy in the manufactured 'solar' gadgets, their petroleum-plastic content, and their transport constitute one example of petroleum's serious role in 'renewable energy'. Another example is the petroleum content of cars and their infrastructure – even if the cars run on biodiesel or solar-charged batteries: asphalt pavement (tarmac) is mostly the dregs of oil refining. Tires were formerly from rubber plantations, but since the early 1970s are mostly

petroleum. Most of the car's pollution comes not out of the tailpipe, but from the manufacturing and mining process 'upstream'.⁴

The Worldwatch Institute has a careful function to fulfil, walking a fine line between accusing and cajoling polluters who are bringing the curtain down on life. But, as we support the contribution of organisations that measure the decline in our life support system, we must guard against mere 'symptomology' – studying the problem. In collaboration with the UN Environment Programme, Worldwatch's *Vital Signs 2003* paperback says 'the benefits of a growing global economy are still not reaching billions of people'.⁵ Does Worldwatch really expect that 'benefit' could happen, when the staffers there know that the growing economy is harming billions of people and the web of life?

Overpopulation & petroleum

The issue is not so much what form of technology is more terrible, but how many people are engaging in the technologies. There appears to be very little thought given to how large a population size is sustainable with a renewable-energy economy. Petroleum is fast dwindling.⁶ The funded environmental movement has no accountability while it is paid to tout the renewable-energy technofix. Hypocritically, many of the professionals involved admit privately that there is no chance of a huge 'green consumer economy' lasting beyond the upcoming loss of abundant petroleum. Very few funded environmentalists want to rock their own boat by using their funders' stock-market earnings to tell the public unpleasant truths about economic growth, carrying capacity, and entropy. So, the party goes on 'forever', and enviros in suits live alright today on a burning, dying planet.

The world's huge overpopulation is the controlling factor. Agricultural dependency on petroleum and oil-fueled vehicular distribution of food means that soon there may not be as many consumers surviving for the anticipated green economy. In that sense, renewable energy *will* take over, but only as far as serving the small population that may survive and thrive in locally-based bioregional economies.

Until we resume petroleum-free living, we will have to heed Neil Young's lyric, 'The same thing that makes you live can kill you in the end.'

² Fuller, R.B. (1980) *Humanity's Option For Success* Buckminster Fuller Institute <http://www.bfi.org/option.htm>

³ See United Nations (2001) *Report of the Panel of Experts on the Illegal Exploitation of Natural Resources and Other Forms of Wealth of the Democratic Republic of the Congo* United Nations, New York <http://www.un.org/News/dh/latest/drcongo.htm>

⁴ See Whitelegg, J. (n.d.) 'Dirty from Cradle to Grave' <http://www.eco-logica.co.uk/DirtyfromCradletoGrave.pdf>

⁵ Worldwatch Institute (2003) *Vital Signs 2003* W.W. Norton & Company, New York, NY.

⁶ See related articles at <http://www.culturechange.org> and to learn about the imminent global peak in oil extraction, see <http://www.peakoil.net/>

Conclusion

Earth living can be called a mix of current know-how or enlightenment combined with the wisdom and experience of the millions of years' successful evolution in harmony with nature. Here are some links toward understanding the requirements of living and sensible 'development':

<http://www.citizen-planners.org/ecocitybuilders>

<http://www.permacultureactivist.net>

<http://www.culturechange.org/links.html>

See our alternative energy webpages

http://www.culturechange.org/alt_energy.htm

Acknowledgement

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The moors and landmarks in and around Wycoller Country Park in Lancashire feature in the Brontë sisters' novels.

Except for residents and disabled visitors, cars are excluded from Wycoller village which has many preserved buildings. The place has a rare feeling of tranquillity.

The twin-arched pack-horse bridge is believed to date from the 13th century. Despite the precarious appearance of the southern arch and its slant, the bridge is not falling over.

Seven bridges cross Wycoller beck (a stream in North of England dialect). Before the development of the canals and railways, it was a busy crossroad on pack-horse trade routes in England.



B

BANERJEE-GUHA, S., see LOW, N.

Benchmarking & European Sustainable Transport Policies GUDMUNDSSON, H. (2) 24

BROEKE, A. van den & KORVER, W. Tourism by the elderly in Europe (3) 26

BRONZAFT, A.L. United States aviation transportation policies ignore the hazards of airport-related noise (1) 37

C

CAIRNS, S., see COPE, A.

Car Club Development: The Role of Local Champions MEATON, J. & LOW, C. (3) 32

COPE, A., CAIRNS, S., FOX, K., LAWLOR, D.A., LOCKIE, M., LUMSDON, L., RIDDOCH, C. & ROSEN, P. The UK National Cycle Network: an assessment of the benefits of a sustainable transport infrastructure (1) 6

D

DIETERICH, M., see PFLEIDERER R.

E

(An) evaluation of the bicultural services of the McAllen Central Bus Station linking the USA & Mexico FEINBERG, M. (1) 18

F

FEINBERG, M. An evaluation of the bicultural services of the McAllen Central Bus Station linking the USA & Mexico (1) 18

(The) Future development of air traffic in the UK HART, P.E. (1) 41

FOX, K., see COPE, A.

G

Gender equality & transport policy in Sweden POLK, M. (4) 28

GILES-CORTI, B., see STONE, G.

(The) Global Tyranny of Roads: Observations from Mumbai & Melbourne LOW, N. & BANERJEE-GUHA, S. (2) 5

GUDMUNDSSON, H. Benchmarking & European Sustainable Transport Policies (2) 24

H

HART, P.E. The future development of air traffic in the UK (1) 41

HOLVAD, T. Public transport provision in two European cities – Oxford & Odense (1) 26

HOLZAPFEL, H. Traffic without violence: The path to a vision (3) 5

I

IMRAN, M. & LOW, N. Time to Change the Old Paradigm: Promoting Sustainable Urban Transport in Lahore, Pakistan (2) 32

Integration of cycling & Light Rapid Transit: Realising the potential McCLINTOCK, H. & MORRIS, D. (3) 9

J

JACKSON, B., see STONE, G.

K

KORVER, W., see BROEKE, A. van den

L

LAWLOR, D.A., see COPE, A.

LOCKIE, M., see COPE, A.

Local mobility management & urban renewal in public-private-partnership – the example of the ‘Car reduced living in an existing residential area at Johannesplatz in Halle/Saale’ demonstration REUTTER, O. (2) 40

LOW, N. & BANERJEE-GUHA, S. The Global Tyranny of Roads: Observations from Mumbai & Melbourne	(2)	5
LOW, N., see IMRAN, M.		
LOW, C., see MEATON, J.		
LUMSDON, L., see COPE, A.		
LUNDBERG, J. Petroleum culture versus Earth living – The fallacy of the technofix	(4)	34
M		
MARTE, G. Slow Vehicle Traffic is a more Attractive Alternative to Fast Vehicle Traffic than Public Transport	(2)	18
McBRIDE, S., see STONE, G.		
McCLINTOCK, H. & MORRIS, D. Integration of cycling & Light Rapid Transit: Realising the potential	(3)	9
MEATON, J. & LOW, C. Car Club Development: The Role of Local Champions	(3)	32
MEATON, J., STARKEY, R. & WILLIAMS, S. Stelios – the accidental environmentalist? The potential impacts of the Easycar Club in the UK	(1)	31
P		
Petroleum culture versus Earth living – The fallacy of the technofix LUNDBERG, J.	(4)	34
PFLEIDERER R. & DIETERICH, M. Speed Elasticity of Mileage Demand	(4)	21
POLK, M. Gender equality & transport policy in Sweden	(4)	28
Public transport provision in two European cities – Oxford & Odense HOLVAD, T.	(1)	26
R		
REUTTER, O. Local mobility management & urban renewal in public-private-partnership – the example of the ‘Car reduced living in an existing residential area at Johannesplatz in Halle/Saale’ demonstration	(2)	40
RIDDOCH, C., see COPE, A.		
ROSEN, P., see COPE, A.		
S		
SHEATE, W., see WINTERTON, B.		
Slow Vehicle Traffic is a more Attractive Alternative to Fast Vehicle Traffic than Public Transport MARTE, G.	(2)	18
Speed Elasticity of Mileage Demand PFLEIDERER R. & DIETERICH, M.	(4)	21
STARKEY, R., see MEATON, J.		
Stelios – the accidental environmentalist? The potential impacts of the Easycar Club in the UK MEATON, J., STARKEY, R. & WILLIAMS, S.	(1)	31
STONE, G., GILES-CORTI, B., McBRIDE, S. & JACKSON, B. ‘Walk it, Bike it, Bus it’: Perceptions of active modes of transport	(3)	15
Sustainability & Road User Charging in UK Cities WINTERTON, B. & SHEATE, W	(4)	5
T		
Time to Change the Old Paradigm: Promoting Sustainable Urban Transport in Lahore, Pakistan IMRAN, M. & LOW, N.	(2)	32
Tourism by the elderly in Europe BROEKE, A. van den & KORVER, W.	(3)	26
Traffic without violence: The path to a vision HOLZAPFEL, H.	(3)	5
U		
United States aviation transportation policies ignore the hazards of airport-related noise BRONZAFT, A.L.	(1)	37
(The) UK National Cycle Network: an assessment of the benefits of a sustainable transport infrastructure COPE, A., CAIRNS, S., FOX, K., LAWLOR, D.A., LOCKIE, M., LUMSDON, L., RIDDOCH, C. & ROSEN, P.	(1)	6

W

- 'Walk it, Bike it, Bus it': Perceptions of active modes of transport STONE, G., GILES-CORTI, B., McBRIDE, S. & JACKSON, B. (3) 15
- WILLIAMS, S., see MEATON, J.
- WINTERTON, B. & SHEATE, W. Sustainability & Road User Charging in UK Cities (4) 5

RoadPeace

event to mark

UN Road Safety Week 5–11 April 2004

World Health Day 7 April 2004

'Road Safety is no Accident'

The United Nations and World Health Organization have joined forces to address what is now recognised as the 'Global road safety crisis'.

A UN Road Safety Seminar will take place on 5 April in Geneva and on World Health Day, the WHO will launch a ground-breaking *World Report on Road Injury Prevention* in Paris.

7 April UK Launch of the *World Report on Road Injury Prevention*
 Press Conference at the London School of Hygiene & Tropical Medicine jointly convened by RoadPeace and the London School of Hygiene & Tropical Medicine

8 April Inaugural RoadPeace Lecture
 'Weapons of Mass Destruction and Global Indifference
 to 1 million Deaths Each Year on the World's Roads'
 by John Whitelegg
 at City Hall, Queen's Walk, London SE1, 6 – 8 pm
 Book early, small fee of £10 (£3 concs) in aid of the RoadPeace helpline

RoadPeace is also planning special posters and leaflets and is looking for sponsors

Contributions to *World Transport Policy & Practice* are welcome. Whether you are a novice author or an experienced one, the Editor would like to invite you to consider sharing your thoughts and experiences with others like yourself. We can promise a considered and constructive review of your article and, for contributions deemed suitable, publication in *World Transport Policy & Practice*.

Read through the following guidelines and feel free to contact John Whitelegg, the Editor, who will be pleased to offer comments on drafts, work in progress, or ideas which could be made into an article.

Editorial objectives

The journal aims to provide validated information about the latest developments in transport policy to enable local authorities, governments, consultancies, NGOs and supra-national organisations to speed up their policy development and implement new ideas from around the world. It will:

- cover all passenger and freight transport
- deal with global as well as local issues
- include the development of the ideas of sustainability, the design of cities and rural areas, transport corridors and international links to improve health, the economy and the environment.

Article composition

Articles should normally be between 2,000 and 4,000 words. Shorter articles can be published as 'Comment' pieces. Responses to papers which have appeared in the journal, either as letters to the Editor or as response articles, will be welcomed.

Submitting articles

1. By e-mail

Articles for publication may be submitted by e-mail attachment to Pascal Desmond. It is useful if authors indicate what software is required to read any attachments and if they include the letter combination 'zq' in the title. Please DO NOT name articles 'whitelegg', 'wtp' or variations of these. Authors are advised that they may need to provide a version on paper and/or on 3.5" disk prepared on an Apple Macintosh or PC system.

2. On paper

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Presentation

Headings and subheadings should be used at approximately 500–750 word intervals. Ensure that headings and subheadings are clearly identified.

Charts, diagrams & figures

These should be called 'Figures' and numbered consecutively (e.g. Figure 1, Figure 2, etc.). Make sure they are clear and can be reproduced easily. In addition, provide the raw data so that we can redraw them, if necessary.

Indicate where in the text they should appear ('Figure 1 about here'). Each figure should have a brief title (e.g. 'Figure 1. Schematic of the Programme').

Tables

Tables should be numbered consecutively, independently of figures. Indicate in the text where they should appear. Give them a brief title. Ensure that they are clear and legible. Authors should not use many tabs or spaces between columns of data – normally, one tab is sufficient.

Maps

Maps are especially welcome as 'tiff', 'pict' or 'jpeg'. They should be numbered consecutively, independently of figures and tables and their location in the text should be indicated. Ensure that they are clear, uncluttered and legible. They should have a title.

Measurements

SI units should be used throughout.

Abstracts & Keywords

Write an abstract of 75 words or so which summarises the main points of the article. It should be sufficient for a reader to decide whether or not they want to read the whole article. Also note up to six keywords which describe the content of the article. These could include geographical area, if specific, industry, functions, managerial activity and process.

References

Authors should keep references to a minimum, ideally no more than ten to fifteen. References should be confined to essential items only and those that are necessary to establish key steps in an argument or key areas of support for a particular proposition.

Reference citations within the text should be by the author's last name, followed by a comma and year of publication enclosed in parentheses. A reference list should follow the article, with references listed in alphabetical order in the following form:

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Articles: Surname, Initials (Year of Publication) 'Title' *Journal* Volume, Number, Pages.

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