

# WHAT LIGHT RAIL CAN DO FOR CITIES

A Review of the Evidence

Final Report

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## Executive Summary

### *The Problem*

1. Light rail has become a key element of the transport networks and future plans for many of our major cities. However, promoters of light rail schemes currently face real difficulties over the affordability and the financing of new systems. In part, this has been due to a perception that some schemes have been expensive follies and have somehow failed.
2. The National Audit Office has recently reviewed the implementation of schemes in the UK and concluded that, while light rail has improved the quality and choice of public transport, some systems are not achieving their forecast patronage, suggesting that their potential is unfulfilled. They were also unclear what broader benefits had been delivered.
3. *pteg* have commissioned this report to review the available evidence held by the promoters of schemes in the UK of the benefits that have been delivered so far and how this has been achieved in the current planning and regulatory frameworks. The research has highlighted some findings on benefits and integration of schemes that were not discussed by the NAO.

### *The Context*

4. Over the past 30 years or so, urban areas in the UK have experienced inexorable growth in car use, decline in bus use and rising levels of traffic congestion. At the same time most face major challenges to maintain the vitality of city centres and to regenerate declining areas. In order to improve transport conditions and contribute to wider economic, social and environmental objectives, broad transport strategies have been developed. Light rail has emerged as a key component of these strategies because it is perceived as being able to provide a step-change in the quality and capacity of the public transport network. Typically, these strategies envisage a hierarchy of public transport modes with new light rail and the existing rail network providing for movement in the major corridors with bus services feeding those networks and catering for demand elsewhere.

### *The Light Rail Offer*

5. The characteristics of light rail schemes differ significantly but, in general, they can offer:
  - **Penetration of town and city centre with permanent, visible, and acceptable infrastructure:** direct access can be provided to city centre jobs, shopping and other facilities in a way that is highly visible and perceived as reliable and dependable;
  - **Predictable, regular and reliable journey times and service patterns:** service levels are generally high (5 to 20 or more trams per hour) on simple, easily understood routes, generally operating at a high level of reliability due to segregation from traffic, priority at junctions and contractual incentives to operators;

- **Accessible and visible stops:** Vehicles are highly accessible to all users and can provide 100% level boarding at stops. Other features include highly visible stops, good information, easy to purchase tickets and security measures (visible staff or police on and around the system, CCTV etc);
  - **A high quality of ride throughout the entire journey:** whether or not a system is fully segregated or mixes on-street and off-street running;
  - **Short dwell-times:** Multiple doors and off-vehicle ticketing ensure light rail has the benefit of short dwell times at stops, with consequent journey time benefits;
  - **High passenger carrying capacity:** In radial road corridors in urban areas, light rail can provide a more efficient and sustainable use of existing capacity by making best use of available junction priority. Indeed, it is essential to provide this priority for light rail to avoid reliability problems on street-running sections. Light rail can increase capacity on an existing rail corridor by providing more stops and higher frequency services – made possible by the provision of dedicated routes in city centres thus avoiding congested rail termini;
  - **Additional capacity in a sustainable way:** Light rail can provide additional passenger carrying capacity to existing city centres or major developments, whereas new road capacity would not be acceptable;
  - **Park and Ride facilities attractive to car users:** Evidence suggests that car users find the quality of service operated by light rail attractive;
  - **Integration with new developments:** The development of light rail in conjunction with major changes in the urban fabric is an effective way of supporting development activity, as has been demonstrated primarily in London Docklands, but also in Manchester and elsewhere;
  - **Linking major traffic generators/attractors:** Routes that serve more than one major travel market are particularly efficient as they help to provide balanced all day flows and make better use of the infrastructure. Examples include city centres to town centres, major park and ride sites to city centres and major developments to city centres;
  - **Integration:** Physical integration of light rail routes is often ‘designed-in’ (e.g. to major rail or bus stations or major developments). Integration of fares and services with bus and rail operators is limited by the regulatory environment in the UK, although it is usually achieved to some extent;
  - **Permanence:** the image offered by light rail infrastructure, vehicles and operations secured in the long term, gives individuals and business confidence to make location decisions.
6. These features can deliver substantial and widespread benefits to users and non-users alike, which, in turn, provide an impetus to changes in the broader economy, environment and social make-up of the areas in which they operate .
7. A particular feature of light rail is its ability to carry significantly more passengers than conventional bus networks or higher quality bus-based alternatives. In busy corridors, not only does light rail have the potential to carry flows of up to 20,000 passengers per hour per direction (around four times more than conventional buses and twice that of the largest, tram-like bus alternatives), but it can also provide more attractive journey times by making best use of available traffic signal priority. Further benefits of the higher capacity offered by light rail are reducing the congestion caused by large numbers of buses circulating in city centres and bringing economies of scale in the costs of provision.

8. Most light rail systems in the UK operate at lower capacities of up to 2,500 passengers per hour per direction. At this level of service, the overall, long-term cost of carrying passengers is comparable to that of bus services, but light rail also offers many benefits in terms of faster journeys and improved quality of service. At higher levels of demand (over at least 2,500 passengers per hour per direction) light rail actually becomes a cheaper means of providing the same capacity and leads to even higher levels of benefits.
9. Promoters of light rail systems are also responsible for planning and securing improvements to the rest of the public transport network and, clearly, there is much that can be done to improve the quality of bus services. However, in order to achieve a step-change in quality and capacity as described above, the costs inherent in a light rail system's construction – land/property-take, statutory undertakers service diversions etc will be incurred whatever mode is employed. In practice, some features simply cannot be provided by bus-based systems – for example, physical guidance to provide level boarding **throughout** the system or guaranteed service quality provision in the long-term, which is not possible under the existing regulatory regime. As such, costs generally will be lower for alternatives but so will the scale of benefits delivered.

### ***Light Rail Usage***

10. It has been suggested that UK light rail schemes have not been successful because the numbers of passengers they carry is less than was predicted. However, all the light rail schemes operating in the UK are carrying large numbers of people and all are experiencing increased usage. This is similar to the experience with local and national rail services, while the numbers of people using buses, except in London, has continued to fall.
11. Evidence from the schemes presently operating in the UK show that light rail:
  - is popular, with all the UK schemes operating at or near capacity at peak times;
  - carries significant numbers of people outside the traditional “rush hour”; in some cases peak flows at weekends exceed those during the commuting peaks;
  - is successful at attracting passengers, with patronage steadily increasing over time on all the UK schemes – 52% increase in patronage since 1999; and
  - this increase has come despite significant increases in the fares charged for using the systems – again similar to the rail network, but in contrast to the bus network where, outside London, fares have risen and patronage has fallen.
12. Light rail provides a feasible and affordable way of reducing urban traffic levels in key urban corridors, because:
  - It is proven to attract people out of their cars where it provides a fast, frequent and comfortable alternative;
  - Evidence shows that about 20% of peak hour passengers using UK tram schemes previously travelled by car;
  - At weekends up to 50% of UK tram passengers used to travel by car;
  - quality bus services in the UK have attracted much lower levels of demand from cars; and

- there is evidence, particularly in Manchester and Croydon of reduced road traffic levels following the opening of the systems.
13. This success has arisen despite very limited abilities for promoters to secure integration of light rail with other modes, or to secure complementary measures to improve usage and deliver further benefits. The evidence is that actually a lot has been achieved in this regard:
- there are numerous successful Park & Ride sites on all systems outside London;
  - the level of priority and effective traffic management secured by promoters for light rail has improved and new schemes are increasingly well designed;
  - there are some excellent examples of integrated design of tram stops with bus stations, rail stations and major development sites; and
  - there are well developed (voluntary) integrated ticketing schemes in most instances.
14. The integration of light rail and bus services is one of the most difficult outcomes to secure outside London. Recently, the involvement of the local bus operator in the operation of NET in Nottingham has resulted in a more coordinated service, information and fares offer. There is clearly scope to improve integration on all systems and some improvements may be possible under the provisions of the recent White Paper.

***Improving the Image, Improving the Economy***

15. There is real evidence that UK light rail schemes have provided business with better access for customers; giving better access to labour markets, supporting business expansion and providing the confidence to make investment decisions based on evident commitment to improved public transport. Increased development activity has brought a “buzz” to areas served by the tram schemes.
16. The idea that light rail embodies modernity and commitment to urban renaissance has been a key driver in the case of almost all of the schemes in the UK. This originated particularly from the experience gained from France during the 1980s, particularly in Nantes and Grenoble. These French schemes run wholly on-street and included large amounts of pedestrianisation and streetscape improvements, with fountains and public-space art, as well as good integration with the mainline rail network. Their influence on UK schemes in the 1990s is clear, with on-street running and, within the limitations imposed by administrative and operational arrangements, as much integration with other public transport modes as possible. There has also been a noticeable improvement in the care taken to ensure that light rail is sensitively incorporated into the urban fabric.
17. There is clear evidence that all of the schemes implemented to date have had a positive effect on the image of the city in which they were built, even where, initially, public reactions may have been adverse (usually due to disruption during construction). This in turn has brought benefits in terms of attracting inward investment as well as business and tourist visitors.

18. The physical presence of the infrastructure needed for light rail, compared, say, with the less tangible presence of bus-based schemes, is undoubtedly a key factor in the public's favorable perception of trams. The confidence that is instilled from a very visible, long-term commitment to improved public transport and the feeling that this indicates an area is "going places", is a common response in user surveys and focus groups. It is also clear that light rail has a role in the "branding" of places that the bus only rarely achieves.
19. It is obviously difficult to identify what success specific regeneration strategies have had and harder still to quantify the contribution of light rail schemes. However, it is clear that implementation of the UK tram schemes has, without exception, been accompanied by beneficial effects on property values, both commercial and residential. While economic regeneration may not be directly attributable to the tram schemes themselves, they have certainly contributed in each city.

### ***A Fairer Society***

20. Social inclusion is a relatively new concern for the promoters and operators of light rail schemes. Consequently, little has been written and published on the subject generally, and experience relating to light rail schemes in particular is very limited. However, there is some clear evidence beginning to emerge on the value of schemes in this respect from the experience of the schemes in the UK.
21. The key roles that light rail plays in the promotion of inclusion are:
- Improving independent access and mobility for disabled people and other whose mobility is impaired. The accessibility and reliability of higher rail provides the certainty and confidence required to make journeys by public transport. This is reflected by good take-up of use of light-rail by these groups;
  - Quick and accessible links to jobs. This is particularly effective where deprived areas are linked to areas where jobs are available so that jobseekers are able to take advantage of these additional opportunities. Several light rail schemes provide direct cross-city centre links that would be difficult to make by separate public journeys;
  - Providing access for local people to community facilities and shopping opportunities; and
  - Personal safety at stations and on trams is perceived as being good, and the high quality of design, use of CCTV and levels of staffing are important factors. Greater use of trams has been encouraged by groups for whom this is key issue (particularly women, the elderly and those from ethnic minority groups) compared with conventional rail or bus services, although where pedestrian links to and from stops are perceived as poor this is undermined.

### ***A Better and Safer Environment***

#### *Environment*

22. In the UK, light rail provides environmental benefits through the reduction in car use of some 22 million car trips per year. As road traffic continues to increase inexorably, any measures that can be demonstrated to avoid greenhouse gas emissions, noise and

local air pollution must have a value, even if it is not afforded one in current appraisal methodology.

*Safety*

23. Evidence from the UK schemes is that light rail is demonstrably safer for passengers than travelling by road. Therefore, modal shift from car to light rail must help to improve safety overall. There is also no evidence that pedestrians and other road users are any more at risk in areas where trams run on-street than in other areas. On the systems themselves, CCTV and other measures mean passengers generally feel safe using light rail. This contrasts with some of the perceptions identified in relation to light rail safety where concerns about safety were expressed frequently.

## 1. INTRODUCTION

### About This Report

- 1.1 Light rail schemes have been built by, or are key elements of the transport plans of, the Passenger Transport Authorities<sup>1</sup> and other Local Authorities (for example, Edinburgh, Nottingham, Hampshire, and Blackpool). In London, light rail is a major part of the Mayor's Transport Strategy implemented by Transport for London (TfL).
- 1.2 However, several difficulties face promoters of light rail schemes, the main ones being the affordability of new systems and the losses incurred in operating some existing schemes. As a consequence, light rail schemes generally have been presented as expensive follies by some sections of the technical and popular press and there is renewed interest in lower cost alternatives (e.g. guided bus) as solutions to urban transport problems. Although a funding package was agreed for extensions to Manchester Metrolink at the end of 2004, the Department for Transport (DfT) recently revoked funding for schemes in Hampshire, Leeds and Blackpool when the Government announced its recent White Paper on Transport<sup>2</sup>.

**The Times: 8<sup>th</sup> October 2003**

**Cities' Great Tram Revival Goes Off The Rails**

*"The great tram revival was meant to rescue Britain's city centres from gridlock by tempting motorists out of their cars. It was promoted with great enthusiasm and the conviction that the middle classes, who would never consider catching a bus, would flock to the sleek new trams. But the experiment appears to have failed and ministers are withdrawing support from a series of tram projects. They have quietly dropped a key commitment to double the number of tram journeys to 240 million by 2010."*

**Financial Times: 10<sup>th</sup> March 2004**

**Carillion pledges healthy growth after flat 2003**

*"Carillion, the UK construction and support services group, on Wednesday reported flat underlying profits for 2003... The company blamed its lacklustre performance on cost overruns on the Nottingham tram project..."*

- 1.3 **pteg** recognises these concerns and commissioned Steer Davies Gleave to examine the available evidence on the benefits of light rail systems, particularly in the UK. This report sets out evidence supporting the case for light rail, to inform the debate on the development of light rail in the UK and influence Local Transport Plans to be submitted in July 2005 for the period 2006-11.
- 1.4 At the same time, in order to make light rail more affordable, several **pteg** members are developing alternative procurement approaches to those employed to-date,

<sup>1</sup> i.e. the authorities in Greater Manchester, Merseyside, South Yorkshire, Strathclyde, Tyne and Wear, West Midlands, West Yorkshire.

<sup>2</sup> Secretary of State for Transport (2004a) - **The Future of Transport: A network for 2030** - Cm 6234, The Stationery Office, London.

including changing the profile of risk to the public and private sectors. There also may be scope for cost efficiencies through making more use of common design approaches and more tailored safety standards for light rail schemes. Discussions are taking place with the DfT on how these approaches may be taken forward.

### Approach to the Study

1.5 The overall aim of this study has been to review available evidence on the benefits of light rail, to identify what has been delivered and what can be expected from future schemes. The key features and potential applications of light rail and alternatives are considered in the context of travel demand and planning processes in the UK today.

1.6 A number of hypotheses, typical of the benefits routinely cited as the reasons for promoting light rail schemes, have been tested. It is often claimed that light rail can be more effective than bus or rail in some circumstances, because it:

- is more efficient at moving large numbers of people in urban areas;
- attracts more people from cars and eases traffic congestion;
- is perceived as a permanent commitment to improving an area's public transport, economy and environment;
- can assist economic regeneration, strengthen the vitality of town or city centres, support sustainable development and improve property values;
- promotes social inclusion by providing better access to jobs and other facilities for those living in deprived areas; and
- improves the urban environment by reducing traffic noise, pollution and accidents.

1.7 These statements have been tested by reviewing available published and unpublished evidence from studies of light rail projects in the UK and overseas. It has been possible to identify:

- What evidence is available to support or to disprove the hypotheses;
- Whether there are some consistent themes running through the evidence that, in combination, can provide a stronger case than presently is being argued; and
- What gaps there are in the evidence, which may suggest avenues for further research and enquiry in the future.

1.8 The specific tasks that have been executed in the study are as follows:

- **Task 1: Identifying sources of evidence:** *pteg* identified a great deal of research material available from the Group's members; contact was made with the promoters of light rail schemes in the UK; and searches were undertaken to identify any other relevant items of interest.
- **Task 2: Securing access to published and unpublished evidence:** Meetings were held with the UK promoters. The American Public Transport Association (APTA) and the International Association of Public Transport (UITP) provided sources for international comparisons.
- **Task 3: Literature Review:** The evidence was evaluated in a systematic way to identify the extent to which it supports the hypotheses identified above. The technical basis of the research material was also considered to identify whether it could affect the findings.

- **Task 4: Reporting:** This report sets out the main findings from the research and highlights the primary benefits of light rail systems that can be demonstrated from the available evidence. There is particular focus on understanding how the way schemes are designed affects the benefits secured. Key issues where the research is inconclusive, or where little or no investigation has been undertaken, are highlighted. These possibly provide an agenda for future research.

### Structure of the Report

1.9 After this introduction, the remainder of the report is set out as follows:

- **Section 2** sets out the historical and present context of planning for light rail schemes in the UK.
- **Section 3** examines the main features of light rail systems in a UK context and compares these to the main alternatives.
- **Section 4** reviews available evidence on patronage and mode shift from car.
- **Section 5** looks at the evidence that light rail affects the image of urban areas, assists regeneration and shapes patterns of development.
- **Section 6** looks at how light rail has helped promote social inclusion by improving access to employment and community facilities.
- **Section 7** looks at the contribution of light rail to the urban environment and safety.
- **Section 8** sets out the conclusions from the review, identifies remaining areas of uncertainty on benefits of light rail and recommends possible areas for future research.



## 2. THE CONTEXT OF PLANNING FOR LIGHT RAIL IN THE UK

### THE PLANNING CONTEXT

In urban areas throughout the UK, the past 50 years have seen an inexorable rise in car use and decline in public transport use, leading to high levels of traffic congestion and worsening accessibility for those without access to a car.

In particular, bus use outside London has consistently declined. Demand for buses in London has held up and, recently, rail demand has risen generally. These increases are, in part, due to the benefits of integration, regulation and certainty of provision.

PTEs and local authorities have, increasingly, been tasked with developing transport strategies that support broader economic, environmental and social inclusion aims.

Most have identified light rail as a major component of these strategies due to its ability to provide a step-change in quality of public transport in major corridors of movement. This step-change is seen as necessary to provide the desired scale of transport benefits and to act as an impetus to achieving broader aims.

There are now seven light rail schemes in operation in major cities in the UK, all opened within the last 25 years.

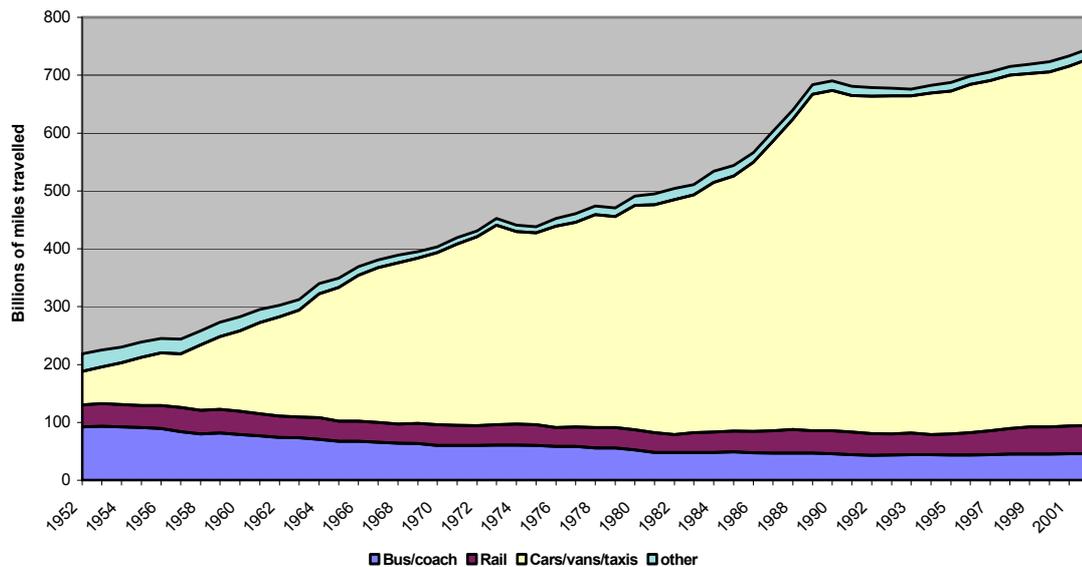
The recent NAO report on light rail recognised many success with these schemes, but also found that the benefits achieved were less than those potentially achievable, particularly as regards integration with other modes.

The Government's recent White Paper on Transport seeks to continue the trend to more integrated planning and specifically mentions light rail in this context.

### History

- 2.1 The way that people travel in the UK has changed significantly in the past 50 years in two fundamental respects:
- There is much more travel – the total distance travelled in 2002 was almost 3½ times that travelled in 1952; and
  - The mode of travel has changed – the car has become the overwhelmingly dominant mode, accounting for only about 27% of travel in 1952, but 85% of travel in 2002.
- 2.2 These characteristics are illustrated in Figure 2.1

FIGURE 2.1 TRAVEL BY MODE IN THE UK - 1952-2002



Source: Transport Statistics Great Britain 2003 Edition

- 2.3 The increased popularity and falling cost of motoring, together with planning policies which dispersed homes and jobs away from traditional urban areas, drove these changes in the use of different modes. The creation of New Towns and expansion of suburban areas also meant people increasingly lived further away from where they worked and shopped.
- 2.4 The result was rapid growth in road traffic, particularly for journeys to work, and a dramatic decline in the numbers of people using public transport. By the mid-1970s people were finding it increasingly difficult to travel as congestion levels increased, further affecting the movement of freight and contributing to a general degradation of the urban environment to live and work in.
- 2.5 In response, the early 1970s saw a marked shift by local authorities to the provision of traffic management measures to favour public transport<sup>3</sup> and decisions were made to abandon costly and intrusive road schemes. However there was little effect on the prevailing trends: car use continued to increase, bus patronage continued to decline and although the slide in rail use was halted, there was little evidence of growth.
- 2.6 The deregulation of the bus industry in the 1980s meant that outside London, local authorities' powers to use buses for public policy ends was lost. As a consequence there are now many constraints on local authorities/PTEs<sup>4</sup> in the planning and provision of bus services:
- They are unable to influence fares, service frequency or capacity;
  - Integrated timetables are deemed to be 'anti-competitive';

<sup>3</sup> White, P. (1986) – **Public Transport: Its Planning, Management and Operation** – 2<sup>nd</sup> Edition, Hutchinson, pp.192.

<sup>4</sup> Steer Davies Gleave (2004) - **Bus Planning, Performance and Regulation: Executive Summary** – *pteg*, Leeds.

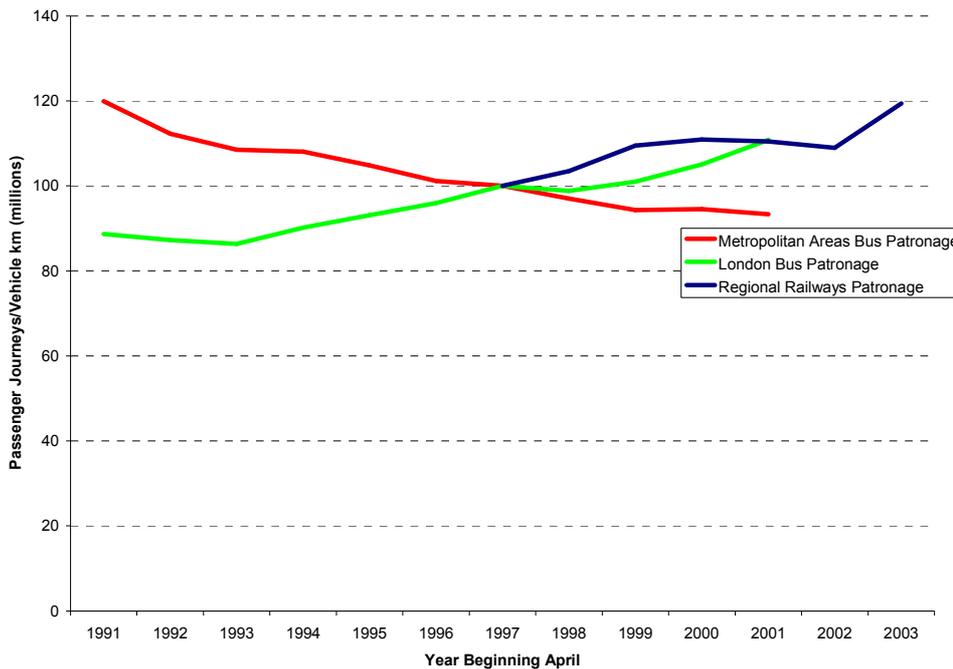
- Interchange and integration with other modes cannot be forced;
- Services cannot be developed in advance of demand;
- Fare levels cannot be capped;
- Vehicle standards cannot be imposed; and
- Operating performance cannot be regulated.

- 2.7 By contrast, in London (where TfL retains powers to regulate services and set fares), bus patronage increased by almost 25% over the period 1991-2003. Recent growth has been supported by a comprehensive package of service enhancements implemented prior to the introduction of the Congestion Charge<sup>5</sup>. This included frequency enhancements, higher capacity buses, service restructuring, new routes and additional bus priority measures (e.g. bus lanes extended to become continuous along large sections of some routes). The subsidy required by TfL to make these and other improvements to London's bus network is expected to increase substantially. The bus network funding requirement will rise from approximately £100 million per annum in 2000/01 to nearly £1 billion per annum by 2009. TfL recognises that this is not sustainable in the current funding environment<sup>6</sup>.
- 2.8 However, London enjoys unique political and administrative powers which are not currently available in other UK cities. It also has a Mayor with an unwavering personal and political commitment to improving public transport. The lack of these factors and the high costs involved, mean that neither comprehensive bus improvement strategies nor congestion charging have been delivered elsewhere.
- 2.9 The more recent trends in bus and rail usage for the major urban areas are shown in Figure 2.2. Bus patronage levels outside London have declined steadily. Reasons for the decline include higher availability and use of cars, but increasing fare levels and perceptions of low quality of service are also factors.

<sup>5</sup> Transport for London (2004) – **Congestion Charging Central London: Impacts Monitoring – Second Annual Report: April 2004** – pp. 40.

<sup>6</sup> Transport for London (2003) - **The Case for Investing in London's Buses: Presenting The Results of The London Buses Strategic Review** – London, September 2003, pp. 10.

**FIGURE 2.2 INDEX OF BUS AND RAIL PATRONAGE (1997=100) IN METROPOLITAN AREAS EXCLUDING LONDON 1991-2002**



Source: DfT Transport Statistics

- 2.10 Over the same period, the use of local rail services in the regions has increased significantly in contrast to bus use. Although there have been many problems with the quality of service provided, commuting and leisure travel by rail has grown in the PTE areas. This perhaps reflects the increasing journey time advantage rail holds over the car and bus as traffic levels increase.

### Development of Light Rail Schemes

- 2.11 It is in this context of changes in the usage of public and private transport modes, that light rail systems have been developed in the last 25 years. The modern history of light rail in the UK began in the 1960s, when local authorities were first given responsibility for developing plans for integrated transport. Funding mechanisms were put in place for the Government to make significant contributions towards the cost of public transport infrastructure projects. The Passenger Transport Authorities were set up in the major cities outside London to take over responsibility for operation and development of public transport. Major land-use/transportation plans were prepared, in which it was recognised that significant improvements to public transport were required.
- 2.12 Construction of new rail lines was considered in some areas (including city centres), but was generally found to be prohibitively expensive and disruptive. Light rail offered the opportunity to provide the same sort of quality, at a lower cost and with more potential to be physically integrated with the urban fabric. The Tyne and Wear Metro (see below) was built in the late 1970s and a “light rail boom” occurred in the

1980s and early 1990s. More than 30 different schemes were proposed up and down the country.

2.13 Most of these schemes failed to materialise due to feasibility problems, poor economic cases or lack of political support. The systems implemented to date (shown in Figure 2.3) are as follows:

- The first new “light rail” scheme, **Tyne and Wear Metro**, converted 42km of under-used local rail lines, linked by 17km of new infrastructure including city centre tunnels and stations. It was integrated with the local bus network, including provision of feeders to purpose-built interchanges. The first phase of the system opened in 1980 and extensions to Newcastle Airport (1991) and Sunderland (2002) followed.
- In 1987, the **Docklands Light Railway (DLR)** opened using former rail alignments and some new construction to link the City and the Dockland development areas, including Canary Wharf. The scheme was delivered for a mere £77 million, but has subsequently been upgraded and extended to Bank, Beckton and Lewisham with further extensions under construction (North Woolwich), or in planning (Woolwich Arsenal, Barking Reach and Stratford International).
- In Greater Manchester, **Manchester Metrolink** converted the existing Altrincham and Bury rail lines to light rail and linked them through the city centre by on-street tramway. The system opened in 1992 and a further extension to **Eccles** opened subsequently.
- **Sheffield Supertram** - a largely street-running system opened in 1994-5 with three lines linking the city centre to Meadowhall, Middlewood and Halfway.
- **Midland Metro** opened in the summer of 1999, linking Wolverhampton and Birmingham via the Black Country, mostly using a former rail alignment with some on-street running.
- **Croydon Tramlink**, a three-line network linking Beckenham, New Addington, and Wimbledon to Central Croydon, opened in May 2000. The system involves street running, new segregated alignments and replacement of rail services.
- The most recent scheme to open **Nottingham Express Transit**, came into service on 8<sup>th</sup> March 2004 and links the north of the city (including Park and Ride sites) with the city centre using a mixture of segregated alignments and on-street running. It is well integrated with local bus and rail services.

2.14 Other systems are in various stages of development (seeking statutory powers, funding from DfT, or in procurement):

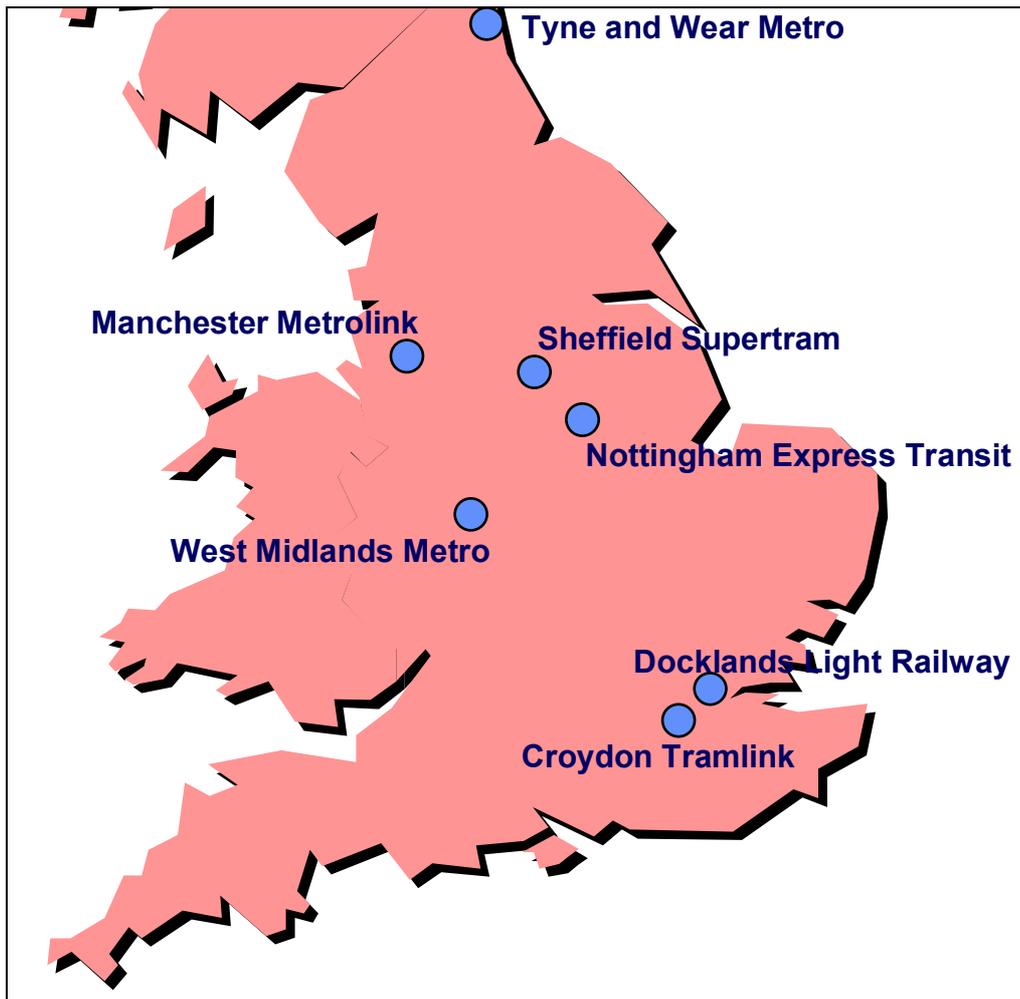
- Leeds Supertram, a 3-line network;
- Merseytram, a 3-line network in Liverpool;
- South Hampshire Rapid Transit to link Portsmouth and Farnham;
- Five extensions to Manchester Metrolink;
- Two extensions to Midland Metro;
- Two extensions to Nottingham Express Transit;
- Two lines in Edinburgh.

2.15 At the end of 2004, a Transport and Works Act (TWA) order giving powers to build Merseytram Line 1 from Liverpool to Kirkby, was made, subject to funding approval from the Government. A similar decision was made in relation to the proposed

extension of Midland Metro from Wednesbury to Brierley Hill, again subject to Parliamentary confirmation, and funding approval. Also, A £520 million budget package for extensions of Manchester Metrolink to Oldham and Rochdale, Tameside and South Manchester, including the airport, was agreed by the Transport Secretary.

2.16 In addition, TfL have well developed plans for West London Tram and Cross-River Tram and are also considering the feasibility of extensions to the Croydon network. Other less well-developed schemes being considered include further extensions of the West Midlands and Sheffield networks.

**FIGURE 2.3 LIGHT RAIL SCHEMES PRESENTLY OPERATING IN THE UK**



### The Planning Context

2.17 These schemes have been developed over the last 15 - 20 years in an evolving framework of statutory planning processes, funding regimes and procurement methods, including:

- More integrated planning as LTPs replaced Package Bids, which themselves replaced TPPs;
- More open statutory powers processes with TWA Orders replacing Private Members Bills;

- The transfer to the private sector of more of the risk of building and operating systems;
  - The use of PFI/PPP finance and local authority contributions to supplement central government capital grants.
- 2.18 The processes have strengthened the objective-led approach to planning; lengthened the time taken to develop and implement schemes; and increased the scrutiny to which schemes are subjected.
- 2.19 Within this framework, light rail proposals have been developed as key elements of comprehensive transport strategies designed to deliver broad objectives including: easing traffic problems; assisting economic development; and achieving environmental improvements. Typically, such transport strategies fit with broader economic, environmental and regeneration strategies.
- 2.20 Often, the objectives are challenging. They are not to achieve a small improvement here or there: they identify significant problems that require significant solutions. Traffic congestion is widespread and solutions are sought which will attract car users to public transport. In order to make public transport sufficiently attractive, often requires a step-change in transport quality, a significant increase in capacity, improved reliability, faster journey times and “whole journey quality”, i.e. ambience, quality of ride and so on.
- 2.21 Alternatives to light rail (i.e. heavy rail/metro or bus-based schemes) are examined as a matter of course during the development of transport strategies, in the development of more detailed plans for light rail schemes, when seeking powers for schemes and when funding is sought from the Government. More recently, further re-examination of alternatives has been undertaken for the systems where procurement is stalled. The basis for comparison is consequently a fairly well researched area and the key messages from this analysis can be clearly summarised. The major differences in output of various systems are described in Section 3 of this report. Policy makers will focus on the relative levels of benefits attainable from different systems and whether they can deliver the broader objectives of the strategy.
- 2.22 Even with the undoubted success that TfL have had in reversing the fortunes of the bus services in London, they recognize the importance of light rail to provide an important intermediate level of capacity between the rail and tube networks on one hand and bus services on the other. The Mayor’s strategy has a commitment to the further development of the DLR and Croydon Tramlink, as well as bringing forward new proposals such as the West London Tram and the Cross River Tram schemes.
- 2.23 Elsewhere, development of light rail systems remains an attractive option. They can be delivered within existing powers and administrative arrangements and can provide improvements in public transport quality necessary to attract new passengers. Effecting the same scale of improvement through the bus network has not been achieved and, even if the regulatory environment for bus service procurement was to change significantly, it is arguable that in key corridors the most effective response would be to provide better-integrated services in support of the existing rail network or light rail schemes.

## The Current Climate for Light Rail Development in the UK

2.24 The publication of the NAO report ‘Improving Public Transport in England Through Light Rail’<sup>7</sup> has provided focus for debate in the last year. Subsequently, the Government’s recent White Papers on transport strategy<sup>8</sup> and the rail sector<sup>9</sup> set the future policy context for the development of light rail schemes. These recognise that light rail solutions should be pursued where they are most appropriate. However, the Secretary of State has revoked the funding of the Leeds, Manchester, Hampshire and Blackpool schemes because their costs are considered too high.

### “Improving Public Transport in England Through Light Rail” - NAO

2.25 The NAO report reviewed DfT’s work in funding the construction of light rail systems in the UK. The major conclusions of the report were:

- The Department’s contribution to the construction of the six new systems built since 1980 (excluding Nottingham) was kept within the original agreed budget in all cases except the Sunderland extension to the Tyne and Wear Metro.
- DfT and the promoters have evaluated four of the systems in terms of patronage levels, travel patterns, passenger perceptions and congestion relief. However, whether the anticipated benefits were delivered, such as quick and reliable services for passengers, impacts on the local economy, or the extent to which systems were integrated with other forms of public transport such as buses have not been evaluated. The NAO concludes that *“The Department therefore has an incomplete picture of what has been delivered for the significant amount of public monies invested in the schemes, and does not have as informed a base as it should have for the consideration of future schemes”*.
- The NAO found that light rail has improved the quality and choice of public transport: systems have been delivered much as planned, they do deliver fast, frequent and reliable services and do provide a comfortable and safe journey. PTEs have generally expressed themselves as, on the whole, satisfied with operators’ performance levels. It was acknowledged that usage is increasing, that there has been a shift away from car use and that they enhance the image of their host cities or towns.
- However, the report focuses on the point that patronage has fallen short of what was predicted. From this, the NAO concludes that potential benefits have been over estimated, that they have not been fully exploited and identifies several areas for improvement:
  - Integration: The NAO believes that light rail systems are not fully integrated with other forms of public transport. Public transport best competes with the car if it is operated in a joined-up, integrated way, with co-ordination between services, ease of interchange, through-ticketing and widespread availability of passenger information about routes, fares and timetables. The report notes that passengers consider integration to be the least satisfactory aspect of light rail, with integration with bus services poor on many lines.

<sup>7</sup> National Audit Office (2004) – **Improving Public Transport in England Through Light Rail** – Report by the Comptroller and Auditor General – HC Session 2003-2004: 23<sup>rd</sup> April 2004.

<sup>8</sup> Secretary of State for Transport (2004a) – **Ibid**

<sup>9</sup> Secretary of State for Transport (2004b) – **The Future of Rail** – Cm 623, The Stationery Office, pp. 81

- Modal Shift, Environment and Safety: The NAO also states that light rail has had a limited impact on road congestion, pollution and road accidents. Their report identifies that there has been a shift away from cars in some cases, although there has not necessarily been an easing of road congestion or a reduction in pollution or road accidents.
  - Economic Impacts and Regeneration: The NAO is unclear what impact light rail has had on regeneration and social exclusion but allow that in measuring regeneration and social inclusion benefits, it is difficult to separate the impact of light rail from other regeneration programmes or from changes in the local or national economy.
- 2.26 Overall, the NAO report notes that the picture regarding the benefits delivered by light rail in the UK is far from complete, but nevertheless it is clear that the quality and choice of public transport has improved. The report focuses on the shortfall between the actual patronage on light rail schemes and that predicted for them, but acknowledges that systems operate in excess of capacity in the peak. It does not examine whether it was feasible for the predicted patronage to have been delivered, given that operating conditions have often been significantly different from planning assumptions (e.g. service frequencies and reliability). The report is also critical of the extent to which light rail schemes in the UK have been integrated with other forms of public transport, and the complementary measures that have been put in place to maximise the benefits of the systems, in comparison with schemes in France and Germany. However, it does acknowledge that such matters are generally beyond the control of the promoters and operators of light rail in the UK, and that in the few cases where they could have been influenced (i.e. in London and Nottingham), there are regulatory constraints to overcome.

### ***The White Paper on Transport***

- 2.27 The Government's recent White Paper on Transport<sup>10</sup> looks towards a transport network for the next 20 to 30 years to support a growing economy and an increasing demand for travel, while achieving environmental objectives.
- 2.28 The White Paper envisages many interventions to achieve these aims, including: greater influence from local/regional stakeholders to ensure transport decision are made alongside other policy areas; improvements in the management of networks (including charging mechanisms and measures to improve bus services); improvements in the accessibility of public transport; and taking full account of all costs and benefits of investment decisions.
- 2.29 Specifically in relation to light rail, the findings of the NAO report are acknowledged and a need to learn from experience to date is recognised, so that light rail is pursued where most appropriate, to deliver local authorities' wider transport strategies. The White Paper suggests that light rail can work best for routes with the highest traffic and passenger flows.

<sup>10</sup> Secretary of State for Transport (2004a) – **Ibid**

- 2.30 While the White Paper recognises that all existing light rail schemes and current proposals for new schemes have undergone rigorous assessment, it stresses that, in the future, promoters must ensure their forecasts of passenger numbers are realistic and that appropriate measures are taken to attract people to use the new services. This could include better integration with other forms of transport – through integrated ticketing and bus Quality Contracts, provision of park and ride facilities, complementary parking policies and other forms of demand management.
- 2.31 The degree to which benefits from complementary measures can be secured is limited by the planning and regulatory regimes within which promoters can operate. If the regimes change, greater usage would be achievable - a key issue is whether measures *can* be planned into schemes now, or whether they should be developed independently and the benefits captured at a later date.
- 2.32 For example, greater local authority control over bus networks would enable networks complementary to light rail to be designed. However, the implementation of a Quality Contract has its own delivery risks, which could delay the benefits of light rail investment if the two were coupled. Furthermore, a Quality Contract would be unlikely to reduce the perception of revenue risk borne by the operator unless guarantees over the control of the bus network for the life of the concession were made. Such guarantees would be unlikely under current arrangements and, in any event, would probably be counter productive to local authorities' ability to plan the network over time.
- 2.33 In order to make light rail solutions more affordable, several *pteg* members are developing alternative procurement approaches, with a sharing of the revenue risks and, in some cases, separation of infrastructure procurement from operations. There also may be scope for cost efficiencies through making more use of common design approaches and more tailored safety standards for light rail schemes.
- 2.34 The new rail structure set out in the recent Rail White Paper<sup>11</sup>, suggests decisions on the provision of rail services will be taken at a more local level. The Welsh Assembly Government will take on more direct responsibility for passenger services. The Scottish Executive will directly manage the ScotRail franchise and may take an extended role with regards to infrastructure in Scotland. In England, Passenger Transport Authorities in the main metropolitan areas will be given the right to buy increased services, and flexibility to transfer funding between rail and other modes of transport. Transport for London will also have an increased role in specifying services in the capital. It is suggested that these changes will enable light rail schemes to be developed as part of a more considered and integrated strategic approach to local urban transport problems.
- 2.35 In particular it is suggested that, for example, a PTE might make real choices between revenue support for rail and other solutions, for example conversion of heavy rail to light rail, or new light rail options<sup>12</sup>. These options will be considered by PTEs in the future development of transport strategies.

<sup>11</sup> Secretary of State for Transport (2004b) – **Ibid**

<sup>12</sup> Secretary of State for Transport (2004b) – **Ibid** – pp. 86

- 2.36 However, overall many of the interventions envisaged in the White Paper are areas already considered by PTEs in their Local Transport Plans. Where their powers are strengthened to improve the overall achievement of the broader objectives, no doubt they will be adopted.



### 3. LIGHT RAIL AND ALTERNATIVES: AN OVERVIEW

#### THE RELATIVE QUALITY AND CAPACITY OF LIGHT RAIL

Light rail systems offer a step-change in the quality of public transport which can contribute to the aims of integrated transport strategies. In particular it offers:

- Penetration of town and city centres in a permanent and highly visible manner;
- Reliable and easily understood service patterns;
- Quicker journey times than competing modes;
- High levels of capacity that can increase accessibility to existing centres and new developments in a sustainable manner;
- High levels of accessibility to all users; and
- A proven ability to attract car users to public transport.

The higher capacity offered by light rail than bus alternatives leads to economies of scale in the costs of provision of public transport services in major urban corridors.

Buses will always provide extensive coverage in many areas of all towns and cities. However, while there is great potential to improve the quality and provision of bus services, it is not possible to achieve the desired step-change in quality and capacity required in major corridors with bus-based modes.

#### Definitions

- 3.1 The terms *tramway*, *light rail* and *light rapid transit* are, together with further terms for bus-based modes such as *guided bus* or *guided light transit*, often used interchangeably. *pteg* has previously<sup>13</sup> defined *light rapid transit* as "a public transport system which is mainly segregated from other traffic, running within or adjacent to the highway, or on separate rights of way, with an average speed of at least 20 kilometres per hour and a capacity in the range of 1,000 to 15,000 passengers per hour per direction". Within this broad definition, this study is concerned with rail-based versions, whether operating on segregated routes or sharing rights of way with other traffic.
- 3.2 The role and performance of a range of alternatives to light rail, using various forms of bus technology, have also been considered - although the attempt here is not to replicate the many technology reviews undertaken elsewhere. Instead, the emphasis is on the scale of benefits they might deliver. Not considered are higher capacity rail or metro systems, lower capacity "ultra-light rail" systems or specialised modes such as people-movers or monorails.

#### Features of Light Rail

- 3.3 Light rail has the following range of physical and technological features:
- Steel wheels running on conventional track formations or on rails laid into the highway;

<sup>13</sup> Select Committee on Environment Transport and Regional Affairs (2000) - Eighth Report: Light Rapid Transport Systems - HC 153, 8 June 2000, paragraphs 5-6

- An ability to operate on alignments with steeper gradients and sharper curves than is possible with heavy rail;
- Generally manually operated, but full automation is possible on fully segregated systems;
- Speeds of up to 80kph and rapid, yet comfortable, acceleration and deceleration.
- A vehicle length of 20 metres (m) to 40m, width of 2m to 3m, with multiple doors and one or two articulated sections, often capable of being coupled into longer formations;
- Typically electrically powered, although diesel trams are feasible;
- Provides full, or partial, level boarding for passengers at all stops, either using high-floor vehicles and raised platforms, or low-floor vehicles and platforms almost at street level;
- Fares collection is not undertaken by the driver, instead ticket vending machines, other 'off system' sales, or conductors are used;
- A centralised control system for operational management and security monitoring. Signalling can range from line-of-sight to full automation on fully segregated routes; and
- Requires a dedicated depot and stabling facility.

### What Can Light Rail Deliver?

3.4 The objectives and characteristics of individual light rail schemes vary considerably, but in all cases the provision of infrastructure, vehicles and systems as described above can deliver a product with a number of attractive features to users and policymakers:

- **Penetration of town and city centre with permanent, visible, and acceptable infrastructure:** direct access can be provided to city centre jobs, shopping and other facilities in a way that is highly visible and perceived as reliable and dependable;
- **Predictable, regular and reliable journey times and service patterns:** service levels are generally high (5 to 20 or more trams per hour) on simple, easily understood routes, generally operating at a high level of reliability due to segregation from traffic, priority at junctions and contractual incentives to operators;
- **Accessible and visible stops:** Vehicles are highly accessible to all users and can provide 100% level boarding at stops. Other features include highly visible stops, good information, easy to purchase tickets and security measures (visible staff or police on and around the system, CCTV etc);
- **A high quality of ride throughout the entire journey:** whether or not a system is fully segregated or mixes on-street and off-street running;
- **Short dwell-times:** Multiple doors and off-vehicle ticketing ensure light rail has the benefit of short dwell times at stops, with consequent journey time benefits;
- **High passenger carrying capacity:** In radial road corridors in urban areas, light rail can provide a more efficient and sustainable use of existing capacity by making best use of available junction priority. Indeed, it is essential to provide this priority for light rail to avoid reliability problems on street-running sections. Light rail can increase capacity on an existing rail corridor by providing more stops and higher frequency services – made possible by the provision of dedicated routes in city centres thus avoiding congested rail termini;

- **Additional capacity in a sustainable way:** Light rail can provide additional passenger carrying capacity to existing city centres or major developments, whereas new road capacity would not be acceptable;
- **Park and Ride facilities attractive to car users:** Evidence suggests that car users find the quality of service operated by light rail attractive;
- **Integration with new developments:** The development of light rail in conjunction with major changes in the urban fabric is an effective way of supporting development activity, as has been demonstrated primarily in London Docklands, but also in Manchester and elsewhere;
- **Linking major traffic generators/attractors:** Routes that serve more than one major travel market are particularly efficient as they help to provide balanced all day flows and make better use of the infrastructure. Examples include city centres to town centres, major park and ride sites to city centres and major developments to city centres;
- **Integration:** Physical integration of light rail routes is often ‘designed-in’ (e.g. to major rail or bus stations or major developments). Integration of fares and services with bus and rail operators is limited by the regulatory environment in the UK, although it is usually achieved to some extent; and
- **Permanence:** the image offered by light rail infrastructure, vehicles and operations secured in the long term, gives individuals and businesses confidence to make location decisions.

3.5 These features deliver substantial and widespread benefits which will, in turn, enable the objectives of policy makers to be achieved:

- **Transport benefits to users** – in comparison to their previous modes, users will have quicker, more frequent, more reliable, more comfortable and more convenient journeys. Under DfT Guidance, these benefits are measured in terms of journey time savings to the forecast users of a system and usually form the largest element of benefit in a cost-benefit appraisal.
- **Transport benefits to non-users** – where people change from another mode to a light rail scheme, remaining users of that mode may benefit. Most commonly, where car users switch mode, there may be time or cost savings to remaining road users if traffic congestion levels fall.
- **Consequent wider (non-transport) benefits** – the improvements to ease and convenience of users' and non-users' journeys will, in turn, have a positive effect on the broader economic, environmental and social character of the area in which the investment is made. The extent to which these impacts are evident for UK schemes is discussed later in this report.

3.6 These benefits are, in principle, deliverable by any improvement to public transport. The advantages of light rail are its ability to deliver a higher *scale* of benefits and provide benefits to a greater range of users.

### Light Rail Capacity

3.7 A particular feature of light rail systems is the mode’s ability to move large numbers of people in urban areas, which means that the benefits described above can be delivered in substantial form. An illustration of the capacities of light rail and bus-based modes is shown in Table 2.1 (note that there are many ways of defining these alternatives). At very high frequencies (of 60 vehicles per hour), bus-based modes

can carry 4,500 to nearly 10,000 people per hour per direction, whereas the larger vehicle size of light rail and the ability to couple vehicles together, means that a capacity of 20,000 or more is achievable (indeed, the DLR equipped with 3-car units will be able to carry more than some Underground lines in London). The highest capacity bus based systems, such as the TVR operated in Caen and Nancy, in France, are also not particularly cheap alternatives. Their implementation requires segregated rights of way and other infrastructure built to tram-like standards.

**TABLE 3.1 COMPARISON OF MAXIMUM PASSENGER CAPACITY OF TRANSIT SYSTEMS (APPROXIMATE VALUES)<sup>14</sup>**

	Standard Bus	Double-deck bus <sup>a</sup>	Articulated bus	Guided Light Transit <sup>b</sup>	Tram <sup>c</sup> (2- car unit)
Length	10m	12m	18m	24.5m	2 x 30m
Width	2.5m	2.5m	2.5m	2.55m	2.65m
Vehicle Capacity <sup>d</sup>	75	105	125	160	350
Seated	35	95	50	60	150
Standing	40	10	75	100	200
Maximum Capacity (per hr), per direction <sup>e</sup>	4,500	6,300	7,500	9,600	21,000

**Notes**

- a. Normal capacity of UK double-deckers varies between 73-89 passengers.
- b. e.g. TVR, Philieas, Van Hool, etc.
- c. Trams have a range of capacity: San Diego accommodates 134, Sheffield Supertram 250 passengers standing and sitting.
- d. Calculated assuming 4 passengers per m<sup>2</sup>.
- e. Assumes a 1-minute practical headway.

- 3.8 The very high frequencies that underpin these *maximum* capacities are not typical of most urban light rail systems in the UK, which more regularly operate at around 5-10 trams per hour, carrying up to 2,000 passengers per hour per direction; but with the potential for more.
- 3.9 Total bus service levels of around 60 per hour are not uncommon in radial corridors in many UK cities. In such instances, bus journey times are typically affected by delays as it is not possible to provide junction priority for all of the buses. Congestion may also occur at bus stops on route and in city centres. The same sort of capacity could be provided by a much lower level of service by tram. For example, by straight replacement by a 2-car unit operating at a 5-minute headway. In practice, in the absence of local authority control of bus service levels, combined bus and tram services are usually provided with the tram having added capacity to a corridor and improving journey times.
- 3.10 In most urban areas in the UK, light rail schemes are typically designed to cater for between 5 and 20 trams per hour and are usually constructed to allow the use of coupled vehicles. Within this range, a typical service level of 10 trams per hour could provide capacity for 1,750 passengers per hour per direction with single vehicles (and

<sup>14</sup> Adapted from Hass-Klau, C. et al (2003) – **Bus or Light Rail: Making the Right Choice** – ETP/Bergische Universität Wuppertal, 2<sup>nd</sup> Edition, Table 7, pp. 51

up to 3,500 passengers per hour per direction with coupled vehicles). The alternative bus-based modes in Table 3.1 would have to operate at the following service levels to provide the same capacity:

- Standard Bus 46 bph;
- Double-Decker Bus 33 bph;
- Articulated Bus 28 bph;
- Guided Light Transit 22 bph.

- 3.11 Clearly, operation at these frequencies would incur additional staff resources, require additional vehicles and would be more difficult to cater with effective priority at junctions. This would, in turn, affect service speed and reliability, push up operating costs further still, and passengers would perceive the quality of service to be poorer because their bus would be subject to more delays. In such cases, it is clear that light rail can provide a more effective and efficient service than bus-based modes.
- 3.12 Transport for London has looked into bus and light rail systems worldwide and compared characteristics as shown in Table 3.2. Here the suggested capacities are lower than those *theoretically* possible described in Table 3.1.

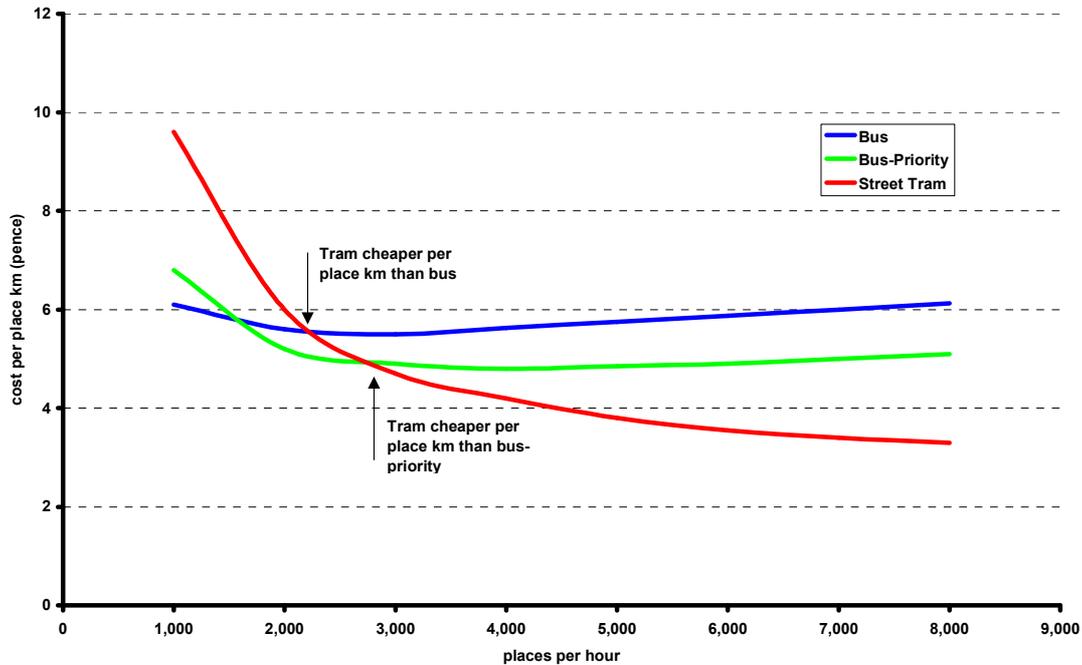
**TABLE 3.2 MODAL CHARACTERISTICS COMPARED**

Mode Characteristics	Bus	Maximum Bus Priority	Segregated Busway	Tram
Max. capacity (pphpd)	2,500	4,000	6,000	12,000
Capital cost per route km	< £1m	£1m - £2m	£1m - £20m	£15m - £20m
Operating cost per passenger place km	3.8 p – 8.8 p	2.5 p – 5.8 p	2.5 p – 5 p	1 p – 2.1 p
Average speed	10–14 km/hr	14–18 km/hr	15 – 22 km/hr	15 – 22 km/hr
Reliability	Improving	Medium	Good	Medium to Good
Road space Allocation	Mixed running with traffic	Mixed running and on-road bus lanes	Totally segregated alignment required	Mixed running, on-road tram lanes and segregated
Theoretical Land Use 'best fit'	Best suited to lower density dispersed urban form	Best suited to lower density dispersed urban form	Best suited to high demand corridors in medium to low density areas	Higher densities of development, or connecting denser urban centres

- 3.13 This analysis of the relative costs and features of public transport modes, suggests that light rail is best suited to providing high-capacity services in major corridors not served by frequent rail services. Bus services will always be the main public transport mode beyond such key corridors and investment to provide improvements to bus services in those areas will often offer good value for money.
- 3.14 Figure 3.1 shows TfL’s analysis of the relative whole-life capital and operating costs of service provision in a ‘medium cost’ corridor (likened to Croydon Tramlink). At volumes up to around 2,500 passengers per hour, bus services are cheaper to provide.

At higher passenger volumes, the costs of light rail become lower than buses (if it were possible to replace all of them), and light rail could be preferable on cost alone. At lower volumes, to make a case for light rail investment, the benefits of reduced journey time, improved accessibility, greater comfort etc would have to be greater than the additional costs involved - as has often been shown to be the case.

**FIGURE 3.1 COMPARISON OF COST PER PASSENGER FOR DIFFERENT MODES FOR A MEDIUM COST URBAN CORRIDOR (E.G. CROYDON)**



Source: TfL

### Bus Systems as Alternatives to Light Rail

- 3.15 Bus is the main public transport mode in most areas of the UK, apart from those very well served by rail, or by the relatively few major light rail schemes. There are many opportunities for area-wide improvement of bus services. Smaller-scale infrastructure schemes (such as short sections of guideway), extensive junction priorities, and quality partnerships can all deliver service quality improvements. These are all promoted outside London, by local authorities and some operators.
- 3.16 The merits of bus-based systems as alternatives to light rail schemes are not usually determined on cost grounds alone. Most corridors will have a level of demand below that shown in Figure 3.1 where bus costs exceed those of light rail and, in any event, the bus services are not under the control of local authorities. Each case is obviously unique, but there are some general issues that emerge from analysis of alternatives.
- 3.17 Enhancements to existing bus services can be readily secured through provision of sections of guideway, junction priorities, new vehicles, new stops and better information under the existing regulatory regime. This would usually be delivered

through a quality partnership between local authorities and operators with new infrastructure funded through the LTP process.

- 3.18 Generally, it would be expected that bus-based schemes would have sound investment cases under DfT appraisal guidance, but would deliver a level of benefits very much lower than a light rail scheme. The key reasons for this are:
- Significant journey time improvements cannot be secured without provision of large-scale, lengthy segregated sections of route, requiring land and property-take commensurate with that for light rail;
  - The quality of journeys cannot be improved over the *whole journey* to the *same extent* as light rail. Bus services will still operate on existing roads with consequent poor quality of ride; will be subject to disruption when access is required to statutory undertakers apparatus; and will not have visibility and presence at city centres or major developments;
  - Car users' perception of the quality of bus services can be improved but will remain below that of light rail. As a consequence levels of car transfer are demonstrably lower (see Section 4);
  - The improvements offered in terms of accessibility and safety and security are less substantial. Level boarding is not possible at all stops without a guidance system throughout the route. Kerb guidance cannot be constructed in town or city centres, while other forms of guidance (e.g. optical) remain unproven in the UK. The poorer quality of ride makes it much harder for passengers to stand. Unless procured in the same way as a light rail system, levels of staffing on the system are likely to be much lower. CCTV provision will cost the same whether provided on a bus or a light rail system; and
  - Uncertainty over provision of services, which as part of the deregulated network are subject to change under the normal arrangements for the bus industry.
- 3.19 New vehicles coming onto the market such as the CIVIS or "f-t-r" (First Group and Wright Group concept) offer much improved vehicular quality at perhaps 25% of the cost of a tram. While these improvements are universally desirable, vehicle quality alone plays only a small part of the quality offered by light rail. In order to effect the same step-change in quality the above issues need to be tackled. Some can, but at high cost, others cannot and will limit the benefits attainable.
- 3.20 This point is illustrated by the 'high' end of the bus-based range of systems such as the TVR operated in cities such as Nancy and Caen in France. These systems provide a tram-like experience including fully segregated routes, relocation of statutory undertakers apparatus, electric power through overhead lines and stop infrastructure on a par with light rail. As a result, the cost of such investment is also not significantly less than that for a light rail system (the cost of the Nancy system has been estimated at over 80% of the cost of a comparable light rail system, excluding vehicle costs).
- 3.21 In practice, there are few examples of major bus *infrastructure* schemes in urban areas in the UK. There are many quality bus corridor initiatives, some with limited use of guideways to achieve some of the objectives that might be set for light rail, but no system of the nature of the TVR in France. Perhaps the most promising opportunities for larger-scale investment in buses in particular corridors are the use of former rail alignments. Schemes such as Luton-Dunstable Translink, Cambridgeshire Guided

Busway and the Leigh to Manchester Quality Bus Corridor would provide services *between* urban areas and enable buses service to fan out across residential areas.

- 3.22 In these circumstances, provision of busways would cost approximately £4 million per kilometer while light rail lines between urban areas would be about £10 million per kilometre, plus higher levels of expenditure in town centres. The population densities along these routes are not enough to support the level of investment required for light rail.

#### 4. LIGHT RAIL: A HIGH CAPACITY AND ATTRACTIVE ALTERNATIVE TO THE CAR

##### LIGHT RAIL USAGE: A SUCCESS STORY

There has been a 52% increase in passenger journeys and a 66% increase in passenger kms carried on UK light rail systems since 1999. Patronage is increasing on all systems.

All schemes now experience overcrowding to some extent in peak periods.

The increases in patronage on some systems have been achieved despite significant real fare increases, in contrast to bus services outside London where fare increases have, generally, contributed to the steady decline in volumes of travel.

##### How Many People Use Light Rail Schemes in the UK?

- 4.1 There are presently seven light rail systems in England that have been developed since 1980. The seven systems vary in the design of vehicles they use, their size and the amount of segregation from other traffic. The characteristics and levels of use of each are described in detail in **Appendix A**.
- 4.2 Many reports on light rail schemes focus on their failure to carry as many passengers as was predicted during their development. Indeed, one of the key conclusions of the recent NAO report was that:

*“Patronage levels [of light rail systems] have fallen short of expectations. Promoters estimate passenger numbers in the business cases they submit to the Department [of Transport]. They expect patronage levels to build up over time, usually reaching maturity after five years of operation. We found that actual passenger numbers have fallen well short of expected patronage levels in three of our five<sup>15</sup> case studies. Shortfalls ranged from 24 per cent to 45 per cent.”<sup>16</sup>*

Comments such as this are often taken to mean that light rail schemes are failing to attract large numbers of passengers and are not as successful as might have been intended.

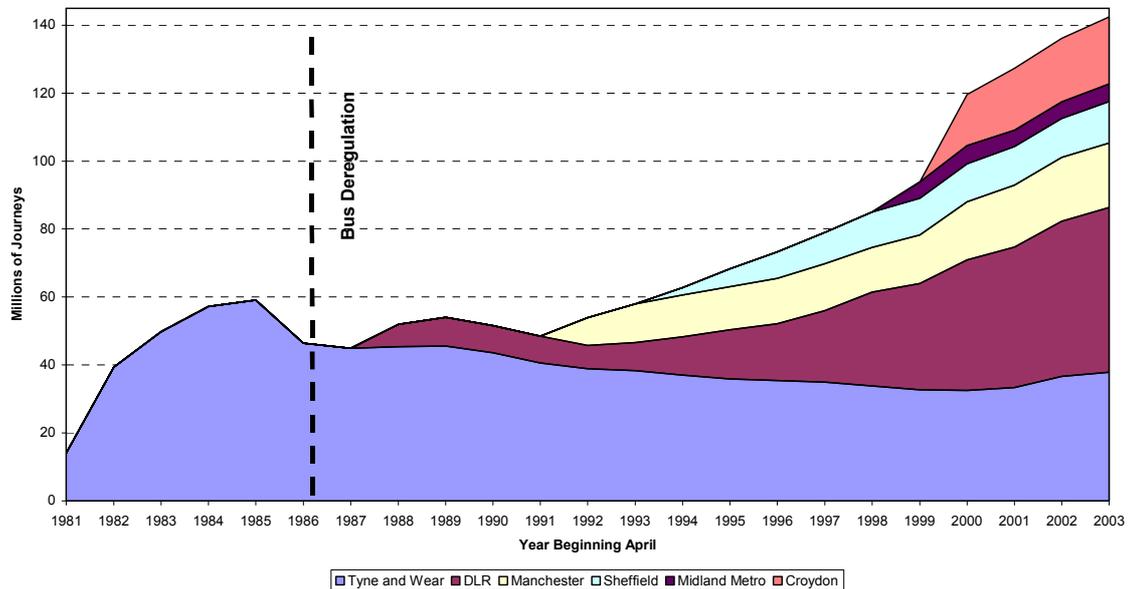
- 4.3 However, most of the UK systems have been successful in attracting large numbers of passengers. All are now operating at capacity at peak times. There is impressive evidence of passengers being attracted from other modes, particularly the car. In providing new opportunities to travel, light rail systems have led to new, or induced, passenger traffic and support for broader economic and environmental aims.
- 4.4 Overall, the light rail schemes operating in the UK carry more than 140 million people annually and usage is increasing on all of the schemes. Overall usage is illustrated in **Figure 4.1**. The Docklands Light Railway and first phase of Manchester Metrolink have exceeded promoters’ forecasts of patronage. On the second phase of Metrolink, Midland Metro and Croydon, initial performance was disappointing, but have yet to

<sup>15</sup> i.e. Sheffield, Midland Metro, Croydon and the two phases of Manchester Metrolink

<sup>16</sup> National Audit Office (2004) – **Ibid** – Paragraph 2.11, pp. 21

be open for the 5 years typically allowed for demand to ramp up. On NET in Nottingham, initial reports of patronage are very encouraging.

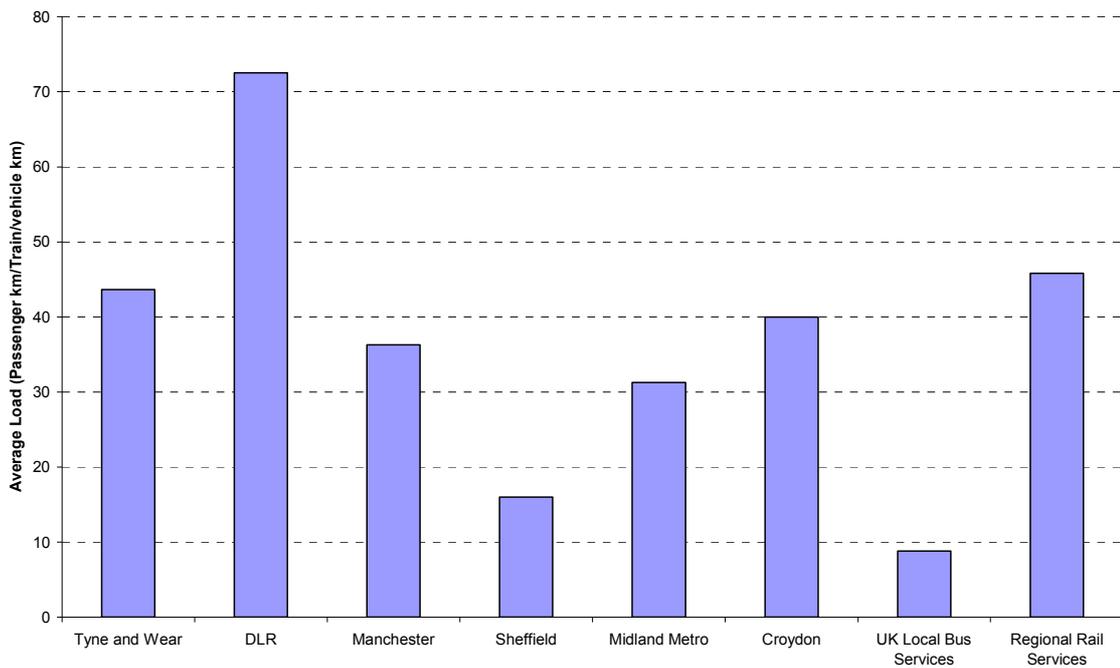
**FIGURE 4.1 PATRONAGE ON UK LIGHT RAIL SCHEMES 1982-2004 (MILLIONS)**



4.5 All of the schemes in the UK presently operate at capacity at peak times and some, such as the DLR and Manchester Metrolink, experience sustained overcrowding. Even on other schemes that are reputedly not well used, such as Midland Metro, it is reported that passengers have to let trams go because they are too crowded to board during peak periods.

4.6 Average loads on the systems are also high, as shown in Figure 4.2. All schemes have average loads well above those carried by local bus services nationally and most are comparable to regional rail services (i.e. all services excluding London and South East commuter and inner-city TOCs).

**FIGURE 4.2 AVERAGE LOADS ON UK LIGHT RAIL SCHEMES (2003)**



Source: Transport Statistics for Great Britain, DfT

4.7 Patronage is steadily increasing; there has been an overall 52% increase in journeys and 66% increase in passenger km carried since 1999. In part, this is due to system expansion and build-up, but growth is continuing on each system as shown in Table 4.1. Growth has occurred in journeys to work carried by light rail, but also in shopping and leisure trips. There are often even more people travelling at weekends than during the commuting peaks on many of the schemes.

**TABLE 4.1 RECENT PATRONAGE INCREASES ON UK LIGHT RAIL SCHEMES (2002/3-3/4)**

	Annual increase in patronage
DLR	6%
Tyne and Wear	4%
Manchester	1%
Sheffield	7%
Midland Metro	4%
Croydon	6%

4.8 On several systems, substantial growth in patronage has been delivered despite real fare increases, which contrasts well with the decline in patronage on bus services in the face of fares increases. Average yields have increased significantly on all schemes outside London. Users are clearly willing to paying for the additional benefit they receive from light rail and if fare levels had not risen on these systems, usage would be considerably greater.

- 4.9 The Manchester, Croydon and Sunderland schemes have demonstrated how the provision of more stops, higher frequency services and direct city centre access can dramatically increase patronage where light rail has replaced an existing rail service. In Manchester, the combined patronage of the Bury and Altrincham rail services was 7.5 million per annum before conversion to phase 1 of Metrolink which is now carrying more than twice that figure. In Croydon, Tramlink has delivered an eight-fold increase over the use of the former Wimbledon to West Croydon line. The Sunderland extension of the Metro system has also led to far higher demand than the rail service it (partially) replaced.
- 4.10 Many systems overseas (see Appendix B) demonstrate the potential for UK schemes to have still higher levels of usage, as was noted in the NAO report<sup>17</sup>. For example, in France many schemes carry 2-3 times as many passengers per route kilometre as UK schemes. The reasons for this difference include the higher density nature of French cities, but also much better integration of fares and services and subsidised low fare levels.

#### **Getting People Out of their Cars to Reduce Traffic Congestion**

- 4.11 A key objective for light rail schemes in promoters' transport strategies is to attract passengers who previously travelled by car. The extent to which a light rail scheme achieves this is affected by a number of factors. The relative journey time of each mode, the level of fares, availability and cost of parking, and the accessibility and attractiveness of the tram journey are all factors in modal choice.
- 4.12 The provision of faster, more frequent and more comfortable public transport can make people change their mode of travel from car. If coupled with restraint of other road vehicles (e.g. through traffic management, area bans, tolls or parking charges) the mode-shift will be more pronounced.

#### **FEWER CARS, LESS CONGESTION**

Light rail is proven to help to reduce urban traffic congestion as part of integrated transport strategies, because:

- It can attract people out of their cars where it provides fast, frequent and comfortable services.
- Generally speaking, about 20% of peak hour passengers on UK tram schemes previously travelled by car.
- At weekends, up to 50% of tram passengers used to travel by car.
- UK schemes appear better at attracting passengers from cars than schemes in other countries, despite operators having less control over other factors, such as competition from buses and traffic management.

Investment in quality bus services in the UK has been shown to deliver much lower levels of mode-shift from the car.

<sup>17</sup> National Audit Office (2004) – **Ibid**, pp. 27

- 4.13 People will change their destinations, routes, time of travel or mode used in response to either an improvement or worsening of their journey. If public transport alternatives are made efficiently attractive, motorists will leave their car at home. This will be to the benefit of both those who change modes and those who continue to drive, as congestion should be reduced. In response, some further road use may be generated which can make it difficult to identify the direct effect of investment in light rail.

#### ***Tyne & Wear Metro***

- 4.14 The initial monitoring studies of the Metro<sup>18</sup> noted that use of the new system by former car users, together with the accompanying large-scale reduction of bus movements in central Newcastle, had helped to reduce congestion. Between 1980 and 1984, average vehicle speeds in Newcastle City Centre increased by about 20%.
- 4.15 The mode-shift from car reduced growth in traffic levels in central Newcastle to 3-4% below that experienced in outer areas. In particular, over a million trips a year were made by park-and-ride passengers, mainly for trips to and from central Newcastle. Today, the system has 2,200 park and ride spaces, most of which are used everyday.
- 4.16 Nexus estimate that 16% of users of the Sunderland extension previously used car and demand is still increasing.

#### ***Docklands Light Railway***

- 4.17 The purpose of the DLR is not primarily to attract existing car users, but to minimise car to use new commercial and residential developments in the Docklands area.
- 4.18 The extent of development in the Isle of Dogs and the consequent volumes of travel mean that, as with Central London, mass transit is essential - it could not be served by car and bus alone. The scale of public transport provision has increased over time: DLR was gradually extended and, in 2000, the Jubilee Line extension opened. The DLR clearly has supported development in the Docklands area, allowing commercial activities to expand while being served mainly by public transport. Prior to 1997, 22% of travel to work in the Isle of Dogs was by car, but today only 11% of Canary Wharf employees arrive by private vehicles and 89% use public transport, cycle or walk. The long-term target of the developers is to reduce private vehicle usage to below 10%<sup>19</sup>.

#### ***Manchester Metrolink***

- 4.19 The monitoring studies for Metrolink<sup>20</sup> used information from user surveys and household interviews to ascertain changes in travel modes for people making the same trips before and after the opening of the system. Table 4.1 shows how many users of each mode switched to Metrolink for journeys to Manchester city centre, as reported

<sup>18</sup> Transport Research Laboratory (1985) – **Ibid**

<sup>19</sup> Canary Wharf plc (2002) – **Environmental and Social Report 2001-2** – pp. 13

<sup>20</sup> Oscar Faber (1996) – **Metrolink Monitoring Study: Vol. 1 – Impacts on Travel Patterns and Behaviour** – Department of Transport and GMPTE

from the household interviews. This shows, for example, that 21% of people interviewed in the Altrincham corridor said they had switched from car use to Metrolink during the morning peak. Obviously, the majority of former rail users switched to Metrolink given the replacement of one by the other. Similar findings were obtained from the user surveys: the proportion of Metrolink users to central Manchester who previously travelled by car ranged from 11% to 21%.

**TABLE 4.2 MODAL TRANSFER TO METROLINK FOR JOURNEYS TO MANCHESTER CITY CENTRE**

Corridor/Pre-Metrolink Mode	Percentage of Respondents Transferring to Metrolink		
	Weekday AM Peak	Weekday Off Peak	Weekend
<b>Altrincham</b>			
Bus	53%	55%	54%
Car	21%	31%	49%
Rail	77%	95%	100%
<b>Bury</b>			
Bus	37%	61%	67%
Car	14%	29%	40%
Rail	41%	98%	99%

Source: Oscar Faber (1996) – **Metrolink Monitoring Study** – Vol. 1, Table 7.2

- 4.20 The highest levels of transfer from car to Metrolink were observed in the Altrincham Corridor, probably reflecting higher levels of road congestion in that corridor and greater competition from express bus services in the Bury corridor. The level of transfer was also greater in the off-peak than peak periods, reflecting the attractiveness of Metrolink for non-work trips to and from the city centre.
- 4.21 The observed levels of mode-shift from car are lower than if Metrolink had not replaced a well-used rail service: public transport mode share was already high.
- 4.22 The modal shares for travel to Manchester city centre for households in Metrolink corridors before and after Metro began operation are shown in **Table 4.3**. There was an immediate shift from car to Metrolink that grew over the first year of operation.

**TABLE 4.3 MODAL SHARES FOR JOURNEYS TO MANCHESTER CITY CENTRE 1991- 1994**

Mode	1991	1993	1994
Car	55%	35%	33%
Bus	28%	13%	9%
Rail/Metrolink	17%	52%	58%

Source: Oscar Faber (1996) – **Metrolink Monitoring Study** – Vol.1, Table 7.3

- 4.23 This shift to public transport led to reduced traffic flows on key routes into Manchester city centre, with traffic reduced by up to 10% at peak times. The effects are summarized in Table 4.4.

**TABLE 4.4 ESTIMATED IMPACTS OF METROLINK ON ROAD TRAFFIC FLOWS INTO CENTRAL MANCHESTER (AM PEAK HOUR)**

Route	1991 Flow	Cars Removed	% Reduction
A56 (from Bury)	700	20	2.9%
A567	2,010	75	3.7%
A665	2,010	68	3.4%
<b>Total from north</b>	<b>4,720</b>	<b>163</b>	<b>3.5%</b>
A56 (from Altrincham)	1,760	177	10.1%
A5103	1,860	123	6.6%
<b>Total from south</b>	<b>3,620</b>	<b>300</b>	<b>8.3%</b>
<b>Grand Total</b>	<b>8,340</b>	<b>463</b>	<b>5.6%</b>

Source: Oscar Faber (1996) – *Metrolink Monitoring Study* – Vol.1, Tables 6.1 and 6.2

4.24 More recently, much of the patronage growth on Metrolink has been from the longer distance commuter markets of Bury and Altrincham<sup>21</sup> where Metrolink is at its most competitive. Without Metrolink traffic congestion would undoubtedly be greater.

**Sheffield Supertram**

4.25 The monitoring study for Sheffield Supertram<sup>22</sup> found that the proportion of Supertram trips previously made by car was around 20%.

4.26 The degree of road traffic reduction resulting from Supertram is less clear. Reductions in traffic levels in the Don Valley of 6% between 1994 and 1995 were observed as were fewer car trips to at least one city centre zone in Sheffield from origins along, and beyond, the Meadowhall corridor between 1991 and 1995.

4.27 It is suspected that the discrepancy between the level of use of Supertram by former car users and observed road traffic reduction could be that no account was taken in the surveys of induced road traffic (i.e. by the road spaced freed up by car transfer to Supertram).

**Midland Metro**

4.28 Among users of Midland Metro, 14% of passengers have reportedly transferred from cars (10% car drivers, 4% passengers)<sup>23</sup>. A further 30% of Metro passengers reported they were making trips that they previously had not made and, when asked how they would travel if the Metro was not available, 12% said that they would travel by car.

**Croydon Tramlink**

4.29 Monitoring undertaken after the opening of Tramlink indicated that almost 20% of people using the system had previously made their trip by car, while modal shift from

<sup>21</sup> Tyson, W (2004) – *Personal Communication*

<sup>22</sup> Atkins and TSU (2000) – *Supertram Monitoring Study: Final Report* – SYPTE and DETR – pp. 4-2 to 4-5

<sup>23</sup> Centro (2003) – *Midland Metro User Survey* – Ref. No. M10.03, pp. 11

other public transport modes accounted for about 75% of demand. The latter is not surprising given that Tramlink both specifically replaced some existing heavy rail services and that TfL made changes to bus routes and services to take account of Tramlink operations. Indeed, given that many peak users of the system travel to, or from, Central London by onward rail connection and effectively do not have the option of using a car, the mode-shift from car is particularly impressive. **Table 4.5** shows the main mode previously used by Tramlink users as identified in the Tramlink Monitoring Studies<sup>24</sup>, and Household Interviews<sup>25</sup>:

**TABLE 4.5 MODAL SHIFT FOLLOWING OPENING OF CROYDON TRAMLINK**

Mode	Users Survey	Trips transferred
Bus	69%	9,316,271
Car as driver	16%	2,160,295
Car as passenger	3%	405,055
National Rail	7%	945,129
Walk	4%	540,074
Other	1%	135,018
Total	100%	13,501,842

4.30 In order to assess the impact on car use in Croydon, traffic levels in Croydon and Kingston were compared, both being major centres in outer London. In the 5-year period before Tramlink opened, traffic flows across cordons around central Croydon and Kingston were fairly constant, varying within a range of  $\pm 3\%$  annually. However, after the opening of the Tramlink in May 2000, there was a 14% reduction in traffic in Croydon, while traffic levels in Kingston continued to remain fairly constant. This is illustrated in **Table 4.6**.

**TABLE 4.6 CHANGES IN AVERAGE DAILY FLOW FOR CENTRAL CROYDON AND KINGSTON (1994 - 2000) (% CHANGE ON PREVIOUS YEAR)**

	1995	1996	1997	1998	1999	2000
Croydon	-1%	-3%	+1%	+2%	-3%	-14%
Kingston	-2%	-1%	-2%	0	-1%	+2%

Source: adapted from Oscar Faber (2000) – *ibid* – Table 4.4

4.31 It is also clear that Tramlink was successful in generating trips. The surveys carried out indicated that more than 3.8 million trips per year, some 22% of those using Tramlink, did not make an equivalent journey before the introduction of Tramlink.

<sup>24</sup> Oscar Faber (2002) – **Croydon Tramlink Impact Study: Tramlink User Surveys – Working Paper No.6** – Final Report – Transport for London

<sup>25</sup> Oscar Faber (2002) – **Croydon Tramlink Impact Study: Household Interview Survey – Working Paper 2** – Final Report – Transport for London

### **Nottingham Express Transit**

- 4.32 NET report that by mid June 2004, the system was carrying an average of around 23,000 trips, between Monday and Saturday. Almost 5,000 daily trips (i.e. 21% of the total) have been recorded using the five park and ride sites and the promoters believe that there is a significant amount of modal transfer from car to the tram. Although the ridership experienced to date is high it is felt that the full effect of implementing feeder bus services is yet to be felt. It is also felt that there is possibly quite a high rate of induced reflected in travel. Initial indications that the public transport market in the corridor has increased by over 20%<sup>26</sup>.

### **Comparative Mode-Shift to Quality Bus Schemes**

- 4.33 While the effectiveness of light rail in attracting car users has been clearly demonstrated, the ability of bus-based schemes to affect significant mode shift in the UK remains largely unproven. A comprehensive study of existing schemes found overall potential passenger uplift from bus quality initiatives<sup>27</sup> ranged from between 4.1% and 6.4% in the medium term (i.e. 3-5 years after implementation of all measures).
- 4.34 For example, the guided bus system on Scott Hall Road in Leeds uses a series of relatively short stretches of guideway on, or immediately adjacent to, existing roads. The major operator in the corridor has recorded increases in patronage of over 75% in the corridor since the opening of the first section of the guideway in 1995, while patronage on other services has been in decline. This dramatic increase is in large part due to restructuring of the network to bring more services into the corridor. Around 6% of passengers actually reported using the bus as a result of the guided bus investment, while others were prompted to do so when changing job or home. While the operator estimates that between 10% and 20% of *new* passengers have shifted from car<sup>28</sup>, other researchers have found little direct evidence of a reduction in car use<sup>29</sup>.
- 4.35 More recent evidence from three Quality Bus Corridors (QBC) in Greater Manchester has shown that investment has delivered growth from 1998 to 2003 of:
- 16% between Leigh and Bolton;
  - 55% between Bury and Manchester;
  - 9% between Hazel Grove and Manchester.
- 4.36 Over the same period, overall demand growth across the network was estimated at 7%. As well as the QBC effects, growth in the Bury and Manchester corridor was also affected by overcrowding on the parallel Metrolink route. Across all three corridors, 53% of *new* passengers were reported as being previous car users.

<sup>26</sup> Personal communication: Chris Deas, NET Development Manager, Nottingham City Council

<sup>27</sup> LEK Consulting LLP (2002) - **Obtaining Best Value for Public Subsidy for the Bus Industry**- Commission for Integrated Transport, London, pp. 26

<sup>28</sup> Institute of Transport Studies, University of Leeds

<sup>29</sup> Daugherty G.G. and Balcombe R.J. (1999) - **Leeds Guided Busway Study** - TRL410. Transport Research Laboratory, Crowthorne

4.37 These responses are encouraging but, in comparison to light rail, suggest a much lower level of car transfer:

- Typically, around 20% of peak light rail users have been found to transfer from car. In a peak hour, a typical system operating at, say, 6tph would have resulted in c.240 cars per hour removed from the road network.
- Similarly, 20% of *new* bus users in a quality corridor might transfer from car and a 20% uplift in total demand might be achieved. At an overall level of service of, say, 30bph then c.40 cars per hour would have been removed from the road network.

4.38 As such, the ability of light rail to deliver a much higher scale of benefits is demonstrated by the available evidence.

### The Benefits of Integration - Some Successes

#### **INTEGRATION: WHAT HAS BEEN ACHIEVED**

While the NAO have identified that promoters have been unable to achieve the potential benefits of light rail, in practice, there are many success stories of integrated planning within existing planning and regulatory regimes:

- Successful Park & Ride sites on each system outside London;
- Improvements over time in the priority afforded to street running systems (such as in Croydon and Sheffield) since opening;
- ‘Designed-in’ integration of light rail stops with bus stations, rail stations and development sites on all systems;
- Integrated tickets are offered on all systems, particularly in London;

The main area of difficulty remains the integration of light rail and bus services.

4.39 The ability of light rail promoters to integrate light rail with other networks and demand management measures is, as noted by the NAO, limited. However, all existing schemes have achieved success in providing a range of features.

4.40 Most of the UK schemes have introduced **park and ride sites** since opening:

- Tyne & Wear Metro has several successful sites, particularly at Callerton Parkway, Four Lane Ends and Heworth. In total 2,200 parking spaces are provided and utilisation of the spaces is currently running at 80% daily;
- Manchester Metrolink has parking facilities at several stations on the Bury-Altrincham line and a dedicated, staffed site at Ladywell on the Eccles branch which is now well used by commuters;
- Midland Metro has sites at the Hawthorns in West Bromwich, Priestfield, Wednesbury Parkway and Black Lake, most of which attract significant usage;
- Sheffield Supertram has five purpose-built, staffed sites at Middlewood to the north of the city, Meadowhall and the Don Valley to the east, Halfway to the south and Nunnery Square which is close to the city centre on the Sheffield Parkway city centre to link M1;

- Nottingham Express Transit was the first system where park and ride sites operated from the day that the system opened. These included improved facilities at stations on the adjacent Robin Hood rail line.

4.41 For those systems that include on-street running, having **priority over other road traffic** is also an important success factor. Experience has been gained in the UK in this regard over the last 10 years. For example, Sheffield Supertram did not have priority at traffic lights and road junctions when it first opened and, as a result, journey times were extended and punctuality was poor. Supertram now has a higher degree of priority at road junctions and journey speed, reliability and punctuality, as well as the tram's image, have significantly improved. There is evidence that on Croydon Tramlink, alterations to signal timings since the system opened have now meant that both trams and other road traffic operate more smoothly<sup>30</sup>.

4.42 **Integration of light rail with national rail and bus stations** also encourages more use of public transport overall. Good examples of success in this regard include:

- Purpose-built interchanges between Tyne & Wear Metro and rail services at Newcastle Central Station, Heworth and Sunderland. Bus interchanges are provided at Regents Centre, Heworth and Sunderland.
- The adjacent Metrolink stop and bus terminal in Piccadilly Gardens; the integration of Metrolink with national rail stations at Deansgate, Piccadilly and Victoria in the city centre and purpose-built bus interchanges at Bury, Altrincham, Eccles and Shudehill in the city centre.
- Midland Metro terminates at Snow Hill station connecting to local rail services. A new bus station has been built at West Bromwich;
- Sheffield Supertram has much improved integration between Supertram and the city's main railway station;
- The DLR has numerous well planned interchanges with LUL, national rail and bus services;
- Croydon Translink integrates well with stations including East Croydon, West Croydon, Wimbledon and Mitcham Junction. Cross platform interchange is possible at the latter two.

4.43 In most of these cases the quality of interchange facility is very high and several have won awards.

4.44 **Integrated ticketing** is also important. It makes the journey more convenient, saves time and reduces the cost to passengers by avoiding the need to buy multiple tickets. Docklands Light Railway and Croydon Tramlink have obviously benefited from the integrated ticketing and pricing that Transport for London is able to provide. Most national rail passengers can also use these systems as part of the price of their ticket. Outside London, the regulatory system is different, and bus operators are not necessarily obliged to accept tram tickets, and vice-versa. West Midlands and Tyne and Wear Metros do benefit from travelcard systems offered locally. Elsewhere voluntary agreements have led to the issue of some multi-modal tickets in Manchester and Tyne & Wear.

<sup>30</sup> It should be noted that Transport for London, uniquely in the UK, has control over public transport and street management, including urban traffic control systems

- 4.45 **Coordination of complementary bus and light rail services** is limited. Outside London, de-regulation means bus and light rail services often compete on the same routes and the effect of deregulation on the previously integrated services in Tyne and Wear are described above. However, bus services remain regulated in London, so when the DLR and Croydon Tramlink opened, bus services were re-cast encouraging more people to use both light rail and buses. Greater integration is possible where local bus companies are involved in light rail operations (e.g. Nottingham City Transport, in the case of the Nottingham Express Transit). It is then possible to integrate bus and light rail timetables, information and ticketing.
- 4.46 Beyond these benefits delivered by existing schemes, there is clearly scope for more integrated planning so that each public transport mode can play its most appropriate role in the urban transport hierarchy - heavy rail and metros providing for longer trunk journeys, buses for local trips, with light rail providing high volume trunk journeys at a regional level or for intermediate length journeys. However, to work efficiently, public transport should be organised so that:
- Buses provide feeder trips to and from light rail stops, rather than compete on routes for intermediate journeys;
  - Trams have priority over other traffic at road junctions where schemes run on-street;
  - Park and ride facilities are provided at appropriate locations on the light rail networks to provide a quick and comfortable alternative to the car for trunk or intermediate journeys;
  - Good interchange facilities are provided to bus and rail services; and
  - Comprehensive integrated ticketing is provided to ensure that passengers can fully benefit from integrated services and get good value for money from fares. The experience from overseas of higher levels of usage is in part due to integration of fares across modes.

## Conclusions

- 4.47 There is a perception that UK light rail schemes are unsuccessful because some schemes carry fewer passengers than was predicted. However, the evidence here shows that all the light rail schemes operating in the UK are carrying large numbers of people and that usage is increasing in all cases. On the basis of the available evidence, it is clear that light rail:
- is popular, with all the UK schemes operating at or near capacity at peak times;
  - carries significant numbers of people outside the traditional journey to work peak period with, in some cases, peak flows at weekends exceeding those during the commuting peaks;
  - is successful at attracting passengers, with patronage steadily increasing over time on all the UK schemes – the NAO report comments on the 47% increase in patronage since 1999 (which has now increased to 52%)<sup>31</sup>;
  - has delivered this patronage growth despite regular fare increases on most systems;

<sup>31</sup> National Statistics/DfT (2004) - **Light Rail Statistics – England: Key Facts**

- has delivered substantial mode-shift from car at levels that have not been seen on bus infrastructure schemes; and
- has achieved successful modal integration within existing regulatory regimes.

4.48 These successes have been achieved in a planning and regulatory environment where design and integration of schemes, both in terms of land use planning and relationships with other public transport modes, is not conducive to maximizing either the patronage or the benefits of light rail.



## 5. IMPROVING THE IMAGE, IMPROVING THE ECONOMY

### A STRONGER IMAGE AND STRONGER ECONOMY THROUGH LIGHT RAIL

An objective for all of the UK light rail schemes has been to contribute to broader economic development and regeneration strategies.

All of the schemes are perceived in a positive light by businesses and are recognised as having improved the image of each city they operate in.

Evidence from monitoring studies of each system shows that benefits to business have included:

- Better access for customers and increased catchment areas.
- Better access to labour markets.
- Greater confidence to make investment decisions given the obvious commitment to improved public transport.
- Increased development activity bringing a “buzz” to areas identified with the tram schemes.

An increase in property values has been identified in the monitoring of all schemes.

Other broader economic benefits identified have been:

- Sites which have been undeveloped for many years have been kick-started after implementation of a tram scheme.
- Better access for some residential areas to jobs, shopping and other facilities.
- Halting out-migration from declining areas.
- Increasing the area in which job-seekers can search for jobs.
- New shopping and leisure developments adjacent to tram stops.

### Importance of Image

- 5.1 The question of how light rail improves the “image” of a city and how this in turn leads to tangible improvements in the use of public transport, the economy and environment, is contentious. Since the opening of the first modern tram system in France at Grenoble in 1987, the quest for the so-called “Grenoble Effect” has been one of the key drivers for the development of light rail systems in the UK.
- 5.2 However, some schemes in the UK received adverse public reactions, certainly in the early days. Stringent financial constraints and lack of integrated planning to fit light rail into the townscape, meant that, in some cases, its implementation had the opposite effect in the short term. The main problem was the disruption caused by the laying of tram tracks in city streets. This undoubtedly coloured initial reactions to some schemes.
- 5.3 Generally, these negative experiences were soon overcome and in most cases immediate and discernable benefits appear to have been derived from city being “able to feel good about itself”. The tangible investment in the shape of light rail can come to symbolise less visible investments in regeneration programmes. This is something that bus-based schemes seem far less able to offer. Developers and investors recognise the high visibility of light rail and seem to fear that, although a bus-based scheme may offer good improvements in accessibility, there is always the possibility that the service will be withdrawn, perhaps at short notice.

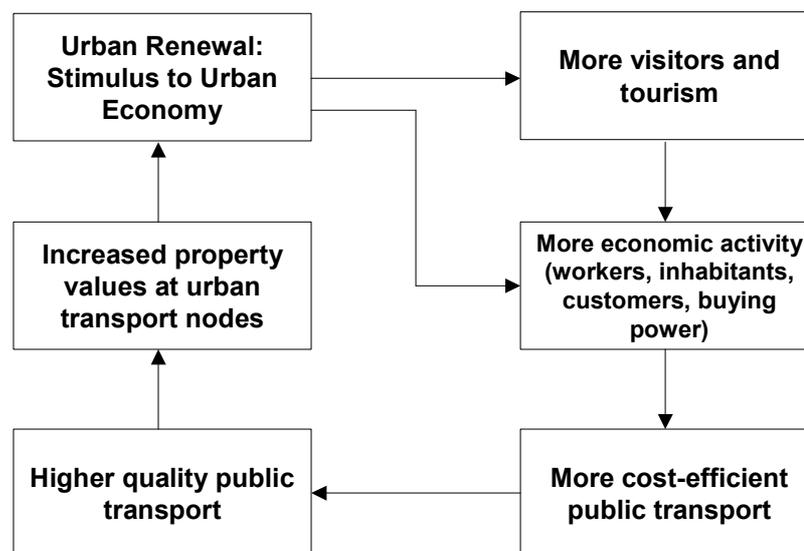
### How Light Rail Can Help Regeneration

5.4 In general terms, transport improvements can provide economic benefits either by reducing the costs of production, or through reducing journey times for various business-related activities. These benefits include:

- reorganisation or rationalisation of production, distribution and land use;
- effects on labour market catchment areas and hence on labour costs;
- increases in output resulting from lower costs of production;
- stimulation of inward investment;
- unlocking inaccessible sites for development; and
- triggering growth that in turn stimulates further growth.

5.5 A theoretical framework for how economic development and urban regeneration can lead to, and benefit from, public transport improvements is offered by Priemus and de Koning<sup>32</sup>. They assert that urban renewal enhances economic activity and brings more visitors, which provides the basis for improvements to public transport, which in turn has the potential to impact positively on property prices, which then stimulates further renewal and regeneration in a “virtuous spiral” This is illustrated in **Figure 5.1**.

**FIGURE 5.1 RELATIONSHIPS BETWEEN TRANSIT INVESTMENT AND URBAN RENEWAL (AFTER PRIEMUS AND DE KOENIG)**



5.6 In this view, the improvements to public transport are largely incremental, driven by increasing demand from economic regeneration. Many economic development strategies also place public transport investment as a key stimulus to renewal *itself*, principally by providing improved access to the regeneration areas. Light rail is a particularly attractive option because:

<sup>32</sup> Priemus H. and R. Konings (1999) - *Stadsgewestelijk Openbaar Vervoer; Sleutel Tot Stedelijke Vitaliteit – (Metropolitan Public Transport: The Key to Urban Vitality)*, Delft: Delft University Press

- It offers a high quality of service (attractive journey times, reliability, ambience etc.);
- It is permanent and visible to visitors;
- It offers high passenger carrying capacity; and
- It is proven to be attractive to car users and can thus help achieve sustainable development objectives.

5.7 Of course, such development strategies do not anticipate that, on their own, new light rail systems can induce development. Instead, they can form part of a package alongside *investment* in housing, jobs, shops and leisure facilities (mostly by the private sector) and *incentives*, such as tax reductions or reductions in planning restrictions. The roles light rail can play in the process are:

- providing a modern, efficient way for residents to reach jobs *outside* an area;
- providing access *into* an area for workers, shoppers and those on leisure trips;
- demonstrating a commitment to an area by various levels of government; and
- providing a useful theme for marketing an area.

5.8 A comprehensive review undertaken by TRL<sup>33</sup> of factors affecting public transport demand, found an identifiable value to developers from light rail investment. This comes from the commitment made by the public sector and the “high tech” image of light rail that investment in buses simply would not deliver. In some cases, the effect of regeneration packages, including light rail, may simply be to shift development from one area to another. Elsewhere, it may be making the city more attractive than other areas without such a system. In either case, if the objective is to stimulate development in a particular area and the scheme is co-ordinated with other investment, it will make a positive economic contribution overall.

### Measuring the Effects

5.9 The UK Government’s advisory committee in this field (SACTRA) has recognised that transport benefits can flow through into lower prices of goods and lower travel costs for consumers<sup>34</sup>. This implies that specific economic benefits to businesses would, in theory, be picked up by the scheme appraisal undertaken by the promoter of a scheme when seeking funding from the DfT.

5.10 Therefore, SACTRA concludes, at the scheme level the emphasis of appraisals should be on the direct transport and environmental costs and benefits of the project. Additionality resulting from property and labour market processes may occur and may be capable of demonstration in particular cases, but is considered unusual. For many projects, SACTRA believes it will be impossible, in practice, to demonstrate any wider economic impacts not already counted in the transport benefits/disbenefits. However, it is noted that additional economic benefits/disbenefits could be considered in justifying a scheme if the scheme appraisal includes an 'incorrect' or 'incomplete'

<sup>33</sup> Balcombe, R. et al (2004) – **The Demand for Public Transport: A Practical Guide** – Report 593, TRL, Crowthorne, pp. 134

<sup>34</sup> The Standing Advisory Committee on Trunk Road Assessment [SACTRA] (1999) – **Transport and the Economy** – Chapter 10 – October 1999 – The Stationary Office, London

cost benefit analysis, or in the case where there are market imperfections and the perfect competition assumptions do not hold.

- 5.11 This is not to say that there are not employment impacts - just that generally, in scheme appraisal, these are not considered *additional* benefits. The contribution of investment in light rail to achieve broader policy goals is a key interest of UK light rail scheme promoters and, therefore, their separate identification is important at the planning stage.
- 5.12 However, it is not just the scale, but also the distribution, of economic impacts and the contribution of schemes to goals such as economic regeneration and competitiveness that are also relevant. In this respect, SACTRA allows that economic impact studies might be useful in principle, both to identify any sources of additional benefits and to help assess the broader policy relevance of schemes, but the two concepts should be kept analytically separate.
- 5.13 A method for appraising additional economic benefits has been developed and is now required by DfT for all light rail schemes for which funding is sought. The approach focuses on the number of jobs created that can be directly attributable to the new transport infrastructure and does not take account of effects such as increased retail turnover or development of new homes.

#### **Evidence of Economic Impacts**

- 5.14 There is a lot of literature on the economic impact of tram schemes, although surprisingly little formal and consistent monitoring of the effects of individual schemes. There is often some variation as to what regeneration means - benefits in terms of improved housing, new job opportunities, more commercial development or uplifted property values are often discussed interchangeably. Consequently, it is often not clear precisely what benefits were envisaged for schemes, or whether these are in fact realised.
- 5.15 In practice, it is often very difficult to identify what regeneration benefits have occurred, as it is impossible to see what would have happened without intervention. It is then more difficult still to identify the result of individual strategy elements such as light rail.
- 5.16 Taking as an example, effects on land values, a review commissioned by ODPM<sup>35</sup> identified about 150 references on the topic and found an enormous variability in results. The conclusions included the following regarding the impact of public transport investment:
- Much of the analytical and empirical research comes from the USA and Canada, concentrating on the commercial property market. Evidence from Europe is more varied, but includes case studies and comprehensive reviews.
  - Overall, it seems that the expected effect on both the residential and commercial property markets is positive, but the range of impacts is very variable. In the UK

<sup>35</sup> RICS Policy Unit (2002) – **Land Value and Public Transport: Stage 1 – Summary of Findings** – Office of the Deputy Prime Minister, October 2001

the main positive impact has been in capital uplift of residential property values. However, some of the observed uplift may be due to the optimism of the markets rather than actual effects.

- The impact area for residential developments seems to be wider than those for commercial developments. Depending on the investment, residential impacts could extend to 1000m, whilst those for commercial developments are likely to be concentrated in a 400m radius. There is also some evidence that sometimes residential property prices might be depressed immediately around new stations.
- Similar transport investments will have different impacts in locations where there is a vibrant local economy and where the economic conditions are less advantageous. The key question then becomes, what other actions are needed in an area apart from the transport investment to make a measurable impact in terms of value uplift?

5.17 This having been said, while the extent of the wider economic benefits may not have been specifically quantified, there is clear empirical evidence of the positive effects that light rail has had on the cities where it has been implemented in the UK. We now turn to consider this.

### Experience from UK Schemes

#### *Tyne & Wear Metro*

5.18 A study of impacts of the Tyne and Wear Metro was undertaken not long after the system became fully open in 1984<sup>36</sup>. Access to Metro stations was held to have influenced the local housing market, particularly raising interest in inner areas such as Jesmond, and the report noted that significant housing development had occurred close to Metro stations at Byker, Chichester, Howden and Percy Main since the opening of the system. In the retail sector, the report noted that improvements in public transport access had brought competitive advantages to some individual shopping locations and that similarly there had been a boost to office employment in the central area of Newcastle, reinforcing the strength and diversity of economic activity in the city centre.

5.19 Overall, the local Chamber of Commerce believes that the improvement of public transport infrastructure in Tyne and Wear has been very important in maintaining and enhancing “connectivity” between homes and jobs in the area and has improved its competitiveness as a consequence<sup>37</sup>.

5.20 Other studies have identified Metro as having a localised effect on the housing market. The attractiveness of housing was found to have increased in a few inner urban areas and some redevelopment took place<sup>38</sup>. Impacts on property values were found to be, in general, that properties near the Metro gained and maintained a slightly higher value compared with properties further away. Overall, it was found

<sup>36</sup> Transport and Road Research Laboratory (1986) – **The Metro Report: The Impact of the Tyne and Wear Metro and Public Transport Integration in Tyne and Wear** – Crowthorne, pp. 34-36

<sup>37</sup> Hass-Klau, C. and Crompton, G. (2004) – **Economic Impact of Light Rail: The Results for 15 Urban Areas in France, Germany, UK and North America** – ETP, Brighton, pp. 266-267

<sup>38</sup> Walmsley, D.A. and Perritt, K.E. (1992) – **The Effects of Rapid Transit on Public Transport and Urban Development** – TRL, HMSO, London, pp. 31

- that residential property values increased by 1.7% two months after the opening of the system when compared with values two months previously<sup>39</sup>.
- 5.21 Another case study<sup>40</sup> notes that the centre of Newcastle has stood up well to competition from out-of-town centres, principally MetroCentre, which was developed during the 1980s.
- 5.22 Metro was originally developed to serve a balance of residential, retail and existing employment areas around the existing rail lines it replaced. However, during the 1980s and 1990s there was further decline of traditional industries while new development tended not to be located near Metro, depending more on good road access. While this will have affected usage of Metro, it is thought that for some sites affected by increasing road congestion (such as Metro Centre) there has subsequently been a loss of business relative to the city centre shopping areas<sup>41</sup>.
- 5.23 This finding is consistent with others<sup>42</sup> that indicate a longer-term beneficial effect from Metro on Newcastle city centre. Retail and commercial uses have shifted northwards, closer to the Monument and Haymarket Metro stations, aided also by pedestrianisation and regeneration projects.
- 5.24 One of the key objectives of extending Metro to Sunderland was to address the long-held perception that Wearside was the “poor relation” in the Tyne and Wear area, by providing better links between Sunderland and Newcastle and within Sunderland. The route alignment and location of Metro stations was originally planned in conjunction with development strategies of the mid-1990s in Sunderland. Since opening, revised development plans around stations have been drawn up by the Sunderland Area Regeneration Company. The extension has been open since 2002 and patronage is continuing to increase. The extension has clearly improved accessibility, but it is too early to gauge the effect on specific development sites in the corridor.
- 5.25 Metro is also playing a role in the growing importance of tourism in the North-East economy. Newcastle is marketed as the ‘cultural capital of the North’, has more than 800,000 visitors annually and generates over £150 million in tourism revenues<sup>43</sup>. Part of the strategy for the city has been to promote a number of iconic symbols that tourists and other visitors are encouraged to identify with the city. Each year, the city council surveys visitors to gauge “brand recognition” of these and other attractions. The most recent indicated that Metro and its distinctive “M” logo, is now the 5<sup>th</sup> most recognised brand associated with the Newcastle area. An “Art in Transport” scheme run by Nexus, which delivers significant public art projects throughout the area’s

<sup>39</sup> Pickett, M. and Perrett, K.E. (1984) – **The Effect of the Tyne and Wear Metro on Residential Property Values** – Supplementary Report SR852, TRL, Crowthorne

<sup>40</sup> TRANSECON Consortium (2003) – **Urban Transport and Local Socio-economic Development: Socio-Economic Impact Assessment** – Deliverable 5, European Commission DG Energy and Transport, Brussels

<sup>41</sup> Hass-Klau, C. and Crompton, G. (2004) – **Ibid** – pp. 261

<sup>42</sup> Babalik (2000) – **Urban Rail Systems: A Planning Framework to Increase Their Success** – Unpublished PhD Thesis, Centre for Transport Studies, University College London

<sup>43</sup> Clarke, L. (2000) – **Newcastle-upon-Tyne: A Market Profile** – HotelBenchmark, Deloitte, London

transport network, including at Metro stations<sup>44</sup>, also helps maintain Metro's high profile.

### **Docklands Light Railway**

- 5.26 The DLR was one of the subjects of review in the LiRa Study<sup>45</sup>, part of which examined economic transport and real estate development effects of schemes across Europe. LiRa identifies DLR as the most important element in planning the development at Canary Wharf<sup>46</sup>, as it was only when there was certainly that there would be 'quality rapid transit' serving the area that the investment decision was made.
- 5.27 In particular, the report highlights that:
- Canary Wharf office retail space has excellent integration with the DLR station, with the platforms literally within the building. Platforms on both sides of the LRT vehicles ensure good access;
  - The Beckton extension of the DLR has provided the backbone for the development of the Royal Docks; and
  - Large-scale 'travel generators' are well integrated with DLR stations. These include ExCeL (Exhibition Centre of London), the Royal Docks, the London Arena and the tourist attractions in Greenwich (e.g. the Cutty Sark).
- 5.28 The LiRa report also notes the close links between the provision of high quality public transport and the overall design and development of the Docklands area, indeed the DLR has been named 'the regeneration railway' because of its role. The high visibility of the system is also seen as having had a positive effect on its image.
- 5.29 The DLR's image has improved as the system has developed. It was initially conceived as a low cost investment to cater for a demand level seen as being "insufficient to justify a new conventional railway, let alone an underground line"<sup>47</sup>. The nature of the railway has changed considerably over time. Planning work to improve capacity and operational flexibility had begun before the scheme was opened in 1987, while the extensions to Beckton and Lewisham have followed. The reliability, capacity and accessibility to Docklands offered by the system have all improved as has its image.
- 5.30 It is difficult to understate the importance of the DLR in the development of the Docklands area. Initially, the scheme was aimed to overcome the constraints on development imposed by the docks themselves and the lack of public transport access. However, as levels of employment began to outstrip what was originally envisaged, providing sufficient capacity and accessibility for people to fill the new jobs became critical. There will be about 70,000 employees at Canary Wharf by the beginning of

<sup>44</sup> Knight, A. and Meagher, J (2004) - **Nexus: Art In Transport** – Proceedings of the Second Transport Practitioners Meeting, Aston University, 7-8 July 2004, PTRC

<sup>45</sup> **Light Rail, Economic Impact and Real Estate Development** – LiRa Pilot No. 3, Nijmegen/Amersfoort

<sup>46</sup> Buck Consultants International (2000) – **LIRA: International Network of Light Rail Cities – State of the Art** – EU North Western Metropolitan Area, Interreg II C Programme –pp. 38-39

<sup>47</sup> Pearce, A. et al (2000) – **Docklands Light Rail: Official Handbook** – Capital Transport, Middlesex, pp. 4

2005 and about 88% of them will travel to work on public transport<sup>48</sup>. Although the Jubilee Line Extension now provides a high-volume route to the Isle of Dogs (particularly for links to the national rail network at Stratford and to the West End), development of this scale would never have been achievable or sustainable without the access provided by the DLR.

- 5.31 On housing, the LiRa report<sup>49</sup> notes that the decline of neighbourhoods in Docklands has been halted by successful regeneration policies, supported by the DLR system. One early study of residents in Beckton indicated that 31% of private householders had bought their houses in anticipation of the DLR being built<sup>50</sup>. Population decline due to people leaving the Docklands area has now been replaced by net in-migration, with the building of many new houses and apartments (often of a ‘waterfront’ nature).

### ***Manchester Metrolink***

- 5.32 Manchester Metrolink initially had to overcome some problems with public image. There were difficulties associated with fitting the system into the city centre and relocating buried utility services. Also, the conversion of existing heavy rail lines to operate through the city centre required larger and perhaps more obtrusive platforms in the city centre than if a low floor system had been feasible. However, in operation, Metrolink has developed a very positive image and has become an integral part of the renaissance of Manchester.
- 5.33 Immediately after opening, monitoring showed little evidence of economic benefits directly associated with Metrolink, probably because such effects can take longer to develop and because of recession in the UK economy as a whole. However, the Metrolink Impact Study did identify the development of GMEX and developments around Victoria Station<sup>51</sup> in the early 1990s as being influenced by Metrolink. It also identified the relocation of “back office” activities to Salford Quays by Barclays Bank as an early indication of the potential effects of Metrolink, as they had cited the announcement of the then proposed extension through the area as one of the key factors in the decision. Some sites in the southern part of the central area of Manchester were redeveloped through the actions of the Central Manchester Development Corporation. Metrolink has been cited as helping in this process<sup>52</sup>.
- 5.34 Where Metrolink has had most impact on regeneration is the Eccles extension, particularly for new residential and commercial developments in the Salford Quays area which is a large area of former docks on the Manchester Ship Canal to the west of Manchester City Centre. It has been comprehensively redeveloped in the past 15 years with major office developments, housing and an increasing range of retail, entertainment, leisure and cultural facilities including the Lowry Centre and Imperial

<sup>48</sup> Berry, J. (2004) - **Funding New Transport Infrastructure: A View From Property Owners** – Proceedings of “Rail and a Growing London” Conference – 23 March 2004, Waterfront

<sup>49</sup> Buck Consultants International and Twynstra Gudde (2000) – **Ibid** – pp.40-40

<sup>50</sup> Thacker, D. and Ashmore, D. P. (1989) – **The Impact of the Docklands Light Railway** – Report of a project carried out for the BSc. Civil Engineering Course, University College London, pp. 47

<sup>51</sup> Law, C.M. et al (1994) – **Metrolink Impact Study: Final Report to GMPTE** – University of Salford Department of Geography, pp. 32

<sup>52</sup> Babalik, E. (2000) – **Ibid**

War Museum North. The Metrolink route and stops were part of an integrated development design and £11m of contributions to the cost of the scheme from developers were made. Metrolink carries large numbers of employees and visitors to the area and patronage continues to increase.

- 5.35 Beyond the immediate Quays area, the provision of Metrolink has also attracted new development along the Eccles New Road corridor. Salford City Council believes that Metrolink has made the corridor a more attractive place for residential and commercial development. The proximity of Metrolink to a new business park at Quays Reach has proved a selling point for the developers. Quays Reach consists of two business village blocks of 100,000 sq feet, over half of which was already taken by tenants by the beginning of 2004. Once complete, the site will accommodate 800 jobs.
- 5.36 Another example of an upturn in confidence in the area is a residential scheme where the city council had unsuccessfully marketed a site for three years. With the improved access provided by Metrolink the land values are now expected to be in the order of £500,000 per acre.
- 5.37 The role of the “extensive and popular tram system” has been recognised in helping Manchester present a positive image that is attracting major investment from financial institutions<sup>53</sup>. Metrolink has become so much a symbol of the city that it is now used to firmly locate the fictional district of Weatherfield in Manchester by showing the tram running across the viaduct at the end of the set in the opening titles of the popular soap “Coronation Street”.
- 5.38 It is difficult to isolate the specific contribution made by the Metrolink scheme to the overall regeneration of the city, although it has undoubtedly played a role alongside rebuilding after the 1996 bomb attack, the hosting of the Commonwealth Games, and other regeneration initiatives.
- 5.39 Looking forward, GMPTA sees the expansion of Metrolink as critical to the future development and regeneration strategy for Greater Manchester. The extent of the campaign for the extensions following the Government’s decision not to proceed illustrates the importance attached locally to Metrolink.

### ***Sheffield Supertram***

- 5.40 Sheffield Supertram also suffered from an initial poor perception as, during construction, there was considerable disruption to traffic and pedestrians that attracted adverse media attention. This was then exacerbated by lower than anticipated patronage.
- 5.41 On the other hand, Supertram has always had some positive features in terms of image. The care taken in the planning and installation of catenary wires, with 90% of the city centre supports attached to buildings, avoids the need for support poles which had caused controversy in Manchester. More than 130 separate organisations had to

<sup>53</sup> URBED (2003) – **Changing Places: Case Studies of the Urban Renaissance** - Public Realm:Central Manchester: The Repopulation of a City Centre – see [www.changingplaces.urbed.com](http://www.changingplaces.urbed.com)

- be approached for permission for fixings on their property<sup>54</sup>. Similarly the low-floor vehicles means that stop infrastructure is unobtrusive.
- 5.42 Supertram was another scheme studied in detail in the LiRa report. It notes that development opportunities offered by Supertram were not fully exploited<sup>55</sup> as it was not well integrated with development plans: either the urban fabric was already established or blocks of flats well served by Supertram were demolished; elsewhere, attempts to integrate Supertram with new developments were unsuccessful.
- 5.43 The LiRa report notes that, subsequently, the corridor from Sheffield city centre to Meadowhall has seen some economic benefits from the introduction of Supertram, especially in terms of helping attract foreign investment. The report suggests that a large-scale call centre built in the Lower Don Valley was partially triggered by the system and that it helps to attract the workforce. LiRa conclude that real estate values in areas close to Supertram are now possibly attracting a 10% premium in comparison with similar locations elsewhere.
- 5.44 A monitoring study of economic impacts<sup>56</sup> concluded that, overall, Supertram had a positive impact on Sheffield's image. In particular, external agencies seem to have improved their perception of Supertram as an agent to improve the city's image. No systematic influence on land-use and development could be identified but the study did find that 12%-15% of land use change in three city centre areas could be attributed to the implementation of the scheme. Most of these developments may have occurred in any event, but there was evidence that they had been implemented earlier because of the tram. Supertram's impact on regeneration in the Lower Don Valley was found to be undermined by key initiatives such site decontamination being undertaken more closely to road network improvements than to the tramway.
- 5.45 In terms of property values, a survey of property agents in Sheffield<sup>57</sup> indicated that the Supertram increased values for shopping and leisure uses ahead of opening.
- 5.46 However, the Monitoring Study identified a 7% reduction in residential property values prior to opening, mainly due to concerns about disruption during construction of the on-street sections of the system. After the scheme had been open for a while, this negative effect disappeared but no positive effect on commercial and industrial property values was identified. This was thought in part to be due to depression in the local market.
- 5.47 The Monitoring Study found that Supertram had a limited effect on the labour market with some jobseekers being able to look for work and succeeding in taking jobs in a wider area than otherwise. The Study also calculated that Line 1 might have lead to the creation of 295 jobs, while Line 2 could have created between 380 and 1275 jobs.

<sup>54</sup> **Design: Learning the Lessons of Metrolink** – Contract Journal, 1<sup>st</sup> June 1995

<sup>55</sup> Buck Consultants International and Twynstra Gudde (2000) – **Ibid** – pp.44

<sup>56</sup> Crocker, S et al (1999) - **Monitoring the Economic and Development Impacts of South Yorkshire Supertram 1992 – 1996** – Centre for Regional Economic and Social Research, Sheffield Hallam University for Department for Transport, ESRC and SYPTE

<sup>57</sup> Dabinett, G. (1998) – **Realising Regeneration Benefits From Urban Infrastructure Investment: Lessons from Sheffield in the 1990's** – Town Planning Review, No. 69, pp. 171-189

These figures are lower than were predicted for the system before it opened. However, they are in line with the outcomes of more recent systematic studies for other transport infrastructure using the new approach set out in DfT guidance.

- 5.48 SYPTE noted<sup>58</sup> in 2000, that there were signs that the rate of development adjacent to Supertram was accelerating, citing as evidence, a new Virgin entertainment complex, a new Sheffield College site and a new development by Dixons.

### **Midland Metro**

- 5.49 The monitoring of Midland Metro by its promoters found that users perceived it as a “clean, fast and stylish” service compared to the “antiquated, slow, dirty and uncomfortable” image of the bus<sup>59</sup>. The convenience of trams, and the faster journey times were particularly popular among users. Non-users thought of it as expensive, although they had little knowledge of service levels, journey times and fares<sup>60</sup>.
- 5.50 Surveys of economic effects were also undertaken by the promoter<sup>61</sup>. While direct economic benefits were not identified, various positive signs were. These included JobCentres having a good supply of vacancies, an increase in the number of business start-ups and commercial property markets (including retail) doing well. Metro was considered to have had a direct regenerative effect in Handsworth and Soho and estate agents in Wednesbury reported that house-hunters came from further afield than previously because of the improved access afforded by the tram.
- 5.51 Businesses in Birmingham, West Bromwich and Wolverhampton were reported as experiencing improved custom following the opening of Metro, while some in Wednesbury reported a loss of trade. Retailers located on access routes to the Metro stops reported an increase in passing trade. At least one business cited the tram as a key positive factor in their decision to choose their present location. A larger study is being undertaken by West Midlands Enterprise, looking in more detail at the regeneration benefits of the scheme.
- 5.52 A key current initiative in the area is Regenco Sandwell, the first Urban Regeneration Company in the West Midlands. Its aims include regeneration of a corridor of land shadowing Midland Metro from Hill Top in Wednesbury, through West Bromwich to Smethwick. An estimated £1.6 billion of public and private sector investment will go into the area over the next 10 to 15 years. Sandwell's Cabinet member for regeneration, Steve Eling, said on formation of the company: “*It unlocks the potential for development right along the Metro corridor from Smethwick to Wednesbury,*

<sup>58</sup> Atkins and TSU (2000) – **Ibid** – Post-script by SYPTE

<sup>59</sup> Oscar Faber (2000) – **Midland Metro Line 1 Monitoring: Working Paper 12 – Focus Groups** – Centro, pp. 25

<sup>60</sup> Oscar Faber (2000) – **Ibid** – pp. 12

<sup>61</sup> West Midlands PTA (2003) – **Best Value Service Review: Metro Line 1 Operation – Gap Report** – August 2003 – **Ibid** – pp. 37

*creating thousands of new jobs that will alter the economic landscape of the Borough for the better.”<sup>62</sup>*

5.53 Midland Metro is specifically identified as the transport spine of the Regeneration Area and is viewed by the company as vitally important to the implementation of the vision for the area. Key developments served by Metro, within Regenco’s area of interest, include:

- A new Headquarters for the Northern Division of the West Midlands Police located between West Bromwich Central and Town Hall tram stops.
- A new 65,000 ft<sup>2</sup> GP Clinic providing GP Practices, Community Nursing, PCT offices and Social Services adjacent to West Bromwich Metro stop.
- The Lyng, a £50m edge of town centre residential redevelopment, also adjacent to the West Bromwich metro stop, as part of the Housing Market Renewal Area for Sandwell & Birmingham.
- A new campus for Sandwell College, in the Centre of West Bromwich, located close to the Trinity Way tram stop.
- A site identified for leisure use adjacent to the Trinity Way stop.
- The Anne Road Industrial Area with improvement to existing industrial buildings and new build advance factories adjacent to the Booth Street tram stop in Handsworth.

5.54 All of these developments, and others, will benefit from the wider connections Metro provides. Regenco is clear that the Metro offers opportunities for Black Country firms to expand and for residents to reach a wider range of employment and service opportunities, stating that:

*“Building upon the sustainable transport system of the Metro, ...(these opportunities) will be developed in the spirit of the urban renaissance agenda with mixed uses, higher quality and higher density thus reducing the need for travel. Environmental quality, urban space and the public realm will be improved making them attractive to new forms of urban housing and residents. Thus meeting social, economic and environmental ends and thereby the full sustainability agenda”<sup>63</sup>.*

5.55 **Figure 5.1** on the following page, provided by Centro, indicates the extent and range of urban regeneration projects that are presently active in the Metro corridor.

5.56 Centro has long been a champion of public art in public transport. Many Metro stations have benefited from public art incorporated in the design. The aim is to create an enjoyable and high quality travelling environment, that is also safe and secure.

5.57 The commitment of the promoters to public art and community involvement in its design, choice and siting has proved popular, has contributed to local pride in the system and has possibly led to lower levels of vandalism than would otherwise have been anticipated.

<sup>62</sup> Advantage West Midlands (2003) - **Major Regeneration Initiative for Sandwell Approved** – Press release 8<sup>th</sup> April 2003

<sup>63</sup> Regenco Sandwell (2004) – **The Sandwell Vision** - [www.regenco.co.uk/sandwellvision.asp](http://www.regenco.co.uk/sandwellvision.asp)

**IMAGE, PUBLIC ART AND COMMUNITY ENGAGEMENT ON MIDLAND METRO**

The designers of the Metro were contractually obliged to appointment artists and designers as part of the project design team, with a £500,000 budget for public art available.

Local communities were active in developing many of the works. At Winson Green Metro Station in Handsworth, every child in local primary schools was involved in designing a large entranceway feature and new fencing for the schools. The design depicts a giant steam machine with a conveyor belt taking raw materials through an elaborate process in order to produce colours of the rainbow as the final product.

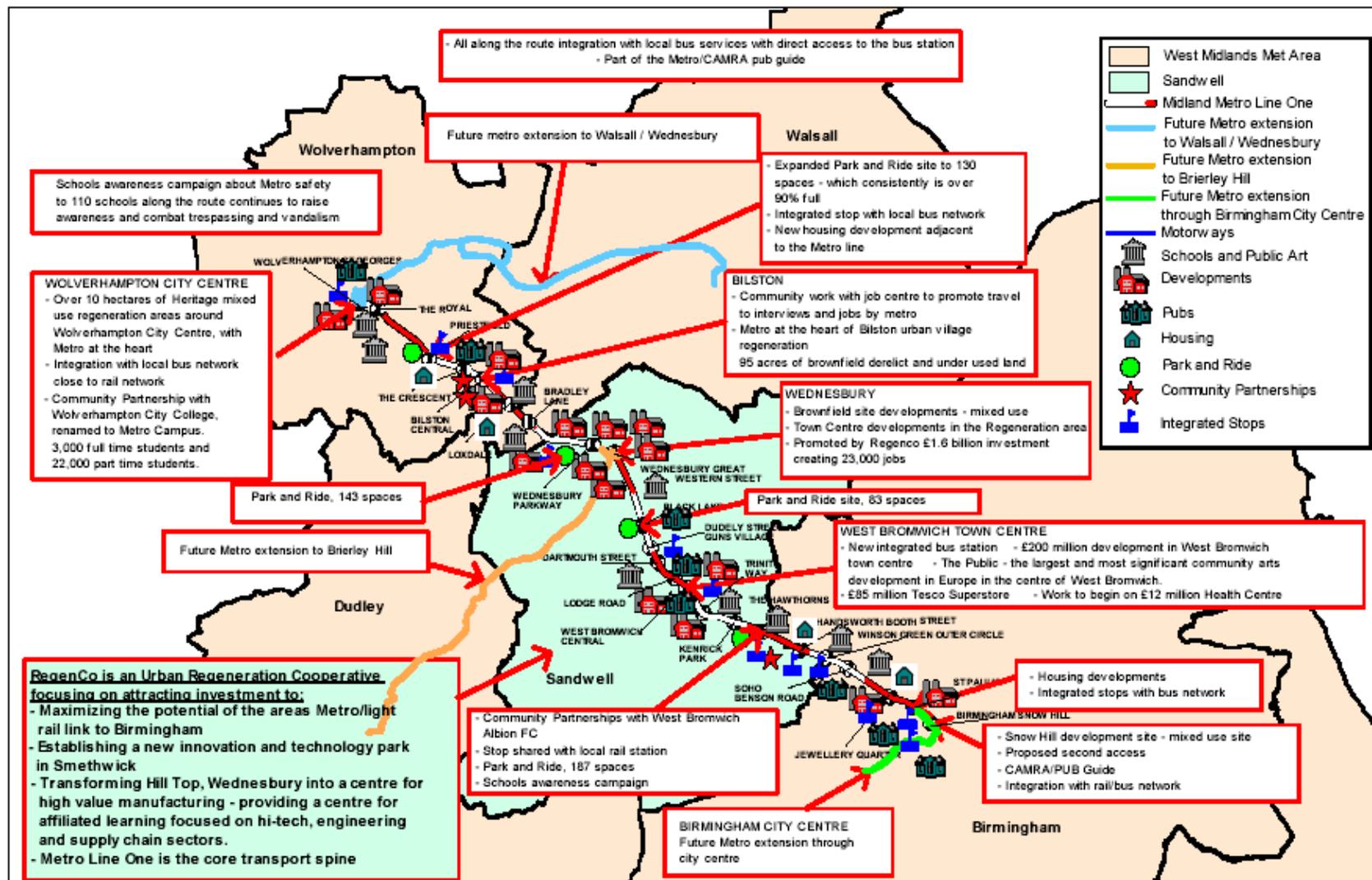
A public house adjacent to the tram stop in Dudley has been renamed as “The Metro Bar”.

West Bromwich Albion Football Club advises visiting fans to use the Hawthorns Tram Stop (less than 300 yards South of the ground) on fan websites.

Also, Metro’s operators arranged for comedian Frank Skinner to name Metro Tram No 9 in honour of Albion footballer Jeff Astle - echoing Astle’s shirt number. Astle was chosen after Sandwell Council invited suggestions from the public for an appropriate name.



FIGURE 5.2 URBAN REGENERATION AND MIDLAND METRO LINE 1



Produced by the Strategic Planning Group of Centro 7/2004. (SB\_Metro Developments)  
 This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Office © Crown Copyright



## Croydon Tramlink

### Image

- 5.58 The Croydon Tramlink Impact Study, undertaken by TfL, included before and after studies to attitudes to Tramlink which indicated that the scheme is viewed in a more positive light since the system came into operation than before it opened<sup>64</sup>. In particular, local people said that they used Tramlink more than the bus, which contrasted strongly with views expressed prior to the opening of the scheme, when most people said that would not use Tramlink more than the bus in future. Safety and security on the Tramlink system was identified as a key positive attribute of the scheme, as was the reliability of the services. People using the system indicated that they were using the tram more frequently than they had anticipated prior to its opening, indicating that the system has led to generated travel.
- 5.59 There is a perception that Croydon has moved into a period of regeneration and expansion since Tramlink opened and that the system has helped “put Croydon on the map”- due to it being viewed as “fast and high tech”. Most people interviewed thought that “the people of Croydon are genuinely proud of the tram” and that the system has “helped to create a more modern and European feel for the town”<sup>65</sup>. Croydon Council are reportedly confident that Tramlink has increased accessibility levels within the borough, and that bus users have also benefited from the priority measures implemented for the trams.

#### COMMENTS FROM LOCAL BUSINESSES IN CROYDON

*“Croydon feels more like a European town/city than it ever did and the tram has changed the feeling of the town centre.”*

*“Floating vehicles and all this sort of, you know, crazy space stuff. It’s, you know, quite cool and sleek, it’s almost a shame that they are spoiling them by putting big adverts on the outside.”*

*“Also it makes it a very cosmopolitan town... it improves the image of Croydon to be a cutting edge rather than following everything”.*

*“Tramlink has given a major boost to the feeling about what Croydon actually is...”*

*“I’m from Yorkshire, and even people I know up there when you mention Croydon, they go ‘ur, they’ve got trams now. ”*

*“I think it’s a topical thing, so people do talk about it, you know, especially Croydon people, but not only Croydon people, I mean the institutions for example, and we do a lot of business with the likes of Legal and General, Axia, and people like that, and its a big talking point actually.”*

<sup>64</sup> Oscar Faber (2002a) – **Croydon Tramlink Impact Study: Household Interview Survey** – Working Paper 2, Transport for London, pp. 36

<sup>65</sup> Oscar Faber (2002b) – **Croydon Tramlink Impact Study: Agents of Change Interviews** – Working Paper 4, Transport for London, pp. 37

- 5.60 Before the scheme opened, many respondents viewed Croydon as a town in decline. However, after the opening of Tramlink, most saw the area as experiencing regeneration and expansion. There was an expectation expressed that on completion of developments that were under construction or being planned, Croydon would enter a period of prosperity.
- 5.61 The survey indicated that, to some extent, it was felt that Tramlink helped Croydon achieve a more European feel. Other European cities are known to have light rail systems and Tramlink is seen to symbolise this European sophistication. During the summer, people now take advantage of the paved pedestrian areas and sit outside during lunch hours, with pavement cafes becoming a popular feature. Many respondents are aware of how Tramlink has become a badge for the town and feel there is a perception of Croydon as “the London Borough with the tram”. Tramlink was seen by Croydon Council and the Croydon Chamber of Commerce to be energising the central area and to make Croydon a more recognisable name on the national stage.
- 5.62 A subsequent study<sup>66</sup> found that all stakeholders interviewed cited Tramlink as being a unique, invaluable marketing tool. Even those who cannot cite specific impacts claim that they “would not be without it”. It is perceived to be high quality, modern and environmentally friendly. It is seen as a sign of confidence and of successful delivery of a complex project (the “Can Do” image) and as an asset beyond its utility”. The RICS study<sup>67</sup> identified a general perception of the Tramlink as an overwhelming success. Several respondents across a range of business sectors cited the improvements in accessibility for staff as a key benefit bought about by Tramlink.

#### *Property Values*

- 5.63 The Croydon system has had a positive effect on property values. One (albeit small) survey of estate agents who operate within reach of Tramlink stops suggested that the system has had a significant impact on the housing market<sup>68</sup>.

#### **ESTATE AGENTS VIEWS ON CROYDON TRAMLINK**

*"Easy access from Wimbledon to East Croydon has created much greater interest in the area. Transport links have always been a bit of a problem here but the new tram has seen prices increase by about 10% above the national trend".* Singletons, Mitcham

*"It has made a difference. Demand for the area has gone up and prices have risen by up to 10% . . . people will be able to get to East Croydon Station in about 5-6 minutes. This will add considerably to the attraction of this part of Croydon".* Benson and Partners, Addiscombe

Source: [www.findaproperty.com](http://www.findaproperty.com)

<sup>66</sup> Colin Buchanan and Partners (2003) – **Ibid**

<sup>67</sup> RICS Policy Unit (2004) - **Ibid**

<sup>68</sup> **Slow Tram Coming** – Feature at [www.findaproperty.com/cgi-bin/story.pl?storyid=0224](http://www.findaproperty.com/cgi-bin/story.pl?storyid=0224) , 10 May 2000

- 5.64 As well as the general findings of the RICS study on economic impacts reported above, a further study by RICS on behalf of ODPM<sup>69</sup> used Tramlink as a pilot for a new methodology to test how new transport infrastructure affects property values. To do so, it undertook a comprehensive review of the impacts of Tramlink.
- 5.65 The RICS Study also considered the views of local estate agents, who thought that, in general, the impact of Tramlink was positive, primarily following the opening of the system in May 2000. In terms of uplift of property values, the response was less enthusiastic, with only one agent estimating an annual increase of 5%. It was found that while accessibility is a key factors affecting property market values, proximity to schools; heavy rail stations; access to central London; and employment are also major influences. Nonetheless, the overall perception reported was that Tramlink is “a huge success due to the convenience it offers the passengers, the improvement of accessibility to previously difficult areas and the efficiency of the service.”
- 5.66 The agents interviewed suggested that properties located close to public transport nodes did attract a premium, with rail the highest, followed by the tram, while few felt that bus routes added considerable value. These premiums were noticeable up to 20 minutes journey time from stations by foot.
- 5.67 Buchanan's report on behalf of the South London Partnership<sup>70</sup> found that, in Croydon, property prices have risen by 4% more in wards served by the tram than those that are not, while in the other Boroughs served there has been no discernible difference. This study also found that agents used Tramlink as part of their marketing. The price of property in Croydon on the Tramlink line was found to have risen faster than that off-line both during construction and after opening. The increase after was larger than that before, suggesting some anticipation of the opening of the line.

#### *Impacts on Business*

- 5.68 The RICS Study found that the impacts on businesses of Tramlink are mixed:
- The demand for office space within central Croydon which had been in decline for many years since the major developments of in the 1960s and '70s does not appear to have been influenced immediately by the introduction of Tramlink. Some commentators have suggested that Tramlink may have arrested the decline of the office market, but such comments appear to be anecdotal rather than based on clear evidence;
  - There is, however, a general consensus that Tramlink has caused retail turnover to increase in central Croydon by increasing the catchment area; and
  - Tramlink has provided a boost to industrial businesses by enabling employees to reach industrial areas estates more easily. This may be causing greater stability for businesses and possibly arresting some decline.

<sup>69</sup> RICS Policy Unit (2004) – **Ibid**

<sup>70</sup> Colin Buchanan and Partners (2003) – **Economic and Regeneration Impact of Croydon Tramlink: Final Report** – South London Partnership

- 5.69 Other stakeholders interviewed in the RICS Study perceived a greater interest in the town centre, with an increased number of developments under construction or in advanced planning stages. Although these were not attributed to Tramlink directly, it was felt that the general supply of public transport was key. Others felt that while new construction was a result of other economic conditions, the tram had helped prevent a drift of occupiers from the town centre to other localities. A key developer of industrial space along the route noted that Tramlink had helped to increase rents and enhance the stability of tenure compared to estates further away and inward investment officers supported this opinion. Another effect identified is for developers to push for residential developments on land designated for other uses.
- 5.70 The Buchanan Study also found that Tramlink had reduced unemployment by between 5-9% compared to other areas. Within this overall improvement some deprived areas are clear winners while others are not. Disparities between wards can be due to many factors including the effects of other policies and initiatives, demographics, inward and outward migration and the growth and decline of local employers.
- 5.71 The report also notes that overall Saturday patronage is three quarters of that of an average weekday but that for shopping and leisure destinations it is far higher. Examples include Ampere Way (out of town shopping: 172% of average weekday use), Waddon Marsh (out of town shopping: 134%), Mitcham (town centre: 123%), George Street (central Croydon: 110%) and Wimbledon (town centre: 110%). Tramlink helps to support existing town centre shops and out of town retail and leisure facilities along Purley Way, an area previously virtually inaccessible by public transport.
- 5.72 The Buchanan Study also reported that the majority of businesses in the Croydon area regard Tramlink as having a positive impact on their business. Major developments are now taking Tramlink into account and high profile office-based employers have recently moved in, quoting high accessibility as a key factor in their choice. The tram appears to have been a significant factor in the development of a new leisure complex (multiplex cinema, health club and bars) as it allowed the development to proceed without any new on-site car parking. Tramlink was also seen as helping to maintain the main Croydon shopping centre's footfall and income during a difficult period when it was part-closed for demolition/rebuilding.

### **Nottingham Express Transit**

- 5.73 NET has not been in operation for long, so evidence is limited to initial perceptions. However, initial reports suggest that it is very popular with local people. The City Council uses NET as part of an overall image that the city is trying to project of Nottingham as a "continental city".
- 5.74 Even before NET opened, there were discernable regeneration impacts in the city. During 2003 six months before the scheme was due to open, local agents were reporting an upturn in the market specifically in those areas through which the tram now runs. This not only applied to the city centre, which witnessed a lot of activity and very buoyant prices for sites at Commerce Square, Plumtree Street and Fletchergate, but also in Hucknall, where "*first time buyers who might have opted for*

*the leafy suburbs are wondering why they should pay £140,000 to live somewhere without the tram when they could pay £100,000 and live on a tram stop”<sup>71</sup>.*

- 5.75 There is currently intensive development in the immediate vicinity of the tram route in Nottingham city centre, particularly in the Lacemarket area. Many are mixed use developments, combining living spaces with commercial and light industrial uses, much favoured by media and culture enterprises. There are also indications that NET is benefiting some business parks on the periphery of Nottingham by providing a link to the main rail station in the city centre. Developers are using the presence of NET as a key selling point in marketing their new developments and they believe they are attracting higher value tenant than they would have without NET.

**NOTTINGHAM: TOTAL INSPIRATION**

By Stephen McLarence

*“(Nottingham) has, almost effortlessly, become a city of café-bars, comedy clubs, loft apartments, sushi bars, conspicuous leisure and, crucially, shopping. An estimated two million people shop regularly in Nottingham city centre. It has been voted Britain’s third-best shopping city, after London and Glasgow. It has Versace, Armani, Ghost, Ralph Lauren, Prada, Karen Millen, Kookai, Jigsaw, Ted Baker and, of course, Paul Smith. I pass on these glitzy names on trust, checking spellings as I go. I am no shopper. But, as I settle into the Lace Market Hotel, I can see how this retail renaissance has helped dynamise Nottingham’s image...*

*“As the lace industry declined, however, the Lace Market teetered on the edge of dereliction and became a no-go area at night. Now - well, gaze out of the hotel’s windows. An elegant street stretches out, continental in feel, charming, and dominated by the Galleries of Justice, an award-winning evocation of the world of crime and punishment in the old County Gaol. ...*

*“The history is still there, but it’s being put in a lively contemporary context. There’s a perceptible buzz to the place...*

*More newness a few streets on, in front of Nottingham Playhouse Anish Kapoor’s Sky Mirror, a vast tilted disc, is one of the UK’s biggest pieces of public art. One side reflects the sky; the other, unexpectedly, reflects the streetscape and flatteringly puts you at the centre of it. All around, Nottingham is at lunch and looks remarkably at ease with itself.”*

Source: [www.visitnottingham.com/mcclarence\\_article.asp](http://www.visitnottingham.com/mcclarence_article.asp)

- 5.76 There are also many examples of investment by businesses on sites close to NET<sup>72</sup>, such as:

- a new supermarket next to the park and ride site at Hucknall, where planning applications have also been submitted for extensive new housing development;
- a hotel development opposite Nottingham Trent University’s city campus tram stop;
- new mixed used developments overlooking the tram route, including flats, offices, shops and restaurants.
- in the city centre two new city centre pubs close to the system.

<sup>71</sup> **Fast Track to a Boom** – Sunday Telegraph, 29 June 2003

<sup>72</sup> Nottingham Express Transit (2004) – **Tramlines: Property Special**

5.77 Looking to the future, the City Council has entered into a partnership to develop the Broadmarsh shopping and leisure centre to the south of the city, which would be served by a stop on the planned extension to NET. This would be an integral part of the development.

#### **Experience from Overseas**

5.78 Overseas, investment in light rail has often been targeted specifically at revitalising existing centres. Evidence from studies of the economic effects of schemes outside the UK is presented in **Appendix C**. Perhaps the best researched evidence comes from schemes in France - such as those in Grenoble, Nantes and Strasbourg - where investment in light rail was part of a broader strategy to revitalise city centres and accompanied measures to increase pedestrianisation and remove road traffic from central areas.

5.79 As a consequence, positive effects have been observed in each case:

- Grenoble - increase in office locations within corridors, property price increases;
- Strasbourg - retail and housing development in centre, property price increases; and
- Nantes - concentration of new office and residential development in tramway corridors.

5.80 Improvements to the image, rate of development or property prices in central commercial areas are the commonest effects identified following investment in light rail, including that in Portland (USA), Edmonton, Calgary (Canada) and Freiburg (Germany).

#### **Conclusions on Improvements to Image and the Economy of Cities**

5.81 An objective for all light rail schemes in the UK has been to play a role in economic development and regeneration by improving accessibility, raising the image of an area and demonstrating a permanent commitment to renewal. There is a noticeable difference in the role played by the earliest schemes (Tyne & Wear Metro and the DLR) which were wholly segregated and those implemented in the 1990s, (starting with Manchester Metrolink) which included on-street operation, particularly in city centres. Experience was gained from the Nantes and Grenoble schemes, which run wholly on-street and include large amounts of pedestrianisation and streetscape improvements.

5.82 All subsequent schemes in the UK have included some on-street running and, within the limitations imposed by affordability and administrative arrangements, promoters have tried to ensure that light rail is sensitively incorporated into the urban fabric or new development including improvements to the streetscape.

5.83 There is clear evidence that all of the UK schemes have built up a strong positive image since opening. In some cases, disruption caused during construction (particularly in Sheffield) lead to a negative perception prior to opening. Subsequently, all of the schemes have had a positive effect on the image of the city.

There is also evidence that the improved image has, in turn, contributed to attracting inward investment as well as business and tourist visitors.

- 5.84 While the improvement to a city's image is clear, identifying what economic benefits have been delivered by light rail is very difficult. This is because light rail investment is usually one of a package of measures aimed at tackling economic decline and because it is impossible to know what would have happened without the intervention.
- 5.85 Regeneration is not directly attributable to light rail schemes alone, but they do play a role in shaping how it has developed and in helping to channel it in particular directions. The strongest evidence is from city centres - either retention of business in the face of competition or reinvigoration of business activity. The available evidence does show that implementation of the UK tram schemes has, without exception, been accompanied by increases in property values, both commercial and residential.
- 5.86 In every case there is evidence that businesses found benefits from being near to a scheme such as:
- Better access for their customers, and increased catchment areas;
  - Better access to labour markets to support the growth and expansion of businesses;
  - Investment decisions could be made more quickly and with more confidence given the commitment to improved public transport; and
  - Increased development activity was felt to bring a "buzz" to an area and, while not necessarily attributed to the tram schemes directly, was certainly identified with them.
- 5.87 What generally has not been measured is how these benefits translate into new jobs or increased turnover. However, in qualitative terms, other economic effects have been identified in relation to light rail schemes in the UK, which include:
- Kick-starting development of sites that had remained undeveloped for many years;
  - Improving the attractiveness of residential areas through better access to jobs, shopping and other facilities;
  - Halting the out-migration of residents from areas previously in decline;
  - Increasing the area in which job-seekers have been able to search for jobs; and
  - Channelling commercial and leisure developments to sites adjacent to tram stops.

## 6. PROMOTING SOCIAL INCLUSION

### PROMOTING SOCIAL INCLUSION THROUGH LIGHT RAIL

The role of light rail in promoting social inclusion has not been well researched. However, the various monitoring studies have found evidence of the following:

- Much improved access to public transport for people with disabilities and others whose mobility is impaired.
- Improved access to jobs, especially where deprived areas are linked to areas where the number of jobs is growing.
- Providing access for local people to community facilities and shopping opportunities.
- Good levels of personal safety at stations and on trams are perceived.

6.1 Promoting social inclusion has become a key UK Government policy in recent years and it is now a specific focus for transport policy. All of the UK light rail schemes were developed with broad social aims in mind (e.g. improving access for the mobility impaired, serving areas of low car ownership etc.) before social inclusion became an explicit part of the policy agenda.

6.2 In UK cities, there are particular problems with public transport that contribute to social exclusion. These include:

- Access to stops and vehicles for the mobility impaired. There are physical barriers such as stairs, unequal platform and vehicle heights, and ticket barriers. Operating practices such as short dwell-times can also make public transport difficult to use. These issues affect all people with physical disabilities and many others including elderly people, parents with small children and people with large amounts of shopping.
- The availability, affordability and reliability of public transport services to job-seekers can limit employment opportunities.
- Similarly, access to health, education and other public services can be limited by the quality of the public transport network.

6.3 One of the most important aspects of light rail in terms of social inclusion is its accessibility. All schemes in the UK are now designed to be DDA compliant. Modern vehicles are designed for level entry and wheelchair access, while a uniformly high quality of ride is also helpful. Tram stops are fully accessible and ticket vending machines are easy to use. Generally a high standard of security is also provided on and off the vehicle. These improvements mean that light rail offers a meaningful alternative for many people who hitherto would have travelled for work, education, shopping or leisure using private vehicles.

- 6.4 Light rail can also provide quick, reliable, convenient and permanent links between areas of deprivation and areas where job opportunities exist. The benefits can be maximised if promoters and operators work with other agencies to promote the use of public transport in general, and light rail in particular, by jobseekers and other excluded groups.

### **Experience from UK Schemes**

#### ***Tyne & Wear Metro***

- 6.5 The Metro was constructed to be fully accessible to all users. All stations are equipped with ramps or lifts where appropriate.
- 6.6 Little research has been undertaken on the effects of the Metro on social exclusion. Metro does provide access throughout Tyne & Wear to employment in existing centres and development areas for a large proportion of the population including many deprived areas. Nexus also works with local Jobcentres to promote the use of public transport.

#### ***Docklands Light Railway***

- 6.7 The DLR has been designed to be fully accessible to the mobility impaired.
- 6.8 In terms of social inclusion, the LiRa report found that the improved mobility provided by DLR between “booming areas” like Canary Wharf and deprived areas<sup>73</sup> had contributed to the improvement of deprived areas.
- 6.9 However, the report also notes that regeneration has brought house price increases that may have exacerbated social exclusion. This view is re-enforced by a report for DETR, which stated that while the arrival of the DLR may have improved mobility for local inhabitants, new office employment and more expensive housing are often not available to locals. For some, the arrival of rail transport (“not for us” is the opinion of many) may be an additional symbol of an unequal society<sup>74</sup>
- 6.10 DLR also provides access to a range of local facilities for local people. Shopping at Canary Wharf (which was originally aimed at office workers) has grown steadily and is now a regional centre with weekend footfall now comparable with that of the Bluewater out-of-town centre in Kent.
- 6.11 Recently, DLR and Tower Hamlets Council<sup>75</sup> have undertaken research to establish what “barriers to use” of the system are perceived by excluded groups. Key findings of this work are that:
- The frequency of services was important;
  - Personal safety at DLR stations and on trains is perceived as being good, but pedestrian links to stations are perceived as poor. People from many groups

<sup>73</sup> Buck Consultants International and Twynstra Gudde (2000) – **Ibid** – pp. 40

<sup>74</sup> TRaC at the University of North London (2000) - **Social Exclusion and The Provision and Availability of Public Transport** – DETR, London, July 2000, pp. 85

<sup>75</sup> DLR/LB Tower Hamlets (2004) – **Good Going**

(particularly the elderly and those from ethnic minority groups) use the system less as a result.

- People from ethnic minority groups prefer clear messages in English only, rather than announcements in their own languages that they feel draws attention to them. They also felt route plans need to be clearer and easier to understand.
- There is a general feeling among people in excluded groups that the DLR provides access to better jobs/homes.
- Some of the DLR stations are felt to be cold and windy and this deterred people from using the system more frequently.
- The minimum fares on DLR are perceived as too high when compared with buses and are a deterrent for local trips.

DLR are considering the findings of the research to examine ways in which these issues can be addressed in the future operation of the system.

### ***Manchester Metrolink***

- 6.12 Metrolink is accessible to all users with level boarding at all stops. In the city centre this is provided by raised platforms that are accessed by ramps.
- 6.13 The first phase of Manchester Metrolink was not driven by social inclusion objectives, although it does serve some areas of deprivation in inner Manchester. The extension to Eccles, on the other hand, does serve relatively deprived areas and links them with the new job opportunities at Salford Quays. Patronage on this section was originally disappointing, in part due to stiff competition from cheaper bus services. In consequence, fares on the Eccles route were held steady when increases were made on other parts of the network, and patronage has risen as a result.

### ***Sheffield Supertram***

- 6.14 Supertram was the first low-floor vehicle system in the UK, avoiding the need for raised platforms.
- 6.15 The LiRa report found that the effects of Supertram on social inclusion have been limited<sup>76</sup>. Serving deprived areas was an objective that played a part in the original choices of route. The fierce competition from buses after the system opened reduced the impact of Supertram and undermined the positive social inclusion effects envisaged for Supertram.

### ***Midland Metro***

- 6.16 Midland Metro is also a low-floor system fully accessible to all users.
- 6.17 Midland Metro was developed to assist in achieving better social inclusion, particularly in areas with high unemployment and large ethnic minority communities. Since opening, Centro have been active in promoting its use for this aim. For example, work has been carried out jointly by Centro and the Bilston Jobcentre to promote the use of the Metro, particularly among jobseekers formerly employed in the

<sup>76</sup> Buck Consultants International and Twynstra Gudde (2000) – *Ibid* – pp. 46

steel industry. A guide on how to use the Metro has been produced, and free tickets are provided for jobseekers. Similarly, in Wolverhampton, Jobcentres provide free travel for jobseekers to interviews and to work for an initial period.

- 6.18 The new developments close to Metro stops (identified in Section 5) will be linked to deprived areas on the route of Metro. Metro also links areas of high unemployment with developing employment sites in Handsworth and Smethwick, as well as providing links to employment opportunities in Birmingham and Wolverhampton city centres.

### **Croydon Tramlink**

- 6.19 There is evidence that Tramlink has significantly improved accessibility and mobility for people with disabilities. Interviews undertaken on behalf of Transport for London among people with disabilities indicate that because the system is fully accessible for people in wheelchairs and is highly reliable, it is becoming more popular than other services such as “dial a ride”. The key benefit of Tramlink is that it can be counted upon for return journeys to a much greater extent than other services. Reported discussions with various community groups<sup>77</sup> highlighted Tramlink’s impact on the ability of various socially excluded people to access retail, leisure, employment and community facilities. The groups benefiting included the elderly, physically and mentally disabled, and parents and carers with young children. Tramlink is fully compliant with the Disabilities Discrimination Act.
- 6.20 One of the key objectives of the Tramlink project was to improve accessibility between New Addington, a large housing area poorly served by public transport, and Croydon Town Centre. New Addington was seen as relatively deprived in terms of job opportunities and unemployment was higher there than in other surrounding areas with better transport links. Before and after journey time surveys undertaken for the impact study indicated that journey times by public transport between New Addington and Croydon improved by some 22 minutes, almost halving the journey time overall<sup>78</sup>. Employers in Croydon also indicated that they now actively considered job applicants from New Addington and other areas east of Croydon, where previously they may not have done<sup>79</sup>.
- 6.21 The recent RICS study on Croydon Tramlink<sup>80</sup> quoted evidence provided by the Job Centre Plus in New Addington, which, since the opening of the Tramlink, had become the best performing centre of the twelve in the sub-region and provided jobs in both Beckenham and Wimbledon. Although, it is not possible to prove this is solely down to the tram, Tramlink does allow job centre staff to tell clients that they can access jobs within a set time and cost.
- 6.22 The report also concluded that while it is not clear that Tramlink has caused any significant reduction in unemployment, it is apparent that the system has opened up

<sup>77</sup> Colin Buchanan and Partners (2003) – **Ibid**

<sup>78</sup> Oscar Faber (2000) – **Croydon Tramlink Impact Study: Summary Report** – Transport for London, Table 4.6

<sup>79</sup> Oscar Faber (2000b) – **Ibid** – pp. 34

<sup>80</sup> RICS Policy Unit (2004) – **Ibid** – pp. 29

opportunities for residents of areas such as New Addington to access jobs in Croydon and Central London.

### ***Nottingham Express Transit***

6.23 The scheme has only been open a short time so it is too early for any clear trends to have arisen. However, there are a number of features of the scheme that potentially will help tackle social exclusion, for example:

- Improved access to jobs opportunities in Nottingham for people in Hucknall, an area that has suffered from the decline of traditional primary industries; and
- The tram serves pockets of deprivation in the city and will improve access to job opportunities and other facilities for people in these areas.

### **Conclusions on Social Inclusion**

6.24 Social inclusion is a relatively new explicit concern for the promoters and operators of light rail schemes. Consequently, little has been written and published on the subject generally and experience relating to light rail schemes in particular is limited.

6.25 The key roles that light rail can play in tackling social exclusion include:

- Improving independent access and mobility for disabled people and other whose mobility is impaired. The accessibility and reliability of light rail provides the certainty and confidence required to make journeys by public transport. This is reflected by good take-up of use of light-rail by these groups;
- Quick and accessible links to jobs. This is particularly effective where deprived areas are linked to areas where jobs are available so that jobseekers are able to take advantage of these additional opportunities. Several light rail schemes provide direct cross-city centre links that would be difficult to make by separate public journeys;
- Providing access for local people to community facilities and shopping opportunities; and
- Personal safety at stations and on trams is perceived as being good, and the high quality of design, use of CCTV and levels of staffing are important factors. Greater use of trams has been encouraged by groups for whom this is key issue (particularly women, the elderly and those from ethnic minority groups) compared with conventional rail or bus services, although where pedestrian links to and from stops are perceived as poor this is undermined.

## 7. A BETTER AND SAFER ENVIRONMENT

### ENVIRONMENTAL AND SAFETY BENEFITS OF UK LIGHT RAIL SCHEMES

The evidence on the contribution of light rail schemes in the UK to environmental and safety objectives shows that the mode itself does not have any significant adverse effects: it does not generally increase noise or pollution levels or cause any safety problems to the public.

Because light rail is proven to attract significant numbers of car users (approximately 22 million trips per year) from the roads it does help reduce the adverse environmental effects of car use and lead to fewer accidents.

#### Introduction

7.1 The key environmental issues associated with the development of light rail schemes have been identified as follows<sup>81</sup>:

- **Noise and vibration:** Trams are quieter in operation than heavy rail, buses and trucks, although re-radiated noise and vibration can be a significant, but localised, problem. Where there is a transfer of car users to light rail, reductions in road traffic flows can help reduce ambient noise levels.
- **Greenhouse gas emissions and local air pollution:** Trams do not emit air pollutants (save for a negligible amount of dust from brakes, etc.). Again, where there is transfer of car users to light rail there is the potential for local air quality improvements. However, account has to be taken of how the electricity used by the system is generated.
- **Visual impact:** Street-running trams introduce new visual elements in terms of fixed infrastructure (track, stops, signals, overhead catenary etc.). This leads to qualitative changes in townscape and landscape.

7.2 Assessment of environmental impacts of light rail schemes is required for funding applications to Government and, under the Transport and Works Act 1992, a full environmental impact assessment (EIA) is required to be submitted with the Order application, so the likely effects of individual schemes have been predicted in quite some detail.

<sup>81</sup> Ferrary C. (1996) - **The Implications of Environmental Assessment Procedures for the Engineering of Railway Projects** - Proceedings of the Institute of Civil Engineers, 111, February, pp. 33-39

## Noise

- 7.3 Trams have relatively quiet electric motors and the main source of noise is from the steel wheels running on steel rails. Measurements taken of Sheffield Supertram by the Institute of Hearing Research suggested that trams were noisier than buses<sup>82</sup>, while other studies have indicated that taking account of distance from the vehicles, both had average noise levels of around 80.0dB(A)<sup>83, 84</sup>. Environmental consultants ERM have reportedly made measurements of the latest generation of modern trams at Croydon and found noise levels at least 5dB(A) lower than those reported by the IHR study.
- 7.4 However, the assessment of noise from a specific light rail scheme and people's reaction to changes, are very complex issues. There are a number of factors to take into account, such as:
- Where tram schemes are segregated, a wholly new source of noise may have been introduced which is likely to be at levels considered significant. Where trams run amongst other traffic a net change in noise will be observed the scale of which depends on changes in other vehicle flows;
  - If the scheme is replacing a heavy rail service, higher or lower noise levels could occur depending on the specific engineering and operational characteristics of a scheme; and
  - With street running, reactions to a change in traffic flows and/or the introduction of trams into the street scene can be very complex.
- 7.5 By and large, the noise generated by a typical tram scheme, operated at a frequency of, say, 5-6 trams per hour, would compare favourably with the noise from traffic on a moderately busy road. Where trams run on-street, the tram is unlikely to lead to a noticeable increase in overall noise levels. Where there is a significant reduction of road traffic, either on the tram route or on parallel routes due to traffic management measures, there may be a noticeable reduction in noise levels.
- 7.6 However, people are not particularly sensitive to changes in noise levels from road traffic or railways. Traffic flows need to be reduced by 50% to achieve a 3 dB(A) decrease in traffic noise levels, which is generally accepted as a noticeably significant change. This is greater than reductions in traffic due to light rail recorded in the UK. Complementary traffic management and pedestrianisation measures are essential to secure significant noise reduction benefits from the introduction of light rail.
- 7.7 Some schemes have had specific noise problems. For example, re-radiated noise from the old railway viaducts used to carry the DLR in London caused problems for people living close to the alignment in the early days of its operation. Lengthy technical

<sup>82</sup> Foster, J. R. and Coles R.A.R. (2001) - **Acoustic Evaluation Of Tram Noise** – MRC Institute of Hearing Research, University of Nottingham

<sup>83</sup> dB(A) is a measure of sound pressure level ("A" weighted) in decibels as specified in British Standard number BS EN 60651: 1994. The decibel scale runs from 0 dB (threshold of hearing) to 120 dB (threshold of pain). The "A weighting" is a correction that best relates to human responses to noise. 68 dB(A), measured at the building façade, is specified as the level at which double glazing needs to be provided for residential properties close to new tram schemes

<sup>84</sup> See: [www.nottinghamexpressstransit.com/network/General\\_faqsanswers.asp](http://www.nottinghamexpressstransit.com/network/General_faqsanswers.asp)

studies identified extensive mitigation measures that were retro-fitted to the scheme to overcome these issues.

### **Greenhouse Gas Emissions**

- 7.8 While overall CO<sub>2</sub> emissions in the UK dropped 10% between 1990 and 2002, those from the transport sector increased by 50%. The largest increase of 85% was from air transport but road transport emissions also increased by 59%.
- 7.9 Road transport now accounts for 22% of total UK emissions of carbon dioxide (CO<sub>2</sub>), which is a major contributor to climate change. Voluntary EU agreements with motor manufacturers will reduce average CO<sub>2</sub> emissions from individual new cars over the next few years, but as traffic levels are predicted to continue to increase, road transport will continue to be a significant contributor to greenhouse gas emissions. As such, encouraging people to travel by more environmentally-friendly modes remains one of the key measures identified by Government to reduce emissions.
- 7.10 Because trams do not produce greenhouse gas emissions, light rail schemes are often promoted in terms of their contribution to this policy. However, if the power used has been generated from fossil fuels, greenhouse gas emissions will have been created elsewhere. If non-fossil fuel sources of energy are used (e.g. nuclear power or renewables) then no emissions are caused. Therefore, the relative effectiveness of light rail in reducing greenhouse emissions, compared with road traffic, is highly dependant on the generating mix. In the UK presently, about 73% of electricity is generated by burning coal, oil or gas, 26% is from nuclear sources, while renewable sources account for less than 1% presently<sup>85</sup>.
- 7.11 Any calculations of the net change in emissions requires information on other factors such as usage of each mode. As a consequence, different results can be derived. Estimates made for GMPTE, for example, indicate that cars emit 30% more CO<sub>2</sub> per passenger km than trams, while buses emit almost about 17% more<sup>86</sup>, while another research project<sup>87</sup> claims to show that trams release more greenhouse gas emissions than private cars and buses, contrary to popular belief (however, the conclusions of this study must be treated with some scepticism, as the assumptions upon which the estimates of emissions are made are highly questionable).
- 7.12 Overall, there is little certainty of the value of this benefit. The methods available to predict greenhouse gas emissions are either over-simplistic<sup>88</sup>, or require prohibitive amounts of input data<sup>89</sup>. Furthermore, there are no available quantified criteria to determine whether a given reduction in emissions is significant or not, e.g. in terms of

<sup>85</sup> Department of Trade and Industry (2004) - **Energy Trends: March 2004** – Table 5.1

<sup>86</sup> ETSU (1995) – **Energy Use and Emissions from Public Transport Modes in Greater Manchester – GMPTE**

<sup>87</sup> Boyapati, E., Hartono, A., and Rowbottom, J. (2003) - **Comparison Of Emissions from Public Transport System and Private Cars** - Proceedings of the 8th International Conference on Energy and Environment, Cairo

<sup>88</sup> Department for Transport (2000) – **Guidance on the Methodology for Multi-Modal Studies** – Volume 2, Paragraphs 4.5.1 – 4.5.7

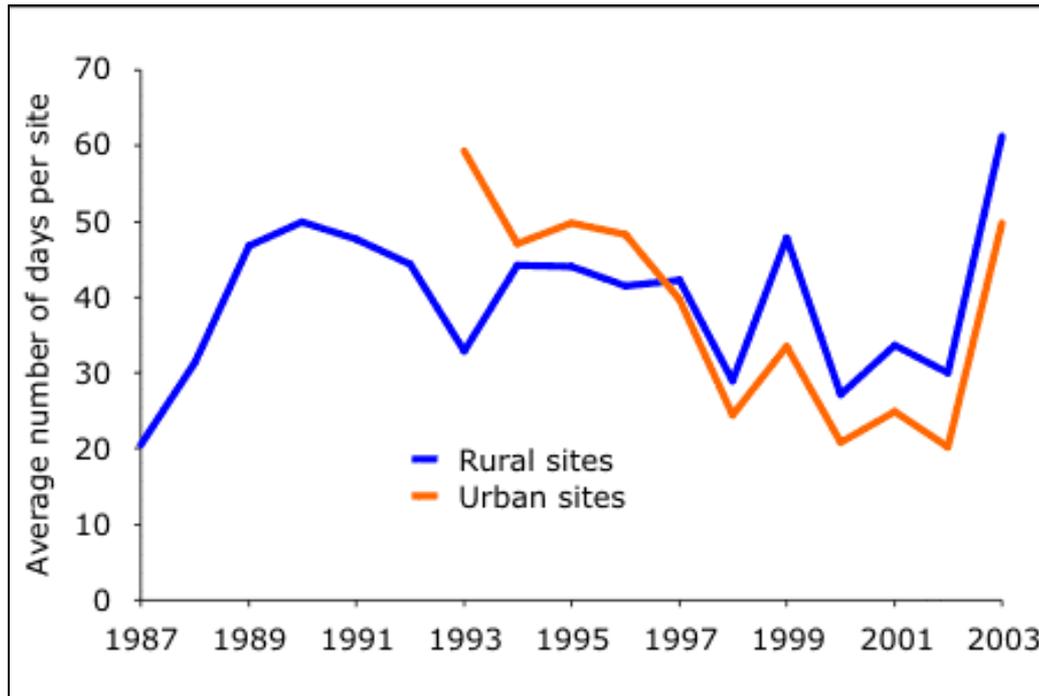
<sup>89</sup> Institute of Transport Studies, Leeds University and AEA Technology (2001) – **Surface Transport Costs and Charges, Great Britain 1998** – DETR, London

the objectives of the Government’s Climate Change Programme. As a result, any value of light rail in this respect is given little weight in the decision-making process.

**Local Air Quality**

7.13 In the UK, urban air quality has generally improved significantly since 1993, while rural air pollution, caused largely by ozone, has shown no overall trend. This is illustrated in **Figure 7.1**.

**FIGURE 7.1 DAYS WHEN AIR POLLUTION WAS MODERATE OR HIGHER IN THE UK 1987-2003**



Source: DEFRA

7.14 The key drivers of these improvements have been falling emissions from road transport and energy production. Road traffic emissions are estimated to have dropped by around 60% between 1995 and 2005, mainly as a result of tighter European vehicle emission and fuel standards, while conversion to gas power and investment in modern burners reduced nitrogen oxide emissions from power stations by over 54% between 1990 and 2000. Current projections predict that UK emissions of nitrogen oxides from all sources will be halved to about 1.2 million tonnes by 2010.

7.15 The key benefit of trams in terms of air quality is that electrically-powered trams do not produce exhaust emissions in the way that petrol or diesel-driven buses do. Where there is a reduction in car use, there may be a reduction of emissions of key pollutants, particularly of oxides of nitrogen and particulates, the concentrations of which are of concern in most urban areas. These effects on air quality may be experienced over wide areas; often remote from the alignment that makes their prediction very difficult. As the most recent study in the UK notes, “*Quantifying the changes in air quality in*

*detail along all roads with modified traffic flows would be an impossible task*<sup>90</sup>. As it is considered unlikely that changes in air quality will occur where changes in road traffic flows are less than 10%, studies into the air quality effects of schemes have focused on those areas specifically.

7.16 However, given the small number of schemes, the contribution of light rail must be considered negligible to date. The imperative to improve air quality in the UK's urban areas at the end of the 1980s that was used in part to justify some of the light rail proposals has obviously dissipated in the face of technical innovations in emissions control at source, driven by legislative requirements. However, there are two future considerations:

- Unless further technological innovations are the level of vehicle emissions will rise again if traffic levels continue to increase; and
- Because of improved emissions control in industry and the changing structure of the British economy, the importance of road transport in terms of a source of pollution is growing.

7.17 As a consequence, the reduction of pollutant emissions from road transport is likely to be a focus of Government future air quality strategy. Encouraging the use of less polluting modes, such as light rail, will be one of the clear policy options available.

### Improving Safety

7.18 There are two key ways in which light rail schemes can improve safety:

- For **users**, public transport is inherently safer than the private car. Government statistics indicate that people driving or travelling in cars are 11 times more likely to be killed than rail passengers and more than 30 times more likely to be injured. Therefore, if introduction of a light rail scheme can affect a modal shift from cars to rail, there should be a consequent reduction in deaths and injuries.
- **Pedestrians** are much less likely to be involved in accidents with light rail vehicles than with general traffic. If, through modal shift and the reallocation of road space, traffic flows can be reduced, this should lead to a consequent improvement in road safety.

7.19 Overall, light rail systems are demonstrably very safe. The numbers of accidents, personal injuries and fatalities that have occurred on schemes in the UK are very low, the rates at which these occur are in line with other types of public transport and far safer than private cars.

7.20 **Table 7.1** shows the total number of incidents for various schemes in the UK over the period 1998-2003. There were three fatalities, and only 10 minor injuries (2 employees, 1 passenger and 7 other members of the public) recorded on light rail schemes in the UK in the year ending 31<sup>st</sup> March 2003<sup>91</sup>.

<sup>90</sup> Environmental Resources Management (2003) – **Ibid** – pp. 206

<sup>91</sup> Health and Safety Executive (2003) - **Annual Report on Railway Safety 2002/03** – pp. 23

**TABLE 7.1 LIGHT RAIL INCIDENTS 1998-03<sup>92</sup>**

	1998/99	1999/00	2000/01	2001/02	2002/03
Croydon	-	18 (13)	44 (38)	36 (22)	29 (19)
Manchester	30 (29)	47 (24)	33 (31)	24 (22)	16 (9)
Midland	-	11 (10)	15 (7)	12 (8)	28 (18)
Sheffield	58 (55)	53 (52)	47 (44)	57 (48)	49 (40)
<b>TOTAL</b>	<b>131 (108)</b>	<b>163 (129)</b>	<b>178 (148)</b>	<b>201 (148)</b>	<b>166 (120)</b>

Figures in brackets refer to the number of incidents involving road vehicles colliding with trams.

7.21 **Table 7.2** breaks down the total accidents recorded on light rail systems in the UK for 2000 – 2001 by type.

**TABLE 7.2 ACCIDENTS INVOLVING TRAMS IN THE UK 2002-2003<sup>93</sup>**

Category	Number
<i>Fatalities and Injuries to people<sup>1</sup></i>	
Fatal accidents	3 <sup>2</sup>
Major injury accidents	0
Minor injury accidents	7
<b>Total killed and injured</b>	<b>10</b>
<i>Derailment and collisions</i>	
Derailments	11
Collisions between trams	2
Collisions with obstructions	140
Damage to tram windscreens	12
Fire damage on vehicle	1
<b>Total Derailments and Collisions</b>	<b>166<sup>3</sup></b>

Notes:

- 1) Includes trespassers and suicides.
- 2) Two on Croydon Tramlink, one on Manchester Metrolink
- 3) Approximately 95% of these incidents were road vehicles blocking the tramway.

7.22 In terms of modal shift to a safer mode, leading to accident savings, the safety record of light rail compares extremely well with other forms of transport, as follows:

<sup>92</sup> Health and Safety Executive (2003) – **Ibid** – Table on pp. 82

<sup>93</sup> Health and Safety Executive (2003) – **Ibid** – adapted from tables on pp. 23, 24 and 37

**TABLE 7.3 COMPARATIVE ACCIDENT RATES IN UK FOR DIFFERENT TRANSPORT MODES (PER BILLION PAX KM TRAVELLED, 2001)**

Mode	Killed	Killed and injured
Motorcycle	112	5,549
Cycling	33	4,525
Walking	48	2,335
Private car	3	337
Bus or Coach	0.1	196
Heavy Rail	0.1	13
Light Rail	0.00002	0.00007

7.23 This contrasts with some of the perceptions identified in relation to light rail, where concerns about safety were expressed frequently. One possible explanation for this relates to the context of the comments made. For example, fears over safety were expressed in focus groups in Birmingham and reference made to accidents that had occurred in other areas. However, this was despite Midland Metro being largely segregated, while the accidents referred to occurred on street-running sections of other schemes. The awareness of light rail accidents among the general public is perhaps puzzling, in that there would have been more rail and even major road accidents in other cities that they would not have known of.

7.24 The reporting of the light rail accidents in the national media together with the heightened awareness of tram-related issues in general through public consultation and awareness exercises, perhaps cause the public to dwell on some of the perceived negative aspects of scheme when they are reported, as well as the positive.

**Conclusions on Environment and Safety**

***Environment***

7.25 Environmental studies for proposed tram schemes are a requirement of the planning process in the UK and abroad. Notwithstanding this, there is very little material on the environmental effects of trams reported in the literature, other than some discussion of the air pollution and noise characteristics of particular bus and light rail vehicles<sup>94</sup>. Environmental improvements are often difficult to measure consistently and, in any event, appear often to be presumed self-evident so there is no specific focus on environmental issues in general reviews of the performance of schemes.

7.26 It is well-known that road traffic is the major source of air pollution and noise in our cities. It is also known that trams can carry more people in an energy-efficient manner, are typically quieter than buses and other heavy road vehicles, and that trams themselves emit no air pollution emissions when in use. Therefore, it seems axiomatic that trams must be “a good thing” for the environment. However, there are difficulties in monitoring the benefits and of understanding the value of benefits achieved meaning that significant local environmental improvements have not regularly been identified.

<sup>94</sup> Hass-Klau, C. et al (2003) – *Ibid* – pp. 58-59

7.27 What is missing here is a strategic quantification of the contribution that light rail makes to the protection of the urban environment. Assuming that 14% to 20% of UK light rail passenger would otherwise use car equates approximately to some 22 million car trips (or about 128 million passenger km) removed from the roads in those UK cities with light rail schemes. This is not very significant in terms of the 5 billion vehicle kms travelled by cars in our cities, but is a significant absolute value. In a context where road traffic continues to increase inexorably, any measures that can be demonstrated to avoid greenhouse gas emissions, noise and local air pollution must have a value.

### **Safety**

7.28 In terms of safety, the evidence from the UK schemes indicates that light rail is demonstrably safer for passengers than travelling by road. Therefore, modal shift from car and bus to light rail must help improve safety overall. There is also no evidence to suggest that pedestrians and other road users are any more at risk in areas where trams run on-street than in other areas. Overall, it may be concluded there are clear safety benefits associated with trams.

7.29 However, unlike environmental benefits, the economic appraisal of proposed schemes in the UK includes explicitly the quantification and monetary valuation of safety improvements. Therefore, the safety benefits of schemes, which can be large given the high monetary valuations that are attached to deaths and serious injuries, do influence decision-making in a direct way.

7.30 This position contrasts with some of the negative perceptions that have been recorded in relation to safety, both in terms of unprompted reactions to tram proposals, and solicited through surveys and focus groups.

## 8. CONCLUSIONS AND RECOMMENDATIONS

### Overview

- 8.1 **Table 8.1** summarises the key findings from this review of the available evidence in relation to the hypotheses on light rail benefits set out in **Paragraph 1.6:**

**TABLE 8.1 HYPOTHESES ON LIGHT RAIL AND THE SUPPORTING EVIDENCE**

Hypothesis	Summary of Evidence
<i>Light rail is an efficient way of moving large numbers of people in urban areas.</i>	UK LRT Schemes typically transport up to 2,000 people per hour (with the capacity for many more) to and from city centres, efficiently and in relative comfort. They operate at, or near, capacity at peak times. Patronage is steadily increasing on all the UK schemes, with a 52% increase since 1999 despite increasing fare levels. Also, there are often even more people travelling at weekends than during the commuting peaks. Despite limited powers, promoters have achieved a substantial degree of integration with other transport networks.
<i>Light rail reduces the car's modal share and help ease traffic congestion to a greater extent than other alternatives.</i>	The rate of modal transfer from car to tram at peak times is consistently around 20%. This compares with estimates of between 4% and 6.5% for quality bus investment. Levels of traffic reduction from light rail are typically around six times greater than with bus schemes. Reductions of road traffic of up to 14% after introduction of tram schemes have been recorded.
<i>Light rail improves the city's image and assists urban regeneration.</i>	All UK schemes have had positive effects on the image of the city in which they have been built, which has brought benefits in terms of attracting inward investment as well as business and tourist visitors. This is supported by the examples from overseas, where the tangible improvements to a city's image may have been more obvious. Beneficial effects on property values, both commercial and residential have, without exception, accompanied implementation of tram schemes in the UK. Tram schemes have played an important part in delivering regeneration and shaping how and where it occurs.
<i>Light rail promotes social inclusion.</i>	Light rail is proven to improve access and mobility for people with disabilities. It can also provide access between deprived areas and job opportunities and give better access to community and shopping opportunities.
<i>Light rail improves the urban environment and leads to fewer accidents.</i>	In the UK, light rail schemes are removing approximately 22 million car trips p.a. from the roads. The value of avoiding the worsened congestion, greenhouse gas emissions, noise and local air pollution that would have occurred as a result of these car trips has not been specifically identified. Similarly, the pressures on urban land for more road space and parking that have been relieved have not been specifically quantified. There are clear safety benefits associated with trams.

- 8.2 It is important to note that, in reviewing this evidence, in many cases Steer Davies Gleave has reached conclusions that concur with those in the NAO report<sup>95</sup>. There is agreement that light rail has improved the quality and choice of public transport and that that systems have been delivered much as planned. Light rail is fast, frequent and

<sup>95</sup> National Audit Office (2004) – **Ibid**

reliable, providing a comfortable and safe journey. Operators' performance levels are generally good, and all UK systems have attracted so many passengers that they experience overcrowding at peak times. Systems have also encouraged a shift away from car use, while most people also think that they enhance the image of their host cities or towns. Steer Davies Gleave also agrees with the NAO that light rail often provide services to run down areas that offer real benefits to the socially disadvantaged, and also concurs with the NAO report that light rail has had an impact on road congestion, pollution and road accidents.

## **Lessons Learned**

### ***Being Clear About Objectives***

- 8.3 There is a history in the UK for proposals for new and extended light rail systems to be developed as part of integrated transport strategies linked to broader economic/environmental aims. This is increasingly a requirement by Government, not least through the recent Transport White Paper. The nature of these objectives and the scale of change that they seek to achieve (e.g. contribution towards regeneration, significant modal shift from private car) generally require a step-change in quality and capacity that only conventional or light rail can deliver. Generally, new conventional rail lines are too expensive or impossible to fit into an existing urban fabric.
- 8.4 Light rail can provide a *sustainable* increase in transport capacity to and from city centres, which in turn allows cities to continue to grow. The number of people travelling into city centres can be increased either by building new alignments (which may be more acceptable than road building) or because light rail makes better use of priority than bus. For example, where a line has (say) 20 priority calls at major junctions, this can provide priority for up to 4,000 passengers on trams, but would only provide capacity for around 800 passengers on buses - beyond this point, buses would increasingly face delays.

### ***Heavy Rail Conversion***

- 8.5 Converting existing conventional rail lines to light rail can provide a way to avoid major renewals costs particularly, where rail infrastructure has reached the end of its serviceable life. This will remain an attractive option given recent escalation of railway maintenance and construction costs. Tyne and Wear Metro, the first phase of Manchester Metrolink and Croydon Tramlink were all to some extent rail conversions. Each increased overall capacity and penetration of the city centre compared to the service they replaced and patronage has increased significantly over that previously carried by the rail services.
- 8.6 Other features of successful conversions of rail to light rail are much-improved city centre access, higher frequency services and more stops in residential areas. A better quality, more reliable and more accessible public transport system can be provided. However, there are not very many circumstances where lines are largely separate from the rest of the rail network so that they can be separated off and connected to a town or city centre without major problems of interface with the rest of the rail network. Sunderland Metro has proved that track sharing with light rail is possible, but it is not easy to operate a high frequency of service in these conditions.

### **Urban Areas - Other Corridors**

- 8.7 Urban areas without rail services are the focus for most schemes presently proposed in the UK. Here, light rail can give a higher scale of benefit compared with other modes. Generally, there needs to be sufficient demand to support a service of a minimum of about six trams per hour - much below that figure an economic case for light rail becomes much weaker. Connecting multiple major trip attractors makes good sense – for example, all the existing and proposed Manchester lines serve not only Manchester city centre but also a town centre at the end of the route.
- 8.8 Park-and-ride may provide a big opportunity in many places. This has been a key factor in the apparent success in Nottingham. A major aim of Leeds Supertram is to provide large-scale park-and-ride to promote modal shift. They are similar cities, so if it works in Nottingham, there is every prospect that it will work in Leeds. Another key aim is integration with development proposals as has been achieved on the DLR and as is planned in Merseyside, where the tram is seen as critical delivering new commercial development in Liverpool city centre.

### **Urban Light Rail vs. Bus - A Question of Scale**

- 8.9 Whether light rail or bus-based proposals are more appropriate is chiefly a question of scale. Bus-based alternatives to light rail can be provided, but what is being delivered will have very different characteristics. One of the key differences between light rail and bus in a major urban area is that light rail, by its very nature, provides the infrastructure and hence the quality throughout the **whole** route, at every stop and on every kilometre of track. Even if it is sharing track with other traffic, the quality of ride and the visibility and permanence of the system are there for all to see. Bus-based systems offer a more partial treatment - for example it is physically impossible to build guideways in city centres. We heard from NET in Nottingham that the physical constraints of providing adequate bus priority measures, such as segregated guide lanes, was a key factor in the choice of a light rail solution<sup>96</sup>.
- 8.10 Guided bus schemes, such as in north and east Leeds, operate very efficiently in these corridors and speed buses up. However, in the city centre away from the guideways, they are no more apparent than existing bus services. They are, when off-guideway, subject to factors that affect reliability of bus services throughout the network. Consequently, they are simply unable to deliver to the scale of benefits of light rail – an improved city image through tangible commitment to better public transport and better access to and within the city centre.
- 8.11 Light rail's value for money increases with high levels of demand. In very high demand corridors, the overall cost of light rail may actually be lower than alternative bus provision. More generally, the economic efficiency at higher levels of demand is clear. Three thousand people can be served with 15 trams, compared with 25 to 70 buses, depending on how big they are. Higher levels of service increase costs and provide little additional benefit - once buses are running every couple of minutes adding more does not really reduce waiting times significantly.

<sup>96</sup> Personal communication: Chris Deas, NET Development Manager, Nottingham City Council

### Conclusions on Alternatives

- 8.12 In developing transport strategies, meeting different objectives will require different alternatives in different areas. There is plenty of need and scope to improve the existing bus networks. Most transport strategies require that, but most are also seeking something more - a significant shift in the quality and capacity of key parts of the public transport network.
- 8.13 There are circumstances (particularly for inter-urban routes) where guided busway can produce better value for money than light rail. It is also clear that light rail conversion of rail routes can provide very good value for money. But generally, major corridors in urban areas are where light rail is appropriate. In those areas, while bus infrastructure investment can provide good value for money, it will be on a much smaller scale. It will not deliver the objectives of the strategies or the scale of benefits.

### Remaining Uncertainties and Recommendations for Further Research

- 8.14 The NAO report concluded that there is an incomplete picture of the benefits delivered by light rail schemes in the UK. Certainly, this review has confirmed that this is the case, although we believe that there is perhaps more evidence available than the NAO had indicated. In terms of cost escalation, and options for controlling this, *pteg* members are already examining different approaches to procurement and discussing these with the DfT.
- 8.15 On the benefits side, what evidence is available has been collected on a fairly inconsistent basis. Even the way that relatively simple statistics, for example on patronage, are collected varies between operators and promoters of schemes and often the basis on which data has been assembled on individual schemes has changed over time.
- 8.16 This problem is more acute when considering second order effects such as improvements to the environment or the stimulus for urban regeneration. In the case of environmental improvements, while effects have been predicted in almost every case, there is very little work that has been done on identifying and quantifying actual improvements to urban environments that have occurred due to the implementation of tram schemes. Consequently, the role that light rail can play in strategies to improve urban environments is poorly understood. In terms of economic regeneration, although there has been extensive research carried out, this has not been done on a consistent basis, and again little work has focussed on identifying and quantifying the *specific* effects of tram schemes within broader strategies.
- 8.17 The following issues should be considered in terms of setting an agenda for future research on the effects of light rail schemes in the UK, with a view to developing a consistent and comprehensive dataset that can be used to more accurately and confidently predict the effects of planned schemes:
- **Patronage:** Developing a more consistent method of capturing data, and a common format of reporting, so that more reliable comparisons may be made between schemes, and a more accurate reflection of responses of patronage to outside influences can be identified. This could be done through the work of the Light Rail Committee of *pteg*.

- **Modal Shift:** Present practices on users surveys to identify previous modes of travel and/or availability of a car should continue, but there should be more consistency on how these are reported. There seems to be a lack of agreement on how modal shift is defined in these terms, and both approaches are used. The former would appear to be more appropriate to immediate “before and after” monitoring studies, while the latter would seem more suited to monitoring of the effectiveness of traffic reduction in the longer term.
- **Attitudes to the permanence of schemes:** There appears to be clear evidence that people appreciate that the infrastructure associated with light rail schemes demonstrates more of a commitment to improvements in public transport that cannot be easily reversed. However, precisely how this affects behaviour is not clear. Attitudinal surveys among users and other stakeholders to establish the nature of this effect are required.
- **Environmental effects:** The quantification of the actual environmental effects of operating schemes is essential to the understanding of the role of light rail in improving the urban environment in conjunction with other policy initiatives. Using the approaches adopted to modelling area-wide air quality used to develop local air quality management plans, the effects with and without the presence of individual schemes could be examined, together with the contribution to traffic reduction and maintaining air quality standards in the longer term. Attitudinal surveys to establish the response of the public to townscape improvements associated with the implementation of tram schemes and also changes in the ambient noise environment may also be useful in establishing the precise nature of these benefits.
- **Social inclusion:** More work is required to establish precisely the ways in which social exclusion of particular groups may be reduced by light rail schemes. User and non-user surveys among particular groups such as jobseekers, students and young people, the elderly, non-car owners, people with disabilities relating to mobility, people on low incomes and ethnic minority groups are required on a consistent basis across different schemes to identify the extent of such benefits and the ways in which they are distributed in society. Recent work commissioned by DLR and Tower Hamlets Council may point the direction of such studies.
- **Urban Regeneration:** The methodology recommended by the DfT for reporting the economic impact of transport projects is equally applicable to the prediction of effects during the planning and evaluation of a light rail scheme, and to examining actual effects post hoc. Future monitoring studies should adopt this approach to examining the actual gains in employment due to improved accessibility provided by light rail schemes. The recent study on effects on property impacts in Croydon<sup>97</sup> also provides a standard approach to looking at this issue in relation to future schemes, but the findings of the recent study are disappointing inconclusive. There appears to be a potential further source of data from the monitoring carried out by several promoters on residential property values in the vicinity of light rail projects in relation to claims made under Part 1 of the Land Compensation Act 1973. This information has typically not been published, but if collated could provide an interesting overview of the effect of light rail schemes in this respect.

<sup>97</sup> RICS Policy Unit (2004) – **Ibid**



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