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Alternative urban transport technologies for the Belfast Metropolitan Area in the period to 2030 AD: the research design and its implications for study recommendations and policy outcome

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Abstract

The study of Alternative Urban Transport Technologies for the Belfast Metropolitan Area 1991/92 commissioned by the Northern Ireland Transport Holding Company Ltd/D.O.E.
(N.I.) had three main goals:

1 The development of guidelines for assessing the potential technologies for Belfast based on a review of conditions in other sites.

2 Review of 'candidate' technologies and the development of systems concepts to meet the long term transportation needs of the concurbation.

3 Assessment of the efficacy of the systems concepts including their operational, economic and financial performance and implications for the environment and the local economy.

This paper provides an overview of the research design employed and considers the implications of the approach adopted for the study recommendations together with the likely policy response from the government body which commissioned the study.

1 Introduction

At present Belfast is served by conventional buses, a limited network of railway lines operated with diesel multiple units and a 'black-taxi' paratransit service. The majority of areas are dependent on buses and these have suffered from a dramatic decline in passenger numbers in recent decades. Such a scenario of declining public transport is not unique to Belfast and in other cities similar problems have stimulated the examination and implementation of alternative transport technologies.

The **Belfast Urban Area Plan: 2001 (BUAP)** Adoption Statement [1] published in 1989 committed Government to the improvement of public transport in support of urban region goals for industry, commerce and housing. For the longer term Government recognised that demands placed on the total transport system by economic development and social economic and demographic trends required that alternative technologies should be assessed for their potential to contribute to local land use, economic and environmental goals.

It was in this context that the Northern Ireland Transport Holding Company (N.I.T.H.Co.) commissioned the Transport Research Group, (T.R.G.) University of Ulster and the Departments of Environmental Planning and Civil Engineering at the Queen's University of Belfast to undertake an assessment of the potential for Alternative Urban Transport Technologies (A.U.T.T.) in the Belfast Metropolitan Area [2]. The research goals set for the A.U.T.T. study called for:

1. The development of guidelines for assessing the potential of alternative urban transport technologies for Belfast based on a review of conditions in other cities.
2. A review of candidate technologies and the development of systems concepts to meet the long term transport needs of the conurbation.
3. Assessment of the efficacy of the systems concepts including their operational, economic and financial performance and implications for the environment and the local economy.

The study was to be characterised by a number of particular features:

- recognition of the two way relationship between land use and transport
- study not to be technology driven and to avoid preconceived ideas for the future development
- 40-year time horizon to reflect durability and longevity of many of the technologies under consideration
- elicitation of 'lessons' from the experience of other cities
- study area to encompass urban area and city region

2 The Preferred Strategy

The recommendations which emerged from the study can be summarised under three main headings as follows:

Transport Infrastructure
Proposals which may be ultimtely inplemented will reflect a tradeoff albeit implicit in the relative importance attributed to the implications of alternative strategies for the various impact groups/objectives. Because it is apparent from the pattern of impacts that in general substantial accessibility, environmental and economic development potential benefits would accrue from investment in a network of Light Rail Transit (LRT) lines. Moreover the analysis demonstrated that assuming the availability of supra-intra funding, on the basis of the efficiency indicator, NPV, the scheme performs well. The investment would generate some 2000 man years of direct employment much of it local during implementation both through construction of fixed infrastructure and rolling stock under Alternative A, a four line network covering two corridors eastward from the city centre, one in the south encompassing the controversial Annadale-Grahamholm/Ormeau corridor and a route intended to serve West Belfast.

In the case of the busway proposals (Alternative C) the accessibility, environmental and development potential benefits would be much more modest particularly with respect to the environment and development potential. At the same time the NPV value was much smaller. Conversely the gross capital costs would be less than 40% of the figure of £143 million required to implement for Alternative A.

Overall Alternative A provided the greatest value for money on the basis of efficiency, accessibility, environmental and economic development potential benefits and assuming coordination between public transport modes and availability of EU Funding. The choice therefore ultimately rests on the relative importance which society, as reflected in the decisions of its elected representatives and public officials place on these impacts. In the absence of EU Funding LRT Alternative A could not be justified on efficiency grounds alone. Moreover, the absence of coordination would tend to rule out any substantial LRT network.

Complementary Transport Measures
Legislation current in 1992, the year the study was completed, required both rail and bus companies to compete in the market place and to operate on a commercial basis. However, a fundamental prerequisite for the introduction of alternative public transport technologies study area is co-ordination of services between operations in the relevant corridors. A number of alternative innovative structures through which such co-ordination could be achieved were put

forward. The study also made recommendations concerning a range of bus priority measures including with flow bus lanes and Selective Bus Detection (SBD) equipment installed at certain light controlled junctions. These would provide the basis for a network of high quality commuter services.

It was evident from the study that travellers to Belfast City Centre are generously provided for in terms of parking space. The work highlighted the unusually high propensity for free and subsidised parking for commuters working in the public sector. Together with the involvement of this sector in the financing and construction of multi-storey carparks this is clearly undermining the relative competitiveness of public transport. The study made recommendations on the general direction of future policy on parking including park 'n' ride at peripheral sites.

Complementary Land Use Measures

Belfast (like most UK cities) is in the final stages of 'decentralisation'. In future it will tend to stabilise rather than 'recentralise' with regard to residential land use but some recentralisation - particularly focused on the city centre - may occur with regard to employment. Land availability and topography are unchanging stabilising factors and the current policy of containment will continue for the foreseeable future. All of these 'stabilising' factors point to the conclusion that any new public transport would have to maximise the existing potential - high density, low car ownership, compact form, centre orientated axial pattern - rather than relying on additional growth. A compact, centralised pattern of development would also favour the inner city given that all the routes envisaged pass through these areas which have the highest residential densities and the lowest car ownership. The acceptance of higher residential densities along transport lines generally would provide opportunities for thinning-out elsewhere providing open space or recreation facilities. The preference for traditional two-storey housing could be accommodated within the density recommendations made in the study.

In the city centre the key planning policy should be the control of parking provision - which Belfast has hitherto been more reluctant to undertake than most UK cities. Allied to this urban design policies, which specifically earmark transport modes for 'high-building location', a common policy in many cities could provide developers with an incentive to propose integrated station/commercial schemes in selected areas and could divert high-building schemes from more sensitive townscapes.

The study conclusions appear to contradict those drawn by the Belfast Transportation Strategy Review (BTSR) [3] as summarised in the BUAP [4] and the subsequent Belfast City Centre Local Plan (B.C.C.P.) [5] which in both cases rejected any case for LRT. Given that all these studies were initiated

within a six year time span how can such widely divergent conclusions be reached? It can be argued that the factors likely to influence the conclusions reached include the demand forecasting models and assessment frameworks employed, the assumptions concerning the regulatory framework and the sourcing of funding, and the planning horizon. Together these form the core of a study research design and it is our contention that differences in research design have played a major part in producing the different conclusions concerning the efficacy of introducing alternative urban transport technology into the Belfast Metropolitan Area reached by these studies.

3 Research Approach

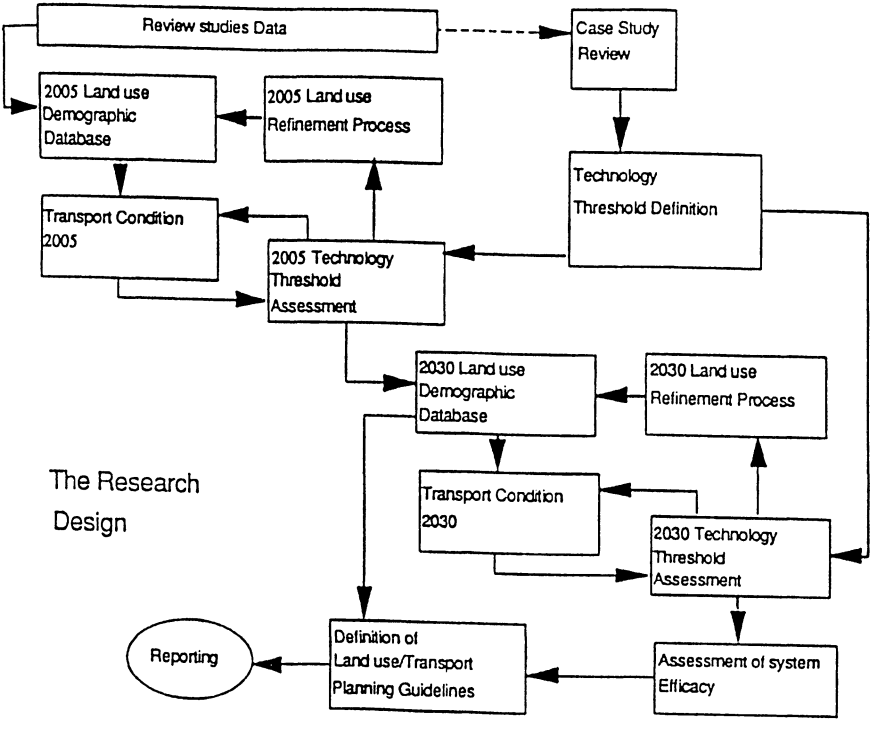
The research design for this study while adopting many of the conventional guidelines set out for strategic urban transportation planning also sought to extend they methodology and at the same time simplify the process. The former was to be achieved by an attempt to integrate land use and transportation elements permitting feedback effect between travel demand, transport supply and the spatial distribution of population and commercial activity (Fig. 1). At the same time a proposed review of conditions in other cities was seen as offering an approach whereby screening criteria might be developed to reduce the number of systems concepts alternatives and candidate technologies to be assessed at a detailed modelling level without introducing unnecessary bias into the process. The research design can be characterised as consisting of three main phases or stages as follows:

In Stage 1 a review of conditions in other UK cities and abroad provided for screening criteria reflecting viable ridership thresholds for a range of technologies under different site/alignment condition and broadly consistent with output from Section 56 based appraisals to be developed and applied to facilitate identification of the most promising corridors in the study area for further investigation. Stage 1 also addressed the issue of the appropriateness of the various alternative urban transport technologies to the market conditions likely to obtain in any medium size city with a similar spatial structure to that of Belfast. Additionally, the cost implication of various technologies and consideration of the likely maximum ceiling on funding (from public sources) were taken into account. These pointed to restricting analysis of alignment opportunities and constraints to medium and low capacity modes such as LRT, Guided Busways and Guided Light Transit. Various automated systems in this capacity range were also excluded either on grounds of cost (underground) or environment (elevated systems). The possibility of unguided busways and High Occupancy Vehicle (HOV) lanes was kept under review.

Stage 2 focused on the opportunities and constraints facing any decision to introduce a number of alternative urban transport technologies into the existing

Alternative Urban Transport Technologies Project

Fig. 1



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urban fabric and surrounding commuter hinterland making up the Belfast Metropolitan Area. The overview of opportunities carried out in Stage 2 consisted of three elements:

1. Operations: alignment availability including the practicality of on-street operation.
2. Associated Capital Costs (fixed infrastructure only).
3. Environmental Planning Issues associated with individual alignments.

Each of the corridors selected as a result of Stage 1 was assessed individually producing potential routes and in some instances more from one route option. Analysis was based on current civil engineering practice while particular attention was given to the suitability of road junction design and traffic control where on street operation was implied. More details are given in Ferguson, McEldowney and Smyth [6]. Stage 2 also involved a screening of this set of corridor alignment options as a precursor to definition of a number of systems concepts which would be subject to detailed analysis using the full transportation model. In contrast to the AUTT research both the other studies referred to undertook little analysis of specific corridor and alignment conditions.

Stage 3 involved the detailed modelling of systems concepts and the application of a formal and comprehensive assessment of options. This provided the basis for the development of the preferred strategy recommendations. In this instance forecasts of travel behaviour were obtained from the B.T.S.R. model with amendments made to it. In addition certain sensitivities were employed to reflect elements not explicitly addressed in that model structure. Estimates of demand were made for the do minimum public transport and highway network and for the various systems concepts. Forecasts were derived for both coordinated networks and those employing continued competition between public transport modes including any new technology and existing bus services. In the case of the BUAP/BTSR study the analysis of alternative transport technologies was completed in advance of the BTSR transportation model becoming fully operational while for the BCCP an updated version of the model assuming a competitive regulatory framework was employed.

In the case of the AUTT study a distinction needs to be drawn between the forecast of demand for travel within the study area covered by the BTSR model in full, namely the Belfast Urban Area, from external locations for which the BTSR model in effect assumed no modal shift in travel behaviour. Forecasts of internal demand were made using the BTSR model. For external travel use was made of the stated preference models developed by Transecon International [7] for use in assessing various railway projects in the Belfast area in the case of corridors currently served by rail, while for others it was assumed that the BTSR modal split model would apply beyond the internal zone boundary.

In Stage 3 a comprehensive assessment framework was required compatible with the output from detailed modelling of schemes. Such a framework should reflect the planning goal and the values underlying same for the study area. Consideration was given to relationships between urban structure and transport and the further consequences of different urban forms for energy efficiency, the environment generally and the concept of sustainability. These were translated into a number of objectives.

- Efficiency (Quantifiable Benefits/Costs)
- Accessibility
- Environmental Compatibility
- Economic Development Potential
- Feasibility

Assessment involves examining the extent to which the various systems concepts and related measures meet the objectives defined within the assessment framework. While the importance of these various objectives is recognised conventionally, emphasis is placed on the efficiency objectives as well as funding to the detriment of consideration being given to the other objectives. Increasing use is being made of more comprehensive assessment frameworks by the European Community following practice standard in many Continental countries. In this study no attempt was made to explicitly identify either the absolute or relative importance of each of the objectives. Instead the objectives and the performance of the systems concepts in relation to them were ultimately presented in a multi criteria format goals achievement matrix. This facilitated identification of the 'trade-offs' implied by implementation or indeed non implementation of proposals.

For the case of the BUAP/BTSR study the assessment framework was less comprehensive following conventional UK practice as of the late 1980's while for the BCCP a more comprehensive approach to assessment was invoked. Unlike the BUAP/BTSR study the AUTT study assessment framework provided for the possibility of supra national funding contributing to the costs of introducing a new system.

In relation to the planning horizon both the BUAP/BTSR and the BCCP studies employed forecast years some 15 years after the base year. In contrast the AUTT study incorporated two forecast years, one approximately 15 years and the second some 40 years after the base year.

4 Government Response to the AUTT Study Findings

The study was completed in 1992 and submitted to NITHCo.,which subsequently handed the work over to the Department of the Environment (NI).

There has been no response to the study by government to date. However, in the intervening period the delayed BCCP report rejected arguments in favour of Alternative Public Transport Technologies. A realistic conclusion to draw concerning the AUTT study is that its findings have been rejected. Nevertheless, Government did announce one major policy change in February 1995, involving a switch to coordination between public transport modes. Such a policy shift was recommmened by the AUTT study as a prerequisite to the introduction of radical improvements to the public transport system in the Belfast Metropolitan Area.

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