

# Assessing traffic-generated “dread” risk

**Alan G. Hallsworth**

Professor of Geography, Staffordshire University, UK

**Colin Black**

Researcher, University of Portsmouth, UK

**David Evans, Rodney Tolley**

Senior Lecturers in Geography, Staffordshire University, UK

The decision process behind observed individual behaviour is known to be a complex one. This is especially so when aspects of that same behaviour are apparently contradictory. Introduces a measurement scale for revealing underlying motivations for behaviour. Focuses on the trip to school by car; apparently favoured by individuals on safety grounds, however, it also leads to extra trips and therefore increases car-borne pollution. Tests the scale in a survey involving British geography undergraduates.

## Introduction

In this paper we focus on the problems generated by the propensity of British parents to take their children to school by car. This is an example of how, while we “think global” in the face of common environmental problems, we also “act local”: producing local outcomes that can vary considerably. The numbers of children being driven to school in Britain are well ahead of those in other countries despite there ostensibly being a common awareness of Dread Risk (Slovic, 1987) from car-borne pollutants. Clearly, common problems are mediated by local circumstance: but how to analyse the problem? Since Slovic put car-generated risks alongside other major risks including nuclear war; and since reactions to nuclear war risk have been well documented, we seek in this paper to draw some analogies. We use existing nuclear war work (Hallsworth, 1987) that showed how individuals used psychological “coping mechanisms” in the face of perceived threats.

We relate this to the trip to school by asking which issues are at the forefront of one’s mind when such trips are contemplated – and which are pushed to the deeper recesses. We know that there are cross-national differences in this process because, as all traffic-related issues have risen in salience (Goodwin *et al.*, 1992; Tolley 1990; Whitelegg, 1993) so the types of cross-national differences in responses also reported in the nuclear threat work (Hallsworth, 1987, p. 293) have again become evident. This is particularly clear from Anglo-German cross-national work by Hillman *et al.* (1990) – yet only recently (Tranter and Whitelegg, 1994) has new empirical evidence been produced to compare with the original work. It is especially of note that in a particular way in Britain: “safe routes” and “walk-to-school” initiatives being announced (Tolley, 1995). Our basic question is this: When we think of “safety”, from which risk are we seeking to protect ourselves (and our children)?

## The journey to school

Recent figures suggest that, in Britain, some 30 per cent of all peak-hour car trips involve journeys to school and it is currently suggested that a full 25 per cent of all car trips made by British schoolchildren are trips to school. General contextual factors to the trip to school have recently been discussed (Bradshaw, 1995) though only limited information seems to be available on the travel habits of the youngest school children (for example, Black and Hallsworth, 1994). We find the Hillman *et al.* (1990) researches to be very interesting for one particular reason: there is, in the Hillman work, a clear expression of how little real danger there is to child’s wellbeing on a walk to school. Germans seem to accept this since most small children walk to school without an adult (Hillman *et al.*, 1990, p. 52). Indeed, at the age of seven, the ratio between German and English children allowed to walk to school alone is 8:1 (Hillman, 1993, p. 14) This British “avoidance tactic” is a common one that has a direct parallel in work on crime: 81 per cent of British people who feel very unsafe because of crime fears never go out alone at night on foot (Mirlees-Black and Maung, 1994, p. 2). When a child is taken to school, does the parent think first of the environment, of personal convenience, cost, etc., or of road safety issues? Certainly, others have shown that there is more than one problem for parents:

Children... have particular problems coping with traffic ...and... fears of assault and molestation (Tranter and Whitelegg, 1994, p. 265).

The pioneering work by Hillman *et al.* is therefore important to us because it reinforces the likelihood that decisions are made on the basis of beliefs, perceptions and intuitions ... as most studies of crime fear have shown (Williams and Dickinson, 1993). It must, therefore, be that the British parents are not examining rational, objective, facts but are basing decisions on other criteria.

### A pilot study on car usage for school trips

The long-term aim of this research is to target the parents of children attending primary/infant schools in Britain. Such schools will typically cover the age range of 4-8 years: known to have little awareness of risks from traffic. It is logical to assume that parents with cars will be most tempted to escort children of this age to school by car. In order to gain test information from this general cohort, 276 parents at a primary school in Hampshire, England, were sent a questionnaire on car usage for the trip to school. Overall, 188 parents responded (68 per cent), and results showed overwhelmingly that if a car was available for the school trip then it was used. This contrasts markedly with the results for the older cohort in Germany (a country with higher per capita car ownership) where over 80 per cent of 9-year-olds walked to school without an adult (Tranter and Whitelegg, 1994, p. 269).

When the parents were asked to explain their reasons, half said the child was too young to walk alone and 28 per cent regarded the roads as too busy for child safety. When asked why "other people" might use the car for the trip to school, 20 per cent of respondents thought that those "other people" might feel that the child was safer in the car. Some were genuinely fearful for the safety of their child despite evidence that (other than for robbery) "strangers" are not responsible for a high proportion of violent crime. Clearly, the notion of generally-accepted societal norms and of the expectation that other parents, other adults, even the police, are acting in *loco parentis* in public situations has gone into steep decline in Britain. This is in contrast to Germany where

The German language contains the words *Kinderunfreundlichkeit* ... general unfriendliness towards children ... an attitude ... which is observable. German children out alone are much more under the general supervision of adults on the street whom parents know can, and will ... act in *loco parentis* (Hillman *et al.*, 1990, p. 84)

In contrast, we feel that British parents have increasingly retreated into isolation – perhaps haunted by the image of the child-murderer Myra Hindley. Popular media representations are that British streets are desperately unsafe for children.

Societal norms are clearly very powerful and yet are notoriously difficult to quantify. We suggest that outcomes at the national scale are likely to be a mixture of the elusive concept of "national characteristics" plus some influence from the built environment.

Equally, the British propensity to drive may reflect a structural under-provision of price-competitive transport alternatives that are perceived as safe. Our focus is on the "coping mechanisms" that allow people mentally to "run away from" a threatening environment.

### Preparation of a measurement scale for coping with threat

What we can now present is some evidence on how a scale for the measurement of "coping" mechanisms was devised – and the first results obtained. In the nuclear war work, much time was devoted to deriving a scale for the measurement of psychological coping mechanisms. It was felt that six reactions emerged in the face of the dread risk of nuclear war and the same general notion of "coping" is used with the new traffic-related scale. It is not necessary to cover again the formulation of the scale as this is outlined in Hallsworth (1987). The six "mechanisms", many of them very familiar, are these:

- 1 "Helplessness" (or more commonly "powerlessness").
- 2 The "wiser heads" defence. Abrogating responsibility to a higher, wiser, authority – usually the government.
- 3 "Displacement". Here the threat is the fault of a third party that is responsible for (or is deliberately overstating) the problem.
- 4 Denial of risk (often, it is "habituation" rather than "denial").
- 5 "Vulnerability"; this simply reflects, those who face up to the threat and really do fear it (strictly *not* coping).
- 6 "Activism". We must be aware that activism is a coping mechanism and there are many groups of "anti-road" protesters in Britain.

All the statements that made up the original scale were constructed from phrases taken from newspapers, political statements or research findings (Grinspoon, 1964). The familiarity of the phrases attested to their relevance as descriptors of attitudes towards the threat of nuclear war (see the version in Hallsworth 1987, p. 291). It was felt that the scale had proved itself to be robust so, in order to focus on key traffic-related worries, the phrases were simply modified to fit the threat under study. The first version of the adapted scale is shown in the statistical analysis presented in Table I.

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**Table I**  
Principal components loadings on "coping" scale

Statements	Component loadings					
	1	2	3	4	5	6
People spend too much time worrying about pollution	0.64					
It is morally acceptable to commit a small crime on a construction site in order to protest against the greater crime of environmental destruction				0.52		
When getting children to school, nowhere is safer than in the car						
Protest is pointless, you will never get a government to change its policy – unless it wants to						0.60
The government will act long before traffic problems get out of hand					0.66	
But for the so-called "greens", society would not be worrying about pollution						0.52
You could die tomorrow – car accidents are just another everyday risk			0.51			
On environmental issues, you just have to trust the government						
The world has far more cars than is sensible		0.51				
I have never seen any local evidence of pollution caused by cars		-0.41				
There are so many cars now; you could be hurt in an accident tomorrow			0.61			
The human race can overcome any obstacle to progress			0.56			
I am far too busy to worry about environmental issues	0.71					
The car is with us forever			0.52			
I feel a moral duty to preserve the planet from pollution damage	-0.54					
If I don't use the roads – someone else will				-0.63		
Cars are part of a good lifestyle			0.47			
I expect that at some future date this country will have severe pollution problems						
Cars can be designed that will totally eliminate pollution						
It is not my responsibility to worry about the environment	0.61					
Car manufacturers produce new models and then they attempt to sell them to the public – whether they are really needed or not			0.62			
Nothing I do makes any difference to the environment, one way or another						
People overestimate risks from traffic – plenty of people survive car accidents		-0.34				
"Greens" stir up all the so-called environmental campaigns					0.44	
Problems with car fumes are getting out of control		0.50				
If my job caused environmental problems, I'd rather be unemployed than carry on causing pollution			0.56			
It is naive to believe we could ever ban cars totally			0.63			
Our government should ensure that this country takes the lead on environmental issues	-0.59					
Catalytic converters will turn out to be just another expensive gimmick foisted on car-buyers						

### A pilot study

A pilot survey was attempted using undergraduates in Geography at the University of Portsmouth, England. We have no reason to suppose that Geographers are more sensitized than others to such issues and we regard these preliminary findings as most encouraging.

### Results

A coping scale was, then, modified from the nuclear war scale previously used and "threat" questionnaires were presented to undergraduate geographers in a controlled, classroom situation. A total of 29 statements or propositions on traffic-related topics were presented as a semantic differential test. The

respondents were a roughly equal mix of males and females and were mostly aged 18-21. Overall, 300 responses were received.

As in the previous studies, the assumption was made that the six forms of coping mechanism should emerge as six separate or distinct dimensions of the overall opinions held by the cohort. Principal Components Factor Analysis (PCA) was therefore again used.

### Data analysis

The results obtained after varimax rotation of the six largest components are shown in Table I which indicates the actual questions that were used and also shows the strongest "loadings" on each of the six components.

#### Component one

Component one is primarily a reflection of "denial", which contains the dismissive elements of "being too busy" to concern oneself with something. The component is not, however, a clear-cut one since we cannot deny some links to statements that were included to denote "helplessness" or "nothing I can do". Perhaps, then, there are two forms of powerlessness. One is powerlessness in face of a major dread, a threat against which no individual action has any meaningful effect. However, as we have argued elsewhere (Hallsworth *et al.*, 1995) some actions might need to be taken collectively. An individual is therefore equally powerless if he or she can see what actions could be taken collectively - but does not believe that anyone in power is actually going to facilitate them. We gain a sense of these two forms of helplessness in this component and we will return to them again later.

#### Component two

This is vulnerability. As in the earlier work on nuclear war, this is the component for those who believe that a catastrophic outcome could happen, and who are afraid.

#### Component three

We earlier expressed the belief that the concept of the "threatening enemy" is more difficult to articulate with environmental topics. We feel that what is under threat from the environmentalists is the car-based lifestyle - the freedoms to drive wherever one wants, whenever one wants.

#### Component four

The variables loading strongly here are clearly the personal moral issues. There is no obvious expectation that personal moral values will be espoused by the powers of central government. The counterpoint is, of

course, pure self interest "If I don't use the roads - someone else will".

#### Component five

This is the higher authority or "wiser heads" defence. The respondent believes that someone else has the responsibility and knowledge to act. The individual is thus absolved from personal responsibility by virtue of having elected someone else to take collective responsibility.

#### Component six

Helplessness is more prominent here than in component one though the cross-links to "denial" remain. In defining helplessness, this component relates more to component five than to issues of environmental pollution *per se*. This form of helplessness is really political powerlessness in a country with no regional government at all and where local democracy is at the whim of an all-powerful centre.

### Overall conclusions

Our feeling is that the results merit further development of the scale. Multiple interpretations may be partly responsible for the emergence of notions of "powerlessness" on more than one component and this can be modified. A further key point is that the issue of child safety on the trip to school - a perceived "British" preoccupation - did not load significantly on any component. This is by no means a problem since the cohort completing the questionnaire comprised undergraduates. Typically these are young people aged 18-21 and very few of the respondents would have any responsibility for children at all. We know that this variable will perform more strongly with parents of small children. Overall, we think that the "British problem" is a hybrid. The global concerns are quietly pushed to the back of one's mind as "too awful to think about". However, instead of relying on safety in numbers, the fear of the image of child-murderers is reinforcing the withdrawal of children from the streets. As the herd immunity slips away, we seek refuge in the car; leaving those on the streets increasingly isolated. We believe that the same "coping mechanisms" that were used in the face of the threat of nuclear war are being utilized again: as shown in this pilot work with British geography undergraduates. It will now be used with parents as the subjects.

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# The impact of improved ferry services on an island economy: the case of Mull

**Hugh M. Begg**

Consultant Economist and Town Planner, St Andrews Economic Consultants, UK

**Bob Henderson**

Government Economist, Scottish Office Agriculture and Fisheries Department, UK

**Peter Tyler**

Fellow of St Catherine's College, Department of Land Economy, University of Cambridge, UK

**Colin Warnock**

Consultant Economist, Segal Quince Wicksteed Ltd, Cambridge, UK

Sets out the methodology developed to establish the impact of an enhanced ferry service on the Island of Mull in Scotland. The work on which it is based was undertaken for the (former) Scottish Office Industry Department in co-operation with Highlands and Islands Enterprise and Caledonian MacBrayne Ltd. Their principal concern was the impact of operating and capital subsidies made available to Cal Mac as operator of services throughout the Western Isles. The research improves understanding of ways in which transport infrastructure can enhance the prospects for remote rural communities and the local economies on which they depend.

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## Introduction

This paper sets out the methodology developed to establish the impact of an enhanced ferry service on the Island of Mull in Scotland. The work on which it is based was undertaken as part of two major pieces of research for the Scottish Office Industry Department and Highlands and Islands Enterprise in co-operation with Caledonian MacBrayne Ltd (CalMac). Their concern was the impact on island communities off the West Coast of Scotland of the operating and capital subsidies made available for the provision of ferry services (Scottish Office, 1993a; 1994). The research represents an attempt on the part of the research team to help to improve understanding of the impact of enhanced transport infrastructure provision on remote rural economies. The authors believe this to be a relatively under-researched topic, which is surprising given the substantial volume of public expenditure being committed to such measures by both national governments and the European Commission.

Mull, with a land area of some 90,000 hectares and a population of around 2,700 is located off the west coast of Scotland at the southern end of the Firth of Lorne. Following almost a century of continuing decline the past decade has seen a reversal of the trend as fewer younger people leave in search of work and growing numbers of returning Muil-leachans and others retire to the island. However the resident population is still not sufficient to sustain a large service sector. The manufacturing sector is also very small and is mainly based on food and drink and craft-based production. Thus Mull remains heavily dependent on its natural resources which are the basis for the agriculture, fishing, and forestry sectors as well as the developing tourist industry which is the largest sector of the economy.

From earliest historical times the economy of Mull has been dependent on easy access by

sea. In 1880 the Caledonian railway was extended to Oban and from there a ferry service, provided by David MacBrayne Ltd to the island capital of Tobermory, linked Mull to the economy of Central Scotland. The basis of the current network of services was laid with the opening in 1964 of the Craignure pier in the south east of Mull and the contemporaneous setting up of a road haulage distribution service to handle goods to and from the mainland.

A series of enhancements to the ferry services was undertaken by the operators Caledonian MacBrayne Ltd over the period 1988 to 1991. These are summarized in Table I. The consequences were substantial improvements in the road and ferry network. The Tobermoray/Kilchoan link, with only around 3 per cent of the total traffic, is of local significance. More important was the upgrading of the Fishnish/Lochaline service which accounts for around 28 per cent of vehicle carryings. However, of greatest significance for traffic and potential economic impacts were the improvements to the Oban to Craignure crossings which account for over 80 per cent of passengers and almost 70 per cent of vehicle movements.

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## Research objectives and data sources

The objectives for the research reported on here were to establish the changes in carryings to and from Mull attributable to the ferry service enhancements; to estimate the impacts of the changes in traffic flow on the local economy; and to consider the extent to which the increased traffic flows and their associated expenditure were diverted from other nearby areas.

CalMac provided information on the carryings of the ferry services (including capacity, frequency and volume of passengers/vehicles/freight moved) before and after the upgrading. These data were critical in the estimation of the impact of the improvements to ferry services.

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This paper throws new light on research undertaken by the authors in collaboration with colleagues at St Andrews Economic Consultants, PA Cambridge Economic Consultants, and the Scottish Office Industry Department. The authors acknowledge the key contributions to the work presented here of Tony Jackson and Stuart McDowall.

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**Table I**

Enhancements to ferry services between the mainland and Mull

Ferry service/change	Outcome	Date of change
<i>Oban/Craignure</i> Replacement of vessel with another with higher clearance for commercial vehicles, no deadweight restrictions and greater capacity	Increased carrying capacity for vehicles (from 45 in summer, 55 in winter to 80 all year round), larger commercial vehicles can be carried and greater total cargo deadweight	April 1988
<i>Lochaline/Fishnish</i> Increase in size of vessel, drive through vessel	Increased capacity for cars, from six to 12 cars in winter and six to 18 cars in summer; drive through	August 1986
<i>Tobermory/Kilchoan</i> Introductory of vehicle-carrying ferry following provision of slipways. Substantial increase in services	New vehicle route to Mull with six cars per sailing	April 1991

In order to establish the impact of the net effect of changes in the ferry carryings, it was necessary to undertake fieldwork relating to both the demand and supply sides of the local economy. For the demand-side, a survey of over 1,000 passengers on the ferry service allowed estimates to be made of the volumes of different types of visitors, their spending profiles and trip duration of their visits. Information on resident trips off-island was also acquired and was used to estimate displacement of activity from Mull as a result of the improvements in ferry services. The passenger survey also provided the information required to calculate the extent to which the benefits for Mull were at the expense of other nearby local economies. On the supply-side, a survey of 30 local businesses provided indications of changes in economic activity in the local area.

#### The problem of the peak and modelling the effects of ferry service enhancements

The peaking of seasonal, weekly and daily demand, with considerable excess capacity at other times, is a common problem in transport economics. It is these peaks which determine the need for an enhancement of supply which typically must be kept operational during periods of slack demand. Examination of the trends in ferry carryings to and from Mull revealed an extreme example of “the problem of the peak”. It was a consequence of the seasonal pattern of tourist traffic between Mull (including Iona) and the Mainland, and the concentration during the tourist season of most traffic on a limited number of crossings between Oban and Craignure. Thus, the summer season of 16 weeks accounts for around 60 per cent of total passengers and

55 per cent of vehicles. These movements are further concentrated on the morning crossing from Oban and the evening return from Craignure.

It was attractive for policy makers and the ferry operators to try to smooth the pattern of demand through the use of differential pricing, aggressive marketing and related policies. However experience demonstrated that the scope was limited in the face of the underlying trends in consumer behaviour and notably those of day-trippers and tourists. The only realistic alternative was an increase in ferry capacity to meet peak demand.

In modelling the effect of service enhancements we expected that the relief of constrained/discouraged demand would be followed by an immediate increase in carryings: the “new facility” effect. In addition, longer term dynamic benefits would arise from the opening of the market to new sources of demand. This “enhanced capacity” effect would emerge as the routes accommodated their share of the growth in traffic within the wider ferry network as a whole. This would be determined by regional and national trends in carryings. Finally, there was the “island specific” effect: changes in carryings which emerge as a consequence of developments particular to the individual local economy.

Our approach to the estimation of the “new facility” and “enhanced capacity” effects is illustrated in Figure 1. The continuous line represents the first step which was to produce a summary of actual carryings. This demonstrated the impact of capacity constraints and the result of their relaxation following the introduction of improved services. The second step was to estimate what the growth in carryings would have been if there had been no capacity constraint in the first place and

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carrying had been free to grow at the same rate as the rest of the Western Isles ferry network (the WIN growth rate). For this purpose the actual carryings were projected forward using the WIN growth rate. The third step was to estimate what the carryings would have been if the service enhancement had not taken place, (i.e. the counterfactual situation). If appropriate pricing, promotional and rationing schemes could have been introduced to smooth the pattern of seasonal, weekly and daily demand then growth might have continued using existing spare capacity at much the same rate as in the period just before the enhancements came into operation. However, it seemed likely these could not be introduced, and very little growth would be possible. We had to make a judgment of where within these two estimates of constrained growth the most likely path would lie. The final step was to identify "one-off" past and likely future changes in the local economy with significant impacts on traffic generation. We concluded that in this case the deleterious and beneficial impacts balanced one another. However it is important that they could have had an important influence on the counterfactual situation one way or another.

Table II summarizes our estimates of the additional carryings to and from Mull over the period 1986 to 1992 attributable to ferry enhancements.

### Measuring the impact of improved ferry services on the economy of Mull

The starting point for our estimation of the impact of improved ferry services on the economy of Mull was to recall that producers and consumers on the island incur costs in their day-to-day transactions which they

**Table II**

Estimating the additional vehicle carryings attributable to improved ferry services to Mull: 1986-1992

	Cars (000s)	Coaches
a: 1986 vehicle carryings	76.0	716
b: Additional carryings on the assumption of constrained growth 1987-92	+14.7	+535
c: Total constrained carryings 1992 (a+b)	90.7	1,251
d: Actual carryings 1992	123.8	2,293
e: Extra carryings attributable to service improvements (d-c) of which:	+33.1	+1,042
f: "Enhanced capacity effect" (additional carryings on the assumption of WIN growth rate 1987-92) <sup>a</sup>	+24.2	+238
g: "New facility effect" (e-f)	+8.9	+804

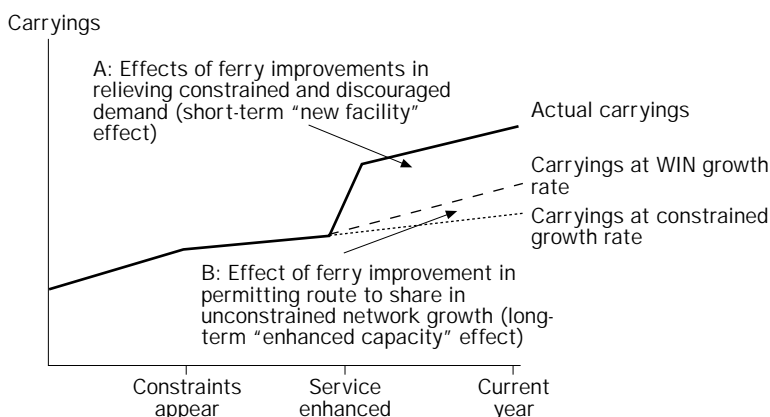
Note: <sup>a</sup> The gains from enhanced capacity will continue beyond 1992, until capacity constraints re-emerge

would not incur if they lived on the mainland. Other things being equal they experience a higher cost of living. Having to use a ferry also has an impact on those producers and consumers who wish to engage in trade. An obvious example (of particular importance in the case of Mull) is the demand attributable to tourists who wish to visit the island. The important point is that changes in the characteristics of a ferry service, such as price, frequency or capacity (all of which can be translated into changes in cost) affect the island economy in a number of ways. From an economic point of view, they are all reducible to supply-side or demand-side effects on island output. The former are transmitted through the cost curves of individual island producers. The latter are transmitted through the demands of purchasers, both on and off the island, for the output of island producers.

The analysis was advanced further by dividing economic activity into that relating to export markets; and that which supplies the requirements of residents. Output of the former category is a function of demand off the island; and output of the latter is largely determined by the size and income of the resident population. It is crucial that the ability of the island economy to achieve growth in incomes is largely dependent on the ability to export. In the Mull context this means the ability to attract tourists.

The direct effects of improving the quality of a ferry service on the export activity of tourism are relatively easy to conceptualize. By increasing capacity and reducing delays,

**Figure 1.**  
Modelling the effects of ferry service enhancements





it makes the island more accessible to tourists. Other things being equal, more tourists will be inclined to visit the island. In technical terms, the demand curve for tourists to the island is shifted outwards, as the preferences of potential tourists change (in other words, for a given ferry price structure, because these other factors have changed, there would be a higher level of demand). This impact on tourist activity can be expected to come through relatively quickly, although the extent to which it leads to additional output and employment effects on the island is dependent on the amount of surplus capacity, particularly in the labour force, in the sectors concerned.

Within the context set by this analysis we established the expenditure of visitors from surveys of ferry users, interviewed at their point of departure from Mull. This survey was also used to derive figures for average occupancy rates for car-borne traffic (2.6), for average total spend per head on Mull and Iona by day-visitors (£12) and for average daily spend per head by staying visitors (£34), as well as for the share of day and stay visitors in each category. We applied a conservative estimate of 30 occupants per coach. The relevant calculations are summarized in Table III. This provides data on total expenditure by the additional visitors attracted to Mull as a result of improvements to the ferry services.

Although the open nature of any island economy (including that of Mull) means that leakages are high, increased activity in an

export sector can be expected to generate additional demand in domestic activities with further beneficial effects on output and employment in the sectors concerned. With this in mind we applied the local tourism multipliers obtained for Skye (Scottish Office, 1993b) to the visitor expenditure estimates obtained from the passenger surveys. Although it has a rather larger population Skye provides a reasonable parallel to the Mull economy, both in terms of its dependence on tourism, and in its accessibility to the Scottish mainland.

These results suggest that ferry enhancements were responsible for injecting £3.5 million in additional tourism expenditure into the Mull economy in 1992. This generated an additional £1 million in local income and supported 124 full-time equivalent (FTE) jobs. In addition, this extra activity on Mull supported a further 30 FTE jobs elsewhere in the Scottish economy. In order to place this contribution in the context, the total contribution of tourism to the Mull economy in 1992 was calculated, by applying the same procedures. It is estimated that tourist expenditure on Mull and Iona amounted to £15.4 million in 1992, generating £4.5 million in local income. This sustained a total of 544 FTE jobs in the Mull economy, and a further 132 in the rest of the Scottish economy. Economic activities, including provision of accommodation, attractions, retailing and specialist manufacturers, all gained from the increase in tourism.

**Table III**

Economic impact of improvement to Mull ferry services

	Cars	Coaches
Additional CalMac traffic carryings (excluding residents)	31,444	1,042
Number of trips to Mull (= 0.5 x carryings)	15,722	521
Number of passengers carried (average 2.6 per car, 30 per coach) = additional visitors	40,877	15,630
of which:		
Day visitors (27 per cent car, 98 per cent coach)	11,037	15,317
Stay visitors (73 per cent car, 2 per cent coach)	29,840	313
Total expenditure day visitors (26,354 x £12 average spend per head)		£316,248
Total expenditure stay visitors (30,153 x £34.3 average spend per head x average length of stay 3.1 for car users, 2.8 for coach users)		£3,202,947
Combined day and stay visitor expenditure		£3,519,195
<i>Economic impact, applying Skye multipliers:</i>		
Additional local income (= £3,519,195 x 0.291)		£1,204,086
Additional full-time equivalent (FTE) jobs in Mull economy 1992 (£28,374 expenditure per FTE job)		124
Additional FTE jobs in Scottish economy 1992 (£22,838 expenditure per FTE job)		154

Even in an island economy such as Mull with a limited primary and manufacturing base, reductions in freight costs affected the cost of production for island producers. Given the type of the goods typically produced, island exporters were nearly always price takers or selling into niche markets. Thus reductions in production costs were not reflected in lower prices (for the former the price is set by the market, and for the latter there is a degree of monopoly power). Instead it fed into higher profits and, on occasion, higher wages. Higher profits were the more likely outcome and the increased viability of island businesses which resulted helped lead to increased output, employment and investment.

### Displacement effects

We had established that changes in the quality of ferry services to Mull resulted in additional numbers of visitors to the island over and above the volume which would have visited if no improvements in the ferry services had taken place. As a result the local economy benefited from additional expenditure which would not otherwise have occurred. However, we were concerned to establish whether this had been at the expense of other areas, i.e. whether the additional activity had been displaced from other parts of Scotland.

The displacement effect was considered at different spatial levels: the impact on visitors spending in Scotland as a whole, the Highlands and Islands and in specific destinations within them. In order to provide an indication of the potential displacement effects within Scotland, visitors were asked whether they would have gone elsewhere if their trip had been frustrated by being unable to cross to Mull as a result of the constraints on the

provision of ferry services. The impact of the displacement effects at these different spatial levels can be estimated by applying the findings to the information set out in Table III which relates to the amount of additional expenditure and jobs generated on Mull as a result of the ferry enhancements. The results are set out in Table IV.

On the other hand we recognized that the ferry enhancements may have involved some displacement of activity from Mull. Improved access to the island for tourists is accompanied by easier access to the mainland for island residents. This can be expected to encourage some residents to make more frequent visits to the mainland for shopping or recreational activities and so reduce the proportion of household incomes spent on the island. By reducing remoteness, more islanders may be persuaded to remain who might otherwise have emigrated. Additionally, incomers could be attracted to the island. We could not make any detailed forecast of these outcomes. However, in our view this "increased population" effect could, in the longer term, more than offset the "displaced expenditure" effect.

### Concluding remarks

The methodology set out in this brief paper was devised to deal with a specific set of problems and our results are, of course, particular to the circumstances under consideration. However our case study required us to address a number of general issues to be found wherever ferry improvements for the benefit of island economies are under consideration. These include: the peaking of demand with substantial excess capacity at other periods; modelling the traffic movements consequent on the enhancement; establishing the impact on the local economy; and, finally, the issues raised by displacement of traffic and economic activity. The approach which we adopted dealt effectively with these and related issues. We recommend its application to other similar situations.

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**Table IV**

Potential displacement effects of improvement to Mull ferry services

	Visitor spending (£)	FTE jobs
Spending on Mull associated with ferry service improvements	3,519,195	124
Non-displacing activity (33.6 per cent)	1,182,450	42
Potentially displacing activity (66.4 per cent)		
of which:	2,336,745	82
Potential displacement from other Scottish islands	1,280,536	45
Potential displacement from the Western Highlands (excluding other Scottish Islands)	750,095	26
Potential displacement from the rest of Scotland (excluding other Scottish Islands and the Western Highlands)	306,114	11

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# A path out of the wilderness?

**Angus W. Witherby**

Lecturer in Transport Planning, Department of Geography and Planning,  
University of New England, New South Wales, Australia

**The discipline of transport planning is in conceptual disarray, yet the techniques and models of yesteryear continue to be applied. Argues that we need a new conceptual framework for deciding what methods to apply and how to apply them to produce liveable cities. Concludes that eco-relational thinking may offer a useful framework.**

## Introduction

This paper deals with the activity of transport planning. Transport planning is a specialized subset of the more general activity of urban and regional planning. However, while the land use side of urban and regional planning has struggled, somewhat introspectively, with theories of planning, transport planning has paid significantly more attention to theories in planning. In large part this is a natural consequence of the discipline's strong intersection with engineering. The rationalist, objective techniques that underlie the activity of transport planning as we have seen it develop historically since the 1960s, are to do with the city as a machine. The implication is that it can be modelled, predicted, manipulated. It is also this intersection with engineering which gave transport planning a significantly more durable and clearly defined core of technique when compared to its cousin discipline, land use planning.

## Technique

Yet clearly we must face the reality that the objective/rational body of technique developed over the last 30 years has and is failing us. Our cities are not improving in liveability as far as transport is concerned. This is despite an ever increasing plethora of techniques developed to analyse, predict and ultimately plan the transport networks of the city. In data collection we have household travel behaviour surveys, origin/destination studies, traffic surveys and the like; in demand analysis we have econometric models, heuristic models, simulation models and scenario development; in supply analysis we have impact models and cost models; in decision making we have approaches such as the rational actor, satisficing, incrementalism, organizational process, political bargaining, decision-orientated planning process and more (Meyer and Miller, 1984). All this is before we even begin to deal with management techniques such as Transport Demand Management (Ewing, 1993).

## Conceptual disarray

Dimitriou (1992) summed up the situation well when he described transport planning as

being in "conceptual disarray". While conceptual disarray as a phenomenon could not be considered to have entered transport planning overnight, Dimitriou dates its dominance from the mid-1970s. In fact, the seeds were sown much earlier.

Buchanan's ground-breaking 1963 report clearly identified the essential tension faced by the discipline of transport planning in coming to grips with the ever-expanding use of the private motor vehicle. While most commentators, and in fact governments, focussed their attention on one aspect of Buchanan's thesis – that urban environments would need to be radically transformed to cope with the car – less attention was paid to the other side of his thesis. Buchanan clearly acknowledged that limiting demand for the motor vehicle would be essential if we were to maintain the essential form and structure of urban areas as they had existed up to that time.

We are now in 1996. A total of 20 years have elapsed since the start of the period that Dimitriou labelled conceptual disarray. Yet in that time we have not seen any fundamental new paradigm for the discipline of transport planning that could help us re-focus the discipline's undoubted strengths on tackling the transport problems of urban areas in a manner that improves the liveability of the city. Instead, we have seen the evolution of a pastiche of techniques, some rooted in the behavioural, some in traffic modelling, some in models of land use and transport interaction. Yet, returning to an earlier thesis, our approaches still attempt to treat the city as a machine. Even the behavioural approaches, which have arisen out of a clear recognition of the failure of transport planning to adequately predict results when focusing merely on vehicles, tends to fall into the deterministic trap.

At its worst, the current situation can and does lead to feelings of entrapment and desperation on the part of the transport planning professional. We endlessly, almost mindlessly, continue to repeat the use of techniques that we know are flawed and which we suspect are not tackling the heart of our problem. Yet without the development of a coherent frame of reference within which to place those

techniques, our planning processes are more fundamentally flawed than they need be.

### **A new breed?**

Although resident activism has been a feature of transport planning debates for several decades, that activism has largely concerned itself with what we now describe as the “nimby” syndrome – not in my backyard. In other words, the activism has not opposed the concept of (for example) a new freeway – instead it has tended to oppose the location as affecting them.

Speaking from the Australian perspective, the first major signs of the shift in community activism came in Brisbane in the 1980s. A community group called Citizens Against Route 20 (CART) was formed in response to a proposal to widen an existing “rat run” into a major arterial route. Instead of lobbying to have the route put somewhere else, the group focussed its attention on the whole process of transport planning in the city of Brisbane, and, perforce, the role of the motor vehicle in society. The group, drawing extensively on European experience, prepared a small volume entitled *Traffic Calming* (CART, 1989).

While it is certainly true that mainstream transport planning authors such as Brindle paid, and continue to pay, significant attention to the local area aspects of car/people interaction, the CART publication attempted, somewhat falteringly, to place local needs in the big picture. It was an attempt, in the context of Arnstein’s (1969) ladder of public participation, to develop genuine partnership between the community and the planners.

A founder of CART, David Engwicht, developed the thesis in his book *Towards an Eco-city – Calming the Traffic* (1992). It was in that book that he used the term “eco-relational thinking”.

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### **Eco-relational thinking**

Engwicht’s “eco relational thinking” is used to cover a variety of issues surrounding the planning activity in general, the role of specialist, and more particularly applying these things to the examination of transport planning. At its core, eco-relational thinking is not a technique nor a philosophy. Instead it represents more of an attitude.

### **A change of attitude?**

Is the answer to transport planning’s current conceptual problems as simple as a change of attitude? The answer, as with all such questions, is both yes and no. On the “yes” side, it is difficult to dispute Engwicht’s thesis that, if society as a whole and transport planners

in particular changed their attitude to the role of the motor car in society, then we could certainly improve the liveability of our cities. The “no” part of the question comes down to the difficulty and complexities (not to mention some interesting moral questions) involved in changing the attitudes of an entire society.

Yet Engwicht provides examples of aspects of living where this has been done. He quotes the example of smoking (Cunningham *et al.*, 1994). Until the 1980s the dominant paradigm on smoking was that it was an activity of unconstrained free choice by adults. Yet as the health implications of smoking became more widely known, especially those of passive smoking, governments through a combination of regulation and education, backed by a number of other medical and community groups and organizations, achieved a societal shift in views on smoking. The odd person out in Australia today, in any particular group of people, is likely to be the one with the cigarette – not those without.

Engwicht sees the possibility of achieving a similar shift in public attitude to the use of the motor vehicle. It almost goes without saying that he sees such a shift in attitude as a necessary precursor to transport planning gaining the ability to improve substantially the liveability of our cities. Engwicht is not alone in perceiving these shifts. Authors such as Nijkamp and Reichman (1987) identify clear shifts away from satisfying endless growth in car-based mobility, albeit from a European perspective.

In many respects, the attitudinal change that Engwicht is seeking is one that is contrary to the prevailing ethos of our time – one of increasing privatization and individualization – which some consider to be leading to the fragmentation of our culture (Cunningham, 1996). It is also contrary to the “reductionist thinking” identified by Giannakodakis (1994) as underpinning our current approach to transport planning. Can we return, asks Cunningham (1996), to the city as the highest pinnacle of human achievement where the public and cultural aspects of human nature can make their highest contribution to human quality of life?

### **The nature of the city**

Ultimately the city is all about human exchange – not just of goods and money, but of thoughts, ideals, emotions, indeed all facets of human behaviour. In Aristotlean terms, the city is the fundamental basis of “the good life”. By focussing on transport as an end in itself, we have lost sight of the fact that it is merely a means to the end of exchange. We have, unfortunately, assumed that mobility

equals exchange opportunity. Therefore, all we have to do is enhance societal mobility, primarily through the private car, and everybody will have a happy and fulfilling life.

### **The big picture**

It is the “big picture” of the city and its purpose which lies at the heart of the concept of eco-relational thinking – to examine the city holistically in the context of the complex web of inter-relationships that give it its form and function. It is important, however, not to confuse holistic thinking with only thinking about the city at a macro scale. Holistic thinking can also be applied at a variety of scales when examining the city from metropolitan right down to neighbourhood, street or even household scales (Giannakodakis, 1994). We see glimmers of holistic thinking in the behavioural approaches to transport analysis that have been under development for the past decade or so. Techniques such as the household and travel survey (HATS) clearly attempt to get a handle on the complex inter-relationships of travel and behaviour of a household; Fisk (1986) attempts to deal holistically with both supply and demand; Florian *et al.*'s (1988) situation planning paradigm clearly recognizes the importance of a broad perspective in dealing with particular transport problems, to quote just a few.

Nevertheless, while these techniques are groping forward towards the eco-relational concept, they miss one vital point. They are still focussed on transport the activity. The problem with this approach is that transport is a derived demand. With virtually no exceptions, transport activity is undertaken as an enabling activity to allow people to do something else. It is that “something else” that should be the real focus of the planner's concern.

### **The role of the professional**

Transport planners are mobility specialists. This is what we are good at. We are not, however, as good at dealing with the question of why the mobility is necessary, the other side of the mobility coin: accessibility. The increase in mobility in our society blocks, and continues to block, accessibility to many basic services and functions for many people (Manning, 1978). How could this problem occur? Part of the answer lies in professionalism.

Professionalism is increasingly about specialization. No one individual, for instance, can grasp even the detail of a single specialization in our society. Looking to our own field of transport planning, a thorough grasp of even the major techniques currently used in the discipline would be beyond all but a

few. Engwicht sees the present specialization of the professions as symptomatic, and an evolution, of the compartmentalization of thinking that has developed in western society throughout the last several hundred years. Engwicht maintains that in the rise of the scientific method and its pervasion of all aspects of our society, we have lost “the big picture”.

### **The role of the generalist**

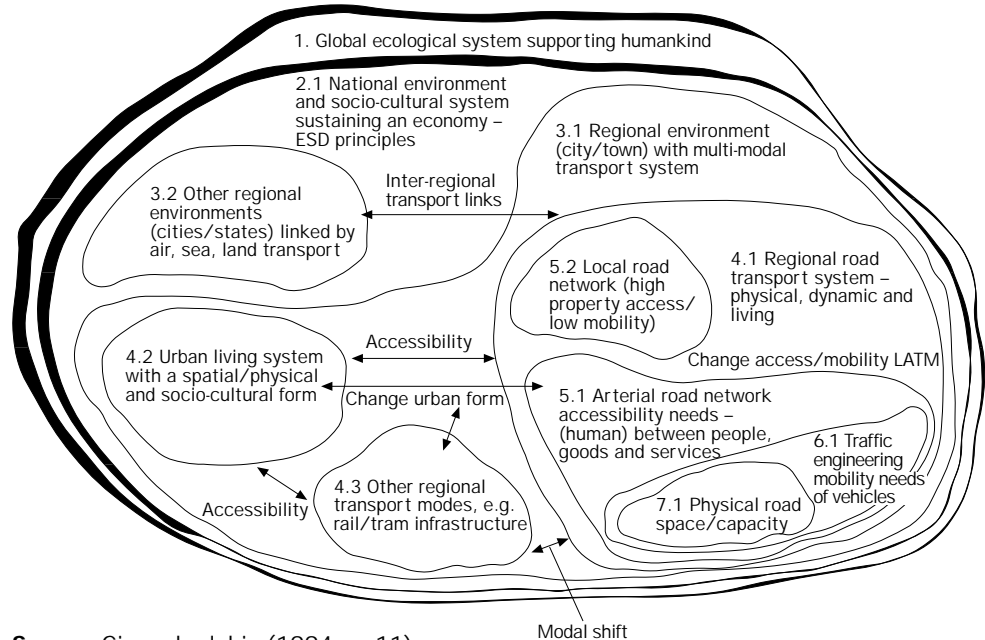
Engwicht does not advocate abolition of the specialist. Rather, he sees the role of the specialist as informing the generalist. But who is the generalist? It has been stated that every person is an expert – even if it is only on their own backyard. By the same token, every person is, at least potentially, a generalist. Yet in looking at the role of the generalist, we need to go beyond the mere accumulation of general knowledge that the average individual collects during the course of their life about their society and how it works. At the other end of the spectrum, we do not need a modern version (male or female) of “renaissance man”. Instead, we need people with the skills to integrate and translate. The “professional generalist”, as such a person might be termed, has the role of bringing the input of specialists to bear on the particular problem of liveability in cities.

This, in Engwicht's conception, can only be done by such a person not only immersing themselves in the problem from an intellectual sense, but also by engaging themselves in living with and in the problem. Thus the professional generalist acts as the bridge for the intersection of the hopes, desires, fears and aspirations of communities within the city, and the skills, expertise and experience of specialists who have some of the tools to address those problems.

This approach can be viewed along with the strategic planning and performance systems framework of Giannakodakis (1994), an example of which is shown in Figure 1. Yet despite the different perspectives from which these two authors view the problem, their views are complementary rather than divergent. Immersion in a problem is necessary, but humans are structure-needing beings who need frameworks on which to hang the product of their work.

The Engwicht approach also intersects neatly with the conceptual framework developed by Brindle and others, known as the Darwin Matrix (Table I). This matrix attempts to explore the range of measures available to implement what is now known as traffic calming. It probably also has wider application and could be used to encapsulate the major aspects of transport planning. In

**Figure 1**  
 A systems entity model of the road transport system



Source: Giannakodakis (1994, p. 11)

**Table I**  
 The Darwin Matrix

Scope of measure	Type of measure	
	<i>Physical/environmental ("technique")</i> (includes all physical and management measures to control level, route and speed of traffic)	<i>Social cultural ("ethos")</i> (includes both deliberate attempts to change community attitudes and other societal changes that may not be directly related to traffic matters and that may not be either deliberate or voluntary)
<b>Local</b> (street or neighbourhood)	Level I traffic calming techniques (e.g. speed control devices; "green street")	Level I social change (e.g. neighbourhood speed watch; attitudinal change)
<b>Intermediate</b> (zone, traffic corridor, regional road)	Level II traffic calming techniques (e.g. sub-arterial traffic management (SATM) parking policies, pedestrianized shopping areas)	Level II social change (e.g. voluntary behaviour/mode choice change)
<b>City-wide</b>	Level III traffic calming techniques (e.g. urban form manipulation, total system measures/policies)	Level III social change (e.g. cultural change, loss of choice, technological change)

Source: Adapted from WSROC, 1993, p. A7

many respects it represents a simpler (reductionist?) view of Giannakodakis's (1994) system model. Effectively what Engwicht is suggesting, is that transport planning needs to pay much more attention to social/cultural measures (the "ethos" of what we are doing) and use this to inform the "technique" of the profession. Giannakodakis attempts to provide a framework that could be used for systematic action within the matrix.

### Implementation

It is all very well to talk about attitudinal change, but how in practice can we translate this changed attitude into practical planning outcomes? This will be addressed through the examination of two small-scale case studies. The first of these attempted to implement eco-relational principles as part of a broad-based strategic planning effort. The second was a

“traditional” traffic study designed to address the long-term structural needs of a growing area. Both of the case studies had as their output clear recommendations regarding the development of transport infrastructure to serve the needs of the area. These recommendations were, however, arrived at by completely different routes.

### **The Armidale/Dumaresq Strategic Plan (after Witherby, 1994)**

The Armidale/Dumaresq Strategic Plan arose out of a perceived need to provide for urban growth around the small rural city of Armidale, NSW. Armidale is an inland city with a population catchment of around 30,000 people. There was a perceived shortage of residential land to meet the needs of the city, and concern was being expressed about the social, environmental and transport implications of growth. Although commencing as a somewhat traditional land use planning exercise, the strategy soon evolved into a broader strategic consideration of the region’s future. In particular, it became clear that the Armidale/Dumaresq community had and was capable of articulating a range of views regarding its vision of the region’s future. Through a series of consultation processes similar to those espoused by Engwicht, the strategy was able to not only gather the views of the community, but also, with the community, develop them into an over-arching vision within which the majority of the community’s aspirations could be pursued. The vision emerging was clearly a “quality of life” vision. Integral to this vision was seen the need to come to grips with the implications of the motor vehicle on quality of life.

It must be stated at the outset that in conventional transport planning terms, Armidale does not have a traffic problem. Nevertheless, it was clearly seen that in terms of improving the quality of urban space within the city, the balance between the car and other road uses needed to be redressed. The outcome of the process was a clear set of recommendations regarding transport in the city. It should be noted that these were developed in the clear (and deliberate) absence of the use of traditional traffic modelling or forecasting tools. Those conclusions, together with their place in the Darwin Matrix were (Witherby, 1994, p. 323):

- 1 Pedestrianize the central business district (CBD) completely, while ensuring adequate peripheral parking, disabled car access and alternative “clean” transport from the peripheral parking areas through the CBD area (local scope, level I, II and to an extent III physical/environmental

changes, level I and II social/cultural change).

- 2 Consider the implementation of a local government-based “community service obligation” payment to the local bus operator to assist their proactive efforts to improve mode split towards public transport (city-wide scope, level III physical/environmental changes, level II social/cultural change).
- 3 Develop a transport plan for the University of New England to reduce car dependence by people travelling to this single largest employment node in the city. Aspects such as improved public transport, car pooling, reducing parking availability on campus and further encouragement and provision of facilities for cycling are under review (intermediate scope, level I and II physical/environmental changes, level I and II social/cultural change).
- 4 Programme, over a 20- to 30-year period, the reconstruction of the complete road system of city of Armidale under Local Area Traffic Management principles. This reconstruction would occur as and when roads fell due for reconstruction in the normal course of events and would produce design speeds of 40 kph on the “arterial” and collector roads and design speeds of 20 kph on residential access streets (city-wide scope, level I, II and III physical/environmental changes, level I, II and to an extent III social/cultural change).
- 5 Maintain the current land use pattern of the concentrated CBD core and encourage further development in medium density housing in and near the CBD area. In addition develop measures that assist the retention of the corner store network throughout the city (city-wide scope, level III physical/environmental change, level II and III social/cultural change).
- 6 All new subdivision areas be constructed on integrated, multi-mode principles from day one with those areas more remote from the city being connected by denied assess collectors as well as cycling, walking and public transport routes (local scope, level I physical/environmental change, level I social/cultural change).

Probably the key aspect of the Armidale case study is that it deals with the problem of bringing about physical and social change through the simultaneous application of changes on both fronts in a variety of ways. It seeks not revolution, but evolution.

### **Coffs Harbour**

The Coffs Harbour exercise was somewhat different. Coffs Harbour is a rapidly growing

coastal NSW town with a regional population of approximately 50,000 people. It is also a popular tourist destination. The high growth rate, coupled with previous under-investment in transport infrastructure, has produced a situation where there is a perceived need for substantial upgrading and expansion of the road network. In traditional transport planning fashion, a traffic study was commissioned from a mainstream transport engineering firm. Setting aside some quibbles with the methodology, it is useful to focus on the key assumptions underlying the study. Of major importance were the linear projection of traffic growth as population and economic activity rise, and the assumption of increased trip-making propensity by the residents of the area. Naturally enough, the study recommended widening of the main north-south highway through the region and the development of a "traffic relief route" to bypass the major commercial centre.

Many residents in the Coffs Harbour area challenge the need to upgrade substantially road infrastructure. They point to the significant severance and traffic noise and safety implications of constructing a traffic relief route along the proposed corridor, which bisects a major tourist residential area. They note that during the peak holiday period, Coffs Harbour (which is a significant resort destination) appears to function quite adequately with nearly a doubling of its population.

These resident views suggest that the style of exercise carried out in Armidale may be appropriate. Perhaps an attempt needs to be made to place transport within its context as an enabler of the various activities of the city, and to address seriously the degree to which mobility enhancement via the private car will further that function. Certainly it is clear to many "non-experts" in Coffs Harbour that traditional transport planning has failed them.

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## Conclusions

While the above outcomes demonstrate that Engwicht's principles are capable of operation and appear to have benefit when applied on a small scale, the question is still open as to whether these principles can be applied at the metropolitan level. For example, there has been increasing discussion about what are becoming known as "urban villages" as a "solution" to urban liveability. Cunningham *et al.* (1994) proposed a framework within which substantial shifts in the need for mobility could be achieved, thereby reducing car dependence, yet maintaining a good level

of access to "exchange opportunities". A similar framework has been proposed by Newman and Kenworthy (1992) with their transit oriented urban villages.

Yet intrinsic within the viability of these frameworks is the need to modify substantially mobility patterns within the city. Simply providing local opportunities for shopping, work and leisure may not necessarily impact on mobility - people with access to private cars will freely travel out of their urban village unless attitudes to, and restrictions on travel change significantly (Manning, 1978). Another difficulty is that people appear to have a travel time "budget" which they are willing to use in whatever way technology will let them and they can afford. A good example is the average journey to work time, which has not varied significantly in Sydney in the last century. A final (and more significant) problem is that we are not seeing evidence of these types of approaches being developed from the "ground up" using Engwicht's principles of understanding of the city and full partnership with its people. Neither can we be confident that they are "solutions" that really operate within the full scope of Giannakodakis's systems framework.

The conclusions that we can draw from this are that planning solely at the local scale, while complex enough, is unlikely to solve metropolitan scale problems unless quite substantial shifts in attitude occur at a societal, rather than just a community level. Even then, and even at the local level, change towards the bottom right of the Darwin Matrix is more likely to occur by evolution rather than revolution (Witherby, 1994). It is also clear that we cannot solely address the problems of the city at the macro scale. If we do (and as we have), the hopes, fears, aspirations and concerns of local communities are unlikely to be truly addressed.

This is not to say that substantial improvement to the liveability of our major cities cannot be achieved. There is much that can be done and is being done to address major problems and issues. Many of these are "whole city" strategic initiatives; many of these are local initiatives. The two need to be given equal recognition, and the impacts of one on the other addressed in true partnership with the communities affected. There are some signs that we are now entering a period of relative stability after the rapid change of the post-war era (Deen, 1984). This will assist in providing an environment more conducive to the planning task, provided we have an appropriate frame of reference for that task.

What is also becoming apparent is that, even with changed attitudes, and a more



stable framework, these problems cannot be solved by planners (whether transport or land use) alone. Changing the framework, and our attitudes to the task, of our profession is, however, an essential start, and one which can give us an effective direction for the future.

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# Placebo or panacea? Rural transport corridors: some social and environmental issues

Amanda Root, William J. Fielding

Transport Researchers, Environmental Change Unit, University of Oxford, UK

**Travel poverty, defined as "inadequate access to choice in relation to travel", is faced by those who cannot travel as much as they would like, or who have inadequate local amenities, reducing options about travel. The context for this study is increasing rural car use and by policies which directly or indirectly promote it, damaging the quality of life and the environment and lessening the safety of public space. Presents evidence from a study of two rural villages indicating that the development of public transport corridors might, in some circumstances and to some extent, meet sustainability (i.e. environmental, equity and participation) objectives. Also discusses possible limits to the effectiveness and potential disadvantages of developing rural public transport corridors. Raises the particular effectiveness of rail corridors in meeting environmental objectives.**

## Rural travel and its problems

Increases in miles travelled per capita is a worldwide trend, but one that is more pronounced in developed countries. Between 1989-93 there was a 9 per cent growth in distance travelled in Oxfordshire (Oxfordshire County Council, 1994). The County exemplifies the upward travel trends which are found in Europe and across the developed world (Greene and Santini, 1993).

In Europe, there are clear correlations between income and travel, with a trend that increased affluence contributes to greater demand for travel (Stanner and Bourdeau, 1995). Currently, there are also spatial differences in UK travel demand. Rural dwellers travel further in total than urban residents (Table I). Rural people are travelling 49 per cent further than their urban counterparts, 70 per cent further as car drivers and 66 per cent more in cars as drivers and passengers. Rural people are also less likely to use public transport or walk than urban residents. This is ironic when it is considered that the stereotype of life in the countryside is that it is "settled" and "rooted" and not as mobile as urban life.

Car travel is exceeding other modes of transport by a ratio of almost 8:1 in rural areas (Table I), but this was not always the case. It has been argued that the UK policy of closing railways in the 1960s and supplying a substitute bus ("bustitution") contributed to the growth in private car ownership:

The so-called "bustitution" policy has proved wholly ill-founded, for where the railways had proved more than capable of competing with the private car, buses had failed. Indeed railways closures had actually forced many people to buy their own transport, precipitating the near collapse of rural public transport (Henshaw, 1994).

The loss of rural public transport, referred to earlier, has been exacerbated by the 1985 Transport Act, which deregulated buses, enabling many bus companies to choose more profitable, often urban, routes and to withdraw more remote or less well-used rural services.

The rise in the use of private cars has contributed to the loss of local facilities,

particularly in rural areas. Cars allow access to non-local amenities for those with their own transport, but have facilitated a spate of centralization of public and private sector facilities. Peripatetic health services, which were commonplace in small (<1,000) Oxfordshire villages until the 1960s, are now a rarity. It would appear that rural travel poverty, defined as inadequate choice in relation to travel, has grown as local facilities and public transport have declined.

Those without access to cars, are frequently travel poor, especially in remote rural areas, where public transport and local facilities are often negligible. Of households in rural England and Wales, 21 per cent do not own a car (ACRE, 1994). It should also be noted that a much larger percentage of people do not have access to a car during the day, often because the main household car is being used by a wage earner, or they do not have a driving licence or they are too young or disabled to drive. In rural areas a large number of households (estimated to be approximately 11 per cent of the rural population) run a car and are unable to afford "necessities" as a consequence.

There are also a large number of disadvantages of increasing reliance on the private car. As many authors have described, climate change and an increase of morbidity and mortality are attributable to vehicle emissions. Transport accounts for approximately 30 per cent of personal energy use and the proportion is increasing.

## Transport corridors

Public transport corridors are defined as particular routes along which there is a concentration of bus, train or other forms of public transport. In this study, the public transport corridor included buses and trains. They could be based on guided buses, community buses, new railway lines, trams or even cycle lanes.

Developing public transport corridors would involve allowing more housing or light industrial development at the "nodes" or public transport corridors and so, potentially, providing larger numbers of passengers,

**Table I**

Average number of miles per person per year by mode of transport

Type of settlement	Rural	Urban
Car driver	4,890	2,881
Car passenger	3,046	1,878
Other private	355	218
Rail	311	429
Local bus	194	285
Other public	186	207
Walk (over one mile)	157	247
All modes	9,140	6,145

Source: Stokes (1995)

which might generate more frequent services, easier and faster modal changes and greater numbers of destinations.

Some transport corridors have been successfully developed. Copenhagen, for example, has fostered a “hand print” shape in which the “fingers” are transport corridors. The European Union is also developing a Trans-European Network (TENs) which is intended to provide public transport and road corridors, mainly for inter-urban freight journeys. It was our intention to investigate the usefulness of rural public transport corridors for passengers, on a much smaller scale.

## Methodology

Two villages in South Oxfordshire (the outer South East region of the UK) were surveyed in the summer of 1995. Information was

gathered from Chalgrove, which has limited bus services; and Cholsey, which has good bus and train services (Figure 1).

A total of 279 people completed questionnaires, which included a travel diary of single day journeys. A total of 1,692 individual journeys were analysed. All the travel diaries have been put onto a database: 279 people filled in travel diaries and questionnaires. Information was gathered fairly evenly from both villages: from Chalgrove 145 people (52 per cent of the sample), and from Cholsey 134 people (48 per cent of the sample) returned and completed questionnaires (see Table II).

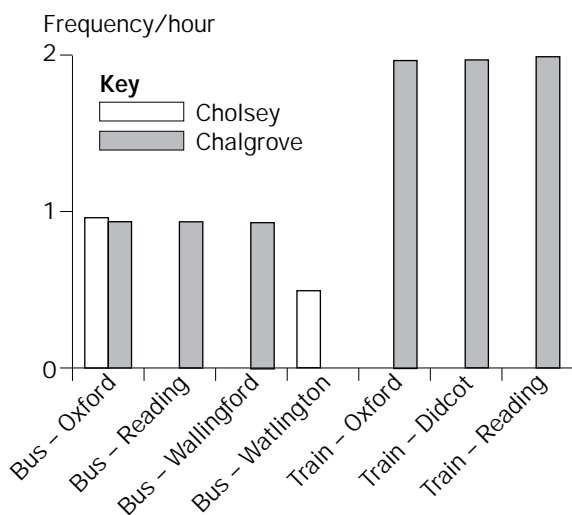
The survey methodology involved a team of interviewers visiting households identified by the Census, and sometimes by local contacts, as likely to have residents in the 16-29 age group. If the household did contain a 16-29 year old and if those concerned were willing, each person was left a form which consisted of a day’s travel diary and a questionnaire.

The questionnaire methodology was supplemented by various focus group interviews and unstructured interviews. In a cultural analysis it is possible to find “structures of feeling” or “cultural forms” that often play a more important and permanent part of everyday life than any particular set of opinions or views. It is hoped that the brief introduction of cultural analysis helps to lose some of the difficulties inherent in attitudinal surveys where answers may appear inconsistent or superficial (often owing to the context-dependence of the questions remaining unanalysed).

A total of 76 16-29 year olds were interviewed in groups in Oxfordshire. No statistical data were collected, but the interviews were recorded and have been transcribed. One of these interviews is quoted in this article.

**Figure 1**

Public transport in Chalgrove and Cholsey



Note: Frequency of train services are variable throughout the day

## Background information about the villages

Cholsey and Chalgrove were chosen because they are similar in size and demographic profile. Cholsey is approximately one-fifth larger than Chalgrove (the villages are 2,832 and 3,428 respectively). No two villages are identical, but there are strong similarities

**Table II**

Sample by age group

Village	Age					Total
	Under 12	12-15	16-29	30-59	60+	
Chalgrove <sup>a</sup>	1	7	50	82	3	143
Cholsey	4	20	38	69	3	134

Note: <sup>a</sup> Two missing cases from Chalgrove

between these two villages. House prices (compared in January 1996 from a sample of 45) after allowing for number of bedrooms and house design, were broadly the same (£96,000 and £100,700 respectively).

### The effect of transport corridors

The residents of Chalgrove travel to more diverse destinations than the residents of Cholsey. Figure 2 shows the journeys from Chalgrove, which are almost in the shape of a star and Figure 3 shows journeys from Cholsey, in which there are three main axis of pathways from the village.

In Figures 2 and 3 the lines have been weighted by volume of journeys to the main destinations. The figures relate to total of journeys - by any mode, not just public transport. Journeys within the same village, town or city and journeys between and from non-Oxfordshire destinations into Oxfordshire have been omitted.

Public transport availability may funnel travel demand into corridors. The availability of good public transport, i.e. at least an hourly service, contributes to over half of all trips going to destinations along its routes (Figures 2 and 3).

### Do public transport corridors diminish travel poverty?

Travel poverty is related, we believe, to lack of choice. From the questions of mode of travel used for each journey and the availability of a car, it has been possible to ascertain some information on choice.

In Tables III and IV, the numbers indicate the proportion of journeys in which a car was available as an alternative, ranging from no choice for bus users (0 per cent) to complete choice of car mode for motorcycle and taxi users (100 per cent). There is a 97 per cent level of choice for car users as some of them were being given lifts, and they did not have a car available to use on a different journey.

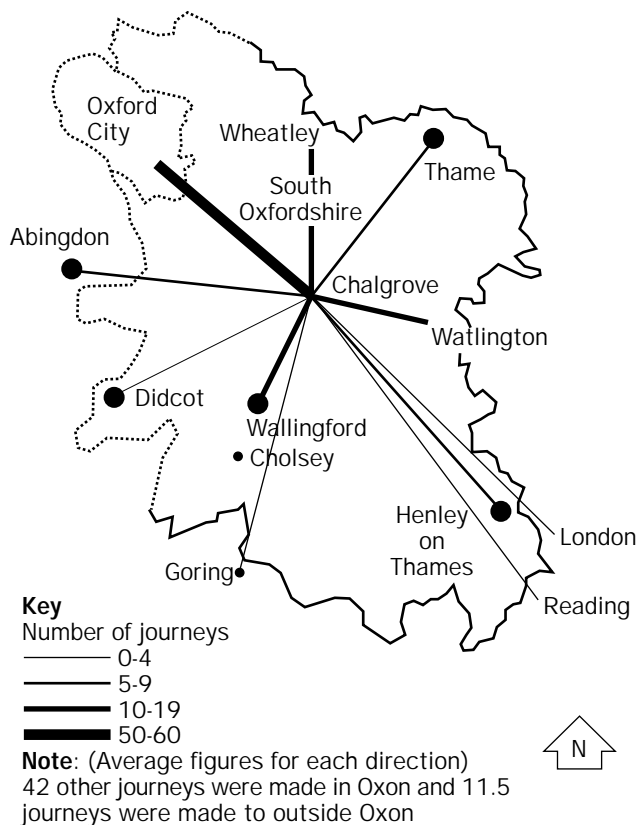
Tables III and IV show that a higher proportion of those travelling by bus and train in Cholsey had a choice (37 per cent and 92 per cent respectively) of using a car compared with those in Chalgrove (0 per cent has a choice in relation to the bus, there was no train use recorded by residents in the sample). This indicates that the higher level of public transport provision in Cholsey increases modal choice and discourages car use.

However, more of those cycling had a choice in Chalgrove than in Cholsey. This figure may reflect the higher levels of car ownership in Chalgrove compared to Cholsey.

There is clearly a greater proportion of people making a choice not to use a car in Cholsey. (The weather was not a factor as this survey was undertaken during a heatwave in August, when there was no rain.) Apart from taxis, the trains have the ability to attract the highest proportion of those who could use a car. Journey destinations from Cholsey have already been shown to be concentrated along the routes served by the train (Figure 3). This indicates potential for encouraging modal switching to the train, given more appropriate costs and services.

In terms of increasing choice, then, this public transport corridor, along with good local facilities (in this case a market town about 4 miles away) succeeds. However, it is not clear that those who were able to exercise the choices were those who would otherwise be unable to travel. Much of the most telling data which we collected to answer this question were qualitative, as the issues were often complex and dynamic, and could not be easily be captured with, in this instance, the somewhat blunt instrument of a questionnaire.

**Figure 2**  
Journeys made by the residents of Chalgrove



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### The travel poor

In both villages, those on state benefit, unskilled manual workers and housewives are making, on average, much shorter journeys than people in other social groups (Figures 4 and 5). People on state benefit and housewives would be likely to spend much of their time at home, and, possibly, unskilled manual workers might work more locally than people with other skills. This could indicate travel poverty. Typically, these groups are amongst the low-paid, and lack of disposable income is often correlated to not being able to travel as much as is wanted.

In answer to the question “Has there ever been a job you considered, but didn’t apply for because of the difficulties of getting there?” 33 per cent of those who answered (37) said yes. This answer raises issues about the economic inefficiency of not having more adequate public transport infrastructure or land-use policies.

However, this figure may be inflated by the large number of young people in this survey, many of whom may be students or in the early stages of their working lives, and so

**Table III**

Choice in travel mode for journeys starting in Chalgrove

Mode of transport	Proportion who had a choice (%)	Number of journeys
Bicycle	33	33
Bus	0	39
Car	97	405
Motorcycle	100	7
Taxi	100	2
Walk	75	275

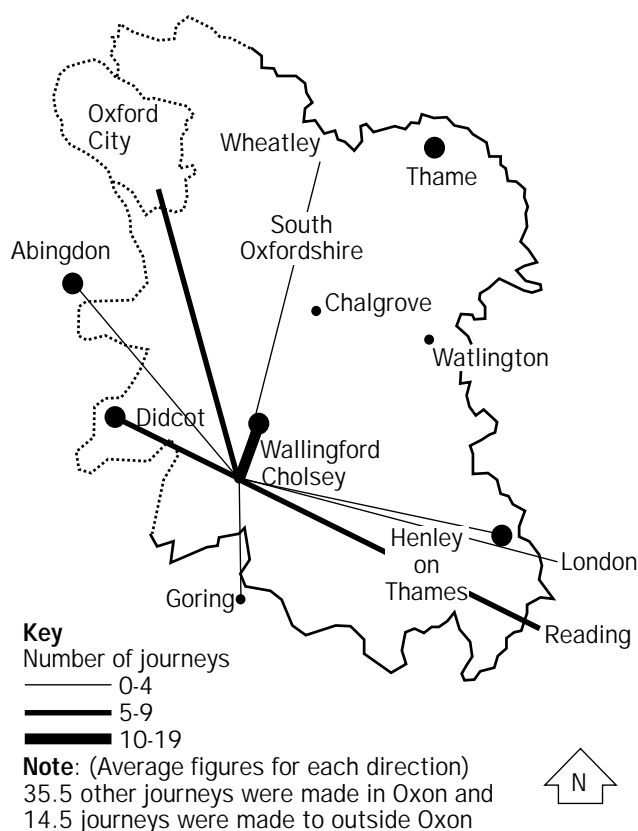
**Table IV**

Choice in travel mode for journeys starting in Cholsey

Mode of transport	Proportion who had a choice (%)	Number of journeys
Bicycle	16	79
Bus	37	35
Car	97	406
Taxi	100	3
Train	92	37
Walk	91	243

**Figure 3**

Journeys made by the residents of Cholsey



unlikely to be earning average wages. Low income could then be correlated with a lack of mobility due to not being able to afford driving lessons or a car.

The following comment illustrates some of the strong feelings about lack of travel opportunities from a group of young people in one of the villages studied. The boys perceive that lack of facilities leads them to crime:

Spike: We need transport or we need facilities. Or all we do is get in trouble. True or false?

[Clamour of voices]

AR: How do you think transport would help?

Spike: Get us out of trouble, won't it? We'd be doing things. We might get pissed an' that, but...

Andy: What's stopping you going to Oxford and beating someone up? That [transport] ain't going to keep you out of trouble is it?

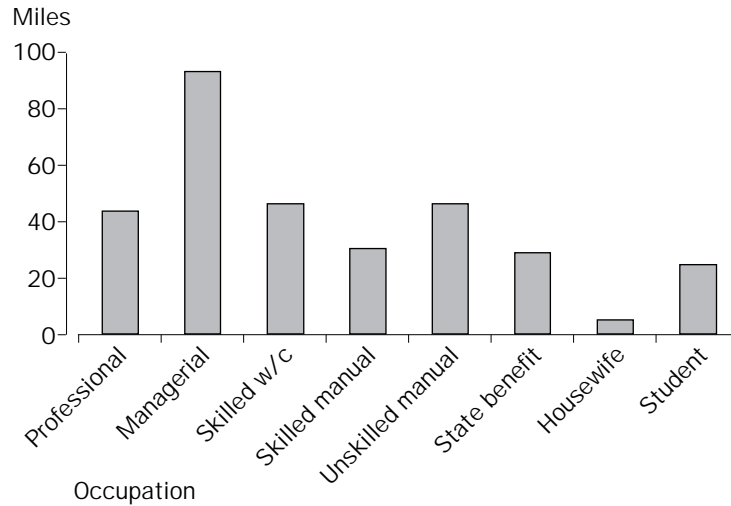
Spike: Yeah! (emphatically) But what's stopping us here... smoking drugs and that? If we went to Oxford...

Andy: There's nothing stopping you smoking drugs, man...

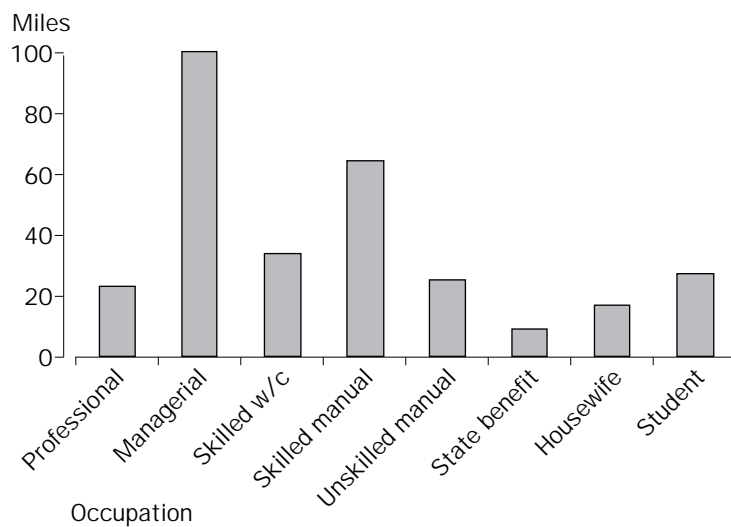
Spike: Yeah, but if we'd got transport you're going to be doing other things ain't you?

Spike felt that the absence of good transport and facilities lead to anti-social behaviour (e.g. the desire to get into fights) and better transport would encourage more socially acceptable activities through wider

**Figure 4**  
Median distance travelled on study day by occupation for the residents of Chalgrove



**Figure 5**  
Median distance travelled on study day by occupation by the residents of Cholsey



opportunities. The problems of isolation for people in rural areas can mean that deprivation is hidden. In these instances, the discussion is usually focused on those who have slipped from genteel affluence to impoverishment that often the poor themselves find difficult to admit to. Another form of deprivation is reflected in Spike's comment: it is the boredom and frustration of travel poverty.

Young women in the sample were much more likely to be escorted by parents and/or boyfriends than the young men. Their

choices about travel were frequently curtailed by fears about their safety, and sometimes by the cost of travelling. The availability of finance for cars was also affected by gender.

In this study, none of the women but 17 per cent of male respondents had their cars paid for by sources such as "company", "someone else" or cars were jointly purchased by parents and children.

Travel poverty does not have any objectively measurable effects, unlike, say fuel poverty. In this study, we concentrated on the

16-29 year-old age groups and found that they did experience lack of choice about travel. The public transport in the travel corridor did provide some extra choice, albeit only to the extent of buses and trains being used for 6 per cent and 5 per cent of all journeys respectively. The qualitative data suggests that, for this age group, mobility might be most effectively enhanced by reductions in fares and alternative transport schemes such as lift-sharing, shared taxis, or pay-as-you-ride type of car-sharing which could allow autonomy and some (perceived) degree of personal safety, especially at night.

### Travel corridors and the environment

Energy use is directly linked to carbon dioxide emissions, which contribute to climate change. The impact of the journeys on energy use have been estimated in Table V. These figures include journey length with mode and passengers as the main variables. Estimations based on figures by Banister (1992). Car occupancy is assumed to be 1 for car drivers, but 2 for car passengers. Buses and trains are assumed to be 33 per cent full electric trains. Both diesel suburban and Intercity trains use more energy. Similar figures, but with a lower MJ figure for cars, are given in Hughes (1993).

The environmental gain made (2,300 MJ per day, 16,000 MJ per week, 839,500 MJ per year) amongst those sampled in Cholsey is probably as a result of the existence of rail use. The energy use in Chalgrove is 0.0191

MJ/mile/ person/day and 0.0179 MJ/mile/person/day in Cholsey. If the 679 miles travelled on trains had been undertaken by car, then the energy use for Cholsey would rise to 0.0204 MJ/mile/ person/day.

Cholsey uses approximately one-fifth less energy than Chalgrove. The difference in energy use may partly be attributable to a convergence of more journeys in a “transport corridor” and better public transport in Cholsey compared to Chalgrove. More than double the miles were travelled by environmentally friendlier modes of transport, such as public transport or cycle, in Cholsey than in Chalgrove (Table V).

The proportion of “green” miles is strongly affected by the rail service from Cholsey. Railways miles account for 48 per cent of all distance by environmentally friendly travel modes. This points to the particular environmental usefulness of rail corridors. In Figure 5 all the groups except the unskilled manual workers, those on state benefit and the housewives used the train. This strongly suggests a correlation with average or above average income and rail use, a correlation which is broken, perhaps, by the students because they are allowed discounted rail fares.

### A challenge for planners

The problems of rural transport nearly always involve the need to develop popular community services without high infrastructural costs. Many innovative rural transport solutions such as post buses, lift-sharing or shared taxis are successful but have two main problems:

- 1 they are relatively unattractive to those who might otherwise travel by car; and
- 2 they often require subsidies – either financial or the unpaid work or goodwill of volunteers – to ensure they can run.

From the evidence above, it appears that public transport corridors might be a way of encouraging use of public transport in rural areas – allowing housing development in greater concentrations could enable the commercial viability of transport corridors.

Public transport corridors can offer a low-public-cost alternative that will allow greater personal travel, if demand continues to grow. The changes to land-use planning which would allow the further development of public transport corridors, through encouraging certain types of development at “nodes” along these corridors is within the powers of County Councils, the UK

**Table V**

Estimated energy use and mode of transport

Mode	Estimated energy use MJ/passenger mile	Chalgrove (MJ/day)	Cholsey (MJ/day)
Bus	0.83	164	318
Car	3.21	10,245	8,349
Company car	3.21	1,944	1,435
Cycle	0.10	8	15
Friend's car	1.60	564	15
Hitchhike	1.60	78	N/A
Minibus	1.15	141	15
Motorcycle	3.13	141	N/A
School bus	0.83	7	N/A
Taxi	1.15	9	8
Train	0.89	N/A	595
Underground	1.08	N/A	11
Walk	0.25	43	45
<b>Total: MJ per day</b>		<b>13,345</b>	<b>11,006</b>
<b>Average miles per person</b>		<b>33</b>	<b>34</b>
<b>Number of people in sample</b>		<b>145</b>	<b>134</b>

equivalent of regional planning authorities. Taking this opportunity would be in accord with current planning guidance, which encourages the adoption of measures designed to reduce the need for car travel, e.g. Department of the Environment and Department of Transport (undated).

There is considerable pressure for councils to develop road corridors, as some influential groups believe these encourage economic development. However, this has been shown not to be the case. Whitelegg (1994) writes 50 years of economic geography on both sides of the Atlantic have clarified exactly which factors encourage new firm creation, job creation, inward investment and the locational decisions of entrepreneurs. Transport costs are not a significant variable and rarely account for more than 2 per cent of value of sales.

Whitelegg's article shows that roads do not contribute significantly to economic prosperity.

*"...Evidence presented here suggests railways have the ability to compete with car travel. Many of the private car trips were shown to be along 'corridor' routes, demonstrating, prima facie, opportunities for switching to public transport...."*

There are difficulties with the development of public transport corridors:

- 1 It would appear, from the results described here, that rail corridors are not, under current circumstances, likely to alleviate travel poverty to any significant extent. The costs of travelling by rail are, on the whole, prohibitive to people on low-incomes or the unemployed.
- 2 There is also a problem that not all villages will be likely to be on, or amenable to the creation of, a public transport corridors. What happens to those that are not on one? The number of railways is limited and the creation of new railways is rare. The likelihood is that the current privatization of the UK railway is unlikely to change this situation. However, there are also possibilities for developing better walking and cycling facilities, which might be more appropriate than public transport in some areas. Sustrans, a charity, has developed a national network of cycle tracks, often on disused railway lines, and has demonstrated the attractiveness of non-motorized rural and urban "corridors", for example.
- 3 If councils were to subsidize services on public transport corridors in order to support the development of a "virtuous spiral" of growing services and increased

usage, then this might mean, in current financial circumstances, cutting services from elsewhere. Is it justifiable to develop a high quality public transport service in one area if this means depriving some people of an infrequent bus service?

The proportion of journeys which have a destination accessible by public transport is higher from Cholsey than Chalgrove, suggesting that the public is using centres that are served by public transport and might be willing to use more public transport with an acceptable level of service.

One opportunity exists for extending the range of accessibility of rail services via connecting bus services, which is that the changing legislative structure will allow more combined bus service and rail service ownership in the same geographical area, something which was not allowed under previous regulations. This expansion of ownership might be used to ensure better inter-modality and complementary of bus and train services. Stagecoach, a large service provider, has already opened an innovative bus service that joins a train service in Hampshire, southern England.

## Conclusions

This article supports the idea that public transport corridors could provide environmentally friendlier forms of travel in some rural areas. Rail transport corridors were shown to increase modal choice but they were not found to be affordable by some groups – such as the those dependant on state benefits – whose travel poverty is directly linked to low-income.

Evidence presented here suggests railways have the ability to compete with car travel. Many of the private car trips were shown to be along "corridor" routes, demonstrating, *prima facie*, opportunities for switching to public transport.

The main environmental advantages of rural public transport corridors appear to be that they reduce energy use from transport, and potentially, allow for an increase in personal mobility while keeping emissions at current, or similar levels. This aspect could contribute to the meeting of the internationally-agreed "greenhouse gas" reductions. Without a change in fiscal measures, rural travel corridors do not help the travel poor much. They are not a panacea, or a placebo, but one small move in the direction of sustainability.



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Amanda Root and  
William J. Fielding  
*Placebo or panacea?  
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# Freight transport, food production and consumption in the USA and Europe (or, how far can you ship a bunch of onions in the USA?)

Stefanie Böge

Wuppertal Institute for Climate, Environment, Energy, Wuppertal, Germany

**Focuses on freight transportation, food supply and consumer behaviour in the USA and Europe, especially Germany. Finds that on both sides of the Atlantic, in freight transportation and food supply there are many differences as well as similarities. The main differences are that the USA has a bigger land area and larger, more concentrated economic units. Naturally, therefore, one finds a higher volume of long distance freight transport than in Europe. Similarities can be observed such as the trend towards privatization and liberalization, to more extended suburbanization or to an unreflected way of consumer behaviour. In addition raises some new questions: is the "technological solution" of environmental problems the only way? What can be done to include lifestyles and consumer behaviour into a new strategy?**

## Introduction

This is a condensed version of a report undertaken for an Environmental Fellowship from the German Marshall Fund (GMF) of the USA for which the author was selected in 1995. The GMF's environmental programme is referred to as "Building US - European Environmental Partnerships". It focuses on local, regional and national responses to the threat of global warming. The main focus of the fellowship report was on freight transport, food supply and consumption patterns.

In general the answers to the environmentally problematical development in freight transport are technical ones namely that: administrators and scientists should try to improve engines, transportation modes and logistic strategies. Freight transport is influenced by production, consumption, land-use patterns and lifestyles, but these fundamental determinants of increasing traffic are rarely given the same priority as the technical solutions.

Freight transport is heavily influenced by the nature of countries' economies (i.e. what and how they produce, and where they produce and consume it), as well as their size and physical geography. Because the USA and Western Europe are quite dissimilar in size, geography, production and consumption characteristics, their freight systems have many differences.

However, on both sides of the Atlantic there has been an increase in the travelling distances made by freight transportation, and with that an increase of environmental problems from freight. Reasons for the distance-intensive development in production and consumption can be found in transport policies, the locations and production patterns of the (food) industry, the policy and location of retailers, the principles behind agriculture, the shopping behaviour of consumers and land-use patterns. To reduce the environmental impacts of freight transportation, it is necessary to consider the nature of food supply as a whole (as well as automobile usage for shopping); freight transport is a result of policies and distance-intensive lifestyles.

## Transport policies in the USA

The USA has more than five times the land area of former West Germany; UK; France; Italy; Sweden and Norway (US Congress, Office of Technology Assessment, 1994) and therefore more long distance freight transport. In general, this long distance travel is not seen as a problem in the USA. It is common that food is produced on the west coast and sold on the east coast and therefore shipped over thousands of miles.

Transport policy in the USA concentrates on efficiency standards, but in spite of the better fuel efficiency in the vehicle fleet, the energy consumption and emissions are growing, especially in freight transportation (Schipper and Scholl, 1995). New regulations (i.e. a CO<sub>2</sub>-tax), so many decision makers say, are opposed to the free enterprise market economy. Because of the extreme recession in the economy in the last five years, politicians are very careful with any regulations. As in Europe freight issues are not very important in planning (on the official side planning is seen as communism or socialism), even though consciousness of the problem is growing.

Although there are no formal freight transport policies showing how this sector should be handled in a more environmentally sound way (neither in the Clean Air Act nor in the Climate Action Plan), there are some initiatives at regional level to improve the current freight system. The basis for that is the Federal Intermodal Surface Transportation Efficiency Act (ISTEA), which expanded the role played by metropolitan planning organizations in regional transportation decisions affecting freight (Jones, 1995). In addition some regions develop Air Quality Management Plans which include mobile emission sources such as trucks and trains[1] and there are efforts to find out how much material is transported within a region and to resolve the lack of knowledge about freight data[2].

In general, as in Western Europe, there is an assumption that the costs and prices of freight transport are too low. However in the USA this is a more theoretical debate than in Europe because there is no serious sign

(there is even a retreat) from politicians, and, nobody can predict what would happen if prices were increased. Would this reduce road traffic and lead to more environmentally sound transportation modes? European gasoline prices are 2.5 times higher than in the USA, but there is an increase in road freight transport here as well. Therefore, pessimistic representatives point out, nothing will change with higher prices – especially higher gasoline prices. Everyone knows that one cannot raise prices so much that a significant change will happen. The optimistic view is not only to raise fuel costs (only 4-5 per cent of operation of the vehicle is fuel cost) but also change other factors which have effects on trucking (i.e. fixed costs). It is estimated that if transportation costs for road freight are doubled, there will be more rail and intermodal (especially with double stacked containers), and more regional self-sufficiency.

Nevertheless, the current situation is different. Because of the fixed costs for running a truck, short distances are much more expensive than long distances, even empty back movements are not a serious cost factor. Beyond that the freight sector is more elastic than passenger transport, because there is the possibility to pass on the higher prices to consumers. The situation in freight has stabilized on a distorted basis and the system can continue in the same (environmentally bad) way, although there are some clever environmentalists with good ideas. To reduce long distance (road) freight transport, much more than a raise in prices will be necessary.

### Food and freight transport

Compared with other sectors, transportation costs in the food sector are relatively high. The delivery distances of low value agriculture commodities such as cattle and soya beans are dependent on transportation costs. In general, raw materials (low value products) are transported over small, and processed products over longer, distances. Therefore one important question in agriculture is how to minimize transportation costs.

However from the production standpoint, the main decision concerns finding the market for the product. The east coast of the USA has very little basic food production and agricultural farming is cheaper on the west coast. As a result the largest food industry can be found in California, Oregon and Washington State. For reasons of low production costs, food comes mainly from the west coast and is sold all over the USA. Although theoretically no potatoes are shipped over thousands of miles because it would be too

expensive, one can buy bunches of fresh onions from California in Washington, DC (for 90 cents).

As in Germany, an increase in organic agriculture can be observed. Unfortunately, transportation issues are not taken into consideration with organic or healthy food, although long distance transport has an impact on the quality. Farmers, manufacturers, shopkeepers and consumers pay little attention to these issues. Many Americans suppose that products from Europe are healthier (or safer). This might be because of the defined standards and labels for organic food in Europe. Products in Europe are tested by independent associations in which consumers trust whereas in the USA there are no comparable standards or labels which are valid for the whole country. Certain states and manufacturers try to fix their own standards, but they are more or less without any control and so have gained little trust. There is no agreement on what form standards should take.

There is therefore much more confidence in European food and US health food shops contain a lot of products, such as crisp bread, cheese or juice from Switzerland or Germany. Furthermore, as with conventional food, organic fruits and vegetables are produced mostly on the west coast, so that a lot of these products are shipped thousands of miles to the east coast. There is a similar structural situation for organic food in Germany, but on a smaller geographical scale. When organic food first became available, the demand for it tended to be concentrated in South Germany and thus organic food had to be shipped over hundreds of kilometres to organic food shops. Now, after some years of supply, one can find much more organic farming and food processing in all parts of Germany, so that the delivery distances of such products are decreasing.

With the growing demand for organic food the situation in the USA is changing in the direction of more decentralized production patterns. Especially on the east coast there is a growing interest to get more regional and local products, but the lack of organic production sites and adequate infrastructure still make it difficult to serve the market with “low distance organic food”. Nevertheless, one can find some initiatives which are heading in this direction.

Regional and local food production in the USA is supported from diverse initiatives, especially from food co-operatives. In some States such as Minnesota, these communities are very strong. They realized that transportation changed the economy towards a global mass production and mass market

with the result of loosing more and more regional economic power. Therefore a growing number of local initiatives (i.e. direct delivery initiatives) try to keep small production sites in their region, in food and other sectors. A reason for this is not least to create and preserve jobs. Cities are supporting such initiatives (i.e. community marketing or farmer markets). However, consumer behaviour today is generally in contrast with the ideas of a sustainable food system with less transportation.

### Consumer and travel behaviour

Product demands and shopping patterns in Europe are becoming more like those in the USA:

- people buy more and more processed food (the main reason for this is given as the time-saving aspect);
- people buy many more products at one time, i.e. once a week or even once a month; and
- more and more people use their own cars to go shopping (it is estimated that 99 per cent of Americans go shopping by car).

These trends are directly related to more freight and more passenger transport and, furthermore, to other land-use patterns (large centralized production and large retail sales units) which affect consumer behaviour.

In general, processed food is closely associated with more freight transport. More materials are used, for which more production steps, and with that more transshipments, are necessary. In addition, various packaging materials are needed. However, in addition to freight transport being stimulated by the current food system, by buying more products at one time, it is necessary to carry all products in a car and, because of existing land-use patterns (big supermarkets outside the cities), almost everyone needs a car to go shopping. This initiates the vicious circle of land use and traffic.

Because of the increasing number of food malls outside cities, shops in small towns have become very specialized and grocery stores for daily needs are few in number. Supported by this consumer behaviour, there has been a change from a nation of small business owners to much fewer, but larger, operations. Stores are becoming larger and therefore need more consumers to remain profitable. On the other hand, large supermarkets can offer better prices and a “better” quality of food, and consumers see advantages in using such facilities. The result is that people have to travel longer distances to buy daily things.

An identical situation in consumer behaviour, traffic and land-use patterns can be observed between West and East Germany, especially before but also after, the reunification – again to a lesser degree. Prior to reunification there was a low ownership of private cars and therefore East Germany had a much more dense and mixed land use. People went to the shops on foot and bought produce more frequently because they could not carry so much. Even today big department stores from West German companies have problems in working profitably because people do not buy enough. But with the rapidly growing ownership of private cars this phenomenon disappears.

It seems that transport and consumption behaviour is not, or almost not, changeable because it is related with other issues such as land-use patterns, prices or comfort. But some people are optimistic: if the public understands what the problem is there is a potential that they will change behaviour, as seen with the anti-smoking campaigns in the USA. People are more and more aware of what they eat and safe food has an increasing importance.

### Conclusions

On both sides of the Atlantic one can find two groups of environmentalists: people who want to improve existing systems and people who want to change value systems and standards of values. Technical improvements are – compared with values or behaviour – easy to imagine and therefore most of the environmentalists believe in such solutions. The question however is whether such “solutions” can be the only response to the threat of global warming. CO<sub>2</sub>-emissions (especially in the transport sector) are increasing, although there were enormous technical improvements in the past. Therefore values and behaviour should play a bigger role in the future. Not least because CO<sub>2</sub> or other emissions are not the only problem but the decrease of our quality of life, which is related, i.e. in the USA, with the problem of unsafe food or in Europe with the problem of increasing need of space for motorized traffic. The first step for changing values is the understanding of connections, in this case between transport, quality of food and the quality of living space.

Information and education are very important to change values, although it seems that people have too much information about too many (useless) issues. For example, advertising can be used for showing people how food is produced and how fresh and healthy it can

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Stefanie Böge  
*Freight transport, food  
production and consumption  
in the USA and Europe (or,  
how far can you ship a bunch  
of onions in the USA?)*

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be if it is consumed in the same region where it is produced. Shorter transport distances are connected with a better quality, a better taste and a higher variety of food. Such information should not be seen as additional but instead of the current information.

It is said that the USA is the country of choice and possibilities. Looking closer, this variety seems an illusion as the amount and the international choice of products has obviously increased, but the system behind food production is based on very homogeneous products (a few kinds, same size, same taste, same colour) which are easy to use for mass production. Moreover, the interregional variety (different kinds, size, taste and colours of fruits, vegetables or animals) has decreased dramatically. As Simone de Beauvoir described the USA as far back as 1947:

...And soon one finds out, that all chocolates have under the colourful wrapping the same peanut taste and that all best-sellers tell the same story. And why selecting this toothpaste of all toothpaste? This useless overabundance has a taste of mysticism. There are thousands of possibilities – and it remains already the same. You have a thousand fold choice – and one is as much as worth like another. The American citizen can use his freedom without realizing that such a life is not free (de Beauvoir, 1988).

Today it seems that people in the USA are more aware of this than in Europe, and that Europe is believing in the myth of “useless overabundance” much more.

However compared with the USA one can find in Western Europe much more environmental consciousness and more activities for

a sustainable way of life (especially in food production and consumption, even a little bit in automobile usage). This does not mean that the world looks better in Europe but it seems that together with the more diverse and smaller structures there are more opportunities to create a sustainable way of life.

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## Notes

- 1 For example, *The 1994 Air Quality Management Plan of the South Coast Air Quality Management District and the Southern California Association of Governments*, September 1994.
- 2 For example, *Truck Operations Survey Results, South Coast Air Quality Management District*, prepared by Lockheed IMS, LA, March 1993.

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# Car-free households: who lives without an automobile today?

**Ulrike Reutter**

Research Institute for Regional and Urban Development of the Federal State of North Rhine-Westphalia, Dortmund, Germany

**Oscar Reutter**

Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany

Considers methods to reduce private car ownership. Argues that conventional strategies are approaching the limits of their efficacy. Concludes that the solution lies in implementing car-free zones.

## Introduction

Many people have come to recognize private motor vehicle traffic as being one of the major driving forces behind declining environmental and residential qualities in the cities. Rising numbers of motor vehicles and increases in the mileage covered by privately owned vehicles bring with them growing accident risk, land consumption, soil contamination, overall resource depletion and energy use with the concomitant CO<sub>2</sub> problems, wastes in the manufacture and disposal of automobiles, and noise and air pollution. The countenance of the city and the quality of life in cities both suffer.

Conventional strategies for solving such problems, including widespread traffic calming or optimizing motor vehicle technology, are approaching the limits of their efficacy. They do indeed reduce the stress on the environment but the gains are more than offset by increasing loads emanating from an unbroken rise in the numbers of vehicles and volume of travel. This makes it necessary to abandon a taboo in our thinking and instead develop planning concepts aimed at reducing the number of automobiles. In this effort regional, urban and traffic planning should provide incentives to those households which even today do without an automobile and encourage those who are considering eliminating a car now on hand in the household so that they will actually relinquish that vehicle.

Car-free neighbourhoods within towns would make it possible for people who do not own a vehicle at present and all those who would like to do without a car in the future to experience, both individually and collectively, the benefits which liberation from the private car offers. All the residents, children as well as adults, could then move freely within the entire public roadway area, not endangered by vehicle traffic, and be able to cycle, play or simply sit and relax in this newly reclaimed space – without automobile exhausts and noise.

The data reproduced below stem from broad-based German statistics and above all from a telephone survey embracing 146 car-

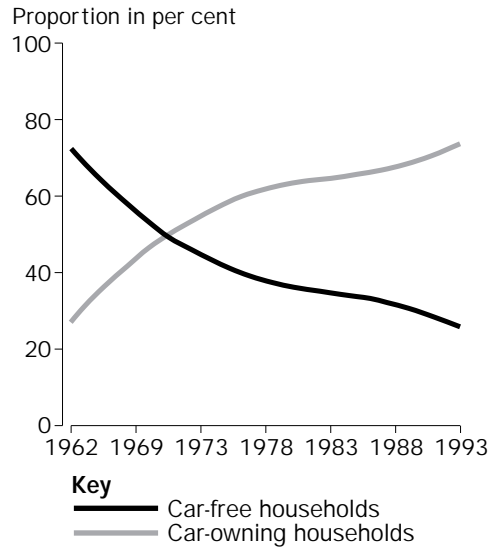
free households selected at random in Dortmund; we conducted this survey in November of 1992 in conjunction with writing our dissertation (Reutter and Reutter, 1995). Here a “car-free” household is defined as one which has not owned a vehicle for at least a half year and does not have access to either a company car or a motorcycle. Our empirical results are representative for the car-free households in Dortmund.

## How many car-free households are there?

In 1993 Germany was home to a total of 81.3 million people; at the same time 38.9 million passenger cars were registered (cited in German Economic Research Institute, 1994, p. 7). In the period since the first Income and Consumption Sampling (ICS) which was conducted in 1962, the number of non-motorized households has fallen continuously as a result of ongoing mass motorization, down from the original 73 per cent of all households (Figure 1). The ICS conducted in January of 1993 revealed that of the 35 million households in Germany, about 10 million (28 per cent) do not have a car, while 25 million households (72 per cent) own at least one vehicle. About 18 per cent of the total German population lives in car-free households; expressed in figures, that comes to 14 million of the some 80 million people in Germany (German Federal Statistics Office, 1994, see Reutter and Reutter, 1994, pp. 112-18, for detailed information on the socio-demographic structure of car-free households.) On the national average, at least one household in four does not own a vehicle. It is thus not possible to speak of “full motorization” in Germany. In Dortmund about 81,000 (32 per cent) of the total of 255,000 households do not own a vehicle (Figure 2).

These figures clearly indicate that, when planning and setting up car-free zones, the people who today already do without a car represent considerable demand or market potential.

**Figure 1**  
 Car-free households in western Germany through time



**Sources:**  
 Pöschl S. 925 (1993);  
 Euler (1989, 5.314), S. 314;  
 Reutter and Reutter (1995)

**Where are the car-free households located?**

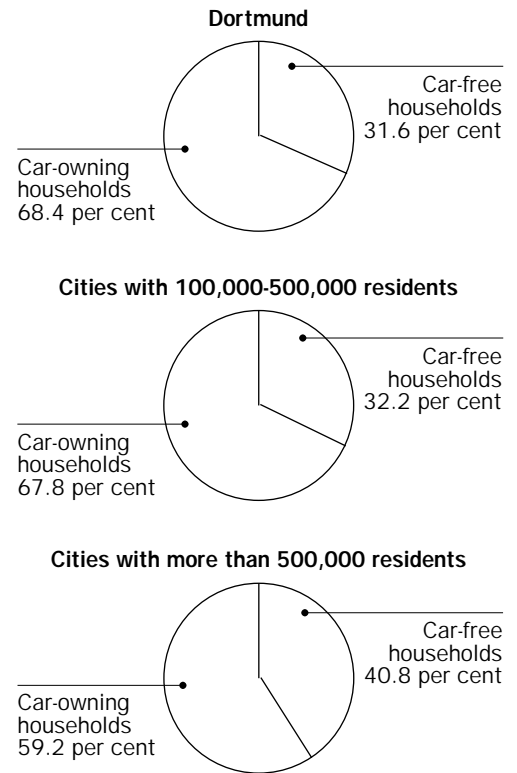
The more “urban” the surroundings, the greater the number of car-free households. The proportion of non-motorized households rises with the size of the town or city. Taking the average of all cities and communities in Germany, the share of car-free households lies at 28 per cent; in the larger towns with 100,000 residents or more, this proportion is considerably higher. In fact, in the major cities with populations exceeding 500,000, car-free households now account for more than 40 per cent of the total.

Within these large cities, the percentage of car-free households in inner-city and mixed-use areas is especially high. In areas of this type within the city of Dortmund, almost half of all the households are without a car (46.4 per cent); only slightly more than half of all households there have one or more vehicles at their disposal (53.6 per cent) (see Figure 3).

These findings clearly indicate that the large cities particularly lend themselves to the planning of car-free zones, and within a city the inner-city residential and mixed-use areas are especially suitable for car-free zoning. Let us summarize the factors here:

- almost half of the households in the inner-city residential areas in the large cities in western Germany already live without a car;

**Figure 2**  
 Share of car-free households in Dortmund and in large western German cities



**Sources:** Authors’ own results from a telephone survey of selected, representative households in Dortmund in November 1992, *N* = 640 households, German Federal Statistics Office 1994a; unnumbered; income and consumption sampling in January 1993 (Reutter and Reutter, 1995)

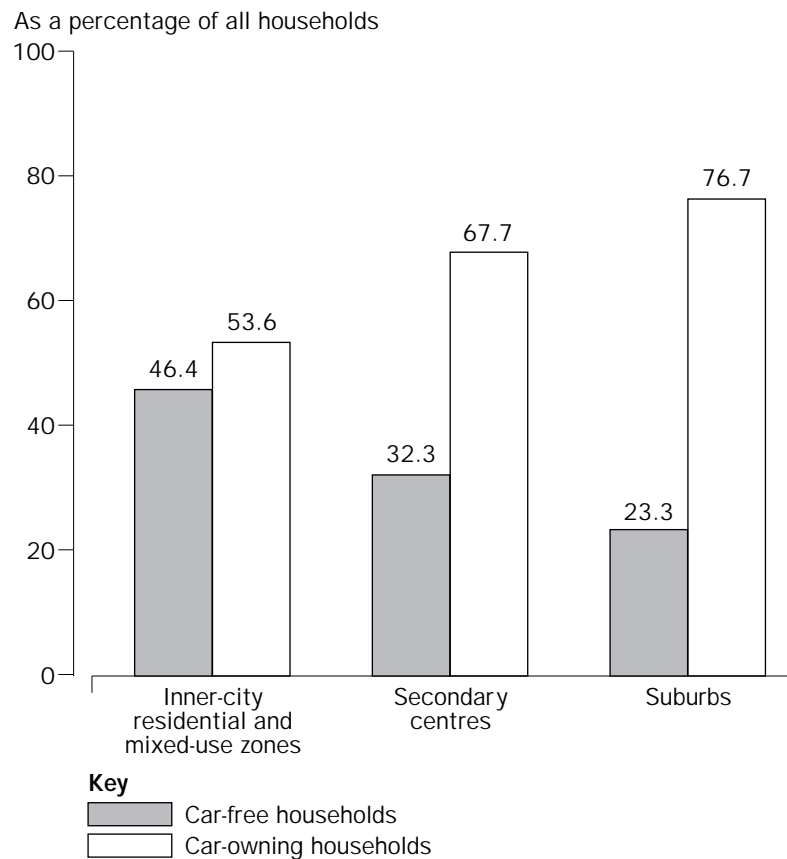
- these areas are characterized by a comparatively great number, variety and density of activities which represent destinations for individual journeys, including residential areas, workplaces, shopping facilities and cultural and recreational facilities;
- these destinations can easily be reached using the so-called “green modes” – namely on foot, by bicycle and with public transport.

The logical conclusion is that future focus should be on identifying such quarters, capitalizing on the favourable existing situation there, in addition to pursuing citywide planning projects to promote car-free living.

Car-free city zones in inner-city residential and mixed-use areas should be set up both within existing urban structures and in newly redeveloped areas – including those built on rehabilitated inner-city land such as abandoned commercial properties, evacuated barracks and other military facilities or

**Figure 3.**

Car-free households according to the structure of the respective residential area in Dortmund, in November 1992



**Source:** Author's own results from a telephone survey of selected, representative households in Dortmund in November 1992,  $N = 146$  households + 146 car-free households (see Reutter and Reutter, 1995)

former railway freight yards. Conversion and re-development projects in existing residential areas over longer periods of time are so decisive because, in comparison to the volume of new construction, the bulk of available housing is to be found there. In addition, quite a large number of non-motorized households are located in such areas today; if they wanted to enjoy the collective advantages of car-free living they would otherwise first have to relocate. Older citizens in particular, no longer wanting or able to move house, would have hardly any prospects for enjoying the benefits of a car-free neighbourhood unless projects were to be carried out in existing residential areas.

#### Who currently lives without a car?

In addition to the role played by the character of the neighbourhood itself, the socio-demographic household type to which a given unit belongs correlates to a large degree with

its daily internal organization in regard to time and distances. If, for example, many people live in a single dwelling, their activities have to be jointly arranged. If there are children in the home, their activities have to be co-ordinated with those of the parents – and more often than not, of the mother alone. The daily rhythms of older people are quite different from those of young people; if members of the household are gainfully employed, then they face very specific constraints in terms of time and space.

Mobility research efforts and particularly action radius studies (time and space) show that three socio-demographic characteristics:

- the ages of the adult members of the household;
- their participation in the working world; and
- the presence of children in the household;

can be used to describe quite accurately the situation within which a household operates, i.e. the family's rhythms form the basis for



specific time-and-space constraints (see Holzapfel, 1980; Holz-Rau, 1990; Kreibich *et al.*, 1989; Mentz, 1984; Neuwerth, 1987; Reutter *et al.*, 1991).

Applied to the non-motorized households in Dortmund, three situationally homogenous types of car-free households emerge:

- 1 retired households – aligning with the trend;
- 2 working households without children – countering the trend;
- 3 working households with children – also counter to the trend.

Taken together, these three types describe 93 per cent of all car-free households in Dortmund (Figure 4).

The retired households in line with the trend include:

- those made up of older and elderly persons, where the individual responding to the survey was 55 years of age or older;
- in which there are no working adults;
- in which there live no children under 18; and
- in which the adults are retired or have taken early retirement or are housewives.

The members of these households have to consider only relatively minor outside constraints in terms of space and time since none of them is involved in gainful employment. They must cover the distances and routes required for personal business (shopping, errands, banking, medical appointments, etc.) and for leisure-time activities. Among those older households in Dortmund where the person responding to the survey was 65 years of age or older, about three-quarters were single-person households, comprising almost exclusively women living alone; about one-quarter were two-person households where the only constraints arise from the need for co-ordination between the two

adults. Four out of ten retired households in line with the trend could, in their own estimation, afford a car. In Dortmund retired households account for almost two-thirds of the non-motorized households; they are estimated to number about 54,500.

The structure of the retired households corresponds precisely to the trend which can be read from the data for western Germany (Reutter and Reutter, 1994), the proportion of car-free households being relatively high in the groups of households

- made up of older or elderly respondents;
- where the respondents are not employed;
- without children; and
- in the smaller households, particularly among the one-person units.

Included in those “working households without children” which run counter to the trend are the:

- young and middle-aged households where the person responding was in the employable age bracket, from 18 to a maximum of 55 years;
- households in which at least one adult is gainfully employed; and
- households in which there live no children less than 18 years of age.

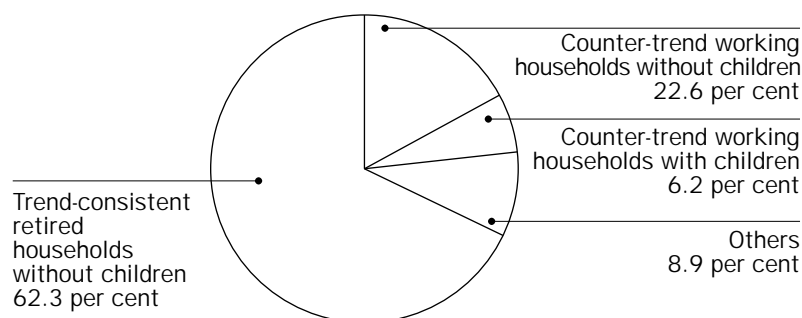
The working members of the household must deal with major limitations in terms of time and distance, since they must pursue the “mandatory activity of working” at fixed workplaces and during fixed working hours. Also affected by these constraints are the other activities of these particular household members such as taking care of personal business and pursuing leisure-time activities; the other adult members of the household are also affected even if they are not working. When the members of the household want to spend free time together, for instance, they are restricted to the early mornings, late afternoons and evenings, and weekends, all times at which public transit services are considerably sparser than during normal working hours.

In Dortmund at least half of these households are single-person households. About four out of ten households are two-person households and only about 5 per cent include three or more persons in which the need to orchestrate activities among the adult members of the household is particularly evident. Two-thirds of the counter-trend working households without children could, in their own opinion, afford to keep a vehicle. In Dortmund this type of household structure, estimated to number 19,700, accounts for almost a quarter of the car-free households.

When it manages without a vehicle, the “working household without children”

**Figure 4.**

Situation-homogeneous types of car-free households in Dortmund, in November 1992



**Source:** Authors' own results from a telephone survey of selected, representative households in Dortmund in November 1992,  $N = 146$  households (see Reutter and Reutter, 1995)

behaves exactly contrary to the trend which can be gleaned from the data for western Germany (Reutter and Reutter, 1994), the proportion of car-free households being relatively low among those households with:

- younger or middle-aged respondents;
- gainfully employed respondents; and
- higher net household incomes.

To be counted among the “working households with children” which operate contrary to the trend are households with:

- young and middle-aged where the person replying was of employment age, from 18 to 55 years;
- at least one adult gainfully employed; and
- at least one child less than 18 years of age.

In these households – almost 90 per cent of which include three or more persons in Dortmund – the activities and associated journeys taken by the adults and the children must be particularly carefully co-ordinated and – especially where smaller children are present – closely synchronized. The organizational effort in this type of household is enormous. Family members have high mobility requirements to cope with the need to co-ordinate time and the journeys resulting from the variety of activities to be carried out: travel to and from work at regular times and fixed locations, tending to personal business, leisure-time journeys and the various trips occasioned by the children all have to be harmonized. This is aggravated by the increased amount of transportation capacity required not only for the foods and beverages needed daily but also for the equipment used on family excursions and holidays. In their own estimation, two-thirds of these households could, without qualification, afford a vehicle. In Dortmund this group accounts for 6 per cent or about 5,500 of the car-free households.

Where the “working household without children” does not own a car, it also contradicts the trend seen in the data for western Germany (Reutter and Reutter, 1994), the proportion of car-free households being relatively low among those household groups:

- with younger or middle-aged respondents;
- with gainfully employed respondents;
- with at least one child;
- made up of three or more persons; and
- with higher net combined income.

On the basis of the typology elucidated here, urban planning and traffic planning should, in our opinion, support the everyday organization of time-and-space requirements specific to those people now living in car-free households so that individuals who today do

without a motor car will not need to purchase one in the future to cope with living in cities.

People who live without a car in the “trend-consistent retired households” are quite particularly dependent on an intact infrastructure close to their homes to take care of personal business and to pursue leisure-time activities – particularly daily walks in the nearby neighbourhood. This is because older people often suffer from motor and sensory limitations relevant to negotiating in traffic, complicated by physical frailty; as a consequence they are particularly sensitive to distances and are at high accident risk. Older and elderly people who organize their day-to-day living without a car require services which are easily reached and universally accessible (including safe walking and cycling paths) in the transportation options offered by the “green modes” so that they are not limited in their mobility.

For people who live without a vehicle in the “counter-trend working household without children”, efforts designed specifically to promote this target group would concentrate particularly on the evenings and weekends, namely when they are pursuing activities which are not work-related – such as shopping, running errands and enjoying leisure activities – making the organization of daily living both simple and efficient. This is particularly important for people in car-free households with several employed individuals who can spend only a relatively small share of their time together in leisure activities. Simple and efficient day-to-day organization for people in car-free households means in particular an arrangement of “activity destinations”, such as workplaces, shopping facilities, leisure and recreational facilities, which adheres to the principle of keeping distances short. Also essential are adequate transit services within the “green modes”, particularly in the evening and at the weekend.

For those living in “counter-trend working households with children”, support efforts targeted specifically at this group would also mean – over and above the measures initiated for the “counter-trend working households without children” – that in particular the children’s infrastructure facilities such as kindergartens and day-care centres, school or recreational facilities be located near the home, where they may be easily and safely reached with the “green modes”. It should be possible for children to play in the immediate vicinity of their homes safely and without hazard, these being the most accessible play areas for children and young people. In addition, improved delivery services could ease the increased transportation requirements for the groceries required daily. The greater

amount of transportation capacity needed to carry luggage and equipment when travelling with children should be met with carefully considered improvements in public transport services, particularly on weekends.

### In closing

The demand for car-free city neighbourhoods is evident. "All that needs to be done" is to implement car-free zones in the cities – when planning new areas and within existing residential structures.

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# Road construction and economic growth from a southern European perspective

**Gianni Silvestrini**

Research Unit: Energy and Environmental Policy, Cnr Ieren, Palermo, Italy

Claims that economic development should be decoupled from transport growth, as conventional economic growth stimulates demand for transportation infrastructure, particularly roads, with consequent environmental repercussions. Feels that potential impact on the environment should be assessed, particularly in relation to global warming. Explores alternative solutions to building new roads and gives examples from Spain, Italy, Austria and Switzerland.

## Introduction

Transportation represents the sector of human activities that seems more difficult to adapt in a context of sustainable development. Besides the well-known local environmental impacts, the increasing contribution to emissions of greenhouse gases will represent an alarming deficit in the following decades. The decision taken in April 1995 by the Conference of the Parties in Berlin to define by 1997 limitation and reduction objectives on greenhouse gases emissions for industrialized countries by 2005, 2010 and 2020, could make a radical redirection of the transportation policies obligatory.

The carbon dioxide contribution of mobility is in fact growing faster than in all other sectors and the conventional scenarios prepared by different governments consider a continuous increase of the emissions in the next 10-20 years.

Since road transport is mainly responsible for this situation, particular attention should be devoted to the policies able to reduce the contribution of this sector, controlling the mobility demand, improving the vehicles technologies and rethinking the investments in infrastructures.

## Is it possible to decouple transport from economic growth?

While during the 1970s and the 1980s it was possible to decouple energy consumption and economic activity in the industrialized countries, there are very few signs that a similar "revolution" is also beginning for the transportation sector. On the contrary there are strong forces, like the liberalization of the markets, that move in the opposite direction.

However, if carbon reduction targets are to be achieved in the following decades, it is quite obvious that a decoupling similar to that achieved in the energy sector should begin, breaking the link between mobility

and economic growth and reducing, at least, the transport growth rate.

The situation is well known. In Europe, freight transport has grown by about 60 per cent since 1970 and according to official forecasts the trend will continue for the next 15-20 years, with rates up to 4 per cent per year. There has been a strong correlation between the economic growth and the goods traffic growth. The elasticity index has been of 0.9 for total freight transport and 1.7 for road freight transport.

Similar data describe the passenger mobility situation. Each 1 per cent of GDP increase has seen in OECD Europe a 1.4 per cent increase in private car traffic.

## Added traffic induced by new infrastructures

The construction of a new infrastructure will inevitably create more mobility.

Considering that, according to empirical investigations over different countries and different time periods, the "Travel Time Budget" (the mean time travelled per day by an active adult) has remained stable over time, averaging about one hour, and that the "Travel Money Budget" (the amount of money for personal mobility) is also considered constant at approximately 13 per cent of the disposable income (Marchetti, 1988), the time "saved" by an improvement of a road will be spent in additional mobility increasing the spatial access (as the diffuse urbanization of US towns demonstrates).

This tendency is, however, never considered in cost-benefit analyses. These usually assume that improved roads, or new roads, will not generate additional traffic. This fact is quite misleading in situations where networks operate close to capacity, because the induced traffic affects the level of congestion of the whole network. Not considering this side effect will lead to an overestimate of the benefits from the new proposal.

A very precise critic of the conventional planning approach has been elaborated by a special committee on behalf of the UK government, using for this analysis also the

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forecast and observed traffic of 151 trunk road schemes (Sactra, 1994). A committee member, Philip Goodwin, has calculated that a new road generates an average 10 per cent more traffic the moment it opens.

According to an evaluation related to the German situation, a third of the annual traffic growth should be attributed to the construction of new roads (Pfeiderer and Dietrich, 1995).

This phenomenon has been detected also in presence of new high speed trains lines. In Spain for example, the introduction of the Madrid-Seville, line has produced 300.000 trips per year (26 per cent of total) that would not have been made in absence of the new rail infrastructure (Estevan and Sanz, 1994).

### **Change the priority from hardware to software**

In order to provide mobility services, in many situations it is cheaper and environmentally more friendly to explore other solutions than building new roads. Organizational measure, software-oriented strategies user charges can increase the efficiency of transport networks and reduce the need for new infrastructure.

*"...It is cheaper and environmentally more friendly to explore other solutions than building new roads..."*

The cost of this approach is usually much lower than that of the traditional strategy of new constructions. It may be useful, for this reason, to transfer the "least cost planning" procedure applied with success in USA in the energy field to the mobility sector.

This approach consists in comparing different options on the "demand side" through energy saving technologies along with different power plant options in order to define the mix of solutions able to satisfy a forecasted demand increase with the least cost for the utility (or for the society).

A similar approach could be applied also to transportation, evaluating the best way to provide mobility services rather than just considering the construction of new roads.

### **Rethinking economic co-operation to reduce good transport**

The dominant transport policy in the European Union consists in the adaptation of the existing national transport infrastructure into cross border networks in order to provide access in Europe as a single country.

The proposed TEN (Trans European transport Networks) will absorb an incredible amount of money (400-500 billion ecus over the next 15 years, of which 10 per cent will be covered by European funds) and will have significant environmental impacts, while the effects on economic growth and employment are questionable.

Just to concentrate on the global warming issue, it has been calculated that the programme will cause a rise in carbon dioxide emissions from the transport sector of 15-18 per cent above existing forecasts of 42 per cent increase by 2010 (Greenpeace, 1995).

Since these new connections should stimulate employment and economic recovery, in particular in the less developed regions, it is important to verify how the projects really will reach these results.

Analysing in particular road freight transport, we should note that the large majority of the exchanges in Europe are for destinations shorter than 50km (in Germany this fraction covers 85 per cent of total).

The tendency, however, is to increase the accessibility between distant places and to substitute regional with supra-regional co-operation.

A clear example of the enlargement of the market area is given by the fact that while in the 1970s the Italian shops were selling only local mineral waters and other drinks, now these products travel over much larger distances. In an investigation of a few years ago, drinks represented 8 per cent of the total road freight transported over distances of more than 400km. The increase in travel is not only generated by the distribution system but also by the production logistics.

A striking example of the travels' derived by the actual distribution of production centres has been given analysing the direct deliveries travel necessary to produce yogurt in the Stuttgart area in Germany (Böge, 1995). A total length of 3,500km is necessary to deliver all the ingredients necessary to produce the yogurt; a single 150g pot implies 9.2m of lorry movement with a fuel consumption equal to 2 per cent of the product weight to be sold. Considering a different territorial distribution of production centres that privileges the manufacturers nearest to the consumption area, a 67 per cent reduction in distances travelled could be achieved, with a 75 per cent reduction in transport on motorways (Holzapfel, 1995).

In contrast with this example is equilibrium of peripheral regions based on the increase of inter-regional connections,

which will inevitably lead to an increase in transportation demand.

The effect of a dislocation of industries in peripheral regions has been studied in the Transport General Plan of Italy. A redistribution of activities has been analysed in order to have 10 per cent of the demand of the northern regions, at present satisfied by northern industries, supplied by southern industries, and 5 per cent of the southern demand, at present satisfied by the north, captured by local industries (PGT, 1988). By the year 2015, while the conventional scenario considered a growth of freight transport of 130 per cent compared with the 1980 data, in the re-equilibrium scenario the increase was higher (+137 per cent).

#### Different transport scenarios

The contradiction between the inexorable transport growth and the environmental limits has recently led different governments to try to define new mobility policies.

In Germany the Ministry of Transport has explored the possible traffic developments through the year 2010 after unification (Rothengatter, 1994). A conventional scenario was compared with an "intervention" scenario that includes capacity restraints in the road network, road pricing and higher costs for air transport. A significant effect in the modal split would be achieved in the

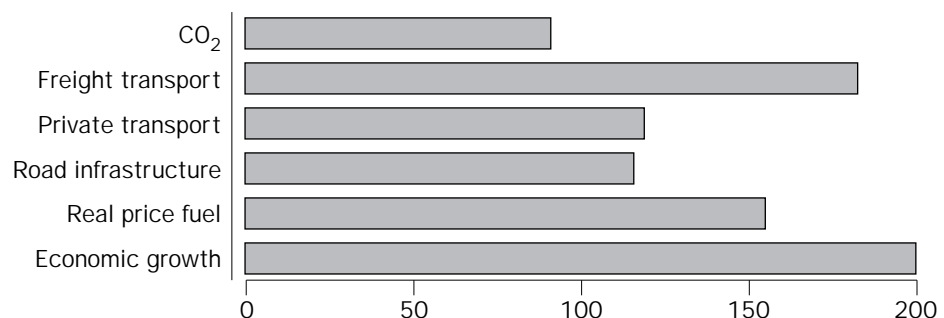
**Table I**

Volume of passenger transport in the year 2010 in Germany (1988 = 100) for two different scenarios

	Conventional scenario	Intervention scenario
Car	141	116
Rail	132	203
Air	241	206

**Figure 1**

Scenario for sustainable mobility in The Netherlands 1990-2015 (1990 = 100)



"intervention" scenario, but globally the mobility demand would still increase by 32 per cent (see Table I).

In terms of car pass-km, a 41 per cent increase (compared with 1988) was evaluated for the conventional scenario, while a smaller increase, 18 per cent, was calculated in the intervention scenario (a slight decrease, -3 per cent, considering only West Germany).

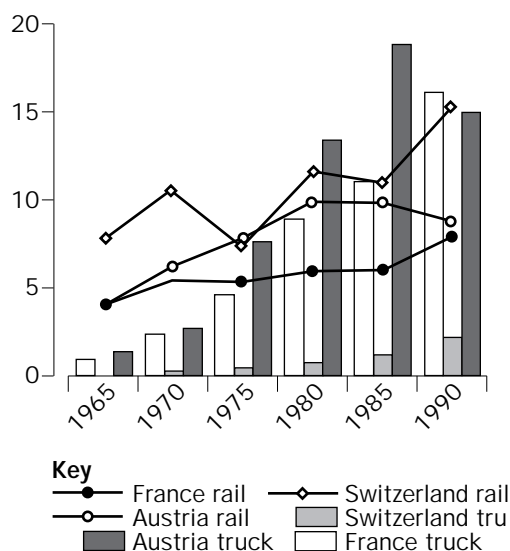
A similar evaluation has been made in The Netherlands with the elaboration of a "European Renaissance scenario" through the year 2015 (Figure 1). The increase in passenger mobility in this case is lower (+19 per cent), while freight growth continues to be high (+83 per cent). It is important to note, however, that CO<sub>2</sub> emissions are considered to decrease slightly in this scenario due to the introduction of high efficiency vehicles, bicycles... (CPB, 1992).

Is it possible to invert the trend to an increase of the road transport share?

Environmental problems, like congestion, noise and pollution are more and more influencing the conventional transport policies, as recent decisions in Austria, Switzerland and California demonstrate.

Austria and Switzerland have decided to introduce limits truck transit through their countries. As seen in Figure 2 a combination of rigid constraints on truck transit with an aggressive rail promotion strategy has created a high rail share in Switzerland (Aeta, 1995). In the same figure it is also possible to see the effects, after 1985, of the Austrian limitation in truck transit. The recent decision by the Swiss government to improve greatly the rail corridors (Neue Alpen transversale) will increase the share (by 2004 no

**Figure 2**  
 Cross-Alps goods transport between northern Europe and Italy



trucks will be allowed to pass through Switzerland, as a result of a 1994 referendum).

In Southern California the need to improve air quality influenced the transport policy. In 1992 the Los Angeles County Transportation Commission produced a "30 years Integrated Transportation Plan", in which 300 miles of new urban and commuter rails were considered, at a cost of nearly \$90 billion. This may be the beginning of a reversal in transport strategies in a region in which the complete domination by cars (Los Angeles had dismantled its 1,600km tramway network) produces alarming air quality problems.

If these examples demonstrate how local environmental problems are increasingly influencing mobility policies, the transformation will be much more radical in the future as governments react to larger risks such as global warming. Even if there are the first signs of a redirection of transport policies, the situation has historically been very unbalanced, with a concentration on road building and a neglect of alternative transport options.

For example the government of the USA has spent, between 1958 and 1989, \$13 billion on freeways, almost ten times more than on railways. In western Europe during the 1970s and the 1980s the investments in roads have been three times higher than in railways (Lowe, 1994)

It is important to be aware that the redirection of economic resources in order to obtain

visible results will be enormous. For example, if in the UK 10 per cent of car trips should move to rail, this would represent a value of 50 billion p-km (passengers-kilometres), equivalent to a 125 per cent increase in p-km trains. The costs of upgrading the trains and to building new lines would be on the order of 9 billion ecu, that is 0.2 ecu per p-km transferred from car to rail (Transnet, 1990).

### Road building from a peripheral perspective

Even if a change of attention is emerging in the most advanced European countries (Sweden has decided to invest for the future the same amount of money on road and on rail infrastructures and Germany intends by 2010 to invest more in rail than in roads, (Lowe, 1994), the strategy for the peripheral regions seems to reproduce the conventional distorted path that is considered unbearable in the other European countries.

For example analysing the funds (19 billion ecu) made available in the 1988-1993 period for transport to less developed countries by the European Investment Bank, the investments for railways were 40 per cent lower than those in roads.

Even more unbalanced is the situation of the European Union Cohesion Fund projects on transportation infrastructures. In 1993, three-quarters of the investments have been allocated to road construction (Table II).

Figures 3 and 4 show, for the period 1985-1992, travellers by transport mode and the public investment in public infrastructure in Spain (MOPT, 1993). The correlation between the growth in road transport expenditures and the growth of road passengers is impressive.

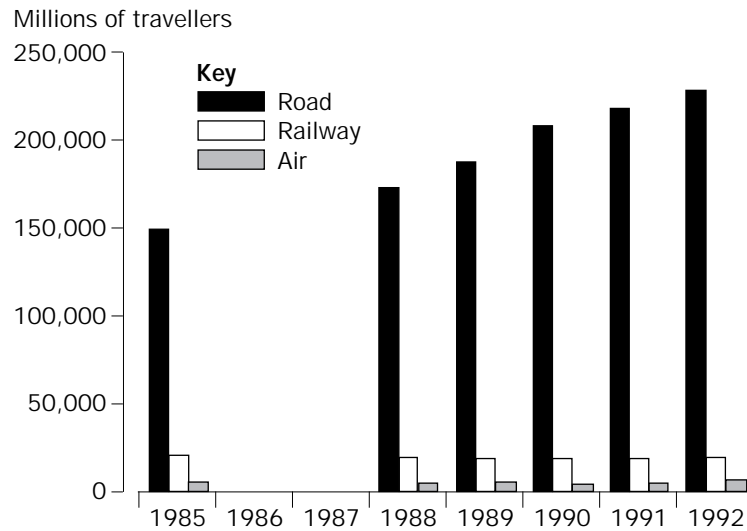
The same distortion is present in the Sicilian situation, that will be described in more detail with planned investments in road construction for the next decade 50 per cent higher than in railroad lines.

**Table II**

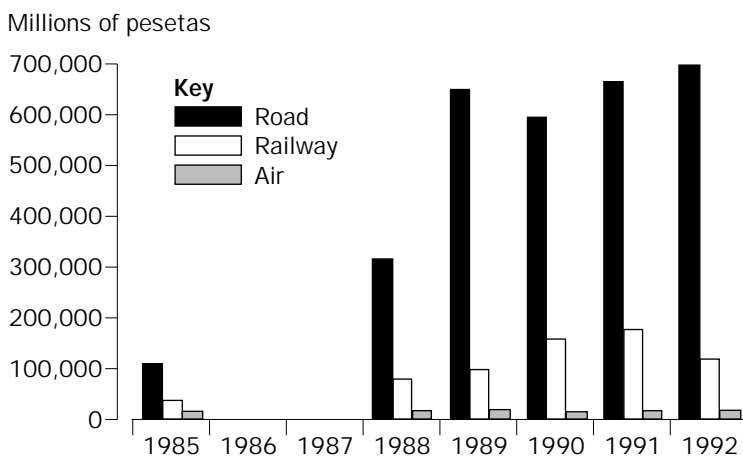
Distribution of the European Union Cohesion Fund in the transport sector for 1993

	Road %	Rail %	Ports %	Airports %
Spain	70	15	2	12
Portugal	72	24	4	
Greece	69	13	3	15
Ireland	64	23	9	4

**Figure 3**  
 Travellers by transport mode in Spain (1985-1992)



**Figure 4**  
 Public investment in transport infrastructures in Spain (1985-1992)



Proposals for new infrastructure do not always address serious transport problems. One of the risks of unplanned improvements is, in fact, to have serious over-capacity. This is the case, for example of the Madrid-Barcelona corridor, where a highway, a freeway, normal roads, a rail line, a high-speed rail line and different air connections coexist, with the result that the provision is ten times higher than the real demand (Estevan and Sanz, 1994).

**Are new roads really needed?**

The creation of good connections with the centre is considered a major point for peripheral regions and this is partly true.

However, some attention should be paid to the different ways in which this can be achieved.

First of all, in some situations the best connection with the centre (especially for freight) could be given by sea and rail services. Two cases exemplify the validity of this assumption.

In Scotland 92 per cent of the journeys are within Scotland and, as a report has underlined, freight services through a direct ferry service to the European mainland would be more beneficial than a transit through England and the Channel Tunnel (McKinnon, 1992).

A similar conclusion can be obtained analysing the situation of Sicily, an Italian peripheral region. Also in this case a direct connection with ferries or with combined transportation could represent a better alternative than the proposed new infrastructures, like the construction of a bridge across the Messina Strait, as will be better explained in the following paragraph (Figure 5).

According to these considerations, it should be concluded that at least part of the Trans European Networks proposed by the European Union should be rediscussed in the context of sustainable transportation.

A second aspect to be considered is the real efficacy of the introduction of reliable transport networks on regional development.

Improving the road connection between a peripheral region and the centre will certainly be more effective for competitive than



for marginal industries. As the more competitive industries are generally located in the central regions, an improvement of the transport facilities will at first favour the penetration of outside products.

Therefore, paradoxically, the presence of high level transport connections could damage the expansion of a regional network of activities. On the other hand, as it was already described with the yogurt case, a regional co-operation will lead to a more sustainable mobility.

### Periphery-centre relations: the case of Sicily

The Sicilian situation is typical of many peripheral areas in which the public expenditure has the result of increasing the imports due to the limited internal industrial structure.

For example, from an increase of the demand of goods of the agro-food sector of 1 million ecu, only 340,000 ecu will flow to the Sicilian system with the creation of 40 new jobs (out of a total of 113 added employment PRS, (1991)).

This fact has to be considered when discussing the correct balance between the enlargement of the connections with the

continent and the improvement of the internal transport network.

### The bridge across the Strait of Messina

An interesting example of the interactions between the construction of new transportation infrastructures and regional economies is given by the project of the bridge which should connect Sicily with the Calabria region in southern Italy. The infrastructure has been proposed in order to reduce the marginality of these peripheral regions but, the transportation benefits will be minimal, while there are many strong counter indications for the project.

The proposal has been under active discussion since 1971 when a public society was created in order to develop the technical studies and to analyse the economic and financial aspects of a connection between Sicily and Calabria. In 1987 the bridge solution was chosen between different technical options. A final decision on the construction of the bridge, however, has not yet been taken, given the very high costs of the infrastructure (on the order of at least 5 billion ecu).

This project is a typical example of misallocation of economic resources, not considering the environmental impacts of the structure which have been specifically criticized (Legambiente, 1993).

First of all, the new infrastructure will only slightly improve the travel conditions, since 75 per cent of the trips have a length of more than 500km and that the reduction in time (from 15 minutes to 1 hour) for long journeys is considered marginal, especially for freight transport (considering also loading, unloading). For this reason the introduction of the bridge is not considered likely to have much effect on the flows between Sicily and the rest of Italy.

The evolution of traffic has been evaluated by Marchetti (1988), using the UMOT (unified mechanism of travel) model in connection with The Volterra-Lotka equations in order to grasp long-term trends. According to this analysis, both freight and passenger demand will not significantly increase in presence of the bridge, unless completely different high-speed transport systems, like Maglevs, are considered, in which case the two connected towns, Reggio Calabria and Messina, will form a unique metropolitan area (by the way, the planned bridge allows a maximum speed of 130km/h, much less than the velocity considered in the Marchetti proposal).

Figure 5

Location of the Messina Strait



A second critical aspect is given by the fact that the actual offer of transport through the ferries and aliscafis is much bigger than actual demand (Figure 6) and could easily match the demand forecasted for the next 20-30 years, considering also the fact that 400 million ecu will be spent in any case to improve the sea connections.

A third criticism pointed to the unbalanced financial effort for this plan, considering the very low quality of the road and railway infrastructure in Sicily (only 7 per cent of the rail lines is double track and only 48 per cent of the lines are electrified).

A completely different "distributed" approach has been explored, with the activation of direct connections between Sicilian and continental harbours. This solution would be much more economical and could greatly reduce both local and global environmental impacts, as was well demonstrated in

a study financed by the National Research Council (Oikos, 1985).

It would make much more sense to invest part of the money considered for the high-tech bridge in a massive improvement of the Sicilian and Calabria railroad networks and harbours. This general upgrading will increase the accessibility to the continent much more than the cathedral in the desert represented by the bridge.

### Rationalization of combined transport

Combined transport represents a very exciting alternative to long-range road freight transport from peripheral areas. In recent years it has grown rapidly in Sicily. But what is even more interesting, is the large disparity between the void transport units arriving in Sicily and the leaving the island (Figure 7). This fact shows the great potential, in a context of a growing local economic development, of a more rational use of this solution to export Sicilian goods.

In 1994 1,5 million tons travelled using combined transport vectors. Of this quantity 79 per cent of the transport units leaving the island were void, while there was only 12 per cent of incoming units (FS, 1995).

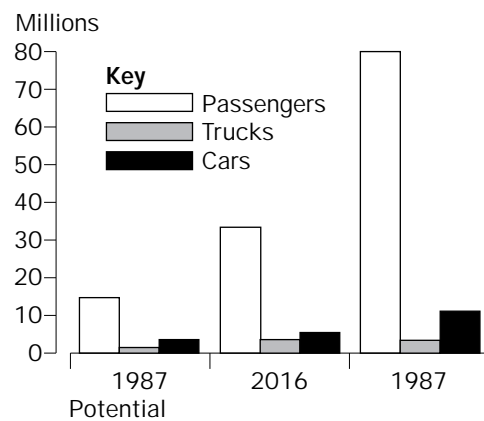
### Internal connections

The Sicilian road situation can be described as a network of over-sized main routes with some very evident bottlenecks (beginning with the missing part of the Palermo-Messina freeway).

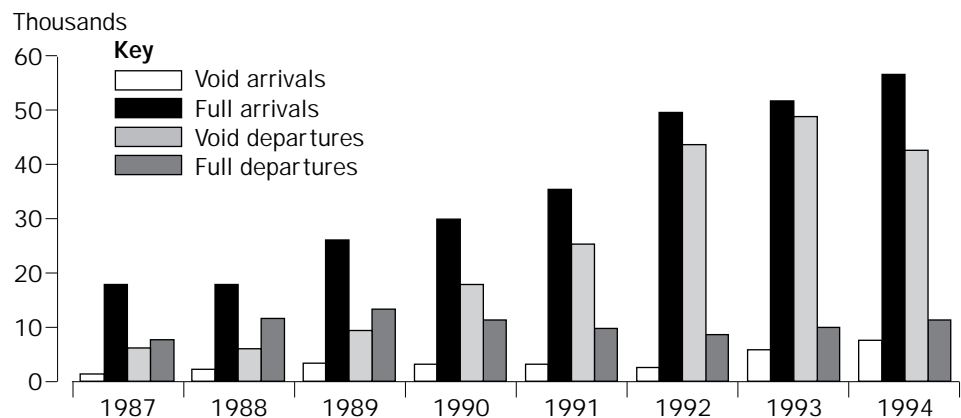
The internal less important roads are on the contrary not adequate. The density of these municipal roads is less than half the average Italian value.

This lack of connections has been represented by the image of an "internal lake"

**Figure 6**  
 Amount of transport by ferries through the Messina Strait



**Figure 7**  
 Combined transport units moved from/to Sicily



due to the poor accessibility in the central part of the island. This weakness represents a great obstacle both to the creation of a regional industrial co-operation and to the development of tourist activities.

This situation is likely to change very much. Analysing the proposed investments contained in the Regional Transport Plan, the roads of lower importance will receive only one-third of the total road finance (PRT, 1991).

On the other hand, the combination of political and mafia interests has led, in the past, to the construction of roads, viaducts, and tunnels, many of which are not needed. It is no surprise that the density of highways and roads per square kilometre in Sicily is slightly higher than the Italian average.

The same result is obtained by the analysis of the transit data in different highways of north and south Italy in 1994 (Table III). The daily transit per km in Sicilian highways is less than half of the Italian average.

Attention should of course be paid in order to improve internal mobility, but whatever is chosen must be sustainable.

An example of two quite different solutions of a transport problem is given by the inadequate connection between the Sicilian towns of Palermo and Agrigento (116km), guaranteed at present by an uncomfortable state road and a single track rail.

According to the regional government programmes, a completely new four-lane road should be built (partly passing through an ecologically sensitive territory) with a cost of 500 million ecu. Moreover, a new airport should be added, with a location in the Agrigento area (35 million ecu).

A complete different approach, proposed by the Rail Company, is based on the upgrading of the existing rail line that could connect Agrigento directly with the Palermo Airport (100 million ecu) and on specific interventions in the road bottlenecks. This choice would be cheaper and give correct mobility answers in an environmentally sustainable way.

## Conclusions

Conventional economic growth stimulates further demand for transportation infrastructure, which provides the pretext for further infrastructure expansion. This is particularly true for the construction of new roads, the sector in which the larger increases in mobility occur and that will induce environmental impacts that will last for many decades.

This vicious circle should be interrupted and a strong effort should be made in order to decouple economic development from transport growth.

If this target is to be achieved, all the strategic decisions involving different sectors (location of new industries, urban planning, construction of new infrastructures) should pass through an environmental assessment impact including specifically the issue of the contribution to global warming.

For peripheral regions the transport policies should improve the possibility of a self-centred development. Regarding the connections with the central areas a preference, when possible, should be given to the sea or rail transport.

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Table III

Number of vehicles (thousands) travelling daily in 1994 in different segments of Italian highways

North Italy		Sicily	
Torino-Milano	Milano-Brescia	Messina-Catania	Messina-Palermo
85	196	50	38

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