

Achieving Sustainable Urban Transport

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Abstract

Singapore aspires to have a world class land transport system (LTA 1996) and in many ways it has already achieved one (May 2004). But the goals of governments for their cities are changing, with an increased emphasis on achieving a sustainable urban transport system (EC 2007). This paper offers a possible interpretation of this goal, considers the extent to which cities are currently sustainable, and reviews the barriers to achieving sustainability. It then looks at ways in which the decision-making process might be enhanced to achieve more sustainable outcomes and reviews research evidence on the nature of more sustainable transport strategies. Finally it suggests the steps which are needed to enable cities to implement such strategies.

Introduction

Many governments are now advocating the development of sustainable urban transport systems. The European Commission has recently issued a Green Paper on the pursuit of such a policy for all European cities (EC 2007). But the concept of sustainability is still being interpreted in widely differing ways, leading to different policy recommendations. Moreover, where there is agreement on what constitutes a potentially sustainable transport strategy, as in recent work by the then European Conference of Ministers of Transport (ECMT 2006), there are significant barriers to implementing such strategies. In this paper we consider how best to interpret the concept of sustainability, review evidence on the lack of sustainability in European cities, summarise recent

recommendations on sustainable strategies, and outline recent research into reducing the barriers to implementing such strategies.

The Meaning of Sustainability

The concept of sustainability was introduced by the Brundtland Commission in 1987 as an approach which meets the needs of the current generation without reducing the ability of future generations to meet their needs (Brundtland 1987). This concept of inter-generational equity remains an important force in current thinking, with concerns that global warming and fossil fuel depletion will severely limit our grandchildren's ability to enjoy the opportunities which we do.

However, the concept of sustainability has since broadened to one which encompasses environmental sustainability, social sustainability and economic sustainability (Lautso et al. 2004). The environmental aspects include the concerns for the global environment as well as the more immediate local environmental impacts of transport. The social aspects involve inequities today between rich and poor, within cities and between countries, but also address the original Brundtland concern for future generations. Both of these are areas in which it is accepted that enhancements are needed. But those enhancements will only be affordable if the economy itself is sustained so that we can afford such enhancements.

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Unfortunately, this broadening of the concept has resulted in the term being used to justify a wide range of differing policies and aspirations. The lack of a common understanding of the term has also contributed to a lack of coherent action. It is therefore necessary to define these terms more specifically. An ECMT report on Sustainable Transport Policy (ECMT 2000) identified nine objectives shown in *Table 1*. More recently some policy documents have added security and contributions to education and social policies to the list.

How Sustainable Are Our Cities Today?

The objectives in *Table 1* offer a clearer and more specific definition of sustainable urban transport, but the terms are still abstract. It is often easier to prompt action by pointing to the concrete evidence of unsustainability. The European Commission in its Green Paper on Urban Transport (EC 2007) presents such data for 2005 and the pre-enlargement EU-15.

Table 1: Transport objectives and their contributions to sustainability

ECMT Transport Objectives (2000)	Sustainability “leg”		
	economic	social	environmental
Improving transport safety	✓	✓	
Creating wealth	✓		
Improving access		✓	
Reducing congestion	✓		✓
Reducing severance, fear, intimidation		✓	
Protecting landscapes and biodiversity		✓	✓
Reducing noise			✓
Reducing greenhouse gas emissions			✓
Improving air quality			✓

Congestion was estimated to cost €100billion per year, or over 1% of GDP, with 80% occurring in urban areas and costs anticipated to double in a decade. Over 100,000 deaths are brought forward each year by transport-related pollutants, of which over 70% are generated in urban areas. Over 20% of the population is exposed to daytime noise levels of over 65dBA, the threshold beyond which noise has been found to increase the risk of heart attacks by as much as 20%. German and Dutch research suggests that between 20,000 and 50,000 deaths might be brought forward each year as a direct result of traffic noise. Road safety is another area in which considerable improvements have been made, but there are still around 13,000 direct fatalities and 210,000 serious injuries each year on the roads of Europe’s cities. Finally, transport in Europe’s cities accounts

for 14% of all Europe's CO₂ emissions, a proportion which is expected to grow substantially, and which is clearly inconsistent with the goal of a 60% reduction in emissions by 2050.

Indeed, the decision of the Commission to focus on urban transport is itself an indication of the severity of these problems. The Commission and its member states had long argued that urban transport is a matter for local and, at most, national governments, and that under the principle of subsidiarity, the Commission should not intervene. However, as its Green Paper points out, with cities accounting for 60% of Europe's population and 85% of its economy, such problems are of direct concern to Europe as a whole.

Cities' Ability to Develop Sustainable Transport Strategies

An earlier study by the European Conference of Ministers of Transport (ECMT 1995) had already focused attention on the importance of improvements in public transport, better management of road space and controls on the demand for car use as the key elements in a sustainable urban transport strategy.

In parallel, two research programmes also independently identified the key elements of a sustainable urban transport strategy. The EC PROPOLIS project (Lautso et al. 2004) concluded that the key contributors were

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improvements to public transport services and fares, pricing of urban car use and more concentrated land use development. A separate UK project (May et al. 2005b) identified bus frequency increases, fares reductions and charging for car use, together with low cost improvements in road capacity as the most effective combinations.

A subsequent review (ECMT 2002), however, concluded that the implementation of such sustainable transport strategies was "more easily said than done". The review highlighted as the principal barriers poor policy integration and coordination, counterproductive institutional roles, unsupportive regulatory frameworks, weaknesses in pricing, poor data quality

encouraged to follow. This logical structure starts with a clear statement of the city's objectives and an identification of the problems to be tackled. It uses these to stimulate the identification of possible solutions and overall strategies, which are developed taking into account the barriers to be overcome in implementing them. The likely impacts of these strategies are then predicted and appraised, prior to selecting a preferred approach for implementation.

The DISTILLATE Research Programme

The challenges which cities face in decision making have formed the focus of a four-year research programme, funded under the UK Engineering and Physical Sciences Research Council's Sustainable Urban Environment initiative. The programme, DISTILLATE (Design and Implementation Support Tools for Integrated Local Land use, Transport and the Environment) was designed to help overcome those barriers to decision making which were amenable to research-led solutions. It set itself a vision of helping to achieve a step change in the way that sustainable urban transport and land use strategies are developed and delivered.

After an initial scoping study, nine priority research areas which were of most importance to local government were identified. Seven of these were selected for funding, and each was encapsulated in one of the seven objectives of the programme:

1. To document and review the barriers to the delivery of sustainable strategies;
2. To establish an effective set of core indicators and targets as input to strategy formulation, forecasting and appraisal;
3. To develop new methods for generating appropriate strategy and scheme options and for designing integrated strategies;
4. To develop approaches for overcoming the financial barriers to effective implementation;
5. To enhance existing predictive models to reflect the impact of the wider range of policy instruments, and to facilitate interactive strategy development;

6. To improve the methods used for appraisal to reflect more effectively the requirements of sustainability; and
7. To support more effective collaboration between agencies responsible for transport strategy development, both within and between local authorities.

The next five sections consider some of the outputs from areas 1, 2, 3, 5 and 6 above. Further detail is available from the project website (www.distillate.ac.uk) and May, Page and Hull (2008).

The initial survey of barriers

A first survey undertaken in September 2004 sought to map out the issues affecting the delivery of integrated and sustainable transport solutions, and help develop the more detailed approach to the other programme objectives. To elicit self-reflection by the respondents, they were asked how “satisfied” they were about practices within their own authority and how important a particular issue was to them. A seriousness score was derived from the product of the importance and satisfaction responses (Hull and Tricker 2005).

The results in *Figure 2* show that the most problematic stages are in strategy option generation, modelling, strategic appraisal, funding, implementation and monitoring and evaluation.

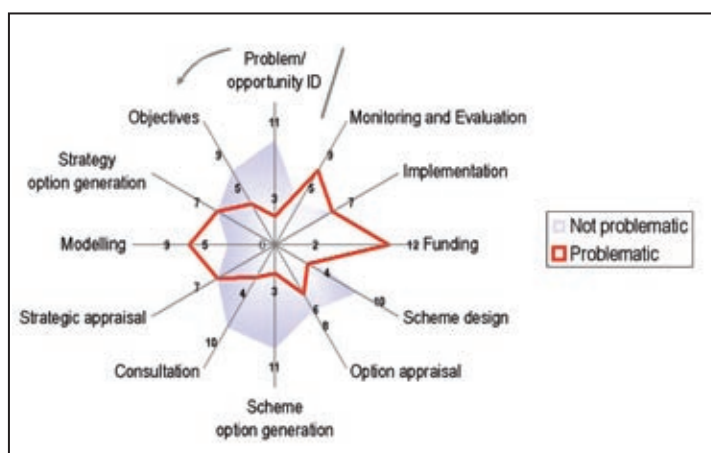


Figure 2: Problematic stages in the process of transport planning

Subsequently respondents were asked about the importance of different policy instruments and their satisfaction with their ability to employ them. *Figure 3* shows the resulting seriousness scores, and illustrates the particular problems with managing bus services, fares, restraint measures and land use planning. Since these are precisely the policy instruments which the studies reported above have shown are central to effective sustainable transport strategies, this is a serious weakness.

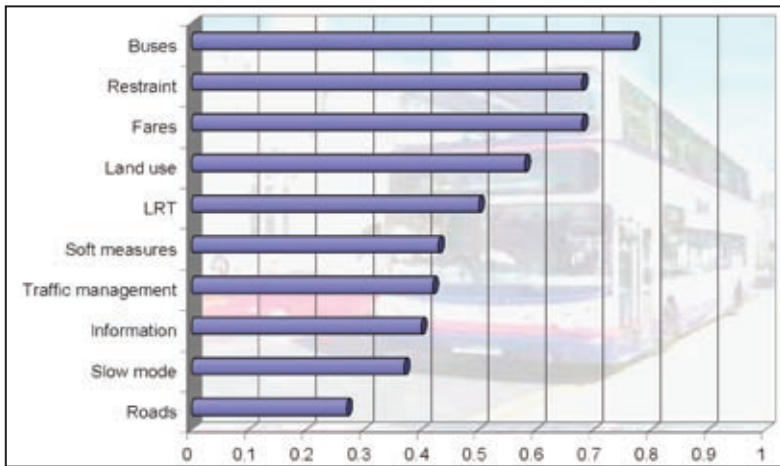


Figure 3: Seriousness of challenges in the implementation of transport strategies

Selecting suitable indicators

Monitoring and evaluation was found to be one of the most difficult processes. Monitoring had become a task carried out to satisfy others rather than, as suggested in *Figure 1*, a key input to the policy formulation process. Moreover, many of the indicators simply measured outputs in terms of actions taken (such as length of cycle lane) rather than intermediate outcomes (such as growth in cycling) or final outcomes (such as reductions in congestion or pollution).

In response, the DISTILLATE team has produced three guidebooks (Marsden et al. 2008a, b, c). The first advises readers on how to design a monitoring strategy to support sustainable transport goals, such as those listed in *Table 1*. It demonstrates the use of a causal flow diagram between interventions (such

as cycle lanes) and objectives (such as environmental improvement) to identify the information needed to understand what is happening. It advocates the use of a combination of intermediate outcome and final outcome indicators to better understand the impacts of a given strategy. The second guidebook provides more detailed advice on how to select indicators suitable for a particular objective, and offers an audit process. The final guidebook broadens the scope to consider how such monitoring strategies can be extended to other policy sectors and to regional strategy.

Generating strategic policy options

A study of the UK Local Transport Plan process found that cities were typically not very innovative, placed too much emphasis on supply-side solutions, were reluctant to use demand management measures and lacked information on the performance of different solutions (Atkins 2007). The Eddington Report into transport and the economy recommended that the government should consider steps to improve option generation in urban areas, so that the right policies can be brought forward (Eddington 2006).

As a contribution, the DISTILLATE team has developed a strategic option generation tool that uses the KonSULT library of some 42 transport and land use policy instruments (www.konsult.leeds.ac.uk). The option generator enables users to interrogate KonSULT to identify those instruments which are likely to be most useful in a specified context. The aim is to broaden the range of policy instruments which are considered, rather than to dictate a particular approach. Users can focus on their objectives, problems or performance indicators, specify their relative importance, indicate the overall strategy which they wish to pursue and identify the context in which they are working. The option generator then uses the assessment scores for each instrument in KonSULT to identify those instruments which are likely to contribute most effectively. Its development is described more fully in Kelly et al. (2008).

Predicting the impacts of alternative solutions

The impacts of many of the policy options are difficult to predict without access to a model which reflects the complex interactions between demand and supply. However, many local authorities used limited or no modelling. It emerged from the DISTILLATE survey that the principal barriers were the complexity of existing models, lack of skills in using them, failure to understand and hence to trust their outputs, and inability to model many of the newer policy instruments.

The DISTILLATE programme has included more demand management and public transport measures in pre-existing transport and network models (Shepherd et al. 2008). However its principal contribution was the enhancement of a simpler strategic land use-transport model, MARS, for use in strategy development. MARS is capable of analysing policy combinations at the metropolitan level and assessing their impacts over a 30-year planning period in less than one minute (Pfaffenbichler et al. 2008). A “flight simulator” approach has been adopted which allows users to change policies in a simulation environment with easy to use “slider bars”. Outputs, based on intermediate and final outcome indicators, can be presented in graphical, tabular and map-based formats. In addition an optimisation facility can be used to optimise a package of policy instruments against a given set of objectives or targets. Potentially the policy maker can take a package of suggested policy instruments from KonSULT and decide how best to combine them in a given context. This facility also enables the planner to look at the impacts of target setting and to identify potential trajectories for key indicators (Shepherd et al. 2008).

Appraising the performance of policy options

Used effectively, appraisal is invaluable in helping to enhance the design of a given policy option, to select the best performing of a series of alternative schemes, and in understanding how a package of policy instruments can best be combined. Appraisal in all of these cases should be based on the same outcome indicators as those used earlier in the policy process.

In practice our local authorities perceived appraisal, whose procedures are tightly specified in the UK, as a hurdle to be overcome in seeking government funding, rather than as a design tool in its own right. In particular, they felt that the outcome of appraisal, with its emphasis on value for money, was inconsistent with the authority's underlying objectives. Once again, they found demand management measures particularly difficult to appraise, but also had problems with public transport provision and fares, land use policies and smaller schemes for which they perceived appraisal methods to be too cumbersome.

Against this background, the DISTILLATE team developed a flexible appraisal method specifically for small schemes and for early stage prioritisation. This requires local authorities to select indicators based on the guidance outlined above, score the impact of a given scheme against each indicator and then weight the indicators to obtain an overall performance score which is consistent with the authority's priorities (Jopson et al. 2007). In addition a guidebook has been produced to suggest ways of overcoming the potential inconsistencies between the use of indicators, targets and valuation of benefits (May, Page and Forrester 2008).

Achieving Sustainability

In conclusion, it is important to stress that sustainability must remain an aim, rather than a measurable goal which we will recognise once we have reached it. We now have much clearer guidance on what needs to be done to make cities' transport systems more sustainable. The key policy instruments are enhancements to public transport service levels, quality and fares; charging for the externalities caused by road use; land use plans which are consistent with these two policies; and, potentially, reallocation of road space to more sustainable modes and intensified use of "soft" measures which encourage greater use of such modes. Such strategies should be relatively inexpensive, by avoiding large infrastructure projects and expecting users to meet many of the costs of the transport system.

But the principal barriers to implementing such strategies are outside the traditional sphere of transport planners and engineers. Overcoming them requires a concerted effort on many fronts, including more appropriate

institutional structures, improved policy processes, greater acceptability, better information and more flexible finance (May and Crass 2007).

Our own work in the DISTILLATE research programme has focused particularly on improvements in the policy process. It offers methods for specifying performance indicators, using them to generate more appropriate policy and strategy options, predicting their impacts interactively using streamlined predictive models, and appraising them in ways which are consistent with the city's objectives. It also provides advice on the more effective use of finance and the development of partnership working. However, achieving the step change in policy formulation which DISTILLATE envisaged will require continued effort to disseminate these enhancements and to encourage their use.

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