

World Transport Policy & Practice

ISSN 1352-7614

Volume 6, Number 2, 2000

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ISSN 1352-7614

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Sustainably Distributed? An environmental critique of the UK Government's 1999 White Paper on Distribution

Francis M Vanek

The recent UK Government White Paper entitled "Sustainable Distribution: A Strategy" is reviewed from the perspective of achieving sustainability. After highlighting the content of the strategy which pertains to reducing environmental impact, two shortcomings are identified and discussed: (1) the lack of a long-term strategy for reducing environmental impact, and (2) the failure to address spatial spreading of freight transport patterns. Additional long-term policy measures and an expanded list of sustainability indicators are then proposed.

Keywords: air quality, CO₂ emissions, distribution, energy efficiency, freight transport, sustainability

Mobility & Accessibility: the yin & yang of planning

William Ross

The concepts 'accessibility' and 'mobility' are central to urban and transport planning, and although they are often used interchangeably, they convey fundamentally different concepts. For example, mobility, especially when excessive, can have a negative connotation, whereas accessibility is always seen as making a positive contribution to a community. In investigating the relationship between mobility and accessibility it emerges that planning policies which favour the one, act against the other, and the two can be seen as opposites.

Keywords: accessibility, choice, indicators, mobility, planning,

The Vasco da Gama Bridge on the Tagus Estuary: A paradigm of bad decision making, but good post-evaluation

João Joanaz de Melo

The Vasco da Gama bridge over the Tagus Estuary was one of the most polemic projects ever built in Portugal and indeed in the European Union. Benefiting from significant funding from the Cohesion Fund, the project failed to uphold its main declared objectives (decongesting the old bridge and providing a north-south link around Lisbon), and its location was the worst of three alternatives regarding land management, nature conservation, transportation system and cost. It was nevertheless forwarded by the will of the very powerful Portuguese Ministry of Public Works (against opinions of almost everybody else), aided by the unwillingness of the European Commission to withdraw financing. However, the

public outrage raised around the project both in Portugal and in Europe, not only for the sloppy decision but also for illegal impacts during construction, led to several stringent control and compensatory measures, unprecedented in Portugal and rare in Europe.

Keywords: Cohesion Fund, Environmental Impact Assessment, European Union, Lisbon, NGO, Tagus Estuary.

Pedestrian priority planning principles

John Seaton

Despite the good intentions of all involved in the planning, design and development of transportation infrastructure, it has generated problems. Some have contributed to international concerns about environment, health and sustainability. Others generate significant negative impacts and impose tremendous costs on communities.

In the context of transportation, the significance of the interaction between facility users and the site, space, speed and surface characteristics of the particular facility cannot be over-stated. The respective influences of these criteria are paramount to the safety outcomes of all users.

Australia has adopted the movement of people and goods in lieu of vehicles as the fundamental transport infrastructure design/development criterion. Its support and implementation will require planning that considers all criteria and characteristics in a manner somewhat different to that adopted in the past. If it doesn't, nothing will change.

Keywords: Pedestrians, planning, site, space, speed, surface.

Let's Bike – The 10 Point Pedalling Action Programme to support cycling

Ulrike Huwer

At the 11th VeloCity Conference in Graz and Maribor, in April 1999, experts, lobbyists and users from all over the world exchanged their experiences and developed ideas. As the potential of cycling has not been exhausted in any country, a 10 Point Pedalling Action Programme was devised. It includes basic requirements for the greater promotion of the bicycle in policy development and society. Image and use of the bicycle must be improved and necessary infrastructure must be provided.

Keywords: Bicycle, cycling, infrastructure, planning, VeloCity

It is now quite clear that the UK Government has completely lost the plot in its attempts to deal with traffic and transport problems. It has rejected traffic reduction targets after initially agreeing to them, it has rejected lower speed limits on rural roads and through villages and it is now devoting its efforts to making the purchase price of new cars lower. As if this wasn't enough to signal a major political withdrawal from the electorally difficult territory of reducing our dependence on the car the Government has now refused to become involved in the European Car-Free Day planned for 22nd September this year. It takes the view that this is essentially a local matter and must be decided by individual towns and cities.

This re-positioning of a Government that was elected in 1997 with one of the biggest majorities in parliament ever seen in the UK is full of lessons for the world of transport policy. The UK has no shortage of good ideas about how to solve transport problems. The history of exceptionally innovative traffic analysis and understanding is peppered with the work of Smeed, Buchanan, Mogridge, Roberts, Adams, Hillman and others; all of whom have shown that it is not possible to have our cake and eat it in terms of ever-rising rates of car ownership and use and ensuring that towns and cities are livable and desirable. This wealth of intelligence has had to come to terms with the political realities which in the main lean in the direction of more cars, more use of cars and a staggering underestimation of the damaging consequences of this auto-centred approach.

The main lesson to be drawn from this history is a hard one. Progress does not come from clear, articulate analysis. The Government knows about the health impacts of traffic, the rapidly escalating problems of climate change and the impossibility of paying for and maintaining transport infrastructure up to the task of 100% car ownership, car parking requirements and use of cars for every trip greater than 50 metres. It knows that new roads do not solve traffic congestion problems and do not bring about the economic miracle that is supposed to follow a new road. It knows that poor people suffer more from appalling noise, air quality and traffic danger environments than do rich people. Contemporary highly paid professionals are

just as adept at escaping from the highly unpleasant world of traffic (which they create) as were their Victorian predecessors in escaping the dark, satanic mills (which they created). We have an overload of information and a deficit of backbone to do anything about it.

There is a glimmer of light in what is going on elsewhere in Europe. The enthusiastic application of car-free days in France and Italy is certainly not a fully packaged transport solution but it is showing millions of people the kind of world that normally doesn't even begin to penetrate the consciousness of those locked into car dependency. This is the sadness of the UK's thoughtless denial of 22nd September. Car dependency is a psychological problem and the start of any solution has to be the growing awareness that things could be better if there were fewer cars around or if ordinary, everyday journeys could be made by an alternative to the car. The main positive lesson of the dreary history of traffic and transport policy in Britain in the last 50 years is that we have to find ways to show that there is a huge improvement in health, quality of life, sociability and neighbourliness just around the corner and it is there to be liberated if only we can put the genie back in the bottle and get on with a life that celebrates the joy of human contact, the richness of public space and the pleasure of being freed from servicing the metal box that offers so much and yet delivers so little.

Writing in 1933 in *Street Traffic Flow* (p. 375) Henry Watson concluded his analysis with:

'In the future the central areas of great cities will be closed to private vehicles of limited utility...'

Almost 70 years later we are still waiting. I wonder what Henry Watson would have made of our craven inability even to think of one car free day in a year.

John Whitelegg

Editor

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Reference

Watson, H (1933) *Street Traffic Flow* Chapman & Hall, London

Sustainably Distributed? An environmental critique of the UK Government's 1999 White Paper on Distribution

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Abstract

The recent UK Government White Paper entitled "Sustainable Distribution: A Strategy" is reviewed from the perspective of achieving sustainability. After highlighting the content of the strategy which pertains to reducing environmental impact, two shortcomings are identified and discussed: (1) the lack of a long-term strategy for reducing environmental impact, and (2) the failure to address spatial spreading of freight transport patterns. Additional long-term policy measures and an expanded list of sustainability indicators are then proposed.

Keywords

air quality, CO₂ emissions, distribution, energy efficiency, freight transport, sustainability

Introduction

The UK, like most other industrialised nations, faces mounting pressures on its transport system. Issues ranging from congestion to air quality and climate change pose a difficult challenge to the movement of both passengers and goods. Efforts aimed at developing policy to address these issues have, in response, been forthcoming in a steady stream. One milestone in this process was the publication in 1998 of the Transport White Paper, 'A New Deal for Transport: Better for Everyone' (DETR, 1998a). Although this document mentioned issues in freight transport, its main emphasis was on the passenger side, and an additional document addressing freight and related distribution issues was promised at the time.

The promise was made good in April 1999 with a second White Paper, entitled 'Sustainable Distribution: A Strategy (DETR, 1999) (Hereafter referred to as 'the White Paper'). The White Paper takes a 'supply chain' approach to the distribution function, which encompasses the movement of products from raw material to processing to retail sale, the requirements for moving and storing product as it passes along this chain, and the relationships between the multiple firms involved in the process.

Such an approach is eminently sensible, as without consideration of the broader production and distribution system, opportunities for reducing the environmental impact of the movement of goods are limited.

While the goals of the White Paper are very positive and the approach prudent, I will argue here that the document falls short of a comprehensive strategy for achieving a distribution system which is truly sustainable. In response to the shortcomings identified, an expanded list of both long-term policy options and sustainability indicators is advanced. A note should also be made regarding the scope of my analysis. Generally, the manufacturing process itself is not included in the supply chain view of distribution. Therefore, the main contributor to environmental impact from the remaining activities is the freight transport component, which forms the main focus of this paper.

Background on Environmental Considerations in the White Paper

The White Paper takes as a basis the World Commission on Environment and Development's definition of sustainable development, namely 'a pattern of economic development which provides for the population of today without compromising the position of future generations' (WCED, 1987, as quoted in Wallner *et al.*, 1995). The three elements of sustainability commonly used are then adopted – economic, environmental, and societal sustainability – and the relationship to distribution strategy is discussed.

The pursuit of environmental goals is thus not the only objective of the Sustainable Distribution initiative, but this aspect does occupy much of the content of the White Paper. Environmental impact reduction measures are divided into three main categories: intermodal integration to encourage modal shifting, improved operation within modes, and better law enforcement. These are briefly described here.

For the first point, the White Paper identifies the current imbalance between modes as a potential source of improvement: while road freight incurs ever increasing tonne-kilometres, the rail and water modes have freight transport capacity available for immediate use. A policy of encouraging intermodal integration is then discussed, including investments in key interchange facilities, such as the Daventry International Railfreight Terminal.

The White Paper also proposes improvements within the road freight mode to complement increased use of rail and water. The introduction of a new generation of clean vehicles is envisioned along with more efficient use of existing vehicles and improved driver training.

As a final component, enforcement of both driving and maintenance standards is put forth as a way of achieving environmental savings while simultaneously protecting the public. Despite improvements in this area in recent years, significant numbers of vehicles operate below existing standards, leading to excessive fuel consumption and emissions, among other things. In response, the White Paper proposes more effective enforcement to reduce the total percentage of violators.

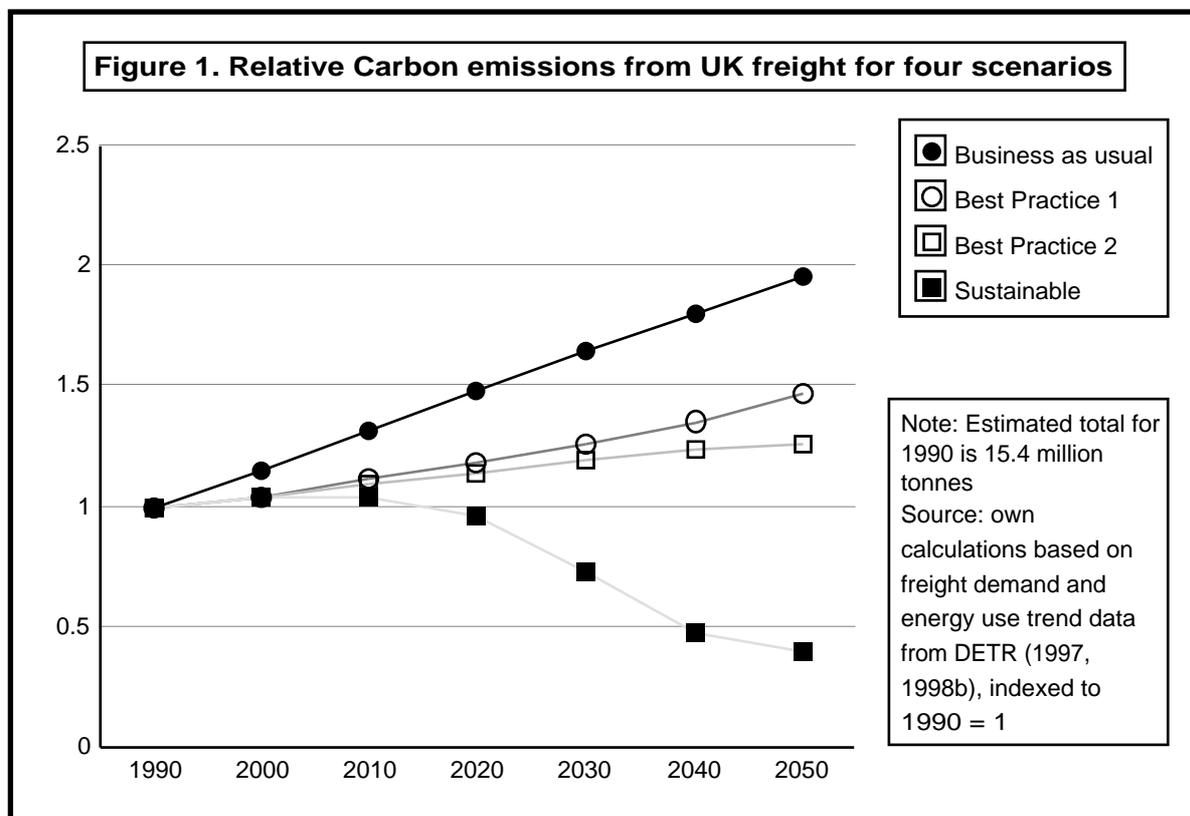
In its concluding passages, the White Paper emphasises the importance of having quantifiable indicators to measure progress toward these goals,

though only two are proposed: total tonne-km per unit of GDP, and road tonne-km per unit of GDP. Possible expansion of this list of indicators is discussed below.

Problems with the use of the term 'sustainable'

The environmental elements of the distribution plan discussed in the previous section provide a reasonable environmental policy that, if fully implemented, would lead to a large reduction in the environmental impact of distribution. Problems arise, however, when one takes into account the long-term environmental implications of adopting sustainability as a goal for distribution.

Here it is useful to focus on a particular aspect of sustainability; I will take up Carbon emissions. The White Paper promises to contribute, if possible, to the 12% reduction against 1990 levels called for in the Kyoto convention, and the more ambitious 20% target set by Government (though exact numerical targets are not presented). However, these are only interim targets on the way toward reducing the emissions rate to a level that would stabilise the atmospheric concentration of CO₂. For stabilisation, these emissions would need to fall by 60-80% for the UK, on the basis of current emissions rate and fraction of world population. Also, since no agreement has yet been reached about how different sectors should contribute to long-term Carbon reductions, a 'fair



share' policy (Dings *et al.*, 1998) provides a reasonable starting point: each sector contributes 60-80% so as to reach the overall target (The possibility of trading between sectors is discussed below).

While the approach advocated in the White Paper can make a non-trivial contribution to reducing Carbon emissions, a wide 'policy gap' remains between the available reductions and the stabilisation target. To illustrate this point, possible emissions trends out to the year 2050 under different scenarios are presented in Figure 1. In the figure, the business-as-usual scenario assumes freight tonne-km increasing in line with the projected linear growth of the economy, and furthermore, no improvements in efficiency, so that energy use in freight would experience linear growth as well. The two 'best practice' curves assume the same trend in tonne-km, but varying rates of improvement in energy efficiency. Specifically, Best Practice 1 assumes that energy efficiency of freight improves, albeit at a declining rate, while Best Practice 2 assumes that the rate of improvement accelerates gradually over time. Lastly, the Carbon Stabilisation curve follows the best practice curve up to the year 2010, and thereafter show steep reduction to an eventual 40% of 1990 levels as additional measures are brought to bear alongside the best practice ones.

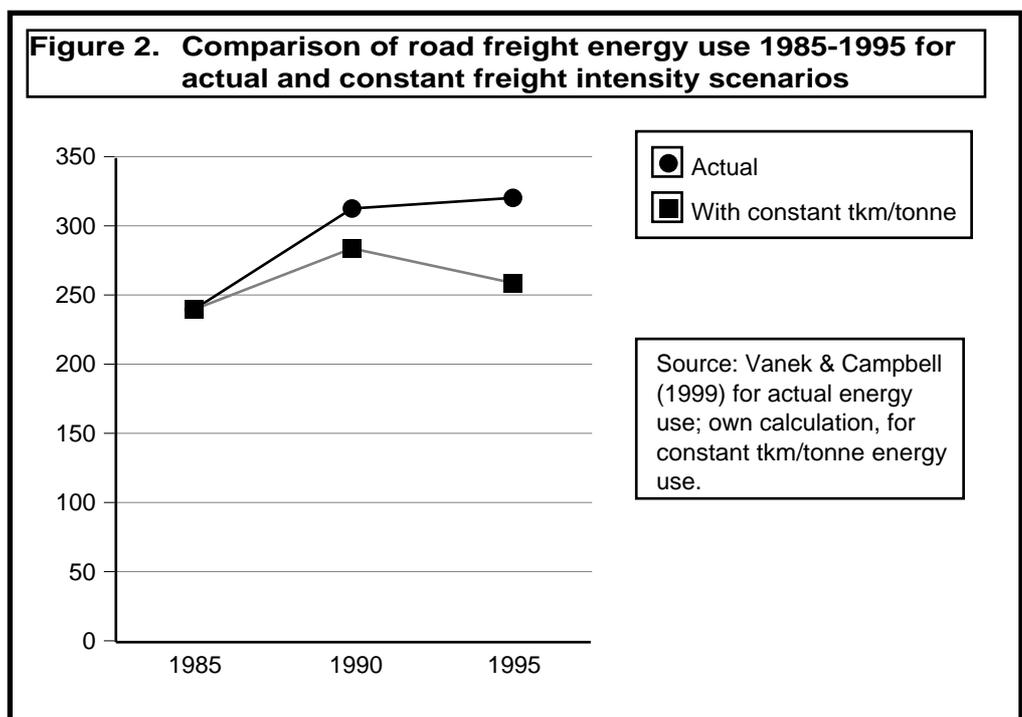
The problem with the White Paper is that it does not address the long-term requirements (over a timespan of 50 years or so, as in Figure 1) for a sustainable rate of Carbon emissions, and hence does not find a place to address any measures to be taken, beyond the best practice and intermodal integration policies suggested. Indeed, it makes no attempt to estimate what level of savings might be possible from the included measures, although it seems certain that they will not achieve the reductions envisioned in the Carbon stabilisation scenario. Realistically, neither the potential savings available from best practice nor the long-term strategy for reducing

environmental impact to a sustainable level can be described in detail at this point, given the current state of the research. However, there should appear somewhere in the White Paper a preliminary estimate of the potential savings and remaining policy gap, or at least recognition of the long-term goals for Carbon reduction.

Issues related to spatial spreading and total freight tonnage requirement

One way the White Paper can expand the range of options available for making freight more environmentally sustainable is to expand the debate to include other drivers of the growth of environmental impact. Here one inevitably comes up against the growing intensity of freight, measured in terms of average tonne-kilometres per tonne lifted in the system. While growth in tonnes lifted has been modest in recent years, growth in freight intensity has been rapid, leading to substantial growth in tonne-kilometres overall. This growth in turn puts upward pressure, *ceteris paribus*, on total ecological pressure.

The effect of increasing freight intensity can be observed by reviewing trends in the UK road freight sector – which accounts for 88% of the total freight energy use (Vanek & Campbell, 1999). Between 1985 and 1995, intensity measured in tkm/tonne lifted grew by 24%, while total tonnes lifted grew by 18%, so that overall tonne-km grew by 46%. The effect of this change was to offset improvements in energy efficiency per tonne-km over this period: while energy



intensity for road freight declined from 2400 to 2190 kJ/tkm, road freight energy use increased from 241 to 321 PetaJoule (10^{15} Joule). As shown in Figure 2, if tonne-km per tonne had been held constant and the same efficiency improvements achieved, a declining curve would have been seen instead. It is true that improvement in efficiency prevented energy use from growing as rapidly as road tonne-km. However, if the ultimate goal is an absolute reduction in Carbon emissions from all sources including freight, then this sector lost ground during the ten-year period.

A number of sources in the recent literature have referred to this problem (e.g. Whitelegg, 1994; Vanek, 2000), which is sometimes referred to as 'spatial spreading'. Of particular interest is the Royal Commission on Environmental Pollution's 18th Report on Transport and the Environment (RCEP, 1994), which recommended a target for curbing growth in tonne-kilometres from 20% to 10% per decade by encouraging changes in manufacturing patterns. Surprisingly, the White Paper does not refer to this earlier proposal, or to the possibility in general of developing a policy which addresses spatial spreading as a component of a broad-based programme to reduce environmental impact from freight transport. The only context in which overall tkm growth is mentioned is in regard to its correlation with economic growth, with the implication that since increased demand for freight is an integral part of economic sustainability, we can expect continued growth in tonne-kilometres in the future and should look to efficiency gains and intermodal integration to offset this growth. To the environmental community, who place certain expectations in the use of the word 'sustainable' in the titles of documents such as this one, the exclusion of the spatial spreading issue can only come as a disappointment.

A related issue is the difference between total tonnes produced and tonnes lifted, as once a tonne of product enters the freight transport system, it can be lifted more than once on its way to its end use, incurring additional tonnes lifted and tonne-km at each step. Tonnes produced are difficult to measure in the economy as a whole, but it is likely that given the growing complexity of supply chains, material is on average lifted more times as it passes through the supply chain from raw material to final consumption (McKinnon & Woodburn, 1996). Given continual pressure to use materials more efficiently in production, production tonnage may already be at quite a lean level; however, additional reductions could have benefits for total environmental impact

from freight.

Recommended additional policies for sustainable distribution

From the preceding analysis it can be seen that the range of measures proposed is not sufficiently broad to adequately address the challenge of sustainability. An attempt is therefore made here to outline supplementary policy options for the sustainable distribution strategy.

As a starting point, the general long-term goals for sustainability that pertain to the environmental impact of distribution should be stated. For freight transport, and much of the rest of the distribution function, the two most important issues are air quality and Carbon emissions. (Local issues such as the effect of freight vehicles on community livability fall under the heading of societal sustainability, and therefore I do not consider them here.) The long-term goals (across all sectors: industrial, residential, freight transport, etc.) for these two can be stated fairly unambiguously as the attainment of healthy air across all urban areas, and the UK's contribution to the global effort to stabilise the concentration of Carbon in the atmosphere, respectively. An estimate of the reductions in pollutants and Carbon that would constitute distribution's fair share of these goals could then be adopted for the distribution system.

Before proceeding with the outline of an approach for attaining pollutant and Carbon goals, differences between the two should be explained. The issue of freight transport's contribution to air quality targets raises a complicating factor not relevant to Carbon reduction, namely the geographic distribution of emissions and hence effect on air quality. Any policy aimed at improving the efficiency of freight can contribute to improved air quality, although depending on which freight vehicle movements are subject to what policy, the effect will be different. Here the tightening of European emissions standards will potentially make a large contribution. According to documentation in the White Paper, NO_x and PM_{10} emissions per unit of engine power are to be reduced by 78% and 95%, respectively, by the year 2009 compared to the base year of 1993. Assuming these targets can be met, the White Paper projects that turnover in the national vehicle fleet will lead to the elimination of the majority of these emittants from freight vehicles by 2020. The need for Carbon reductions would then become the main driver of further pursuit of sustainability from an environmental perspective.

Four possible policy alternatives

The supplementary policy could then continue with a list of alternatives available to meet the long-term goals, with a brief description for each. These alternatives will likely fall more or less into the four approach categories outlined in Table 1.

Clearly, the long-term prospects for achieving a sustainable freight transport system through one of the four approaches calls upon many unknown areas, so any consideration is likely to be speculative. A discussion of the strengths and weaknesses of these approaches as best they can be observed at present is, nevertheless, appropriate here.

Strengths and weakness of the four alternatives

The question of timing can be addressed first. Approach 1 is certainly the logical starting point, as it avoids a major reshaping of the pattern of goods movement, or the development of a major new energy source, in the short- to medium-term. However, it is unlikely to achieve a sustainable outcome without help from one of the other three approaches. For example, on the Carbon side, it seems doubtful that the reductions in emissions on the order of 60-80% could be achieved from best practice alone, especially given the physical limits on improving the technical efficiency of freight.

Turning to other alternatives, either Approach 2 or 3 has the potential to make up for the shortfalls of Approach 1 when used in conjunction with it. Each possesses additional strengths as well. Approach 2 has a very high ceiling in terms of absolute

improvement possible: it could by itself greatly reduce or even entirely eliminate Carbon emissions and pollution from vehicle movements, regardless of operating practices or spatial distribution. Approach 3 addresses local concerns such as noise, congestion, and infrastructure deterioration, in addition to Carbon and pollutant emissions, since it reduces total tonne-kilometres directly.

The drawback for either of these approaches is the time horizon required for full implementation. It may take years or even decades to develop mature zero-Carbon vehicle technology and the required fuel production and distribution systems. Likewise, spatial redistribution would require a detailed study of current patterns on a sector-by-sector basis, followed either by new Government controls or voluntary targets from industry, either of which would take many years to yield the results envisioned in RCEP (1994). Such a plan undertaken too rapidly could be disruptive to the economy as transport patterns shift.

Given these impediments, Approach 4 may provide an attractive alternative. This approach recognises that the requirement for motion in any type of transport system introduces a complication not present in converting stationary systems to zero-Carbon energy sources. Hence it may be desirable to use the latter to compensate for the former. The total energy use in freight is relatively small compared to total usage in the industrial and residential/commercial sectors (7%, 24%, and 42% of the total energy use for 1995, respectively (Vanek & Campbell, 2000)). If most or all energy use in these latter two

Table 1: Four possible policy approaches

Approach 1	A distribution system resembling the current one, using fossil fuels as an energy source and generating a similar volume of tonne-kilometres, but with greatly improved energy efficiency and cleanliness (for example, on the order of 20-25 g Carbon per tkm, versus the current 73 g Carbon).
Approach 2	A distribution system with similar volume of tonne-km but where vehicles use zero-Carbon fuels (e.g. Hydrogen distilled from water), hence emitting little or no Carbon. Although this technology is not yet mature, steady progress is being made, and prototype vehicles which combust Hydrogen in fuel cells are currently being tested.
Approach 3	A distribution system which is much less freight intensive. This could come about from a combination of the rearrangement of raw material sourcing, manufacturing, and distribution patterns and the reduction of total weight and volume of goods being lifted. Also, the percent contribution of non-material enterprises to total economic activity could be increased.
Approach 4	A distribution system in which excess Carbon and pollutant emissions are offset by having other sectors make reductions beyond the fair share requirement. For example, if the Carbon reductions deemed to be necessary under the fair share arrangement amount to 70% of the 1990 total, or 11 million tonnes, then these reductions could be made, for example, by improving energy efficiency or expanding the use of renewable energy. Users of the freight system could pay for these savings through a charge levied per unit of Carbon emitted.

sectors were converted to non-Carbon energy sources, sufficient 'trading credits' would be made available to compensate for continued use of fossil fuels in freight and other distribution functions. For example, if the combined industrial, commercial, and residential sector eliminated all Carbon emissions and freight remained the same, Carbon emissions from across all four sectors would fall by 91%, and the long-term Carbon reduction goal would be attained, even with freight vehicles continuing to operate on fossil fuels. (Of course, this calculation does not consider passenger transport, which without conversion would continue to emit a substantial volume of Carbon.)

A likely outcome of the transformation process over the long-term is that some combination of the four alternatives will emerge, rather than only one or two. Consideration of the four alternatives shows that no single alternative necessarily excludes any other. Moreover, an optimal combination of approaches is likely to cost less than relying exclusively on one approach. An example using projected growth in road freight vehicle travel can illustrate the point. In 1995 these stood at 22.6 million vehicle-km (DETR, 1997); according to current trends, they might reach approximately 35 million vkm by 2030 under a business-as-usual scenario. If Carbon-based fuels were to be phased out by this time using Approach 2, it could well cost less to eliminate some fraction of the

35 million vkm rather than continue to power the full amount using zero-Carbon fuels.

To conclude this discussion of long-term issues in sustainable distribution, one may ask whether a projection into the future of this type belongs in a Government White Paper that is intended to present the fundamentals of Government distribution policy to a wide audience. The answer is yes, I believe, if the use of the word 'sustainable' in the title is to be defensible. Care should be taken that any outline plan is as concise as possible, and does not prejudge questions for which we currently do not have enough information to provide definitive answers, such as an overall ranking of the four approaches listed above. However, a basic framework is at least required in order to make the document truly a 'strategy for sustainable distribution'.

Towards a more complete list of sustainability indicators

As stated above, the presence of only two quantitative indicators in the White Paper gives only partial information regarding the sustainability of the distribution system. The measures, total tonne-km per unit of GDP and road tonne-km per unit of GDP, give only an indication of relative performance between economy and ecology; they do not provide an absolute measure of ecological progress.

Table 2. Possible additional indicators to measure the economic sustainability of freight:

Tonne-km per tonne produced or tonne-km per tonne lifted:

An indicator of the relative efficiency of the freight transport system in meeting demand for a given quantity of material goods. Ideally, one would collect data on the former, since it provides a measure both of distances moved and complexity of supply chains. However, since in practice data on tonnes of production are difficult to measure or estimate, it may be necessary to use the latter measure.

Vehicle-km per tonne produced or vehicle-km per tonne lifted:

Converts measurements of tonnage in the previous to measurements of vehicle movement, which in general are more closely correlated with total levels of environmental impact. One potential difficulty is the consideration of different modes, and of different vehicle types within modes (i.e. road freight). It may be possible to develop a standard HGV-equivalent unit which could be applied across all modes; alternatively, it may be simpler to track separate measures for each mode.

Total weight of freight pollutant emissions (NO_x , PM_{10}):

An inventory of the estimated tonnes of the two most important emittants from freight per year across all modes nationally. Exact targets for average emission rates required to satisfy air quality standards for all urban areas are difficult to derive, but it should be possible to estimate an approximate target and stipulate freight's maximum allowance under that target. The total weight could then be compared to this target, in order to track progress towards sustainability.

Per capita freight CO_2 emissions:

Emissions of greenhouse gases take on an international dimension not present in tackling local air quality. Specifically, since allocation of Carbon rights is usually proportional to population (with some possibility of adjustment, for example for severe climactic conditions), it is possible to calculate a national per capita emissions target across all sectors. A per capita freight emission target can be set in proportion to the total target; the per capita freight emission indicator can then track progress toward this target.

The limitations of these relative measures can be illustrated by applying them to the case of the United States of America in recent decades. Taken together, evaluation of the two measures between 1970 and 1994 suggests that sustainability of the distribution system either rose or fell slightly; while total tkm/GDP declined by 12%, road tkm/GDP rose by 14% (Vanek & Morlok, 2000). However, during this time, many absolute measures of ecological impact changed dramatically: modal share of tkm for road increased by 30%, total freight energy use increased by 66%, and road freight energy use increased by 150%. Furthermore, many new distribution and retail facilities were built on greenfield sites, encroaching on valuable farmland. While the effect of these changes on the environment is difficult to quantify precisely for the U.S.A. as a whole, it is clear that the documentation of these trends adds important information not perceived when looking only at tonne-km per unit GDP.

The text of the Paper is itself cognizant of the need for a larger number of indicators. Its stated objective is to 'to track a range of measures, including (for example) statistical trends in accidents, pollution and congestion, and indicators of the relative success of different transport modes' as the policy develops and matures in the future. The discussion of alternative approaches to sustainability provides the basis for a number of possible additional indicators, as outlined in Table 2.

It should be noted that these indicators are seen as complementing rather than replacing the current set in the White Paper. Also, indicators for societal aspects of sustainability have not been addressed, and these should be developed in the future, including indicators that relate the societal dimensions of sustainability to the economic and environmental ones. The greatest difficulty may be interpreting an expanded set of indicators. Since it is probably impossible to combine a wide range of indicators into a single overall measure of sustainability, the evaluation of the indicators inevitably relies, and will continue to rely, on judgment and interpretation. Nevertheless, at present the expansion of the list of indicators remains an important priority.

Conclusions

In this paper, I have reviewed the UK Government's Sustainable Distribution White Paper. Two key shortcomings were identified:

1) the lack of a clear long-term strategy for reducing environmental impact to sustainable levels, and

2) the lack of consideration of the spatial spreading phenomenon.

In response to these shortcomings, two additions to the policy are proposed:

- a set of four long-term alternatives for reducing environmental impact from freight movements, and
- an expanded list of sustainability indicators.

From a broad perspective, it may seem that the attainment of sustainability from an environmental and societal perspective while continuing to grow the economy poses a difficult if not impossible task. Here a candid evaluation is essential: full sustainability is indeed a far-reaching challenge, which can only be achieved with hard work over a long period of time – this should not be underestimated in any writing on the matter. Moreover, fully developed policy options, such as technology enhancement or dissemination of best practice in distribution, will not by themselves achieve goals such as a 70% reduction in Carbon emissions from freight. Therefore, the development of other alternatives cannot come too soon.

Lastly, the balance between short- and long-range planning is perhaps the most important element in a successful sustainable distribution strategy. At the outset, it is important to make a long-term commitment to a system that is sustainable in all three dimensions. Following from this commitment, plans for long-term changes should be developed and documented even as the short- to medium-term policies already contained in the White Paper are put in place. The combination of the existing strategy in the Paper with ideas presented here would represent a very positive step toward the goal of sustainable distribution.

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Mobility & Accessibility: the yin & yang of planning

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Abstract

The concepts 'accessibility' and 'mobility' are central to urban and transport planning, and although they are often used interchangeably, they convey fundamentally different concepts. For example, mobility, especially when excessive, can have a negative connotation, whereas accessibility is always seen as making a positive contribution to a community. In investigating the relationship between mobility and accessibility it emerges that planning policies which favour the one, act against the other, and the two can be seen as opposites.

Keywords

accessibility, choice, indicators, mobility, planning.

Introduction

The private motor vehicle provides unsurpassed levels of mobility, flexibility and comfort. But its use has also had major social, environmental and economic impacts on cities: loss of natural bushlands, urban wetlands and coastal zones; deteriorating urban air quality; rising transport costs; longer journeys; noisy residential streets; deterioration of the public realm; inequitable transport systems; unviable public transport networks; and dangerous road environments. All these have been blamed on the car in its quest towards improving accessibility to destinations.

While recognising that accessibility is the ultimate aim of mobility, researchers and planners are now beginning to question the philosophy that more mobility equates to more accessibility (Cervero, 1997a). However although the concepts have long been in common use, their meanings remain blurred and difficult to define in a way which makes them easily and objectively measurable.

A clarification of the concepts, and a practical and robust definition, would be useful in the realm of policy and professional practice. The ability to objectively quantify differences in accessibility would provide valuable information to planners: accessibility could become a basic element in defining urban form; it could highlight areas of unequal access opportunities to facilities so that these inequities may be addressed; and level-of-service changes could

be monitored for their affect on accessibility (Schoon *et al.*, 1999; Wachs & Kumagai, 1973).

This paper defines mobility and accessibility in a way which clearly distinguishes them and makes them quantifiable so that comparisons between cities, within cities and regions, and in time series can be made. The accessibility indicator thus derived is applied to data collected in 46 cities by researchers at Murdoch University's Institute for Sustainability and Technology Policy (ISTP).

Mobility and accessibility

The concept of mobility is often linked to discussions about individual rights and freedoms and, like many transport-related issues, it continues to be surrounded by controversy (Janssen, 1993). Mobility is often portrayed as a basis for prosperity, or as an expression of freedom and choice, but it is also recognised that by itself, motorised mobility contributes nothing to wealth, can be wasteful of resources, damages communities, and contributes to air, water and noise pollution (Kreibich, 1992).

Clearly, at least in the absence of congestion, mobility is most effectively provided by the private motor vehicle, and it can be measured by vehicle kilometres travelled, vehicle occupancy, passenger kilometres, traffic speed or vehicle ownership. While trip rates, trip lengths and/or the proportion of the population who are travelling on a given day may also be used to measure mobility, these values can be interpreted ambiguously, and it is difficult to say whether more or less travel is preferable, and whether more or fewer trips are better (Jones, 1987). Two examples: parents drive children to school out of fear of road accidents or physical harm, resulting in a trip which can hardly be seen as positively contributing to lifestyle; and secondly, the growth of suburban centres, focusing on shopping, entertainment, education and medical services can result in longer individual journeys than if these concentrated complexes were dispersed throughout the suburbs. In fact, such forms of 'forced mobility' equate to a loss of freedom for both adults and children (Engwicht, 1993).

This paper argues that mobility, seen as ‘movement’ or ‘amount of movement’, can be measured in terms of vehicle kilometres travelled, and personal mobility as per capita vehicle kilometres travelled. Recent data shows that a more car dependent society is more mobile, that residents in a lower density region of a city are more mobile, and that people in cities with a poor public transport system are more mobile (Kenworthy *et al.*, 1999). Furthermore, it is claimed that mobility is higher in the United States and Canada than in Europe, and mobility in Europe is higher than that in Asia (Laube, 1998).

In modern suburban environments, shopping, recreation and other activities can often no longer be carried out in the local neighbourhood but require longer, generally motorised journeys. Furthermore, as car ownership increases, the number of motorised trips, trip length and overall distance travelled continues to grow (Felz, 1988). The suggestion that the range of destinations of shops or workplaces increases with increasing mobility, and that choice is thereby enhanced, is valid only to the extent that these destinations are distributed throughout a city rather than zoned to specific areas, as is often the case where car dependency is high. Under these circumstances, it appears that mobility is rising in order to maintain accessibility (Würdemann, 1993), suggesting that accessibility and mobility are not always complimentary. In fact, it is suggested that the relationship is one of reciprocity:

- planners recognise that the outward growth of cities encourages car use, reduces the effectiveness of public transport, increases overall transport

- costs, and reduces the accessibility of those residents in these areas who do not have a motor vehicle available at all times (Department of Planning & Urban Development, 1992);
- as distance travelled, or mobility, increases, transport costs rise as accessibility to destinations is maintained; and
- as a general truth, it is postulated that accessibility cannot increase in an environment where distance travelled is increasing (Weibull, 1976).

Accessibility, unlike mobility, is always seen as a positive, regardless of how ‘accessible’ a city or region is, so that, unlike mobility, more is always seen as better. Nevertheless accessibility remains more difficult to define and measure than mobility (Gould, 1969). In urban geography, the term is used to explain the growth of towns, where facilities are located, and the relationships between different land uses (Ingram, 1971). A standard definition is often based on ‘the ease of reaching some destination’, and may include real or perceived costs in terms of time or money, distance travelled, level of comfort, availability and reliability of public transport, or any combination of these (Department of the Environment, 1996; Schoon *et al.*, 1999).

However, attempting to measure accessibility based on these variables is extremely difficult: *perceived* costs are subjective; public transport frequency and travel time change during the day; and some variables, such as residential density, public transport level of service, and modal split, are not independent of one another. It becomes apparent that

accessibility is not a concept which can be directly measured, but rather one which can only be quantified, or indicated, in terms of other variables. The data collected in 46 cities by researchers at the ISTP, highlights the strong correlations existing between per capita vehicle kilometres travelled (mobility), and a large number of other urban and transport planning indicators. The strong, positive relationships shown in Table 1 indicate that, for example, private

Table 1: Spearman rank order positive correlations between mobility and a range of urban and transport indicators from up to 46 cities in Asia, Australia, Canada, Europe and the United States

<i>Dependent variable</i>	<i>Spearman r</i>	<i>Number n</i>	<i>Significance level</i>
Private mode energy use per person	0.97	45	***
Car ownership per 1000 persons	0.90	46	***
Journey to work speed	0.89	32	***
%journey to work by private modes	0.88	45	***
Total transport cost per person	0.85	36	***
Car speed	0.83	46	***
Road provision per capita	0.80	46	***
Journey to work distance	0.78	32	***
Bus speed	0.55	46	***
Transport deaths per 100,000 persons	0.46	36	**

Data source: (Kenworthy *et al.*, 1999)

Note: Significance levels:

‘****’ is significant at better than the 0.1% level

‘***’ is significant at better than the 1% level

mode energy use increases with increasing per capita vehicle kilometres travelled, as does car ownership, journey to work speed, car speed, car use, total transport costs and so on. These are indicators associated with car use and mobility.

In contrast, Table 2 shows the negative correlations to mobility in the ISTP dataset, and these are indicators generally associated with accessibility: use of transit and non-motorised modes, residential density, job density, time taken for the journey to work, and cost recovery of public transport.

The strong relationships shown in these tables and the following discussion on indicators suggests that mobility could be used as an indicator of accessibility.

Accessibility indicators

The purpose of an indicator is to measure and communicate a trend of events, and to simplify our understanding of these (Eckersley, 1997). Indicators are a useful tool for policy makers and as a means of driving change in a particular direction. For all their disadvantages, common indicators in use include: gross domestic product (GDP) as a measure of the amount of goods and services a country produces; consumer price index (CPI) as a measure of inflation; and the many indices used by stock exchanges to express the business community’s expectations of future economic growth.

While an indicator of accessibility may combine measures of the transport system with those of land use, its aim is really to provide a means of quantifying ‘ease of travel’ (Morris *et al.*, 1979), and it is possible to measure a proxy if this can be shown to accurately represent accessibility. The resulting indicator should inform planners as to how an area of low accessibility can be improved, how new developments can consider

accessibility at the planning stage, and how accessibility in a city is changing over time.

After taking into account the research work carried out in the field of accessibility (for example Black & Conroy, 1977; Brockelt, 1995; Cervero, 1997a, 1997b; Damen & Davidson, 1998; Forster, 1978; Hansen, 1959; Ingram, 1971; Morris *et al.*, 1979; Ryan & McNally, 1995; Schoon *et al.*, 1999; Wachs & Kumagai, 1973; Weibull, 1976), the search for an accessibility indicator in this paper was guided by several principles: it should be simple to use and understand; it should identify the means of improving accessibility; and it must be based on credible data with a convincing and rational method of calculation.

A long-standing, often cited and well recognised method of measuring accessibility is given by Hansen (1959), who uses a gravity model formula to relate accessibility of, for example, jobs in one zone directly to job density in that zone and indirectly to the distance between that zone and another (possibly residential) zone, with total accessibility to jobs being the sum of the accessibility from each of the residential zones. According to Hansen’s formula, accessibility increases as job density increases, and as travel distance falls. Gravity models, derived by combining Newton’s Second Law of Motion and his Law of Gravitation, are often used to describe accessibility by likening *gravity*, the force of attraction between two masses, with *accessibility*, the level of attraction of activities between locations.

The Gaussian, or normal, curve also fits the gravity model if the level of attraction declines with increasing distance, indicating that accessibility can in fact be quantified by a formula based on mobility. Formula 1 has been used to translate the mobility

data from the ISTP study into an indicator of accessibility. Both data items are given in Table 3 alongside the 46 cities from the study. Average accessibility in the Australian and Canadian cities is seen to be nearly identical and very close to the mean of 6422 kilometres of all the cities in the study, although the spread of the Canadian cities is greater. The US cities have the lowest accessibility, and the Asian cities the highest. European cities in the study have uniformly high accessibility.

Table 2: Spearman rank order negative correlations between mobility and a range of urban and transport indicators from up to 46 cities in Asia, Australia, Canada, Europe and the U.S.

<i>Dependent variable</i>	<i>Spearman r</i>	<i>Number n</i>	<i>Significance level</i>
% of total passenger kilometres on transit	-0.95	46	***
Urban density	-0.86	46	***
Activity density	-0.84	46	***
% journey to work by public transport	-0.84	45	***
% journey to work by non-motorised modes	-0.82	45	***
Inner city job density	-0.79	44	***
% public transport cost recovery	-0.79	36	***
Journey to work time	-0.55	32	***
Public transport energy use per person	-0.46	46	***
Ratio of public transport speed to car speed	-0.42	36	**

Data source: (Kenworthy *et al.*, 1999)
 Note: Significance levels as in Table 1

Table 3: An accessibility indicator (formula 1) applied to 46 world cities

	Mobility (km/cap)	Accessibility
Hong Kong	493	99.3
Singapore	1864	90.5
Tokyo	2103	88.0
Wealthy Asia	1487	93.8
Bangkok	2664	81.5
Jakarta	1112	96.5
Kuala Lumpur	4032	62.6
Manila	573	99.1
Seoul	1483	93.9
Surabaya	1064	96.8
Developing Asia	1821	90.9
Amsterdam	3977	63.4
Brussels	4864	50.6
Copenhagen	4558	54.9
Frankfurt	5893	36.8
Hamburg	5061	47.8
London	3892	64.6
Munich	4202	60.1
Paris	3459	70.8
Stockholm	4638	53.8
Vienna	3964	63.6
Zurich	5197	45.9
Europe	4519	55.5
Calgary	7913	16.4
Edmonton	7062	23.8
Montreal	4746	52.2
Ottawa	5883	36.9
Toronto	5019	48.4
Vancouver	8361	13.3
Winnipeg	6871	25.6
Canada	6551	29.0
Adelaide	6690	27.5
Brisbane	6467	30.0
Canberra	6744	27.0
Melbourne	6436	30.3
Perth	7203	22.4
Sydney	5886	36.8
Australia	6571	28.8
Boston	10,280	4.8
Chicago	9525	7.3
Denver	10,011	5.6
Detroit	11,239	2.6
Houston	13,016	0.8
Los Angeles	11,587	2.1
New York	8317	13.6
Phoenix	11,608	2.1
Portland	10,114	5.2
Sacramento	13,178	0.7
San Diego	13,026	0.8
San Francisco	11,933	1.6
Washington	11,182	2.7
U.S.A.	11,155	2.8
Median (k)	5890	36.8

Source: Kenworthy *et al.*, 1999

Formula 1: A formula for accessibility based on the gravity model

$$A = 100 \cdot e^{(-M^2/k^2)}$$

where: *A* is accessibility, *M* is mobility measured as vehicle kilometres travelled per capita, and *k* is a constant for a given sample. By giving *k* the median value of the per capita distance travelled of the sample being investigated, a dispersed spread of points is achieved on the graph. The numeric constant (100) ensures a value is obtained between zero and 100 (rather than between zero and one as would otherwise be the case).

The data in Table 3 is diagrammatically presented in Figure 1, and it becomes clear that the cities in the regions shown have accessibility indicators which are quite closely grouped together. The trend in accessibility, from cities with the highest to cities with the lowest, goes from the wealthy Asian cities, to the developing Asian cities, followed by the European, Canadian, Australian and US cities. The following section shows that even within cities, accessibility can be indicated as the reciprocal of mobility.

Accessibility comparison within a city

A major study of 8,350 households in Sydney and Melbourne looked at housing, transport and urban form characteristics across these cities. The Housing and Location Choice Survey (HALCS) provides information on the accessibility of services for a full range of household types and income levels (Newman *et al.*, 1992). For all household types, households in the innermost suburbs were found to have above average accessibility, and in the outermost suburbs, below average accessibility. Significantly, for all income groups, core and inner suburbs were found to be the most access advantaged, while the outer and fringe suburbs were the most access disadvantaged.

Locational disadvantage has also been recognised by other researchers:

- in Adelaide, accessibility to work generally declines with distance from the central city (Forster, 1978, cited in Black, 1992);
- average fuel consumption of residents of inner Sydney suburbs was found to be 60% that of residents in the outer suburbs, while in

Melbourne, inner city residents consumed just 41% of the fuel used by residents in the outer suburbs (Newman & Zhukov, 1996);

- in Perth 8.6% of employed people travelled to work by public transport, the highest percentage of these resided in inner suburbs and in suburbs along the rail lines. In contrast, 81.7% of employed people in Perth travelled to work by motor vehicle, the majority from the outer suburbs, the minority from the inner suburbs (ABS, 1997); and
- Canadian studies also show that the number of motor vehicles owned per household increases as the distance from the centre increases: more than half of all households in the inner core of Toronto did not own a motor vehicle in 1996, but only 6% of outer suburban households were without a motor vehicle (Gilbert, 1998). Furthermore, the study notes that mobility increases as distance from the centre increases, a sign that accessibility is highest in the denser inner core area where employment and shopping opportunities are greatest, public transport more available, and where the use of public transport, cycling and walking modes is

higher.

These examples add further support to the general argument of this paper that accessibility and mobility are linked by a reciprocal relationship.

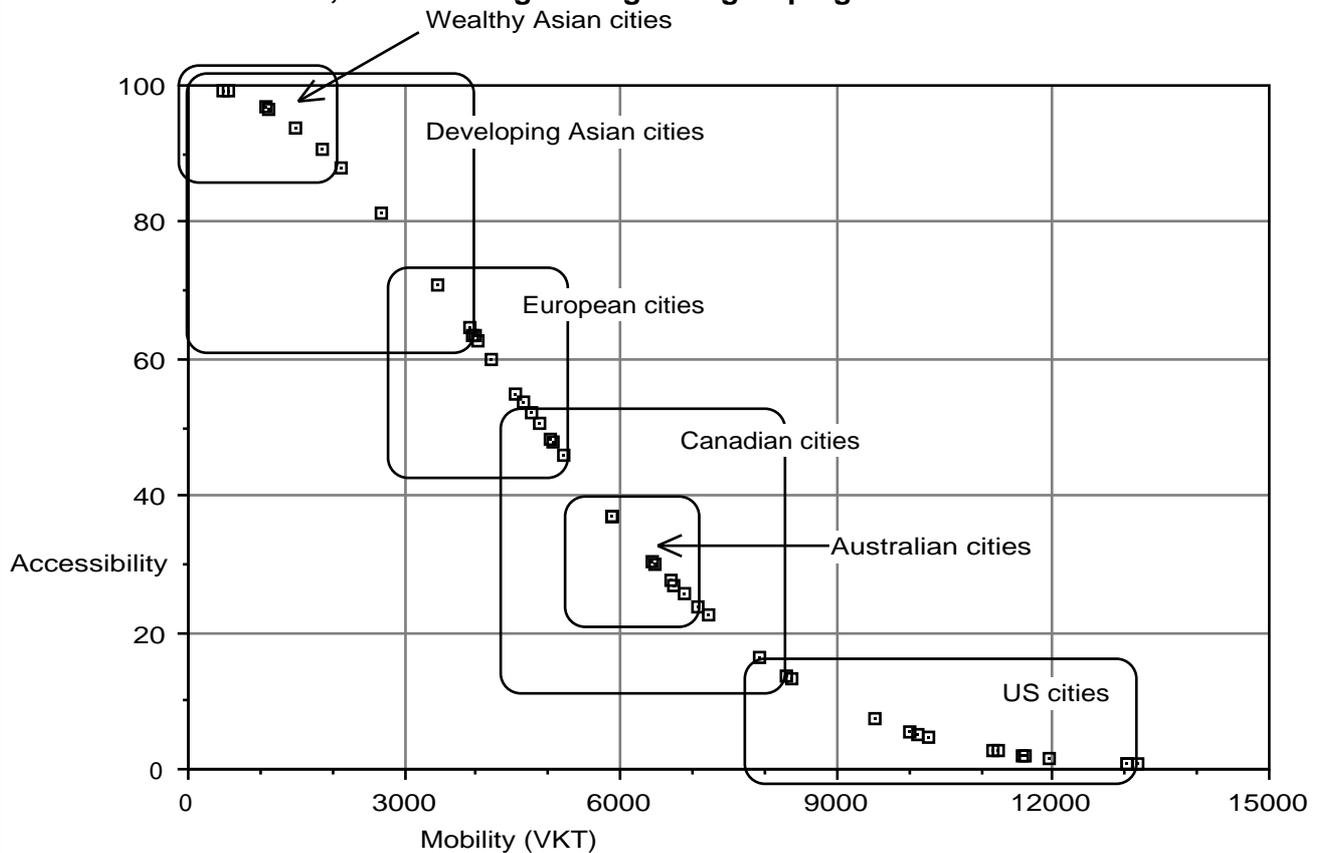
Conclusion

While it is widely accepted that accessibility to destinations can be enhanced by improving mobility, this paper has shown that this is not the case.

Mobility was defined as the amount of travel people undertake, and it was shown that a positive relationship exists between mobility and such indicators as transport energy use, motor vehicle ownership and use, journey to work distance, journey to work speed and general car speed.

Accessibility is far more difficult, if not impossible, to measure. Often understood as the ease of access to destinations, amongst other parameters it encompasses ideas of costs in time and money; extent, comfort and frequency of the public transport system; and the distance to be negotiated to reach destinations such as shops, work places and schools. However, a negative relationship was found between mobility

Figure 1: Relationship between accessibility and mobility graphed using a gravity model, and showing the regional groupings of 46 world cities



and a range of indicators often associated with accessibility, including urban density, walking, cycling and public transport use.

Since these indicators are not independent of one another, and because of the strength of the correlations, it is apparent that accessibility can be negatively related to per capita vehicle kilometres travelled, that is mobility.

A comparison of 46 cities showed accessibility to be highest in those cities where walking, cycling and public transport use is highest, where per capita car ownership and road space is lowest, where population density is highest, and where transport expenditure is lowest. Within cities, on a continuum from inner-city to outer urban, the same relationships were evident. In fact, far from being complimentary, the relationship between accessibility and mobility is found to be one of reciprocity.

By understanding that accessibility and mobility are the yin and yang of planning, planners are in a better position to comprehend the outcomes of their policies: to increase accessibility, then car use and personal mobility must be restricted.

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The Vasco da Gama Bridge on the Tagus Estuary: A paradigm of bad decision making, but good post-evaluation

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Abstract

The Vasco da Gama bridge over the Tagus Estuary was one of the most polemic projects ever built in Portugal and indeed in the European Union. Benefiting from significant funding from the Cohesion Fund, the project failed to uphold its main declared objectives (decongesting the old bridge and providing a north-south link around Lisbon), and its location was the worst of three alternatives regarding land management, nature conservation, transportation system and cost. It was nevertheless forwarded by the will of the very powerful Portuguese Ministry of Public Works (against opinions of almost everybody else), aided by the unwillingness of the European Commission to withdraw financing. However, the public outrage raised around the project both in Portugal and in Europe, not only for the sloppy decision but also for illegal impacts during construction, led to several stringent control and compensatory measures, unprecedented in Portugal and rare in Europe.

Keywords

Cohesion Fund, Environmental Impact Assessment, European Union, Lisbon, NGO, Tagus Estuary.

Introduction

The new Vasco da Gama bridge over the Tagus Estuary was commissioned in 1998. It is one of the longest in Europe, but unfortunately it became well known for much less auspicious motives. From the original decision to this day (and probably for years to come), the project has generated unprecedented controversy in Portugal and Europe, for a number of reasons:

- It does not fulfil any of the goals it was supposed to meet, and indeed impedes the resolution of problems it was supposed to solve;
- The choice of location for the bridge was, by all accounts, the worst possible option;
- It creates very significant negative social, ecological and economic impacts;

- It was made possible only by heavy EU financing, despite multiple violations of European regulations. In short, this project has become a textbook example of poor decision making, sloppy economics, poor use of public money and excessive environmental impact fostered by public works. On the other hand, the huge problems it conjured up led to the creation of an observation committee, Comissão de Acompanhamento da Obra (CAO), which is unique in Portugal and has in turn become a textbook example of co-operative efforts to mitigate impacts of a major project (not always successful, but nevertheless valiant).

This paper briefly describes the decision process that led to the new bridge and explores the environmental, economic and financial consequences; then it proceeds to discuss the role of the EU in the process, the current problems in land use planning and the role of CAO. The reader will notice that decisions of Portuguese and European authorities are apparently senseless and often contradict available technical background information. If in doubt, the reader is strongly advised to check on source documents (now in the public record), because the whole affair is incredible to the untutored observer.

The decision process

In 1991 the Portuguese Government created the Office for the Crossing of the Tagus at Lisbon, Gabinete para a Travessia do Tejo em Lisboa (GATTEL), an inter-ministerial agency chaired by the Ministry of Public Works, Ministério das Obras Públicas Transportes e Comunicações (MOPTC), with representatives of the Ministries of Planning (Ministério do Planeamento e Administração do Território), Environment (Ministério do Ambiente e Recursos Naturais) and Finance (Ministério das Finanças). GATTEL was charged with the development of a new road crossing of the Tagus Estuary, with two clear cut goals: solving the ever-increasing traffic jam on the old '25 Abril' bridge at Almada; and supporting the north-south traffic

around Lisbon.

One should note that the Tagus Estuary at Lisbon is very broad (up to 20 km in places) and any new crossing is an expensive, technically challenging enterprise. GATTEL was directed to consider road transport only, without any integrated land use management or transportation perspective. Uncoordinated to the work of GATTEL, studies went on to install a heavy railway on the old bridge and to create the Regional Land Use Plan for the Metropolitan Area of Lisbon, Plano Regional de Ordenamento do Território da Área Metropolitana de Lisboa (PROTAML).

By September 1991, GATTEL issued a series of studies (GATTEL, 1991) comparing three corridors for a new road bridge: eastern (Sacavém–Montijo), central (Chelas–Barreiro) and western (Algés–Trafaria). At the time, little of this information was released and no Environmental Impact Assessment or public auditing was conducted. Public debate was promoted only by non-Governmental organisations, both professional and environmental. Opinions fell to two

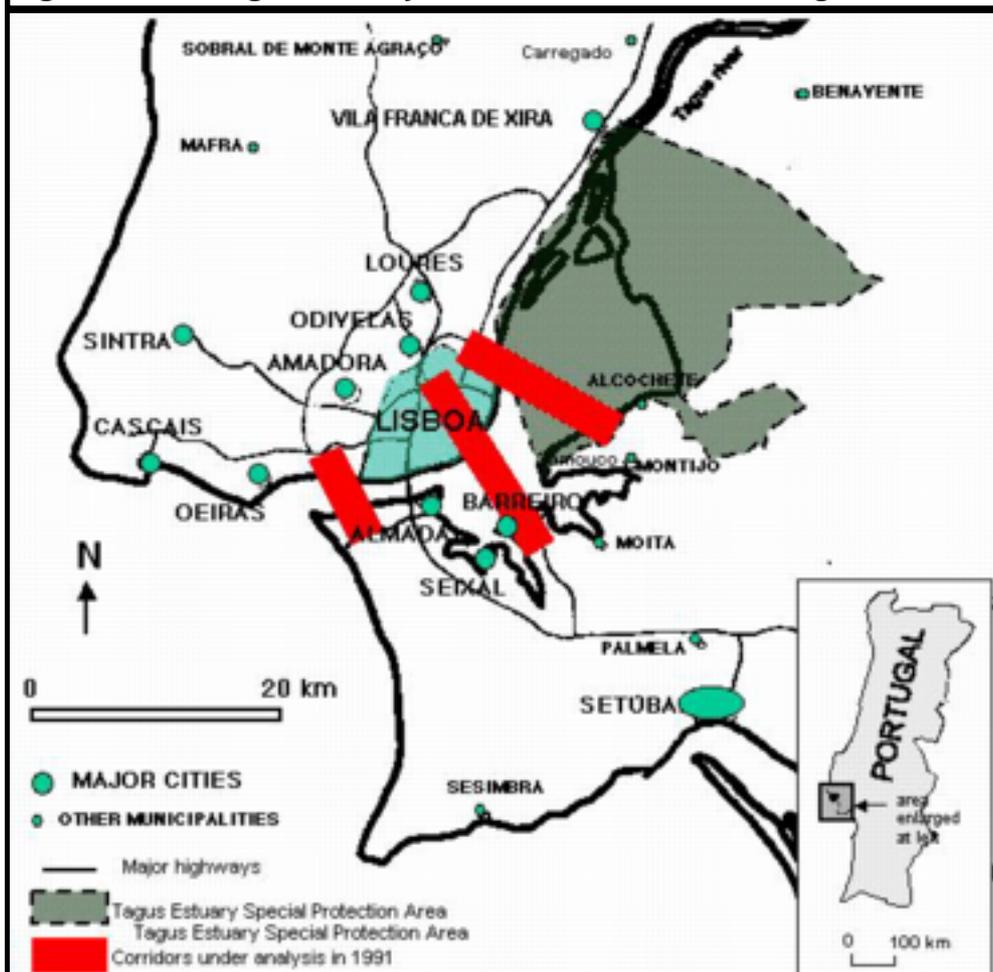
global alternatives, linked to opposite development strategies for the Metropolitan Area of Lisbon:

- *The 'MOPTC option': Sacavém–Montijo road bridge, complemented with heavy railway on the old 25 Abril bridge and eventually a new Chelas–Barreiro railway bridge.* This option was based on a strategy of opening new urban development fronts, top priority to roadways and individual transport. It was actively and loudly supported by the Minister of Public Works and the municipalities of Montijo and Alcochete;
- *The 'Rest of the World option': Chelas–Barreiro rail and road bridge, complemented with a light railway on the old bridge.* This option was based on a strategy of urban regeneration, an integrated approach to land use and transportation, and priority for public transport. It was supported by the Ministries of Planning, Environment, Industry, Employment, Defence and Justice (among others), by the planning office and GATTEL's consultants, by the PROTAML team, by the municipalities of Almada, Barreiro, Seixal and Moita, by the mayor

and the municipal planning office at Lisbon, by environmental NGOs and by the majority of experts on transport, land management and environment.

The Sacavém–Montijo route crosses a Special Protected Area under the European Birds Directive, which is considered one of the ten most important wetlands in Europe. It does not solve the two major problems (congestion on the old bridge and north-south link), because it is away from populated areas. It causes major impacts on wildlife (bird and fish habitats), generates road traffic and agricultural land is urbanised. Official reports (GATTEL, 1991; MPAT, 1992) show that the 'Rest of the World option' would fare much better in solving transportation and

Figure 1: The Tagus Estuary and the alternative crossings in 1991



development problems, would be less expensive and would induce far less impacts. The reason is immediately apparent just by looking at a map of the region (see Figure 1): the area around Barreiro is much more urbanised and populated, by a factor of ten, than the vicinity of Montijo.

The question that now springs to the mind of any and every observer is: *Why on earth was the MOPTC's Sacavém–Montijo road bridge option chosen?*

Unfortunately, the answer is unfathomable. One can just say that nearly all stakeholder positions were founded on objective, if misguided reasons. For instance, the municipalities of Montijo and Alcochete favoured the Montijo location because, quite clearly, they were bound to gain (politically and financially) with that location for the new crossing. The one exception, the never satisfactorily explained position, was that of the Minister of Public Works.

This forceful, unfounded position of the Minister of Public Works prevailed over an unorganised opposition, and the Sacavém–Montijo bridge was approved by Government in July 1992. The draft PROTAML that recommended the 'Rest of the World option', was ordered back to redrafting. Legislation was approved to establish the location and financing model of the bridge, based on a joint concession of the new and the old bridges – with much higher tolls than before.

A major hurdle appeared, predictably, in June 1994, when the tolls on the old bridge were raised by 50%; this was to be a first step of a programmed 250% toll increase, preparing for the takeover by Lusoponte (the chosen contractor). The ensuing public outrage became the biggest political crisis of the decade, and shattered the 'financial engineering' of the project, based on toll revenues – of which over 80% would come from the old bridge. The Government had to make a number of concessions, both to the old 25 Abril bridge users and to Lusoponte; amongst them, no further toll raising. Henceforth, the project became heavily dependent on the Government budget.

By summer 1994, the Environmental Impact Statement (drafted for the Sacavém–Montijo option only) was issued and reviewed, receiving inordinately harsh criticism from the scientific community, the Government agencies and environmental NGOs. For example, the Ministry of the Environment Evaluation Committee noted that:

'The Environmental Impact Statement does not justify the project. There is no evidence of the goals

stated in the EIS (diverting north-south and Spain-bound heavy traffic from the urban centre and solving the saturation of the existing 25 Abril bridge) being met by the project. In truth, additional information commissioned by the Evaluation Committee imply that the 25 Abril bridge will continue to present high saturation rates. Furthermore, the volume of regional heavy traffic crossing the existing bridge is already very small.' (MARN, 1994, p. 35).

Despite this criticism by the Ministry of the Environment, by the end of 1994 the project had been approved by the Portuguese Government and by the EU's Cohesion Fund.

All these decisions and violations by Portuguese and European authorities, and others by Lusoponte, were strongly opposed by environmental NGOs, led by GEOTA (Grupo de Estudos de Ordenamento do Território e Ambiente) and LPN (Liga para a Protecção da Natureza). They mounted a public campaign and filed some eight lawsuits for infringement of Directives 85/337/EEC (Environmental Impact Assessment), 79/409/EEC (Birdlife), 92/43/EEC (Habitats) and other legislation; some of which are still pending in the courts. In addition, they placed a long list of complaints before the European Commission.

The last opportunity to stop the project was missed when the new Government, elected in October 1995, decided to keep the project going, despite openly considering it totally inadequate to fulfil its stated goals. The decision to carry on may have been pressed by the upcoming Expo '98 (the World Exposition in Lisbon from May to September), and by the financial commitments already assumed by the Portuguese State.

Non-compliance with project goals

All official documents issued by the Portuguese Government are unanimous in defining two goals for the new crossing of the Tagus at Lisbon: alleviating traffic on the old 25 Abril bridge and providing a north-south link around Lisbon. These goals are clearly stated in the preamble of Decreto-Lei no. 14-A/91 de 9 de Janeiro, the Government Decree creating GATTEL; in the application to the Cohesion Fund (MPAT, 1994); and in the Environmental Impact Statement for the Montijo bridge (GATTEL/Lusoponte/Coba, 1994, Tomo I, p. 3).

Amazingly, according to all available data, the Sacavém–Montijo bridge quite clearly does not satisfy any of its pretended goals.

Let us briefly examine the official reports.

Regarding the north-south link:

'The traffic crossing the AML (Metropolitan Area of Lisbon), so without origin or destination in the AML, represents only 0.2% of light vehicle traffic crossing the Tagus at Lisbon and 0.3% of heavy traffic ... The analysis performed shows that none of the corridors under consideration (western, central and eastern) is interesting as far as the improvement of the north-south link of the country is concerned' (GATTEL, 1991, report 4, p. 2.14).

Thus the so-called north-south link does not explain, either the need for a new bridge, or the insertion of the bridge in the national network. As for the Spain-bound traffic, it is insignificant and not even quantified in official reports. On the contrary, the future Tagus crossing at Carregado (located about 30 km upstream from Lisbon), which has been planned for about fifteen years, will unquestionably become the main north-south crossing, and the best route between Setúbal and the West and North of the country, around Lisbon.

Regarding the traffic congestion of the existing bridge:

'The eastern corridor does not contribute significantly to relieve the saturation of the existing bridge' (GATTEL, 1991, report 6, p. 18).

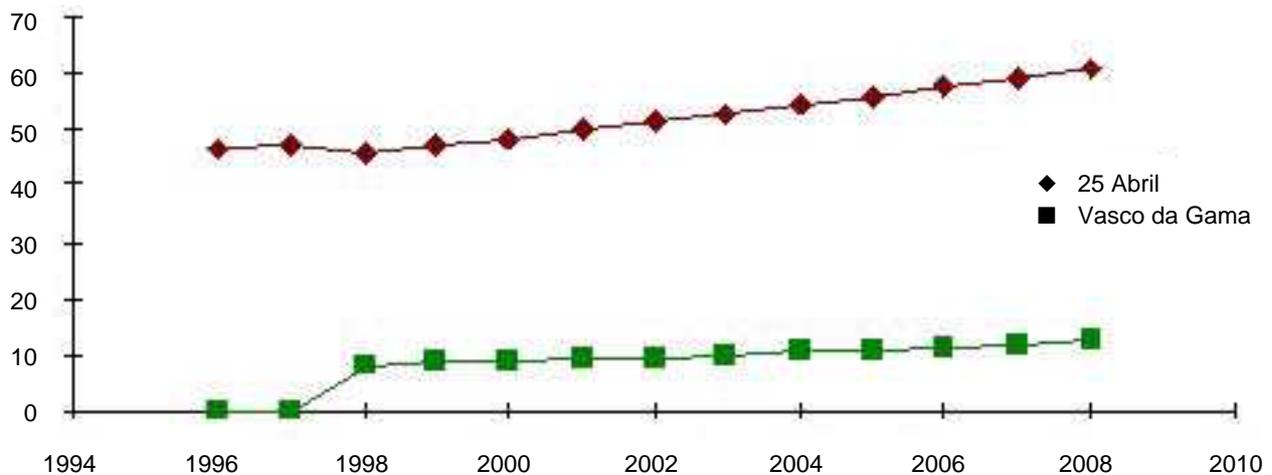
All traffic experts agree that the traffic overload of the old bridge can be solved only by railway crossings and a significant improvement of public transportation modes and nodes. However, the corollary of this evidence – priority for railway

crossings – was never accepted by the Government. But even if the priority for roadways was right, there is no justification for the choice of the Sacavém–Montijo route. According to GATTEL (1991, report 4, p. 3.106), a bridge on the eastern corridor (Montijo) would divert up to 19% of the traffic on the old bridge, on the central corridor (Barreiro) up to 46% and on the western corridor (Trafaria) up to 99%. The same trend was confirmed by the traffic studies supporting the application to the Cohesion fund (MPAT, 1994).

According to this official 1994 document, accepted by the European Commission, the new bridge would generate a surplus of seven million vehicles in 1998, above and beyond normal traffic growth rates (see Figure 2). That is, the new bridge generates its own traffic by promoting urban growth, but does not divert significantly the traffic from the old bridge, for the very simple reason that it is too far away from existing major urban areas. This prediction was confirmed in full with real data (see Table 1).

In the period between 1992 and 1995 the Minister of Public Works invoked several reasons (besides the decongestion of the old bridge and the north-south link) to justify his preference for the Montijo location. Those accessory reasons were however never assumed in formal Government papers, so they will not be discussed in detail here. Let us just say that his opinions were not shared by his Government colleagues, and were essentially contradictory with the official data, as demonstrated by, e.g. Melo (1995), Shmidt (1995), Granado (1996), and many other analysts.

Figure 2: Traffic estimates in the application to the Cohesion Fund



Unit: million vehicles per annum (sum of traffic in both directions)
 Source: MPAT, 1994.

One may note that the percent distribution of traffic between the two bridges (CCRLVT, 2000b) is remarkably close to early predictions. However, the *total* traffic is significantly higher than expected, especially on the new Vasco da Gama bridge. This discrepancy can be explained by two factors:

- The 1991 studies by GATTEL assumed that Governmental policy would promote public transportation. This did not happen. The most important project to reduce traffic on the 25 Abril bridge, the Southern Bank Light Train, that should interface with the bridge train, is at least 6 years behind schedule. This ‘policy for cars but no transportation policy’ affects other public transport projects on both sides of the estuary, including new interchanges and the modern Lisbon tramway system. Therefore, increasing road construction has provoked an inordinate traffic increase;
- A significant share (as yet not quantified) of the traffic currently crossing the Vasco da Gama bridge is probably north-south traffic. This traffic will disappear, however, when a new bridge is built upriver at Carregado, because it is a much more practical and cheaper north-south route. The Carregado bridge should be in place in a few years, according to current planning.

The environmental impacts

It was clear from the earliest studies that the Sacavém–Montijo route, besides not complying with pretended goals, had the worst environmental impact of the alternatives considered:

‘The eastern corridor presents the highest environmental hazards’ (GATTEL, 1991, report 4, p. 3.33);

‘it promotes the extension and dispersion of urban development, with highest facility building effort; it is grounded on the southern bank in an area where urban structure to support rapid development is very fragile; it presents relevant negative effects on the Tagus Estuary, terrestrial ecosystems and environmentally sensitive areas’ (GATTEL, 1991, report 6, p. 18).

The Environmental Impact Assessment of the Sacavém–Montijo bridge, in 1994, confirmed the earlier prognosis:

‘The Evaluation Committee concludes that this project, by its features and dimension, will

cause changes with regional scope ... amongst which the most significant impacts are: land management, economic and social issues, especially on the southern bank; the ecological equilibrium of the estuary and surrounding areas. The Evaluation Committee notes very significant negative impacts, some not subject to mitigation, and others that need more thorough study to allow for any meaningful mitigation.’ (MARN, 1994, p. 36).

Unfortunately, not only were these warnings overlooked and the project approved, but also many of the mitigation measures proposed in the Environmental Impact Statement, or demanded by Portuguese and European authorities, failed to be enforced.

Major violations by either Lusoponte, the Portuguese Government or the municipalities included:

- An attempt to cut the Tagus Estuary Special Protection Area (SPA) on the northern bank, to build a new highway right over the bank (this project was later redesigned to affect the SPA as little as possible);
- Construction works on Samouco salt pans (southern bank) during the bird nesting season;
- Dredging operations during incoming tide in sensitive areas;
- Dumping of dredged sediments outside designated areas. Particularly, dumping of contaminated sediments inside the estuary, with yet unknown consequences. Such materials were supposed to be dumped off the coast, but according to Lisbon harbour records, only 2% of the contaminated sediments were actually dumped outside the estuary, and even then there is evidence that they did not reach the designated destination (Granado, 1996);
- Failure to fence off construction grounds, resulting in bird life disturbance and, more seriously, the deaths of two children who drowned in an unprotected ditch;
- Approval of urban developments inside the SPA;

Table 1: Traffic crossing the Tagus at Lisbon, 1997 to 1999

	25 Abril bridge	Vasco da Gama bridge	Total
1997	50.2	0.0	50.2
1998	49.3	10.2	59.5
1999	57.0	15.9	72.9

Unit: million vehicles per annum (sum of traffic in both directions)
 Source: CCRLVT (2000) citing Lusoponte, corrected with data from Junta Autónoma de Estradas

- Failure to approve meaningful land use management instruments, namely the PROTAML.

All these violations were known to Portuguese authorities, were denounced over time by the NGOs to the European Commission, and were presented in the media with hard evidence. To no avail. The action of the authorities was always too little, too late, if ever.

The economics

The alleged lower cost was at some point one of the arguments of the Minister of Public Works to justify the option for the Montijo bridge. However, this argument, like all the others, was contradicted by official reports. For instance, the Council for Public Works and Transport, that compared road-only corridors found the following:

‘Regarding the technical solutions and corresponding costs: On the eastern and central corridors no special problems are foreseeable in the foundations, therefore cost per kilometre is judged to be similar in both corridors; on the eastern corridor there may be technical problems of some complexity, such as found in the construction of the 25 Abril bridge.’ (CSOPT, 1992, p. 24)

But what was really at stake was not the cost of a road bridge standing by itself, but the cost of the overall transport system and the level of service provided to users. Official reports show that a road and rail bridge at Chelas-Barreiro plus a light railway on the existing 25 Abril bridge would be much cheaper than a road bridge at Sacavém-Montijo plus a heavy railway on the 25 Abril bridge, in addition to the cost of urban facilities and added travel cost – see Table 2.

Although these figures are tentative, the

conclusion is beyond doubt. For a similar level of service (two roadways, two railways), and not accounting for further consequences regarding environment impact and regional development, the ‘MOPTC option’ is € 790 million (or greater than one-third) more expensive than the ‘Rest of the World option’.

The project finance is equally grim. The Contract between the Portuguese State and Lusoponte established, as a matter of principle, that the revenues of the concession should come from tolls on both bridges, and, supposedly, the financial risks should fall to Lusoponte. The reality, however, is somewhat different. First, the public outcry in 1994 saw to it that the tolls would not increase as programmed, hence the State Budget is paying something around € 25 million per year to Lusoponte as compensation. What should have been an exception clause became the main revenue of Lusoponte. Second, the contract contains a number of clauses that, in practice, transfer most of the financial risk to the Portuguese State. Clause 101.1 is instructive:

Taking into account the distribution of risk stated in article 99, Lusoponte will have the right to the reposition of financial equilibrium, in the following cases:

- Unilateral modification of the conditions of activities integrated in the Concession, if, as a result of such modification, a significant reduction of revenue or added cost ensues;
- Unpredictable circumstances according to article 92, except if, as a result, ensues the resolution of the Contract according to number 92.3;
- Exceptionally serious perturbations in the foreign exchange market which provokes

Table 2: Tagus crossing cost comparisons

	<i>MOPTC option (2 new bridges)</i>		<i>Rest of the World option (1 bridge)</i>	
Building new bridges	Sacavém-Montijo road bridge	850	Chelas-Barreiro road + heavy rail	1400
	Chelas-Barreiro heavy rail	850		
Complementary access works	Sacavém-Montijo road	35	Chelas-Barreiro road	90
	Chelas-Barreiro rail	40	Chelas-Barreiro rail	40
Reinforcing 25 Abril bridge	road	150	road	150
	heavy rail	500	light rail	350
New urban infrastructure		330		70
Additional travel, 25 years		135		-
Total Cost		2890		2100

Unit: Million Euros

Source: MPAT (1992) and AR (1994), adapted by Melo (1995)

substantial changes in the principles of the Base Case;

- d) Legislative changes that have a significant direct impact on revenues or operation costs of the crossings;
- e) Cases where the right to the reposition of financial equilibrium are specifically granted in the Contract ...' (Clause 101.1)

If we overlook the warranties for unpredictable situations, diminishing tolls and foreign exchange unbalance, there is still one fundamental issue: traffic. Clause 101.1 implies that, whenever foreseen toll revenues fail for any reason resulting from State policy, the State must compensate Lusoponte. Changes in the amount of traffic in relation to the Base Case, caused for instance by incentives to use public transportation, may fall into such a category, because the Base Case has little flexibility regarding passenger transfer to alternative modes, be it railway, boat or road. Thus, significant investments in public transportation may result in the State paying substantial amounts of compensation to Lusoponte. Depending on the difference between programmed and actual tolls, and the difference between forecast and actual traffic, the transfers from the State Budget to Lusoponte may increase to € 50 million per year, or more, within twenty years.

The on-going land use planning problem

It is a well-known phenomenon that a new road, especially a river crossing, generates traffic and urban growth; moreover in a suburban area. The bridge influence is more worrying because this is a still largely rural area, with little capacity to accommodate rapid urban growth, insufficient urban facilities (from sewerage to public transportation), and on the doorstep of the Tagus Estuary SPA. This is why land use planning is a key issue here.

Uncontrolled urban growth is one of the most serious impacts of the new bridge, and one that was little and poorly studied in the 1994 Environmental Impact Statement (see, e.g., MARN, 1994, pp. 14-15). Although this has been recognised as a very serious failure, for nearly five years no effort was made by the authorities to gather information to evaluate the impact of the bridge on land use, despite repeated demands from the environmental NGOs, at CAO (1996/98a) and elsewhere (GEOTA/LPN/Quercus, 1998).

Only recently the so-called 'observatory of land use on the south bank' was furnished with adequate staff and funding to gather information on the issue.

The first report with some hard data was released in July, 1999 (CCRLVT, 1999).

The Environmental Impact Statement, (GATTEL/Lusoponte/Coba, 1994) listed a vast number of issues and specific actions regarding land use management and urban control (see EIS, tomo II, volume 3, pp. 75-86). These actions and measures are synthetically described in table 9.2.1(7) of the same volume of the EIS. Unlike mitigation measures for construction works (that fall mostly to Lusoponte), land management and urban control measures fall to either the municipalities (local scale) or the Government (regional scale). Regional level is the most important, as recognised by the EIS and the Ministry of the Environment's Evaluation Committee.

The major issue at municipal level was the approval and integration of the bridge in the municipal land management plans, Plano Director Municipal (PDM). However, a PDM, or a collection of PDM, do *not* fulfil any of the regional goals. A PDM is purely municipal and limited in scope. It is checked by the Government for legality, but it does not undergo any evaluation of merit regarding regional or national criteria other than law. It does not and cannot address issues like regional integration, total urban growth in the area, urban facilities, transportation, demographic changes or ecological corridors between protected areas – all of which are essential for any meaningful land management and urban control.

Among the recommendations of the 1994 EIS, the following should be outlined:

- 1) Improving the mobility in the region, regarding especially the public transportation and the road-rail interfaces (p. 78);
- 2) Definition of urban green areas and semi-natural areas at the regional level, to avoid compartmentalising the natural space, to guarantee appropriate ecological equilibrium and access for the population to high-quality recreational areas (p. 78);
- 3) Definition and integration of needs for urban facilities on a regional scale, including preferred sites and means of implementation (p. 8);
- 4) Definition, for the region and, co-ordinately, for each municipality, of maximum and desired levels of density and concentration of urban growth, according with the hierarchy of urban centres and actual growth needs (pp. 78-79);
- 5) Keeping, with a very high priority, the natural corridors between sensitive areas, namely the links Tagus-Coïna-Arrábida, Corroios-Lagoa de

Albufeira–Arrábida and Tagus–Sado (p.79);

- 6) Reinforcing the natural corridor network with a regional status (p. 79);
- 7) Priority construction areas, with adequate urban facilities, should be indicated in the PDM and the PROTAML in order to avoid unstructured urban growth (p. 83);
- 8) Enlargement of the ‘urban defence and control area’ (Decreto-Lei no. 9/93 de 18 Março) and effective control of urban growth until the PROTAML is in force (p. 86).

The EIS recommended that all these and many other lesser measures be integrated in a regional land management plan. The evaluation committee considered that a specific plan for the southern bank was not adequate, since the PROTAML was under way and expected to cover the relevant issues. This assessment was duly confirmed by the Portuguese Government and the European Commission. Therefore, under the terms of the Funding Decision (CEC, 1994, article 5, no. 2), the references to a regional plan in the EIS should be interpreted as referring to the PROTAML. The EIS recommended further that the plan should be completed by June 1995 and that it should be implemented and in full force, at the very latest by the inauguration of the bridge (tomo II, vol. 3, pp. 78-80).

This problem was thoroughly discussed at CAO, as stated in the minutes of several meetings (CAO 1996/1999a); the key discussion was on 25 February 1998, but the issue was raised often, before and after this date. CAO adopted the position of just reporting whether the land management-related measures in the EIA were complied with or not, taking no further steps on the issue because it went beyond its mandate.

Successive drafts of PROTAML were issued in November 1996 - and then ordered back to redrafting without public discussion - and again in April 2000. This time, it was at last forwarded to public discussion. As yet, no date of approval has been set.

Let us examine the last draft of PROTAML (CCRLVT, 2000a). One must first note that the PROTAML will not be mandatory. This stems from a new Governmental philosophy, consecrated by the new Framework Law on Urbanism and Land Management, that regional plans should be advisory only. Originally, the PROTAML was intended to be mandatory and, if necessary, would override the PDM. If the advisory-only character is adopted, the goals of the EIS (and the goals of the PROTAML itself) will likely not be fulfilled.

Now about the key issues listed above (here PROTAML refers to the 2000 draft):

- 1) Mobility problems are well diagnosed in the PROTAML. Solutions and some financial means are identified, but no priorities are forwarded. Hence, no warranties about when needed facilities will be built, or in what order. Most projects, such as the southern bank tramway (which is absolutely necessary to solve congestion on the 25 Abril bridge), the road-rail-boat interchanges, the new boat links, the bus network update, the new heavy rail bridge, among others, are well behind schedule or yet to begin. In short, there is no regional transportation integration;
- 2) The PROTAML identifies the problem of recreational areas and makes some positive proposals, but no means of implementation;
- 3) The PROTAML identifies preliminarily the failures and needs for urban facilities. Means of implementation are not addressed. Issues like water or sewer systems are not considered in depth (note, this implies a significant estuary pollution impact);
- 4) No definition of level or density of urban growth is essayed, although some regional integration is discussed as a matter of strategy. By and large, the PROTAML was drafted under the assumption that it must accept all or nearly all intentions of urban growth from all municipalities, although it recognises this as a serious problem. No means of correcting this situation have been forwarded, although this is one of the key issues under discussion. Renewal of old urban areas is supposed to have high priority, but few means are allocated to this goal;
- 5) The natural corridors between the Tagus, the west coast and Arrábida are, already, almost completely gone, severed by uncontrolled urban growth (CCRLVT, 2000a). The corridor between the Tagus and the Sado estuaries still exists, but is not protected. The PROTAML proposes and attributes a high priority to the natural corridor network, but does not impose specific restrictions, so it may well be ineffective if municipalities do not co-operate. Note that, in the long term, this will be the worst threat to the Tagus Estuary SPA and other protected areas in the region;
- 6) The PROTAML does propose a regional natural corridor network, but it remains to be seen how mandatory it will be. This is intended to complement the ‘national ecological reserve’,

Reserva Ecológica Nacional, that is a classification with the goal, among others, of keeping a natural corridor network along rivers, coasts and mountains; but it is overridden by a PDM classification as urban area. Unfortunately, most of the former natural corridors in the region are already built-up, have become urban expansion areas or are cut short at municipality borders by unintegrated PDM. The much needed and promised review of the national ecological reserve by the Ministry of the Environment is well behind schedule;

- 7) There are no provisions in the PROTAML, or in most PDM, linking priority construction areas with adequate urban infrastructure and facilities. On the contrary, the few available data (CCRLVT, 1999 & 2000b) indicate that a large share of the requests for construction in the region, in the past few years, fall outside consolidated urban areas, on formerly agricultural land;
- 8) An attempt was already made at the Portuguese Parliament to revoke the Decreto-Lei no. 9/93, without its scope ever having been enlarged, or the PROTAML approved. A dismissal decision was approved by the Parliament in the first reading in early 1999, with the votes of the ruling Socialist Party, but fell with parliamentary elections in October 1999. There are no warranties against this happening again.

In short, none of these key land management measures has been accomplished, nor are they likely to be assured by the 2000 version of PROTAML – despite the fact that this version represents a significant improvement when compared with earlier drafts.

The work of CAO

The Observation Committee for the new bridge over the Tagus, usually referred to by its acronym CAO (Comissão de Acompanhamento de Obra), was created on paper in early 1995. This first incarnation of CAO never worked, because it had no staff, no budget and no mandate.

Following the Memorandum of Understanding, CAO was reborn in July 1996, with its full complement of members (now including environmental NGO representatives), newly appointed Chairman and Secretary General, adequate staff and funding, and, above all, a clear mandate: to check on the Environmental Impact Assessment requirements (falling mostly on Lusoponte). The plenary of CAO worked as a body of representatives from Government,

municipalities, environmental NGOs and, as non-voting members, professional organisations. They used to meet monthly to review reports and establish policy (until 1998; the intervals between meetings in 1999 being much longer). The plenary was supported by a technical staff of three or four and an administrative clerk. CAO worked on a regular basis, both on field observation and reviewing reports from Centro de Estudos e Monitorização Ambiental, (CEMA, Lusoponte's environmental monitoring unit).

Early environmental violations by Lusoponte were prosecuted by the Ministry of the Environment, although decisions are still pending in court. Since CAO began working in mid-1996, no more major environmental violations by Lusoponte were reported. There have been many minor violations, duly reported by CAO staff and sooner or later (usually later) corrected. Lusoponte fulfilled the majority of impact mitigation measures, with delays varying from six months to a year.

An interesting by-product was that information gathered in relation to the bridge file (e.g. GATTEL, 1991; CAO, 1996/98a;b;c; CEMA/Lusoponte, 1996/98) has already supported a number of MSc and PhD theses (e.g. Vasconcelos, 1996), and will likely continue to do so for years to come.

However, some critical issues that were never properly studied by Lusoponte, included air pollution monitoring and toxicology in marine life influenced by heavy-duty construction in the estuary. Despite this having been adequately reported by CAO, and despite pressure from the environmental NGOs at CAO and before Government, no action was taken against Lusoponte for these failures.

On the other hand, most mitigation measures depending on public institutions, especially regarding urban and land use plans, were not complied with at all. CAO was powerless to have the municipalities and the Government implement proper land use plans. This prevented adequate solving of transportation problems (that, of course, were not solved at all by the new bridge) and allowed for a continuing unorganised urban growth on the southern bank of the Tagus, including in some cases within the SPA.

The bridge was opened in March 1998. In its first status report one month later, CAO stated that about half of the 160-odd environmental measures related to the construction phase were still not completed. Some one quarter were reported as irrecoverable violations (including the illegal dumping of contaminated sediment in the estuary in 1995). The rest were either done or recognised as irrelevant. As for the operation

phase, the vast majority of measures was not completed or even initiated at inauguration date.

The last verification, in the CAO final report (CAO, 1999), indicates that by late 1999 most of the measures related to the construction phase were at last, with two major exceptions: the same irrecoverable violations noted above (mostly related to illegal works in 1995), still pending in court; and the nuclear measures concerning land management that were the responsibility not of Lusoponte but of the Government and local authorities and were not performed at all. The report notes that many mitigation measures related to the operation were still not in place by December 1999, although the monitoring programme for the operation phase had been recently approved. The CAO final report was duly approved by the Minister for the Environment and CAO was thereafter disbanded. Observation duties relating to environmental monitoring fell then to the *Direcção-General do Ambiente* (Directorate General for the Environment), an agency under the Ministry for the Environment.

A global assessment of CAO work, issued by the environmental NGOs (Melo & Sequeira, 1999), concluded that CAO did a rather good job within its own mandate and restricted goals, managing to control Lusoponte adequately. It failed, however, to address broader, very critical issues stemming from the new bridge, such as land management, transportation system or long-term safeguarding of the Tagus Estuary SPA.

The European Union role

EU involvement in this project began in 1994, when the Portuguese Government applied for European funding for the new Tagus bridge under the Cohesion Fund. Despite overwhelming evidence that the project did not fulfil proposed goals, was technically poorly founded and went against European law, the Commission, under heavy pressure from the Portuguese Government, approved the financing in December 1994. Conditions imposed upon the Portuguese State by the Commission included full compliance with Environmental Impact Assessment findings, the implementation of a regional land management plan, and the creation, under Portuguese law, of the Tagus Estuary Special Protection Area (which had been declared six years earlier but never implemented in practice).

As mentioned above, works on the bridge in 1995 violated several mandatory environmental measures and hence the funding decisions. Warned by

environmental NGOs, the Commission dallied and ignored the situation. This prompted the NGOs to launch an international publicity campaign, that began to gnaw at the apathy of the Commission. By early 1996, the newly appointed Commissioner Monika Wulf-Mathies, responsible for the Cohesion Fund, was frequently confronted with undeniable evidence of repeated infringement of European regulations and decisions concerning the new bridge. Especially tiresome was question time at the European Parliament, where several MEPs wanted to know why a useless, environmentally-destructive project was being funded by the Cohesion Fund. The new bridge over the Tagus became a case study in 'how not to develop a project'.

By mid-1996, public outcry in the media and pressure from the European Parliament activated the Commission. With a series of not-so-nice letters and a couple of definitely rough meetings, the Commission pushed the Portuguese Government into honouring earlier commitments, and creating new, significant, compensatory measures. Most of these measures were actually negotiated by the Prime Minister personally at a lengthy meeting in May 1996 with the Portuguese environmental NGOs. It was an unprecedented gesture of recognition of the work and status of environmental NGOs. The approval of new measures represented a clear acknowledgement of former serious failures to comply with existing rules, although neither the Commission nor the Government ever admitted so explicitly, because that might have led to the cancellation of the bridge's financing from the Cohesion Fund. The new measures, later confirmed by a Memorandum of Understanding, included the enlargement of the Tagus Estuary SPA and the creation of the CAO.

Following the authorisation of the CAO, the European institutions relaxed until 1998, when the Portuguese authorities began to disregard their commitments, again. And again, the reports of Portuguese environmental NGOs and the pressure of the European Parliament (a mission from the EP coming to Portugal in October 1998 was instrumental) pushed the Commission into withholding the remaining finance. This time, the issue was the failure of the Portuguese Government to comply with the funding decision regarding land use planning and a proper management plan for the Tagus Estuary SPA.

It is ironic that those who gave the go ahead for this project by ignoring their own regulations on environmental protection and economic viability, are now refusing to pay for it because certain land use

regulations (that are not usually considered part of European policy but were made mandatory in this case) have not been implemented. It is also a sign that European citizenship is progressing, but still has a long, long way to go.

Conclusion

The decision process that culminated in the approval and construction of the Vasco da Gama bridge may be regarded as a paradigm on how not to develop and finance a public works project. It remains to be unveiled how could it happen, both at national and European levels of decision-making. On the other hand, this project did foster a very interesting experience in post-evaluation, in a country – Portugal – where EIA post-evaluation hardly ever exists. The CAO worked very well as a co-ordinating body for monitoring purposes. It did accomplish its main goal, which was to control Lusoponte's environmental performance and avoid further environmental crimes. On the other hand, CAO did very poorly in influencing public institutions – perhaps because no coercive instruments existed, and neither the Government nor the municipalities were really committed to the measures they were supposed to put in place. One of the lessons learned with CAO is paramount: it takes both political will and technical staff to achieve meaningful post-evaluation work.

One thing is certain: the long-term hope for the Metropolitan Area of Lisbon resides in the creation of proper regional and municipal land use plans. Unfortunately, it looks like this will only come to pass under the threat of the EU withholding the balance of the Cohesion Fund for the bridge. Thus European institutions still have a key role to play in the bridge.

To conclude, it should be said that a significant by-product of the whole affair was the change in methods and posture of the authorities, both Portuguese and European; not only regarding the status and credibility of the environmental NGOs, but also regarding the general public and the decision-making process itself. The change towards more grounded decisions, if not openness, has become apparent in later projects, e.g. the Lisbon–Algarve southern highway, or the new Lisbon airport.

Acknowledgements

The author wishes to thank his colleagues at the environmental NGOs, at the New University of Lisbon and at CAO, without whom this paper would not have been possible: to Jorge Palmeirim, former president of LPN; to Eugénio Sequeira, co-NGO

representative at CAO; to Conceição Martins, president of GEOTA; also to the staff at GEOTA and LPN who worked extra hours to keep the bridge file alive and kicking for many years; to Carlos Pimenta and Claus Stuffmann, our most intelligent contacts respectively at the European Parliament and the Commission; to Lia Vasconcelos, who did the first (but not the last) PhD on the bridge file; to my students, who have kept challenging me with the bridge case-study for the past eight years; to José Guerreiro and Helder Gil, former Chairmen of CAO; to all CAO members, without exception, with whom it was almost always possible to argue amiably, despite often conflicting positions; to CAO and RNET staff, who have borne the brunt of the work on the bridge file for the past three years; and, last but not least, to IAIA – the International Association for Impact Assessment, in whose annual meetings of 1996 and 1999 part of this work was discussed.

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Glossary

AML	Área Metropolitana de Lisboa (Metropolitan Area of Lisbon)
GATTEL	Gabinete para a Travessia do Tejo em Lisboa (Office for the Crossing of the Tagus at Lisbon)
GEOTA	Grupo de Estudos de Ordenamento do Território e Ambiente (Environment and land use study group)
LPN	Liga para a Protecção da Natureza (campaign to protect nature)
MOPTC	Ministério das Obras Públicas Transportes e Comunicações (Ministry of Public Works)
PROTAML	Plano Regional de Ordenamento do Território da Área Metropolitana de Lisboa (Regional Land Use Plan for the Metropolitan Area of Lisbon)
PDM	Plano Director Municipal (municipal land management plan).

Pedestrian priority planning principles

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Abstract

Despite the good intentions of all involved in the planning, design and development of transportation infrastructure, it has generated problems. Some have contributed to international concerns about environment, health and sustainability. Others generate significant negative impacts and impose tremendous costs on communities.

In the context of transportation, the significance of the interaction between facility users and the site, space, speed and surface characteristics of the particular facility cannot be over-stated. The respective influences of these criteria are paramount to the safety outcomes of all users.

Australia has adopted the movement of people and goods in lieu of vehicles as the fundamental transport infrastructure design/development criterion. Its support and implementation will require planning that considers all criteria and characteristics in a manner somewhat different to that adopted in the past. If it doesn't, nothing will change.

Keywords

Pedestrians, planning, site, space, speed, surface.

Introduction

Quality of life is important to every individual the world over. History lays evidence to mankind's ingenuity in endeavouring to improve quality of life. To many, quality of life is about personal financial wealth and the possession of labour saving devices. In this context, the word *labour* is used to mean *physical activity*. (Perhaps more accurately *in-activity*.)

In endeavouring to improve our quality of life in these ways, however, it is now recognised that there exists a global level of responsibility that must be universally accepted. Much is now known about issues of international concern, significant amongst which are those of environment, health and population. In the context of transport, their combined impact has the potential to be orders of magnitude greater than that of any one alone. Since the industrial revolution, what has been done has not been to our global benefit. The challenge is to put right what we can and then

ensure that the mistakes are not repeated. We are all part of the problem and, as such, we are all part of the solution.

To date, the historical development of road networks, their increasing congestion and saturation has led to the intimidation of pedestrian (and cyclist) alike. And with a global population increase of one billion now every twelve years, the movement of people and goods becomes an even greater challenge. So how will this intimidation be overcome?

In recognition, at last, of the (well-documented) socio-economic benefits that result, many countries have already committed to increasing the number of walking, cycling and public transport trips. The result – more pedestrians, more cyclists, more people on footpaths, more people on bike paths, more people on shared paths, and more potential for on-path conflicts.

Of course, not everyone will respond to this call, consequently we will have more motor vehicles. The result – more pedestrians, more cyclists, more buses, more motor vehicles, and more potential for road user conflicts.

Education has absorbed considerable time, effort and money in attempting to improve road user behaviour. It will always be the case. As long as new travellers continue to enter the transport arena, the need to educate them persists. Contrary to the popularly held view that education is a cost, it is actually an investment. To what extent investment in the provision of education resources is needed, however, is dependent upon how well the education process is supported.

Where the education process fails, for whatever reason, enforcement becomes a necessity. The provision of enforcement measures then come at a truly considerable cost.

As road trauma continues to redirect much needed finances from health treatments that cannot be avoided, to the treatment of casualties of motor vehicle incidents, that can be avoided, both enforcement and education continue to be absolutely essential.

Despite repeated attempts to do so, there is probably nothing more difficult to change than personal behaviour, other than, perhaps, a *lifetime* of personal behaviour and particularly, it would seem motor vehicle driver behaviour.

From birth our behaviours reflect the attitudes of our trainers. Thereafter we control our own behaviour as we self-modify our attitudes. Those attitudes in turn are because of, amongst other contributing factors, spatial conditioning. The space engineered to the movement of people and goods is arrived at through processes encapsulated in the word *planning*.

In the light of the increasing global evidence mentioned above, it has become apparent that transport *planning* has been in need of considerable improvement for some time.

As Australia moves to a primary consideration of the movement of people and goods (Austroads, 1998), the deficiencies now associated with giving priority to the movement of the motor vehicle must be overcome.

In the planning process of the future, it is imperative that each category of user is:

- recognised as an entity;
- equally recognised; and
- recognised as having unique requirements.

Each of the above dictate the basic safety design criterion of all facility construction proposals. Their importance cannot be overstated. No matter how good the engineering, it will never be satisfactory if the planning is unsatisfactory.

Correct planning is fundamental to the safe movement of people and goods. Should there be a failure to do so, will it really be possible to develop truly balanced or integrated transport systems?

Change The Rules – Change The Game

Australia Now

In Australia, the Ministers of Transport of each State and Territory meet regularly as the Australian Transport Council. Modal groups are responsible to the Council on all air, sea, rail and road transport issues. The Council modal group responsible for all road transport issues is *Austroads*. Austroads is the national association of road transport and traffic authorities, made up of representatives from each State and Territory of Australia (although the representative may be from the Roads Department and thus not represent Transport).

The mission of Austroads is to pursue the effective management and safe use of the nation's roads:

- as part of the Australian transport system; and
- by the development and promotion of national practices.

Austroads also provides professional advice and support to ministerial councils and national bodies. It works towards uniformity of practice in respect of design, construction and user aspects of roads and bridges and with this in view, publishes guides and procedures.

The Austroads *Guide to Traffic Engineering Practice* is a series of publications providing a practical guide to traffic engineering/planning for highway and transport engineers/planners in State and Territory Road Authorities, in local government, for engineering and planning consultants and as a

Table 1: The Austroads Guide to Traffic Engineering Practice

1.	Traffic Flow
2.	Roadway Capacity
3.	Traffic Studies
4.	Road Crashes
5.	Intersections at Grade
6.	Roundabouts
7.	Traffic Signals
8.	Traffic Control Devices
9.	Arterial Road Management
10.	Local Area Traffic Management
11.	Parking
12.	Roadway Lighting
13.	Pedestrians
14.	Bicycles
15.	Motor Cycles

reference for engineering students. It is adopted and used nationally. The *Guide* now consists of 15 Parts. Various Australian Standards also complement the *Guide*. They too are adopted and used nationally.

The Austroads Change

Consistent with its fundamental transport infrastructure design and development criterion – the movement of the *conveyance* (not that *conveyed*), Austroads traditionally prioritises road transport and road traffic issues far more for motor vehicles than for other travel modes.

This is no longer to be the case as, in 1999, Austroads announced that it would investigate the significance of a revision that *adopts the movement of people and goods in lieu of the movement of vehicles*, as its fundamental design and development criteria.

The 1999 findings of the Victoria Road Safety Committee Report (1999), *Walking Safely: Inquiry*

into the Incidence and Prevention of Pedestrian

Accidents states:

'... With the advent of the motor car, engineers had to re-design the road network to cater for faster vehicles and through innovation, technique and time the right of pedestrians to move freely has been challenged, eroded, and finally transferred to the motor vehicle.'

This statement is not unique to Victoria. It is applicable Australia-wide and acknowledges the need to re-prioritise travel patterns to achieve a shift from the current excessive use of the private motor vehicle to trains, buses, bikes and walking.

This re-prioritisation will only be possible with the assistance of Austroads and its sincerity in changing its fundamental design and development criteria.

Austroads Change Implications

It should be remembered that under the design and development regime that afforded priority to the needs of the conveyance, not that which it conveyed, past expert panels had opinion primarily based upon both the:

- needs of the motor vehicle; and
- behaviours and practices of motor vehicle drivers.

This being so, the content of each Part of the Austroads *Guide to Traffic Engineering Practice* reflects these guiding requirements. One would now have to question the appropriateness of these publications. Why is this so?

Over recent years, it has increasingly become accepted that to be really *au fait* with pedestrian issues, it is equally important to have input to decision making processes from dedicated pedestrians. Like their motor vehicle-user expert counterparts, pedestrian experts are knowledgeable of the:

- needs of pedestrians; and
- behaviours and practices of pedestrians.

Whilst, in fairness, there *has* been increasing recognition of the need for this input, and, to some extent, added representation, it has been within the limitations of the dominant '*motor-vehicles-have-priority*' regime. In the absence of this input, such panels cannot possibly be regarded as adequately representative of the issues of *all* road users. Why is this important?

It is important because those who design and construct facilities do so in compliance with standards and guidelines published by, for example, Austroads and similar organisations. Once built, those who

subsequently own the facilities carry the duty-of-care and bear the responsibility for the safety of *all* users. Each player in the process expects the facility to meet the needs of *all* users, not primarily those of a select group, and to have been designed, built and maintained accordingly.

Can we therefore honestly say that each part of the Austroads *Guide to Traffic Engineering Practice* was compiled to truly meet the needs of *all* users?

Most of the publications are dated. Their content, by default, reflects the limitations of past panel composition. Such panels predate the recognition that the needs of each defined group of users are as important as the needs of any *other* defined group within the *total* of all users. They reflect biased prioritisation to the requirements of one particular modal group – motor vehicles.

Should Austroads thus perhaps recognise that its declaration to adopt people and goods in lieu of vehicles as its fundamental design and development criteria has significant implications? Not least of these implications is surely the necessity to review the adequacy of each part of the Austroads *Guides*. This is a matter of utmost urgency and should be afforded the highest of priorities.

Of course, on a global scale, the Austroads series of publications will not be unique in this regard. For any country now affording (some might prefer – *at last* affording) equality in their consideration of the needs of *all* road users, it has to be accepted that changing the rules inevitably affects the manner in which the game is played.

Road Rules Change Implications

The adoption in 1999/2000 of a national set of road rules within Australia, *Australian Road Rules (ARR)*, brings further change worthy of consideration.

Historically, each State/Territory has maintained its own rules. It is now the intention to achieve national uniformity through adopting the *ARR*. The development of the *ARR* involved extensive consultation both within and between all States/Territories. The process began in the early 1990s and was completed in 1999.

One of the most significant changes in these rules is the redefining of the term *pedestrian*. This definition now includes the users of wheeled conveyances – mobility aids for disabled people, roller-boards, roller-skates and roller-blades.

The change is significant as many pedestrian facilities are shared with bikes on (now described as) *shared paths* (pre-*ARR* called *dual-use paths*).

Additionally, the mix of pedestrians/pedestrian facilities with cyclists/cycling facilities also has the potential to increase. This is because of the recently introduced initiatives to increase walking, cycling and public transport trips, in preference to trips by motor vehicle.

In so doing, it is imperative that each category of user is safe and supported by appropriately designed and constructed facilities. As a principal facility owner, local government is becoming increasingly concerned about its liability in the event of user conflicts and the issue is of particular interest to its members at this moment in time.

The authors of the *ARR* have also (implicitly) acknowledged that the term dual-use path arose from a past simplistic perception of path users – the pre-*ARR* walkers and cyclists. The introduction of the term *shared path* now recognises path use by the *variety* of cyclist and pedestrian user embraces far more than only two actions and/or behaviours.

Does this mean that we can simply now call all existing dual-use paths, shared paths?

The Austroads *Guide to Traffic Engineering Practice – Part 13: Pedestrians* was produced to meet the requirements of pedestrians. It was developed in the context of the *then* defined pedestrian. Dual-use paths were also designed and built for use by both the *then* defined pedestrian and cyclist.

Today, the full extent of the various users of dual-use paths is fully recognised. These users will be joined, in the future, by the additional users of shared paths, now included by the redefinition of pedestrian. These additional users are *mobile* people on wheeled vehicles – mobility aids, skateboards, roller skates and roller blades. Their presence, motion and associated movements were not a consideration at the time of the development of *Part 13: Pedestrians*. Such publications are adopted by local government engineers/planners, consultants, *et al.* in the design and construction of facilities. Quite often, in the provision of new facilities, funding support is totally dependent upon meeting the published specifications in full. Their content is religiously complied with or if not, variances are supported by a risk analysis.

The changes brought about by the *ARR* now renders *Part 13: Pedestrians* out of date. (And what of the other parts of the *Guide*?)

With reference to the existing publication, let us again consider the question, *‘Does this mean that we simply now call all those existing dual-use paths, shared paths?’* and add the supplementary question,

‘What is likely to happen?’

It is unlikely that local government, the majority owner of pedestrian facilities, will support the use of existing facilities by additional users where such facilities have not been designed to meet all user requirements. In the interest of the safety of all users, it would not be safe to do so. Local government could therefore simply choose *not* to call all existing dual-use paths, shared paths.

One option would be to re-classify dual-use paths as *footpaths*. In this way, it would make use of the larger sized dual-use paths to accommodate the additional, and wheeled, pedestrian users. This option becomes additionally attractive as the number of incidents between cyclists and pedestrians increase. (This decision, however, would prove most detrimental to the encouragement of cycling using networks that currently have dual-use paths, or where shared paths are to be components of future bicycle network development.)

In the case of existing footpaths, of a size inadequate to safely support added wheeled pedestrian traffic, signs prohibiting the use of certain pedestrians would be a most likely requirement.

To complicate matters even further, the *ARR* will allow all cyclists under the age of 12 to ride on footpaths. Thereafter, the rules leave it to individual authorities to decide whether or not those over the age of 12 will be allowed to ride on footpaths.

It is most unlikely that future investment into either facilities that are designed inadequately or that compromise safety will ever take place. This being so, it is imperative that the standards or guidelines constantly meet the requirements of all users.

As the numbers of users increase, the design standards and guidelines that are necessary to support the harmonious and safe co-existence of all users must maintain pace. The need to provide sustainable, environmentally friendly, balanced and integrated transport systems that are safe for all users is an ever increasing challenge, but is essential and vital.

The Provision of Facilities

Past Choices

It is an impossible task to accommodate the preferences of every individual. Everyone is somewhat different. However, in relation to some issues significant commonality of choice can be found.

I would suggest that an Australian example of an issue generating a majority view would be in relation

to home garaging. I would count myself amongst those that would prefer to have their vehicles parked in a lock-up garage attached or adjacent to their home. Apart from the convenience, there are issues of security. Associated with the security issue, there are financial issues. Many insurance companies will charge higher premiums if the vehicle is not locked in a garage located on the home site. It is therefore not an unreasonable expectation that access to the home is planned as a component of road network systems.

Not so many decades ago, motor car numbers were far fewer than today. To use a car to travel to the town centre to shop or conduct business was part of the pleasure and benefit of owning a car. There was also an expectation that there would be somewhere to park the car close to where those services were located.

Kerbside parking and parking lots were then planned into the road network system. Whilst, as individuals, we obviously wanted them as close as possible to where we were going – less distance to walk and to carry heavy shopping bags – someone else actually decided where they would be located.

Another choice, that of elevating the surface of the footpath above that of the road, assisted in the demarcation between footpath and road. It also fulfilled other useful (engineering) purposes, e.g. drainage.

Unfortunately, however, the kerb employed as the line of demarcation did act as a hurdle to some. How severe a hurdle it was depended upon who was doing what. Parents with prams, children on tricycles, people with shopping trolleys, the elderly, the infirm, the visually and physically disabled, and no doubt others, would testify to varying degrees of difficulty.

On the other hand, motor-powered vehicles, which are designed to move on cushioned rotating discs, supported by mechanical suspension devices, providing comfort and environmental protection for its occupants don't suffer such an obstacle. Isn't that choice somewhat illogical?

In many countries, it is now mandatory to cater to the needs of disabled people, whatever the disability, on footpaths, at bus stops, roadside kerbs, road crossings, etc. This has led to alternatives to the step-kerb. Despite such alternatives, the fundamental feature remains – the footpath surface is discontinuous and changes height relatively significantly over comparatively short distances. *So, in choosing to elevate the surface of the footpath above that of the road, is the provision of a kerb, therefore, a most*

influential factor in footpath discontinuity?

Amongst the considered advantages of having a motor car is its instant availability and the *perceived* travel time savings. Whilst its availability is a function of ownership, savings in travel time are only achieved if car speeds can be maintained. Contributory to the maintenance of speed is a network of roads planned with minimum interruption to motor vehicle progress. *So, is the provision of a smooth road surface that suffers virtually no discontinuity a most influential factor in maintaining motor vehicle speed?*

The difficulties of maintaining vehicle speed and minimising interruptions to a vehicle journey increases with increasing vehicle numbers. This is particularly true where other than motor vehicles have to be considered. Does the majority population have a motor vehicle, or access to one, or indeed is able or allowed to use one? *So, is the increase in motor vehicle speed and increasing non-compliance with speed limits a most influential factor in the increase in road user fatalities?*

As individual personal wealth has grown, ownership of vehicles has increased in parallel. As the world's population has grown, the number of vehicles has again increased in parallel, and so too has the priority afforded to this seeming panacea of transport. In most situations, the mix of pedestrians and motor vehicles has also increased. *So, is the delay in crossing roads (at grade) a most influential factor in the increase in journey time of a pedestrian?*

Simple mathematics reminds us that if you half the radius of a circle or sides of a square, then the enclosed area reduces by 75%. As global population and the number of vehicles continue to rise, fitting everything in becomes an increasing difficulty! Is it any wonder, therefore, that congestion is a problem if we remain intent on getting motor vehicles to the centre of grid or ring-and-radial geometry networks? *So, is the non-linear reduction of available space in which to accommodate all road users a most influential factor in increased road user congestion?*

The problems of city centre congestion are well known and have been the focus of considerable attention and activity. In a similar manner, vehicular activity around schools has also attracted increasing attention. There are many such nodes worthy of attention when considering the movement of people and goods.

Current Choices

Efforts to date to improve road user harmony would seem to reflect a primary focus on, what is termed,

traffic management or *traffic calming*. This would also seem to be the basis of current thinking by many on future choices, reflecting a basic *no change* choice to the *status quo*. What could possibly underpin the logic of this choice? There is a wealth of evidence indicating:

- that this approach has failed to cater for the safety of the current number of road users;
- the magnitude of socio-economic costs related to transport issues; and
- the impact of future population growth (at unprecedented rates of increase) on both road user safety and community cost.

As previously stated, Austroads is currently undertaking assessment of the significance of adopting people and goods models in lieu of vehicle models in traffic management. Experts were invited to address the issue at a workshop held at ARRB Transport Research in Melbourne, August 1998 (Austroads, 1998). Somewhat unexpectedly, not one author questioned the appropriateness and suitability of existing facilities and infrastructure to the needs of *all* users. Not once was even the question raised that if people and goods were to be considered on an *equal* basis to vehicles, would there be a need for exclusive people/goods facilities, just as there are exclusive vehicle facilities. What did emerge was that the parameters associated with the movement of people and goods would be included with those of motor vehicles, *within the existing infrastructure*, in an attempt to determine the effect of their inclusion on the movement of vehicular traffic.

There seems to be little evidence that, in the same way as motor vehicles, people and goods are being afforded true recognition as:

- entities;
- equal; or
- having particular requirements.

In the absence of these considerations, it is unlikely that the current situation will improve. It is even more unlikely that the future, more populated, scenario will be better. It is likely, however, that it will be worse.

Fundamental to any future choices associated with adopting people and goods models in lieu of vehicle models, must be an acceptance that existing parameters must be revised, modified or discarded. There is also the possibility that it may be necessary to introduce new parameters. Only with this new mindset will it be possible to improve the currently unacceptable situation.

Future Choices

Planning is an activity demanding the inclusion of a multitude of requirements. Not unlike the subject *pedestrian*, planning is equally a significant collection of inter-related issues of differing specialities. To assist planners to respond to the future movement requirements of people, be they associated with the development of new facilities or the updating of existing facilities, it is recommended that the following planning principles be adopted at all times and form the foundation of any planning proposal. (It should be noted that each principle is illustrated by only a few of the many possible examples that could have been chosen.)

A At all times, identify the majority site user and the principal activity(s) of the majority site user.

Examples:

- A school is an educational site used by large numbers of children and a lesser number of teachers and teacher aides. It would normally be enclosed by some sort of fenced perimeter with relatively few dedicated points of entry and exit. Access to or egress from the school should be primarily shared by both pedestrian and bicycle modes of transport.
- A housing estate is a residential building site used by large numbers of children and adults of all age groups. The safety of all users is paramount at all times in their coming and going throughout the site to take advantage of the services and facilities provided. Pedestrian activities and pedestrian and bicycle modes of transport should predominate and be encouraged at all times.
- A shopping centre is a service site used by a large number of people of all ages. It could be part of a city centre, or be a dedicated site located in a suburb. Within the shopping centre site, pedestrians would predominate and walking would be the majority user activity.
- A street car park is a dedicated site used principally by pedestrians driving motor vehicles. It is traditionally located close to a business centre, shopping centre, sports centre, entertainment centre, etc. Walking would be the principal activity of the majority user.

B At all times, identify additional site users to the majority site user and the principal activity(s) of the additional site users.

Examples (related to those above):

- School service vehicle access should be restricted to the times children are in class. Facilities for parents dropping off school children by motor

vehicle, if absolutely necessary, should be designed to occur well away from established school walking and cycling access routes.

- Housing estate access by service vehicles and by privately owned motor vehicles (resident or visitor) to homes should be permitted under a strict regime of speed control and where pedestrians have priority at all times.
- Access to and egress from the shopping centre site would be dependent upon location. Access would vary accordingly and be a mix of pedestrian, bicycle, public transport and private motor vehicle modes of transport. Shopping centre service vehicle access should be restricted to the days/times of minimum shopper density. Service vehicle access to businesses should be permitted under a strict regime of speed control and where pedestrians have priority at all times.
- Street car park vehicular access and movement should be under a strict regime of speed control and where pedestrians have priority at all times.

C *At all times prioritise all site user needs.*

Examples (related to those above):

- 1st School children/teachers/teacher aides.
- 2nd School service vehicles.
- 3rd School children's parents.
- 1st Housing estate residents.
- 2nd Housing estate resident's vehicles.
- 3rd Housing estate service vehicles.
- 1st Shoppers of all ages.
- 2nd Shopping centre service vehicles.
- 1st Pedestrians.
- 2nd Motor vehicles.

D *At all times, reinforce user prioritisation with behaviour conditioning devices.*

- D.I. Adopt a car-free area philosophy where pedestrian activities predominate and for which the city/centre/area is designed.
- D.II. Maintain the footpath surface level at locations where pedestrian activities predominate and for which the city/centre/area is designed.
- D.III. Restrict motor vehicle proximity to sites or the centre of grid or ring-and-radial geometry networks by prohibiting road construction within a radius dependent upon site/centre principal activity/users.
- D.IV. Where vehicular access is absolutely essential (e.g. accessing a home or servicing a shop) maintain consistency of footpath level within

the predetermined radius of the activity area, enforce a strict speed control regime and prioritise pedestrian activities at all times.

- D.V. Maintain consistency of footpath surface level at all locations where pedestrian movements have priority over motor vehicle movements.
- D.VI. Provide grade separated access routes between principal pedestrian activity centres and public transport services.

E *At all times, consider the driver of a motor car to be a pedestrian between walking trips.*

Conclusion

It is unfortunate that our technological progress, following the industrial revolution, has generated the global problems with which we are familiar and often reminded. Nevertheless, these problems exist and the challenge now is to overcome them. At an international level this challenge is being taken up by many of the world's governments, and we all have a part to play.

It is equally unfortunate that despite the good intentions of all involved in planning, design and development of transportation infrastructure, problems have resulted. Some of the problems have contributed to international issues that must be addressed now. Others have major negative impacts on communities, both local and national, generating tremendous costs that we must all bear.

No matter how good the facilities provided, or how much we hope those facilities will be used sensibly and as intended, human failures result in the need to enforce and reinforce attitudes and behaviours. This too has to be provided at some considerable cost to our communities.

Whilst regrettable, it is now necessary to admit that there exists a need for some significant improvements to be made. It is also necessary to admit that these improvements will not come about based on current practices and their continued adoption.

Furthermore, to now adopt people and goods in lieu of vehicles as the fundamental transport infrastructure design and development criteria is revolutionary. Its implementation demands equally revolutionary planning.

Advocates of alternatives to the motor vehicle will indeed see this change to be of much significance. Others will choose not to regard it as such, despite all the evidence that overwhelmingly confirms and reminds us that since the industrial revolution, what has been done has not been to our global benefit.

The challenge is to put right what we can and to then ensure that the mistakes are not repeated. The opportunity is there to be taken – all it needs is the willingness to do so. We are all part of the problem and, as such, we are all part of the solution – particularly planners.

Implicit in this paper has been the significance of **site, space, speed and surface** to **all** travellers. Their significance cannot be overstated. Also of significance is the necessity to consider them equally for all users/ travel modes, i.e. without fear or favour. In so doing, it should not be forgotten that the needs of the motor vehicle must still be accommodated and be as much a part of the process as any other component. Priority remains the main change factor.

The influences of the “Four S’s” – site, space, speed and surface – are paramount to the safety outcomes of all users. The time to consider these criteria in a manner somewhat different to that adopted in the past is now. It is professionally irresponsible not to do so.

Acknowledgement

The views expressed in this paper are those of the author, and in no way represent the views of the Western Australian Department of Transport. No part of this paper may be reproduced without the express permission of the author.

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Conference Announcement

Australia: Walking the 21st Century
An International Walking Conference

20th–22nd February 2001. Perth, W.A.

Speakers include: Jan Gehl, Mayer Hillman, Rolf Monheim, Peter Newman, Carmen Hass-Klau, Spenser Havlick, Carol Garber, Rod Tolley, Ellen Vanderslice, Werner Brog & Geetam Tiwari.

The Program

Keynotes & Theme 1: papers will address planning & related walking issues.

Keynotes & Theme 2: papers will focus on health & recreational walking.

Conference Organiser

John Seaton

Australia: Walking the 21st Century,
Metropolitan Division, Department of Transport,
PO Box 7272 Cloisters Square,
PERTH 6850, W.A.

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Let's Bike – The 10 Point Pedalling Action Programme to support cycling

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Abstract

At the 11th VeloCity Conference in Graz and Maribor, in April 1999, experts, lobbyists and users from all over the world exchanged their experiences and developed ideas. As the potential of cycling has not been exhausted in any country, a 10 Point Pedalling Action Programme was devised. It includes basic requirements for the greater promotion of the bicycle in policy development and society. Image and use of the bicycle must be improved and necessary infrastructure must be provided.

Keywords

Bicycle, cycling, infrastructure, planning, VeloCity

Introduction

As a modern and personal mode of transport, the bicycle meets the needs of individuals for speed and flexibility as well as the demands of society for environment-friendly and sustainable transport. Furthermore, the bicycle is an important economic factor, for example in tourism, and its use helps maintain good health.

The bicycle benefits individuals, families, communities and society:

- *The bicycle meets ecological and environmental demands:*

It is a zero-fuel, zero-emission and zero-noise mode of transportation.

- *The bicycle is an equitable mode of transport:*

It is accessible to almost all including children and even some people with disabilities. It supports vicinity, neighbourhoods, compact and mixed-use urban structures, hence it eases mobility.

- *Investments into bicycle traffic are very cost-efficient:*

Bicycle traffic has a high cost/benefit ratio.

- *Cycling is healthy and keeps you fit:*

When cycling is integrated into your daily life it

keeps you fit without investing extra time and money.

- *The bicycle is inexpensive to purchase and operate:*
It helps cut back your transportation budget.

- *The bicycle is quick from door to door:*
It covers many destinations in a city within competitive journey times. It also is slow enough for you to experience city life and to contribute to urbanity and social interactions.

- *Cycling is individual and spontaneous:*
You are independent from public transport schedules and from car parking spaces.

- *The bicycle's ally for long distances is public transport:*

As a human-powered mode of transport the bicycle is limited in its range. Through bike-and-ride or ride-with-bike these limits can be overcome to the benefit of both modes.

Worldwide comparison of bicycle use

Prior to the 11th VeloCity Conference in Graz and Maribor, participants from 40 countries were asked to evaluate the condition of cycling in their countries. Twenty-eight people from 23 countries responded. The results show widely varying circumstances for cyclists and a widely varying condition of cycling (Huwer, 1999).

In the Netherlands and Denmark, many journeys are made by bicycle, with a national average of 27% in the Netherlands and 21% in Denmark; whereas a large number of countries have bicycle use at less than 5% (Figure 1). The Dutch and Danish values show the potential which can be reached in other countries. In all European countries an increasing acceptance of cycling can be recognised, albeit with significant regional variations and a clear decrease from north to south.

In spite of this in the 'traditional VeloCities' in Southeast Asia, economic success and increasing motorisation is accompanied by the marginalisation

of bicycle traffic. Redistribution of space in favour of car traffic and increasing exhaust gas pollution impair cycling conditions.

In the East European countries and Russia, while the bicycle is used rarely for more than 5% of all journeys and its availability is even worse, urban public transport is quite good. However, as the dense urban structures and land use patterns are changing radically in tandem with increasing car ownership, so the traditionally good access to public transport is at risk and the opportunity to increase bicycle use is lessening.

At the conference, a totally different dimension of the importance of the bicycle in less developed countries was illustrated by a project in Uganda: cycling women now need not carry water over long distances on their head. Nurses and midwives can reach more people by bike, even those living in areas which are not accessible by car. Consequently, health care can be improved (Kisamadu, 1999).

On the other hand, in some countries there are religious and cultural obstacles against the use of bicycles (for example, it is not acceptable for women to ride bikes in Egypt).

Structural influences

In countries with bicycle share of journeys at less than 5%, very different conditions can be found. The

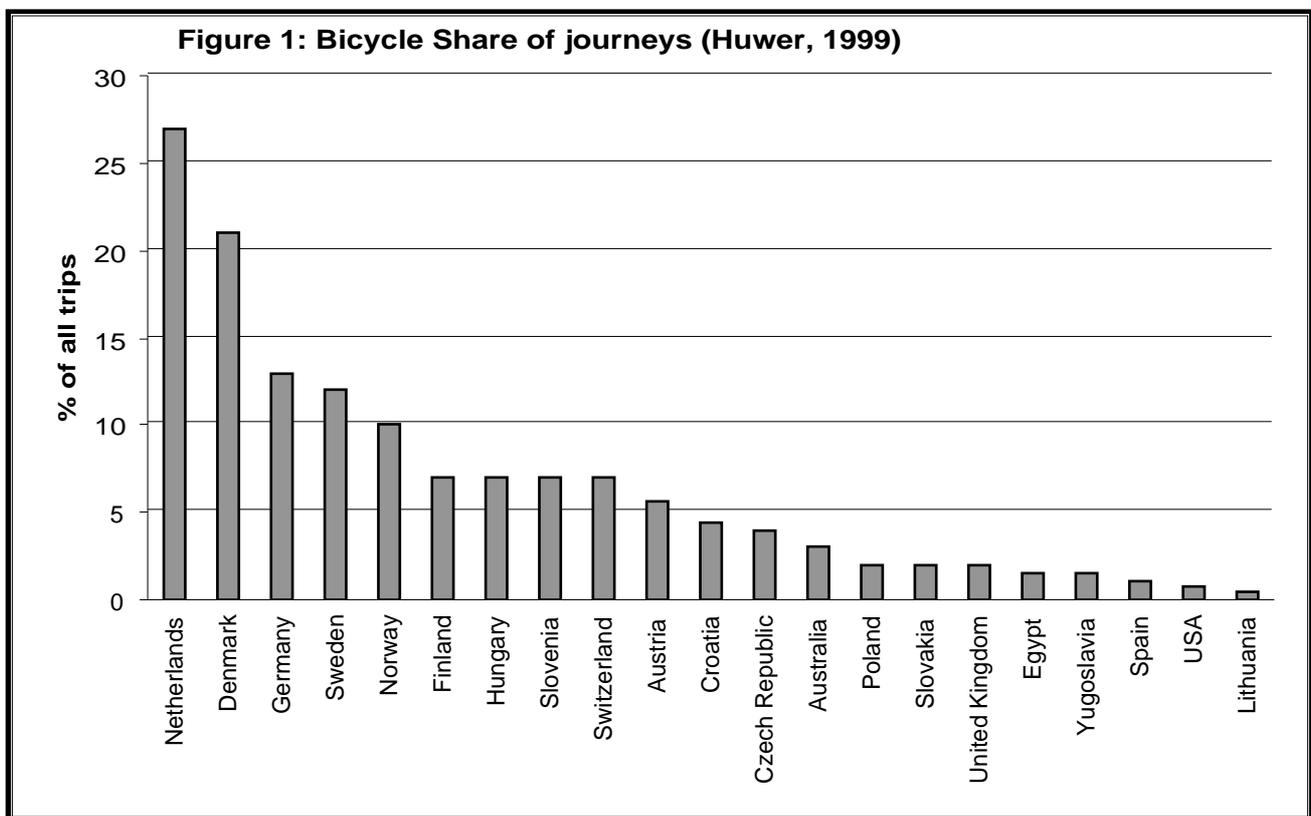
availability of a bicycle, the degree of motorisation, land use and economic power, are dominating structural factors responsible for the acceptance of cycling.

In nearly all countries, more people own a bike than a car (Figure 2). It is particularly noticeable that in wealthier countries bicycle ownership is higher than already high car ownership rates. However, this is not reflected by the bicycle's share of journeys. Only the image of leisure cycling can be related with this fact: the bicycle is seen as recreation equipment or as a toy. Its acceptance as a commuter vehicle in daily use is still missing (Figure 3).

A dispersed, car-oriented land use pattern, such as in the U.S.A. and Australia, is an important factor which restricts cycling. The (originally) high density and mixed land use of European cities offers much better conditions for bicycle use. Or rather development done with non-motorised mobility in mind. This explains how the bicycle as a determining factor of land use development can benefit from urban conservation and infrastructure reconstruction.

Integration in different policy areas

The advantages for transport and urban infrastructure describe only a part of the effects and relationships in which the bicycle is involved. However, the bicycle is a key, and largely



unrecognised, component in many other policy areas, such as the economy and health policy. Initial recognition of this has come from the World Health Organization which now considers cycling and walking as a beneficial, physically active and healthy mode of transport (WHO, 1998).

Acceptance, image and actual use of the bicycle can only be encouraged if it is included in all areas of living. Therefore, the 10 Point Pedalling Action Programme can offer a fundamental approach.

A resolution as the basis of demands

The programme aims at creating an international framework showing the requirements which must be made worldwide. Then, its adaptation to country-specific conditions and needs must be developed at national level.

There are some examples of national bicycle plans. Not only the Netherlands and Denmark but also the U.K., Australia, and the U.S.A. have set goals for the next five to ten years in such programmes. Germany has also begun a discussion about a national bicycle plan, after the adoption of the First Governmental Bicycle Report (Bundesministerium für Verkehr, Bau und Wohnungswesen, 1999).

To ensure the success of a programme promoting bicycle use, dialogue across national borders is very helpful and important. This fact could already be

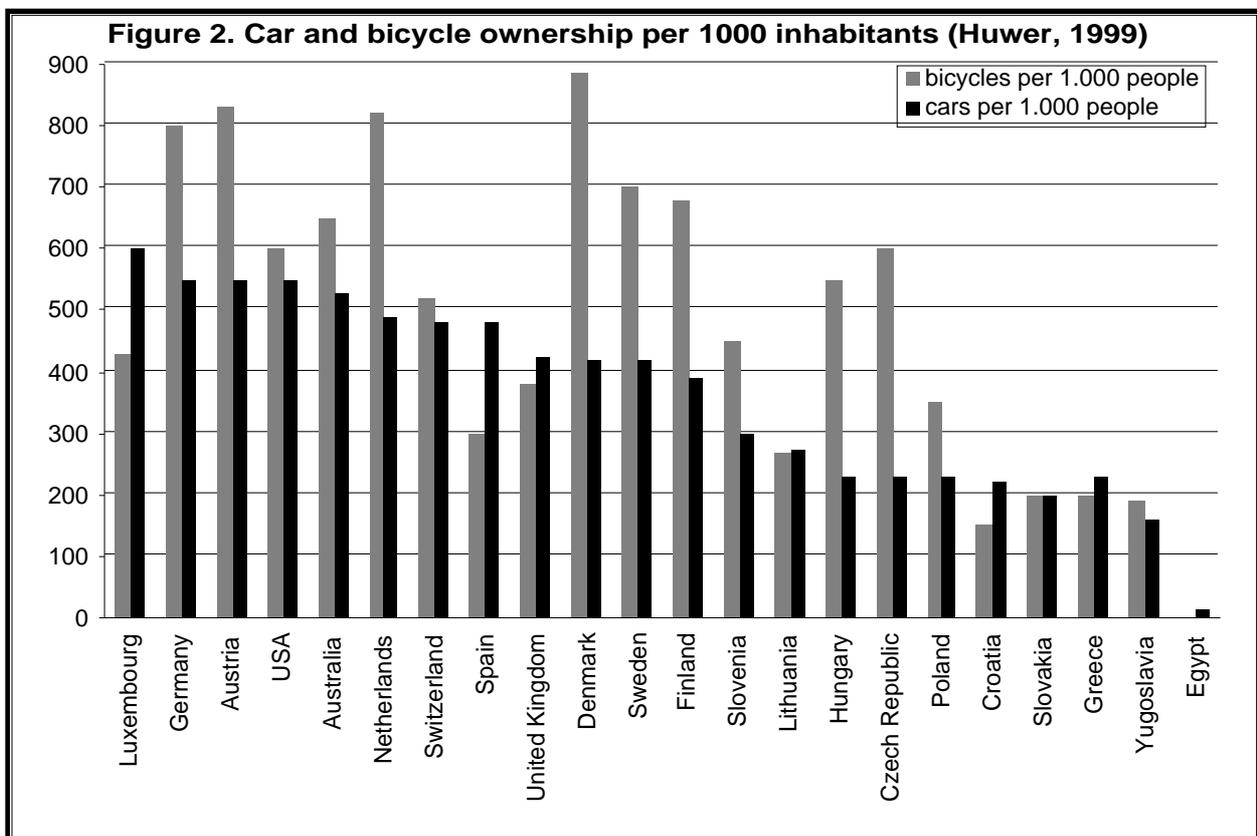
recognised during the development process of the resolution.

Resolution development process

During two days at the conference, the 10 Point Pedalling Action Programme was refined. The discussion was based on a draft devised by Ulrike Huwer, Mary Elizabeth Gonzalez and Hartmut H. Topp at the Universität Kaiserslautern. Fifteen experts from 13 countries and 4 continents were involved. The large number of different problems in different countries became obvious in the discussion and influenced the views on single topics. The perspectives from other countries were helpful and enlightening.

While the planned workshop time was not sufficient, the results of the discussion were integrated in the draft and again discussed on the next day. In an extra cabin on the train which took the complete conference to the meeting point in Maribor, the workshop participants met again to continue and finalise the intensive discussion.

The results of these two days of discussion was the 10 Point Pedalling Action Programme. It was presented to all conference delegates at the closing session and was adopted.



The 10 Point Pedalling Action Programme

1. *Raise community awareness to improve conditions that encourage cycling*

All public and private sectors should promote cycling as a sustainable mode of transport. Campaigns should target improving attitudes towards cycling, its image and status.

2. *Promote bicycle usage in education and professional training*

All countries should integrate cycling in their education programmes. These programmes should aim to increase bicycle use by young people and create an awareness of the benefits of sustainable and gentle mobility. The same applies to professional training for all involved in community services, such as engineers, planners, police, health professionals and driving instructors, who need to have a positive consideration of cycling in their decisions and actions.

3. *Plan land use for bicycle distances*

Town and regional planning should be based on proximity and accessibility to keep distances within bicycle range.

4. *Road traffic accidents involving cyclists must decline by 10% each year*

More cycling with fewer accidents needs a bicycle safety strategy with a benchmark reduction of at least 10% per annum. Special consideration should be given

to the non-restrictive character of safety measures for cycling.

5. *At least 3% of all transport budgets for bicycle traffic*

A minimum of 3% of all public expenditures for transport on the national, regional and local level should be earmarked for promoting cycling and providing bicycle facilities.

6. *Make urban transport networks suitable for cycling*

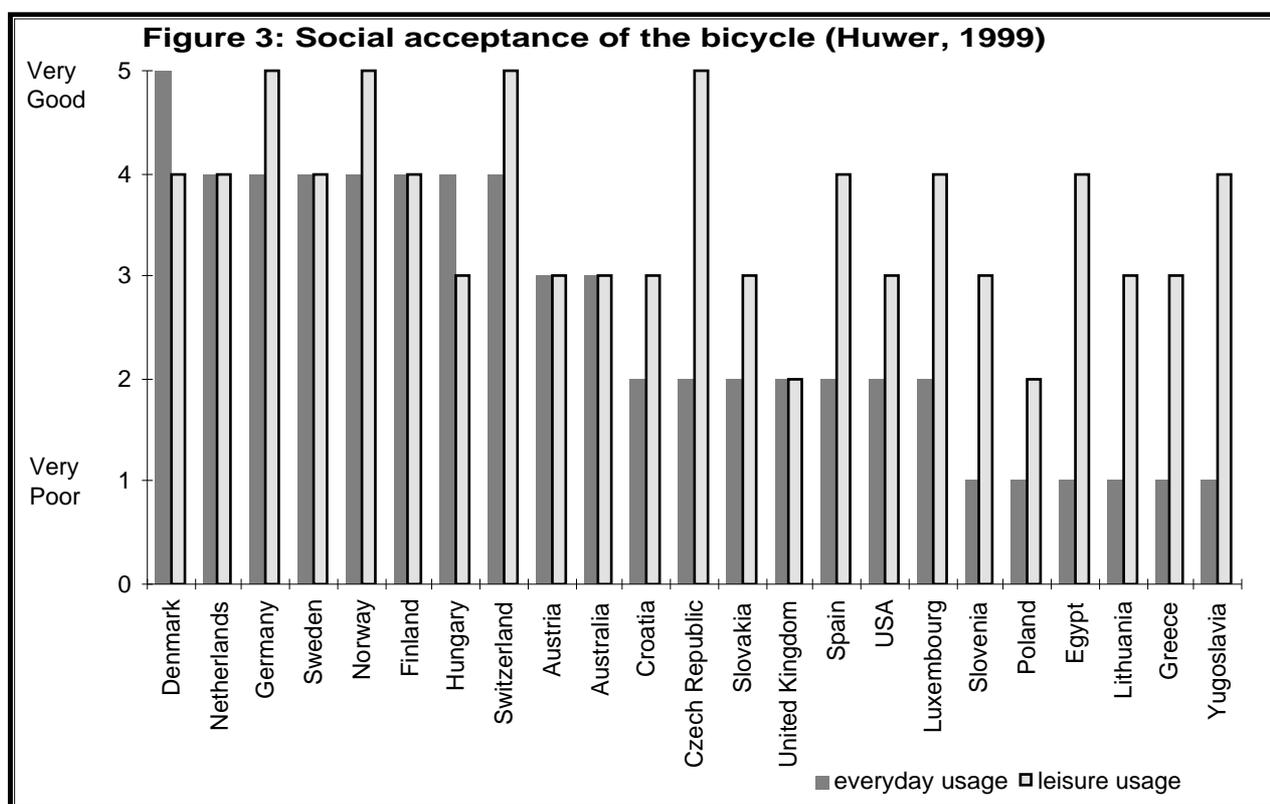
Cycling needs safe, direct, comfortable and attractive connections which ensure independent mobility for all including children, elderly and people with disabilities. Space for cyclists should not be provided at the expense of pedestrians.

7. *Optimise transfers between bicycle and other modes*

Transport modes, interchanges, city and district centres should be reachable and accessible, and provide easy transfers. These focal points of bicycle traffic should be staffed, safe, secure and comfortable bicycle storage, service and rental facilities.

8. *Strengthen the alliance between public transport and cycle traffic*

Theft and weather protected bike-and-ride should be provided at bus and train stops, as well as ride-with-bike in trains during off-peak hours. Railways should generally provide bicycle transport including cross-



border connections.

9. Include bicycle garages in building regulations

Building regulations should require that bicycle garages be included as a part of residential buildings similar to the usually demanded car parking spaces. The same applies to the most common destinations for bicycle journeys.

10. Connecting communities by long distance cycling networks

Outside cities, an uninterrupted cycling network should cover regions and countries. In addition, it should cross frontiers to foster local recreation and tourism.

Conclusion

Promoting the bicycle as a sustainable and healthy mode of transport and implementing these ten points needs incentive, recognition, dissemination and rewards for best practice. Therefore, future VeloCity Conferences will consider 'Let's Bike' awards to support this process.

VeloCity delegates called upon all countries to define, establish and monitor a national bicycle programme. They recommended that the 10 Point Pedalling Action Programme should be included and tailored to the specific conditions and needs of each country.

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Read through the following guidelines and feel free to contact John Whitelegg, the Editor, who will be pleased to offer comments on drafts, work in progress, or ideas which could be made into an article.

Editorial objectives

The journal aims to provide validated information about the latest developments in transport policy to enable local authorities, governments, consultancies, NGOs and supra-national organisations to speed up their policy development and implement new ideas from around the world. It will:

- cover all passenger and freight transport
- deal with global as well as local issues
- include the development of the ideas of sustainability, the design of cities and rural areas, transport corridors and international links to improve health, the economy and the environment.

Article composition

Articles should normally be between 2,000 and 4,000 words. Shorter articles can be published as "Comment" pieces. Responses to papers which have appeared in the journal, either as letters to the Editor or as response articles, will be welcomed.

Submitting articles

1. By e-mail

Articles for publication may be submitted by e-mail attachment to Pascal Desmond. It is useful if authors indicate what software is required to read any attachments and if they include the letter combination 'zq' in the title. Please DO NOT name articles 'whitelegg', 'wtpp' or variations of these. Authors are advised that they may need to provide a version on paper and/or on 3.5" disk prepared on an Apple Macintosh or PC system.

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Three copies of articles, typescript and double spaced with wide margins are needed. Manuscripts will not normally be returned, so you should ensure you retain a copy. Provide the article on paper of no less than 80 gsm weight with high quality print. This will enable electronic scanning if needed. Please supply the same version of the article on a 3.5" disk prepared on a Macintosh or PC system in ASCII format. Mark the disk clearly with your name, the article title and the software you have used. Where there is ambiguity, the disk version will normally be considered definitive.

Presentation

Headings and subheadings should be used at approximately 500–750 word intervals. Ensure that headings and subheadings are clearly identified.

Charts, diagrams and figures

These should be called "Figures" and numbered consecutively (e.g. Figure 1, Figure 2, etc.). Make sure they are clear and can be reproduced easily. In addition, provide

the raw data so that we can redraw them, if necessary. Indicate where in the text they should appear "(Figure 1 about here)". Each figure should have a brief title (e.g. "Figure 1. Schematic of the Programme").

Tables

Tables should be numbered consecutively, independently of figures. Indicate in the text where they should appear. Give them a brief title. Ensure that they are clear and legible. Authors should not use many tabs or spaces between columns of data – normally, one tab is sufficient.

Maps

Maps are especially welcome as 'tiff', 'pict' or 'jpeg'. They should be numbered consecutively, independently of figures and tables and their location in the text should be indicated. Ensure that they are clear, uncluttered and legible. They should have a title.

Measurements

SI units should be used throughout.

Abstracts & Keywords

Write an abstract of 75 words or so which summarises the main points of the article. It should be sufficient for a reader to decide whether or not they want to read the whole article. Also note up to six keywords which describe the content of the article. These could include geographical area, if specific, industry, functions, managerial activity and process.

References

Authors should keep references to a minimum, ideally no more than ten to fifteen. References should be confined to essential items only and those that are necessary to establish key steps in an argument or key areas of support for a particular proposition.

Reference citations within the text should be by the author's last name, followed by a comma and year of publication enclosed in parentheses. A reference list should follow the article, with references listed in alphabetical order in the following form:

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