

TRANSPORT AND SUSTAINABILITY

- Environmental conflicts, limits to growth
- The limits of technology
- Effecting behavioural change

Transport provides benefits in terms of personal mobility and economic activity, but also contributes to environmental degradation. The demand for transport infrastructure and capacity consistently outstrips supply, and a debate is underway on how far current trends are sustainable across generations.

To help inform this debate, POST analysed transport in the context of sustainable development. This note summarises the contents and findings of the full report¹.

ENVIRONMENTAL IMPACTS

The POST report reviews trends in both passenger and freight traffic and the underlying reasons for the increase in travel. The Department of Transport (DoT) (see **Figure 1**) forecast in 1989 that the total distance travelled by car per year would double by 2025, car ownership continue to rise, and the distances travelled by freight nearly triple from 1989 to 2025. So far however, these are proving overestimates of actual demand.

The effects of transport on **urban air quality** are the net result of increasing traffic levels and tightening emission standards. Overall, total emissions of urban air pollutants from road vehicles increased significantly from 1970 to 1989, but with tightening vehicle emission standards, have since started to fall. Ambient concentrations of nitrogen dioxide (NO₂), carbon monoxide, particulate matter, volatile organic compounds (VOCs), lead and toxic organic micro-pollutants (TOMPS) should improve further as catalytic converters penetrate the vehicle pool. However, it remains debatable whether urban air will improve to the extent of always complying with European Union (EU) limit and guideline standards. Over the coming decades, projected traffic growth will eat away at these improvements, and uncertainties remain over whether the long-term performance of catalysts will be maintained. In the short term, achieving ozone standards is more problematic and the initial effects of catalysts could even be to increase ozone concentrations in urban areas.

The full report also examines the contribution made by transport to emissions of carbon dioxide (CO₂), of concern because of **global warming** and subject to restraint under the Framework Convention on Climate

1. "Transport: Some Issues in Sustainability" (110pp) is available (free to Parliamentarians; £15 otherwise) from POST (0171-219-2840).

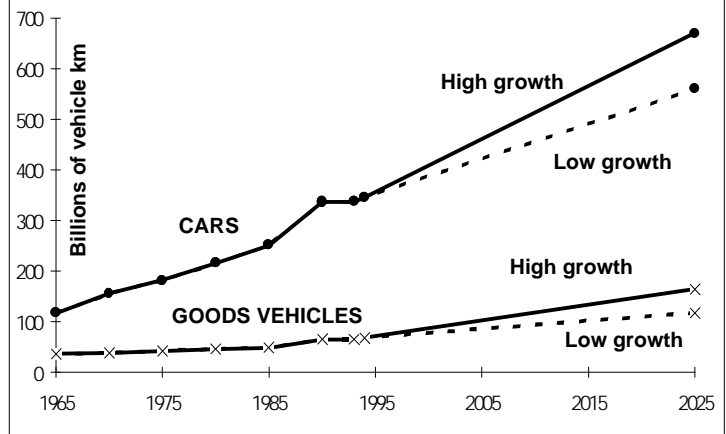


POST
REPORT
SUMMARY

70
November
1995

This is a summary of a 110-page report available from the PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY (extension 2840).

FIGURE 1 NATIONAL ROAD TRAFFIC FORECASTS



Change (FCCC). In this context, the transport sector has become the largest growing consumer of energy in the UK - from 1983 to 1993, the energy used for transport increased by 39% in contrast to demand in all other sectors of the economy which increased by only 2%. In this decade therefore, transport increased its share of UK energy consumption from a quarter to a third.

The UK proposes that total UK emissions of CO₂ should be 5-10% lower in 2010 than 1990. If achieved by all sectors proportionately, this would mean that CO₂ emissions from road transport would have to drop by 1.5-3 MtC from 1990 levels, instead of which, current projections are that they will **increase** by 5.6-12.6 MtC from 1990 to 2010 (**Figure 2** next page).

The full report also looks at the effects of transport on natural habitats and the countryside, water pollution, casualties and other factors such as noise.

THE ROLE OF TECHNOLOGY

Technology already plays a key role in reducing environmental impacts - by the time the 1997 European Union emission standards are in force, pollutant emissions from new vehicles will have been cut by 90-95% relative to the 1970s.

The full report also looks at influences on future emissions reductions technology, including measures applied in California to encourage industry to develop low-emission, ultra-low emission and zero emission vehicles. Although these standards applied initially only to California, they are spreading to other states and have already encouraged substantial investment in electric or hybrid vehicles. In the EU, the 1997 emissions

standards will be achievable with technology currently available. In the longer term, electric vehicles could be a significant factor in the EU and UK, and some European countries encourage electric vehicle sales and infrastructure.

As far as future emission control strategies are concerned, the full report discusses the current research underway in the EU to define what should be the basis of any further tightening of standards in the next century and the technologies and policies needed - in particular over **whether to base future regulatory strategy on an emissions standard approach, or whether policy should aim at achieving agreed air quality standards at the most economic cost.**

As far as **transport research and development** are concerned, the full report reviews UK funding and future research strategies. In particular, the work of the Technology Foresight Panel on Transport is described with its support for work in the areas of:-

- **The informed traveller**, which foresees integrated travel information, ticketing, booking and payment seamlessly across all passenger transport modes.
- **The foresight vehicle** - an environmentally-friendly vehicle with mass market appeal.
- **"Clear" zones** - urban centres with high quality access to shops and offices by zero-emission public transport and freight distribution systems.

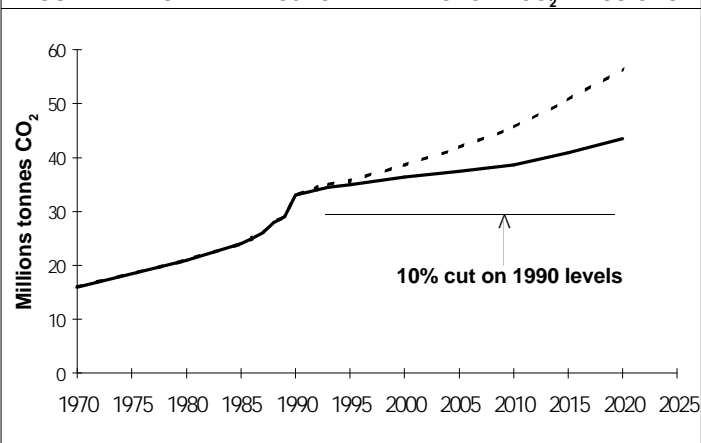
The full report explores possible research options towards the goal of a more **sustainable research agenda.**

One of the measures of the 'sustainability' of the transport system is the degree to which all the resources tied up in infrastructure are utilised, and to this end, the full report looks at ways in which technology could increase road capacity/ decrease congestion through better information, traffic regulation and road pricing. The efficiency of resource allocation is also affected by the **appraisal methods for different transport modes**, and these are discussed in considerable detail for road and rail, and for cross-mode comparisons.

INFLUENCING TRANSPORT BEHAVIOUR

While there is a growing consensus that the unrestricted future growth of transport demand can no longer be automatically met, there is much less of a consensus on how change can be brought about. Some argue for a 'carrot' approach, and advocate more investment in public transport. Others argue for 'sticks' in the form of higher vehicle taxes and restrictions on use. These areas are explored in the full report which looks at attitudes to transport, choices in transport, travel behaviour and a number of case studies where attempts have been made to influence travel behaviour. Insights into what an informed public might be prepared to accept emerged from a 'Consensus Confer-

FIGURE 2 PAST AND PROJECTED TRANSPORT CO₂ EMISSIONS



ence' in Denmark in 1994. Key measures recommended included:

- the price of petrol should double over the next 5 years, and then increase in line with inflation;
- Vehicle taxes should reflect the environmental impact and encourage clean and energy saving cars;
- the relative price differential of public and private transport should be returned to that in 1982 and maintained at that level.

ISSUES

In view of the potential conflict between current trends in CO₂ emissions from the transport sector and international and national policies as shown in Figure 2 (if transport is treated *pro rata* to other sectors, emissions would have to be cut by 20 to 33% relative to present forecasts for 2010), the full report looks at how reductions in emissions might be achieved.

In terms of **technical** potential, many see considerable scope for increasing fuel efficiency- e.g. by lighter body materials, streamlining, low-resistance tyres and advanced engines - possibly halving emissions of CO₂. However, experience suggests these technical targets will be difficult to realise, while consumer tastes and travel behaviour appear likely to create significant potential for increased energy use in transport. **A policy to reduce transport CO₂ emissions which relied on improvements in the technology of petrol-engined vehicles alone could thus carry high risks.**

The full report also discusses diesel's lower fuel consumption and whether this environmental advantage justifies it continuing to attract a lower fuel duty than equivalent leaded petrol. Because of higher emissions of NO_x and particulates, **there are still questions over whether a switch to diesel vehicles should be encouraged as a primary instrument of environmental policy.**

Internal combustion vehicles to run on natural gas offer lower emissions of most pollutants relative to diesel or petrol, and there have been many **calls for measures to encourage natural gas vehicles.**

Much research effort is already underway world-wide, but the UK's role in **electric vehicle development** is small relative to that in the USA, Japan, France and Germany, and one policy question is whether this is to the UK's potential disadvantage. Some point to the rather special nature of California and France (unusual air quality conditions and excess of nuclear power respectively) as suggesting that electric vehicles remain special solutions to special circumstances. Others argue that by failing to carry out the necessary R&D, the UK will be compromising its future competitiveness in a critical area. **Options providing more support in this sector are given in the full report.**

If, as appears likely, the role of technology in improving energy efficiency is insufficient to constrain the growth in transport energy use and CO₂ emissions completely, targets would have to be met by reducing the projected growth in the **actual volume** of road traffic. This could involve a modal shift from cars/lorries to means which emit less CO₂ per kilometre travelled (this can be much lower for rail (by 30-60%), bus (20-60%) and cycle and walking (by 100%)); or reductions in the overall need to travel of people and goods.

On modal shift, experience shows that it can be very difficult to reverse increased dependence on the car, and that even successful policies may have only limited impact on the overall demand for car travel. Moreover, cars have so many advantages relative to public transport that even accessible and economically competitive public transport may be less desirable in many circumstances. It is difficult, therefore, to expect a rational public to 'volunteer' a modal shift in the absence of measures to discourage car use, and the evidence is that spontaneous changes in public behaviour or attitudes could be very slow and limited. The Lord's Sustainable Development Committee noted that appropriate fiscal and legal 'signposts' were needed to overcome barriers to more sustainable patterns of consumption, and many see **an important role for Government in determining or influencing public attitudes, in raising awareness of the environmental impact of individual decisions, and encouraging a public debate on the proper role of transport.**

If technology and modal shifts are insufficient to achieve selected measures of sustainability, the only remaining option is to reduce mobility. Here, it is important to distinguish between people's real need, which is **access**, and the means of achieving it, which is **mobility**. While the concept of access to a variety of services and opportunities is easy to grasp, it is difficult to measure, so transport services are often expressed as mobility (e.g. in miles travelled or trips made), and the success of transport policy may sometimes be judged in a similar way. **Those deciding transport policy need to distinguish carefully between changes that reduce**

travel and access to opportunity, and those that reduce travel but bring opportunity closer.

An issue here is the extent to which economic growth is linked to transport growth, and Ministers have historically held that to constrain the anticipated growth in car use would reduce economic growth. The Lord's Sustainable Development Committee, however, points out that GDP and energy use have been 'decoupled' so that the health of the economy is no longer seen as linked to energy consumption. **Many see no reason why transport demand and the economy could not also be decoupled with appropriate policies to manage demand.**

Continuing to provide or enhance access, while reducing mobility bears most significantly on the role of land use planning, and recent measures announced by the Departments of the Environment and Transport (PPG13) and the proposed strengthening of PPG6, show that Government policy recognises a need to restrain the demand for travel. The full report looks at how such long term measures could be supplemented by **influencing travel behaviour over a period of perhaps 10 years through a balance of equitable economic and regulatory instruments, backed by education and information** highlighting the contributions that can be made by individuals and businesses, towards reducing the need to travel and increasing the use of more sustainable modes of transport.

The full report also examined how far **appraisals and assessments** deliver a 'scientifically objective' conclusion on the inherent merits of a proposed scheme and whether there was a 'level playing field' between modes. To this end, various sensitivity analyses were carried out on the main tool for determining the attractiveness of a road proposal - the cost-benefit analysis calculation (COBA). Favourable outcomes are encouraged by the following factors:-

- Lower discount rates (this is currently set at 8%).
- High valuations for travel-time savings (which typically account for up to 80% of the overall 'benefits').
- High valuation of the cost of accidents.
- High traffic growth forecasts.

The POST analysis demonstrates that a procedure which is complex and apparently 'scientific' does depend for its outcome entirely on the assumptions made and that equally 'reasonable' assumptions can discriminate in favour or against many schemes. **In this respect there are questions over how far the increase in complexity and detail introduced into COBA over the years has been matched by increased objectivity or sophistication of the conclusions. The main value of COBA is in showing which roads are relatively more easy to justify economically than others.**

One of the main obstacles in the way of making COBA assessments more objective is the inability at present to value the externalities - comprised primarily of the impacts on the land during and after a road's construction, and the net effects on air pollution, noise, etc., once it is operating. This field is devoid of a consensus amongst economists on how to proceed, and there **appears to be little alternative to the current combination of ranking schemes through COBA and dealing with the externalities through administrative and political procedures such as Environmental Assessment (EA) and the land-use planning process.**

Separate appraisal schemes for rail have evolved and comparisons of road and rail alternatives to achieving given transport objectives are rare. This had led some to suggest alternative approaches to avoid the somewhat artificial competition of road vs. rail and optimise society's investment in transport infrastructure. Options can be grouped into two general approaches:

- **Developing a National Transport Strategy.** Under this approach people's needs would be defined in terms of access and targets set for environmental protection consistent with the needs of the economy and personal freedoms. This assessment of the transport system as a whole would identify areas of inefficiency and unacceptable costs from which specific national objectives would be derived (e.g. reducing CO₂ emissions, transferring freight from road to other modes, improving access while constraining mobility). National strategic objectives would then be translated into regional and local measures. Where a need for access between two locations was identified, cost-effectiveness appraisals would be applied to select the most efficient means of providing access, thus getting away from the unrealisable target of proving objectively a given level of economic viability as presently sought under COBA.
- **Improved/modified COBA.** This would continue with the philosophy that it is possible to objectively value the worth of a proposal if only all the factors could be included in the calculation - e.g. by deriving monetary values for environmental indicators and including these in the formal COBA. Alternatively, the COBA could evolve into a simpler financial appraisal where costs of infrastructure provision are balanced against revenue raised. With roads, this balance would be between the construction, maintenance and capital depreciation and return on asset value, and income from tolls, vehicle excise and fuel duties; with rail, the balance between fares and track access charges etc.

In Conclusion

The report demonstrates the complexity in technical, 'psychological', logistical and other terms of effecting significant change in current transport behaviour and

moving it towards a more 'sustainable' path. Many policy instruments could have a role to play, but equally, no single one provides the potential to achieve sustainability 'at a stroke'. Indeed, many conclude that the most appropriate response to the increasingly evident conflicts between the decisions of individuals and the effects of their collective actions might have to include a number of interrelated measures, which set the tone for a change in national priorities over the medium term. Such measures include changes in land-use priorities and tightening regulatory standards already underway, and continued encouragement for local initiatives to improve access and urban air quality. But there are also many other options covered at some stage in this report. These include:-

- The Lords' Sustainable Development Committee and others urge the Treasury to develop a **coordinated taxation policy** which incorporates the environmental and other objectives of a transport policy within a broader framework of shifting the burden of tax from labour, income and capital to pollution and resources. This could have several components; an environmental element to vehicle excise duty (e.g. based on fuel efficiency), duty on different fuels which reflects their relative environmental impact; special treatment for low/zero emission vehicles.
- Ensuring that readily identifiable **externalities** are made transparent or accounted for, so travellers bear (or are made aware of) more of the real costs of their activities. Examples could include 'free' parking (either being treated as income or requiring employers to offer workers a cash alternative); also road pricing.
- **Public education** to address the widespread lack of recognition of the link between the action of the individual and the effects of all.
- While modal shifts could significantly reduce transport emissions, it is easy to underestimate the challenge in encouraging a shift to public transport and a key factor here is the **relative attractiveness** of private and public transport in terms of cost, convenience, comfort, speed, etc.
- An option recommended by the Royal Commission on Environmental Pollution (RCEP) is to adopt **quantified targets** - e.g. for specific modal shifts and reduced growth rates in mobility within pragmatic timescales. Such targets could give policy a clearer sense of direction, help its transparency and provide a focus for public debate. The main reservation is that the effects of different policy instruments on behaviour are imperfectly understood, as well as their impacts on the economy and the environment. Moreover, transport policies cannot be divorced from other areas of the economy, and success in achieving a more sustainable transport system is linked with efforts to achieve sustainable development across society as a whole.