The well-travelled yogurt pot:
lessons for new freight transport policies and regional production

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Investigates what can be done to cater for the increase in freight transport on roads

Introduction

Freight transport on roads has increased greatly over the last few decades. But in general, the volume of road freight expressed in tonnes is stagnating, whereas freight transport activity (the product of weight and distance) is increasing. This means that products are transported over longer distances. Only the freight transport activity follows the mainstream of economic development, and is not the result of more production. It is the spatial spreading and the intensity of exchange in the economy that has grown, the quantity which is shipped has not increased in the same manner as the distances (Hesse, 1991, p. 3).

Such structural changes, as shown here for the case of the growth of road freight transportation, are also decisive determinants of the environmental and social impacts. Even today there are capacity limits which become evident in the environmental field in the destruction of natural resources and in the social field in decreasing quality of life. Particularly environmentally sensitive natural areas (e.g. the Alps), or towns and conurbations suffer the main burdens of traffic and its consequences.

At the same time the activity of road freight traffic will increase dramatically: according to some forecasts, the total volume will increase by more than 70 per cent in Germany. The transfrontier volume, which depends on freight transport in the Single European Market, is expected to increase by even more than 100 per cent (Whitelegg, 1990, p. 26).

But this forecasted growth, towards which all trends point, is insupportable because there are physical limits. In the economic sphere this is mainly the impossibility of overburdening the infrastructure even more. Production concepts such as "just-in-time production" (in which production-synchronized transportation takes place in order to synchronize the production process) do not work any more, because there is no longer any reliability in road transport.

One suggestion to solve the problem in road freight transport is to include the true costs in the transportation costs. Today, large parts of transportation costs are externalized. This means they are transferred to the public infrastructure and natural environment. These costs have to be paid by today's society and by those which follow. An adequate use of scarce means of production (in this case the natural and human environments) can only be achieved if all costs are taken into consideration and if all these costs are included in the supply prices. (Teufel, 1989; 1991, has estimated the external costs of freight transport.)

As a result of the Single European Market and the deregulation of transportation, the need to externalize internal costs has become urgent. In Germany in particular, the prices will mirror the actual costs less and less. As a result, environmental and social impacts are growing more and more. Even on straightforward economic grounds, there are signs that the current system is highly inefficient.

An environmentally sound and socially equitable economy (including the transportation of goods) can be realized only by the manufacturers themselves. A prerequisite to this is the knowledge of the effects and connections of production processes internal and external to manufacturing as implemented by freight transport. In this article, I shall describe how manufacturers can document and evaluate the freight transportation of goods. This methodology demonstrates how freight transport can be organized in a way which is economically efficient, environmentally responsible and kind to human lifestyles.

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 7-11

Product-related transportation analysis

A detailed analysis technique addressing transportation processes at the microeconomic level still does not exist. In a general environmental analysis or eco-balance of a production method (or single product), transportation processes as the basis of any production have to be analysed. Their effects on the natural and social environment are large and growing and call for special attention.

The aim of the transportation analysis is to model, as far as possible, all transportation processes in the life cycle of a product, concentrating on the activities of the manufacturer. The result shows how far one unit product was transported (by a lorry) and the conditions and impacts of this product's specific transportation process in a quantitative or descriptive way (e.g. transportation costs, the reliability of transportation, the quality of the product, environmental and social impacts). Only then is it guaranteed that the manufacturer can react to future developments in the transport sector, and do so in a preventive way for the environment.

At the same time, this analysis is oriented towards the consumer, as this can show the implications of the production and consumption of products. Only then can the consumers develop an environmentally sound consumption behaviour. This concept of a product-related transportation analysis has been realized for the first time by a milk manufacturer in southern Germany.

The results of the transportation analysis

In this analysis, a number of milk products including strawberry yogurt weighing 150g in a recyclable glass jar were examined. In this examination all ingredients of the product are included, e.g. milk, jam, sugar and the packaging, e.g. the glass container, paper label, aluminium cover, cardboard box and cardboard sheets, glue and foil.

The product does not have unusual transport requirements and may be regarded as typical of the food sector. The results are summarized under the headings: space-specific, product-specific and vehicle-specific.

Space-specific results

Figure 1 shows the transportation relations of the ingredients (including the main ingredients of the subcontractors) and of the whole product to distribution outlets in southern Germany.

Product-specific results

In the following analysis, trip segments per product in metres (transport intensity) are used. The total distance travelled by all the components is related to the number of units moved and the different segments of the total trip to reveal an average distance in metres per trip segment per unit (i.e. 1 × 150g pot of strawberry yogurt). The results are shown in Table I.

If one 150g strawberry yogurt is purchased in a supermarket in southern Germany, one of the ingredients which could be listed on the container is "9.2m of lorry movement".

Vehicle-specific results

To bring one truckload of product to a distribution outlet in southern Germany, one "theoretical" truck (including all examined relationships) must be moved 1,005km. In 1992, theoretically, 24 fully packed lorries with 150g pots of strawberry yogurt had to be moved each over this distance to supply the southern German area with this product.

Effects of product-related distance

Obviously large trip segments are problematic not only for the future manufacturer, but also for today's natural and social environment, particularly in cities. Simultaneously the behaviour of consumers supports the trend towards increasing freight transport on roads.

The reliability and rapidity with which the necessary goods for production are transported on roads also depends on the motor vehicle density on the roads used. Long distances represent additional risk factors for reliable and punctual supplies and deliveries of the inputs. These risks are likely to increase in the future because vehicle density is increasing. In peak times, the roads are continuously overloaded.

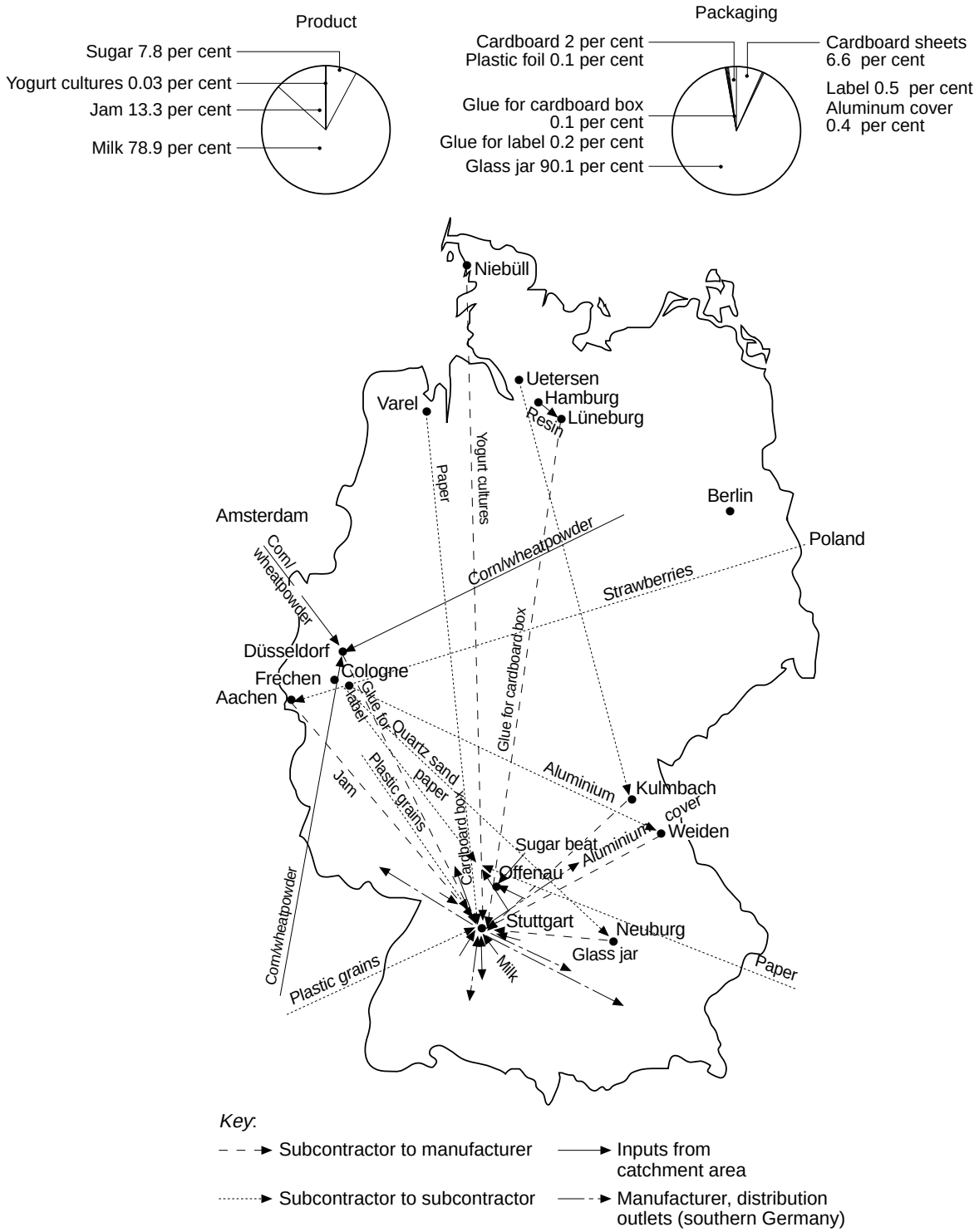
Higher transportation costs, which depend largely on higher petrol or diesel costs, have considerable impacts on the internal cost structures of manufacturers. With the increase of diesel costs in which the external costs are internalized so far as possible, the total transport costs of the yogurt manufacturer would increase by about 21-65 per cent.

The energy consumption, pollutant emissions and the effects on the natural environment from road freight traffic entail the increasing use of natural resources and increasing environmental degradation. The calculated trip segments in this transportation analysis give a clue as to how a daily product contributes to the increasing environmental pollution with its transportation process.

On the basis of the specific distance covered, one 150g strawberry yogurt has used 0.004 litres diesel, if it is distributed in southern Germany. To sell the sales quantities for 1992, 24 lorries had to be used and for them 10,200 litres diesel.

Of course, the examined product has only a low share of the pollutant emissions caused by all freight traffic. Since

Figure 1. *Transportation relationships*



Source: Stefanie Böge, Wuppertal Institut 1993

all products moved around over increasingly longer distances have a negative environmental impact, the pollution caused is still serious, e.g. with 22.8g/tkm NO_x, 1.9g/tkm sulphur dioxide and 1.52g/tkm dust. The total pollution associated with a shopping trolley full of purchases at a supermarket checkout is a large component of total pollution when all such events are calculated over the whole population and the whole year.

Emissions from the traffic sector have negative effects on human health, especially for children (Holzapfel, 1991, p. 239). These emissions are carcinogenic, they cause

Table I. *Distance in metres per trip segment per unit (1 × 150g pot of strawberry yogurt)*

Trip segment	Metres
Subcontractor	5.1
Manufacturer	3.1
Trade	1.0
Total distance	9.2

respiratory diseases and circulatory disorders. Some react with each other and form secondary air pollutants such as ozone and smog. They also have adverse health effects.

Adverse affects on human living space caused by freight shipments become clear mainly in cities and conurbations. Space used by motorized traffic can not be used for parks, playgrounds, pedestrian or bicycle traffic. Urban planning depends on the demand of traffic, especially on freight traffic. The width of roads has been planned according to their demands.

Also the recreation areas are affected by the land use of (freight) traffic. Urban recreation and recreation areas in the immediate vicinity of cities are affected because of pollutant emissions, noise and monotonous planning of the urban structure. If the recreation value decreases in and around cities, human beings drive out and use distant recreation areas. And as a result, in these areas, noise also increases, visual impairments by road building increases and destroys the landscape.

Healthy food, a calm environment and fresh air are important aspects for a healthy lifestyle, as impressively illustrated by the advertising pictures. But in reality the facts of transportation of each product give quite a different picture.

But at the same time it is remarkable, that so-called "environmental" products are not environmental, if the distances travelled are included. Specifically, the greater distances are from the manufacturer to the supermarket. The longer the distances are for a product, the more environmental impacts result. The demand of the consumers to buy everything everywhere and at any time has direct consequences on freight shipment. Increasing demands in this direction increase the effects on the environment and on lifestyle. The existing production system based on the externalization of costs is supported. Consumer behaviour plays a part in forming productions and distribution systems. Last but not least, there is no detailed information for consumers on the connections between production and consumption.

Conclusion

Product-related transportation analysis is aimed at the manufacturing and distribution system and is intended to reveal the importance of distance intensity in the system of production, distribution and consumption. This in turn identifies possibilities for reorganizing production systems to reduce their impact on the social and natural environment.

One cannot suppose that only the manufacturer should show good will in realizing an environmental economy by taking the transportation procedures into account. It is a fact that policy has to dictate other general conditions which motivate environmentally and socially responsible production and transportation. The consumers, on the basis of appropriate information and changed behaviour in consumption, can contribute only to a certain extent, to create a better environment.

In general, there are three basic options for manufacturers:

(1) Use inputs from nearer subcontractors.

(2) Improve existing transportation vehicles.

(3) Shift to more environmentally sound freight shipment vehicles.

To reduce distribution shipments fundamentally, there is the possibility to create decentralized or regional production structures. To reduce distances in transportation processes from manufacturing to trade means in the end a reduction of transport costs for the manufacturer. The more decentralized the production structures, the faster an environmentally sound and economically efficient freight transport system can be implemented. This will also stimulate greater levels of social equity in reinvigorated regional economies. This cannot be achieved by technical optimization of vehicles alone, although that is a desirable contribution.

In addition, policy has to develop and put into effect measures to create appropriate general conditions. To limit freight traffic growth and organize it in an environmental and social way, there is a debate based on three points:

(1) reduction of trips in business/commercial traffic;

(2) improvement of vehicles and infrastructure;

(3) shift to other modes of transport.

It is profitable to build small freight traffic and distribution centres allowing better co-ordination of freight movements and avoidance of unnecessary shipments. In general, measures such as the internalization of external costs in freight shipment with a change in fuel and motor vehicle taxes as well as freight taxes for certain goods, are necessary. Fundamental, far-reaching measures, such as the realization of decentralized urban settlement and

economic structures with short distances should, however, receive priority.

At the same time the information of consumers has to be improved in the direction of comprehensive product information, which includes the transportation processes of a product. Manufacturers should be encouraged to give their products a regional label, issued by a government organization. This label can prove that the ingredients of a product come are locally or regionally sourced, e.g. 80 per cent from a particular region. Product-related transportation analysis can give the basis for such a scheme. With such a label, the consumer can see whether he/she is buying a product with less "distance" or more "distance".

Many consumers also have the intention of doing something to create a better environment. But this "better" behaviour must first be assessed critically, because consumption always has an effect on the environment and is concerned with the ways of manufacturing products. Only with direct changes in the behaviour and basic changes in attitudes can an environmentally sound consumption really be practised.

The strawberry yogurt included a new ingredient: a distance of approximately 10m of lorry movement. This does not seem a lot, but it is enough to make looking in your own trolley or refrigerator worthwhile. In it there is a great sum of distances, which mostly result from distant manufacturing of these products. Besides the consumption of these products, distances are consumed, which have, because of the means of transportation (the lorry), considerable effects on the natural and human environment.

Those negative effects of products which are the result of their transportation processes can be reduced by paying attention to buying regional and seasonal products. "Ecological" products are regionally and seasonally differentiated products. If the food is purchased which has been grown in the neighbourhood and in the appropriate season, long distances of freight shipment are also avoided.

The existing and impending environmental disaster, which depends also on road freight shipment, has meanwhile been realized by every person with any degree of awareness. The situation is becoming worse, because of an outdated attitude towards the existing standard of life or prosperity predominates which depends on mass production and mass consumption.

The direction for a changed awareness leading to a lifestyle which does not make future generations' lives untenable, has to be found. This analysis contributes to this aim by showing connections between freight transportation, economy and consumer behaviour and the resulting effects on the natural and human environment. It is clear that these effects contribute to a progressive destruction of space and with that, to a destruction of the foundation of life and of its quality.

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The end of the urban freeway

Peter Newman

Support for the construction and maintenance of freeways has decreased

The collapse of the Los Angeles freeways could be a symbol of the end of this technology as the basis of city transport. Some of the 13 LA freeways which lie in ruins from the recent earthquake are being rebuilt, but the most damaged could be removed forever. The two in San Francisco which collapsed five years ago have not been rebuilt. The community has demanded something different.

Since Hitler built the first autobahn in the 1930s, the freeway has been controversial. The gigantism of the architecture appeals to macho empire builders – only the high-rise building has similar massive proportions. Nature has tended to level such gigantism throughout history. It has now revealed the limits of the highway engineer and in doing so makes us look again at how we should build cities.

Even before the earthquake in Los Angeles, the freeway was receiving substantial criticism. 1993 saw the opening of the last new freeway in Los Angeles. The Century Freeway, costing some US$200 million per km to build, revealed that such structures had exhausted the political and financial will of citizens. Only 18 per cent of people in a Californian survey believe that freeways solve the traffic congestion problem (Franz, 1989). Robert Reinhold concluded a story on the Century Freeway in the *New York Times* by saying: "…few cities will soon try again to build highways through their urban cores". Some of the LA freeways will no doubt be rebuilt and reopened, but the back of the urban freeway is now broken figuratively as well as literally.

This article will examine some of the trends in providing alternatives to the urban freeway in the UK, USA and Australia where there appears to be the acceptance (perhaps a little reluctantly) that a new paradigm is emerging on how to build cities. These countries are significant as they are probably the ones which in the past, have shown the greatest commitment to the freeway. Little reference is made to European and Asian cities as the majority of these moved some decades ago to this different paradigm though exceptions can always be found.

What is the alternative?

In San Francisco, the Embarcadero Freeway and the Cypress Freeway have not been rebuilt because the community has revolted against their impact and because alternative approaches do exist. Traffic demand management is now seen as necessary and, together with innovative public transport, is providing access in ways which are much more in tune with community ideals, particularly when it is provided in close association with sensitive land development that promotes pedestrian and bicycle access. This three-sided approach – demand management, upgraded transit and non-car-based land development – is the basic alternative to the urban freeway.

Business interests in San Francisco were desperately demanding the Embarcadero Freeway was rebuilt after it was damaged five years ago. After a few years, however, they found their trade was not diminished and could in fact be improved, along with the whole city, if the waterfront freeway was removed. The role of public transport in a city is usually underestimated as is the ability of land uses to adjust to new constraints.

Los Angeles once had the most extensive and efficient public transport in the world. In the 1930s, the famous red trolleys (along with the transit systems in 44 other cities) were bought up by General Motors, Firestone Tyres and Standard Oil – and closed down. The LA freeway era was born in the wake of this decision. It was not however a community decision but a commercial one and illegal at that. The consortium was found to have broken anti-trust laws and was fined $5,000.

Public transport once worked well in LA and continues to provide a softer and more sustainable solution to a city's accessibility. In particular, modern light rail can provide the city centre and cross-city destinations that are required. European cities such as Zurich and Stockholm

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 12-19

and Asian cities such as Singapore and Hong Kong have shown that there is no shame in showing a preference for public transport other than freeways.

For freight, these cities (particularly in Europe) do have good roads, though rarely do they have freeways passing through their cities. In The Netherlands, there is a strong emphasis on limiting car use so that freight can have better access, and limiting freight movements by ensuring that high freight intensity land uses are kept to areas with good road access rather than having to build more roads. At the same time, they have strong land use planning regulations which ensure high people-intensity uses are built around good transit. This process is called "The right business in the right place" (Ministry of Housing *et al.*, 1991). Dutch cities are wealthy, yet they have much fewer cars in use than most cities and have no plans to build a massive freeway network in their much-loved cities. Such a concept would be seen as destroying their major economic asset. Instead there are a number of Dutch cities which see their future as so far away from the urban freeway scenario that they are leading members of the Car Free City movement.

Even in Los Angeles today the new order is under way. At the same time that it had begun to see the impossibility of building ever-greater capacity for automobiles, the first evidence of the new paradigm was appearing. In 1993, its new subway opened, light rail is being built again along old trolley routes and heavy rail passenger trains are being introduced onto freight lines. When the freeways came down, the new rail systems (all of which survived) were flooded with passengers, many of whom the LA transit operators believe are there to stay. Tollways and parking controls are being phased in to reduce traffic, together with other demand management and the first plans for transit-supportive land use are appearing. As the new order gains momentum, the rationale for the urban freeway is losing its last shreds of credibility, particularly in the light of new economic analyses.

New economic awareness

There has always been an awareness that urban freeways cause environmental and social damage (with some confusion about their role in causing more emissions and fuel use, see Newman and Kenworthy, 1988). But this has been acceptably traded off by decision makers who saw the economic gains of the extra mobility. Now there are significant questions about the economic benefits to be gained from urban freeways, even if a government is able to find the huge capital like that associated with the Century Freeway.

The accepted myth for most governments, at least in the English-speaking world, has been that transit systems are inherently a waste of money, while road funding feeds the economy. The reality appears to be the opposite, at least in cities. Yet it appears that in most countries, the acceptance of this myth has not come about from analysis or evaluation but merely from assertions, often dressed up in scientific form in the guise of a model – particularly in the UK, USA and Australia.

In the UK, Oliver Tickell tried to find the economic basis of the Government's "Roads for Prosperity" programme (Tickell, 1993). He examined the direct employment and the economic flow-ons. He found "very poor value for money as a job creator" compared with other investments – £66,000-80,000 was needed to employ one person in road building compared with £30,000-50,000 for railways and £20,000-40,000 for building houses and just £9,000-18,000 for installing domestic insulation. "Roads are built by machines not men" was the comment from the employment secretary Lord Young.

Even with a poor record in employment, roads may still lead to prosperity through improving economic activity. Unfortunately the economic flow-ons are not so obvious either. Tickell (1993) examined the claim that congestion is costing UK business £15 billion a year (similar claims are made in the Industry Commission report in Australia). He found only "anecdotal" support for the claim, and the Department of Transport was "equally short on hard data to back up its view that prosperity follows where roads lead". For example, no part of Birmingham is more than five miles from a motorway but as Tickell says: "If access by road is the key to economic prosperity then Birmingham should be the wealthiest city in Britain. It is not". You can go even further and see that Liverpool, Britain's most advanced economic basket case, is well served by roads. The UK Department of Transport are now saying: "the effectiveness of transport policy in stimulating regional growth may be somewhat limited". This very guarded comment is not the conclusion of most "roads-based recovery" approaches which have been standard fare from this Department for the past 40 years.

Whitelegg (1993) examined a series of major UK road building projects (M58 and M62 in particular) which have failed to materialize economic benefits and concluded: "There is simply no evidence of the claimed link between access and employment or economic prosperity. The emperor has no clothes".

Whitelegg concludes that the factor which most attracts businesses to a locality is "a high quality environment". He says:

> My advice to local authorities is to go for clean air, protected countryside and quiet residential areas. These are the assets that stimulate economic development. Unfortunately, too many authorities are providing the opposite: an area with

> terrific accessibility, but which is noisy, polluted, and criss-crossed with motorways.

He points out that areas such as Covent Garden in London or York are thriving economically but have very poor road access. The same experience has been well known in Europe for some time. Roberts (1989) found that those European cities which had slowed their road systems and not expanded capacity had all benefited economically. Cities, says Roberts, must be "user friendly" and users in the end are pedestrians. In Australia, this link between controlling the automobile and economic success can now be seen in many cities, for example the revival of Fremantle owes as much to the stopping of major road proposals as anything, because several roads were planned which would have destroyed its unique heritage and character.

The mechanism for how improving the urban environment rather than building roads leads to a better economy is not difficult to understand. Road construction leads to dispersal of land uses and, together with the greater road capacity, facilitates a rapid growth in car use. The resulting congestion sets up a never-ending spiral in demand for road space. As Phil Goodwin from Oxford's Transport Studies Unit says, "to try and build our way out of congestion is impossible, since the rate at which traffic levels are likely to increase will far outpace any realistic construction programme". But even before the limits to construction are met, the city will have experienced significant reductions in the quality of its urban environment, which today translate directly into reduced economic performance.

The situation in Los Angeles illustrates this well, with the most extensive set of freeways the world has ever seen and yet the city has huge problems with traffic. It is also now facing serious economic decline as its military spending is cut back and a middle class flight from the city over the past decade is now apparent, owing to its poor environment (Gobor, 1993).

In a post-industrial city, the quality of the environment is critical to a city's success and the role of transport is crucial to this – an overemphasis on road building and an under emphasis on public transport and a pedestrian environment, can spin a city into a decline phase, whether it be Bangkok, Los Angeles or Sydney.

For Britain, the conclusion to this debate on how transport impacts on the economy was a new Government approach summarized by Tickell (1993) as:

> a transport strategy that restrains traffic, that reduces the need for travel and provides high quality transport alternatives.

Such statements are not always appearing from UK public servants and politicians but it is obvious from major reports such as *Sustainable Development: The UK Strategy* (Secretary of State for the Environment, 1994) and the abandonment of most of London's controversial motorways, that the paradigm has substantially shifted.

Similar economic work to that in the UK has been going on in the USA. Aschauer (1989) has calculated that for every $1 million invested in road funding, private sector capital productivity increases 0.24 per cent and private sector total factor productivity increases by 0.27 per cent. This has been highlighted by the road lobby group Australian Automobile Association in its recent report on road funding (AAA, 1994). However they do not record Aschauer's (Aschauer and Campbell, 1991) later study on transit investment where he concludes:

> Within the broad category of transportation spending, the evidence indicates that public transit spending carries more potential to stimulate long run economic growth than does highway spending.

The major findings of Aschauer and Campbell's study were:

- Transit spending has more than twice the potential to improve worker productivity than does highway spending:
  - A ten-year, $100 billion increase in transit investment would yield improved worker output valued at $52l billion; a comparable expenditure on highways would yield $237 billion.
  - The highest annual level of net benefits from such an increase in transit would be $15 billion in the year 2000; the highest annual level of net benefits for highway spending would be $7 billion, also in the year 2000.
  - In the peak year, the productivity of each American worker would be increased by $185 from transit spending versus $87 from highway spending.
- Net economic benefits from transit expenditures occur sooner for the economy as a whole than do net benefits from highway expenditures.

As well as these critical assessments of road funding there is a growing movement to account more correctly for the total costs of transport, in particular how to account for the full costs of feeding government money into the increased use of private motor vehicles. Table I is a summary of the studies we have collected, mostly from US cities but also from Europe.

Our own calculations on a comparison of the total costs of transport also reveal a very different story to the above myth concerning transit's inherent economic problems. Table II shows how car, bus and rail costs vary when their total costs are considered.

These costs do not consider the added benefits due to land development which is inherently more concentrated around transit rather than road systems. There are some who do not accept that road developments lead to more

Table I. *Costs of the automobile from various studies*

Country	Estimate per car in US$ per year	Source
USA	4,220	Ketcham and Komanoff, 1992
USA	2,965	Litman, 1993
USA	2,312	MacKenzie *et al.,* 1992
USA	2,1850-3,636	Moffet, 1991
USA	3,647	Voorhees, 1992
Switzerland	2,813	VCS, 1991
Germany	3,376	UPI, 1991
Australia	3,868	Laube and Lynch, 1994

Note:
Costs include all public and external costs

dispersed cities, though the evidence is very suggestive of this in historical studies and in correlations between levels of road provision, levels of road use and levels of urban dispersal as well as urban concentration related to good transit levels (Naess, 1993; Newman and Kenworthy, 1989, Newman *et al.*, 1992). The study by Naess (1993) confirms all the patterns of our global cities comparison through a study of 22 Nordic cities.

The first outlines of theory showing how transit helps to slow urban dispersal and thus make the city more economically efficient, or on the other hand, how extensive road systems lead to dispersed cities which are not so economically efficient, has been suggested by Jacobs (1984) and Frost (1991). They suggest this is due to excessive commitment to suburban infrastructure which is a significant opportunity cost as well as the costs outlined above. We have summarized the possible mechanisms in Figure 1.

The role of public transport (particularly rail) in helping to reverse this process is strongly supported by Cervero (1992), who concludes that rail systems provide the market incentive for concentrating land use so often desired by cities. He suggests that car-based cities are having to move to extraordinary levels of control over private enterprise to try to minimize the impacts of the car (e.g. forcing firms to introduce ride sharing or risk substantial fines) but rail-oriented development can be left to the market to produce the necessary land use integration that reduces travel needs.

In Portland, Oregon the new light rail system has not only been successful in transport terms (doubling transit share in the city) but also it has been the catalyst for a rejuvenation of the Downtown (from 5 per cent to 30 per cent of retail trade), the development of subcentres (most

Table II. *Capital, operating and external costs of rail, bus and car modes in Australian cities (cents per passenger km, 1991)*

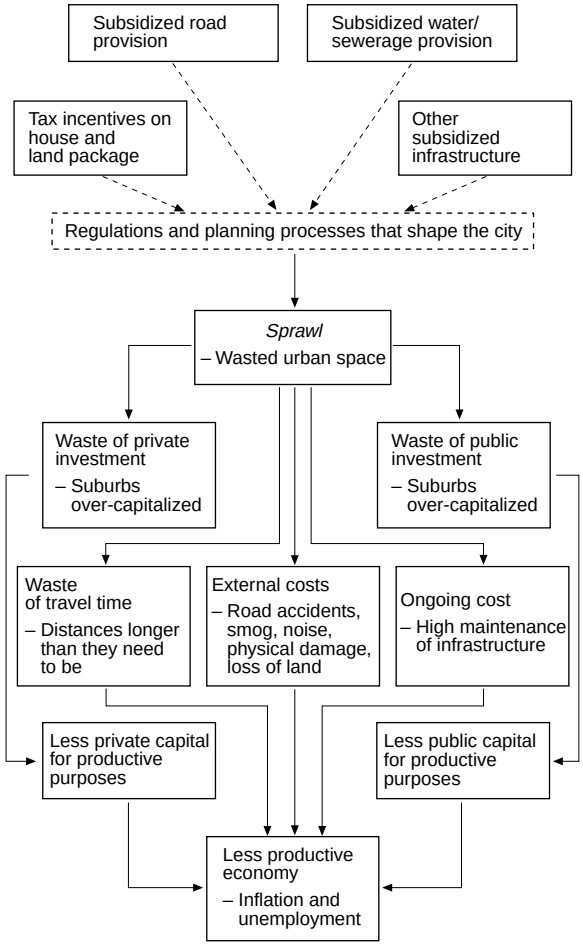
Cost item	Rail	Bus	Car
Capital and operating	27.06	21.51	26.65
Depots/car parking	–	1.09	3.42
Roads	–	–	8.89
Road maintenance	–	0.03	0.00
Fatalities	0.12	0.03	0.35
Injuries	0.00	0.00	0.11
Property damage	0.01	0.00	0.18
Air pollution	0.00	0.25	0.43
Noise pollution	0.00	0.20	0.08
Total	27.19	23.11	40.11

Notes:

1. The data represent the costs for any additional passenger kms of travel added to the Australian urban transport system.
2. The data are mostly Australia-wide averages for the five main Australian capital cities (excluding Canberra), based on information from the BTCE and Rail Industry Council adjusted by McGlynn and Andrews (1991) for inflation and other factors such as petrol tax and insurance for cars.
3. Capital and operating costs for urban rail show a range of 21.24 cents per passenger km to 50.35 cents per passenger km. The low figure is based on the incremental or marginal costs of adding new passengers to existing rail systems, while the high figure is for new light-rail systems for which the incremental costs equal the average costs because entirely new systems must be built. The figure used here is based on 80 per cent conventional rail and 20 per cent light rail to recognize the increasing interest in light rail and prevalence of LRT proposals around Australia and the likelihood that at least some new rail systems in the near future will be light rail.
4. The bus data in McGlynn and Andrews (1991) show a figure of 18.17 cents per passenger km for busways (in line with the Rail Industry Council's work). However, this cost dominates the bus data and seems excessively large. It has been eliminated here since busways are relatively uncommon in Australian cities compared with the great bulk of services which operate in normal traffic.
5. Air pollution and noise costs are based primarily on health impacts and are likely to be underestimated owing to inadequate data in these areas. Also, there is the wider, and as yet mostly unquantified damage, from air and noise pollution (e.g. materials and crop damage from air pollution, psychological/social impacts of noise and reduced real-estate values owing to traffic intrusion).

Source: Modified from McGlynn and Andrews (1991)

Figure 1. *Possible mechanisms linking excessive provision of roads, urban sprawl and economic problems*



development has been attracted to station areas, over US $900 million in five years) and the prevention of urban sprawl (a green belt has now been possible to impose on the urban fringe) (Arrington, 1993).

It is these kinds of results that are beginning to show governments in UK, Australian and US cities that to revamp their urban public transport systems, link them to land development and move towards demand management, may be the basis of achieving sustainable economic development. This is now apparent in three government programmes in each of these countries, which will be briefly outlined.

US ISTEA legislation

The most significant transport and land use legislation in recent US history is the Inter Surface Transportation Efficiency Act (ISTEA) which was passed in the last year of the Bush Administration and now has the full support of Clinton. The key components of ISTEA are:

- a renewed Federal involvement in transit (including the funding of capital works for transit);
- increased funding;
- greater flexibility in use of funds for transit or highways (but subject to the provisions below) or demand management programmes;
- insistence on the use of planning processes involving the community to be adopted in cities before any funding for projects is allowed (i.e. no gun at the head of states to either accept the funds for a major highway or lose it altogether);
- tying of funding to achievement of Clean Air Act initiatives (i.e. no funds if smog levels are increased).

It is no wonder that with these provisions the balance of Federal funds is swinging towards transit. Many cities have been slow to catch on to the new order, but it is firmly in place and communities are beginning to see that it provides the opportunities to rebuild American cities in a more sustainable way.

The key component of having land development that is pedestrian friendly and transit oriented instead of automobile dependent has been the major problem in recent US urban history. ISTEA provides a chance to break that tradition but it requires local land use laws to be developed that are able to facilitate this. In California, there is a set of initiatives which is establishing the legal basis of transit-oriented development: the Transit Village Development Act of 1994 would establish all land within a quarter mile of rail transit stations as a transit-village development district if applied for by a local authority. The area would then be given the powers of a redevelopment agency and staffed to facilitate its transition into a mixed use, high density pedestrian scale urban environment. The district would have first priority for funding from state and Federal innovative transport-land use programmes. The Bill is in response to the US$10 billion worth of planned transit investment in California due to ISTEA; as well as this there could be even further transit investment if a new citizens bill is passed to take a 4c/gallon fuel tax and direct it specifically into transit.

Transit/land-use linkage in the UK

A central concept in the new paradigm of city building is that transit funding should only be used as part of a totally integrated land use package. Thus any new line to be built or any old line upgraded can only go ahead if there is a coherent policy that increases housing, jobs and services in transit station precincts. This is the kind of process successfully undergone by the Toronto Transit Commission on their new lines and also on the Vancouver Sky Train. It is more or less standard practice in Europe, with Stockholm being one of the best examples of

planned land use/transit integration. However it has not been a feature of UK planning which opted for New Towns often without good transit links and with other development only loosely connected to transit.

This is now set to change with the UK Government's much applauded Planning Policy Guideline – PPG 13 Department of Environment and Department of Transport, 1994, which seeks to:

- reduce growth in the length and number of motorized journeys;
- encourage alternative means of travel which have less environmental impact, and hence;
- reduce reliance on the private car.

The new regulations require housing to be located in present urban areas near to work and services especially good public transport, rather than incremental expansion of villages and small towns outside the main cities, or sporadic housing in the countryside that is "likely to result in car commuting to urban centres"(Department of Environment and Department of Transport, 1994, 3.2). They also require rail stations and light-rail stops to be the "preferred location for travel-intensive development" (Department of Environment and Department of Transport, 1994, 4.24). The transit/land-use package is designed to not only overcome deficiencies in the transport area but also to help overcome some of the spatial inefficiencies in cities and make them more attractive places for living, working, recreating and moving around. The paradigm shift is in seeing that this requires transit-oriented development not car-based development. As Robert Cervero (1992) says:

> Creating transit-oriented pedestrian-friendly environments would reduce auto dependency and cleanse the air, not to mention enliven cities and bring people from all walks of life into daily contact. Those previously isolated by the auto society the elderly, the wheel-chair bound, the poor – could fully participate in society's offerings in a transit-oriented city.

Australian better cities program

In each Australian city, there are transport planning strategies that are recommending the new order. Each city has shown that they understand the new policy environment, that they must upgrade transit, create better land use linkages thus reducing the need to travel, create more pedestrian-friendly environments and implement demand management (summarized in Newman *et al*., 1992). However the old order continues relatively unabated because they have the funds and the bureaucracy in place. There is considerable disenchantment being expressed at grass-roots level with sophisticated alternative proposals being developed, even linking up the isolated alternatives from across Sydney into a coherent, integrated alternative plan (Link Up, 1994). When imaginative, future-oriented exercises are undertaken, the results show a much reduced level of automobile dependence, for example the Greenpeace winning concept for the Sydney 2000 Olympic Village is a transit-oriented, pedestrian-friendly urban village. This all seems to suggest that the Australian city is ready for some legislative changes like those outlined above in the USA and UK (Newman, 1994).

There is a major initiative from the Federal Government that is putting demonstration projects into place designed to help Australians envisage an alternative, less car-dependent city. This is the Better Cities Program and it is a five-year A$850 million exercise which is already beginning to bear fruit. Although few of the projects are complete, the state and local Government bureaucracies involved have begun to apply the principles of transit-oriented, denser, more mixed land use to other areas. There are also two cities, Sydney and Brisbane, which are developing small light-rail systems that are likely to set the standard for new transit options in Australian cities.

Several Better Cities projects in Perth are building transit-supportive urban villages around the newly electrified and extended urban rail system. The new service has been a spectacular success, in particular the new Northern Suburbs line has attracted 40 per cent higher patronage than the previous bus-only service and 25 per cent of patrons have switched from cars. Now that land uses are moving to intensify around the stations and that cross-city bus services are occurring through the integrated feeder links, the basis for a lifestyle that is much lower in its auto dependence is now apparent. This is quite an achievement for such a car-dominated city but like all changes that involve a substantial element of paradigm shift, the upgrading of the Perth rail system came about because of political intervention through grass roots processes rather than the transport professionals (Newman, 1993). The professional's preferred choice was a low-key bus option that essentially admitted the task of overcoming auto dependence was not winnable. Once given the direction, the professionals changed and produced an award winning railway, on time and on budget.

This is the great hope as the urban freeway era is ended, that the combination of political commitment and professional expertise can be harnessed quickly to implement the necessary package of transport and land use policies. The global information system can provide the expertise and the evidence is pointing to a rapid rise in the political will to move away from the urban freeway.

The urban freeway protest movement

A recent article in *The Economist* (19 February 1994) says that protesting about new roads in the UK has

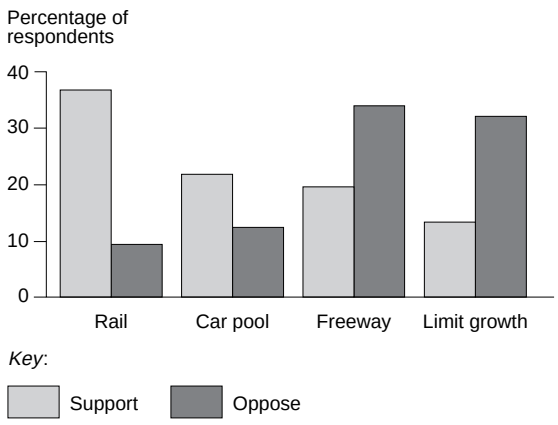
become a "truly populist movement drawing supporters from all walks of life". The movement has strong support from the Tory Party, NIMBY groups and wider environmental groups. Their concerns are for the local countryside, the city's environment and the global environment. The Department of Transport recently received 10,000 submissions on the M25 – only eight were in favour. *The Economist* article went on to say that "the pro-roads lobby, by contrast, draws upon a much narrower constituency – mostly road builders and car makers". The alternative of shifting public money from high capacity roads into public transport is almost universally accepted.

In the USA, the movement to change priorities from road building to transit is very active. The Surface Transport Policy Project co-ordinates hundreds of organizations across the country and was a major force behind ISTEA. In California, the home of the freeway, only 18 per cent of the community believe that freeways help solve traffic problems, whereas 36 per cent believe in rail transit (see Figure 2).

In Norway a very revealing survey found a similar level of anti-freeway/pro-transit sentiment and when asked whether people believed their politicians had correctly judged the feeling of people towards private cars, their responses were: Yes, 19 per cent; No, 53 per cent; Do Not Know, 18 per cent (INRA Europe, 1991).

In Australia the tide is moving in this direction. The Community and Family Commission (1992), in their survey of attitudes in Perth, found a strong dislike for freeways, support for transit, and interestingly a powerful desire to try to create more diverse, village-style communities with close access to services. Across Australia there are many groups producing creative alternatives to large roads as well as opposing freeways. The Link-Up Conference brought together over 100 such groups just in Sydney. These groups have all the energy, vision and commitment of the early environmental movement. The one characteristic which they all express is that they receive little help from government in their work, that government is seen as their enemy, too closely allied to the road lobby and with virtually all government planners, engineers and administrators facilitating the problem, not the solution. This movement is now calling for a Commonwealth initiative on transit (similar to the US ISTEA approach) as it called for such action on the natural environment in the 1980s.

Figure 2. *California support and opposition for options to solve traffic problems*



Conclusion

The kind of "modernist" thinking that produced the urban freeway with its grandiosity, its simplicity in the midst of complexity, its neglect of the social and environmental, its machismo, is now easily parodied by commentators. But the post-modern world in many other areas of human endeavour is still very confused about whether any alternative future can exist. With the urban freeway, it is now clear that the economic basis for its continuance is as shaky as its moral basis and alternatives do exist and are well-demonstrated in European and Asian cities. The English-speaking world have been slower to adopt the new paradigm but the evidence presented here suggests that the last days of the old paradigm are appearing in the UK, USA and Australia. This is not to say that the old way does not have some momentum left or that the political battles are over. What it does mean is that the tide has changed and cities which now build freeways will probably regret it.

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Urban transport policy paradoxes in Australia

Paul Mees

A period of smog highlights Melbourne's inadequate public transport

Summer of discontent

April 1994 brought an "Indian Summer" to Melbourne, a fortnight of unseasonably fine Autumn weather. What should have been an occasion for enjoyment soon turned sour, as the build-up of car exhausts produced the city's worst ever bout of photochemical smog. Instead of sunning themselves, the three million residents of the city designated "the world's most livable" by the Washington Research Institute were coping with irritations to the eyes and respiratory system.

The smog episode refocused concern on the poor state of Melbourne's public transport. Despite possessing the English-speaking world's largest tram/light-rail network and an electrified urban rail system the size of the London Underground with a fleet of modern trains (none more than 20 years old), Melbourne has lost public transport passengers at a world-beating rate since wartime petrol rationing was lifted in February 1950. A Labour Government which held office from 1982 to 1992 and was committed to reversing decades of neglect of public transport could do no more than slow the rate of decline: current modal share is about 8 per cent of total travel and 15 per cent of work trips (Moriarty and Beed, 1992). The rail system operates at only a fraction of capacity, even in peak period (Mees, 1993) and occupancies are now so low that rail transport actually produces similar greenhouse gas emissions per passenger-kilometre to the car (Richardson, 1993).

The conservative Victorian State Government elected in November 1992 is responding with a reform programme comprising service reductions, fare increases, productivity improvements and privatization (urban transport is a state responsibility). The Government has also announced an accelerated urban freeway programme called "Linking Melbourne" (VicRoads, 1994). These policies have the support of most transport academics and other experts, although some believe the Government should "go further". Their reasoning is:

- Urban public transport requires a large public subsidy, but returns little benefit, because so few people use it.
- Little can be done to improve patronage, sadly, because social change and post-war development have made the radial rail and tram systems, and even conventional route bus services, irrelevant to most people's travel needs.
- The only logical response is to cut costs ruthlessly and bring the subsidy to an acceptable level, and to privatize and deregulate as much of the system as possible.
- Since most travel is going to be by road, an expanded freeway network is needed.

But transport policy is not just about moving people and goods around. Transport is one of the major influences on the form of cities. Los Angeles and Barcelona both did most of their growing in the last 120 years. They look very different largely because of differing transport histories. If Melbourne is to be surrendered entirely to the car, we must expect a city more and more like Detroit, Dallas or LA, and more smog epidemics. If, as "Linking Melbourne" proposes, a ring-freeway is built, we can expect a shapeless sprawl of drive-in shopping centres and office parks around the interchanges, uncontrollable suburban traffic congestion and pollution, as can be seen around most US cities and along London's M25 orbital freeway.

Few planners – even those who support ring-freeways or public transport cuts – want this future for Melbourne, but the policies they advocate amount to a return to the 1960s and 1970s, when Thomson noted that Melbourne was "gradually being transformed from a strong-centre to a weak-centre structure" (Thomson, 1977, p. 136).

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 20-24

The dispersed city

The argument that low-density, decentralized post-war development makes conventional public transport non-viable is not new. As early as 1960, the authors of the Chicago Area Transportation Study confidently claimed:

> The conditions of land use and density…are the major determinants of the travel market. If demand is constrained by these factors, it is unlikely that changes in supply will have any great impact on the number of users (CATS, 1960, p. 52).

The argument was presented more thoroughly in Meyer, *et al.,* (1965) and has not been improved on since.

A 1985 study for the European Conference of Ministers of Transport noted extremely low levels of public transport use in Australia (as well as New Zealand and the USA), which was attributed to "high levels of car ownership… and extensive low-density suburbs, which are difficult to serve adequately by public transport" (Webster *et al*., 1985, p. 43).

This is the conventional explanation for the decline of public transport in Melbourne and other Australian cities. A local road engineering text observes:

> Although every effort should be made to encourage the efficient use of public transport. …Current land use trends in Australian cities are towards continued low-density development that cannot be effectively or economically served by public transport (Underwood, 1990, p. 162).

Underwood discusses a series of "flexible and demand-responsive" alternatives, such as shared taxis and neighbourhood car co-operatives. This is also a common theme: in a dispersed, low-density city, "innovative, flexible", car-like (and consequently, highly polluting) forms of public transport are the only viable options. Traditional modes such as rail have a declining role, and public transport is for niche markets such as school children and other people without cars (Hensher, 1994).

An additional form of dispersion is movement of employment, retailing and other activity from the Central Business District to the suburbs, a result of the flexibility created by the car and the truck and of technological change, particularly electronic communications (Brotchie, 1992). This process, noted in the USA by Meyer *et al.* (1965), has produced a diffuse pattern of trip making, which Hall (1990, p. 5) describes as a general feature of Western cities:

> The traditional downtown is now only the leading commercial centre among a number of others, some of which may compete strongly with it. Thus the traditional pattern of movement – radially inward during the morning peak, outward during the late afternoon – has increasingly been overlain by other movements, both reverse commuting and criss-cross commuting... [like] a box of matches thrown almost randomly onto a table.

This dispersed journey pattern does not produce the concentrated flows of passengers required to support public transport (Brotchie, 1992). Much of the new suburban travel is cross-suburban, and cannot be conveniently served by the radial fixed-rail system. Even where suburban jobs are concentrated in centres, these are too small, and attract trips from too many directions, to support much in the way of public transport. Hall, however, is less eager to write off public transport: "in metro areas where suburban jobs are clustered around transit interchanges, for instance, it may not be true at all" (Hall, 1990, p. 6).

Canadian contrasts

The 1985 ECMT study (Webster *et al*., 1985, p. 43) noted that Canadian cities have been much more successful than their Australian and US counterparts at retaining public transport patronage:

> The situation in Canada is particularly interesting, since suburban development … is very much in the North American, car-oriented pattern, yet public transport use is at European levels, and the trend is strongly upwards (p. 43).

The report suggests that this may be due to Government policies which have concentrated employment and other trip destinations in central business districts. Newman and Kenworthy (1989) have sparked controversy in Australian transport planning circles by presenting Toronto as an example of the successful integration of transport and land-use planning, emphasizing the siting of high-density housing near rapid transit stations.

Critics of this approach argue that large increases in density are neither feasible nor desirable (e.g. Hensher, 1994). Public transport will continue to decline or at best play a minor role, because densities cannot or should not be increased substantially nor jobs recentralized. This again echoes the reasoning of the Chicago Area Transportation Study (e.g. CATS, 1959, p. 90; 1960, p. 54). But some planners argue that the environmental damage created by over reliance on the car makes increased densities imperative. They point to successful examples – "urban villages" – of residents of affluent cities happily accepting high-density lifestyles. Even the proponents of increased densities, however, are generally at a loss to deal with employment decentralization, except to argue that existing levels of centralization should be protected.

> Looked at in very simplistic terms, the solution to the public transport dilemma is to alter the way in which Melbourne is developing, to induce a form and density that creates favourable conditions for public transport to operate under (Kohut, 1991, p. 15).

There are, however, other explanations for the apparent success of Canadian urban transit. Vuchic (1981) also regards Toronto as a model, but not primarily of land-use planning:

> Another interesting comparison is between several US cities and Toronto. In 1950, Toronto had a similar transit service to that in US cities; it had a simultaneous increase in auto ownership, it experienced urban sprawl (it has even fewer space limitations), and it constructed some of the widest freeways in the world. The drastic difference is that, unlike most US cities, Toronto made a serious commitment to continuous improvement of transit. It constructed a rapid transit system and introduced numerous operational innovations. The consequences of this policy are clear: between 1961 and 1976 transit ridership in Toronto increased by 46 per cent. During the same period ridership in most US cities… continued to decline (Vuchic, 1981, p. 110).

Cervero (1986, p. 296), comparing Canadian and US public transport, concludes:

> the overriding factor behind transit's success in Canada is, plainly and simply, the superior levels of service, combined with the careful integration of transit and land-use planning.

Another possible explanation for Melbourne's public transport decline thus emerges. Melbourne, like Canadian cities, had a choice about the kind of transport system it was to have; policy-makers chose the path of declining public transport and car dominance. This contrasts with the urban form explanation, which is more deterministic, portraying transport changes as the outcome of "natural" processes of city growth and technological change.

Toronto stands out even in Canada as having achieved the apparently impossible task of providing high quality, cost-effective public transport in a sprawling city. The secret of success is service and integration. Trains are fast, safe and clean, running every few minutes until 1.30 a.m. Buses and trams operate as feeders to the rail system, with frequent services and 24-hour coverage on trunk routes, and changing modes is easy. The excellence of the rail system draws passengers to the feeder buses, which also serve local and cross-suburban travel. The buses generate patrons for the rail system, completing the "virtuous circle". Public transport has been supported by a two-decade moratorium on freeway construction, except in outer areas, limits on downtown car parking and supportive land-use policies (although the latter may have been honoured more in the breach than the observance (Frisken, 1990).

Canada should be able to provide lessons for Australia, particularly since the two nations share many features which distinguish them from the USA, such as the absence of urban race tensions. In many respects, the Australian situation is actually more favourable to public transport: Toronto opened its first rail line in 1954, and must build each addition to its small network underground, while the Melbourne rail and tram systems have been in place for over a century, and have shaped the city's development. Less than 10 per cent of Melbourne's population lives more than 5 km from a rapid transit station, compared with 60 per cent in Toronto; 17 of the 25 largest suburban shopping centres (ABS, 1986) are adjacent to rail stations, to only five in Toronto (Metropolitan Toronto Planning Department, 1992).

But public transport *service* in Melbourne has been deteriorating for decades. Frequencies have been cut and trains are no faster than when the first electric services commenced in the 1920s (see Table I). Even the current State Government acknowledges that service reliability is poor (Brown, 1994). New trams and buses have hardly affected operating speeds, which are determined mainly by traffic conditions. Buses are not timetabled to connect with trains or trams, despite scheduling having been under the control of a single authority since 1982, so nothing has changed since 1953, when Melbourne's planning authority lamented:

> A few… buses run to and from the city, but in most cases they act as feeders to the rail and tram services … On account of infrequent service and poor co-ordination … there are relatively few who can save much time by using these services (MMBW, 1953, p. 184).

Toronto's approach to service has received little attention from transport planners in Melbourne, as both sides of the local transport debate accept the urban form explanation for the decline of public transport. Little attention has been paid to learning what makes public transport successful, because the conventional explanation for its decline has acted as a self-denying ordinance closing off debate.

Developments in the west

Meanwhile, on the West Coast of Australia, a new approach has emerged. Perth, a sprawling, car-dominated city, compared with which Melbourne seems almost European, is following the Canadian model. Newman (1991) comments that other Australians view Perth's rail

Table I. *Decline in train service on Melbourne's Sandringham line*

	1929	1994
Service frequency (min)		
Peak	3-4	15
Shoulder	7-8	15
Interpeak	15	15
Evening and Saturdays	15	20
Sundays	15	40
Fastest service (min)	26	27
Line length (km)	18	
Number of stations	14	14
Population in line's catchment area	80,000	120,000

revival with "some amazement": the reactions of conventional transport planners on the East Coast could be more appropriately described as hostility (e.g. Industry Commission, 1993).

Perth spent heavily on rail upgrading over the last decade. The line to Fremantle, closed in 1979, was reopened in 1983 by a new State Government, the rail system was electrified and modernized. The effect on performance was dramatic. Trains are faster, more frequent and cheaper to run; many bus routes now act as rail feeders, giving a better service at lower cost. Cost-recovery is improving as patronage grows, with the new Northern suburbs line, built along a freeway median, recovering 49 per cent of operating costs from the farebox (Ministry of Transport, WA, 1994).

Newman (1991) claims Perth's improvements were fought at every turn by the transport bureaucracy and other experts, a claim corroborated by the views of unnamed officials cited approvingly by a more orthodox author:

> Railway officials commented somewhat ruefully after this episode [the reopening of the Fremantle line] that the [previous] government should have waited a little longer, ended freight and passenger service simultaneously, and torn up the line so that the restoration of passenger trains would have been impossible (Stevenson, 1987, p. 108).

Their thinking was trapped in paradigms from the 1960s: public transport can never compete with cars in a low-density city, so there is little point improving it (e.g. Director-General of Transport, WA, 1982). The Government used Newman (1991) and Vuchic (1981) as consultants to break the impasse.

In Melbourne, the old thinking dominated decision making. The transport bureaucracy advised the incoming Labour Transport Minister that only minor increases in patronage could be achieved, and even this would create a deficit blowout (Ministry of Transport, Victoria, 1982). When Labour insisted on spending money on public transport, the experts responded with a programme of indiscriminate modernization, rather than a strategy for expanding, co-ordinating and improving service. Meanwhile, the construction of freeways continued.

From the mid-1980s, the Victorian Government's attention returned to cost-cutting. Rail stations were de-staffed at night just as a series of films about New York subway graffiti hit the cinemas: the resulting outbreak of vandalism afflicts the system to this day. The Government met its nemesis in a 1990 industrial dispute sparked by a proposal to eliminate tram conductors. Lines of trams were parked in city streets for weeks, and the lottery-style "self-scratch" tickets introduced to save the cost of vending machines were ridiculed by the public and media. The Government backed down.

The new conservative State Government has returned to the remedies of previous decades: service cuts, fare rises and new technology for public transport, coupled with an accelerated programme of freeway construction. The reform programme has received the full support of mainstream transport planners and "Thatcherite" economists (e.g. Hensher, 1993; Industry Commission, 1993), despite having produced a 10 per cent fall in patronage in only 18 months. The magic wand of competition will create the flexibility needed for public transport to serve marginal niche markets in a car-dominated city. British bus deregulation is cited glowingly as a success story, a fact which may surprise English readers.

Conclusion

Melbourne's land-use planners continue their four-decade struggle to preserve the public transport-oriented land-use pattern inherited from the pre-War city. The Melbourne & Metropolitan Board of Works' 1954 metropolitan plan emphasized containment of urban sprawl and the creation of rail-based suburban district business centres. The most recent update (Ministry of Planning, Victoria, 1987) continues the tradition, prescribing rail-based development corridors and district centres, and urban consolidation (redevelopment of established areas at higher densities). Melbourne has recently emerged as a world leader in traditional neighbourhood design. I have argued elsewhere (Mees, 1994) that the land-use planners have been largely successful.

Meanwhile, transport planners continue their long-established approach of discouraging public transport use through declining service quality and expanding the road network, paradoxically claiming that they have no choice but to do so because Melbourne's urban form is so car-oriented. Unfortunately, they have also been successful.

Urban form is not Melbourne's major transport problem; rather it is an excuse used to perpetuate the real malaise, which is a refusal by transport planners to treat seriously transport modes other than the car.

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How Amsterdam plans to reduce car traffic

Leo Lemmers

The historic centre of Amsterdam was not built for the heavy traffic of today

Background

The city of Amsterdam has one of the largest and most intensely used historic centres in Europe. This centre, designed in the seventeenth century, was of course not built for cars.

The increasing number of cars has been causing problems for a few decades already. There is not enough room for all types of traffic in one narrow street. The city's canal structure has long been used intensively to transport cargo of all kinds aboard boats of all kinds. At the turn of the twentieth century, the city was forced to adapt to automobile traffic and several canals were filled in. The main canals, however, remained largely intact, and today no one would dare to propose adapting the historic city centre structure to the needs of the motor car.

The centre is not an open air museum of the seventeenth century. It covers an area of some seven square kilometres and accommodates a total of 80,000 residents and a further 80,000 employees. There is also a wide variety of functions which are supposed to belong in a city centre. The city's policy is to retain and preferably strengthen the economic importance of the centre. The level of accessibility therefore needs to be adequate for a healthy and multifunctional city centre.

There is also general agreement on the following points:

- Pollution and noise, largely caused by cars, should be reduced.
- Traffic safety should be increased.
- Quality of public space should be improved.

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 25-28

Why make a plan to reduce car traffic?

The fact that a plan to reduce car traffic in Amsterdam's city centre was developed was more or less coincidental. It had a political background that had very little to do with traffic or environmental concerns but was rather a response to the complaint that there was an ever-widening communication gap between the city's politicians and their constituents.

Especially after the local elections of 1990, when there was both a very low level of turnout and a landslide defeat for the ruling parties, politicians were looking for new ways to improve the public's involvement. A referendum – the first ever held in Amsterdam – seemed an attractive way of experimenting with more direct public influence on decision making.

Many subjects for a referendum were suggested but finally the question chosen was "how far should we go with reducing car traffic in the city centre?". Two scenarios were developed: one representing a continuation of the existing traffic policy, the other aiming at a more drastic reduction of car traffic; 50 per cent was a number that was frequently mentioned.

Eventually the referendum was held in March 1992. The result was a narrow victory for the supporters of the more drastic reduction in car traffic; 53 per cent of the voters preferred this scenario.

Politicians first hesitated to act on the results, not only because of the narrowness of the majority but also because of the very low turnout. One month later however, in spite of the uncertainty about the views of the non-voters, the City Council decided to implement the result of the referendum. The risk of losing all credibility by ignoring the voters' choice was an important consideration here. The Council's awareness of the narrow margins between the numbers of supporters and opponents of the plan resulted in a careful step-by-step

approach to ensure public support, which under these circumstances is absolutely essential.

The first two steps contain a series of relatively minor measures, partly new initiatives and partly adaptations of ongoing projects such as improving some facilities for bicycle traffic; not uncommon to that in any other city in Europe.

The third, most important and most interesting step is a comprehensive Traffic and Street Layout Plan for the period between 1995 and 2005.

The traffic and street layout plan

The plan starts with an investigation into possible ways of reducing car traffic by 50 per cent, the figure mentioned before the referendum.

In theory, there are numerous different methods to reduce car traffic in a given area, ranging from completely closing it to car traffic to restricting access. Several options were investigated and rejected, such as introducing a strict system of one-way streets, placing toll-posts on all the bridges over the Singelgracht canal or dividing the area into four completely separate zones. Most of the proposed options had proven more or less successful in other cities. They were however seen as inadequate in the case of Amsterdam because of the size and nature of the city centre. Moreover none of them would result in the desired 50 per cent car traffic reduction.

Eventually a parking policy as the main instrument for influencing the number of car journeys was chosen. Reducing parking space means reducing car journeys. Not every parking space however causes the same amount of car traffic. A resident's parking space generates perhaps only two journeys a day, whereas a parking space in a shopping centre might generate a dozen journeys a day. Therefore, the plan does not only determine the number of spaces, but also attempts to dictate to whom they should be made available and at what price. Long-term parking by commuters was already not considered to be an essential category, so a choice had to be made between reducing the number of spaces for residents or for visitors (for business purposes, shopping, etc.). If the emphasis is on reserving spaces for residents, this may have a negative effect on the city's attraction to visitors and this could threaten the survival of the economic function of the city centre; if the emphasis is placed on reserving spaces for visitors, the volume of traffic will be relatively greater, because of the greater number of journeys generated for these travel purposes.

To find a workable balance between the demands of all the interest groups, it was decided to develop a scenario based on a system of districts. Depending on the dominant function in a district, a differentiation between the two categories – visitors and residents – could be made. In more residential areas the number of spaces for residents will be reduced and in the most central district, the emphasis will be on reducing the number of spaces for residents. Computer model calculations indicated that in this way, a 35 per cent reduction of car traffic in the city centre could be achieved. A further reduction (for instance the reduction by 50 per cent originally aimed at) is considered to be too hazardous to the city's economy, while a smaller reduction would not do enough to improve the quality of the environment.

3,000 parking spaces will disappear completely

Altogether 3,000 parking spaces will disappear completely. Several thousands more will disappear from the streets but will be replaced by spaces in underground garages.

Not only will the number of parking spaces be reduced, but also prices for parking will rise. Moreover parking tariffs will be higher in the centre than on the edge of the inner city. The cheapest car parks will be near the A10 motorway, where transfer to the metro will be easy. More expensive spaces will be on the edge of the city centre and the most expensive ones will be along the inner loop in the very heart of the city.

Why now?

Why does Amsterdam think that there is a good chance, maybe better than ever, to make this policy work? First, the referendum was symptomatic of growing public support, which in turn may be explained by an increasing awareness of the environmental impact of car traffic. Second, parking control has been much improved. Thanks to the introduction of wheel clamps and the towing away of illegally parked cars, compliance with parking regulations is better than ever. Moreover, since parking fines may be regarded as a type of local tax, the Municipal Parking Authority yields a profit of some 15 million guilders a year. Third, the implementation of an ambitious programme to improve the accessibility of the city centre by the construction of new metro lines can start next year, thanks to large financial commitments from the national Government.

In addition to the parking policy, a traffic management scheme is another important item in the plan. The

reduction in the volume of car traffic means that the number of car lanes can be reduced as well. This makes it possible that, for instance, a one-way traffic system could be developed on the main radial streets. In most of those streets there already is an urgent need for improvements to tramlines in terms of speed and reliability. If car traffic can be restricted to one direction only, this will make room for important public transport improvements and new bicycles lanes as well.

The third main element of the plan is the design of urban space.

A key element in these designs is that the available space for cars will be reduced, but streets will never be pedestrianized completely. In our opinion it is better to spread traffic more or less equally over all streets than to concentrate it on some arteries.

The impact of the plan

As the number of car journeys to the city centre deceases, traffic intensities in the adjacent areas will also be reduced.

The plan also gives an estimate of the environmental effects of the proposed measures. The results of the calculations show that the targets for lower levels of noise and air pollution are within reach.

There was considerable confusion about the plan's likely effect on the city's economic functions. There were last minute reports that thousands of jobs in the centre could be lost. Eventually they proved to be subjective and were rejected. It is expected instead that the higher quality of the layout of public spaces will make up for the greater difficulty of access by car. Some businesses may perhaps leave but others will be attracted. The effects will probably be neutral to positive in the medium to long term.

Public support and decision making

The Council's aim, and its hope, is that the necessary conditions can be created to give Amsterdam a new kind of accessibility. Active involvement by the residents and the business community is essential in order to achieve a social consensus on the measures to be taken. A series of activities, initiated by the city, started in September 1993. A conference was held then to discuss the first results of the calculations and whether the desired level of car traffic reduction could and should be achieved. During October and November, a draft version of the Traffic and Layout Plan was discussed with residents, public interest groups and the business community alike.

The next step was that 250,000 copies of a specially prepared newspaper were distributed in the city centre and the adjacent areas. Two public hearings were held which some 600 people attended to give their opinion the plan presented. In addition to all of this, everyone was also given the opportunity to respond in writing during the entire month of November. Including the pre-printed letters prepared by some interest groups, almost 3,000 reactions were received. Roughly speaking, half of the respondents said the proposals went too far and would turn the city into a kind of Venice: a centre attractive to tourists and inhabitants, but lacking in any other serious economic function. The other half of the respondents said the plan would not do enough to improve environmental quality and far too many cars would still remain.

It might be concluded, somewhat cynically perhaps, that the proposals appeared to have found exactly the right balance between the economic and environmental demands. Another possible conclusion could be that virtually nobody seemed to agree with the plan as it had been proposed.

In the first week of January 1994 all the reactions received to the proposed plan were assembled and the city's staff commented on them.

Virtually nobody seemed to agree with the plan

This resulted not only in a three-volume report but also in a proposal to the City Council to modify a number of aspects of the plan in order to meet the reasonable wishes of the public as far as possible. The time pressure on the work was very high since the City Council had to make a decision on the measures proposed in the plan before 2 March. That date was crucial because it was the day of the local elections.

On 9 February, the City Council, decided to ratify the latest proposal. There were indeed some modifications and no decisions have yet been made about most of the design issues.

The Council decided to implement the plan in phases. The aim of this decision is to ensure that the residential and work functions of the inner city shall not be affected at any time. A motion was passed emphasizing this yet again.

The Council also asked for extra emphasis to be placed on the construction of transfer centres near the A10 motorway. This will offer visitors coming to the city by car the opportunity to leave their cars at the edge of the city and transfer to public transport.

In preparing proposals for redesigning the main routes in the inner city, it is assumed that both improving the flow of public transport and increasing the safety and flow of bicycle traffic are of prime importance. The introduction of one-way traffic on some of the main routes may be a possible way to achieve this, but it is not taken as an assumption.

Furthermore, the Council has voted in favour of a motion to carry out a study into sites for supervised bicycle storage, to combat bicycle theft. This is the stage at which the decision-making process stands.

Looking back, the Council's decision was in effect a presentation of a more detailed and clearly defined policy rather than a complete plan whose implementation could start on any day. The actual plans have yet to be produced. It will be very interesting to see whether the results of the local elections will lead to changes. The two parties that most strongly supported the plan both lost a seat in the Council, the two Aldermen responsible were both replaced.

If the next Council wants to continue the same policy that has now been formulated, the first results should be visible within a few years.

To achieve the expected results, however, it will be of vital importance to maintain the comprehensiveness of the proposed measures. Their strength lies in the coherence of the plan as a whole. Implementing only the most appealing or least disruptive elements will certainly not bring about the desired effect.

To see the real effect, some patience will be required. It will certainly take another ten years to see whether Amsterdam really has set an example for the rest of Europe.

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New roads generate new traffic

Rudolf H.H. Pfleiderer and Martin Dieterich

There is widespread ignorance concerning the generation of additional traffic

Introduction

Traffic planners and policy makers argue that new roads are required to meet an increasing demand for transportation. It is claimed that the improvement of the road infrastructure contributes to economic progress, helps the environment by relieving congestion-related air pollution and amends living conditions in residential areas. In addition it is frequently argued that the improved rail and bus infrastructure will further contribute to the relief from environmental pollution as motorists are provided with a fast and thus attractive alternative to using the car.

A simple and fundamental principle of economics is that consumption increases as goods become more attractive to the consumer. If transportation is viewed as consumable goods, then transportation infrastructure will partly determine its attractiveness to the potential user. Improving the overall attractiveness of a transportation system will increase traffic and therefore ultimately lead to more traffic-related pollution.

Apparently, one of the most important features determining attractiveness and thereby controlling the demand for transportation is the speed of travelling. Faster transportation systems allow for longer distances to be covered and thus for more or further distant destinations to be reached, while the time spent in traffic remains constant. This simple fact is bluntly ignored by most traffic planners and politicians. Rather, the standard paradigm of traffic planning presumes that speed influences the choice between different modes of transportation, but has no effect on the choice of the destinations and the total distances covered by individual travellers.

New roads generate new traffic

New roads are frequently built on the grounds of shifting traffic from congested arterials to areas where pollution and noise affect less people. Such new roads accelerate the traffic and the motorists save time. The question then arises of how the motorists spend the time saved. The answer to this question is surprisingly simple but is a key to understanding the increase in traffic. The time saved is used to join more traffic which results in additional traffic. This traffic is ignored by conservative traffic experts, although – apart from the direct impacts on the landscape – it is the most important impact of a new road on the environment. There is a technical term for this kind of traffic. It is called induced or generated traffic.

The phenomenon that people tend to spend a fixed amount of their time for travelling is known as the law of the constant travel time budget. The travel time budget is the average time a person spends in traffic each day. The law of the constant travel time budget is well established (John Allard and Frank Graham & Partners, 1987; Herz, 1985) but is rarely, if at all, applied in the context of transportation planning and impact assessment.

The travel time budget depends on demographic and sociological parameters. For example, it has been found that employees have a greater travel time budget than housewives or pensioners (Herz, 1985). Progress in transportation, for example the invention of the bicycle or the motor driven vehicle, has not changed travel time budgets considerably. Although nowadays there is a tendency to spend more time in traffic as a result of increased leisure time and reduced working hours.

It is not known whether the law of the constant travel time budget also applies to the transportation of goods. However, there is a close connection between the improvement of transportation infrastructure and economic globalization (Norberg-Hodge, 1994). Thus, it appears that as infrastructure is improved, goods are being shipped over longer distances. This is particularly true if companies are allowed to externalize most of their transportation costs owing to massive direct and indirect transportation subsidies.

The acceleration of public transportation also induces traffic. Interestingly, while the induction of motor car traffic through improved infrastructure is consistently

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 29-31

ignored, the increase of ridership in systems of mass transportation as a result of improved services is widely praised as a means of protecting the environment. It is usually implied that one traveller more on the bus or on the train corresponds to one motorist less, Because of this widespread superstition, an alleged reduction of motor car traffic resulting from the improvement of public transportation is often simply stated without backing by appropriate survey data.

Few studies have been published on the interdependence between the improvement of public transport systems and the amount of motor car traffic. In Stuttgart, Germany, a new light-rail line (S-Bahn) opened in 1985. The new rail allowed for faster commuting, and a survey was conducted to demonstrate the expected effects of the new rail on road traffic. The following quotation, which summarizes the result of the investigation, is taken from Younes (1990):

> The Stuttgart case study of a new S-Bahn linking the city of Stuttgart with the industrialised region of Böblingen has some surprising findings. Based on in depth surveys and studies carried out by both the city and the local public transport authority, it is clearly shown that the growth in motor vehicle traffic along the corridor of the new S-Bahn has increased substantially since it was opened and that this increase was significantly more than the increase in traffic for all roads in the city.

The basis of cost/benefit calculations is nonsense

In Germany, road projects are evaluated according to standardized cost/benefit procedures. In the course of the cost/benefit analysis, a monetary value is attributed to the following potential benefits of a road:

- improved accessibility;
- reduced operating costs of vehicles (reduced fuel consumption);
- improved safety;
- environmental benefits.

Time savings for road users are evaluated within the improved accessibility criterion. Typically this criterion contributes significantly to the alleged benefit of a new road. It is worthwhile to note in this context, that new roads tend to be designed for high speeds in order to claim high accessibility benefits. However, since travel time budgets are constant there are no overall time savings and thus there should be no benefits with respect to time budgets alone.

The most drastic error of the cost/benefit analysis is made when fuel savings and the reduction of other vehicular operating costs are calculated. In Stuttgart 2km of a four-lane urban highway are projected to relieve a bottle neck. Motor car traffic on the new road is predicted to be about 80,000 vehicles per day. Allegedly the project will result in a daily fuel conservation of about 8 tons (Stadt Stuttgart, 1987). Calculations of reduction in fuel consumption were based on the assumptions that traffic from other routes will be concentrated on the new highway and that motor vehicles, driven at a speed of 50 to 100km/h, will consume less fuel per distance than vehicles in congestion. Not surprisingly, the rule of the constant travel time budget was ignored in the calculations. The calculations are therefore wrong. Similarly, calculations concerning traffic accidents and air pollution are also wrong, because induced traffic generally is ignored.

Road construction contributes significantly to traffic increase

According to the German Ministry of Transportation and the private institutes largely funded by it, traffic demand does not increase with improved road infrastructure. Rather it is claimed, that improved road infrastructure and promotion of public transport systems both reduce fuel consumption thereby contributing to environmental protection. This is like the idea of a corpulent person eating more food in order to slim down.

No attempt has been made as yet to calculate the amount of traffic induced by the construction of new roads in Germany. However, based on the law of the constant travel time budget, a coarse quantitative estimate of induced traffic can easily be obtained.

For the four-lane highway projected in Stuttgart an overall time saving of 5 million hours/year was calculated (Stadt Stuttgart, 1987). Altogether motorists spend 93 million hours/year on Stuttgart roads and car traffic in Stuttgart consumes 302,500 tons of fuel each year (Ministry of Nutrition, Agriculture, Environment and Forestry of Baden-Württemberg, 1986). The highway project therefore would boost road traffic with respect to the overall traffic in Stuttgart by as much as about 5 per cent. Fuel consumption would increase about 44 tons per day.

Since it can be suspected that official calculations overestimated actual time savings within the framework of the cost/benefit analysis, the actual increase in traffic and fuel consumption is probably less than 44 tons per day. But without any doubt, fuel consumption is going to increase as a result of the new highway. The decrease in fuel consumption claimed in the cost/benefit analysis is nonsense.

Extrapolating from this one road project in Stuttgart to all road projects under consideration nationally, we estimate that annual traffic growth induced by road construction presently is about one-third of the total growth in traffic in Germany. Improvement of the road

infrastructure is thus one of the major causes of traffic increase in general.

Conclusions

Based on the law of the constant travel time budget we argue that the improvement of infrastructure contributes significantly to the general increase in traffic as it allows for faster transportation. Standard cost/benefit analyses neglect traffic induced by improved infrastructure and therefore are faulty. Traffic induced by the improvements of infrastructure can easily be estimated from the time savings for motorists as a result of a construction project.

Any measure that makes road traffic faster, induces new traffic. Any measure that makes road traffic slower, reduces traffic. Therefore, the most important objective of environmentally oriented traffic policy must be the deacceleration of road traffic.

Systems of mass transportation can contribute to environmental protection only if improvements in public transport are paralleled by measures to deaccelerate motorized traffic, thus allowing for changes in the modal split without increasing overall traffic.

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Can trams carry cargo? new logistics for urban areas

Werner Rien and Michael Roggenkamp

The CargoTram may provide an overall transportation system for human-oriented, ecological mobility

Introduction

Towards the end of the 1970s and the beginning of the 1980s, the German Werkbund introduced the theory Design is Invisible. However, can one design and form products that one cannot see? No, that was not what he meant by "invisible". Rather we must recognize that everyday objects are part of "invisible" systems and regulations that man has created. We cannot only design the form of an object, we have to consider their operation, their usage and integration into individual, specific systems. They should be products, which are part of standardized units and can be integrated into structures and subsystems, i.e. into an integrated design. "The human surroundings are only a small visible part and object of formal design; in the much bigger part they consist of organisational and institutional facts" (Burkhardt, 1985).

Looking at our environment in this way, we will recognize whole network of systems. A structure, consisting of different standardized units and subsystems, which co-operate and influence one another, as one whole complex unit. This entirety is designed and planned by various professional specialists. The co-ordination and co-operation of the different disciplines are subject to social interdependence which must be overcome, in order to render possible "interdisciplinary teamwork". The CargoTram project follows this method in combining design and traffic planning. In order to realize this, one must be able to stand back and see the system as a whole unit rather than one part. The system-oriented working method allows a more closer look at the connected system components.

The major problem of all systems lies in their compatibility. All components must fit and integrate together without any difficulties of adjustment to one whole unit, whereas their points of contact have to harmonize with each other. A result of such system-oriented thinking is the worldwide container transport. Parts of this transportation system are specially designed trucks, ships, cranes, haulingcars, reshipping areas, the so-called container-loading stations. "A perfect transportation system" (Käo, 1993).

Therefore the aim is to develop an overall transportation system, in which each single means of transportation, either on the land, in the sea, in the air or on tracks, can develop its optimal performance. In this context, technical progress should work for a more human-oriented and ecological mobility. Mobility within freight and public transport means to understand traffic as a complete system, in which a co-operative teamwork of each means of transportation will be possible.

The CargoTram concept

An extension of transport principle with container, with the highest possible compatibility, offers the freight tram "CargoTram". At present the CargoTram uses two existing systems. It connects the tracks of the public transportation system and since 1991, the inaugurated "Logistikbox" of the Deutsche Bahn AG to the CargoTram concept. Therefore CargoTram uses the already worldwide existing infrastructures of the container freight transportation and the inner-city tracks of the urban transport companies.

System unit "Logistikbox"

The Logistikbox is produced in two different sizes (Deutsche Bundesbahn Zentrale, 1992). Equipped with fork-lift pockets it fills the gap between europalette and container. The box is specially designed, because of the growing importance of transporting components and small goods. Following the trend towards smaller goods in shipping the Logistikbox uses the reloading technique

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 32-36

of the "combined loading traffic". In this way it offers new possibilities for integrated traffic systems.

An extra advantage of the Logistikbox is the possibility of reloading from trucks to freight trains from one side, so that mid-sized fork-lifters can take single boxes out of the transport unit horizontally. "For the first time now there is the realistic possibility, that through this fast and flexible reloading technique, the track system, as well as vehicles of the public transportation authorities could be used for goods transportation" (Sekretariat für Zukunftsforschung, 1991). As an example, the company Nintendo, located in Großostheim in Bavaria, will transport 10 per cent in 1993, and 40 per cent in 1994 of their goods on tracks by using the Logistikbox (Deutsche Bundesbahn/Deutsche Reichsbahn, 1993).

The vehicle

The basis of the present method of transport is the CargoTram (see Figure 1). Form and design of the CargoTram exterior does not consciously aim towards the design of lorries and locomotives. Both vehicle heads are more oriented to the design of modern tram- and light-rail trains, so that the CargoTram train does not look out of place within the city streets and on the tracks of the public transportation system.

However, the independent shape is characterized by the functional conditioned high windowline and the powerful looking, slight radius of crown of the outside planes. Though the overall appearance does not indicate high speed, it should indicate power and reliability in its performance. The two direction vehicle in low-floor technology, features large-scale dimensioned cockpits, allowing the driver a circular view, in order to supervise reloading procedures and secure shunting. The CargoTram is built as a two-system vehicle, in order to adapt to the Deutsche Bahn AG network and the different railway networks of various companies.

Figure 1. *The CargoTram*

Foreseeing a transport capacity of ten four-palette Logistikboxes (1.70m × 2.50m × 2.47m), whereas three of them will fit on the two motor wagons and four on the middle wagon, the train will reach an overall length of 33m (see Figure 2) and will not be longer than a normal tram.

During transportation the Logistikboxes are hydraulically secured. At the stop, the safety device is released from the driver-stand, which now allows a fast reloading of the boxes and shortens the time at the shunting station or on the open track.

Logistic service in the community

Various tasks appear to be possible (see Figure 3). Involved in a regional-oriented goods traffic-management, the CargoTram will offer a logistic service in the urban area. Connected to an environmentally friendly inner-city traffic, the CargoTram takes over the industrial

Figure 2. *The CargoTram will have a transport capacity of ten four-palette Logistikboxes*

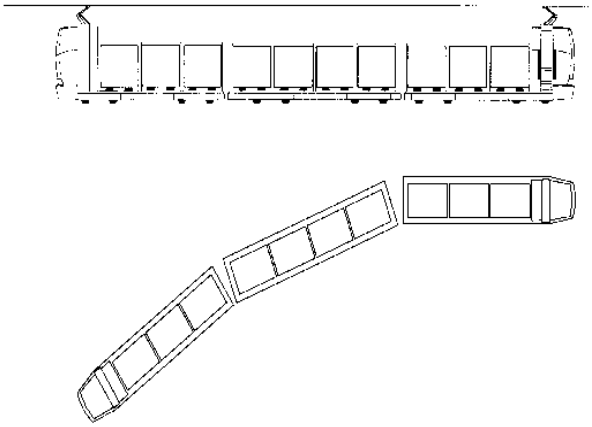
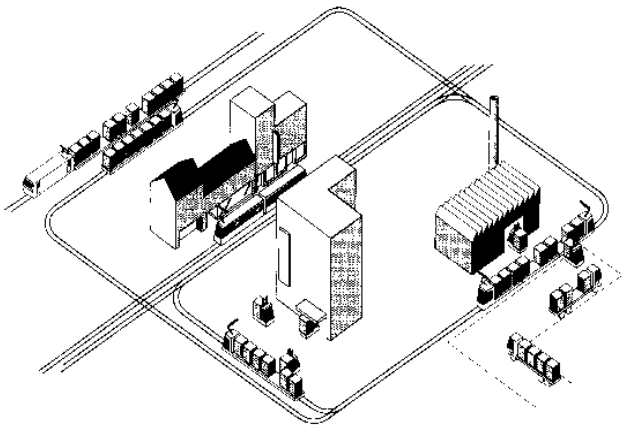


Figure 3. *CargoTram will offer a logistic service in the urban area*



transport, for instance supplying the retail business with goods in the centre of the cities. Taking advantage of the "Green-Light-Switching" of the tramway, the CargoTram profits from the obstacle-free traffic on the inner-city tramway tracks.

Producing factories are using this transportation system to convey semi-finished products and goods. Standardized containers as a development of the existing Logistikbox (cooling containers, etc.) facilitate the transport of goods of retailers and manufacturers. Low emission fork-lifters provide the reloading of the CargoTram. The transport to the consignee is done by electrical or low-emission vehicles. The reloading of the containers takes place on a special track section, on the open track or in specially designed transfer stations, for instance at a final tramway stop or at Logistikbox terminals in the city centre. Regional goods will be ready for reloading onto CargoTram-cars at the terminals of each single CargoTram-line at the city boundaries. This will offer another opportunity to avoid inner-city lorry traffic. Furthermore the CargoTram connects the production facilities within the city with the Güterverkehrszentrum (GVZ). Through "parallel reloading facilities", produced by the company Krupp, every container can be transferred as fast as possible. Efficient and intelligent technology, mobile communication, automatic identification of each single container and their contents, delivery – and transport surveillance allow a train accessibility, which has not been possible before. The overall aim is primarily to avoid further traffic and transport accumulation. The CargoTram enables the reduction of truck traffic (several delivery services) within congested areas, which reduces pollution and noise, and allows the co-operation between the different means of transportation.

Various European, American and Canadian metropolitan areas are already practising various kinds of methods in order to reduce automobile traffic in city centres. All these initiatives refer only to individual automotive traffic. Only by traffic reduction will we gain a better quality of life and more attractive communities. Pedestrians, cyclists and CargoTram benefit from the now open space of the reduced car traffic.

CargoTram, a dream which could come true?

The idea of CargoTram is certainly not a visionary dream, whose realization seems to be impossible. In order to overcome our traffic problems and in the search for new developments the CargoTram concept will be an unalterable necessity. Not only because of its contribution to a controlled carbon dioxide emission, but also to minimize traffic greatly and so leading to an economical co-operation of the several methods of transportation. We have to look for new design concepts and technologies in order to avoid future traffic jams and an ecological catastrophe.

"The execution of new ways in the sense of ecological progress will succeed first, when the already existing possibilities go beyond their verbal explanation, and will be realized within the framework of a demonstration project" (Vester, 1993). The following shows and explains this current theoretical attempt as a model for the city of Kassel.

The attempt of realization – the example of Kassel

The tram network of the city of Kassel is worthy of a closer examination. As Kassel is a relatively small "large" city (about 190,000 inhabitants) with an easily comprehensible tram network, it is possible to show the various possibilities of the CargoTram concept in a small area, considering the following aspects:

- trans-shipment of goods coming from the surroundings of the city;
- several trans-shipments of the network of the Deutsche Bahn AG;
- distribution of commerce and industry in different parts of the city;
- the possibility to supply the department stores in the centre of the city and the tram network with a high density of trains in the inner city.

Furthermore we have the question of the traffic handling centre of goods (GVZ) in Kassel-Waldau.

Problems arising from the Kassel example can be refit to other areas. A standing solution of the problem in general is not possible because of the differing conditions of other areas.

GVZ as a new traffic source

A future problem in the area of the city of Kassel will be caused by the building of a traffic-handling centre for goods (GVZ).

The construction or the transfer of production plants away from the city into a GVZ has been proved many times to be a dangerous solution, as this increases more goods traffic on the roads.

The society for studies on traffic (SNV) proves that the movement of trans-shipment points provides advantages of traffic and ecological improvements for long-distance traffic, but it also shows that the short-distance vehicles have to travel a long way into the city to distribute the

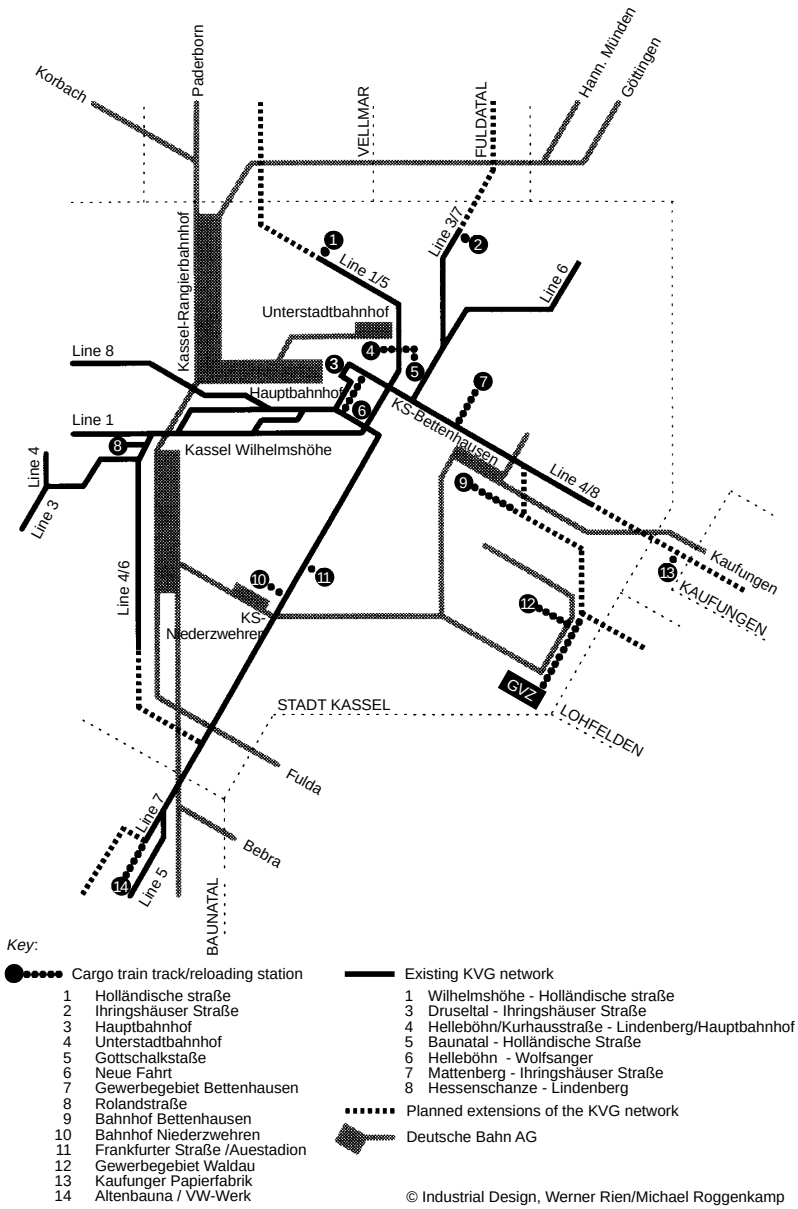
goods (SNV, 1992). Therefore the vehicles are on the road for a long time as the same amount of goods have to be supplied. Consequently the forwarding agents have extended the amount of short-distance traffic. The figures calculated by the SNV for a transfer of a forwarding agency from Berlin-Tempelhof to one of the possible locations for a GVZ tells us very clearly that this means an increase from 22 per cent to 31 per cent of kilometres of the vehicles and an increase from 8 per cent to 20 per cent for the time the vehicle was in use. Additionally, to the increase in use of vehicles in the short-distance traffic, many cities have the problem with the transit-traffic from federal roads which go through the city centres to the peripheral GVZ locations.

Railroad-shuttle as an alternative

In the expert witness report, the SNV suggests, as a possible solution, the setting up of a service of inner-city rail and road trans-shipments points which are connected with the GVZ through a railroad-shuttle network which functions in intervals. In this connection, the tram is considered to be a possible alternative traffic carrier (SNV, 1992).

Concrete planning on this subject is in existence for example in the city of Cologne. “Providing the existence of the above ground public transportation (*Stadtbahn*) one can imagine a good solution concerning the costs

Figure 4. *Schematic plan of the Deutsche Bahn AG network and the network of the public transport company of Kassel (KVG) with extension of the “CargoTrain Net”*



if, as in Cologne, regional warehouses and sales locations are connected by rail tracks or are easy to connect" (Gütter, 1993).

Network draft for the area of Kassel

The planning concept which will be shown can be explained in part and comments on the important elements and the main points.

Specific constructive questions (e.g. vehicles for one or two direction traffic) should not be discussed in detail at this point of planning.

Despite this, we have to consider some technical frame conditions. The logistic box reaches a basic measure of 1.70m × 2.50m or 2.50m × 2.50m. The smaller boxes have the guarantee to be used in a more flexible way.

The universal use of all boxes require a solution of different constructive problems. While the distance between the rails of the tram in Kassel are 2.70m, which in general is sufficient, it is necessary to change the distance between the tracks at the crossroads.

The platforms installed, which are based on the low-floor technology (*Niederflurbetrieb*), 0.18m high, maximum vehicle width 2.42m, have to be surrounded in construction to the extent that the tram profile (*Lichtraumprofil*) is satisfactory on both sides of the train. This would mean a wagon height of 0.48m with the height of the box of 2.49m. The proposed draft is established as follows: starting at the planned GVZ location in Kassel-Waldau the CargoTram connects the relevant points of the city on the mainly existing tram rails, the creation of a new infrastructure is partly necessary.

In the net graphic (see Figure 4) the present network of the Public Transport Company of Kassel (Kasseler Verkehrsgesellschaft – KVG) with the planned extension in the area Helleböhn (Line 6), Baunatal/Großenritte (Line 7), Kaufungen (Line 4/8) as the discussed enlargements to Vellmar (Line 1/5), Fuldatal (Line 3/7) and Lohfelden is shown.

Included in the network of CargoTram are the most important industrial locations, trade companies (in the area of Baunatal, City Nord, Bettenhausen, Waldau, Kaufungen Papierfabrik) shopping locations (city centre, Wilhelmshöhe and the railway stations of the Deutsche Bahn AG (Central Station, Niederzwehren, Bettenhausen, Unterstadtbahnhof). A parallel connection (Neue Fahrt) is planned for the axis with the highest density of trams in the city of Kassel, the Königsstraße. So that there will be no problem with the public tram traffic and the possibility to serve the department stores with Logistikboxes in the city is given.

Furthermore we can see from the draft reloading stations at the northern boundaries of Kassel (Holländische Straße, Ihringshäuser Straße), that these terminals are planned in order to absorb the expected large traffic coming from the northern federal roads in the direction of the GVZ, and also to absorb the already existing traffic in the city centre.

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A new approach to reducing road freight transport

Peter Strutynski

What are the causes of the increase in road freight traffic?

The discussion of those Japanese production methods – known here under the name "lean production" – has sparked off excessive hopes as well as numerous worries. Hopes were held mainly by the industrial producers who believed that a formula had finally been found which could counterbalance the disadvantages in competition as regards Japanese competitors. The producers want to avoid any waste during the production process, to accelerate and make more flexible the complete value chain and to reduce stock, for example by just-in-time delivery. They also want to mobilize human resources, for example by flexibilizing working hours and by teamwork. On the micro-economic level, lean production aims at cutting costs and increasing productivity (Strutynski, 1992). Reservations against this have to do with macro-economy and with ecology. Regional scientists, environmentalists and traffic experts are mainly worried about an increased differentiation in the social division of labour and about the globalization of the supply markets. These would have considerable consequences for the readjustment of spatial structure to demands of freight transport (Hesse, 1993). I should like to discuss both these points under the following aspects.

Vertical integration, division of labour and freight transport

First there is the question as to the extent to which an economy with an increased division of labour will necessarily create additional freight transport and, thus, run counter to targets of environmental politics such as the reduction of carbon dioxide emissions. It is claimed, for example, that the tendency towards a reduced degree of vertical integration would lead to an immense increase in freight transport (see Holzapfel, 1992). This could be so, but in my opinion it does not necessarily have to be so. Indeed, it can be shown that the total transportation volume within a production area can be reduced through the outsourcing of certain material-intensive production segments. Also, the necessity for elements contributing to a cyclical structure of the economy could be used in future to change one-way transport into two-way transport. Thus, the problem of empty runs could be tackled, a problem which apparently has been a nuisance since pre-industrial times. In any case, Friedrich Hölderlin wrote in his annotations on Oedipus and Antigone: "*Der tragische Transport ist recht eigentlich leer*" ("The tragic transport is really rather empty").

One would further have to take in consideration that – parallel to an increased division of labour – the number of direct suppliers is reduced (see Harmon, 1992; Schoenberger, 1987). If the automobile industry seriously went about realizing their intentions of reducing the number of their direct suppliers (in part up to one-third of the present figure), and, if this tendency were continued down the various tiers of the supplier chain (which is only plausible), then there would be a clear reduction in the supplier traffic – in the case of the auto industry up to about 25 per cent. Even the argument of the just-in-time logistics principle cannot shake the basis of this statement. First because just-in-time transport is of interest only to a relatively small circle of enterprises and products. And second, because a general expansion of the just-in-time system would come up against capacity limits. There are signs that, in that case, the transport sector is again moving away from their just-in-time fixation.

My first thesis is, therefore: lean production in the sense of a total rationalization of the entire value chain would not necessarily lead to a clear increase in interfirm freight transport, but rather to its decrease.

From the reduction of vertical integration to an optimization of vertical integration

This is grounded in a configurative change in the assembler-supplier relation. If we look at the automobile sector we can observe apparently contradictory tendencies which are, however, complementary in their economic effect. The reduction of the vertical integration by

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 37-40

outsourcing non-core activities by the assemblers is one side of the coin. The other side is that this reduction often leads to an increase in vertical integration in strategically important core-activities of the very same assembler. Here, shop stewards (in German: *Betriebsräte*) play an active role in various cases. For example in the Volkswagen works in Baunatal near Kassel, 180 new jobs are to be created by the reintroduction of the production of exhaust systems which up until now were bought from subcontractors. This example corresponds to a recent collective agreement at company level by which the enterprise is obliged to strengthen its efforts towards "insourcing". The double strategy employed by disaggregating and by rounding off production lines is beginning to succeed with the subcontractors. We should, therefore, mention the possibility of optimizing vertical integration rather than about a general tendency to reduce it. Figure 1 shows, rather schematically, the traditional assembler-supplier relationship concerning a reduction of vertical integration. This one-way type of inter-firm co-operation, until now predominant, will be replaced in future by a form of manifold network-type supplier relationships (see Figure 2).

My second thesis is that numerous variants of optimization of vertical integration may occur – always depending on the view of the producer (assembler or supplier). It is, however, important that an enterprise has both the options of outsourcing or insourcing, and that at one and the same time.

Division of labour and space development

How can the spatial effects of the new production methods be described? Some holders of the "regulation theory" claim, that a flexible production is accompanied by agglomerations on a large scale. These agglomerations occur in those "geographical connections" that are isolated from older focal points of Fordist mass production (Storper and Scott, 1990). As examples there are a number of well known marvels of settlement or modernization, such as Silicon Valley in California, the City of Science in the south

Figure 1. *SME – subcontractors in the process of reducing vertical integration*

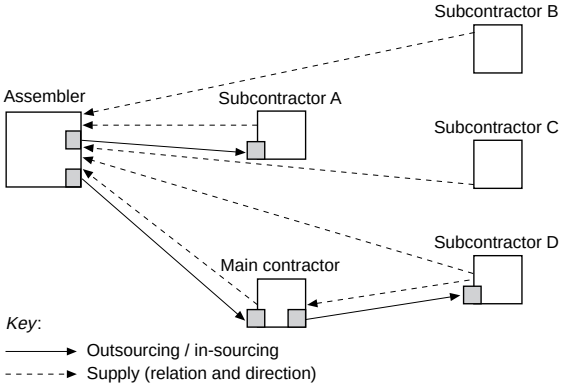
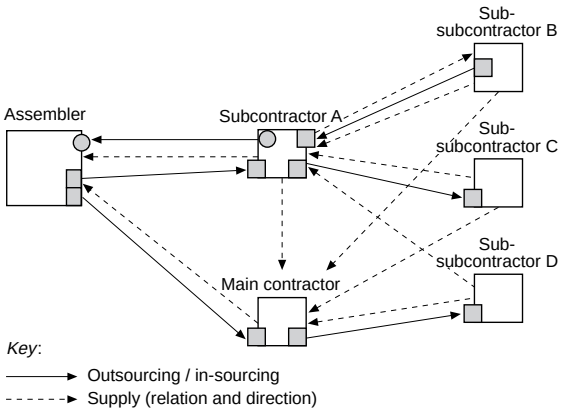


Figure 2. *SME – subcontractors in the process of optimizing vertical integration*



of Paris or the specialized geographical concentrations of the "Third Italy". Agglomerations of functions such as production, trade and services in New York, London, Tokyo and other "global cities" have also increased. And finally, according to this theory, the marginal zones of industrialization moved to the periphery and, thus, created new industrial spaces.

Conclusions as far-reaching as these seem to me to be questionable for two reasons. First the spatial specializations mentioned are nothing new. They have been a part of the spatial agglomeration and depopulation processes since the beginning of industrialization. It was especially because of the conditions of industrial mass production that spaces, often polarized and specialized according to their economic function, came into existence and still exist today. Second, this model cannot be applied to the (old and new) Federal Republic of Germany. The most far-reaching spatial changes in the last decades were effected through causes other than the new production methods. They were, for example, a consequence of a – transitory – shortage of manpower in agglomerations. Among other things, this led to the settlement of numerous industrial branches in peripheral zones. The town of Baunatal with the Volkswagen works in its area, too, profited from this development.

In order to prove the existence of a new spatial allocation pattern it has often been pointed out that the classical location factors have served their purpose and have been replaced by new ones. It is correct that former "hard" location factors (for example accessibility of raw materials) are losing ground in favour of "soft" location factors such as image, cultural facilities or the range of available recreation facilities. But in this competition, too, it is again the peripheral and economically weaker areas that lose out, while the poles of dynamic growth, the industrial areas of old, have long since developed their location advantages. Anyone who is looking for cultural value of a high standard will find it not only in Munich, Frankfurt or

Hamburg, but also in Cologne, Essen, Düsseldorf or Bochum.

My third thesis follows on from the tough nature of spatial structure. It is not possible – in the short term or medium term – to reduce the pressure on mobility and transportation, for example by attempting to reverse the situation in which people live too far from their place of work. This will take generations. Nevertheless, such attempts are of course necessary (see FMRPBUD, 1993). But ways have to be found to, right now, introduce an ecologically-based change of direction on the basis of the existing spatial division of labour.

Regional networks

In order to effect this change, a regional network strategy for the subcontractors would be appropriate. It presupposes a basic flexibility on the part of the subcontractors concerning the innovation of products and processes at given locations. In a recent enquiry on small and medium-sized enterprises, US sociologists have found out that suppliers are indeed flexible enough to adapt to new customers, new products and new processes. "There are a majority of flexible firms in these regions – firms that use computerized technology, perform custom work, innovate and change and adjust products. They are part of an interdependent network of firms that supply job experience, subcontract with each other and buy and sell to each other. But they mainly serve the large firms of this area and of others." (Young *et al.*, 1993, p. 37) It seems to me that this description fits the situation in certain regions of the Federal Republic of Germany.

Most of the small and medium-sized sub-contractors have a broad production mix and a broad technological and qualificatory basis to enable them to react flexibly. Both at EC-level and in most of the states there are, by now, specific programmes for small and medium-sized enterprises which promote the network of SMEs with a view to innovation, technology transfer, quality management and marketing. However, the EC programmes, in particular, contain a fault which is annoying, especially from the point of view of regional economies. In principle, only international projects are promoted. This means that under certain conditions it is easier to establish co-operation between two enterprises in Northern Hesse and the North of Spain than between two neighbouring enterprises, for example in Baunatal and Kassel. Of course, this compulsion towards internationalization also favours transnational transportation. This is exactly the opposite of an ecologically-responsible industrial policy. What we need is a stronger regional network of activities which aims at minimizing the inter-regional supplier network in order to avoid the very economic and ecological nonsense that was demonstrated so clearly by the famous yogurt-beaker study of the Wuppertal Institute for Climate, Environment and Energy (Böge, 1993, see pp. 7-11 of this issue). Figure 3 presents the traditional supplier network with its superfluous needs for transportation through the example of two car- producing locations (in Baden Württemberg and Lower Saxony) and of two supplier regions. Figure 4, on the contrary, makes clear the ecological profit through transportation distances saved. Here, the earlier manifold direct relationships between main-contractors and subcontractors are replaced by

Figure 3. *Traditional supply relationship (subcontractor-assembler)*

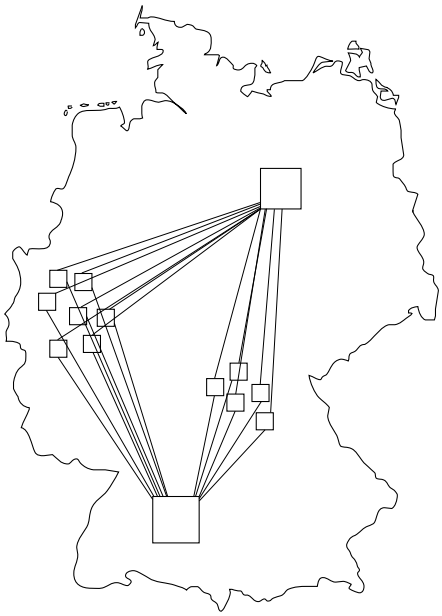
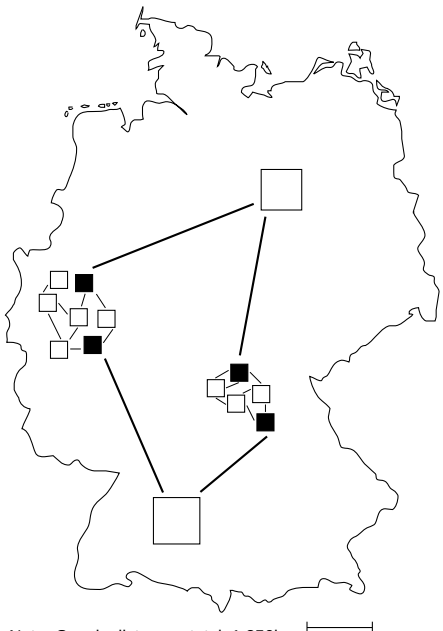


Figure 4. *Supply network – regional co-operation of suppliers*



regional co-operation and subsequent transportation concentration. In this hypothetical case supply, distances are reduced by about 70 per cent.

This concept goes further than the role of the well-known area forwarder. Area forwarders work on the basis of a given regional firm and production structure and they try to rationalize transportation needs within the given framework (see Kaspar, 1993). The idea of regional networks takes all this one step further: the suppliers themselves co-ordinate production both with the customer and with other enterprises operating in the region. Thus, they are able to establish co-operatively more complex supply components within the region.

This leads to my fourth thesis: avoiding and reducing traffic is a task of environmental politics and of ecology not only when the existing freight transportation has to be organized, but also when they come into existence. The realization of this thesis would, however, need close co-operation between loaders, carriers, transportation firms and recipients.

Summary and prospect

The new production methods do not change the fundamental spatial pattern of the industrial division of labour. They do, however, enable a reorganization of industrial production capacities at the given locations. The optimization of the vertical integration does not necessarily increase freight transport because it is connected with the tendency to reduce the number of suppliers. Moreover, a worthwhile reduction in freight transportation can be achieved through enterprises forming alliances for both production and delivery purposes at a regional level. For this purpose, however, it is economic leverage which must be applied (see ECMT, 1994). In the past, as is well known, transport costs as a proportion of the total production costs have steadily diminished. Today they are on average between 3 and 4 per cent.

So my fifth thesis is that it is only a drastic increase in this sector of expenditure, an increase of at least a factor of five, which would effectively reflect economic managerial results as regards the cost of transportation to a worthwhile degree. This would be an essential precondition for motivating enterprises in the direction of transport measures which would be both more economic and more ecological. However, we still have a very long way to go. In the near future the liberalizing of European freight traffic will make the transportation of goods by road even cheaper.

So, in all, the outlook is not good. One can only say, however, that in this case, dangers to the environment do not arise so much from the new methods of production as from failures in ecological and transport policy on the part of the political decision makers at both national and international level. It is here – in the area of politics and policy making – that we must begin to change direction, and we must do so immediately.

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Violence and the car

Helmut Holzapfel

The consequences of road violence have largely been ignored

"A powdery layer of lime dust lay 5cm deep on the road in the Piave valley. George and I raced along it at full throttle. A vast plume swelled out behind us. We terrorised the pedestrians; it was like making a gas attack; their faces contorted and we left them behind us in a world without shape and where field and tree for miles around lost all their colour under a dry carpet of dust." This is Rudolf Diesel's almost euphoric description in his diary in 1905 of a deliberate abuse of humanity by a car (see Sachs, 1992, p. 26).

Nowadays the average German motorist has far more motorpower at his/her disposal than in Rudolf Diesel's time, actually more than 80 horsepower. This continues to increase in an unprecedented process of motorized rearmament. Taking this horsepower literally, every person in the world could ride on the horses installed in German cars alone. Twenty years ago it was only at motor races that you saw such dangerously close distances between cars and such high speeds as are now seen on German motorways. Since 1981 the percentage of 0.5 second gaps between overtaking cars in the fast lanes has risen by one-third to 6 per cent of all cars (according to established precedents even gaps of 8 seconds carry a definite risk).

The term *violence* should be used carefully. Many people drive their cars intending no harm. But automobile driving, in its existing form, is anything but a rational phenomenon with the purpose of getting from A to B: cars designed for speeds at which they hardly ever travel, European cities ripe for good pedestrian development relinquishing their urban charm to chunks of metal – the hallmarks of the car-centred society are all too conspicuous, and its uses by no means compensate for them. The negative influences of the car-centred society are enormous. Indeed car technology resembles no other, not even the technology of war, in the destructive influences it has so far inflicted.

Since the Second World War, more than half-a-million people have been killed on the streets of Germany alone, and the number of animals killed is even higher. The thousands of paralysed and severely brain-damaged represent only the tip of the iceberg of the non-fatal accidents.

The psychological consequences of this regime of automated brutality remain completely neglected. There is a total dearth of analytical studies, apart from some of a more theoretical nature, about how children suffer as victims and what the long-term effects on their lives are. The very fear of an accident is changing children's lives dramatically. In the 1950s, I had total freedom to roam around my home territory without constant parental supervision and could even go to the shops unaccompanied before the age of six. By comparison, the independent domain of children today is limited to their own house, their garden or the child seat in the back of the car. Finding friends by yourself, making new acquaintances – all these are now things organized by parents. The (quite justified) fear of injury from cars (you only need to look at some old urban photos) has driven children away from the streets they once ruled. The reasons for the denial of this state of affairs, within societies unwilling to forfeit even the slightest part of the so-called freedom of the car (which in reality is freedom to be aggressive), never cease to confound the experts or the people who witness the daily suffering (such as casualty doctors). The *Verein demokratischer Ärzte und Ärztinnen* (Union of Democratic Physicians) has criticized the massive "suppression and tabooing" of this subject in Germany; and in the German Medical Council there is a growing number of doctors who are demanding that a determined stance be taken.

Psychology has explanations for aggressive and suppressive behaviour in individuals. The well-known

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World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 41-44

psychoanalyst Arno Gruen associates destructiveness with the self-hatred arising out of the surrender of the self to parental and societal demands for obedience and conformity. The psychoanalyst Hilgers talks about a dehumanization of the car driver (see Hilgers, 1991) and he likewise links questions of autonomy and self-development with aggressive behaviour when driving cars. It is reasonable to suppose that not all people are equally aggressive, but that there are certain members of the population who have a particular predisposition towards violence.

There are some strikingly obvious characteristics associated with motorized transport: almost ten times as many men as women are convicted of dangerous driving offences and the difference is nowhere near accounted for by lower levels of car use nor alleged discriminatory treatment by the police and law courts. Those studying the psychology of driving have often had to give up in the search for the "typical" offender: if the probability of being caught breaking the law is about 1:600 (as mentioned by Bastian, 1991, p. 543), then the probability of being caught a second time is 1:360,000. Nevertheless the latest data on traffic offenders in Germany reveal that one-third of all previously convicted "speeders" offend more than once, and that, again, men are repeaters much more often than women.

There is a particular type of person who indulges in motorized violence□

There is plenty of evidence that there is a particular type of person who indulges in this motorized violence. It is not empirically proven, but there are cogent reasons to suppose that these are people who are also more inclined to behave violently in other areas of their lives. The development of a political car-activist group in Switzerland demonstrates this very clearly. This group, which campaigned aggressively against any restriction on speed and whose members were noted for their similarly aggressive driving, turned quite imperceptibly into an organization which campaigned against foreigners. Evidence of this nature reinforces the close connection between fascist and authoritarian movements and the car. One of Hitler's first political acts as chancellor was to abolish all speed limits – he had a passion for car racing.

But caution is necessary: not all speeders are radical rightwingers and certainly their personality development patterns are varied. But a good proportion of speeders seems composed of conformists who either want to compensate for their lack of authority in other areas by asserting themselves on the street, or who wish to stand out from the crowd because they lack power elsewhere. It is therefore a fallacy to think that if you deprive the potentially aggressive individual of the car with which these compulsions are "worked out", then he/she will simply resort to another "form of aggression". The possibility of "working out" his/her aggression is intimately linked to his/her access to cars. The implications of this are often ignored, for there is hardly anything more dangerous than racing through a neighbourhood with a one to two-ton motorcar. In effect we have made the automobile into a camouflaged means of expression of violence for potentially violent people.

In this article I will consider whether the expression of violent inclinations by means of the car reduces aggression or actually increases it.

Motorization as a system – or how aggression is increasing

It is hardly a matter of dispute any more that motorized transport is a field in which people, especially men, release their aggression. It is a form of aggression that generates destruction in great measure for the simple reason that, although human strength is used, it is enormously amplified by a machine. The hypothesis that this process eliminates or "works off", as it were, this aggression, proves to be scarcely tenable on closer inspection. The fact is, as mentioned above, that a greater part of the speeders keep on speeding even after being caught. This demonstrates that the perpetrators do not "burn it out" of their systems but rather continue to "burn". Indeed there is every reason to believe that for such people it becomes necessary to *increase* risk-taking in order to suppress the feelings of guilt that each act of violence generates.

A simple look at the facts shows – and here the car industry is making a decided, though unacknowledged contribution to the problem – that the amount of aggression on the streets has increased enormously in the last 20 years. Today's model of an Opel Astra achieves a road performance which, 25 years ago, only a Porsche could manage, and there is little doubt that many drivers take advantage of it. Above all, the car industry collaborates in the psychological denial of this by justifying such performance in advertising campaigns as "sporty" or "sensational".

Closer consideration indicates that fast drivers do not dispel their aggression by means of this behaviour at all. Rather it turns out that an even further increase in aggressive behaviour results from competition with other

drivers. There has been far too little attention paid to a study in this context by TÜV Rheinland for the German Traffic Safety Advisory Body (DVR) (both the "Technical Monitoring Association (TÜV)" and the "Traffic Safety Service" are institutions in Germany which usually work closely with the car industry); the study is given out only reluctantly and with severe restrictions. They say among other things, that the sample population is too small and that therefore the investigation allows no conclusions to be drawn. The analysis of TÜV Rheinland, entitled "Survey of Motives for Choice of Speed with Special Consideration of the Competitive Aspect" clearly shows, however, that we are here witnessing a process of constant build up of aggression on German highways. The fast drivers, the TÜV analysis clearly shows, arouse very strong feelings of fear and hatred, particularly in those people who cannot or will not drive as fast in their own car. Anyone who observes motorway traffic can see that these people do show aggressive reactions even though they themselves actually only wanted to drive slowly. Given that these reactions are primarily directed against fast drivers, we must consider, that these people at the same time suffer from a generalized intensification of their aggressive feelings as well.

The whole motorway system will eventually lead not to less, but more stress and potentially more violence for all concerned. This process is harmful to the whole of society. Yet it still gains support because German highways in particular, represent a legal free-for-all in many people's minds. It is repeatedly emphasized, in accordance with the current legal situation, that high speeds are permitted (and this is by no means wrong). Many drivers interpret this as a licence to drive as fast as possible. According to the TÜV study, the fast drivers simply see the slow ones as a hindrance and a limitation to their rights. The TÜV study, comes to the undeniable conclusion that "in the heads of many road users a combative spirit evolves which manifests itself in appropriately aggressive modes of behaviour".

In connection with this I am grateful to Arno Gruen for the reference to an American study which shows that aggressive people drive faster and take more risks when they feel they have a justification for doing so. In the case of this study their "justifications" were placebos which allegedly contained alcohol – that is, driving behaviour was monitored after drivers had been given what they were told was alcohol but was actually a placebo with no alcohol at all. Believing that they had drunk alcohol gave them "permission" to drive recklessly, since now they could not be considered responsible for their actions (De Angelis, 1991).

The advertisements put out by the car industry support just such self justifications; they speak of an extremely high degree of safety and of cars which feel "like they're running on rails". They persuade the driver, by a barrage of technical details, that fast driving is not dangerous at all. Likewise some politicians contribute to this vindication when they themselves drive very fast and ignore the speed limits. A little-noted study was made by the journal *Tempo* in which its editors drove along behind the cars of selected politicians. They were able to show that these politicians drove at speeds considerably above the limit – behaviour which could have cost any ordinary person their driving licence. It is quite obvious that such politicians are not likely to support a proposal limiting speed and curtailing aggressive driving behaviour.

Against this background, the atmosphere of violence is increasing and not just among car drivers but between drivers, pedestrians and cyclists too. Newspapers carry mounting reports of fights escalating to stabbing and other acts of brutality. In this sort of trouble the car driver clearly has the advantage over other more vulnerable road users – at least as long as he/she is sitting behind the steering wheel.

How a technological system can generate violence

The general climate of aggression is also a function of among other things, the visual ugliness associated elements with the whole complex of driving. Urban motorways, acres of asphalt, urban development on an inhuman scale – perhaps these were once welcomed at the beginning of the 1930s, indeed some people considered the stretches of asphalt as fantastic works of art; nowadays however, we know that an environment like this feels threatening to human beings and thus generates feelings of danger. The Berlin planner, Petra Rau highlights the very real dangers to women in this context, and attempts to address the so-called "spaces of fear" of today's urban planning. Of course the brutality of modern town planning is not only the result of accommodating the car, but that accomodation does contribute considerably to the way in which a city is structured. Other effects of the car, such as the grossly intrusive noise of traffic, are to blame for the dwindling opportunities for interaction on the streets and likewise for the lack of empathy between human beings. Several research projects have individually concluded that people exposed to high levels of noise are less prepared to help one another and that the human values become submerged. The impact of our town planners' work, and especially that of our traffic planners, has long remained unscrutinized, or at least relegated to a position of peripheral importance. Bearing this in mind, it is extremely interesting to note, that the vast majority of people who plan our cities, and especially our roads, are men (as shown by Reutter, 1987).

Despite all protestations to the contrary, the automobile-based society is spreading further and further; along with the ever-growing number of cars is an increase in the

hunks of metal standing around the towns. This further promotes a general ugliness and inhumanity.

Car traffic makes a not insignificant contribution to the aggregation, as it were, of aggression within the built-up structures of our cities, and in this manner pervades human life (Petra Rau (1991) calls it structural violence). Little research has been done as to the implications of this for bringing up children, as mentioned earlier. We have already observed that, because of the car, children seldom range the full extent of their home territory, and especially not alone. Having said that, the question arises of whether they can feel comfortable at all in these surroundings. Reclaiming diversity, more space for adventure are in fact slogans bandied about by planners these days. But such endeavour frequently flounder because of the car. The kind of town one could enjoy for its human dimensions will never exist until cars are banned.

Conclusion

Everything points to an increase in violence brought about by the car. Indeed there are clear signs of a self-perpetuating process operating, which fuels itself. Even quite against their will, people are affected by this process and drawn into it. The only way out of this situation is first, a simple admission of the situation and the misery it is spreading. Admittedly it goes against the grain: a gleaming car in an advertisement is a far more attractive proposition than facing the hospitals where brain-damaged children from traffic accidents try to make sense of the world. By recognizing misery such as this, a process must emerge whereby people can be empowered to make the ultimate sacrifice and to live with fewer cars.

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Living without a car

Michael Glotz-Richter

Current attempts to reduce traffic are not proving to be effective

The predominance of the motor car as a means of transport is meeting with more and more criticism. Pollution, traffic accidents, and the overcrowding of the street as an urban space, which has led to cars obstructing even themselves, all contribute to the declining attractiveness of cars. In addition to a whole catalogue of measures designed to favour public transport, the bicycle and pedestrian, consideration is also being given to ways of avoiding motor traffic "at source".

It has been recognized that obstructive measures – such as "calming" traffic by narrowing streets or installing sleeping policemen – can only provide partial solutions in specific situations. They will do nothing to reduce the overall volume of motorized traffic. Since the mid-1980s, thoughts have turned to ways of making the car superfluous. The "car-free" estate, in which the us of cars is the exception rather than the rule, could provide such a new approach to urban planning. It attempts to integrate various ideas into one settlement policy.

Michael Glotz-Richter, from the Senat Administration for Environmental Protection and Urban Development of the City of Bremen, presents as an example the "Hollerland" project. The idea of a car-free estate arose from the space requirements of moving and parked cars. "Almost a quarter of the entire estate, which covers an area of 2.6 hectares, can be used for other purposes if we do without most parking space", Glotz-Richter explains. In the light of this positive ecological and economic balance he wants to direct the discussion to the quality of life offered by car-free urban settlements, which allow higher housing densities but which are nevertheless greener and friendlier for the inhabitants. "The car-free estate is not a project for social minorities; it meets the needs of many people who want to live in attractive conditions in the city."

In his introduction, Hermann Seiberth, director of the European Academy of the Urban Environment, drew attention to the signs indicating a change of priorities in favour of a new quality of life in towns and cities. Urban planning and transport policies must place more emphasis on regaining urbanity, with the road as a public space which can be used in a variety of ways by both adults and children. "It is by no means just a matter of reducing levels of pollution" (Hermann Seiberth).

The discussion of car-free settlements is therefore aimed at encouraging the rational use of the car as one form of transport. "We don't need a car in front of every door, because that only tempts people to use them", explains Glotz-Richter. A long-term survey by the research group "socialdata" has shown that, on average, each car is used for 392 trips every year for which alternatives could have been used. A key element of rational policies lies without doubt in reducing the use of cars – ensuring the mobility of all social groups.

Unmovable assets

Of course, the planners of Bremen-Hollerland are well aware that a dogmatic ban on all cars would be no solution. True, the new tenants moving to the estate do usually have to undertake to do without a car of their own. But car-sharing schemes are planned, and a car-pool will be available when needed. This will involve 30 parking spaces, compared with the 200 otherwise required for such a housing project. Whereas 40 per cent of the road space is usually required for parking space, this can be reduced in Hollerland to about 17 per cent.

In Bremen, they emphasize that they are doing much more than solving the problem of parking spaces. The Hollerland estate is primarily a housing project, not a traffic project, as Glotz-Richter puts it. The City of

World Transport Policy & Practice, Vol. 1 No. 1, 1995, pp. 45-47

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Bremen is not alone in treading this new path. Similar ideas are being considered all over Europe, including in Berlin. Two proposals for car-free settlements in Berlin were presented during the discussion, and there are plans to establish an "Association of car-free cities" in Amsterdam in Spring 1994.

One car-free Hollerland settlement will not make Bremen a car-free city. But from the point of view of urban development, it opens up new perspectives in many towns and cities for the planning of peripheral settlements. After the demise of the purely residential commuter settlement as a model, the innovative qualities of the car-free approach fit in with the new paradigm of the urban mix, and suggest practical steps towards this goal. If an area is to be "car-free", then housing, work and recreation must all be close together, in order to avoid the ebb and flow of commuters. The automotive city has reached its economical, ecological, and spatial limits – a fact which is becoming more and more widely apparent. This is an issue whose time has come.

Long before its realization, the vision of a fully-motorized society has proved itself to be nothing more than a chimera. The idea of a car-free settlement can no longer be swept aside as the pipe-dream of a few outsiders. Glotz-Richter can produce a few surprising statistics. Contrary to most people's expectations, for example, nearly 30 per cent of west German households do not own a car. The figure rises in the cities to as much as 35 per cent in Bremen or even 40 per cent in Berlin. He concludes that there most certainly is a market for car-free housing. A recent survey has shown that 75 per cent of those who have registered their interest in the Hollerland project already no longer own a car.

The willingness to switch to other modes of transport (thus reducing private traffic) also depends, of course, on the quality of these alternatives. At the same time, however, the creation of a new quality of housing is both directly and indirectly dependent on a reduction in motorized traffic, allowing an increase in open spaces through a reduction in parking space, and returning the street to more general use. Glotz-Richter sees the function of housing as making people feel at home, "And we think that our example is attracting support". It seems that the problem motor car can best be solved in the neighbourhood. The problems of air and noise pollution, the dangers to children and old people in particular are exposed, the high costs for new housing and the car's dominance of public spaces are placed in a new context. "But it isn't our intention to exclude cars from the settlement and then offer parking space all around it", emphasizes Glotz-Richter. The undertaking to refrain from using a car is made in exchange for the increased quality of life in a settlement free from cars. Is this model too good to be true?

The problems

"There are considerable problems to be overcome on the way to a car-free settlement." For example there is the question of whether a tenant can legally be obliged not to own a car. A thorough study of the legal situation has established that this is possible on the basis of a voluntary obligation. There are also administrative obstacles to be overcome. "The biggest problem is laying the ghost of the Reich Garage Code of 1939", complains Glotz-Richter. This first laid down the principle of obligatory garage space, which is still found in Land Building Codes throughout Germany. The example of Bremen, however, has shown how this obligation to provide garaging can be overcome.

Underground parking provisions are scarcely affordable these days □

Apart from its ecological sustainability, an essential factor influencing the implementation of the car-free settlement is its economic advantages. Underground parking provisions are scarcely affordable these days, at least as far as publicly assisted housing is concerned. Parking spaces at ground level eat up land, and are a significant cost factor. Reducing parking provisions in Bremen-Hollerland has meant savings of more than DM3 million. This means that rents and house prices can be reduced, or that the building standards can be improved from a biological point of view. Either way, the money is not left just lying in the road. "These economic factors have considerably raised the acceptability of the proposals", reports Glotz-Richter. Planning has already begun on a second project in Bremen. There are thus ecological and economic arguments in favour of the car-free settlement, but the big gain is in the quality of life.

Pre-conditions

There are certain requirements which the site for a car-free settlement must meet. For example, there must be a good public-transport link to the centre of the town or city, and local recreational areas, shopping facilities and workplaces must be within easy reach. The estate should be linked to an urban bikeway system, and infrastructure provisions should be above average, corresponding to the higher residential density which is possible. Appropriate provisions are necessary to increase the attractiveness of public open spaces, and this aspect should form an independent element of the planning. It is beneficial if the area has a high recreational potential, whereas the

Plate 1. *An example of a car-free settlement*

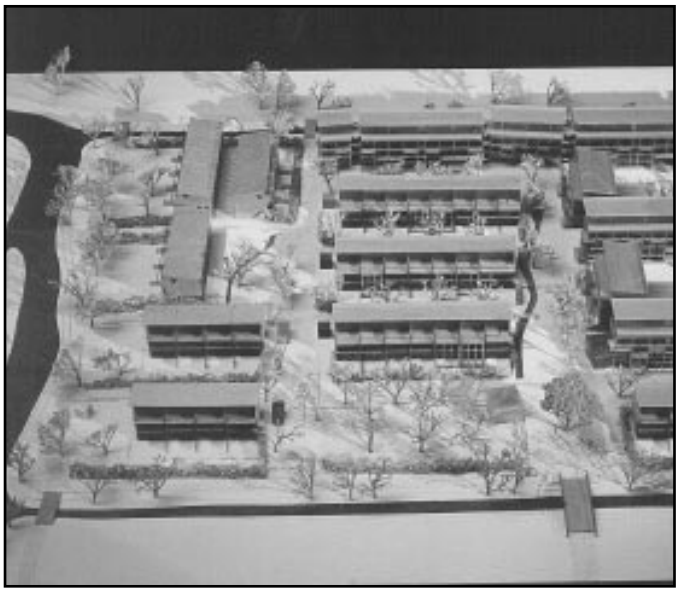

Plate 2. *The car-free settlement is aimed at making people feel at home*

proximity to sources of pollution such as a motorway or a traffic artery does little to improve the motivation of car-free tenants. The same is true of through-traffic, which should be excluded. The appeal of the car-free settlement can be increased by providing facilities for cyclists (bike-stands, etc.), but also by organizing car-sharing schemes. The project in Bremen-Hollerland meets all these requirements, and the success of the project seems to be guaranteed. Future projects can use these model conditions as a guide, adapting them to suit the specific site in question.

Glotz-Richter sees three essential aspects for the success of car-free settlements:

(1) Parking space should be evaluated as an economic asset.

(2) The obligation to provide parking spaces should be removed from the planning regulations (in Germany the Land Building Code).

(3) Model projects should be subsidized.

Above all, it is important that the appeal of car-free estates is recognized. They are not concerned with just providing dwellings, and certainly not roads, they are projects aimed at providing a place where people can "feel at home". The quality of life which they provide will become the benchmark for future urban development.

Project Hollerland

The car-free settlement Bremen-Hollerland has been in the detailed planning stage since 1993. The aim is to have completed 250 housing units by 1996, mostly apartments. The project "Living without Cars" was born in seminars at Bremen University. An enquiry in the press in June 1992 produced considerable resonance in the media, with over 300 enquiries from prospective householders.

The political climate at the time favoured such a development and the administration was open to innovations. A housing organization which administered an area under consideration (GEWOBAG) remained sceptical at first, but came around as administrative barriers were removed and the extent of interest became apparent.

A question mark still remained over the legality of a ban on car ownership, but in a study of the problem, Professor Peter Derleder (Bremen University) concluded in Autumn 1993: "in both rental contracts and purchase contracts, effective clauses (can be included) which bind residents of a settlement to go without motor cars within reasonable limits".

The details of the project have now been worked out in meetings and workshops, the planning framework has been negotiated, and the site was finalized in August 1993. The media continue to show unexpectedly keen interest. Building is due to begin in 1995.

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