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**Editor**

*John Whitelegg*, Professor of Environmental Studies, Liverpool John Moores University, Clarence Street, Liverpool, L3 5UG, U.K.

**Editorial Board**


*Paul Tranter*, Senior Lecturer, School of Geography & Oceanography, University College, Australian Defence Force Academy, Canberra ACT 2600, Australia.


*Mikel Murga*, Leber Planificacion e Ingenieria S.A., Apartado 70, 48930-Las Arenas, Bizkaia, Spain.

**Publisher**

Eco-Logica Ltd., 53 Derwent Road, Lancaster, LA1 3ES, U.K.

Telephone +44 1524 63175  Fax +44 1524 848340

E-mail: *Editorial* j.whitelegg@lancaster.ac.uk  *Subscriptions* pascal@gn.apc.org

**Production Team**

Pascal Desmond (Subscriptions, Administration), Chris Beacock (Production). Please contact Pascal Desmond for sample copies, orders and subscriptions, reprints and copyright permissions.
Abstracts and keywords

Are automobiles really benign members of the modern family?
Karin Sandqvist
Keywords: Automobiles, family, health, society.
Characteristics of the modern family which have not challenged the traditional family paradigm have escaped the notice of researchers and family theorists. Yet children's lives might have been affected to an equal extent, and there may have been negative effects on their health. One such characteristic is the motor car, and its role in the family. This paper outlines the unauspected ways in which the family car might have influenced children's lives, and possibly affected their health.

The Free Lunch Public Transport Centre: A New Zealand case study on how to acquire 2,900 car parking spaces and $0.4 billion in public debt
Michael Gunter
Keywords: Auckland, interchange, public transport, political will.
Local government's attempt to get a monumental transportation centre for no cost through planning gain has failed in Auckland's CBD. In return for large public debt and increased traffic volumes a transport station is planned for construction at the wrong location and of the wrong size. Worse, a viable small scale terminal has been lost as a consequence. This paper documents the process and suggests lessons on what not to do in transportation interchange planning.

Car-Free Housing in Europe: A New Approach to Sustainable Residential Development
Jan Scheurer
Keywords: Car-free housing, Europe, participation, planning.
Many Europeans are choosing to live without a car. However, they find it difficult to avoid cars and the myriad of problems associated with them. As a result, car-free residential areas are becoming popular. This article explores the different approaches to developing and promoting car-free residential areas in different European cities.

Hungary’s M3 Highway: Multilateral Development Banks undercutting each other’s objectives
Walter Hook
Keywords: Banks, development, Hungary, infrastructure.
Hungary is pursuing rapid infrastructure development, in some cases, ignoring World Bank advice. The numbers do not add up but, like elsewhere, there is the mistaken belief that roads bring jobs.

Road Project Evaluation Techniques in the United States of America: A Case Study of the Boston Central Artery/Tunnel
Joe Crosset
Keywords: Boston, consultation processes, infrastructure development.
Boston's road infrastructure is being expanded by constructing a major new road which was planned before the advent of ISTEA. Because of its scale, the promoters were careful to consult widely and address the fears and worries of as many as possible. As a result, by mitigating those fears, the project is generally welcomed.

From Consistency to Chaos
Keith Buchan
Keywords: Forecasts, growth, policy decisions.
The National Road Traffic Forecasts are at the heart of British highway planning, and thus at the heart of national transport policy. The forecasts, which are produced by the Highways and Economic Traffic Appraisal, are inconsistent, in some circumstances contradictory, and bear little relation to local conditions. This report discusses in detail the failings of the NRPF 1989. The 1997 update notes, in paragraph 14, that 'All forecasts are uncertain.'
Editorial

One of the most satisfying aspects of participating in global debates about transport is the frequency with which isolated stories from different parts of the world coalesce into a very clear 'big picture' of both where and how we are going wrong and how easy it is to 'go right'. Recent weeks through the summer and early autumn of 1998 have seen the Swiss vote on a lorcy distance tax. This reinforces an earlier referendum of ordinary citizens that voted for a lorry ban through Switzerland for all lorries beginning and ending their journey outside of Switzerland. The Swiss have identified the importance of their environment and the very special importance of Alpine passes and have laid down a very fundamental marker for the debate. Henceforth transport has to adapt to the needs and desires of people and communities and their local environments, and not the other way round.

The same logic has surfaced in Edinburgh, Scotland, in the development of car-free residential areas. Edinburgh already has a reputation for 'leading edge' transport policies in its development of light rail, 'greenways' for buses and traffic bans on its main shopping street (Princess Street). In opting for a car-free residential area the City Council is demonstrating that the car need not be taken as a fundamental organising principle around which everything else must fit. Life is possible without the car. It may even be more enjoyable. Housing areas without cars will provide safe, relatively clean and noise-free atmospheres, cheaper properties, more green space even at high densities and more opportunities for interaction with neighbours. A large number of virtuous and life-enriching experiences become possible when we think the 'unthinkable' and de-prioritise motorised vehicles.

Several thousand miles away from Switzerland and Edinburgh the city of Calcutta (like many other developing country cities) is gearing up to accommodate huge increases in car numbers and is demonising non-motorised transport as part of the problem. In a recent interview the Chief of Police in Calcutta expressed the very clear view that rickshaws cause traffic congestion and that trams cause pollution. The logic behind these two statements is not addressed here. What is important is that very senior figures in Calcutta (including the transport ministry) believe that this explanation is correct. Here the car is being prioritised way above the rickshaws and trams which in Calcutta is the same thing as ignoring the poorest and most vulnerable groups in this city whilst diverting resources in the direction of the wealthiest. This process is aided and encouraged by developed countries. The United States is actively involved in plans to persuade Calcutta to abandon its widespread, cheap and effective (though badly maintained) tram system in favour of a very expensive, high tech, transit system which will be beyond the economic reach of those currently using trams. The Japanese government has succeeded in persuading the State of West Bengal (responsible for transport in Calcutta) to construct six new flyovers at key intersections. These flyovers will have a significant psychological impact on encouraging car use, they will lead to more noise and air pollution and they will scar a very attractive urban landscape, including the loss of a large number of trees in a city that desperately needs trees. Once again cars have been prioritised over people and over communities.

The tragedy of Calcutta is that countries moving in the direction of sustainable transport and enhancing local environment quality (e.g. Portland, Oregon in the USA) are using their own tax dollars to exacerbate the misery in developing countries. Japan has an excellent track record in developing public transport and restricting car ownership and use but wishes to use its financial muscle to produce the opposite in Calcutta. Clearly there is an enormous contradiction at the heart of the international debate about sustainable development, Local Agenda 21 and healthy cities. The contradiction is so enormous that it begins to take the form of a new global inequality. The new inequality is still based on the usual things: income and wealth, mortality and morbidity, child mortality, life expectancy, etc., but now involves the extra ingredient of environmental degradation, toxic air and an enhanced kill-rate from road traffic accidents. The developed world can still rely on capturing the bulk of the profits from selling cars and flyovers and new transit systems whilst cleaning up its own environment, whereas the developing world becomes a dustbin for the failed technologies and failed value systems of the North.

John Whitelegg, Editor
Are automobiles really benign members of the modern family?

Karin Sandqvist
Department of Child and Youth Studies, Stockholm Institute of Education.

Abstract
Characteristics of the modern family which have not challenged the traditional family paradigm have escaped the notice of researchers and family theorists. Yet children’s lives might have been affected to an equal extent, and there may have been negative effects on their health. One such characteristic is the motor car, and its role in the family. This paper outlines the unresearched ways in which the family car might have influenced children’s lives, and possibly affected their health.

Keywords
Automobiles, family, health, society.

Introduction
With this paper, I want to point out some neglected aspects of the modern family and modern life. When we consider the problems of the modern family, we usually think of mothers’ working outside the home, out-of-home childcare, divorces and absent fathers. When we consider modern life, not just the modern family, and its effect on children, we may also include television and computer games, perhaps a hectic life-style. More rarely do we consider the effects of cars and traffic. The 20th century has been the century of the automobile, with ever increasing numbers of cars and traffic volumes around us, a catalyst which has transformed modern life.

Going back to the point of my paper, ‘benign’ with its implicit alternative ‘malign’ was selected for its associations to uncontrolled, deleterious growth. The ever increasing volume of traffic and its attendant superhighways and parking lots has been noted for its capacity to grow into human and natural habitats in a destructive manner (Whitelegg, 1993, Dower, 1996). Rich countries now have begun to reassess the growth of traffic and are trying to reverse the trend (OECD, 1995; Goodwin, 1996; Houghton, 1996), but developing countries are proud of their new highways, even as they cover the most productive crop land – hardly a sustainable development (Gardner, 1996). In Stockholm, the six-lane artery beside the medieval city was built around 1960, in the name of progress. Now there is political agreement that it ought to be put in a tunnel, as it fouls the Old Town, but of course money is a problem.

From children’s point of view, cars and traffic in neighbourhoods is deleterious and undesirable. Parking lots are not good playgrounds. Noise and air pollution are negative health factors. If the child is run over by a car, it is a matter of life-and-death, and parents therefore curtail their children’s mobility (Hillman et al., 1990; Heurlin-Norinder, 1997). Then, children lose opportunities for learning from first-hand interaction with the real world and with adults and other children in their neighbourhood. Modern children increasingly live a world of vicarious experience provided by television and computers.

It is easy to argue that motor traffic, i.e., cars seen from the outside, is not a beneficial factor in children’s lives. I will not elaborate on this. Instead, when I pose the question whether cars really are benign family members, I will focus on cars seen from the inside and how this influences children and family life. That is, what does it mean to children that part of their childhood is spent in a car? I wish I could present research results, but I have found very little on this. In fact, cars in family life has simply not been regarded as a ‘problem’, not as a social problem or a health problem, and not as an interesting problem to investigate. The reason for this, I believe, is that our paradigm for the ‘normal, healthy family’ of the 20th century includes a car. The spirit of the times embraced the new addition to families, namely the private car, and it was not possible to question whether it really would be good for children. Instead other novelties of family life, particularly working mothers have out-of-home childcare, divorce, and absent fathers, were questioned and scrutinised, and have been ever since. These novel (or increasingly frequent) aspects challenged the paradigm of the normal nuclear family in ways that the addition of a car to the family did not. In fact, at least in Sweden and Germany, building codes for new housing developments were introduced to ensure that
each family would have a place to put their car. Even before a family car was statistically average or normal, it became a paradigmatic norm.

**Aspects to study**
Now, what happens to children and their families when the family gets a car? What aspects should we pay attention to?

**Equality between father and mother**
At least in Scandinavia, the 20th century has been wedded to the ideal that husband and wife should have equal power. Since the 1960’s the ideal has been carried further, and it is now usually considered ideal that fathers and mother have equal roles: they should both be responsible for earning money and for running the household. There is ample evidence that fathers are increasingly active in routine household work, formerly the exclusive domain of women, and of course, mothers usually earn money today. When cars first entered the family, they were the exclusive domain of fathers. Today, mothers drive too, but fathers are the automobile experts, and probably makes the decisions in this domain. There is very little mother involvement in car maintenance (Sandqvist, 1987; Heurgren, 1995) Some might regard this as a desirable gender differentiation, others may regard it as a deplorable remnant of out-dated gender roles. In this instance, however, we should recognise this inconsistency in ideology, note its exception to other trends, and investigate what it means for family dynamics.

**Relations between family members**
From the start, trips in the family car seem to have been regarded as the epitome of happy family togetherness, and car advertisements have frequently drawn on this (Hagman, 1994; 1995). Certainly, a family trip in the car provides a special kind of family intimacy, appreciated by many families (Heurgren, 1995). However, conflicts can arise. In contrast to most other situations, when there are arguments or different opinions, it is not possible for anybody to move away and turn to something else. And if their wishes differ about how to spend time, there is little opportunity to do different things. Today marriage counsellors often mention vacations as being trials for the marriage, often resulting in divorce. It would be interesting to study the occurrence of conflict and disappointments in respect to different settings of family life, of which long car trips is one.

**Strapped into a seat**
When children travel in a car, they are physically restrained. I am not arguing against seat belts. However, if a parent would strap a child into a chair for hours when at home, we would not think it was good for the child, and might even consider it child abuse. Furthermore, while children see new sights on journeys, they get less opportunity for pursuing their own interests together with neighbourhood peers. In what ways are car journeys good for children’s emotional and cognitive development?

**Air pollution**
Cars are associated with air pollution. Usually when we consider its impact on children (and adults) we think of the situation in neighbourhoods. We want schools and playgrounds placed away from traffic. However, we should also consider what happens when we are inside a car, driving along a road. Usually we are just a few metres away from a functioning exhaust pipe. The most concentrated air pollution is always on roads, and the bigger and more trafficked, the more pollution, of course. When it comes to its effect on people, cars and industrial sources are not comparable, the way they are when we are concerned with their impact on the wider environment. Measurements of pollution are often obtained at rooftop levels, away from the highest concentrations of exhausts. We don’t put children in chimneys, but we put them in cars, in the line of other cars. As a rule, the closest car is the one we get most pollution from.

Generally the first thing we do when we stop is open the trunk/boot. The kids come along and stand right at the exhaust pipe. Exhausts continue to emit a number of pollutants even after the motor is switched off. If a family keeps their car in a garage with an indoor entrance to the home, pollutants are likely to enter their home (Peterson, 1995).

Electric cars will be great for reducing the pollution that affects people directly. (Other problems will remain). Measurements in city streets in Göteborg have shown that the air quality inside cars is like a smoky café. In a car on a congested superhighway it is probably worse. We should remember that there are many more pollutants in car exhausts beside those which are usually measured, up to a thousand different compounds (Peterson, 1990; Whitelegg, 1993; Barrefors, 1993; Barrefors & Peterson, 1996). As family lifestyles vary, so does the extent...
of car-dependency. To relate children's asthma and allergies to their extent of car travel should have a high research priority, but this has not happened to date.

**Lack of exercise**

The human body is built for exercise. Without regular exercise, health problems appear. The most apparent is people being overweight, which seems to be an ever increasing problem in modern life, also in children. Perhaps we have underrated the importance of regular exercise, like walking or cycling a few kilometres every day, in all weather conditions. This is what children used to do to get to school. Now parents drive their children to school on a regular basis. Of course, obesity is not just a physical problem. It is also a problem for mental health and self-esteem, due to its connotations to beauty and character. And, if a mother who is overweight sees her daughter gaining weight, it is likely to create tension around snacks and mealtimes. Indeed, it might well be a factor in eating disorders. Food lies at the heart of family life.

**Relations to society**

Cars have transformed our relation to society when we move from place to place in it, by enclosing us in steel and putting a distance between us and our neighbours. This seems indeed to be an important part of their strong appeal (Sandqvist, 1997) Walking, cycling, taking a bus or subway puts us in a more direct and unprotected contact with society. The way we view our neighbour or fellow traveller is also affected, for when travelling in a car, other cars are 'traffic', a hindrance or danger. To survive, you learn to watch other drivers with suspicion, because any other driver's bad judgment may hit you very hard. Children are likely to learn from their parents that other people are 'idiots' or 'maniacs'. In walking in a pedestrian zone or in using public transport, this will rarely be the case. With public transport, people furthermore have to trust the system, i.e., the persons who run it and their organisation. When parents advise their children to take the bus, they simultaneously tell them that society can be trusted. The attitude with which we habitually interact with our society may be more important than we realise. Social capital in the form of mutual trust between citizens seems to be a factor behind both economic growth and social progress (Putnam, 1993).

There are further areas in which I think we should investigate the role of the family car. For example, what is its role in creating a hectic lifestyle ('time-pollution', Whitelegg, 1993)? Or what does it mean for adolescent personality development that dependency on adults for everyday mobility is prolonged until they are 16-18 years old?

**Conclusion**

To conclude, I believe we should pay serious attention to the role of the family car for children's physical and psychological development. It will not be easy to assess a balance between good and bad, given the encroachment of automobiles into most aspects of our lives, but at least we should subject them to careful analysis.
References


Institutionen för pedagogik, Lärarhögskolan i Stockholm.


The Free Lunch Public Transport Centre: A New Zealand case study on how to acquire 2,900 car parking spaces and $0.4 billion in public debt

Michael Gunder
Senior Lecturer, Faculty of Architecture, University of Auckland.

Abstract
Local government’s attempt to get a monumental transportation centre for no cost through planning gain has failed in Auckland’s CBD. In return for large public debt and increased traffic volumes a transport station is planned for construction at the wrong location and of the wrong size. Worse, a viable small scale terminal has been lost as a consequence. This paper documents the process and suggests lessons on what not to do in transportation interchange planning.

Key words
Auckland, interchange, public transit, political volition, public choice

Introduction
Auckland, the largest urban region in New Zealand with a population of a little over one million people, is finally getting a public transport centre in its City’s central business district (CBD). This underground centre will accommodate both bus and rail and have its main entrance approximately 100 metres from the CBD’s marine ferry terminal. The development will replace an existing bus terminal and public car park. It will bring a single rail spur one kilometre closer into the CBD from the railway’s current termination.

The Council’s proposal also includes 2,400 underground private car parking places, a 500 place public parking garage, as well as the public transport station. Indeed the value of the surface development strata titled sites and 2,400 of these car spaces were to be used as leverage to get the Transport Centre without cost to the Council — ‘the financial reports on the Britomart project shows that it can be a self-funding project’ (The Auckland City Council [ACC], 1995, p. 22). Further, the City’s Mayor stated that:

[The Council has resolved that this proposal must be the subject of negotiation with interested developers on the basis of a scheme which eliminates risk to the Council. If the Council does not achieve a no risk contractual situation there is no intention to proceed. (ACC, 1995, p. 2)]

As this paper records, this was not to be. The City Council contractually bound itself to over $0.4 billion of costs and risk guarantees for the overall development while transferring all profit to the developer (ACC, 1996). Nor is the Underground Transport Centre likely to transform the City’s and Region’s public transit system. The City Council’s own Transport Manager has publicly stated that the development is inappropriate for the City’s needs (Hucker, 1995b).

Auckland: A typical post-colonial car based city
New Zealand home ownership rates are high by world standards with the traditional New Zealand dream being realised in the low density suburban 1000 square metre lot (quarter acre). Private car ownership at 1.55 cars per household (Auckland Regional Council (ARC), 1998) is inexpensive, as is petrol which is currently about $0.82 (US$0.42) per litre. The majority of private vehicles in New Zealand are sourced and imported tariff free from the cut-rate Japanese used car market. This author suggests that for many New Zealanders the ‘perceived’ cost of running a car (i.e. filling the petrol tank once a week) ‘appears’ to be lower than the partially subsidised costs of public transit, which is largely bus based in the Auckland Region.

Auckland’s regional transport system is in urgent need of redress. Its various transport networks are generally focused on the Auckland CBD as an unco-ordinated hub, while demand is increasing for cross-town links between residential and employment areas throughout the region. This reflects the existing Auckland and international trend for greenfield ‘edge city’ developments (Garreau, 1992). As a consequence, average trips to work distances between 1986 and 1996 have increased by 29% to 13.9 km (ARC, 1998).

The region’s transportation problem is that the roading and public transport networks are focused on the CBD as the historic commercial centre of the region. Yet this role has withered with the decline of the CBD as the region’s...
major employment location. In the last decade alone the CBD has experienced a more than 25% reduction of its proportion of regional jobs (ARC, 1998). Public transport and road links between areas of the region are required to relieve congestion flowing through and around the CBD, not just into it. This is exacerbated by the CBD’s geographical location adjacent the nation’s largest port which handles over 400,000 containers annually, and its location on an isthmus with only one harbour crossing (see Map 1).

This is further compounded by New Zealand’s post 1984 political preference for market competition (Gunder, 1996). There are more than a dozen ferry, bus and rail commercial public transport providers with little will for co-operation in ticketing and
co-ordinated scheduling. Local government is not permitted to directly provide 'public' transport.

As a consequence, between 1986 and 1996 the use of public transit ridership to work declined by 50% regionally while car trips to work have increased by 21%. Between 1988 and 1995 public transit travel to work into Auckland's CBD declined by 36%, with ridership in 1996 at only 9,700 commuters, less than 20% of the CBD's work force (Statistics New Zealand, 1997; ARC, 1995; 1998). The Auckland Region urgently requires better and more convenient public transport interchanges to encourage an alternative to car dependency. But the most appropriate location for these are not just in the traditional heart of the CBD.

Acknowledging these regional problems and Auckland's heavy car dependency the Regional Council developed and published their Auckland Regional Land Transport Strategy in September 1995. Objectives within the Strategy sought to:

- limit the growth of vehicle travel demand;
- reduce the proportion of trips made by single-occupant cars, and increase the proportion made as car passengers, by passenger transport and by cycling and walking;
- ensure the transport system operates efficiently, effectively and safely; and
- reduce the adverse effects of transport on the natural and physical environment.

The Strategy's policies include a range of means to achieve these objectives including the development of improved park and ride facilities, bus priority lanes and Light Rapid Transit (LRT) in existing rail corridors to Auckland's CBD. The Strategy is currently under revision with an increasing emphasis on more integrated land use and possibly road pricing to reduce travel demand, as well as renewed consideration of a second harbour crossing being likely in the updated Strategy (ARC, 1998).

The Britomart Project

The City Council's proposed Britomart development will provide an underground transit centre. It will comprise two rail platforms, 82 bus stops and parking for 2,900 cars for an originally estimated total cost of $356m (see Figure 1). The overall 4.7 hectare site including surrounding pedestrianised areas is near the waterfront end of Queen Street in the City's CBD (see Map 2).

The area designated is comparable to Sydney's Rocks Area, or Vancouver's Gastown, in regard to heritage buildings connected with Auckland's maritime history and its role as a port, if not in overall quality of environment. The Council's own consultant identified 23 buildings of heritage significance on the site. Only three of these structures are to be retained.
in their entirety under the Council’s plans (see Figure 2) with one of the structures gutted to serve as the transportation station’s main entrance and retail galleria. The rest will at best have their facades retained or be demolished.

The Council considered the estimated total cost of $300m to preserve the 23 buildings while excavating the underground terminal economically unjustifiable (Stewart, 1995).

The first, or underground, phase of the project will be built using a ‘top down’ construction technique. First a ground level slab will be constructed over the site. Excavation will then be made beneath it and the five level car park (including transport station), foundations and services constructed for future above ground commercial development (stage two). The ground level slab will be landscaped on completion awaiting take-up of its 11 development sites covering 3.2 hectares for multi-storey above ground development (see Figures 2 and 3).

Figure 1: The underground parking floors and transportation centre, including main entrance through the Central Post Office heritage building and retail galleria. Note the capping ground level development slab. (Source: ACC)

Figure 2: The Stage One underground structure and ground level development slab showing the three retained heritage structures and development slab landscaping proposal. (Source: ACC)
The initiative for the project does not lie with the Council's urban and transportation planners. The proposal was developed covertly by the Council's Property Department whose manager was a former commercial property developer (Hyde, 1997). Indeed only a few months prior to the tabling of the Property Department's Britomart proposal, the Council's planners had successfully negotiated a deal with the regional and national government for another smaller scale 'Britomart Terminal' with a cost to the Council, itself, of only $4m. This terminal would have been operational in 1996. This will be discussed further below.

Key to the initial public presentation of the larger initiative, and no doubt one reason for the early political support of the much larger development, was that the City Council claimed to be able to fund the $350m project cost through the sale of above ground development platform rights tied to 2,400 of the below ground car parking spaces (Civic Trust Auckland and New Zealand Institute of Architects, 1995). The Council stated that this would result in no costs to the Council or its rate payers (ACC, 1995). An efficient initiative, where in financial terms the transportation centre appears to be gotten free.

Yet the proposal's above ground development (see Figure 3) may saturate the CBD's property market for decades (Hucker, 1995a). The permitted above ground development rights allow replacement of designated heritage buildings with high density development providing 55% more office floor space capacity than forecast as needed to 2005 for all of the CBD. This dense, high rise development will reduce existing harbour view corridors and related amenity for a considerable area of the existing CBD. Further with its additional 2,400 private car spaces above that of the existing 500 place public parking garage which is to be rebuilt underground, and assuming development and occupancy of the new commercial buildings, the project will generate a significant increase in car-based commuting into the CBD. Surely a major contradiction if the justification for the whole project is to enhance public transport ridership!

The Council's own Transportation Manager advised the Council that the proposed location was less than ideal. He advised that the terminal was too large and potentially redundant for most rail use by 2005. He suggested further, that the proposal's location underground would add an additional $120m cost to development of a light rail system proposed within the CBD (Hucker, 1995b).

Others also challenged the proposed Britomart project for its large scale, inappropriate location for a transit centre, heritage issues, lack of alternative options, costs and its provision of 2,400 parking spaces. The last objection was particularly poignant when the project's raison d'être is to encourage public transport (Stewart, 1995).

Most significantly, while most did support in principle some type of public transport centre in the CBD, the proposal raised ongoing criticism in the local media and with the public, including a 28,000 signature petition asking the Council to stop the project (ACC, 1998).

The Council's continued public justification for the project is to improve transport linkages (ACC, 1998). One could also add: while at the same time reducing the CBD's employment decline and protecting its rate base from other locations in the region.

Map 3: Site plan of Britomart designation and proposed extended surrounding pedestrian areas. The original 1994 Britomart train terminal was to be at the right of the map on the other side of Britomart Place adjacent to the original bus station.

Foregoing a bird in the hand
The Britomart Development was initiated by the Council’s Property Department in secrecy. The Council initially spent a reported $1.4m on consultancy fees for the project without the expenditure or activity being notified in its 1994/95 Annual Plan, arguably a breach of New Zealand's Local Government Act's democratic process (Gunder, 1996).

Compounding this, the Annual Plan did make reference to a $4.0m expenditure on a Britomart Transport Terminal. But this was a totally different project! This original initiative was publicly known at the time of notification of the Draft Annual Plan, having been reported in detail in the local newspapers. It was to be an above ground train terminal for a rail spur that
brought commuter rail closer into the CBD. The initiative was to be constructed in partnership with Transit New Zealand and the Auckland Regional Council. It was at an adjacent site to the current Britomart Development by the existing bus station (see Map 2 and 3) and at a total cost of $17m for the three partners, of a totally different scale of magnitude (Hucker, 1995a).

Admittedly, the existing ground level bus terminal needed visual and general amenity improvement. Yet, this author suggests that a bit of innovative thinking and a few million dollars well spent could have overcome these deficiencies. For less than $25m, of which the ACC would have paid less than half, a ground level Britomart rejuvenated bus and new train terminal could now have been in operation. A terminal at ground level would have been well suited to a future LRT system. It might not have been a monument to political volition, but it would have done the job. The City Council stopped this original initiative, largely funded by other authorities, when it launched its major plans for its current Britomart Underground Terminal and Related Developments in December 1994.

Council urban and transport planners played little direct role in planning what could be the City's most significant built environment initiative for the first half of the next century. Of the 16 reports and feasibility studies on the project only 2 were done in-house (Auckland City Council, 1995). Indeed the Council appeared to intentionally distance the project as far as it could from both substantial in-house planning input and public consideration of alternatives (Gunder 1996).

The City did not consider alternative options to their chosen development. The Civic Trust Auckland and the New Zealand Institute of Architects (1995) did propose an alternative of comparable scale at less than a third of the total cost ($110m versus over $350m) of the Council's underground centre. This proposal had greater capacity for buses than that of the Council's development and comparable rail capacity. Most appropriately it incorporated capacity for LRT at ground level which avoided the estimated $120m cost to put the light rail system underground. Finally, this alternative proposal saved twenty of the 23 heritage buildings at the site. The alternative plan did not substantially increase parking spaces, only retaining and enhancing the existing parking garage on the site. Unfortunately the Council dismissed the proposal at a cost of $110m as not economically viable. One wonders why in the context of the following section?

**An economically rational assessment**

The Council's monumental Britomart Development promised major planning gain to the City even at the cost of additional CBD parking. Yet even this 'free lunch' was not achieved in the end. Contracts were signed with the developer, but at considerable cost to the Council and at considerable risk for future costs (ACC, 1996). These include the provision to the developer of a 'soft loan' to allow the purchase of the Council's compulsorily purchased Britomart site properties for $56m. This is in contrast to the Council's book value for the properties of $63m, in effect a $7m gift to the developer. Assuming a three year development of the subterranean centre, the soft loan will cost the Council approximately $15m in lost
Interest. The Council also contractually agreed to purchase the completed station, its associated landscaped public spaces and the underground Quay Street for $124m (see Figure 2), pay for the alterations to the rail corridor at $9m and contribute $16.5m towards the heritage preservation costs. In total the ‘free transportation station’ will contractually cost, one way or another, a minimum of $171.5m.

The cost figure of $171.5m fails to include the contractual underwriting, or risk, which the Council has agreed to on the part of the developer. In the worst case this is a potential cost to the Council of $230m of buying the development rights on the 11 sites back should no above ground development occur within ten years. In total, the Council contractually committed itself to over $400m of expenditure, lost income and assets, and risk guarantees. If the Council’s transportation policy objective for the Britomart development proves to be successful by doubling public transit patronage, this could be at a cost of up to $41,400 per additional user. A pity that for the same price Auckland could have had the start of a high quality LRT (one not need to the $120m cost to ‘underground’ it for the Britomart Transport Centre). Also, this was done without regard to the statutory public Annual Planning process required by the Council and in contrast to the Council’s elected members who repeatedly claimed ‘at no cost to the rate payers’!

It is interesting to note that the Council’s Property Manager who initiated action and then brokered its development contract as a consultant to the Council, has left the Council’s employment. He has subsequently been hired by the contracted developer to manage the Britomart project (Pacific Capital Assets, 1997).

‘Within days of completing his role as the council’s consultant on the project, which effectively ended last December when the council signed the Master Development Agreement with Britomart Investment, [he] popped up again as the executive director of... Britomart Investments Limited’. (Hyde, 1997, p. 54)

The New Zealand Herald’s Business Section of August 2, 1997 (p. E2) made the following statement on the developer’s immediate profit on the development for ‘arranging and structuring most of its complex contractual and financial arrangements’.

“The new float — Pacific Capital Assets — will buy the Britomart properties and development rights from [the developer] and his associates for $126 million. Effectively, on the same day as [the developer] buys the assets from the council (45 days after all resource consents are in place) for $56 million he will on-sell them for $126 million to the new listed company. This will be an immediate after-tax profit of $70 million, or 125 per cent, for [the developer] and his investment consortium.”

The above financial analysis and case study raise many issues which perhaps sit best for critical resolution within regime theory. In this article I suggest that this evidence really just stands by itself on how ‘not to do it’.

Implications for transportation planning, policy and practice: There is no such thing as a ‘Free Lunch’

So what will the City Council get for its over $0.4bn of contractual expenditure, lost opportunity costs and risk guarantees? It will have moved an existing bus station underground. It will have moved a train terminus approximately 200 metres closer to the centre of the CBD than that agreed to in 1994. Foregone is a ground level site which would have been operational in 1996 costing ACC $4m of the $17m total cost. The grander underground Britomart of political volition will produce 2,900 new car parking spaces in the heart of the city. It will damage or destroy 20 buildings of heritage value. It will lower amenity and seas views of many of the CBD’s existing buildings and streetscapes. Over three years on from its conception, Stage One of the project is yet to achieve all necessary resource (development) consents to allow commencement of construction, which itself is expected to take up to three years.

It should be noted that the transportation and urban planners at Auckland City Council did not initiate this action. They appeared to have had little power to flag the implications of the project even though its shortcomings were evident from the start. Flyvbjerg’s (1998, p. 227) Ålborg public transport planning case study is quite similar to that of Britomart. Both showed how local government politicians and their favoured departments, not to mention commercial/developer power factions, can create rationalisation and mistruth that defines ‘rationality’ and hence ‘reality’. Most importantly, both Britomart and Flyvbjerg’s study shows the limited voice of the ‘rational technical argument’ in the face of empowered volition.

Planners and others in the community identified the Development’s many problems. Yet they had little public voice in the face of the Council’s volition and powerful media campaign in support of the project. As Gundor (1996) noted under New Zealand’s 1991 Resource Management Act (RMA), planning’s...
capacity for innovative prescription, concern for social equity and encouragement of public debate, outside of the formal forums of Planning Commissioner Hearings and the Environment Court, is diminished as the country's complex socio-political issues, such as public transport, are reduced to ones of the market.

It appears at Auckland City Council that the vacuum created by the truncation of planning prescription to the Council's elected decision makers has been filled by another professional faction. This faction comprised the Council's Property Department's property developers whose definition of public good was legitimised under the 'new right' banner of achievement of market efficiency or Pareto optimality in the utilisation of Council assets. Yet they did not deliver this efficiency. In contrast, they actually widen the distance between marginal costs and social benefits of public transportation by refusing to consider the alternatives to that of their own proposed grand Britomart Development. In this author's opinion their only apparent area of effectiveness appears to be in inducing increased capital debt to the City's rate paying residents by advising elected decision makers to agree to contractual arrangements which by coincidence ensure risk free — hence superprofit — levels of income for future employers.

Auckland's planners must be more effective in putting forth the ethos of making cities more liveable and sustainable. This message must reach more than just their politicians, but also their fellow urban specialists and the wider community. In the case of Auckland's Britomart development, such values appear to have been outweighed by 'something for nothing profits', monumentality, and development motives which have undermined any possibility of a more sustainable transport solution.

The Britomart Development is patently an expensive folly. What transportation improvement will it provide? Little, I suggest, as the new interchange will be in the wrong location and of the wrong scale, not to mention cost. The voice of common sense planning and sustainability was mute in its development, as was the voice of free public debate. What steps should the planning and transportation professions take to ensure that these voices are not muted in New Zealand, or elsewhere in the future?

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Car-Free Housing in Europe: A New Approach to Sustainable Residential Development

Jan Scheurer
Institute for Science and Technology Policy, Murdoch University, Australia

Abstract
Many Europeans are choosing to live without a car. However, they find it difficult to avoid cars and the myriad of problems associated with them. As a result, car-free residential areas are becoming popular. This article explores the different approaches to developing and promoting car-free residential areas in different European cities.

Keywords
Car-free housing, Europe, participation, planning.

Introduction
In large West German cities, some 41% of all households did not own a car in 1993. Lower rates of overall car ownership suggest this share to be even higher in the urban centres of neighbouring countries, such as Amsterdam, Copenhagen, London, Paris or Vienna. Yet the adverse impacts of urban traffic affect all citizens, car-free or not - in the form of pollution, noise, accidents, spatial barriers between neighbourhoods and open space given over to parked cars. In most new development, the requirements of automobility are still valued higher than those of all other transport modes. This sharply contrasts with the needs of an obviously no longer declining group of car-free lifestyles present in all sectors of society. A 1992 survey in Dortmund, Germany showed that of all car-free households, some 74% were happy about living without a car and 92% did not plan to own a car in the future (Reutter and Reutter 1996, 1997a).

Car-Free Households as a Target Market
Approximately between the 1950s and 1970s, the answer for most citizens negatively affected by urban traffic was to move outwards to a ‘quieter’ suburban environment, thus producing individual relief but further contributing to the buildup of problems in the city from growing commuter and other traffic. Since re-urbanisation trends across European cities started in earnest around 1980, inner-city districts have been much sought-after as residential locations, and concern about the deterioration of urban space due to car traffic has multiplied. Programs of traffic calming and urban renewal have been successful to “take the edge off” those effects, but many citizens feel that their residential environment is still too heavily dominated by cars, especially when parked. The result is even more injustice for those who do not even own a car themselves.

Hence, car-free housing describes the attempt to create a supply for this specific target group. In exchange for savings in space and funds (typically, each off-street parking bay requires a minimum floor area or open space of 25 m² and costs between DM 20,000 and 60,000 to build and maintain) it is usually intended to provide additional benefits to the residents of such projects - this may range from extra public open space to better technical or ecological building standards or merely to lower rents. Ideally, a car-free housing project would:

- be located within easy walking distance of frequent public transit services (in particular, rail);
- include daily shopping and services;
- be connected to a good cycling network;
- be sheltered from traffic noise and pollution; and
- include open space ...

- safe enough for kids to play out of doors without supervision; and
- pleasant enough for adults to spontaneously congregate and use as a natural extension to the private dwelling.

Studies like the 1991 comparison of travel patterns in Milton Keynes, UK and Almere, NL by TEST have shown that children in existing traffic-calmed residential environments generally enjoy individual freedom of movement at a significantly earlier age than in neighbourhoods with high presence of automobile traffic.

In short, car-free housing describes a residential environment that makes it possible to reap not only the private advantages, but also the communal ones from choosing not to own a car. Yet, the term ‘car-free’ is not understood in its most radical sense: it is common practice to include a limited number of parking spaces for
shared vehicles, often supplied by one of Europe's thriving car sharing organisations. There is usually some provision made for visitors' cars and while it is aimed to maintain pedestrian-only internal access, it is normally possible for emergency vehicles to enter the neighbourhood, or when carrying heavy items.

A Cologne study, elaborated in preparation for integrating car-free projects into the city's housing policies (see below), highlights further community benefits of car-free housing: the modal share of cycling has been modelled to rise from 11% to 26% and that of public transit from 17% to 39%, with car use falling from 42% to below 1%. A theoretical energy audit saw savings in primary energy use in transport amounting to 85.5% in car-free developments over conventional housing projects. For a concrete site in a suburb with an already congested road system, it was shown how car-free housing could enable developers to build a larger amount of units that, for the number of car trips it would normally generate, had appeared as 'totally utopian' in conventional housing and would have required substantial upgrading of the surrounding road system (Möllers and Butterweck, 1997).

Recent Innovations in Parking Management

In recent years, the previously quite inflexible handling of parking provision amendments in the housing sector has relaxed considerably (Keipinger, 1996). The state of Hesse, in 1993, delegated the responsibility for parking requirements to the municipalities, some of which have since elaborated more locally adapted schemes (Hoopmann & Volpert, 1996). The city-state of Berlin, in 1995, abolished the collection of cash-in-lieu payments in certain cases and generally allows alternative approaches from parking provision to meet a development's mobility needs. Numerous other cities and states grant concessions to housing projects whose nature render it likely that a lower than usual amount of car traffic is generated. This is where many car-free housing projects appear to have found a loophole which increasingly is being formally recognised by authorities (Dittrich & Klewe, 1997). In North Rhine Westphalia, for example, parking requirements around transit stops have been reduced to 0.8 bays per unit and even down to 0.2 if the development meets car-free characteristics.

Accommodating the needs of car-free housing projects still requires sensitive negotiations between proponents and authorities, as an example from Freiburg may illustrate. In this fast-growing university town in the German South-west, a vast city extension area named Vauban will partly be developed to car-free standards in the next few years; yet, the city does not just waive the parking provision requirements but demands peripheral garage structures to be erected (while the interior of the settlement will be traffic-free). By early
1998, 90 households interested in living without a car had formed a private association which will purchase one of the sites set aside for these garages and use it as communal open space, yet it is required to hold it as a reserve for possible future car parks. For the time being, car-free property owners will save approximately DM 27,000 each on the cost of their new home. There are several contracts between residents, association and the City which, besides including a declaration to renounce car ownership by each resident, determine an equal amount to be paid back to the association should a household decide to buy a car and it become necessary to develop parking facilities on the communal reserve (Forum Vauban, 1998).

In existing urban districts, a frequent alternative is to introduce resident-only parking in the broader neighbourhood and then not issue any permits to residents of car-free projects. This is very similar to the approach already followed in Holland or Denmark (namely in Amsterdam and Copenhagen), where a Garage Code never existed and numerous inner-city housing projects have been carried out with little or no parking provision even since 1945. By such housing policy, these cities appear to have retained a much higher share of car-free lifestyles in their inner city areas than German cities.

The apartments are half owner-occupied and half publicly-subsidised rental housing. The local council ran a newspaper advertisement in 1993, resulting in 4,000 serious respondents who were asked to sign a non-obligational declaration of support for the car-free nature of the housing. The entire 6 ha site is inaccessible to motor vehicles including taxis and removal vans; however, 110 parking spaces have been created towards the western verge to cater for an estimated 20% of residents still owning a car (this figure had been established in a survey, and the spaces were allocated in a lottery). As the surrounding area has been effectively controlled by resident-only parking for years, it can be expected that car ownership will not exceed this level (Leferink, 1997). The apartments were completed in stages between late 1996 and early 1998.

Community-Initiated Co-housing in Hamburg

While the Amsterdam scheme represents a ‘top-down’ model with positive-minded planners and local councillors being the driving force, in Hamburg the opposite path was taken. A group of activists formed in 1992 to follow up the idea of creating an inner-city place to live that would be relatively free of the negative impacts of traffic while specifically targeting households without cars. The group did several architectural design workshops with the Hamburg Fine Arts Academy and gained support from the planning authorities before selecting an ex-industrial site (‘Saarlandstraße’) in the inner suburb of Barmbek, within easy walking distance of two metro stations and a major retail centre, like in Amsterdam at the verge of the ‘old city’, some 5 km from the downtown area.

The scheme includes 220 residential units in three-to five-storey buildings forming several courtyards along an existing canal. Roughly one third each are owner-occupied, co-housing shareholdes and state housing society rental apartments. As protection against the noise from a nearby arterial road, a row of office blocks which are not ‘car-free’ is also part of the design. The initiators have founded an association (‘Wohnwart’) which organises the planning and construction process with maximum involvement of the later dwellers. Wohnwart is also responsible for maintaining the car-free character of the development, a prerequisite for the city to grant concessions on the parking provision requirements (there will be 15 car parks per 100 dwellings instead of 80 as would be common practice). As such, the association also has influence on the selection.
of inhabitants - they have collected the contacts of potentially interested people for several years and in October 1997, had some 1,400 households on file. Construction of the first stage of the project has started in mid-1998.

**Car-Free Housing Market Survey in Cologne**

In Cologne there is a similar initiative to the one in Hamburg (Arbeitskreis Autofreie Siedlung Köln), though their co-operation with the city authorities has a different character. From the very start, the community group focussed on a more strategic level and sought the integration of housing societies, tenants' associations, transportation NGOs and the City Council. The concept of car-free housing could thus be successively lobbied from various sides to penetrate the planning establishment.

Following the recommendations of the round-table group, a city-wide inventory of future housing sites was made and their suitability for a car-free project evaluated. This resulted in four sites being selected as potential pioneer projects. In a second step, the citizens of Cologne were invited to participate in a market survey to establish the demand for car-free housing. People could request a questionnaire about household structures, education and employment, commuting habits, vehicle availability and preference for one of the four locations suggested, which vary greatly in their character and distance to the city centre (inner-city apartment blocks to suburban terrace-housing). Approximately 4,000 respondents representing a broad range of ages, incomes, social backgrounds and household forms gave their preference to two sites - one inner-city, one suburban - which will, from 1998, be subject to detailed planning and subsequent realisation (Stadt Köln, Stadtplanungsamt, 1998). It is notable that about 50% of respondents in the survey owned a car at the time, but were determined to sell it if moving into a car-free housing project; and a further 25% had already got rid of the car they had once owned. Also, a surprisingly high 20% of respondents expressed interest in setting up a home-based business in their new neighbourhood, giving grounds to the vision of an integrated and multifunctional urban district which is fully in keeping with models discussed for a more sustainable urban structure of the future (Newman & Kenworthy, 1998).

**Car-Free Urban Renewal**

Urban structures built before the 1930s have largely been 'car-free' throughout their existence, as the provision of parking space was not on the agenda when cars were exclusively a luxury item for the rich. However, many pre-war housing districts were subject to substantial deterioration when streets and courtyards filled with cars after 1945, depriving their residents of multi-use open space in their immediate residential environment. In Western European cities, traffic calming, the greening of courtyards and in some cases the construction of expensive underground car parks have helped to ease the problem to some extent. In East Germany, the situation is quite starkly different.

The city of Halle, Saxony-Anhalt, has suffered a continuous population decline in its inner city districts since long before 1989 and now also experiences negative growth in its aging housing stock from the communist period, while car ownership is approaching Western levels. The need to enhance the city's attraction has led to an urban renewal program that attempts to deal with both inner urban dereliction and the negative impacts of the car simultaneously, through a combination of revitalisation and support for car-free structures especially in the pre-war neighbourhoods. These older districts, often located near the city...
centre, on good public transit and still bearing many qualities of traditional urban space are once more sought-after in the 1990s and provide vital capital for promoting a compact and lively city. Planning authorities have initiated a co-operation with housing societies and community groups and support from the Federal Bureau of the Environment. The aim is to bring back the original car-free qualities to the modernised buildings and open spaces by encouraging a concentration of car-free households (facilitated by the housing society’s allocation policy) and improving local retail to make car-free shopping as convenient as possible. In a first step, nine potential neighbourhoods were assessed to criteria such as the current transport situation, the accessibility of local services and recreational facilities, and the attitudes of resident groups, landowners and businesses towards a car-free policy (Wuppertal-Institut 1988). As a pioneer site, a neighbourhood 1.5 km south of the city centre (Johannesplatz) has been selected for a process of detailed community consultation during 1998.

Conclusion
Car-free housing schemes represent a vital element of urban planning that aims to reduce the negative impact of automobile traffic in cities and to encourage the evolution of more sustainable mobility patterns. They offer solutions to cost restraints on public housing — often caused by excessive parking space requirements — especially in densely built-up areas, as well as reduce the need for extensions of road infrastructure for access. Nonetheless, the current German experience is showing how both planning authorities and the marketplace take time to adjust to the concept of housing with fewer or no car parks. The role of active community groups as serious promoters of such projects and the availability of a range of mobility opportunities including established car-sharing schemes, appear to help accelerate this learning process.

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Reduced car ownership as a route to clean transport

Richard Gilbert
Managing Director, Centre for Sustainable Transportation, Toronto, Canada

Abstracts
There is a correlation between vehicle ownership and vehicle use - if you own a vehicle you will tend to use it. Discouraging car ownership, therefore, can reduce use. To achieve this, a new policy focus with the following overarching principle is needed... Every part of every urban region should be developed and organised so that the advantages of not owning a car are at least equal to the advantages of owning a car.

Keywords
Cars, democracy, ownership, use.

Introduction
My response to the topic of this session - 'Promoting Clean Transport' - is that the cleanest transport of all is no transport, at least no motorised transport. Motorised vehicles produce pollution, at the vehicle or where the vehicle's fuel is produced, or both. Non-motorised forms of transport - bicycling, walking, and pushing a handcart - mostly function within the Earth's carrying capacity. Thus, the best way to promote clean transport is to promote less motorised transport.

Levels of use of vehicles with motors are closely linked to levels of ownership. It follows that reducing ownership could be a powerful way of reducing use. However, imposing other than modest restraints on ownership is at most a taboo subject. To do so is considered undemocratic. For example, a UK Royal Commission argued in 1994, 'the increased cost of mobility should be imposed on the use rather than on the ownership of cars, in part because we do not consider it equitable to erect high barriers against car ownership.'

The main purposes of this presentation are to begin to defy the taboo, to propose that explicit attempts should be made to reduce car ownership as a central part of the general effort to reduce car use, and to show how car ownership could be reduced.

The link between ownership and use
The link between car ownership and car use is illustrated in Figure 1. Average distance travelled per car in the United States of America has been more or less constant since 1940. Meanwhile, the total distance travelled by cars has increased more than sixfold. The number of cars on the road has increased by almost as much. Thus, on the face of it, the amount of car use in the USA appears to be almost entirely determined by the amount of ownership. However, the similar increases in ownership and use over time are far from conclusive evidence that ownership causes use - the correlation could equally be taken to mean that use causes ownership, or that both are caused by a third factor - but there is clearly a strong link of some kind between ownership and use.

Other evidence that ownership causes use comes from investigations of the travel patterns of households, which have shown large

Figure 1: Distances travelled, car ownership and fuel use in the USA, 10-year intervals, 1940-1990 (1940=100)
increases in car use with each addition of a car to a household. This kind of evidence, together with the kind of evidence shown in Figure 1, has led to conclusions that ownership is the strongest determinant of use.Indeed, it would be surprising if there were no link between ownership and use because if car purchase did not increase use, it would be a largely pointless exercise. But it may be equally surprising that the link is as tight as Figure 1 suggests.

Phases of ownership – international differences
Levels of car ownership in rich countries have gone through several phases, illustrated in Table 1. The table suggests that the UK is following the same pattern of ownership as the USA, but 35 years behind. Other European countries may be on similar paths. Table 1 also describes a fourth stage in the evolution of ownership that follows the stages of luxury, household, and individual ownership. In this new stage of ownership – now happening in the USA – each driver on average owns more than one car. One vehicle may be owned for commuting, another for weekend use, and yet another for creating a good impression. The new ownership pattern involves the breaching of what are sometimes thought to be saturation levels of ownership.

Each of the four phases of car ownership is associated with increased car use. It could be thought that the fourth stage, in which individuals own many vehicles, would be associated with reduced use per vehicle, for the reason that an owner can drive only one of his or her vehicles at a time. On the contrary, available data suggest that this latest stage of car ownership is associated with an increase in kilometres travelled per vehicle, i.e. with even more use.

Transport patterns in Europe in many respects track patterns in North America. There is little to suggest that what is happening now in North America will not be Europe's fate within a few decades.

One way in which transport patterns in North America and Europe diverge is in the use of fuel for personal vehicles. In the USA, as Figure 1 shows, fuel consumption for personal motoring has been more or less constant since 1970, notwithstanding large increases in vehicle ownership and use. In Europe, fuel consumption has continued to increase with increased use. Because the harm caused by transport is in considerable measure related to the amount of fuel used, there may seem to be reason for complacency in the USA. However, fuel use there has stabilised at a level that is far above anything that might be considered sustainable.

Restraining car ownership
Command economies such as those of the former Soviet Union restrained the use of cars in part by limiting ownership. The restraints were imposed for several reasons including facilitation of coercion and avoidance of resource use. However, most such states liberalised ownership during the 1980s – to the extent that, for example, car ownership in East Germany at the end of the decade was as high per capita as that in Japan. Liberalisation is now occurring in China, where car ownership appears to increase at a rate of more than 33% annually.

More relevant to the circumstances of the late 1990s may be the case of Singapore, where a democratically elected authoritarian government has, as a matter of policy, been limiting car ownership for decades. In the 1970s, not long after Singapore was a Third World country in every sense of the designation, the government realised that unrestrained automobile ownership could be a barrier to economic growth. Huge purchase taxes were imposed, raising the cost of automobiles to several times North American levels. As personal incomes grew, these taxes proved inadequate as devices to restrain ownership and use. (Singapore's per capita GDP is now among the highest in the world.)

In 1990, the Singapore government began to ration ownership through monthly auctions of certificates of entitlement to own a vehicle. The number auctioned each month is determined by the number of vehicles taken out of service in the previous year and by the current policy concerning expansion of the fleet of vehicles in use. Without an entitlement, possession of an automobile is illegal. In early 1998, a bid of about £21,000 (US$30,000) was required to secure an entitlement. (It has been said it would

Table 1. Transformation of the automobile in the USA and the UK

| Transformation of the automobile: | Threshold (cars/1000 persons) | Approximate year of crossing threshold
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<tr>
<td>from a luxury item to a household item</td>
<td>60</td>
<td>1920 1955</td>
</tr>
<tr>
<td>from a household item to an item owned by an individual</td>
<td>300</td>
<td>1955 1990</td>
</tr>
<tr>
<td>from an all-purpose individual item (one car per driver) to a specialised individual item (more than one car per driver)</td>
<td>600</td>
<td>1990 2025?</td>
</tr>
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</table>
have been about £ 37,000 but for the Asian economic downturn.) The resulting total price for a typical car is well over £ 40,000. About 4,000 certificates are issued per month for a population of about three million, with about 10,000 residents bidding. The lowest successful bid is each month's certificate price.\textsuperscript{13}

Few non-authoritarian governments have explicitly attempted to restrain ownership. They have not felt the need, or they have feared adverse economic consequences, or they have not wanted to be considered undemocratic.

Such restraint as has existed has been in the form of high purchase taxes, levied for the most part in countries with no indigenous car manufacturing industry, and often imposed as much to raise revenue as to reduce the size of the automobile fleet. Indeed, growth in ownership has generally continued, albeit at a lower rate than would have occurred without the taxes. As the experience of Singapore shows, even extraordinarily high purchase taxes do not reverse growth in ownership.

**Is restraining car ownership undemocratic?**

The question as to whether, on balance, automobilisation enhances or impedes democracy is a profound one that can be no more than touched on here. In one sense, the car has been the 20th century's great liberator and equaliser. It has greatly expanded economic and social opportunities and has enabled ordinary people to travel with a degree of comfort that surpasses anything imaginable in former times, even by royalty. But the car has also fettered those who own one and deprived those who do not. Owners spend hours at work to support their habit of car use, often more hours than they save on account of the convenience of car ownership. Those who are too poor or unfit to own a car (or too principled) find that their opportunities for mobility decline as public transport services are withdrawn for lack of patronage.\textsuperscript{13}

A case can be made that present trends in car ownership and use in rich countries are leading to a loss of personal freedom and democratic opportunities.\textsuperscript{14} But it may also be true that attempts to reverse the trends, particularly growth in ownership, may be worse in these respects than allowing the trends to continue.

Two questions arise:

- Is restricting ownership more undemocratic than restricting use?
- Is rationing more undemocratic than limiting ownership or use through high taxes?

On the face of it, there is not much to choose between restricting ownership and restricting use. If the restrictions are achieved through high taxes or other charges, the poor will be more or less equally disadvantaged in both cases.\textsuperscript{15} There is an important difference, however, between restricting ownership and restricting use. It is that the former has more potential for reducing the size of the constituency of car owners and thus their ability to influence decisions about such matters as road improvements and provision of public transport. Moreover, given that car ownership appears to impel car use, restrictions on use without restrictions on ownership may well be ineffective.

Rationing in its purest form – when everyone has an equal share of a prescribed total – appears to be more coercive than limitation through taxation. Governments must provide ration cards, or electronically 'smart' cards, and police their use. Yet rationing appears to have been popular when the need for restraint has been accepted.\textsuperscript{16}

Rationing of ownership or use would appear to be inherently democratic if the restricted item is equally available to all through equal allocation of entitlements. Schemes that then allow trading can sustain much of the equability. The rich can afford more mobility than the poor but they have to pay the poor for it. Legal trading obviates the establishment of a black market, which may be less equitable.

In answer to the question posed in the title of this section, it may be reasonable to say that widespread mobility can enhance democracy but that democracy may be challenged if a large part of that mobility involves use of the private car. Many methods of restraining ownership and use of cars appear coercive. On examination, some forms of rationing may be found to be more democratic than alternatives based on allocation entirely through price.

**Non-coercive methods of reducing car ownership**

A useful strategy for achieving a particular outcome is to examine places where the outcome occurs 'naturally', identify the conditions responsible for it, and reproduce those conditions.

There are several places, even in North America, where car owners are in the minority. One is downtown Toronto and the residential areas immediately around it. As shown in Figure 2,\textsuperscript{17} less than half of all households in this Core of the Toronto region possess a car. As people live farther from the centre they are more inclined to own a car, to the extent that in the Toronto region's Outer Suburbs only 6 % of
households are without a car. A good strategy for reducing car ownership throughout Toronto could be to reproduce the conditions of the Core throughout the region.

There are two kinds of difference concerning residents of the different concentric rings of the Toronto region that might account for their differences in car ownership and use. One kind is to do with the residents themselves and includes such factors as age, income, and household composition. The other kind is to do with the residents' circumstances, including such factors as proximity to employment and services, availability of public transport, and, above all, density of settlement.

There have been attempts to explain some or all of the differences in travel according to location of residence within urban regions in terms of the first kind of difference, i.e. in terms of socio-demographic factors. The key variable seems to be income, which in some regions increases with distance from the downtown. In the Toronto region, per capita income declines with distance of residence from the downtown; per household income increases, corresponding to an increase in household size. Another key variable is age. Old people and children travel less. In the Toronto region, the Core has more old people; the Outer Suburbs have more children. Socio-demographic factors cannot readily explain the differences in car ownership and use noted in Figure 2.

The differences in environment appear to be more relevant. The destinations of people who live in Toronto's Core – notably employment and retail outlets – are evidently closer, allowing much more ready access by foot or bicycle. Public transport is evidently more available in the Core and the Core Ring, allowing greater use of this for longer journeys.

The conclusions to be drawn are simple, and not new. When destinations are near and public transport is good, people are less inclined to purchase cars and are thus much less inclined to use cars. What is difficult is to use these conclusions in shaping policy. Merely requiring high-density development or mixed development, or both, is not enough if destinations are still distant and public transport inadequate. Merely improving the frequency of public transport can actually result in environmental degradation, if it is not used.

**A planning principle for our times**

A different policy focus is required, one that recognises the importance of ownership as a major factor in car use and thus explicitly seeks to put people in a position where they choose not to purchase a car. This new policy focus has the following overarching principle:

*Every part of every urban region should be developed and organised so that the advantages of not owning a car are at least equal to the advantages of owning a car.*

The question then becomes how to put this principle into practice. Effective implementation will likely depend on several factors, including the following, listed in approximate order of importance:

- Much better understanding than we have of what causes people to choose to or not to choose to purchase a car.
- Good knowledge of where in general people want to travel.
- Good understanding of how to ensure that destinations are reachable primarily by foot or bicycle and secondarily by public transport (including taxicabs, paratransit, etc.).
- Knowledge of how to substitute for many of the desirable features of cars, notably goods transport (shopping) and service as extensions of living or working quarters.

![Figure 2. Travel (trips made) and car ownership in concentric parts of the Toronto region (1996)](image-url)
Gilbert: Reduced car ownership as a route to clean transport
World Transport Policy & Practice
4/3 (1998) 21-26

(e.g. as mobile offices).
- Ability to provide cars when absolutely necessary, through rental services or car-sharing programmes,21
- Special attention to the dreams of young people, particularly males, for independence through mobility.

Above all, we need better knowledge of how to organise our urban regions so that the people who live in them choose to not own cars. These choices can be encouraged by appropriate taxation regimes and other obstacles to car ownership. However, if low levels of ownership are to be sustained in a non-authoritarian democracy, the strongest supports will have to come from appropriate town planning and from appropriate organisation of services.

The appropriate town planning strategy may well be to build on what works rather than to create something anew. For Toronto, this could mean making the Core Ring more like the Core (see Figure 2) rather than practising New Urbanism in the Outer Suburbs.28

Every proposed action by government, local or otherwise, concerning urban regions could be subjected to the following test. Will what is proposed make it more advantageous to live in the urban region without a car? If the answer is 'yes', and the reasons for the affirmative answer are convincing, then what is proposed should be done, and only then.

Application of the overarching principle proposed here, and the test derived from it, would contribute much towards the promotion of clean transport.

Notes
2 The data in Figure 1 come from the following sources: Domestic (inter-city) passenger miles travelled per mode are from Wilson, R.A. (1997) Transportation in America: Historical Compendium 1939-1995 Eno Foundation, p. 20. Vehicle-miles travelled and fuel consumption data are from American Automobile Manufacturers Association (1996) Motor Vehicle Facts & Figures pp. 61 & 66. Population data are from US Census Bureau Inter-censal Estimates of the Total Resident Population of States at http://www.census.gov/population/estimates/ Note that inter-city passenger miles travelled are taken as a surrogate of all passenger-miles travelled, which may be subject to systematic distortion over time on account of suburbanisation and decline in use of public transport.
3 Why owners of cars in the USA drive them an average of about 19,000 km a year deserves investigation, but one could make use of the apparent tight link between ownership and use without understanding how it came about. In the UK and Canada, each vehicle travels about 16,000 km per year. In France, Germany, and Japan the distances are less: roughly 13,000, 12,000, and 11,000 km per vehicle per year respectively.
4 See, for example, Wootton, J. (1993) ‘Local transport solutions with 20/20 vision’ in Local Transport Today.
6 Although ownership without use may be pointless, it appears to be the desired outcome of many policy prescriptions, e.g. that of the Royal Commission detailed in Note 1. This position has been echoed by the current UK government, which is said to believe that 'car ownership is good and car use is bad – or at least to be discouraged'.

(Adams, J. in a letter to the Editor of The Times 3 July, 1998). Schipper (Note 5) has provided a rationale for ownership without use: owning a car per se leads to few environmental problems: A gas guzzler sitting in a garage pollutes and congests less than an efficient car driven several hours per day.' 7 The transformation from household to individual possession is not yet well evident in Europe but it has been noted, for example in Norway. Inge Lian, J. (1991) 'One household with several cars – or several households with one car each?' in Methods for Understanding Travel Behaviour in the 1990s. Proceedings of the 6th International Conference on Travel Behaviour International Association for Travel Behaviour. Quebec, May 1991.
8 For example Adams (see Note 6) refers to the saturation level of car ownership as 'the level reached when everyone old enough and fit enough to drive a car owns a car'. It should be noted that some environmentalists in the USA have welcomed this new stage of car ownership (many cars owned by one individual). For example, at the Vancouver conference referenced in Note 14 Michael Replige of the Environmental Defense Fund of Washington D.C. advised that encouragement of ownership of several vehicles could be an environmentally sound strategy in the USA – although perhaps not in other countries – to allow for more appropriate matching of vehicles to the task at hand.
9 Thus between 1990 and 1995, kilometres travelled per automobile in the USA increased from 18,250 to 19,660, even though there appeared to be more cars than drivers. 'Cars' in this instance includes all vehicles owned for private passenger transportation, including vans, light trucks, and sport-utility vehicles as well as regular automobiles (Bureau of Transportation Statistics, (1997) National Transportation Statistics US Department of Transportation, Washington DC, tables 4-7M and 4-8M). The frequently made observation that cars are typically idle for 95% of each day means there could be considerable scope for car use to increase with multiple ownership.


12 It should be noted that the Singapore scheme constitutes rationing only in the sense that the total availability of an item is limited. Another frequent feature of rationing is absent, namely equitable availability of the restricted item. In the Singapore scheme only the relatively rich can participate in the rationing scheme.

13 It could be thought that there is an optimum of level of car ownership below which increases in ownership enhance democracy and above which increases in ownership impede it. However, note should be made of what might be considered to be undemocratic aspects of relatively low levels of car ownership. In Mexico City, for example, only 17% of households own a car, and yet all are affected by the very high levels of pollution from car use. Also, the cars of the minority disproportionately congest the streets resulting in poorer bus services for the majority.

14 See, for example, Adams, J. (1996) 'Can Technology Save Us?' in *Towards Sustainable Transportation* proceedings of a conference organised by the Organisation for Economic Co-operation and Development, Vancouver, Canada, March. (Published in CD-ROM form by Environment Canada in 1997 and in a printed version by the OECD in 1998.)

15 UK data suggest that households below the average income spend relatively more on the use of their cars than on ownership of them; above-average-income households spend more on ownership. (Bannister, D. (1994) 'Equity and acceptability questions in internalising the social costs of transport' in *Internalising the Social Costs of Transport* ECMT/OECD, Paris, pp. 155-175, table 6.4.) Thus proportionate taxes on ownership could be slightly more equitable than such taxes on use.

16 Here are three examples of the relative popularity of rationing by means other than purely by price. According to John Adams (personal communication), petrol rationing was introduced during World War II, in the UK, in response to popular demand for fair allocation. In Paris in the 1980s, a survey suggested that Parisians would prefer that no one be allowed to bring a car into the city proper rather than have access restrained by charges, on the grounds that the latter type of system would benefit only the rich. In Hong Kong in 1996, a survey conducted by the Social Sciences Research Centre of the University of Hong Kong indicated more support for a Singapore-type rationing system than for a large increase in purchase taxes on cars.

17 In Figure 2 – taken from the Centre for Sustainable Transportation (March 1998) *Sustainable Transportation Monitor* – the Core is downtown Toronto and the adjacent area, a total of some 18 km². The Core Ring is a band roughly 8 km wide around the Core. The Inner Suburbs form a band some 12 km wide around the Core Ring. The Outer Suburbs are the remainder of what is known as the Greater Toronto Area (GTA). The Core, Core Ring, and Inner Suburbs, on the one hand, and the Outer Suburbs, on the other hand, each have about half of the GTA's population of 4.6 million. The population of the Outer Suburbs grows rapidly; that of the remainder grows hardly at all. The source for the data in Figure 2 is the 1996 *Transportation Tomorrow Survey* conducted by the Joint Transportation Project of the University of Toronto.

18 Among those who have emphasised socio-demographic factors is Schipper, as cited in Note 5. He provided evidence that in the USA, the rich travel more than four times as much as the poor, and that adults under 35 years of age travel 50% more than those over 60.

19 Buses in the USA use six times as much fuel as cars but on average carry only five times as many people (Centre for Sustainable Transportation (March 1998) *Sustainable Transportation Monitor*). Thus, mostly on account of declining bus occupancy, the average passenger-kilometre travelled by bus has a greater environmental impact than the average passenger-kilometre travelled by car.

20 At a meeting of experts on the topic of Sustainable Consumption and Individual Travel Behaviour held at the Organisation for Economic Co-operation and Development in Paris in January 1997, 'support for [a version of this] objective was so strong that three quarters of meeting participants chose it as the most significant policy recommendation to emerge from the two days of discussion'. OECD document GD(97)144.

21 Among the most encouraging signs of a different approach to car use is the success of the car-sharing movement (see, for example, Wagner, C. & Shaheen, S. (1998) 'Car Sharing and Mobility Management: Facing new challenges with technology and innovative business planning' in *World Transport Policy & Practice*, Vol. 4, No. 2). Car rental companies are now alert to the commercial potential of non-ownership. A recent article by Harvey Jones in the *Independent on Sunday* (5 July, 1998) described how 'Members of the Privilege Rental Club, run by Eurocar, can book a car for a set number of days, pay a monthly or quarterly charge in advance, and are free to order a car whenever they need one.' The bottom line is that a household that sells its car and relies on Eurocar or one of the more grassroots car-sharing services typically reduces the amount of its motorised transport by 50%. The *Independent on Sunday* article notes too that a lot of money can be saved: rental of a car for 100 days – i.e. every weekend – through the Privilege scheme would cost about £3,000 a year compared with ownership costs of £4,000-6,000. Indeed, car-sharing is being promoted in Singapore, among the most costly places in the world to own a car, as a means of allowing more people to drive. Thus car-sharing could increase car use. However, in most places, use of car-sharing allows households that would otherwise have a car to go without one and thereby reduce their motorised transport by a substantial amount.

22 New Urbanism is a movement within the architectural and town planning community that seeks to avoid the excesses of urban sprawl chiefly by adding to outer suburbs at greater than customary densities.
Hungary's M3 Highway: Multilateral Development Banks undercutting each other's objectives

Walter Hook
Executive Director, Institute for Transportation and Development Policy, New York

The currency used is the Hungarian Florin – ft 230 = US$1.

Walter Hook,
Institute for Transportation and Development Policy,
115 West 30th Street,
Suite 1205,
New York,
NY 10001,
USA
E-mail: mobility@igc.apc.org

Abstract
Hungary is pursuing rapid infrastructure development, in some cases, ignoring World Bank advice. The numbers do not add up but, like elsewhere, there is the mistaken belief that roads bring jobs.

Keywords
Banks, development, Hungary, infrastructure.

Introduction
Private motor vehicle use has expanded rapidly in Hungary since the transition to a more market-oriented economy in 1989 despite half a decade of severe economic recession. While partly a market reaction to the relaxation of controls on auto consumption, the dramatic shift in subsidies to the road sector has also played an important role. Prior to the transition, Hungary raised some ft 60 billion in gasoline and other road user taxes, while spending only ft 10 billion on roadways. In 1989, gasoline tax revenues were earmarked to spending on roads, increasing highway spending by some ft 50 billion. Since that time spending on new roads in Hungary has taken off.

This massive reallocation of funds away from the general budget towards road projects was still insufficient to finance the ambitious new road schemes being proposed by the new government. The government began construction of a ring road around Budapest (M0), and to complete roads connecting Budapest to Vienna (M1), Bratislava (M15), to the Slovenian border past Lake Balaton (M7), to Szeged and the Serbian border (M5), and past Miskolc to the Ukrainian border (M3). On top of this, there was a ft51 billion backlog in unmet basic maintenance and road safety needs inherited from the previous regime.

Unable to finance these ambitious road construction schemes with the speed desired by politicians anxious to show signs of progress to the electorate with gas tax revenues alone, the Hungarian Government decided to build as many of these basic highways as Build-Operate-Transfer (BOT) private toll road concessions. By offering varying degrees of public subsidies to private concessions, the Hungarian government was able to sign concessions for the construction of the M1, the M5, the M15, and the M7. Subsidies to the M1 were ostensibly restricted to the contribution of land in exchange for an equity share, but are now going to be higher as a lawsuit has forced the toll rates below those outlined in the concession agreement. For the M5 a ft 9 billion reserve fund has been established in case of traffic shortfalls.

The M3
Of all Hungary's ambitious new road schemes, the M3 highway has been the most controversial. While the Hungarian government tried to fund the road as a private concession like the other highways, private investors determined that the traffic counts were insufficient to make the road profitable without an enormous government subsidy. An evaluation by Parsons Brinkerhoff showed that if the financial rate of return on the road were increased to cover the cost of capital, (which was possible for the stretch immediately outside Budapest mainly because a large section of the road that would be tolled was already built), then the traffic counts would be too low to justify the project on grounds of an uneconomic rate of return. On the second section of the road, where traffic counts are even lower and no road is built, projected tolls will only cover 20% of the construction costs, thus requiring an enormous government subsidy. The Ministry of Transport concedes that the economic justification for building the M3 highway is weak, and the main justification for the road is political. Trade with Ukraine and the former Soviet Union fell off after 1989, and traffic in the M3 corridor fell by nearly a third. Ukraine, feeling capacity in the corridor is already sufficient to handle the reduced trade, has announced it will not build a road to meet the M3 for at least two decades. The rail line in the same corridor has seen its traffic fall dramatically due to these structural economic changes, and constructing the highway will only further undermine the rail corridor.

Nonetheless, 40 Members of Parliament from
Eastern Hungary, from the Socialist Party, are pushing for the road, hoping it will help bring investment and jobs to the region. They are supported by the Ministry of Industry and Trade, Hungary’s highway lobby, local mayors, Socialist Party organisations, and the biggest association of trade unions, and are opposed by fiscal conservatives, in some sense by the Ministry of Finance, the World Bank, and environmentalists. Rail interests have failed to take a stand for fear of provoking a fight in Parliament over their continued extensive subsidies.

The details of the financing of the M3 illustrate how the institutional objectives of the different multilateral development banks in some cases undermine each other. The World Bank was opposed to building the M3 from the beginning. The World Bank, actively involved in broader Structural Adjustment negotiations with Hungary addressing overall public sector indebtedness, was concerned about the debt ramifications of this ambitious road project. Based on the feasibility study, it was clear that the road could not possibly be built without massive government subsidies. This would require further borrowing against the Road Fund which already had an unsustainable debt service burden that was cutting into its ability to finance the ongoing maintenance work being financed by a previous World Bank loan. The economic rate of return on the backlog of maintenance needs, according to the World Bank, was more than three times higher than for the new construction. The government at that point agreed to provide the funds for the M3 directly from the State central bank rather than from the Road Fund, which would remove the threat to the maintenance expenditures, but the World Bank still refused to agree.

The Hungarian government then turned to the European Bank for Reconstruction and Development (EBRD) to finance the road. The EBRD’s primary institutional objective is to promote the private sector, and they were interested in the M3 so long as it was built as a private sector BOT. With such a large government subsidy required, the government’s incentive to use a BOT was considerably diminished. As such, the government decided to build the road as a 100% government-owned toll road. Once the idea of a private concession was dropped, the EBRD lost interest in the project.

**Lenders**

The Hungarian government found willing lenders in the European Investment Bank (EIB) and the German Government’s Kreditanstalt für Wiederaufbau (KfW). The EIB, governed by the EU, is primarily concerned about pan-European economic integration. As such, it defined priority transport corridors, and will more or less fund them regardless of the economic viability of any of the individual links. The World Bank, by contrast, has consistently argued the need for demonstrating economic viability of each individual link before agreeing to financing, which could not be demonstrated in the case of the M3. The M3 is part of the Trieste-Ljubljana-Budapest-Lvov-Kiev priority Trans-European Network corridor, so the EIB has been willing to finance it over the objections of the World Bank. Germany’s willingness to fund the M3, aside from following the EU position, was apparently related to a broader German Government initiative to promote development in Eastern Hungary.

The EIB and KfW loans for the first section of the M3 went ahead despite opposition from the World Bank, and despite conclusive evidence that the planning and evaluation of the M3 had not followed EU directives. EIB staff acknowledged that for the first phase no public hearings were held to discuss alternatives to the M3 or the route selection, in direct violation of EU directives. Public hearings were restricted to discussions with local government officials. Furthermore, the Environmental Impact Assessment (EIA) ignored the impact of the road on increased traffic inside Budapest, increases in traffic on residential areas along alternative routes, and on animal habitats in the corridor, all in violation of EU norms. A new EIA currently indicates that resulting air emissions in surrounding neighbourhoods may be in violation of public health codes. In short, the economic and political unification agenda of Germany and the European Union undermined the concerns of the World Bank regarding Hungary’s indebtedness, and even undermined many of the EU’s own environmental and public participation directives.

The Government of Hungary is now seeking international funding for the next section of the M3 highway. They reportedly have offers from the EIB, the KfW bank, and Japan’s OECF. With so many sources of international financing available now for major infrastructure projects, poorly planned projects can really only be stopped by political resistance in the country; stopping the project with a particular funding agency is unlikely to stop the project itself in the long run. The M3 highway company has since then held some 47 public hearings and most of the complaints by local residents were about the imposition of tolls on the section of
existing, untolled road. They plan to mitigate this problem by providing a discount pass for frequent users and local travel. Other complaints were from citizens from surrounding roads suffering from the diversion of traffic to their neighbourhood as a result of the toll. This could be dealt with by either lowering the toll, in which case the financial cost of the next section will be increased, or by traffic calming the alternative routes, which would anger drivers but please local residents. Currently the is plan to complete the road as far as Miskolc by 2004, and there is no government decree as to construction as far as the Ukrainian border.

Conclusion
Ultimately, the M3 highway project is going ahead, if somewhat slowly, not only because of the strength of the highway lobby, and despite opposition from the World Bank, but because people and politicians in the region see this as an opportunity to get jobs and construction contracts financed from the central government. So long as the choice from the point of view of regional politicians is ‘highway or no highway’, they will want the highway. Until realistic alternative central government-funded development projects can be identified which, florin for florin, have superior employment generation benefits, road projects like the M3 will go forward with significant public support.
Road Project Evaluation Techniques in the United States of America: A Case Study of the Boston Central Artery/Tunnel

Joe Crosett
Consultant, Hagler Bailly

Abstract
Boston's road infrastructure is being expanded by constructing a major new road which was planned before the advent of ISTEA. Because of its scale, the promoters were careful to consult widely and address the fears and worries of as many as possible. As a result, by mitigating those fears, the project is generally welcomed.

Keywords
Boston, consultation processes, infrastructure development.

A greening of road project evaluation in the US?
In the USA, a nation where the car is perceived as a powerful engine of economic growth and even a cultural icon, it is surprising to find that the country's largest road project also creates new parks and improves transit. The explanation lies, at least partially, in the changes occurring in the policy framework that guides road project evaluation in the USA. Greater public participation is at the core of these changes; and it is forcing a reassessment of the types of activities that are eligible for 'highway' dollars, who should pay for them, and how to balance transportation needs with environmental concerns.

Boston's Central Artery and Tunnel (CA/T) project, by virtue of its huge scale, illustrates many of the challenges faced by transportation agencies throughout the USA as they plan and implement road projects. The CA/T physically impacts a thriving downtown business community, a series of diverse residential neighbourhoods, and an area that includes many of the nation's most important educational and cultural institutions as well as a set of unique environmental resources. The issues at the core of the debate about the CA/T, such as transportation funding, urban renewal policy, and environmental mitigation strategies, are similar to those found on a smaller scale in road projects across the USA.
tunnel named after Boston Red Sox star Ted Williams), and to East Boston and Logan International Airport; completing the last link in the US Interstate Highway System.

But the new highway, 10 lanes wide and soon to be running under Boston’s downtown, is only half of the story. The project replaces the old elevated freeway with new parkland, which will reconnect the city’s urban neighbourhoods to the shoreline. 14 transit and commuter rail projects, and a regional system of high occupancy vehicle (HOV) lanes, agreed to by the state, are optimistically intended to halve the number of people driving into the urban core. This is in addition to the environmental clean-up of Spectacle Island, a contaminated site in Boston Harbour proposed as the location for storing excavated material from the project, and an elaborate strategy for minimising construction-related congestion and noise problems in the vicinity of the project. As Hodges (1998) notes, ‘planners, city enthusiasts, environmental groups, citizen organisations and even developers have found ways to use the CA/T to achieve a multitude of planning objectives’.

How does a road project become a transit project, a parks project and an environmental clean-up project? The short answer is a US $10.8 billion price tag (General Accounting Office, 1997). Behind this cost is what some observers have called a new paradigm in highway planning. At the heart of the new planning paradigm is a focus on public participation and dispute mediation as an integral component of the technical project evaluation process. The Boston CA/T exemplifies this trend perhaps better than any other project in the US.

**How US road planning regulation works**

Planning of the CA/T has been guided by an extensive federal system for planning road development. The National Environmental Policy Act (NEPA), and the Intermodal Surface Transportation Efficiency Act (ISTEA) are the most significant national-level laws that regulate major road project assessment practices in the USA. The technical evaluation process governed by these and other legal requirements guides project development; however it is also proving to be a catalyst for the emergence of a public involvement process that is redefining the content of traditional ‘highway’ projects.

Environmental review of major road projects prior to their implementation is co-ordinated under NEPA. The Act requires creation of an Environmental Impact Statement (EIS) for major federal actions that significantly affect the human environment. This Statement documents the relative impacts of project alternatives, and can be extremely large and time-consuming. NEPA mandates public involvement throughout the review process.

The US Congress passed ISTEA into law in 1991. ISTEA has triggered a major reshaping of the US highway planning process; opening up new funding flexibility, and making state and local transportation agencies the focus of highway planning, with continued federal oversight from the US Department of Transportation. ISTEA’s key themes include the development of fiscally constrained transportation plans, as well as more inclusive planning and public involvement processes.

Fundamentally, ISTEA and NEPA are procedural in nature. This means that neither Act requires that the most environmentally beneficial alternative must be selected, or that the least expensive option should be given priority. As public awareness about transportation issues has increased, however, these procedural tools have evolved into ways to challenge road development decisions. Planning agencies, under pressure to complete projects, are responding by expanding project definitions to include more mitigation.

**Anatomy of a Project Assessment**

The Boston CA/T project illustrates how the formal US planning process is shifting towards a new paradigm of public involvement and non-traditional uses of highway dollars. The formal analysis prepared prior to construction of the project revealed limited options for construction, and substantial environmental impacts. Public interest in the project was high and a commitment by the State to develop mitigation strategies was used to prevent delay or cancellation of the project. At present, mitigation accounts for 30% of overall project costs.

The genesis of the Boston CA/T began on a two track process with each of the two main project elements being considered separately in the 1960s and 1970s. In the 1980s, the two projects were combined into one ‘mega-project’ proposal, and final analysis of the combined CA/T project was not completed until the early 1990s. Significant political debate accompanied each step of the evaluation process. The extensive technical evaluation process was completed as a requirement for approval of funding for the project; but, the political discussion was also critical in shaping the Boston CA/T project (see Luboff and Altshuler, 1996, for a comprehensive assessment of the political history of the
A timeline for key Boston CA/T project evaluation events is shown in Figure 1.

**Long-Range Planning**

Long-range planning documents are the first step in highway project evaluation, and are usually generated at a state or regional level. Vigorous political debate about the proposed elements of the Boston CA/T project took place within the state’s legislature and in the City of Boston at the same time as long range plans were developed. Debate was split between equally strong pro- and anti-highway coalitions. Boston’s business community was concerned about the impact of rapidly growing congestion levels on economic activity in the city’s central business district. However, the state’s political leaders were skeptical about the supposed benefits of more urban highway development, which had significant environmental and social impacts. A lack of consensus prevented development of more detailed project-level evaluations. Then, in early 1983, the Governor of the State of Massachusetts who had previously resisted the tunnel element of the Boston CA/T, agreed to support the project.

**Federal Approval**

With local agreement on the need for the project in place, the state turned to the detailed planning needed to secure the environmental and other permits required by both state and federal law. Because planning of the Boston CA/T project predated ISTEA, the main tool used to evaluate the project was preparation of a federal Environmental Impact Statement, and the state-level equivalent called an Environmental Impact Report. Completion of a project-level Environmental Impact Statement was required before federal funding approval could be obtained.

A Draft EIS, which outlined a proposal for basic design of the project, was developed by the Massachusetts Department of Public Works and released in July 1983. The basic framework of the Draft Statement consisted of a comparison of alternatives for the Boston CA/T project. However, the project had very few reasonable alternatives because of the constraints imposed by highway construction in an existing urban area. The basic alternatives analysed in the CA/T Draft Statement were as follows:
- No-build
- Tunnel only
- Artery only
- Widened artery and tunnel (preferred alternative)

According to the Draft EIS, the existing highway carried between 25,000 and 30,000 cars per lane daily, which was considerably beyond its original design specifications while the preferred alternative added the greatest additional capacity, therefore providing the most congestion relief. At this stage, the State of Massachusetts promised to carry out extensive mitigation efforts to address the adverse environmental impacts of the preferred alternative.

The Federal Highway Administration (FHWA), which has authority for reviewing highway EIS’s, rejected the State’s Draft Statement in November 1984. In February 1985, the State of Massachusetts prepared a response to FHWA’s concerns. The state’s report provided a revised analysis of the travel time and safety benefits of the CA/T. In January of 1986, in response to the efforts of the state to address FHWA’s concerns, federal approval of the Draft EIS/R was granted and a Final EIS/R was issued.

**Public Involvement and the Mitigation Process**

Once funding approval for the CA/T project had been secured through the interrelated EIS and political processes, the focus of the project planning process shifted to addressing local concerns about adverse project impacts. State officials had to address the concerns of three broad constituencies: businesses, neighbourhood groups, and environmentalists. This phase of project evaluation was critical to securing implementation of the project.

Downtown businesses were concerned that construction-related disruption would cause a virtual moratorium on downtown development for 10 to 15-years. State and City officials pledged to minimise dislocation caused by traffic disruption. Generally, business was supportive of the CA/T project. A primary element of the state’s strategy was to maintain open and continuous discussions with the
business community. The Artery Business Council, a group of downtown businesses affected by the project, was formed in 1989 to work with State and local officials. According to CA/T project staff this organisation has been very effective in communicating the concerns of business. Key to mitigating the concerns of the business interests was the strategy of keeping the existing highway fully operational throughout construction of the tunnels below it.

Local communities were less supportive of the CA/T project. Activists in the many residential neighbourhoods near the project were concerned about the project's impacts on property values and noise levels. Public outreach meetings were held in neighbourhoods affected by the CA/T project to gather input on project design elements, and where necessary, project elements were redesigned in response to concerns from neighbourhoods. Of particular importance, was sensitive management of construction-related annoyances such as truck noise. This strategy proved to be effective in mitigating neighbourhood concerns. The beneficial impacts of the project in terms of reconnecting neighbourhoods previously divided by the highway, and adding parkland (over the tunnels) were key to obtaining community support for the project.

Environmental groups grew increasingly concerned about the CA/T project in the late 1980s. A regional environmental organisation called the Conservation Law Foundation (CLF) was one of the primary critics of the project. Major environmental concerns focused on air quality impacts, disposal of fill material, and aesthetics of the Charles River Bridge crossing. CLF and other environmental groups were successful in negotiating a significant amount of transit improvements including 14 transit and commuter rail projects, and a regional system of HOV lanes, as part of the project.

Public involvement in the CA/T project included significant criticism of analysis methodologies, and had a significant influence on major policy decisions. Public involvement was obtained both through public meetings and regularly scheduled direct discussions with interest groups such as the Artery Business Council and the CLF. Numerous public meetings were held during the development of the CA/T process. In addition, an Internet site, a 24-hour telephone hotline and many brochures and newsletters were developed to help provide information to the public about the project. The following example is presented as an illustration of the format typically used for public meetings on the project.

**Public Criticism of Assessment Techniques**

All documentation associated with assessment of the project was publicly available and was closely scrutinised by a wide variety of interest groups. Several high profile debates over project options arose directly as a result of public involvement. The following examples show how public involvement influenced project decision making.

**Conservation Law Foundation**

The CLF is a regional non-profit environmental group that specialises in the use of litigation to achieve environmental goals. As the CA/T project got underway, CLF publicly supported the project because it was perceived to be beneficial to the environment, particularly because of its positive impacts on neighbourhoods in the downtown area. However, CLF specifically criticised the State's air quality estimates for the project, suggesting that they were inaccurate. As a result, state officials reduced the estimates of improved air quality, and in a high-profile negotiation process, CLF persuaded the State to provide extensive transit mitigation measures that would offset air quality impacts.

**East Boston/Park 'n' Fly Lot**

The CA/T project consistently had an uneasy relationship with activists from neighbourhoods near the project. The most sensitive neighbourhood was East Boston. The State's 1983 plan addressed the neighbourhood's greatest concern by locating a tunnel portal and approaches on airport land. However, the plan had significant technical flaws that restricted traffic within the airport, and involved appropriating part of a local playing field located within the official airport boundary.

To address community concerns raised during the EIS process, the interchange was redesigned following the 1983 plan. The new plan avoided taking the playing field and improved airport traffic flow. However, it generated a significantly negative reaction from other neighbourhoods newly impacted by the modified plan. In response, the plan was further redesigned to avoid these neighbourhoods, but it included taking of a 50 foot section from the edge of 'Park 'n' Fly', an off-airport parking lot. Further redesign of tunnel plans was required when owners of the lot protested, and succeeded in mobilising interests in East Boston against the tunnel.

**Conclusions**

The mandatory and highly structured analytical
Evaluation process for highway projects is evolving towards a new paradigm of mitigation and the use of 'highway' funding for purposes such as clean-up of contaminated sites, transit and other environmental objectives. This change is in part a reflection of growing public awareness about the impacts of transportation, a greater level of public involvement in the transportation planning process, and the tools for legal action created by federal legislation.

Can mitigation work as a planning strategy? In the case of the Boston CA/T, the jury is still out. Many of the mitigation strategies promised have yet to materialise. Perhaps more importantly, it is unclear whether mitigation efforts, such as the planned transit improvements, new greenspace, and clean up of Spectacle Island, will really generate the benefits ascribed to them. Critics question the effectiveness of transit as an air quality strategy. Others suggest that the planned parks fail to 'knit the city back together' (Hale, 1998), while environmental experts raise doubts about the ecological benefits of the newly revitalised Spectacle Island in Boston Harbour.

Who should pay for mitigation? At an astonishing US$ 675 million per kilometre, the Boston CA/T is the most expensive civil engineering project in US history. Project leaders attribute 30% of these costs to mitigation. Accusations of 'pork barrel' spending abound from critics in other regions of the country, and a host of questions remain unanswered about how the CA/T will be fully paid for.

In a world characterised by limited resources, financial and environmental, the key lies in finding the right balance between highway transportation needs and mitigation concerns. The solutions will come from a mix of public involvement, better understanding of environment impacts, and new approaches to financial management.

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From Consistency To Chaos

Keith Buchan
Metropolitan Transport Research Unit, London

Address for correspondence: Keith Buchan, MTRU, 4 Netheravon Road, LONDON W4 2NA E-mail: kb.mt@lineone.net

Abstract
The National Road Traffic Forecasts are at the heart of British highway planning, and thus at the heart of national transport policy. The forecasts, which are produced by the Highways and Economic Traffic Appraisal, are inconsistent, in some circumstances contradictory, and bear little relation to local conditions. This report discusses in detail the failings of the NRTF 1989. The 1997 update (see below for a brief commentary) notes, in paragraph 14, that ‘All forecasts are uncertain.’

Keywords
Forecasts, growth, policy decisions.

Introduction
The National Road Traffic Forecasts (NRTF) are at the heart of British highway planning, and thus at the heart of national transport policy. A new set of traffic forecasts were published in 1989, which significantly increased the volumes of traffic predicted for the future. In 1989, they were accompanied by a new and enlarged roads programme (DoT 1989).

However, one effect of the forecasts which had not been predicted was that the traffic models used to test the environmental impact, and the economic value, of road schemes showed that the road network did not have enough capacity to carry the new predictions. This sometimes happened even when new road construction was planned.

This was a serious matter because the earlier forecasts had put such limitations to growth beyond the normal time horizons for road assessments. As time goes by, the levels of traffic which would cause such gridlock become closer in any case, thus a road scheme which made sense in 1976 may well be completely inappropriate in 1996. However, this had been a gradual process, and little recognised. The new forecasts dramatically brought forward conditions under which traffic growth was simply implausible. Some road networks were less than ten years away from, in simple terms, being full up.

In these circumstances, it was clear that much traffic growth would be slowed down by the impact of severe congestion. Equally, if new road capacity were to be provided, this would limit the growth less, or allow full growth.

No-one really knew how to handle this problem of ‘suppressed demand’ while respecting the integrity of the NRTF. As is described later, one early reaction was to use the national traffic predictions based on low economic growth, for at least some of the traffic. However, in most cases this was used for both the ‘Do Minimum’ future - where little new road capacity was provided - and the ‘Do Something’ - where a significant increase in road capacity was proposed. Thus while lack of road capacity was allowed to reduce future traffic levels, the removal of this obstacle was not allowed to make it grow again. There was little rational justification for this, and it was criticised for its inconsistent approach (Plowden, 1992).

One simple way around this problem would have been to allow new road capacity in the Do Something scenario to cause traffic to grow up towards the NRTF prediction until capacity was again reached in the same way as the Do Minimum. One somewhat cynical reason put forward for the lack of enthusiasm for this idea was that many schemes would lose most of their economic justification.

This project was conceived to consider case study examples of the ad hoc ways in which capacity limits were being handled. The idea was to explore the possibilities for dealing with the problem consistently. It was intended as contribution to the debate surrounding the Government’s development of a new NRTF.

This process began early in 1994, and the author of this report is a member of the advisory group on their preparation. However, by the end of that year, the situation was changed completely by the publication of the SACTRA Report on Induced (generated) traffic (SACTRA, 1994).

When this project was first started, the idea of specific testing for the effects of induced traffic was in its infancy (Coombe, 1990). Indeed this is reflected in the open style of the Government’s guidance on testing for induced traffic (DoT 1994). This raises many issues, but
clearly recognises the existence of suppressed demand, and the need to release it.

Thus the project itself has developed, taking into account the changes brought about by SACTRA, but also by other changes in Government policy. The key one is the recognition of demand management (reducing traffic) as a necessary component of transport policy for local authorities. This has in itself led to a serious inconsistency in Government policy because the national roads programme is based on a zero demand management assumption. Thus local councils have to produce demand management plans for their areas if they wish to conform to Government guidance, while the Government assumes that these have no effect. It requires only a moment’s reflection to see that most traffic in the country falls within the influence of local authorities: there are only isolated examples of unaffected flows such as military vehicles or international through traffic (not stopping in the UK) such as Ireland to Germany.

In this sense the project has grown from a survey of what was happening and ideas for change, to one which considers the changed role of the NRTF in the context of forecasts for the effect of induced traffic and demand management. The Government’s Guidance on Induced Traffic appeared to draw a line between the release of suppressed NRTF demand and the creation of entirely ‘new’ traffic. This tried to preserve the integrity of the NRTF while allowing local variation. It is a line which so far appears to have been crossed without hesitation, and this is the major concern of the second part of this report. Before doing so, the report considers the original ‘Hi-Lo’ approach to capacity limitation in road assessment.

**Using High and Low NRTF to simulate suppressed demand**

**The Role of NRTF**

All traffic forecasting in the UK is undertaken in the context of the National Road Traffic Forecasts. These are forecasts of what traffic will occur in the future, given a predicted level of economic growth. High and low figures are produced, derived from high and low economic growth predictions, coupled with low and high assumptions about the cost of fuel. No explicit allowance is made for congestion slowing down traffic growth, or for the capacity of a road network (either at local, regional or national level) to set a limit to the level of growth which can occur. For example, the 1989 NRTF states, ‘All forecasts assume that on a national average basis, traffic levels will not be constrained by changes in road service quality.’ (Paragraph 11)

Thus the NRTF depends entirely upon the mechanism of higher incomes leading to higher car ownership and greater use. It is not strictly speaking a forecast of ‘demand’, although some practitioners have treated it as such.

A forecast of demand (what people would like to do) would only be half of the picture. To produce a final traffic forecast, it would need to be combined with supply forecasts, for example how much it would cost people to act in the way they want, or whether there are enough resources, in this case defined as road capacity, for everyone to do what they want, when they want. At the moment the only supply constraint applied to NRTF, as shown above, is that of fuel price. A new NRTF is due this year, and is likely to take account of additional factors including congestion and suppressed demand.

At the local and regional level, traffic models in already congested areas have revealed that there is quite simply not enough room for traffic to grow in line with NRTF. This is widely recognised by all involved, including the Department of Transport. The technique of ‘matrix capping’ - stopping growth at the point where capacity is reached - is one approach currently in use.

The subject of the following section is another approach which has been used by local authorities and the Department of Transport: applying ‘low’ NRTF growth to built up areas.

**The Use of NRTF ‘Low’ for Capacity Constraint**

This approach, adopted in several recent cases, is the practice of applying low NRTF growth for journeys which start, end, or are entirely within congested or urban areas. This case arises frequently because areas being bypassed are the ones modelled in most detail and are at the geographic centre of the traffic model. They are also, almost by definition, the areas where congestion is worst. Examples of such an approach are the forecasting for the Hereford Bypass Inquiry, and the Birmingham Northern Relief Road (BNRR) Inquiry. High NRTF growth is then assumed for all other traffic.

**If Lack of Capacity Constrains Demand, Should Additional Capacity Release It?**

Before describing other problems implicit in following the NRTF Low/High Mixed approach, it is worth noting that in both inquiry examples above, increased road capacity from a new scheme was not allowed to increase the traffic growth forecast above what was predicted for the ‘Do Minimum’ (no road scheme). This was
despite the fact that lack of capacity was the only rationale behind using the 'low' NRTF. A similar criticism would apply for any technique (including matrix capping) which constrains demand to that which can be run on a 'Do Minimum' network, but has no mechanism for 'unconstraining' it when capacity is increased.

Use of these matrices leads to a serious logical inconsistency between the treatment of 'Do Minimum' and 'Do Something' (with road scheme) future forecasts. This applies in all cases where lack of capacity is assumed to bring traffic growth below levels which would otherwise be predicted by the use of NRTF. The problem is that the provision of extra capacity is not assumed to allow traffic to 'catch up' with the NRTF predictions. This in turn undermines the whole basis on which NRTF is founded, and is inconsistent with the NRTF assumption that short term deviations from the forecast are evened out in the long term.

This is not a question of 'generated traffic' over and above the NRTF. It is a case of additional road capacity allowing the fulfilment of NRTF levels of growth which would, otherwise simply not occur.

In fact at Birmingham, a sensitivity test was eventually run which generated traffic from a future Do Minimum based on a High/Low forecast. Conceptually this seems somewhat difficult to defend.

**NRTF 'Low' - The Cheap and Cheerful Answer?**
Providing that the use of NRTF 'Low' is amended so that additional capacity leads to additional traffic, at least until NRTF 'High' is reached, does it provide a satisfactory answer?

This would undoubtedly improve the situation considerably, and has the merit of simplicity. In view of some of the other highly elaborate proposals now being put forward and used for sensitivity testing, this virtue is not to be underestimated. Unfortunately there are several problems with this approach which remain unresolved.

**NRTF Low is not Congestion Based**
The first point is that the NRTF Low forecast is meant to be used for conditions of low economic growth and high fuel costs, and was never intended as a substitute for local capacity constraint forecasting. It cannot be validated for this purpose locally, and the factors used to produce it in the first place do not include capacity restraint. There does not appear to be a clear rationale behind adopting it at the scheme level.

**Low Can Still Exceed Available Road Capacity**
Secondly, the Low forecast is quite often not nearly low enough, particularly during the AM and PM peaks. For roads currently coming to inquiry, with a design year of 2010 and beyond, even low traffic growth of 30%-40% is well beyond the capacity of many road systems. Annual Average Daily Totals may be pushed up to this level, but to achieve this would need growth in the middle of the night to levels which are completely implausible. People are unlikely to get up and drive around in the early hours of the morning just to achieve the Government's traffic predictions.

**Consistent Traffic Assessment Between Trunk Road Schemes is Lost**
Thirdly, there is a serious flaw arising from the distinction between local traffic, which is capacity constrained, and through traffic (sometimes called 'strategic') which is allowed to grow in line with NRTF High.

This is best illustrated by a simple diagram (Figure 1). This shows four imaginary urban areas of different sizes connected by an existing trunk road. Let us assume that bypasses are planned for the two towns in the middle (B and C). Two sets of forecasts are needed for use in the two local traffic models. If the Local-Low Growth plus Strategic-High Growth 'Mixed' approach is adopted, the following NRTF growth forecasts would be used in the two areas.
bypass models for traffic travelling between the four towns.

**Different Levels of Congestion in Different Towns are Ignored**

Staying with Figure 1, it is also likely that traffic conditions will vary widely between one town and another, not just related to size. For example, Town B could have an historic centre and very narrow streets, while Town C is larger, but with a high capacity distributor network. This means that a town with a lot of congestion already is given the same growth factor as a town with very little. The problem is one of adopting a fixed national figure to describe the results of variable local conditions (in this case congestion).

It is impossible to remedy this using ‘Low’ NRTF, because it is based solely on low economic growth and higher fuel price and there is no data within NRTF to vary it according to congestion.

**Consistent Economic Assessment Between Trunk Road Schemes is Lost**

Behind these traffic assessment problems are a second even more serious set of reasons for avoiding the Low/High Mixed NRTF route. These are most relevant to trunk road schemes.

One key purpose of undertaking value for money assessment for trunk roads is to assist in the choice between competing schemes. It is clear that if the Low/High Mixed Forecast is used widely to cope with the problems of congestion constraint, consistency will be lost. In one scheme assessment, traffic between two places will grow at one level, and in another scheme assessment the same traffic will be growing at a significantly different rate, even when economic growth is the same. This inconsistency is not related to the distance travelled, but whether the journey begins or ends in a congested area (usually defined as urban).

Thus any Cost-Benefit Analysis (COBA) values produced for schemes using Low/High Mixed NRTF will be based on different levels of growth applied to the same journeys between the same areas in any given year. What is more, this bias will not itself be constant, but may vary considerably between schemes. The comparisons between COBA values for trunk road schemes which have used this approach, and where growth factors are inconsistent, will therefore be seriously compromised. Although environmental assessments are likely to be less sensitive to such inconsistencies, these too would no longer be comparable between trunk road schemes.

**Implications for other Variable Forecast Methods**

The original High/Low approach which gave rise to this project is now being dropped in favour of modelling approaches which try to meet at least one of the above criticisms, in particular by using local levels of congestion to restrain growth. The difficulties of applying such techniques are described in more detail later. However, none of them can overcome the difficulty of varying a local forecast while staying consistent with a national forecast. Why is this?

The problem is twofold. First, the same forecast for making journeys between the various places included in a traffic model (the zones) will result in different routeings according to the particular model used (SATURN, QVIEW, CONTRAM, EMME2, etc.) and to the way in which that particular brand of model is constructed, for example the extent of the network, the mathematical formulae used to re-route traffic and the size and extent of the zones. This will result in the same forecast producing different journey times and thus different time savings on the same route. A striking example of this is the reopened North Circular Road Inquiry, where time savings on the same stretch of road (NCR Hanger Lane to Chiswick Roundabout) could be compared using two local models (CONTRAM and SATURN) and the strategic London Area (LTS 2) model. The results are shown in Figure 2. There were slight differences between the forecasts for the CONTRAM run and the other two, but the main difference is in model structure.

The modelling approach and the basic assumptions can also vary between schemes, even where they are in the same area. An example is the growth cutoffs used for the Kidderminster bypass, and the Low/High plus
modified speed flow curves (plus induction later) at the BNRR Inquiry. Different minimum speeds were used to apply cutoffs at the two Inquiries.

In this sense all models are individually applied and have to be individually adjusted in order for them to work. The bigger the area covered, the less detail is provided at the local level. If there were one invariably 'right' form for a traffic model, this could be used nationally and locally and the results would be consistent. The national forecast would be the same as the sum of the local forecasts.

There is no prospect of this happening for the foreseeable future. Thus there will always be inconsistency between local and national forecasts unless a national factor is applied to correct the local results. In the past the National Forecast Adjustment Factor has been used to bring the local forecasts into line.

**Guidance on Induced Traffic**

The local variation of forecasts had to be addressed after the SACTRA Report on induced traffic. The Government's *Guidance on Induced Traffic* holds the NRTF position by calling it a 'Reference Case', and defines any reduction because of congestion as suppressed demand, and any rise above it because of faster journey times as 'induced traffic'. In paragraphs 2.6 to 2.8 it summarises the position as follows,

"To fully appraise the effects of the scheme, it is necessary to assess the amount of traffic suppressed in the Do Minimum, the amount of suppressed traffic released in the Do Something, and the amount of additional traffic induced by the scheme."

In an earlier response to the Guidance, MTRU commented that this distinction seemed clear, and was important because this demand should be released first, before any additional traffic was induced. The implication is that suppression is released very quickly and to a full extent if congestion is removed. On the other hand, additional journeys would be created more slowly than this release effect. The rate of creation (induction) is influenced by the local transport system, especially the extent of walking, cycling and public transport, and the local land use pattern, for example schemes which overcome a major natural boundary (such as an estuary) or connect directly two places not directly connected before.

This interpretation has been refuted by the Highways Agency. While traffic is suppressed by congestion, and this can be done using cutoffs or mathematical formulae, the Agency has been using formulae which only partially release suppressed demand, and worse create new journeys which did not exist under a 'reference case' forecast instead of releasing the suppressed journeys which NRTF says should be there.

If the Agency are correct in this interpretation (which is not accepted by this study), there will be two fresh problems to be addressed. These are separate from other comments made later on the way in which these methods are constructed.

The first is that the induction of traffic away from the original NRTF-based forecast can lead to new traffic between places where there is no suitable land use. For example, the original forecast may have predicted many journeys between a housing estate and a shopping centre or industrial estate. These may be suppressed by congestion in future years. If that congestion is removed by road building, some of the journeys may be 'released', however, many others will be created between zones which did not necessarily have them in the base forecast.

Even if the Agency is right not to prioritise the return of the NRTF journeys (discussed below) this makes individual land use checking absolutely essential to check for the plausibility of the new flows. At its worst, the new flows might involve heavy commuter flows from a shopping centre to a residential area in the morning peak. In the four examples to hand for this study (Newbury, Hastings and Salisbury from the Highways Agency and Torbay from Devon County Council) such checks were not undertaken. This is entirely understandable given that modellers are coming to grips with a completely new approach, it has not previously been needed in a simple NRTF-based approach because the land use data is included at the start of the modelling process. What has gone unnoticed is the fact that these data are effectively rewritten by the induced traffic technique and need to be reassessed. A small warning on this subject appears in the Traffic Appraisal Manual for Urban areas: it needs to be fully and rigorously applied and there is no evidence this is being done at present.

The second is that the whole concept of an NRTF 'reference case' is effectively thrown out of the window if the Highways Agency interpretation is correct. This is related to the first problem, but not the same. For example, it is logical to argue that the NRTF is completely redundant and should be scrapped, and only local forecasts are needed. This would of course contradict Government policy.

If however, an NRTF-based forecast is the best prediction available (ignoring any increase in congestion) the journeys which it predicts must occur as soon as the opportunity arises. In other words their restoration must be given priority in any case where they have been
suppressed by congestion, and new road capacity reduces it. If it is just as likely that a
journey not in the original NRTF forecast will take place as a different NRTF predicted
journey which continues to be suppressed, the whole basis of NRTF is effectively swept aside.

This particular problem is one which only becomes clear in practice when the techniques
are applied to real situations. The clearest example is given by the Agency’s consultant at
the A259 Hastings Inquiry, who presented extensive and useful evidence on the results of
the modelling. Reproduced below is a Table which summarises some of this evidence, and
which was accepted as being so at the Inquiry.

In each case, some of the NRTF trips remain suppressed, while new trips have taken their
place. In some sectors this effect is small, for example West of Bexhill. However in Hastings,
Bexhill and to the North the Do Something still suppresses NRTF demand, while inducing
significant amounts of entirely new traffic.

While such data was made available for Hastings, it was not for Salisbury.

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(Note: Suppression as % of Do Minimum, Induction as % of Do Something)

Locally constrained forecasts

**Requirements for a New Approach**

In view of the problems described above, it is clear that action is required urgently. The flaws
and arguments would not matter if only one or two schemes were affected, but even using the
criteria for induced traffic issued by the Department of Transport, as interpreted by the
Highways Agency, a large number are involved. For example by the end of 1995, 62 schemes
had been reviewed and 40 were judged to require induced traffic testing. All the trunk
road schemes which are affected should be reviewed with the opportunity for public
scrutiny of the sometimes controversial methods which are being used. At present this

**How can Inquiries Cope?**

One obvious difficulty in the evolution of new techniques is that Inquiries are subjected both
to lengthy discussions about mathematical formulae, economics and traffic modelling, as
well as near-philosophical discussions about the role of the NRTF, and the nature of the
‘demand’ to travel. This is in danger of causing two effects (apart from confusion and mental
fatigue).

The first is that people begin to distrust and then reject the use of objective analyses of a
road scheme’s effects. Falling back on feelings about whether a road is a ‘Good Thing’ or a ‘Bad
Thing’ (however wise the person having the feelings) will do nothing to mediate between
the different interests who may support or oppose a road, or indeed any other transport
scheme. At least some of the current disillusion and cynicism is justified by the extreme
positions taken up in the adversarial context of an Inquiry, and in particular by barristers
ridiculing both ordinary objectors and professional witnesses.

The second is that Inquiries cannot be the best place for arguments about traffic
forecasting and modelling, but will continue to be so while there is no other forum. Apart from
their adversarial nature (which could and should be considerably reduced) the imbalance of
technical resources between proposers and objectors leads to intermittent and inadequate
discussion of issues which underpin the whole decision making process. There are several
ideas for reforming this process, but it is likely to need both action at the Inquiry level and
action centrally to hammer out what is and is not technically agreed. Inspectors themselves
sometimes set up less formal technical sessions (for example, at the BNRR) or pause
proceedings to have a three way conversation with two opposing sets of experts direct (i.e.
without legal intervention). In addition, Inspectors have initiated the production of
glossaries, sometimes seeking agreement of both parties to the definitions. The Inspector at the
North Circular used both of these methods to clarify the technical positions during the
Inquiry, and identify the real and substantive differences between professional witnesses.

Before setting out some areas for discussion and recommendations, it is important to review
in some more detail the methods now being used to test for induced traffic effects.

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<td>14.6</td>
</tr>
<tr>
<td><strong>Do Something compared to Do Minimum 2015 PM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Suppression</td>
<td>9.7</td>
<td>4.1</td>
<td>1.0</td>
<td>6.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Induction</td>
<td>10.4</td>
<td>6.2</td>
<td>8.5</td>
<td>8.8</td>
<td>15.0</td>
</tr>
</tbody>
</table>

(Note: Suppression as % of Do Minimum, Induction as % of Do Something)
must mean re-opening Inquiries.

The case of the Salisbury bypass allowed six weeks consultation on induced traffic issues, but with no access to data or modelling comparable to that available at Public Inquiry. The Department and their consultants supplied information, but the end result was an agreement to differ, with some matters which would clearly benefit from technical clarification and discussion.

In the case of the Newbury bypass induced traffic test, information was far less forthcoming, and some of the arguments contained in this paper were put forward but never responded to. This shows a worrying inconsistency. In fact even the local authority which most strongly supported the bypass admitted that relief would only be short lived and demand management measures would be needed.

To meet current Government policy, a new approach should:
- Be simple and cost effective;
- Be directly related to local levels of congestion;
- Allow consistent application across schemes;
- Allow use of a standard national forecast as an input; and
- Be as transparent as possible to all parties.

Locally Constrained Models
In modelling terms the obvious way forward is to allow for the fact that capacity constrains demand in the ‘Do Minimum’ by reducing traffic in line with local congestion. Following on from this, allowance can be made for the fact that additional road capacity will allow the NRTF-based forecast to be achieved to a greater extent (or completely) in the ‘Do Something’. Again this would use local data. Once enough capacity has been provided to accommodate all the NRTF-based growth, growth can be stabilised at this level. At this point, time savings are once again possible within the framework of a consistent approach to NRTF. These time savings can then be used to induce new traffic, if the potential exists.

The first stage in this process is set out below. This is not the same as making an allowance for so called ‘pure generated traffic’ which would be over and above that predicted by NRTF. It is simply using the same assumption, that capacity constrains demand, and applying it equally with and without the road scheme.

A simplified set of figures (which of course would be different at different times of day) illustrates this point. Figure 3 shows NRTF predicted growth. Figure 4 shows how existing or future road capacity may not be sufficient to meet predicted levels of growth beyond a certain date, effectively causing traffic levels to stabilise. This is shown in Figure 4 as being some years away, although in practice such conditions can already be found in many towns as well as major conurbations, and some areas will still have capacity at the end of the forecast period.

Figure 5 shows the logical result of a road capacity increase which provides for some NRTF growth during its design life, but not all. This case has been simplified so that the proposed new road opens at the time the existing network runs out of space to accommodate NRTF High Growth. For a few years there will be time savings, but the long term result can be summarised as more people taking part in the same level of congestion.

If Low NRTF growth was assumed, the real
result would again be time savings in the period between the road opening and the new capacity limit being reached. This will be longer than if High Growth is used, but at a lower level. this is illustrated in Figure 6.

Of course this is a highly simplified view. In practice congestion will slow down growth and create a curve rather than sharp step. Also minor changes in the network are always occurring, and people's tolerance of congestion may also rise over time.

In addition, the new capacity may not be in the right place to allow NRTF to be fully released. However, as seen above a simple test is whether NRTF trips are suppressed in a sector where trips are being induced at the same time.

In both examples, if congestion was already holding back demand from achieving NRTF levels, there will be a quantity of suppressed growth which will be released by any capacity increase. If it has been suppressed to a small degree, benefits will last longer. If the suppression is substantial, benefits will be shorter lived, probably less than 18 months.

The New Complexity
Unfortunately, as suggested above, modelling is not that simple. It would nevertheless be interesting to see which schemes produced positive Net Present Values on the test outlined above. Whether modelling needs to be as elaborate and opaque as at present is a key general issue, but there are several more detailed aspects which already give rise for concern.

Details of traffic modelling, particularly for induction, are extremely complex; so the concerns are grouped into three headings. There is clearly a relationship between them. They are summarised as follows:

- The manner in which congestion slows down or halts growth, the use of 'elasticities' and the use of different formulae to relate elasticities to changes in future traffic flows;
- The difference between releasing suppressed demand and inducing new traffic and the need to replicate the 'reference case' as closely as possible before inducing traffic, this includes internal model interactions between reassignment and suppression/induction; and
- The shape of the test network: interactions between areas modelled in detail and the less detailed long distance network, and how these affect the results.

An Elastic Future
The amount by which congestion reduces traffic in a forecast is complicated by two factors: the way in which the internal structure of the traffic model operates and the sensitivity of traffic to a change in travel time or cost. This relative sensitivity is known as an elasticity, and at an elasticity of time to car travel of 1, a 10% increase in travel time would result in a 10% decrease in traffic.

However, the sensitivity of travel time to changes in car traffic may well be different. For example in highly congested conditions a 10% increase in traffic would result in a greater than 10% increase in travel time. On a dual carriageway with low vehicle flows a 40% increase in traffic may result in virtually no change in travel time. Where a traffic model is available the sensitivity of the network to changes in traffic is automatically calculated by the model.
The third heading above (shape of the network) is covered in more detail later, but it is obvious that the way the network is modelled will profoundly influence its sensitivity to traffic flow changes. For example, if a great deal of traffic is induced on a new road which starts or finishes (or both) in an area which is not modelled, the network travel time will appear to be insensitive to traffic increases. In fact, if the journeys start or end in congested areas (already likely and increasingly so) the network there will be very sensitive to traffic changes. Almost certainly, this will reduce both the level of induced traffic on the new road and also the benefits from induced traffic. The latter can be very extensive, for example about half the benefits in the A259 Hastings test case came from induced traffic on the new road.

This is less important when fixed matrices (no suppression or induction whatever the congestion level) are used. But the sensitivity of the network is a key factor in determining the level of traffic in induced traffic modelling. This is another area which appears to have been missed in the evolution of such work.

Returning to the sensitivity of traffic levels to changes in time (sometimes time plus distance is used), there are two critical choices. The first is the elasticity value, the second is how the elasticity is applied. Values recommended by Government range from 0.1 to 0.5 in the short term, and up to twice this figure in the longer term.

As regards application, recent modelling has offered a range of different equations which alter the effect of the elasticity rather than a straightforward multiplication. This is not an area where there is extensive research on the effect of such equations, but they all alter the effect of the elasticity value in different ways. The traffic model SATURN, for example, offers four options. A power function was used for Hastings and Salisbury (SATURN), while at BNRR (QVIEW) a straightforward multiplier was used.

Nor has research explored the interaction between iterative models and different elasticity values. In some cases the value appears to have little effect on the relative performance between Do Minimum and Do Something. Again this indicates network or model structure is the cause. Put simply, the iterative model seeks to optimise the mix of reassignment and suppression/induction.

An example of both elasticity and equation effects can be derived from tests using SATURN as part of a TRL/Mott Macdonald study for the Department in 1995. Table 3 is based on a new road bypassing two towns with a trunk road passing through both. It should be noted that in all cases (except the non-variable base case) there is considerable suppression in the Do Something, and that there had been some substitution of NRTF predicted trips by non-induced trips.

The key question here is how realistic these methods are, and how far they represent real life comparisons as opposed to demonstrating the mathematical capacity to suppress or induce trips in a traffic model. One observation to be made is that in the long run, all time savings are used up. This is described in the 1994 SACTRA Report, in particular Chapter 4, paragraphs 4.65 to 4.72, which concludes as follows:

'Using values accepted by the Department, a simplified calculation suggests that about half the time saved through speed increases might be used for additional travel. We interpret this as a short term effect. The longer-term effect is likely to be greater, with a higher proportion (perhaps all) of the time saved being used for further travel.'

It should be noted that this apparently includes both the reaction of drivers to the faster journey times, and any network effects. If so, it concurs precisely with the National Travel Survey finding that no discernible change has occurred in the average time spent on a car journey since the mid-1970s. This is despite the fact that tens of billions of pounds worth of time savings should have been achieved if the road programme's COBA results were correct.

It may be argued that patterns of land use and employment are the cause, but this argument is circular. Changes in location are directly influenced by transport availability. SACTRA itself gives examples. This does not alter the simple fact that the average time spent on a car journey has remained at about 20 minutes. On the other hand, the average distance travelled per journey in that time has risen by about 10%.

In view of the locational, social and employment changes which can be affected by transport, and the lack of any evidence that time savings are not spent on extra travel, the

<table>
<thead>
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<th>Table 3: Different methods for induced traffic testing compared (Network and base year forecast constant)</th>
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<tr>
<td><strong>Average speeds compared (kph)</strong></td>
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<tr>
<td><strong>Method</strong></td>
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<td>Matrix Capping</td>
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<td>Power -0.3</td>
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<td>Exponential -0.3</td>
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<td>Exponential -0.6</td>
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first wave of induced traffic modelling may well be completely misleading. It is interesting that so little public scrutiny has been applied or has been able to be applied to these methods, particularly for the forty or so schemes which have been assessed.

The Shape and Sequence of the Test
For reasons which were set out earlier, one concern is how induced traffic tests move away from the new road specifically releasing demand forecast by NRTF. In other words the model constructs a forecast of a similar level to NRTF, but much different from it. This is most likely to occur when the following conditions are met:

- Demand is suppressed in both Do Minimum and Do Something;
- Suppression and Induction are permitted at the start of the assignment process rather than applied to the reference case once this has been established; and
- There are a large number of iterations.

These conditions have been met in several of the cases studied for this report, including Hastings, Salisbury and Torbay. The test for BNRR was strictly speaking an induced test only, since it assumed that the Do Something traffic (largely Low NRTF-based) could pass through the network in the Do Minimum. It should be noted that the area wide model did not use specific junction modelling, and relied on speed flow curves. There was considerable argument at Inquiry as to whether the network could in fact accommodate the traffic, for example Friday afternoon conditions on the M6 at Birmingham would have to be replicated for the whole working day for 365 days a year.

The reason these conditions are important can be illustrated as follows. If we start from the beginning of the test, all reactions are theoretically permitted from the first moment, including re-routing, not making trips, or making more trips. When there is no suppression, the NRTF forecast should initially run through the network, and after this there may be additional trip making. While it is possible for the model to over-induce trips and therefore the need to suppress a few in the following model runs (iterations), this is likely to have only a marginal impact on NRTF.

However, if suppression is present to any significant extent, the first model run will cause the removal of many NRTF-predicted trips. Because of the nature of models, this is likely to over-suppress. Thus there will have to be a re-creation of trips. There is no need for these to be the same as the NRTF-predicted trips which have just been removed.

Prima facie evidence that this rearrangement of the future within the model can in fact happen was illustrated at Hastings. By the year 2000, there was slightly more traffic in the Do Minimum induced traffic test than in NRTF Do Minimum, and yet it travelled slightly faster. By 2015 there was 7.8% more traffic in the NRTF forecast, but it was travelling 22.4% slower.

Further evidence was that in the year 2000 the Do Minimum always had more trips in it (by about 1%) than the Do Something. This was true for all time periods and for both Low and High Growth. In some elasticity based forecasts in the year 2000, the Do Minimum induced trips while the Do Something suppressed them. The reason for this counter-intuitive result was the large scale change around in trip making which underlies these network-wide totals.

In the Do Something by the year 2000 there is again slightly more traffic travelling slightly faster compared to the NRTF-based forecast. However, by 2015 there is only slightly less traffic than the NRTF forecast (about 2%), but a major improvement in speed of 22%. Focussing in on the local SATURN simulation area alone, there is a 7% reduction in traffic compared to NRTF, but a 35% improvement in average speed.

Of course part of these changes is explained by the inclusion of a faster new road in the simulation area. However, this leads to the second key issue: the network design and operation.

The Shape and Nature of the Test Network
The basic network for any model will tend to consist of a detailed local network, in which junctions are likely to be modelled, and an outer network modelled in far less detail, and in some cases hardly modelled at all. This can be subdivided into partly modelled and fixed links. In this case the intermediate network may have a variable or a fixed speed (no change in speed with change in traffic levels) and outside this a notional external network or simply a cordon beyond which there are zones but no network modelling.

There are two key points to be made. First, it is entirely correct to try to include the whole of the trips made by longer distance traffic in any induced traffic test. If they are not, then parts of a journey which are in fact one hour long, will only have part of this time included in the model. Thus if only 20 minutes of a longer trip is in the modelled area, a time saving of 2 minutes would appear to be a 10% improvement in travel time, and, at an elasticity of one, could result in 10% more traffic. However, the true effect should be worked out as a saving of 2 minutes on a trip of 60 minutes: this would cause an increase of 3.3% at the
same elasticity. This over-induction would have knock on effects, for example by causing other traffic to re-route, changing travel patterns and therefore travel times, and causing another round of suppression and induction.

The second point is that if these journeys are to be represented, it must be in a comparable way to the rest of the network. The reasons for this are simple. First, if journey times on one part of the network are not sensitive to changes in the level of traffic using it, the model will seek both to re-route and to induce traffic on that part of the network in preference to the area where traffic increases will cause a drop in average speed.

In addition, if a journey starts or ends in either of the two fixed speed areas, any congestion caused there will be unmodelled. This leads to two effects: first the encouragement of induced traffic which starts or stops in these areas, and secondly an exaggeration of the scheme’s benefits because delays elsewhere are ignored. To illustrate this point, from Hastings: from the model’s point of view someone in Streatham who decides to go to Hastings when they did not do so before will cause no extra congestion either in Streatham itself, or on their way down the A22. The same applies to travel from Brighton, Eastbourne, Battle or Rye to anywhere in the modelled area.

Key Issues
The way in which the road network is modelled will determine the results of induced traffic tests to a far greater extent than fixed trip models (in which it was already important).

Integrity of the NRTF
Elastic assignment methods are capable of producing results which remove substantial quantities of traffic which NRTF forecasts (suppress it) but generate new traffic to replace it rather than simply restoring it if new road capacity is provided.

Elastic assignment is also capable of producing suppressed Do Minimum forecasts which remove NRTF traffic and replace it with induced traffic.

Both of the above seriously compromise the integrity of the NRTF and appear to be against Government policy. NRTF is still the basis for road planning.

Simple versus complex testing
Simple induced traffic tests are being used when at least some elements of new traffic can be predicted reasonably accurately. For example, at the A5 Round Table discussion, the Highways Agency undertook re-routing over a wide area according to different road schemes and Do Minimum. They applied a simple elasticity test afterwards. At the Hastings A259 Inquiry, such wide area reassignments were available, however the case was put that the simple elasticity test covered this too. Therefore the traffic attracted into the area by the new road was added into the Do Minimum even though the road was not present. Thus in reality this traffic would never have arrived.

Independent model auditing
The Highways and Economic Traffic Appraisal (HETA) is being used as a method of endorsement for modelling approaches which are at best experimental, and sometimes, as in the above example, wrong. HETA should either become more of an open resource, not just a support for the Highways Agency, or reduce its activities and not be used as a modern form of carte blanche. This would allow all sides to argue their cases on their merits.

National versus local forecasts
One theme which is present from the ‘Hi-Lo’ method to the most elaborate land use and transportation model is the local variation of traffic forecasts. Of course local land use factors and trip growth rates were used for local forecasts and still are. However, they are also constrained to be consistent with NRTF.

With local variations for induced traffic, there is no method for making the local predictions fit with the national picture. In other words, if local forecasts were all added up they should come to the same figure as the national forecast.

This opens up the issue of what NRTF should be for. Is a nationally ‘correct’ total to which all local forecasts should conform? If this is its intended role, it has already been undermined severely by induced traffic testing. If, on the other hand, the Government needs a forecast for national policy purposes, this role might be fulfilled by a free-standing forecast which is never used in local circumstances.

In any event, if NRTF is to be varied using the abstract mathematical methods for induced traffic modelling, why not vary it according to local sustainable transport packages? These have the merit of being rooted in real likely future actions, while the former take no account of land use, for example whether the forecast growth in trips from an area has enough people living there to make them.

An inconsistent approach to demand management
At the moment the national roads programme is based on a zero demand management
assumption. This is not likely to change in the new NRTF expected this year. However, the Department is aware of this problem, and is investigating the possibility of a 'National Policy Model'. Providing this is kept simple this may help and could indeed completely replace the NRTF. The proviso of simplicity is made for two reasons. First, national policy has been plagued by the inflexibility of the tools available: the time taken to produce a new NRTF and the interim inability to respond to policy changes such as demand management and inter-urban congestion is a good example. Secondly, the more complex a model the less usable it is and the more it relies on vast quantities of accurate and up to date surveys. There is a very strong case for far less modelling and a lot more monitoring. The latter needs to be long term as well as short term, and should be accompanied by a greater willingness to experiment and undertake 'action research'.

To return to the national inconsistency, it can be summarised as follows. At the moment local councils have to produce demand management plans for their areas if they wish to conform to Government guidance, in contrast the Government assumes that these have no effect. As stated at the beginning of this report, it requires only a moment's reflection to see that most traffic in the country falls within the influence of local authorities: there are only isolated examples of unaffected flows such as military vehicles or international through traffic. In these circumstances, there should be available a national demand management forecast which would effectively replace the 'Low' NRTF forecast currently in use.

A new national approach
The overall conclusion from this report is that the partial consistency there was in the earlier, 'fixed trip matrix plus COBA' analysis has been eroded by the use of induced traffic testing, and by the diminished role of COBA in Government decision making. If local traffic is to be varied on the basis of mathematics, why not vary it according to possible or likely real world policies?

The conclusion reached is that induced traffic forecasting is distracting resources from looking at demand management forecasts, which is probably where greatest effort is required. As has been argued elsewhere, the use of an objectives-led national policy which would be consistent with local policy making would remove a major incongruity which has arisen since sustainable transport policies have been, or are being, adopted locally. Perhaps one reason for this is that the tools for modelling induced traffic do not appear to require much other than the application of the formulae and the running of the model. Forecasts which are better related to changing policies require a more radical re-think, and better knowledge and understanding. It is worth noting that for all the road based case studies reviewed for this report, none of the traffic data could be analysed to show how much was on shopping, leisure, visiting friends and relatives, or escorting children to school. It is precisely this basic data which should be ascertained if sense is to be made of the conflicting demand to use cars and heavy lorries, and the desire for a transport system which is environmentally, equitably and economically acceptable: one which is truly sustainable in future years.

References
Update
This report was written for Transport 2000 between 1994 and 1996, at a time when Government policy was undergoing considerable flux and change. Since then, some of the proposed roads mentioned in this report have been postponed and there has been some attempt to address the inconsistencies highlighted: the Guidance on Induced Traffic has been changed, the National Road Traffic Forecasts have been updated and there has been a White Paper on Transport. These developments have not been taken into account in this report. It is noteworthy that the key road construction projects at Birmingham and Newbury continue.

The Highways and Economic Traffic Appraisal, a Government division, continues to advise proposers of roads, but not opponents. Critically, HETA is regarded as an independent arbiter, and at Inquiries its evidence and opinion is always regarded as impartial and forms the basis of the Inspector’s report.

The NRTF was updated in 1997. It is available on the internet at http://www.roads.detr.gov.uk/roadnetwork/nrp2heta2/nrtf97/

NRTF 1989 is evaluated in Paragraph 46. HETA forecast that from 1988 to 1996, GDP growth would be 23%, and traffic would grow by 25%. Actual GDP growth was 12%, while traffic grew by 17%. While reality differed significantly from the forecast, HETA argues that ‘the methods used proved robust - the ratio of actual traffic growth to actual GDP growth was 1.47, compared with 1.09 in the forecasts, that is, the relationships proved considerably stronger than used in obtaining the NRTF 1989.’

NRTF 1997 offers ‘Low’, ‘High’, and ‘Central most-likely’ forecasts (paragraph 18). Appendix E offers a summary of methods in calculating the forecast and the strengths and weaknesses of these methods.

NRTF 1997 is considerably improved in its methodology.
There were essentially two steps to the making of these forecasts:
• Step 1: Preparation of an “unconstrained” or “background” forecast by vehicle type, comparable to the NRTF 1989.
• Step 2: “Fitting on”, applying the background forecast traffic growth to the existing road network; the process takes account of drivers’ reactions to changes in journey times and the physical capacity of the network. [Paragraph 35]

Given that
• the NRTF has been updated;
• the Government has announced in the White Paper that ‘We cannot go on as we are ... Simply building more and more roads is not the answer to traffic growth. The policy of “predict and provide” didn’t work’;
• and it has confirmed in the trunk road review that ‘Simply predicting future traffic levels and building new roads to accommodate traffic growth is not a solution’; and
• SACTRA has issued an interim report questioning the link between transport investment and economic growth; it follows that there is a strong argument for re-opening inquiries into (already) approved road projects with new guidelines which start from the premise of “predict and prevent”.

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Figure 7: The method of NRTF 1997

Step 1: Background Traffic Forecasts By Vehicle Type

Input Assumptions:
- GDP, fuel prices and vehicle efficiency, licence holding, population growth, number of households by type & area, industrial output & imports by sector
- CARS: Combination of cross section & time series models of car ownership & use
- HGVs: Sectoral tonnes lifted models, cost based length of haul model, distribution of task over vehicle sizes
- LGVs: Time series model with growth related to traffic in HGV traffic
- Bus & Coach: Local bus traffic declines as car ownership grows, coach traffic grows with income

Total Traffic - Background Growth

Step 2: Fit On Background Forecasts To Existing Road Network

Input Assumptions:
- Database of base year (1996) traffic by vehicle type, area type, time period, road type and direction (bus & less busy)
- Capacity of roads by area type. Speed flow relationships, reactions to congestion (route switch, time switch and mileage suppression elasticities)

FITTING ON MODEL:
- Background forecast applied to existing road network. Increased traffic increases journey times which, operating through the response elasticities, leads to route switching, time switching and mileage suppression. Traffic growth is cut off at capacity

Final Fitted-on NRTF 1997 Forecasts
Notes for Contributors

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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.

Presentation

Articles should be typescript, double spaced and with wide margins. Please send three copies. Headings and subheadings should be used at approximately 500-750 word intervals. Please ensure that headings and subheadings are clearly identified. Manuscripts will not normally be returned, so you should ensure you retain a copy. Please supply the article on paper of no less than 80 gsm weight with high quality print. This will enable electronic scanning if needed. Please supply the same version of the article on a 3.5" disk prepared on a Macintosh or PC system in ASCII format. Mark the disk clearly with your name, the article title and the software you have used.

Charts, diagrams and figures

These should be called "Figures" and numbered consecutively (e.g. Figure 1, Figure 2, etc.). Please make sure they are clear and can be reproduced easily. In addition, please 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. Please ensure that they are clear and legible.

Maps

Maps are especially welcome. They should be numbered consecutively, independently of figures and tables and their location in the text should be indicated. Please ensure that they are clear, uncluttered and legible. They should have a title.

Measurements

SI units should be used throughout.

Abstracts and Keywords

Please 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. Please also note up to six keywords or descriptors which describe the content of the article. These would 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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Contact details

World Transport Policy & Practice
Eco-Logica Ltd., 53 Derwent Road, Lancaster, LA1 3ES, U.K.
Telephone: +44 1524 63175
Fax: +44 1524 818340
E-mail: (editorial) j.whitelegg@lancaster.ac.uk
E-mail: (administration) pascal@gn.apc.org