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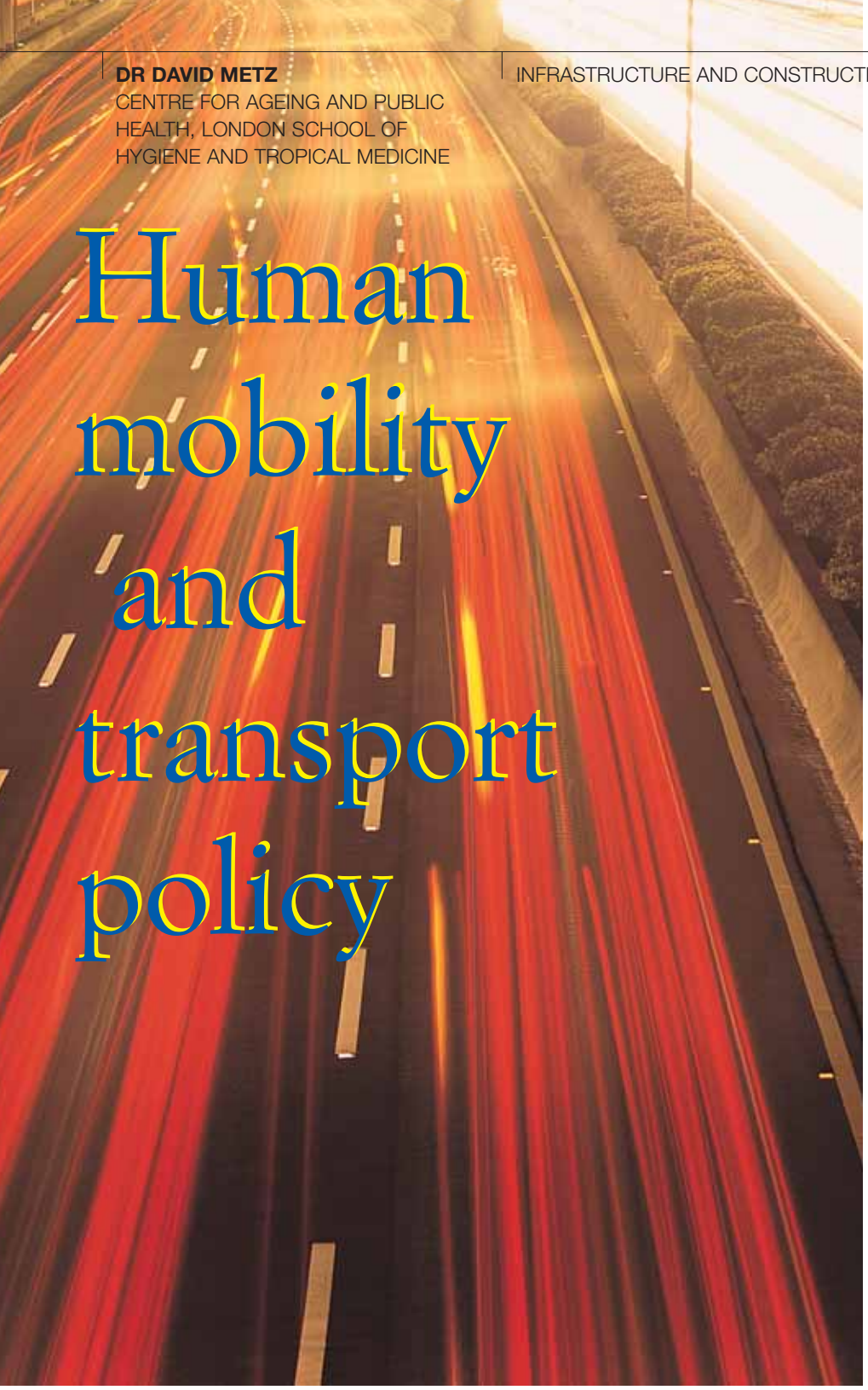
Human mobility and transport policy



A significant proportion of our everyday lives has always been spent getting from one place to another but now, with cheaper, faster transport available, we are increasingly travelling further and further each year. David Metz writes on the past, present and future of transport policy in the UK and reveals how we can become even more mobile.

The growth in travel seems inexorable. Personal travel in Europe and the US has more than doubled over the past 30 years, with no obvious prospect of any natural falling away of demand, and with the developing world yet to experience the benefits of the motorised society. Freight transport increases in a globalising economy in line with GDP growth. We are anxious about the environmental consequences – carbon dioxide and gaseous pollutants, noise, congestion and intrusion – as well as oil consumption. In responding to these challenges, transport policies seem to lack credibility.

> Human populations have the ability to disperse widely and rapidly

Time travel

Not everything in the transport sector is changing, however. There is excellent data to show that average travel time per person per year is invariant. The British National Travel Survey indicates that average travel time has held steady at close to 360 hours per year, or one hour per day, over the past 30 years (see Figure 1). International compilations of travel time data show that this figure of about one hour applies across all cultures and states of development. Of course, within that average of an hour there is some variation as a function of age, geography and other factors. In Britain, older people and children spend less time on the move than do people in mid-life; women spend rather less time than men on average; while Londoners allocate more time to travel than do people living elsewhere. Londoners in their twenties are particularly mobile, spending about 1.4 hours a day travelling on average.

There is persuasive evidence that this constancy of travel time has been the case historically, and indeed that the human propensity to be mobile may be deep-seated, having evolved in our distant past. Genetic and archaeological evidence argues for the origin of anatomically modern humans in Africa, followed by a complex series of migrations over the past 100 000 years that has populated all corners of the Earth. In prehistory, man was hunter, gather and herder (with settlement based on farming arising only 10 000 years ago). Human

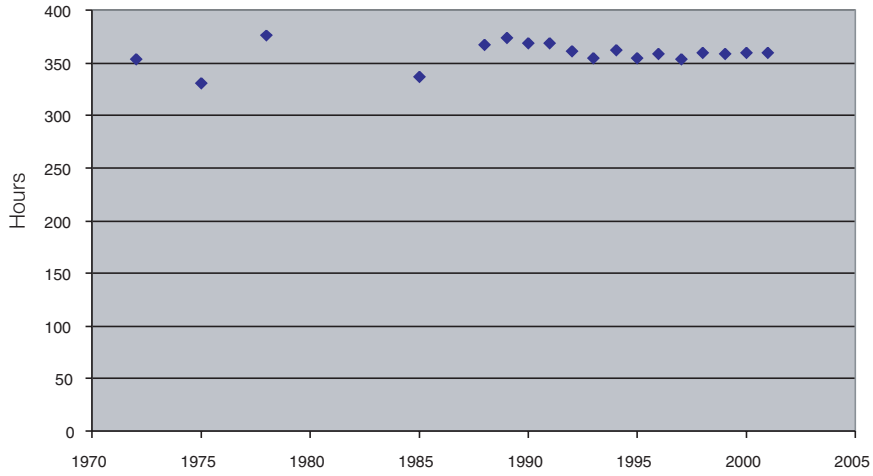


Figure 1 Hours travelled per person per year (British National Travel Survey). Despite the huge increase in personal travel evident over the last 30 years we still spend the same average amount of time travelling each day. This is because we can now get to our destinations much faster than was previously possible

populations have the ability to disperse widely and rapidly. This pervasive spatial mobility distinguishes man from other terrestrial animals.

Territoriality is related to mobility. Human territoriality can be viewed as a strategy to affect, influence or control resources and people by controlling area. The desire to expand the territory under control in order to gain resources and opportunities is constrained by the time and energy required as well as by the risks from exposure to predators and enemies. The mean area of the territory of long established Greek villages is 20 km^2, which corresponds to a radius of about 2.5 km, or one hour's walk from the centre to the periphery at 5 km per hour. No ancient cities (up to 1800) had radii greater than 2.5 km, although as successive transport innovations were introduced – horse trams, electric trams, buses, subways, cars – the effective radius increased in proportion to the speed of transport. The origins of the average travel time of one hour per day may therefore date from the earliest human settlements.

Both through history and across societies, wealth determines average speed and hence distance travelled within the one hour travel time. In ancient Greece and in modern sub-Saharan Africa, walking may be the main mode, providing far less access than in motorised societies.

Journey frequency

Another constant is the number of journeys made per person, which has held steady in the UK at 1000 a year on average for the past 30 years (Figure 2). The major growth in mobility that we have seen over this time reflects an increase in average door-to-door speed, permitting longer journeys within the constant travel time and trip frequency.

This growth in average travel speeds has been made possible by a series of technological innovations through the course of transport history. Recall the Model T Ford, the first mass-produced motorcar, of which 15 million were manufactured between 1908 and 1927. Productivity improvements, based on the moving assembly line, meant that by 1912 this car had become the first to cost less than the average annual wage. Henry Ford doubled the pay of his workers in 1914 to reduce labour force turnover, thus enabling autoworkers to become his customers.

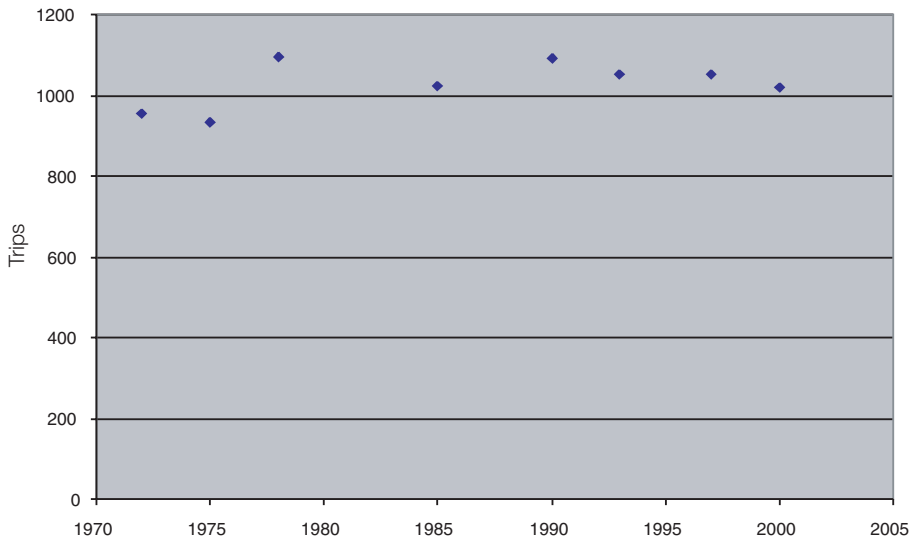


Figure 2 Trips per person per year (British National Travel Survey). The number of individual journeys we make each year has also remained almost constant over the last 30 years. We are making the same number of trips in the same amount of time as in 1970. This also indicates that it is increased speed of travel that has had the biggest impact on human mobility in the twentieth century

Travelling faster tends to cost more, per unit of distance, given the need to overcome air and rolling resistance and inertia, and to ensure appropriate standards of safety (although comparisons are distorted by taxation, and are affected by varying economies of scale and by the crew costs of public transport). However, technological development tends to reduce the unit costs of travel over time, through incremental refinement and through the occasional step-change innovation.

The growth of incomes and the development of technology in combination permit us to travel faster and hence farther, within the time we are prepared to allow for travel.

Travel expenditure

A third factor that holds fairly constant over time is the proportion of household expenditure devoted to transport and travel. International data compilations indicate that households without a car devote 3–5% of income to travel. With increasing car ownership, average spend rises, stabilising in the range of 10–15% cent of household income once car ownership rates exceed around one per household. The expenditure range reflects the range of price levels for travel services. In Britain, the percentage of household expenditure allocated to transport and travel in recent years has fluctuated around 16% (Figure 3), at the top of the international range due to our relatively high rates of transport-related taxation.

A short history of transport

We may summarise the key elements of the history of transport as:

- occasional introduction of innovative technologies, and thereafter their steady refinement, permitting higher average speeds
- increasing affordability of faster travel as incomes rise and as costs decline
- hence increasing distances travelled by individuals – within a constant average travel time
- resulting in increasing adverse impacts of transport, particularly congestion, community severance, carbon dioxide, gaseous pollutants and noise emissions.

That is the past, in a nutshell. What of the future? We may expect continued refinement of technologies to lessen the environmental impact of the motor car in particular, but at the same time making it more affordable. Incomes will continue to rise, permitting travel distances to increase. The human propensity to travel seems to be subject to no constraint other than the time factor, given that time for travel is in competition with time for all the other activities of daily living, within the fixed constraint of the 24-hour day. These factors cause difficulty for transport policy, for example the UK government's Ten Year Transport Plan (see Box 1).

Transport and land use

Transport and land use are intimately connected. Changes in land use cause changes in transport demand, while

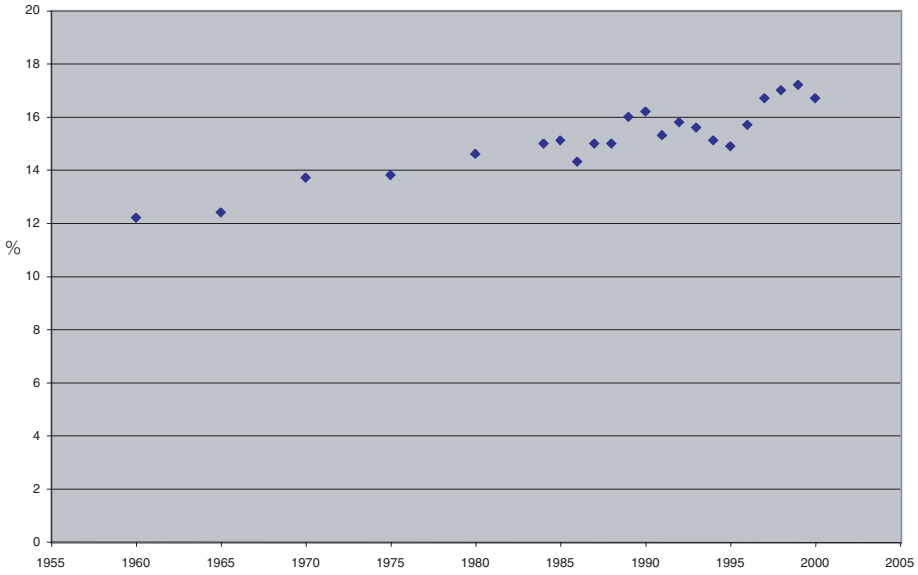


Figure 3 Percentage household spend on transport and travel per year (British National Travel Survey).
The rise in average household income has allowed a greater percentage spend on personal travel for British families, settling at around 16%

changes in transport infrastructure and behaviour can prompt demand for changed land use patterns.

For a given transport infrastructure, the invariance of average travel time constrains travel behaviour and thus limits the demand for land use changes. If improvements in transport infrastructure permit higher average speeds – as would commonly be the case – then demand for land use changes may be expected to follow (typically the seeking of consent to develop green field sites) to take advantage of increased accessibility. Thus, in general, new transport infrastructure can be regarded as a driver of more intensive land use.

The direction of causality can work the other way. This can happen, for example, where the planning system, for strategic reasons, generates a major new entity, such as an urbanisation, or where, in the absence of planning constraints, a major new entity comes into existence, as at Canary Wharf.

The scale of travel demand thus generated necessitates construction of substantial new transport infrastructure. More generally, incremental land use development and intensification will tend to increase local travel demand, resulting in congestion. This in turn generates pressure for decisions to improve the transport infrastructure.

It follows that, in parts of the country where the planning objective is to limit land use intensification, it would be important to avoid improvements to the transport infrastructure that have the effect of increasing average speeds and hence distance travelled. While, for example, the intention of the Government's plans to widen the remaining three lane sections of the M25 to four lanes is to keep the traffic flowing, the long-term effect will be to increase development in the London periphery.

Alternative measures

Not all the measures in the Ten Year Transport Plan have the effect of increasing average speeds. Those that do not include: improvements to safety, the environment, comfort and quality of the journey, for instance quieter surfaces for trunk roads; measures to reduce accidents; quality bus services; park and ride; and modern information, booking and ticketing services. Of particular relevance are measures with the potential to improve road efficiency without materially increasing average speeds. These include the Highways Agency's plans for traffic control centres, active traffic management on the M42, and ramp metering on the M3/M2, as well as commercially marketed traffic information and navigation systems (such as those of Trafficmaster).

What other approaches might increase efficiency without increasing average speeds?

As noted previously, bypasses allow higher speeds because they consist of modern roads, usually dual carriageway and often with grade-separated junctions. However, higher speeds are not inherent in the concept of a bypass, which could be constructed in a way that did not result in reduced journey time, perhaps taking advantage of the experience of urban traffic calming. What might be termed an isochronic bypass would be a more modest road than the conventional bypass, less costly, but hopefully no less safe.

Another possible kind of road construction would be to widen feeder roads to congested motorways and install ramp metering to regulate traffic from the former to ensure free flow on the latter. The widened feeder would act as a buffer store. Congestion would

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occur in planned locations, rather than seemingly at random, which might be perceived as more efficient. This approach is employed in the Netherlands.

If measures that increase average speeds lead to longer trips, then measures that decrease average speeds should have the reverse effect. Urban traffic management measures that limit vehicle circulation and recover carriageway for pedestrian use result in the 'disappearance' of traffic. This can be envisaged as taking place through a reduction in average speed, leading to shorter trips. 'Soft' measures, such as the promotion of walking and cycling, have the effect of reducing average door-to-door speeds and hence reduce journey length.

With trunk roads, an analogous management measure would be to enforce the legal speed limit and

Box 1 The problems of developing a transport policy

What is the scope for transport policies to mitigate the all too evident environmental and congestion problems of the transport sector? Unfortunately, the main policies of national authorities, including those in the UK government's Ten Year Transport Plan, have the effect of increasing average speeds, hence increasing distances travelled, pollution and congestion. Examples include:

- Widening a congested section of a road network has the effect, not merely of relieving congestion at the pinch point, but also of increasing average speed across the network as a whole, thus leading to greater mileages within the average travel time constraint.
- Bypasses are constructed for environmental reasons, to relieve towns and villages of the adverse impact of through traffic. However, bypasses are faster roads than the routes they replace and offer time savings which are a main factor in their economic justification. They therefore have the effect of increasing distance travelled within the overall travel time constraint.
- Congestion charging is intended to reduce congestion. Reduced congestion results in increased average speeds, and hence allows longer journeys for those willing to pay the charge. The adverse impacts of these longer trips is, of course, offset by the trips forgone by those former road users now unwilling to pay. (Or, in more usual terms, the congestion relief arising from traffic deterred by road user charging has to be offset by the extra traffic from the longer trips enjoyed by those who pay.) The magnitude of any net efficiency and environmental gain would depend on the scale of the charge. A modest charge would have the effect of redistributing road space from the worse off motorist to the better off, without much affecting congestion. A high enough charge could eliminate congestion since the scope for increasing average speeds is limited by legal speeds limits and, in urban settings, by impediments such as traffic signals and junctions. It may take time for the impact of any congestion charging scheme, such as that in London, to become clear, since the postulated longer journeys by those willing to pay the charge would depend in part on locational decisions about housing and employment.
- Investment in the new or improved high speed rail routes, such as the West Coast Main Line or the Channel Tunnel Rail Link, will increase distances travelled within the invariant average travel time. While new rail routes are bound to be environmentally controversial, improvements to existing routes are generally viewed as being acceptable and the higher speeds are not seen as environmentally undesirable.
- A new rail commuter facility, such as Crossrail or Thameslink through London, would increase the geographical range of commuting – by the distance that could be travelled in the time saved. Thus a saving of *x* minutes travel time between Paddington and Liverpool Street would lead many travellers to expend *x* additional minutes of high speed rail travel to permit domicile in salubrious places at greater distances, in Wiltshire for instance, or *x* minutes of additional car travel from outlying villages to board at Reading station, say.
- The Ten Year Plan claims that the 'large expansion of rail services will make an important contribution to reducing future levels of congestion on the roads'. Investment to increase the capacity of the existing railway, with the aim of diverting freight or passengers from the roads, would indeed reduce road congestion if the number, origins and destinations of road based trips were fixed (which of course they are not). In fact, diversion of traffic from road to rail would increase average road speeds and thus result in longer journeys, within constant average travel time.

promote the use of cruise control (and/or mandatory intelligent speed adaptation when available). Cruise control is a standard feature of cars sold in North America but is not much used in the UK because of a customary driving style involving higher than legal speeds when the opportunity allows (over half the cars on motorways are observed to exceed the 70 mile/h speed limit). Enforcing speed limits would smooth flows, reduce overall average speeds on trunk roads and hence journey length and would have safety benefits.

There is a rather limited range of measures available to improve transport system efficiency without increasing average speeds. Devising further such measures would be a challenge to highway engineers and transport planners.

Travel quantity versus quality

Standing back from the detail, we can see that the main policy challenge is to accommodate the rising household expenditure on travel and transport. If the proportion of travel expenditure remains at around 16 % (Figure 3), and if household income continues to grow at its historic rate (it has doubled in real terms over the past 30 years), then the question is how best to absorb the growth in travel expenditure. There are three possible ways in which increased private travel expenditure might be employed:

- to achieve higher average speeds and hence greater accessibility within constant average travel time
- in higher user charges
- to improve the quality of the journey.

If, in general, we are concerned to limit the continued growth in personal mobility on account of anxieties about the environmental consequences – carbon dioxide and gaseous pollutants, noise, congestion and intrusion – as well as oil consumption, then we must consider how to divert private travel expenditure away from buying extra speed and towards the other outlets.

Modern public transport can improve the quality of the journey

At present, debate about the potential for higher user charges focuses on the applicability of congestion charging beyond central London. Given that UK transport taxation is relatively high, and bearing in mind the protests against fuel duty increases in 2000, there may be limited scope for absorbing a substantial part of the growth of household travel expenditure through increased user charges.

In the early days of motoring, on the open road, higher expenditure brought shorter door-to-door journey times, given the higher speeds and greater reliability of better quality vehicles. But now, with the enormous improvement in quality of the basic family car and with the growth of congestion, spending more on a vehicle doesn't buy faster road travel. The reason people purchase more expensive cars is to improve the quality of their journeys, whether objectively through improved comfort and reduced stress, or subjectively through feeling good about style and status. The measures discussed previously that enhance system efficiency without increasing speed would be viewed by the driver as improving journey quality.

Given the present state of our transport system, improved quality is probably the highest priority for most travellers. The strategic challenge for both operators and policy makers is to increase journey quality, not speed, and in so doing gently relieve the traveller of their cash. In the long run, the problem we face is one of too much private expenditure on travel, not too little public expenditure on transport infrastructure. ■

Further reading

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