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The Impact of Light Rail on Social Inclusion in England

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Abstract

Since 1980, seven new light rail systems have been built in England at a cost of £2.3 billions (National Audit Office, 2004). The Social Exclusion Unit (2003) promoted social inclusion as a key UK Government policy and it is now a specific focus for transport policy. The Passenger Transport Executive Group (2005) is advocating investment in further light rail systems. Therefore, this thesis seeks to identify from the available evidence the impacts on social inclusion in those communities served by the new light rail systems in English cities.

Firstly, the context of light rail light rail and extent of social exclusion in England is explored. Then, following a review of existing literature, including published before and after studies, the study identifies and reviews the issues around the relationship between transport and social inclusion and the impacts of light rail schemes by reference to five case studies opened 1992-2004: Manchester, Sheffield, West Midlands, Croydon and Nottingham. The hypothesis is that there is a positive relationship between these schemes and improved social inclusion. Can this be demonstrated from the evidence?

Comparison is made between 'on-line' wards where light rail is located and control areas that do not have light rail schemes. The study compares indicators of absolute and relative socio-economic changes within defined corridors of each scheme at a ward level using the Index of Multiple Deprivation 2000; car ownership and travel-to-work data from the Census; and employment levels using NOMIS data for the period, and other published sources.

Despite the accumulating literature asserting the positive contribution of light rail systems to social inclusion in England, from the evidence and analysis of these data the study finds little substantive evidence in support of this, with implications for policy and investment decisions.

Contents

1   Introduction

1.1   Background

1.1.1   Since 1980, and at a cost of £2.3 billions, seven new light rail systems have been built in England. Table 1.1 summarises the current light rail picture in English cities today. Following some early problems, these have been found to deliver fast, frequent, reliable, comfortable and safe journeys much as planned (National Audit Office, 2004). There was optimism that a new era for light rail had dawned with a target of 25 schemes in the government's Ten Year Plan (Department for Environment, Transport and the Regions, 2000b). However, since delivery of seven schemes in England between 1980 (Tyne and Wear) and Nottingham (2004), progress has stalled, largely the result of delivery issues of affordability and escalating and uncertain costs.

1.1.2   Transport systems are essential for equality of opportunity for all people in society. In most modern societies, some form of transport is usually necessary if an individual is to gain access to education, employment, shops, essential services, leisure and the other social activities that are necessary to securing a good quality of life, and people are increasingly reliant on the transport system to access even basic services and amenities (Lucas, 2004).

1.1.3   In recent years, there has been growing recognition of the impact of transport planning and policy upon certain groups within society (Hine and Mitchell, 2001). The government's Transport White Paper *A New Deal for Transport, Better for Everyone* (Department for Environment, Transport and the Regions, 1998) aimed at improving transport for socially excluded groups by explicitly adding social policy aspirations to long-standing economic and environmental objectives for transport policy. However, despite making clear references to social inclusion, *A New Deal for Transport* persisted in centering on environmental and economic concerns rather than the social consequences that an integrated transport policy might have for people within society. It is nonetheless important that the development of transport policy takes into account social considerations in the development of an integrated transport system to ensure that it will be, as the White Paper is sub-titled, *'Better for Everyone'* (Hine and Mitchell, 2001).

Table 1.1: Modern Light Rail in England Since 1980

Location	Opened	Km	Stations	Average Station Spacing (Km)	Passenger Km (m) 2004/05	Annual passengers (boardings) (m) 2004/05	Operator	Cost (£m)	Notes
Tyne and Wear Metro	August 1980	78	58	1.345	283	36.8	Nexus (Tyne and Wear PTE)	£284m. Extended to Airport in November 1991 (£12m) and to Sunderland in March 2002 (£100m).	A metro system, partly underground with major tunnels and bridges. Sunderland extension sharing 14km of National Rail track.
Docklands Light Railway	July 1987	27	34	0.794	245	50.1	Serco/CGL	£77m. Extended to Bank in 1991 (£294m), Beckton in 1994 (£280m), to Lewisham in 1999 (£250m).	Fully segregated, mostly elevated. Powered by side rails. New extensions under construction to Woolwich via City Airport. Significant further expansion planned.
Manchester Metrolink	April 1992	39	37	1.054	204	19.7	Altram	£140m. Extended to Eccles March 2000 (£160m)	Resembles rail with high platforms. Partly segregated using former rail alignments and street running in centre.
Sheffield Supertram	March 1994	29	48	0.604	44	12.8	South Yorkshire PTE	£240m	Street tramway. Partly segregated using former rail alignments and street running in centre.
Midland Metro	May 1999	20	23	0.870	52	5.0	Altram Consortium	£145m	Street tramway. Partly segregated using former rail alignments and street running in centre.
Croydon Tramlink	May 2000	28	38	0.737	112	22.0	Tramtrack/ FirstGroup	£200m	Street tramway. Partly segregated using former rail alignments and street running in centre.
Nottingham NET	March 2004	14	23	0.609	37	8.5	Arrow Consortium/ Nottingham City Transport	£180m (value of PFI credits)	Street tramway. Partly segregated using former rail alignments and street running in centre.
Total	-	235	261	0.900	977	154.9	-	£2,362m	-

Source: adapted from Department for Transport (2004c and 2005b),   Note: excludes Blackpool

1.1.4 From about the mid-1990s onwards, the term 'social exclusion' increasingly emerged as a popular policy concept in the United Kingdom and addressing social exclusion became a central policy concern in the United Kingdom following the election of the Labour government in May 1997. In August 1997, the Social Exclusion Unit (SEU) was established to assist in the development and delivery of this policy agenda (Lucas, 2004). United Kingdom transport policy is now seeking to address the transport dimensions of social exclusion. This has placed a new importance and urgency on identifying the nature of the linkage between transport disadvantage and social exclusion, and mechanisms by which an integrated transport system can reduce levels of exclusion (Hine, 2003) and promoting social inclusion is now an explicit part of the policy agenda.

1.1.5 As a starting point, 'social exclusion' may be defined as including all or some of the following elements:

> *disadvantage in relation to certain norms of social, economic or political activity pertaining to individuals, households, spatial areas or population groups; the social, economic and institutional processes through which disadvantage comes about; and the outcomes or consequences for individuals, groups or communities' (Percy-Smith, 2000).*

1.1.6 However, social inclusion is a relatively new concern for the promoters and operators of light rail schemes (Passenger Transport Executive Group, 2005) and the promoter has to satisfy an ever-widening range of social aspirations – these are laudable aims but they do not put any more money in the scheme (Bartlett, 2004).

1.1.7 The specific impact of transport infrastructure, such as light rail systems, has always been difficult to assess and confounded by other changes in the local economy, or expressed in terms of the confidence and image factors that fixed infrastructure apparently has for business investments. There have been economic impact 'before and after' studies of some of the light rail schemes, such as in Sheffield (Dabinett et al, 1999), Tyne and Wear (Nexus, 2003), Manchester (Tyson, 2001) and Croydon (South London Partnership, 2003), and also on specific effects such as house prices (Royal Institute of Chartered Surveyors, 2004). However, whilst new methods, notably accessibility planning required in Local Transport Plans (Department of Environment, Transport and the Regions, 2000b) and reporting of 'wider economic impacts' (Department for Transport, 2005c), are being developed for appraisal of proposed transport schemes and

policies, there seems to be little reported (independent) evidence of change to the socio-economic condition of those communities served by light rail schemes.

1.1.8 Therefore, the objective of this thesis is to explore this apparent gap in the understanding of the effectiveness of light rail schemes in English cities in delivering government objectives to improve social inclusion.

1.2   Study Context

1.2.1 The stimulus and the starting point for this research arises from consideration of three key recent publications:

- *'Making the Connections: Final Report on Transport and Social Exclusion',* published by the Social Exclusion Unit in 2003;

- *'Improving Public Transport in England Through Light Rail',* published by the National Audit Office in 2004; and

- *'What Light Rail can do for Cities',* published by the Passenger Transport Executive Group in 2005.

1.2.2 Together, these documents provide a powerful and compelling basis from which to begin this study. However, it must be remembered that each was written from its own perspective and has its own motivation, although the third may in part be interpreted as a response to the first two. *Making the Connections* sought to bring together a wide range of government policy initiatives in the course of identifying (or re-discovering) the crucial role of transport and transport planning in delivering the desired outcomes of many policies and interventions, and the links between social exclusion, transport and the location of services. The report particularly focused on access to those opportunities that have the most impact on life-chances, such as work, learning and healthcare. The National Audit Office (2004), in its important examination of the Department for Transport's work in funding the construction of light rail systems to improve public transport in England, specifically pointed towards the need to consider the impact on social inclusion for light rail systems funded by the government. Meanwhile, the Passenger Transport Executives (through the Passenger Transport Executive Group, 2003, 2004, 2005 and 2006), responsible for public transport strategy in the major metropolitan areas have lobbied hard promoting the benefits, including social inclusion, of continued investment in light rail in their cities. These key documents are further evaluated in Section 3 of this study.

1.2.3 Therefore, it is on this basis that this current study is founded. The Social Exclusion Unit has identified the issue; the National Audit Office has called for evaluation and monitoring of light rail systems, and the Passenger Transport Executive Group promotes new schemes on the grounds of social inclusion (but simultaneously has highlighted the lack of evidence). However, the three key documents, whilst together making a case and highlighting the issues, do not achieve a satisfactory conclusion on the particular impact of light rail on social inclusion in England's cities.

1.3 Approach to the Study

1.3.1 If social inclusion is now a key factor driving transport and other sectoral agendas, has anybody tried to measure, ex post, what the impact on social exclusion measures or indicators has been for recent interventions, with a view to influencing the design, location, specification and evaluation of further potential light rail schemes? Although increasingly identified as important and related concepts, transport and social exclusion does not yet have an operationally tractable methodology informing how transport provision influences social exclusion or promotes social inclusion. A recent study in 2006 reported by the Centre for Transport Studies at Imperial College (and others) sought to identify ways in which social inclusion might be better integrated into the Department for Transport's New Approach to Transport Appraisal (NATA) (Department for Environment, Transport and the Regions, 2000a) multi-criteria framework that responds to the White Paper's concern for the five themes of accessibility, integration, safety, environment and economy:

> 'Without an operational definition of social exclusion or a methodology relating transport provision and social exclusion, it is difficult to assess the extent to which current transport provision is or is not 'inclusive' in nature or to formulate in an effective manner new policy measures to address any shortcomings believed to exist in this provision. In particular, the lack of a clear operational definition of the transport-related aspects of social exclusion disconnects the concept from standard modelling and appraisal methodologies, making it difficult for transport policies aimed at addressing problems of social exclusion to be appraised on a consistent basis with other policies' (Centre for Transport Studies, 2006).

1.3.2 This has been problematic partly due to the elusiveness of definable concepts (or methods) to measure the social impacts of transport planning (that has traditionally been concerned with engineering and economics). Furthermore, methods to measure demand and supply are often insufficient to incorporate the

many subtleties and complexities that influence the travel undertaken (Hine and Mitchell, 2001).

1.3.3 This research seeks to identify the changes in social inclusion that may have taken place in response to (or anticipation of) light rail schemes by reference to a sample of cities in England. The study will identify and review the issues around the relationship between transport and social inclusion and the impacts of light rail schemes by reference to five case studies: Manchester (opened 1992), Sheffield (1994), West Midlands (1999), Croydon (2000) and Nottingham (2004). These schemes share a similar technological specification and have been inserted mainly into an existing urban fabric, rather than associated with major new developments such as Docklands Light Railway (DLR), or being entirely segregated (DLR and Tyne and Wear Metro). The hypothesis is that there is a positive relationship between these schemes and improved social inclusion. Can this be identified from the evidence? Is improvement to accessibility and emphasis on economic regeneration synonymous with improving social inclusion?

1.3.4 Like Hall and Hass-Klau (1985), this study is more interested in the more elusive 'indirect' effects of light rail, such as economic activity and social patterns, rather than the 'direct' effects, such as system performance and modal shift. It also considers the achievement of intended effects, such as regeneration, as well as the unintended effects that might have arisen. It is also curious as to why these are not included in reported before and after studies?

1.3.5 The case study approach is a general overview rather than a detailed look at individual local specific (and often extreme) 'problems', which are taken to be instances of social exclusion. Detailed studies are often revealing but tend not to develop a general conception of social exclusion (Burchardt, et al, 2002).

1.3.6 Lessons and outputs from the study include:

- Realistic levels of expectation of what can be achieved to improve social inclusion with tram schemes beyond the rhetoric;
- Inform or adapt current appraisal methods and guidance;
- 'Steer' route selection and specification decisions of new schemes.

1.3.7 This study does not attempt primary research, such as eliciting the impact of light rail on potentially socially excluded groups, both users and non-users of trams. Rather, the approach adopted is to seek, through case studies, whether there is

any evidence available in secondary data, such as the census, to indicate the contribution of light rail systems.

1.4 Contents of the Thesis

1.4.1 Section 2 sets out the background and context of this study. It briefly summarises the recent development of light rail schemes in England, their character and stated objectives of promoters. The prospects for further developments in the context of government policy and objectives, and current and potential methods of evaluation of light rail investments are also considered. Section 2 also explores the extent and nature of the problem of social inclusion in general in England, particularly in the context of its relationship with public transport provision in cities.

1.4.2 Section 3 reviews the literature pertaining to the specific objectives for this study and research. The topic cuts across several areas of practice and academic endeavour and this is reflected in the review, in particular the perspectives of the wider social exclusion debate.

1.4.3 Section 4 describes an analysis of the impact of light rail systems in five English cities on social inclusion. This sets out the selection and definition of five 'modern tram' case study areas, and the secondary source data examined. The section presents the results of analyses undertaken, including comparisons between case study areas and their respective control areas (those parts of the city that do not have a light rail corridor but may otherwise be assumed to be exposed to the same exogenous socio-economic changes); between case study cities, and longitudinally over time (the maturation of effects or possibly anticipatory effects of an imminent scheme).

1.4.4 A discussion and review of this analysis is included in Section 5, presenting some overall conclusions of the study and reflections on the extent to which, if light rail systems can and does make a positive impact, the systems may be specified to ensure that investment is well placed and are best-targeted, and whether the design and specification of further potential light rail systems in England could better match social inclusion objectives.

1.4.5 Final conclusions and remarks are drawn together in Section 6.

2   Light Rail and Social Inclusion In Context

2.1   Introduction

2.1.1   This section seeks to set the context for the study by reviewing the key characteristics of light trail and the objectives for light rail systems. It then goes on to explore the current extent of light rail in England today, and discover the extent and nature of the problem of social exclusion related to public transport.

2.2   Characteristics of Light Rail

2.2.1   In this study, the terms 'light rail' and 'tram' are used interchangeably and refer to the modern trams that run on both segregated and street-running alignments. Light rail fits into a spectrum of 'intermediate' urban public transport modes between buses and heavy rail. The main advantages of light rail compared with heavy rail and metros are cost and flexibility. Light rail has better acceleration, can negotiate tighter curves and steeper gradients, has simpler signalling and can have closer station spacing. Light rail can run on a mixture of city streets and existing railway routes, be totally segregated or operated in the street with mixed traffic and often a combination of these is used to match local circumstances (Balcombe, 2004).

2.2.2   The relative quality and capacity of light rail, particularly in comparison to bus are summarised as:

- *Penetration of town and city centre 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. (Passenger Transport Executive Group, 2005):*

2.2.3   Modern trams, in contrast to some of their forerunners of the period up to the mid-twentieth century, are generally popular with the travelling public. The House of Commons Transport Committee (2005) noted that 'representations from Nottingham, where the tram system is relatively new, tended to raise concerns about noise, safety and the routes of possible extensions, whereas those from Manchester, where Metrolink has been open since 1992, were strongly in support

of light rail.' The public perception is that buses fail to have the impact or confidence factor that can be attributed to modern trams:

> 'There is something peculiarly British about our attachment to all things rail-related that often defies marketing logic when it comes to transport promotion.....Trams and trains are seen as socially acceptable alternatives to car use for middle class, middle Englanders in a way that buses aren't......trams for me conjure up more in the public consciousness – something that is difficult to define but is I think partly explained by the dedicated right of way they enjoy in people's minds at least – even when running on public streets' (Emmerson, 2006).

2.2.4 It is said that there are no problems intrinsic to the mode or its technology (McIntosh, 2005). The 1980s and 1990s witnessed a burgeoning number of new light rail systems in both Europe and North America. Table 2.1 plots the development of new light rail schemes in recent decades.

Table 2.1: Number of Light Rail Systems Opened

	1970s	1980s	1990s
Western Europe	0	7	14
North America	1	13	8
Rest of World	4	17	12
Total	5	37	32

Source: Balcombe (2004)

2.2.5 Table 2.2 summarises the characteristics of light rail infrastructure, vehicles and systems that are attractive to both users and policy makers. Light rail can carry greater numbers of passengers than bus or guided bus and can operate more cheaply (expressed as cost per place-km) above 2,500 passengers per hour per direction (pphpd). The principal characteristics compared with bus-based alternatives are shown in Table 2.3.

Table 2.2: What Can Light Rail Deliver?

Feature	Description
Penetration of town and city 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 time 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 centre 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' (eg 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	Image offered by light rail infrastructure, vehicles and operations secured in the long term, give individuals and businesses confidence to make location decisions

Source of data: Passenger Transport Executive Group (2005)

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2.2.6 Light rail is best suited to carrying large numbers of passengers in dense corridors. A typical tram can carry four times as many passengers than a bus, at higher speed and in greater comfort. At levels of ridership above 2,500 passengers per hour, tram operating costs become cheaper than those of buses (Passenger Transport Executive Group, 2005). Trams also have other benefits for cities, including the environment, the 'confidence factor' caused by the permanence of investment helps regeneration and image-making and, with low floors and boarding platforms, most systems are fully accessible.

Table 2.3: 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	3.8p – 8.8p	2.5p – 5.8p	2.5p – 5p	1p – 2.1p
Average Speed (kph)	10-14	14-18	15-22	15-22
Reliability	Improving	Medium	Good	Medium- 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

Source of data: Passenger Transport Executive Group (2005)

2.2.7 The impact on passenger demand of new light rail schemes may be expected to be primarily a transfer (abstraction) from existing public transport modes (bus, rail and walk) and, to a lesser extent, from private cars. However, other new trips will be generated, either by increasing trip rates in existing corridors or by creating new trip opportunities that would not be previously contemplated. An attractive new light rail system will also tend to increase trip lengths, and possibly this may be used as an indicator of widening travel horizons or access to a wider range of work opportunities or shopping or leisure facilities. However, consideration must

also be given to inadvertently facilitating dispersion and suburbanisation of settlements and simply extending travel to work areas for the already-mobile.

2.2.8 The Manchester, Croydon and the extension of Tyne and Wear Metro to 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 (Passenger Transport Executive Group, 2005). In Manchester, the combined patronage of the Bury and Altrincham rail services was 7.5m 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 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.

2.2.9 It is also interesting to examine the typical characteristics of the users of light rail in comparison to other modes. The characteristics of bus and rail users are very different which in turn influences their wider social and economic impact. In simplistic terms, rail typically carries mostly male commuters, whereas buses carry mostly women, pensioners and children for shopping and leisure. South London Partnership (2003) conclude that:

> *'light rail schemes bring these two extremes together to provide a more balanced usage in terms of gender, age and journey purpose and therefore end use impacts....Croydon Tramlink has a far wider user base than bus, underground or heavy rail networks. That is, its users more accurately reflect the characteristics of the population which it serves'*
> *(South London Partnership, 2003).*

2.2.10 Hass-Klau and Crampton (2002) have reviewed the characteristics of cities and transport areas served by light rail in a quest to identify the factors that may cause the success of schemes. A particular feature that they investigated for case studies drawn from Europe and North America was the population density within the potential market area. However, they concluded that 'cities or transport regions which have low population densities have been very successful in gaining light rail passengers. On the other hand there are some cities with high population densities which do not have especially successful light rail systems' (Hass-Klau and Crampton, 2002). Table 2.4 shows some selected comparative population statistics for some English and European cities.

2.2.11 These results suggest that low population density is not a reason for not constructing light rail. But perhaps the most important conclusion is that 'higher

population densities have not developed along established light rail routes in comparison to the rest of the urban area' (Hass-Klau and Crampton, 2002).

2.2.12 However, they concluded that in Britain:

> *new light rail lines are mostly located in relatively low population density areas, partly because it is assumed that higher population and employment densities may follow after construction, but also because of lower costs and the ease of constructing light rail lines on existing right of way. The success of light rail in France can be explained by the new generation of tram infrastructure which started in Nantes in 1985 and was implemented along the corridors of high population and employment densities (Hass-Klau and Crampton, 2002).*

Table 2.4: Population Densities of Selected Light Rail Systems

City	Track (km)	0.6km Corridor Population	0.6km Corridor Population Density per track-km	0.3km Corridor Population	0.3km Corridor Population Density per track-km
Strasbourg	25	195,458	7,818	113,116	4,525
Rouen	14	105,387	7,528	55,920	3,994
Cologne	148	709,732	4,795	488,292	3,299
Zurich	68.5	285,012	4,161	214,173	3,127
Croydon	28	124,881	4,460	74,361	2,656
West Midlands	20.4	85,907	4,211	41,499	2,034
Tyne and Wear	56	196,905	3,516	101,257	1,808
Basel	88	172,786	1,964	140,737	1,599
Greater Manchester	37	115,403	3,119	55,931	1,512
Leipzig	153	305,416	1,996	179,310	1,172

Source: Selected data from Hass-Klau and Crampton (2002)

2.3   Objectives for Light Rail

2.3.1 Before considering the impact of light rail as a policy instrument it is very important to consider the original motives for why such systems are developed. It is not reasonable to criticise systems for not achieving certain objectives if such

objectives were not amongst the objectives the systems were designed to meet (Balcombe, 2004). A study was conducted by Mackett and Edwards (1998), based on surveys undertaken in 1995-6, to identify the underlying objectives for various planned and operating urban transport systems, including twenty five light rail systems. This research is summarised in Table 2.5. However, Mackett and Sutcliffe (2003), in drawing up a reduced list of only five measurable objectives, added two that are 'so obvious that they are generally not stated explicitly': the probably implicit objectives of high patronage (the higher the patronage, the greater the likelihood of achieving the other objectives), and to operate cost-effectively.

2.3.2 'To improve public transport' cited in 12 out of 25 cases, might be argued to be axiomatic, but usually it was linked to a social objective, for example, providing better access for those without a car. However, in some cases the objectives shifted, reflecting the current issues under debate, for example from urban regeneration to traffic congestion in Birmingham, and a shift from environmental concerns to helping reduce increasing unemployment in Bristol (Mackett and Edwards, 1998). Since then, it may be argued that 'social inclusion' has come to the fore and is prominently cited in current objectives for schemes such as Cross River Tram (Cross River Partnership, 2003 and 2005).

2.3.3 The Cross River Partnership's manifesto for tackling social exclusion through transport in London's South Central area makes explicit the expected linkage between improved transport (including the proposed Cross River Tram into central London) and regeneration and job creation for localities that suffer poor levels of accessibility such as Peckham (Cross River Partnership, 2003). For example the case for Cross River Tram states aims that are more akin to the French model which seeks to use tram systems as a mechanism to provide a general uplift to an entire area:

> 'When CRT was first contemplated, it focussed on addressing the access and transport problems in Central London. Now the issues that it seeks to address or contribute to are more far-reaching, including regeneration, employment development, social inclusion, enabling higher density development, facilitating inward investment, enabling environmental improvement and helping to enhance the quality of life in the Capital' (Cross River Partnership, 2005).

2.3.4 Another reason for developing the systems, for example in Manchester and Newcastle, was the need to take action to deal with heavy rail lines in serious need of investment (Mackett and Edwards, 1998).

Table 2.5: Objectives of Developing Light Rail Systems

City	To Improve Public Transport	To Reduce Traffic Congestion	To Improve the Environment	To Serve the City Centre Better	To Stimulate Development	Other
Brisbane					•	
Melbourne				•		
Sydney					•	
Calgary		•	•		•	
Scarborough	•			•	•	•
Vancouver						•
Tuen Mun, Hong Kong	•					
Copenhagen	•	•	•		•	
Stockholm	•	•	•			•
Lausanne	•				•	
Croydon	•	•			•	•
Leeds	•				•	•
London Docklands					•	
Manchester				•		•
Nottingham		•		•	•	
Sheffield						
Tyne and Wear	•			•		•
West Midlands	•	•		•	•	
Baltimore	•	•				•
Dallas	•	•			•	•
Honolulu						•
Kansas City					•	
Sacramento	•		•			
San Diego		•	•			•
San Jose		•				
Total	12	10	5	6	13	11

Source: Balcombe (2004), based on Mackett and Edwards (1998)

2.3.5 Alluding to biases in the political and methodological justification for some schemes, Mackett and Edwards (1998) point out that few of the operational systems seem to have met their objectives. It is clear that the anticipated ridership has not materialised on many of the new urban public transport systems, and so the other anticipated impacts which follow from this would have occurred to a much lesser extent than anticipated (Mackett and Edwards, 1998). Although patronage levels seem to have improved since then, lower than expected ridership (and therefore user benefits as well as revenue streams) remains an issue in Sheffield and West Midlands.

2.3.6 In 2005, the Commission for Integrated Transport produced its *Affordable Mass Transit Guidance* to complement existing guidance and advise on its application in the context of the withdrawal of final approval for schemes and in response to problems including cost escalation, inaccurate forecasting and lengthy planning processes highlighted by the National Audit Office's *Improving Public Transport in England Through Light Rail*. The report suggests that the issues which may prompt a feasibility study for a mass transit system. These serve to illustrate the kinds of issues that a light rail system in English cities might be expected to meet in today's policy and funding climate:

- *High levels of current or forecast demand between identified origins and destinations, or on key corridors;*
- *Severely congested sections of the highway network, resulting in unreliable journey times or large delays;*
- *Need to encourage mode shift and reduce car use;*
- *Need to encourage regeneration or redevelopment;*
- *Need to cater for development pressures in a sustainable way;*
- *Congestion of rail infrastructure;*
- *Identification of air quality problems;*
- *Identification of accessibility problems; and*
- *Need to make more effective use of existing railway routes.*

(Commission for Integrated Transport, 2005)

2.3.7 It should be noted that tackling social exclusion does not feature explicitly in this list. However, the guidance goes on to say that a further issue is the absence or a gap in the supply which may manifest itself in problems of accessibility, and may be closely linked to issues of social exclusion and car availability (Commission for Integrated Transport, 2005). The Passenger Transport

Executive Group (2004) regard light rail as a success story and puts this down to the following factors:

- *High passenger carrying capacity into urban centres provided in an environmentally acceptable way;*

- *A sense of permanence which gives individuals and businesses the confidence to make location decisions;*

- *Predictable, regular and reliable journey times and service patterns;*

- *A high quality of ride throughout the entire journey;*

- *Good integration with new developments, the urban fabric and other public transport modes.*

2.3.8 Therefore, prominent contemporary advice and guidance to practitioners from the Commission for Integrated Transport and the Passenger Transport Executive Group seems to remain focussed on economic efficiency and environment objectives with little explicit mention of the third 'social' pillar of the government's New Approach to Transport Appraisal. An alternative take on the apparent advantages of light rail as an attractive and sustainable alternative to the car include:

- *it reduces transport exclusion by making access easier for non-car owners to work, learning, health care, shopping and recreation and leisure facilities;*

- *secures modal shift from cars and helps to limit urban traffic congestion and reduce air pollution;*

- *creates a positive image acting as a catalyst for economic development and urban regeneration, and plays a key part in the renaissance of cities such as Manchester.*

- *when running mostly on segregated alignments, can provide a 'win-win' solution for politicians unwilling to upset the powerful car-user lobby but enabling them to be portrayed as tackling congestion, by not reallocating highway capacity, as in bus priority schemes (Knowles and White, 2003).*

2.4   Light Rail in England Today

2.4.1 The first wave of construction during the late nineteenth century and early twentieth century produced electric tramways in virtually every town and city, and these were very influential in the structuring and encouragement of a rapid spread of urban development. But the systems were often poorly planned and

fragmented, with various privately built lines in London notoriously unconnected (Hylen and Pharaoh, 2002). The demise of particular British tram systems has been chronicled as:

> In the decade after World War Two, all Britain's major cities moved to scrap their tram systems. Some, such as London and Manchester, had begun to do so even before 1939, and had completed the process early (Manchester in 1949, Newcastle in 1950, London 1952, Birmingham in 1953); others, such as Glasgow, Liverpool and Sheffield, did so slowly and reluctantly: Liverpool in 1957, Sheffield in 1960, Glasgow in 1962 (Hall and Hass-Klau, 1985).

2.4.2 The reason for the end of the traditional trams in English cities seems to have been deliberate policy, fortified by the hard accounting economics of municipal transport systems, rising car ownership and the trams as a source of road congestion; and the 'old-fashioned' image of trams in the brave new world (Hall and Hass-Klau, 1985). The rise and fall of trams in Britain was summarised as:

> 'Tramways were extensive in the United Kingdom during the late nineteenth and early twentieth centuries. At their peak, there were over 300 systems. From the 1920s onwards, however, they were gradually closed down because they could not compete with motorised buses and cars and many systems were in need of renewal, for which there were insufficient funds. By the 1960s, only the system in Blackpool survived' National Audit Office (2004).

2.4.3 The land use-transportation studies of the 1960s and 1970s, undertaken by most large conurbations, identified that mass public transport was required. Faced with difficulties of delivering new underground or traditional heavy rail schemes, light rail systems re-emerged in Britain to play an important part in integrated transport policy in the large conurbations. The Passenger Transport Executives (PTEs) therefore developed proposals for light rail schemes, the first of which was the Tyne and Wear Metro opened in 1980.

2.4.4 Meanwhile, traditional trams remained in operation in many European cities, with notable new developments especially in Nantes and Grenoble that were seen to contribute very positive image and economic effects, and became the model for further systems, such as Sheffield Supertram.

2.4.5 To put in a European context, the seven schemes in England compare to fifty-six in Germany and eleven in France, with a total of 137 systems in the European 25 Member States (European Rail Research Advisory Council, 2004). However, the experience of the delivery of public transport schemes is not straightforward with key problems being statutory procedures and, more fundamentally, affordability.

2.4.6 By comparison, in France (with 11 cities with light rail systems) and in Germany (50 cities) there are fewer barriers to constructing light rail systems, where they benefit from reduced expenses of utilities diversion, subsidy through local employer taxes, and track sharing with heavy rail (National Audit Office, 2004). The recent political context and organisational structures of the current public transport scene in England has been described as:

> the general impression is that whilst the rest of Europe has been giving priority to increasing the role played by public transport by improving its quantity and quality, Britain has been obsessed with reducing costs, in many instance with disastrous consequences for the quality of services, their ability to limit growth in car use, and the safety of passengers....Until 1985, public transport was almost entirely in public hands and the loss of public control of public transport and the potential consequences for disintegration within the sector and between the sector and other urban and environmental objectives was seen as a small price to pay, if indeed it was recognised at all.....New Labour may have adopted a more pro-public transport stance in its urban transport policies than the Conservative government, but it has embraced privatisation as the means of delivery (Hylen and Pharaoh, 2002).

2.4.7 Figure 2.1 and Table 2.6 show that the extent of the light rail systems (route-kilometres) has grown substantially in the past decade, with much of this growth arising from a burst of activity in the period 1999-2000 with extensions to Docklands Light Railway and Manchester Metrolink, and the opening of new systems in Croydon and the West Midlands.

Figure 2.1: Light Rail System Development 1995-2005 (Route Kilometres)
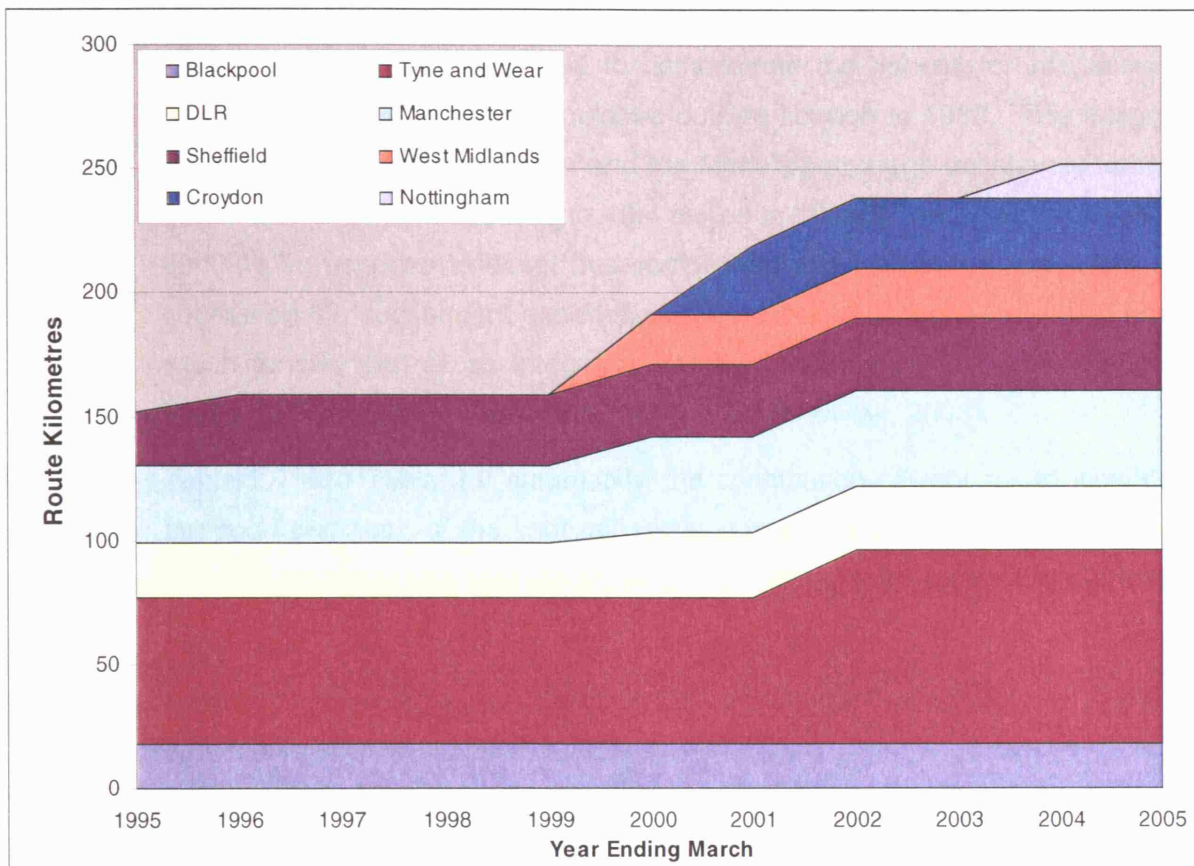
Source of data: Department for Transport (2005b)

Table 2.6: Light Rail System Development 1995-2005 (Route Kilometres)

Year Ending March	Blackpool	Tyne and Wear	DLR	Manchester	Sheffield	West Midlands	Croydon	Nottingham	Total
1995	18	59	22	31	22				152
1996	18	59	22	31	29				159
1997	18	59	22	31	29				159
1998	18	59	22	31	29				159
1999	18	59	22	31	29				159
2000	18	59	26	39	29	20			191
2001	18	59	26	39	29	20	28		219
2002	18	78	26	39	29	20	28		238
2003	18	78	26	39	29	20	28		238
2004	18	78	26	39	29	20	28	14	252
2005	18	78	26	39	29	20	28	14	252

Source of data: Department for Transport (2005b)

2.4.8 However, of the new English light rail schemes, only the Tyne and Wear Metro in 1980 was constructed and able to demonstrate the benefits of integrating bus feeder routes before bus deregulation outside London in 1986. This integration collapsed with bus deregulation and the Metro's patronage fell sharply from 61.1 million passengers in 1984/85 to 46.4 million in 1986/87 and then 32.5 million in 2000/01 in response to direct bus competition and higher car ownership. This contrasted the subsequent experience of the Docklands Light Railway in London which formed part of an integrated system made possible because London's buses and Underground were not deregulated (Knowles, 2003).

2.4.9 Table 2.7 and Table 2.8 summarise the contribution of light rail to local public transport and each of the light rail systems in England. The local mode shares between local bus and light rail are shown in Table 2.9 for selected conurbations.

Table 2.7: Annual Passenger Journeys by Mode in Great Britain 2004/05

Mode	Journeys (millions)	Annual Change (%)	Share (%)
Local bus (English PTEs)	1,083	-2.8	15.8
Local bus (London)	1,782	5.3	26.0
Local Bus (Other Areas)	1,744	-0.8	25.5
National Rail	1,088	7.3	15.9
London Underground	976	3.0	14.3
Glasgow Underground	13	-0.2	0.2
Light Rail	159	8.3	2.3
Total	**6,845**	**2.4**	**100**

Source: Department for Transport (2005b)

Table 2.8: Light Rail Journeys by Scheme in England 2004-05

Mode	Passenger Boardings (millions)	Share (%)
Docklands Light Railway	50.1	32
Tyne and Wear Metro	36.8	24
Croydon Tramlink	22.0	14
Manchester Metrolink	19.7	13
Sheffield Supertram	12.8	7
Nottingham NET	8.5	5
Midland Metro	5.0	3
Blackpool	3.9	2
Total	**158.7**	**100**

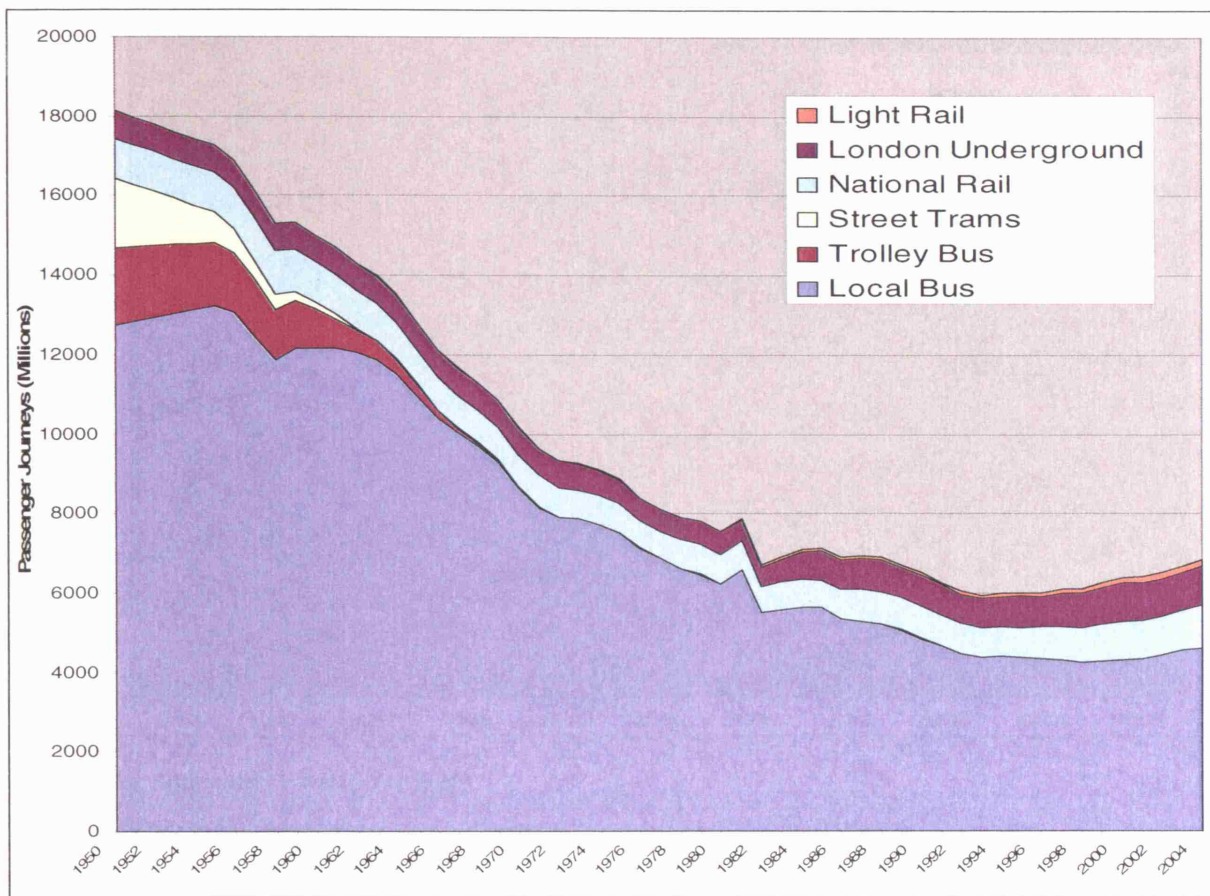*Source: Department for Transport (2005b)*

2.4.10 Passenger journeys on the modern light rail systems in England increased by 8.3% in 2004/05, compared with the previous year: a significantly greater increase than the total local public transport market share. In all, 154.8 million journeys were made in the year to 31 March 2005 on the modern systems, plus 3.9 on Blackpool Tramway (Department for Transport, 2005b). However, this increase coincides with the first full year of operation of the Nottingham system which is already carrying considerably more passengers than the West Midlands Metro.

Table 2.9: Light Rail % of Combined Local Transport Journeys 1995-2005

Year Ending March	Tyne and Wear	London	Greater Manchester	South Yorkshire	West Midlands
1995	18.0%	1.0%	5.2%	1.3%	0.0%
1996	17.6%	1.2%	5.5%	3.1%	0.0%
1997	17.7%	1.3%	5.9%	4.9%	0.0%
1998	17.9%	1.6%	6.1%	6.0%	0.0%
1999	18.0%	2.1%	5.7%	7.2%	0.0%
2000	17.8%	2.4%	6.6%	7.7%	1.3%
2001	18.2%	3.8%	7.8%	7.8%	1.5%
2002	19.2%	4.0%	8.0%	8.2%	1.3%
2003	21.0%	4.0%	8.3%	8.2%	1.4%
2004	22.0%	3.9%	8.4%	9.3%	1.5%
2005	22.5%	3.9%	8.8%	10.4%	1.5%

Source of data: Department for Transport (2005b)

Figure 2.2: Passenger Journeys on Public Transport in Great Britain (Millions)
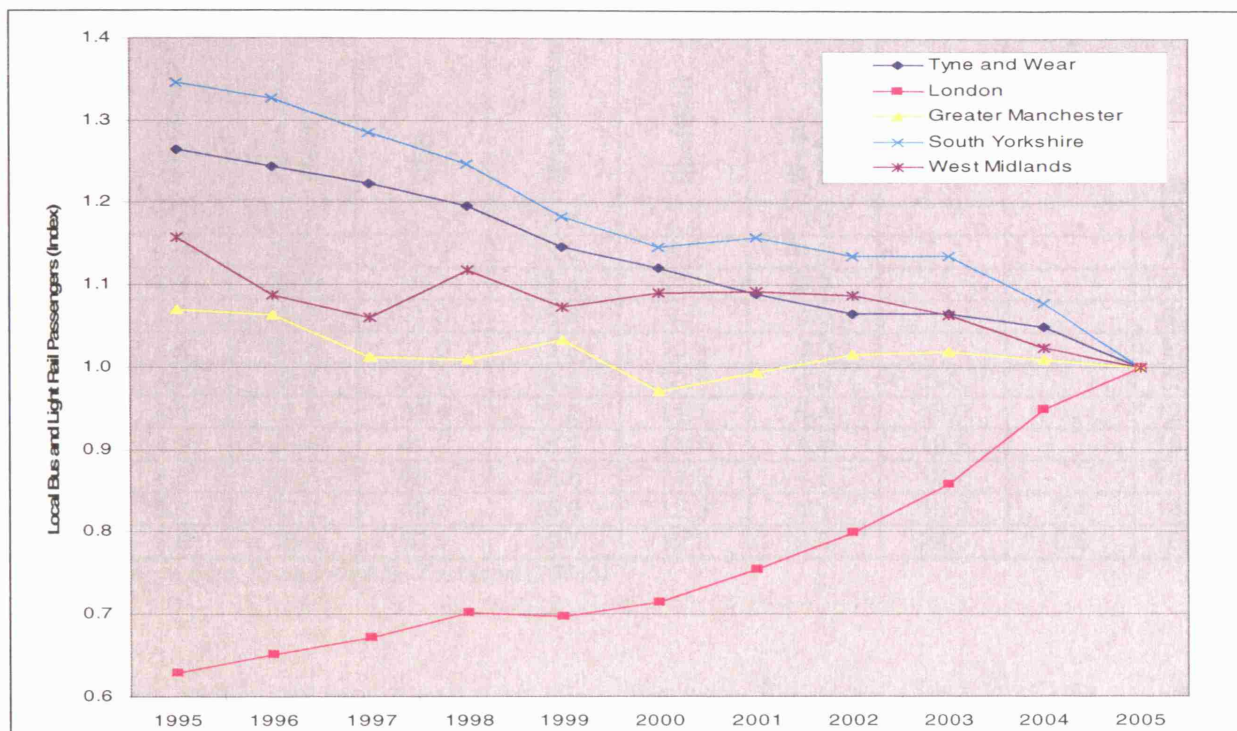

Source of data: Department for Transport (2005b), Note: 'Light Rail' includes Glasgow Subway (closed 1978-80)

2.4.11 Therefore, light rail is not a significant mode in London or West Midlands but growing in significance elsewhere (although total market is shrinking outside London). Overall, the demand for public transport has fallen dramatically over the past fifty years (by about two-thirds despite a growing population), although the recent trend is upwards with increases in National Rail, London Underground and London Buses, as well as a growing contribution from new light rail systems (Figure 2.2).

2.4.12 However, this must be set against a generally declining role of public transport in England's major cities outside London (Figure 2.3). In the PTE areas outside London, the index of local bus fares has increased by 22% in ten years (at constant prices) whereas in London they are at the same level as they were ten years ago Department for Transport (2005b), and have actually fallen when deflated by increases in real London earnings (Transport for London, 2006).

Figure 2.3: Local Light Rail and Bus Passenger Journeys (Index 2005=1.0)

Figure 2.4: Light Rail System Passenger Journeys 1995-2005 (Millions)
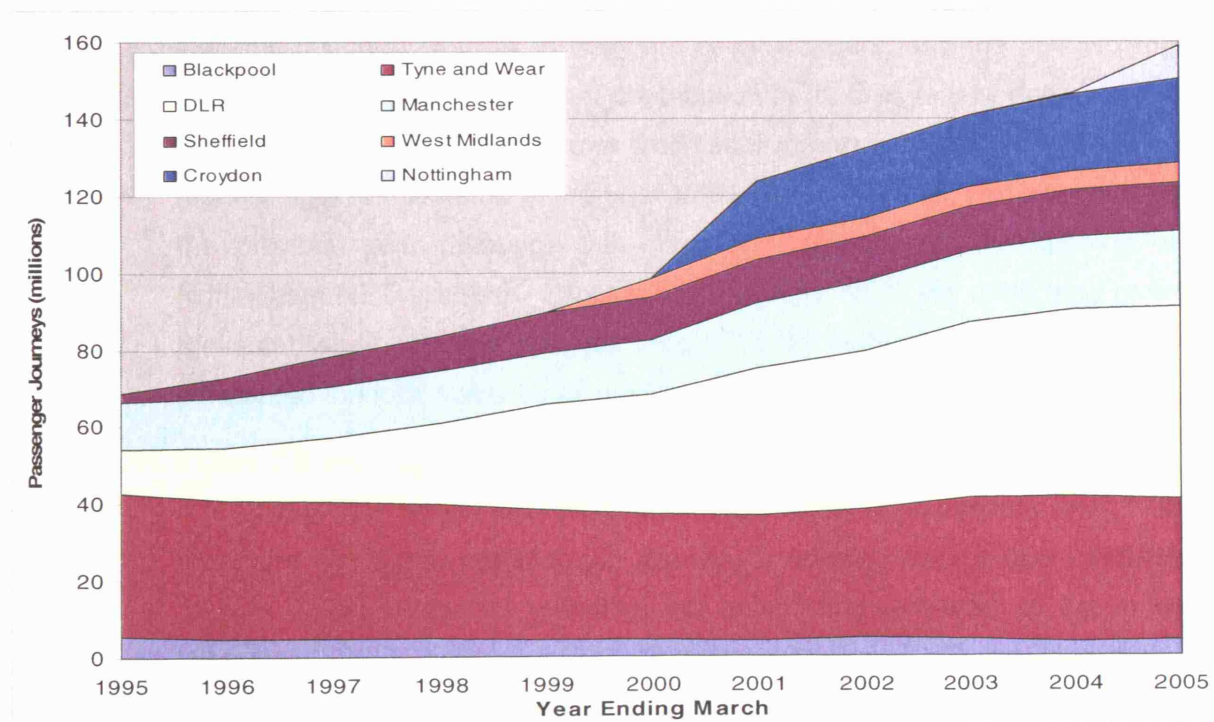
Table 2.10: Light Rail System Passenger Journeys 1995-2005 (Millions)

Year Ending March	Blackpool	Tyne and Wear	DLR	Manchester	Sheffield	West Midlands	Croydon	Nottingham	Total
1995	5.4	37.2	11.5	12.3	2.2	0.0			68.6
1996	4.9	35.8	14.0	13.0	5.0	0.0			72.7
1997	4.9	35.4	16.7	13.4	7.8	0.0			78.2
1998	4.7	35.0	21.0	13.8	9.2	0.0			83.7
1999	4.4	33.8	27.6	13.2	10.4	0.0			89.4
2000	4.3	32.7	31.3	14.2	10.9	4.8	0.0		98.2
2001	4.1	32.5	38.4	17.2	11.1	5.4	15.0		123.7
2002	4.9	33.4	41.3	18.2	11.4	4.8	18.2		132.2
2003	4.5	36.6	45.7	18.8	11.5	4.9	18.7		140.7
2004	3.7	37.9	48.5	18.9	12.3	5.1	19.8	0.4	146.6
2005	3.9	36.8	50.1	19.7	12.8	5.0	22.0	8.5	158.8

Source of data: Department for Transport (2005b)

2.4.13 Figure 2.4 and Table 2.10 show that there has been a strong overall growth in light rail patronage in the last decade, more than doubling from 68.6 million journeys in 1995 to 158.8 million by 2005. A significant part of this growth has arisen with the expanding and increasingly successful Docklands Light Railway. Whilst Tyne and Wear Metro (despite a substantial extension to Sunderland), and Sheffield Supertram appear to have levelled off, Croydon and Manchester systems continue to grow in numbers of passengers, and the new Nottingham scheme has made an important contribution in its first year of operation. Table 2.10, excluding Blackpool, shows that 154.9 million journeys were made on the modern light rail systems in the year to 31 March 2005, an increase of 8.4% on the previous year (although this step up coincides with the opening of the Nottingham NET system). Excluding Nottingham NET, the underlying growth of the established modern systems was 2.7% in the year (and not significantly different to the total travel by all modes).

2.4.14 Figure 2.5 and Table 2.11 show the average trip length for each light rail system in England. The typical trip length for all light rail is approximately 6km. Clearly, there are significant variations in trip length ranging from 3.5km (Sheffield) to 10.5km (West Midlands) reflecting the extent and character of the individual systems.

2.4.15 However, a significant change in trip length in response to network expansion and creation of new (and longer) trip opportunities is apparent only for

Manchester following the opening of the Eccles extension in 2000. (However, it is not understood why the Manchester trip length increases so dramatically in 2005 given no change in service and only a modest rise in the number of journeys, and this may be an anomaly in the passenger-km statistics). Somewhat surprisingly, this phenomenon does not seem to arise in the data for DLR Lewisham extension or the Tyne and Wear Sunderland extension.

2.4.16 An alternative presentation of the data is a reflection of passenger density in the system (or its 'busyness') expressed as passenger-km per route-km. This is shown in Figure 2.6 and Table 2.12. This shows a growth of 40% over the decade for all systems, including a massive 370% increase on Docklands Light Railway that is currently driving the introduction of longer vehicles.

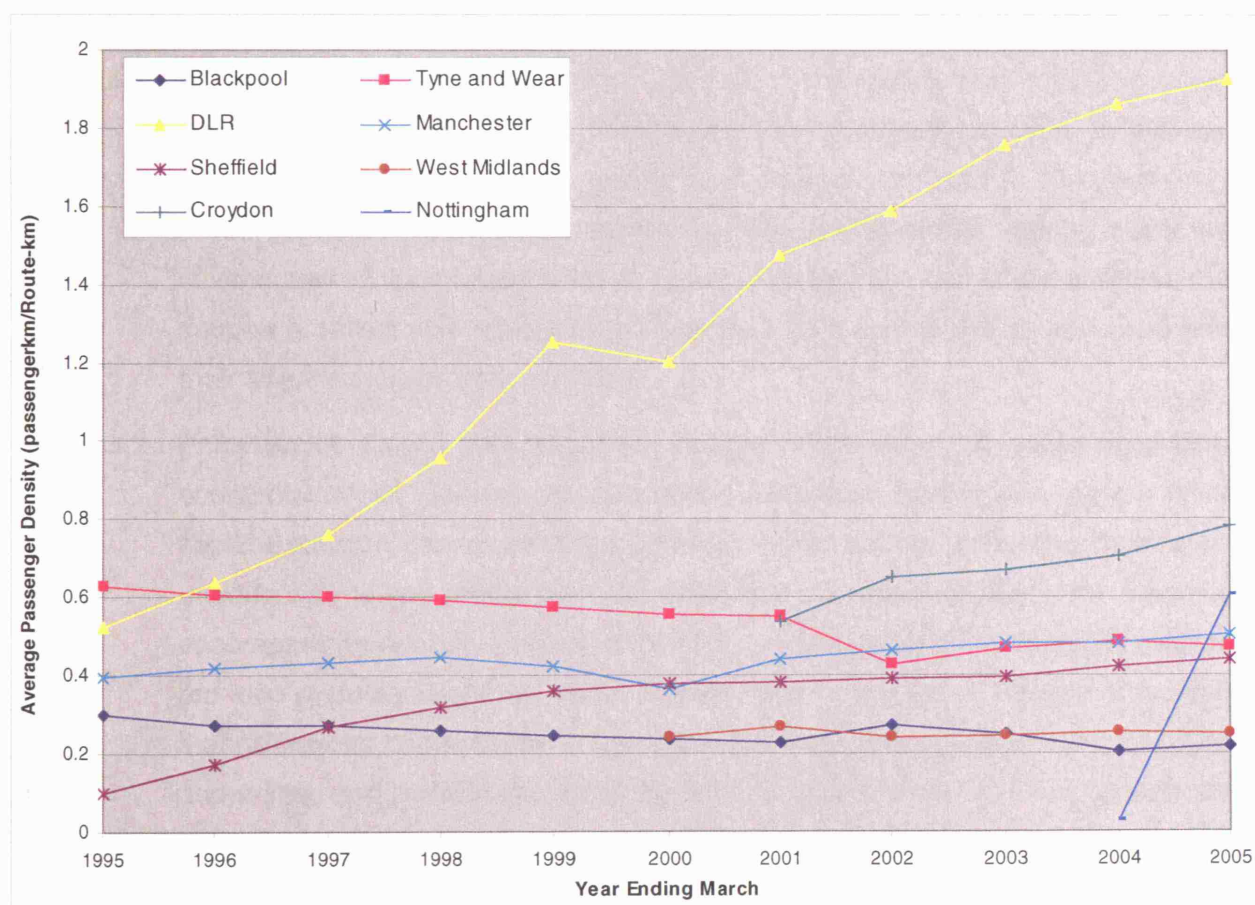**Figure 2.5: Light Rail Passenger Journey Length 1995-2005 (km)**
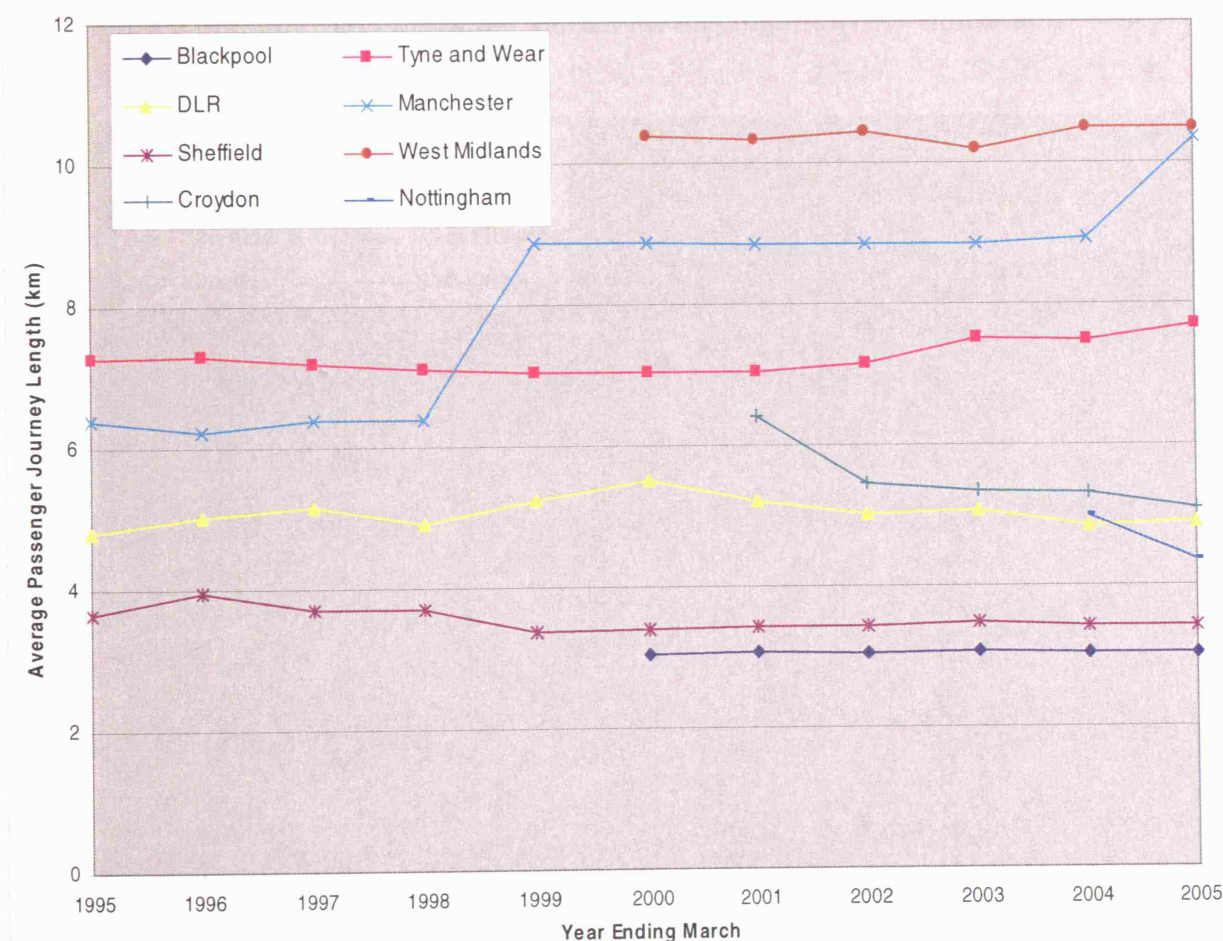
Table 2.11: Light Rail Passenger Journey Length 1995-2005 (km)

Year Ending March	Blackpool	Tyne and Wear	DLR	Manchester	Sheffield	West Midlands	Croydon	Nottingham	Total
1995		7.27	4.78	6.39	3.64				6.01
1996		7.30	5.02	6.22	3.94				5.94
1997		7.18	5.15	6.39	3.71				5.82
1998		7.11	4.90	6.39	3.70				5.66
1999		7.04	5.23	8.86	3.37				5.97
2000	3.05	7.03	5.50	8.87	3.39	10.40			6.40
2001	3.07	7.05	5.21	8.85	3.42	10.33	6.40		6.34
2002	3.04	7.14	5.01	8.86	3.42	10.44	5.44		6.12
2003	3.07	7.51	5.08	8.86	3.48	10.20	5.35		6.24
2004	3.05	7.49	4.86	8.94	3.41	10.49	5.30	5.00	6.15
2005	3.05	7.70	4.90	10.36	3.44	10.48	5.10	4.36	6.24

Source of data: Department for Transport (2005b)

Figure 2.6: Light Rail Passenger Density (Passenger-km per Route-km)

Source of data: Department for Transport (2005b)

Table 2.12: Light Rail Passenger Density (Passenger-km per Route-km)

Year Ending March	Blackpool	Tyne and Wear	DLR	Manchester	Sheffield	West Midlands	Croydon	Nottingham	Total
1995	0.30	0.63	0.52	0.40	0.10				0.45
1996	0.27	0.61	0.64	0.42	0.17				0.46
1997	0.27	0.60	0.76	0.43	0.27				0.49
1998	0.26	0.59	0.95	0.45	0.32				0.53
1999	0.24	0.57	1.25	0.43	0.36				0.56
2000	0.24	0.55	1.20	0.36	0.38	0.24			0.51
2001	0.23	0.55	1.48	0.44	0.38	0.27	0.54		0.56
2002	0.27	0.43	1.59	0.47	0.39	0.24	0.65		0.56
2003	0.25	0.47	1.76	0.48	0.40	0.25	0.67		0.59
2004	0.21	0.49	1.87	0.48	0.42	0.26	0.71	0.03	0.58
2005	0.22	0.47	1.93	0.51	0.44	0.25	0.79	0.61	0.63

Source of data: Department for Transport (2005b)

2.5 What is Extent of Transport Social Exclusion Problem?

2.5.1 It is important to start with some feeling for the nature and extent of social exclusion caused by transport in England, and to understand which individuals, groups and communities are typically most affected. In general, the problem of social exclusion may be regarded as an 'accessibility deficit' among many low income and excluded groups which serves to 'lock them out' of the activities that support a reasonable quality of life and thus both contributes to and reinforces their social exclusion (Lucas, 2004).

2.5.2 Percy-Smith (2000) has identified various 'dimensions' of social exclusion: economic; social; political; neighbourhood; individual; spatial, and group. While social exclusion cannot be reduced to economic factors, economic factors are undoubtedly a key aspect of social exclusion. Economic factors are taken as encompassing not only poverty, defined in terms of lack of an adequate income, but also exclusion from the labour market. This in turn has a number of aspects that go beyond unemployment. Social factors may include household breakdown and crime, and political exclusion can lead to a lack of participation through the normal channels. At the level of the neighbourhood, social exclusion might include the withdrawal of local services such as shops and public transport, whereas the individual might be affected by physical or mental disability, or groups may be at risk of social exclusion by their position in society. The spatial

dimension of exclusion is important since it typically results in large numbers of disadvantaged people living together, which can in turn lead to an area itself being defined as disadvantaged, or it can mean that socially excluded individuals are 'invisible' if masked by the rest of the population.

2.5.3 Accessible public transport is a key determinant of their quality of life for a range of users, namely non-car available households, the mobility impaired and the retired. Access to the public transport system is evidently most important for those people who do not have a car available. This includes both members of households with no car and individuals in households with a car, but without access to it for particular journeys (Brand and Preston, 2005).

2.5.4 Although the problems will manifest themselves very much at the local and personal scale, some aggregate national statistics are useful at this stage to paint a picture setting of some of the underlying issues to be explored in this study. For many people, the lack of access to opportunities and services is inextricably linked to their status as car owners. Non-car owning households are, of course, found disproportionately in the lowest income groups. However, high car dependency, even among the lowest-income households, suggests that public transport is generally inadequate to the mobility and accessibility requirements of a modern society and that those on a low income will go out of their way to own or gain access to a car (Lucas, 2004).

2.5.5 The National Travel Survey *Focus on Personal Travel* (Department for Transport, 2005a) describes the patterns of travel in Great Britain in the period 2002/03 and disaggregates this to help identify those individuals and groups who may find themselves most likely to be socially excluded. The National Travel Survey finds that access to a car is the most important factor affecting travel patterns, and this is illustrated in Table 2.13 by some simple statistics of the amount of travel undertaken.

Table 2.13: Variations in Travel by Household Car Availability (2002/03)

Persons in Household with:	Trips per Person per annum	Distance Travelled per Person per annum (Miles)	Time Travelling per Person per annum (Hours)	Trip Length (Miles)	Average Trip Time (Hours)
No Car	724	2845	291	3.9	0.40
One Car	1031	6518	358	6.3	0.34
Two or More Cars	1106	9329	404	8.4	0.37

Source of data: Department for Transport (2005a)

2.5.6 Those in households with one car travelled more than twice the distance of those in households without a car, and those with two or more cars travelled over three times the distance. Not only do those with no car travel shorter distances, and thereby have reduced travel horizons (for example, in seeking work opportunities), they also travelled less frequently.

2.5.7 Household non-car ownership, with a national average of 27%, varies significantly between household types, with nearly 70% of pensioner households and over 50% of lone-parent households, although car ownership has grown for all household types since the 1992/94 survey. In Metropolitan built-up areas, non-car ownership is 35% and in London it is 40% of households. Income also has a clear bearing on non-car ownership: from 1992/94 to 2002/03, car ownership rose in all income quintile groups, and in the lowest quintile, non-car ownership fell from 67% to 59%. Travel expenditure is clearly related to income. The more money a household has, the more is spent on travel. For the poorest third of households, transport accounts for about 10% of weekly expenditure compared with 15% for all households (Department for Transport, 2005a).

2.5.8 Whilst mass car ownership has been liberating and it is evident that it allows the average citizen to carry out far more activities and to travel greater distances, increased car dependency has encouraged dispersed and car-orientated patterns of development, reduced the viability of other modes, significantly contributed to

poorer local environments and has a role to play in the exclusion of already disadvantaged sectors of the population (Lucas, 2006).

2.5.9 Those with cars make significantly more commuting, business and escort trips whilst people in households without a car make far fewer leisure trips, which may mean that they are more socially isolated. People in higher income, car-owning households travel further and more frequently than those with lower income, non-car owning households. However, average trip time is longer for the less well off and non-car owners since a greater proportion of trips are made by foot or public transport (Department for Transport, 2005a).

2.5.10 The ability to make essential local journeys is also significantly different in the most deprived wards. For example, Figure 2.7, based on data presented in *Making the Connections* (Social Exclusion Unit, 2003), illustrates the usual mode of transport by level of deprivation to the chemist and the local hospital, showing the greater reliance on walking and public transport in the most deprived wards.

Figure 2.7: Usual Mode of Transport to Services by Level of Deprivation
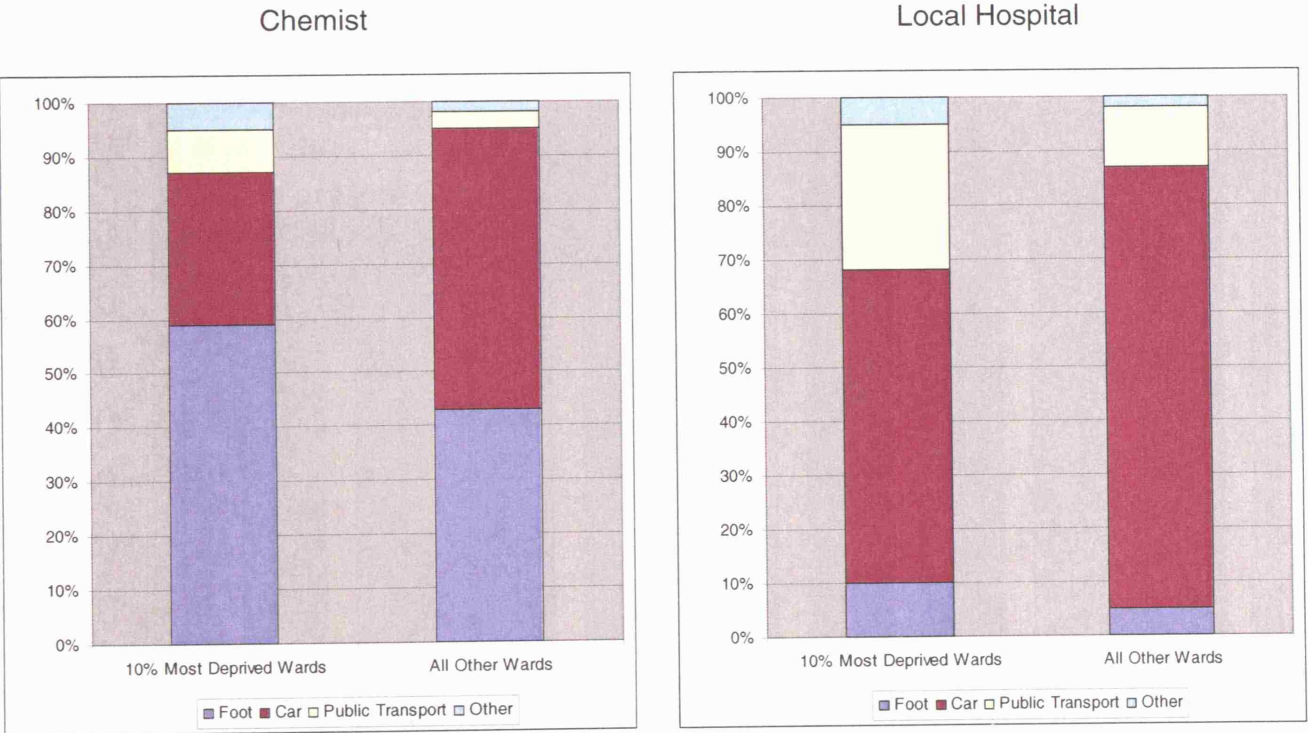
2.5.11 There is also a clear relationship between car availability and overall deprivation (based on the Index of Multiple Deprivation). In the most deprived decile (based on Super Output Areas), more than half of households were without a car, compared with about one in ten in the least deprived decile of areas. Consequently, people in the most deprived areas make far less trips than those in the least deprived areas (around a quarter less trips). For distance, the discrepancy is even greater, with less than half the distance travelled by those in the most deprived compared to the least deprived household average. Furthermore, the cost of transport can overwhelmingly constrain the method and extent of travel for people on low incomes, inhibiting the geographical extent of job-search and job-travel.

2.5.12 This is illustrated in Figure 2.8 for data at ward level in the National Travel Survey presented in *Making the Connections* (Social Exclusion Unit, 2003) and clearly shows that people in the most deprived areas (Deprivation Decile=1) are much less likely to be able get to key services by car.

Figure 2.8: Car Ownership by Deprivation Decile
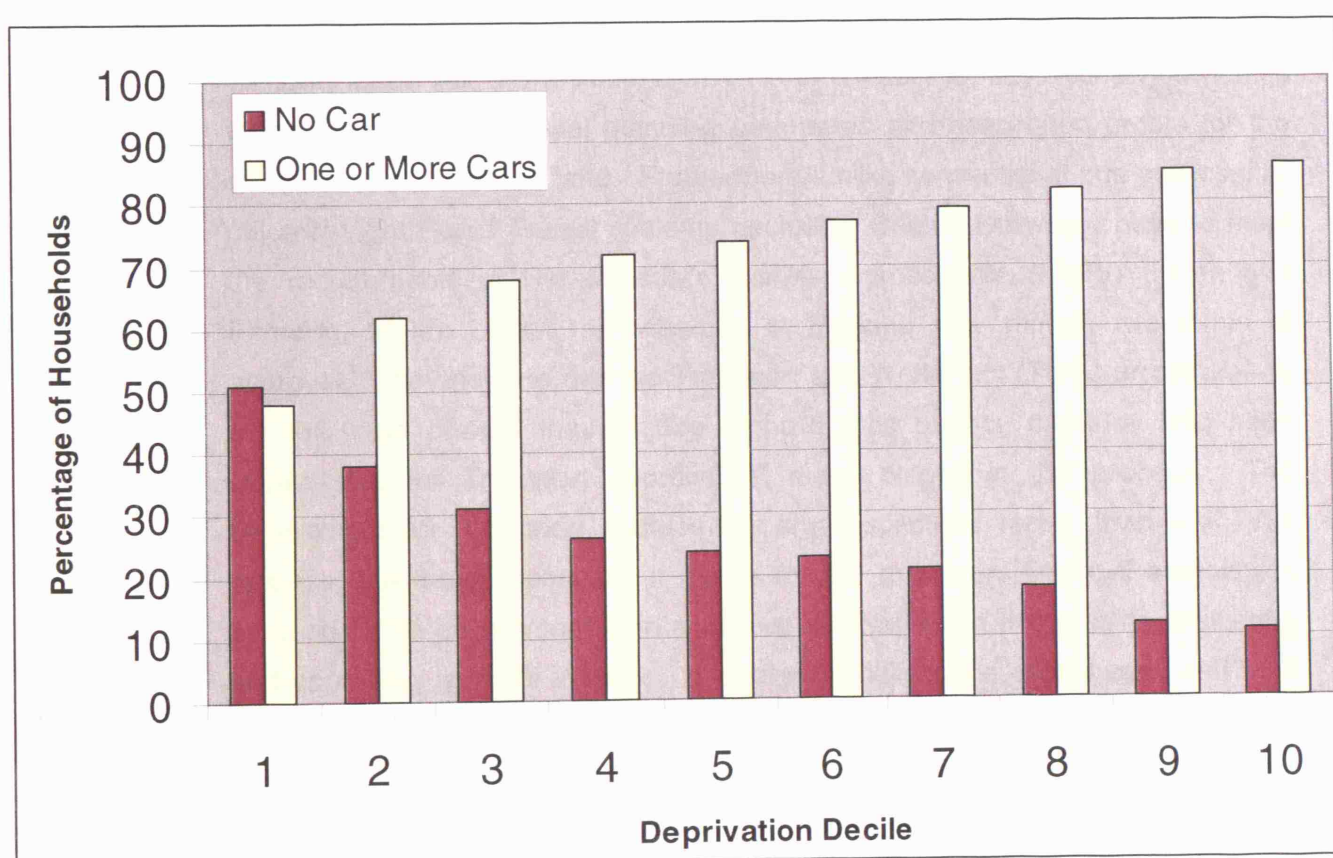
2.5.13 Despite the policy rhetoric of integrated transport and land use planning, major new developments continue to be dispersed. However, many of these location decisions are taken out of the hands of planners by other more powerful agencies (such as health and education) or more compelling considerations of private profit, job creation and value for money (Lucas, 2006). Public transport networks have also largely failed to adapt to new land use patterns and irregular working hours, meaning that those who rely on them have less opportunity to access key activities and amenities (Lucas, 2006). Even a public transport system that has been successful (such as Tyne and Wear Metro) can lose passengers over time as car ownership increases and decentralisation occurs (Mackett and Edwards, 1998).

2.5.14 Physical access constraints to public transport may also lead to increased levels of social exclusion for some groups. All new tram and light rail systems are fully accessible. This contrasts with full-size local buses which has a target of 50% by 2010/11, and a current standing of 46%, having risen from only 8% in 1997/98 (Department for Transport, 2005b).

2.6 How are Light Rail Schemes Promoted and Evaluated?

2.6.1 Until 1992, Light Rapid Transit schemes in the UK generally required the authority of an Act of Parliament. This is in contrast to, say, highway schemes which require conventional planning permission and associated orders for the compulsory purchase of land. Furthermore, unlike conventional bus services, all rail and Light Rapid Transit systems (including Guided Busways) have to meet the requirements of Her Majesty's Railway Inspectorate (HMRI) (Hylen and Pharaoh, 2002). Light rail schemes in England now require two forms of approval. They need to use the Transport and Works Act (TWA) procedures to get the legal powers they require to build their project, but they also need Department for Transport approval at many stages in the process. The Department for Transport decides on any inspector's report from the TWA process, but more importantly it needs to give promoters financial authority to proceed. The government is in a difficult position when it comes to evaluating and approving light rail systems. It bears the bulk of the capital cost, and so it must scrutinise the proposals carefully. It also faces any risks borne by the public sector, since although these may be the responsibility of the promoters, in practice, as the experience in Sheffield shows, the Department may find itself

bailing out imprudent local authorities (House of Commons Transport Committee, 2005).

2.6.2 The Ten Year Plan (Department of Transport, Environment and the Regions, 2000c) included a target to more than double light rail use (an implied increase from 120 million light rail passengers a year in 2000/01 to 240 million by 2010/11 that could be expected from the opening already-approved schemes and was therefore not really challenging) and an aspiration to deliver up to twenty five new light rail schemes (but no quantification of the investment or the length of schemes). However, in the meantime, schemes were beginning to operate unprofitably and patronage in Manchester was below expectation, therefore the caused uncertainty for the private sector.

2.6.3 The development and delivery of tram schemes in England has become bogged down in issues of affordability, funding and the planning process. For example, schemes close to their final stages of development such as Merseyside, Leeds and South Hampshire have become axed by the government's funding approach. The West London Tram project being promoted by Transport for London is in danger of being stalled by influential Nimbys and local politicians with an eye to re-election. In fact, local pressure from car users is resisting the tram proposal on the grounds that trams will hold up car traffic (Planning, 12 May 2006). This contrasts to France where, for example, schemes such as Lyon have emerged very quickly with over-riding strategic objectives and political vision allowing city authorities to rapidly plan, fund and approve schemes. The difficulty in delivering new systems is summed up by:

> *In England, minimising demands on the public purse, and minimising risk, is implicitly the main priority in the way light rail is developed. Provision of the optimum public service to serve wider economic, social or environmental objectives is stated in the rhetoric, but does not encourage the development of light rail, as apparently is the case in France' (Hylen and Pharaoh, 2002).*

2.6.4 Tony Blair, the Prime Minister, in his foreword to the Department for Transport's White Paper *The Future of Transport: a Network for 2030*, stated:

> *Good transport is essential for a successful economy and society. It provides access to jobs, services and schools, gets goods to the shops and allows us to make the most of our free time (Department for Transport, 2004b).*

2.6.5 However, whilst noting the opening of the new light rail system in Nottingham and mentioning the role of various schemes and policies '*appropriate where it makes economic sense and, is realistic environmentally*', he made no mention of a role for light rail in the next thirty years. Following up, the Secretary of State for Transport, Alistair Darling, responding to pressures of '*safeguarding our economic and social well being and our environment*', also finds no role for this mode, in contrast to earlier pronouncements in the Ten Year Plan. The White Paper goes on to (very briefly) review the role of light rail in terms of worries about affordability and risk associated with delivering this solution.

3 Literature Review

3.1 Introduction

3.1.1 The key sources reviewed and cited in this section include local and national government, government agencies, published academic research and articles. Though by no means exhaustive, the literature search confirms the extensive breadth and depth of contemporary material in this area, including policy, practice and academic endeavour. Other key resources are the project appraisals and studies reported by promoters, local authorities, their consultants and the Passenger Transport Executives of the major cities. This draws together themes from the perspectives of the public transport providers and promoters, the 'transport and social inclusion debate', and the 'barriers' to delivering effective public transport in England.

3.1.2 Having, in Sections 1 and 2, identified the need for study of the impacts of light rail on social inclusion in England, and provided an overview of the implementation and characteristics of light rail in recent years and the general problems of social exclusion based on published national statistics, this section reviews the literature in the area to explore the extent to which other research has touched on this subject and provide a foundation and can help inform this investigation. Firstly, however, the three key 'starting point' documents described in Section 1 are reviewed in further detail in order to examine how the problem of urban public transport (and light trail in particular) and social inclusion is addressed and conceptualised in the recent literature.

3.2 Key Documents

3.2.1 The three recent documents that are used provide the starting point for this research together highlight the need for a study of the impact of light rail on social inclusion. The three documents, in sequence of publication, are:

- *'Making the Connections: Final Report on Transport and Social Exclusion'*, published by the Social Exclusion Unit in February 2003;

- *'Improving Public Transport in England Through Light Rail,* published by the National Audit Office in April 2004; and

- *'What Light Rail can do for Cities'*, published by the Passenger Transport Executive Group in February 2005.

3.2.2 In England, the concept of social exclusion came to the fore with the setting up by the government on 1997 of the interdepartmental Social Exclusion Unit (there are separate devolved strategies for Scotland, Wales and Northern Ireland). The Social Exclusion Unit has developed a range of policies and redirected other policies towards the social exclusion agenda, to address the lack of policies to address the structural causes of decline, a failure to engage local communities, too great an emphasis on regeneration at the expense of creating opportunities for people, and a failure to develop 'joined up' approaches (Percy-Smith, 2000).

3.2.3 The Social Exclusion Unit's first report, '*Bringing Britain Together*' (Social Exclusion Unit, 1998), announced a programme of investigation into the multiple problems facing people living on Britain's worst estates, noted that physical isolation was a regular feature of many of England's poorest neighbourhoods and identified that many estates had become effect 'no go areas' for services and deliveries and 'no exit areas' for the people living on them. The report also found that numerous deprived neighbourhoods lacked the basic public and private services which others take for granted, for example local food stores, health services, and banks. This, combined with low car ownership and inadequate public transport provision, meant that many of the people living in these areas would be suffering from an 'accessibility deficit', which could be contributing to their social exclusion (Lucas, 2003).

3.2.4 The problem of social exclusion and local public transport was encapsulated as:

> '*Despite the recent transformation of city centres the conurbations still contain significant concentrations of deprivation, social exclusion and low car ownership. Public transport is critical to these areas and groups who depend on affordable public transport for access to jobs, education and other key services. Nowhere more so than in the city regions where the majority of the country's most deprived neighbourhoods are to be found: 84 of the 100 most deprived neighbourhoods in England can be found in PTE areas; a third or more households in PTE areas do not own a car, and bus and rail fares both rose by more than a third between 1980 and 2003, in contrast the overall real cost of motoring has remained at or below its 1980 level' (Passenger Transport Executive Group, 2004).*

3.2.5 Meanwhile, '*Making the Connections*', stated that:

> '*Historically, nobody has been responsible for ensuring that people can get to key services and employment sites. As a result, services have developed with insufficient attention to accessibility. In addition, too often access to services has been seen as merely a transport issue rather than one that can be solved by, for example, better land-use planning, or through policies to enable safer streets and stations' (Social Exclusion Unit, 2003).*

3.2.6 This reflected the desire to ensure 'joined-up government' on the impacts of transport patterns on health, social polarisation and urban regeneration. For example, statements on health and social exclusion linked air pollution, and promoting healthier lifestyles by walking and cycling. On social exclusion, improving the availability and quality of public transport was deemed equally important, with the low levels of car access in particular groups, including women, the elderly, the young and the unemployed, as being a major barrier to 'a fairer, more inclusive society' (Docherty, 2003).

3.2.7 To meet objectives to promote mobility and reduce social exclusion, 'The Department [for Transport] continues to work with other Government departments to implement the 37 cross-Government policies contained in the Social Exclusion Unit's 2003 report *Making the Connections: Transport and Social Exclusion*. Almost half of the policies have now been implemented' (Department for Transport, 2004a). The Department for Transport *Annual Report* went on to say:

> *Following the SEU report, local authorities will be expected to pay greater attention to accessibility in their second LTPs, due in 2005. Accessibility planning seeks to ensure that there is a clearer and more systematic process for identifying and tackling the barriers that people, especially those in deprived groups and areas, face in accessing jobs and key services, such as education and health care' (Department for Transport, 2004a).*

3.2.8 The key idea in *Making the Connections* was 'accessibility': can people get to key services at reasonable cost, in reasonable time and with reasonable ease?

> *Accessibility depends on several things: does transport exist between people and the service? Do people know about the service? Do people know about the transport, trust its reliability and feel safe using it? Are people physically and financially able to access transport? Are the activities and services within a reasonable distance? Solving accessibility problems may be about transport but also about locating and delivering key activities in ways that help people reach them (Social Exclusion Unit, 2003).*

3.2.9 The 2004 National Audit Office report on *Improving Public Transport in England Through Light Rail* found that light rail had improved the quality and choice of public transport, and departmental expenditure had been kept within budget, but it also considered that:

- *Passenger numbers, and therefore benefits, had been lower than expected;*

- *Light rail systems were not fully integrated with other forms of public transport;*

- *Light rail had a limited impact on road congestion, pollution and road accidents;*

- *It was not clear what impact light rail has had on regeneration and social exclusion (National Audit Office, 2004).*

3.2.10 As a consequence, it recommended that:

> *'In conjunction with promoters, the Department (for Transport) should commission a comprehensive evaluation of the costs and benefits of every light rail scheme it has funded after it has opened to assess whether the expected number of vehicles and other infrastructure has been put in place, the frequency and speed of services are as expected and systems are delivering the other expected benefits to passengers and local communities' (National Audit Office, 2004).*

3.2.11 The Department (for Transport) has failed to give a strategic lead in the development of light rail. Indeed, the House of Commons Transport Committee in 2005 was surprised to learn that that there had been no consistent evaluation of the effects of light rail schemes and went on to ask itself 'does light rail have a future in the United Kingdom?' (House of Commons Transport Committee, 2005).

3.2.12 Barriers to public transport delivering social inclusion policy objectives were set out by the Social Exclusion Unit (2003) and taken up by the Passenger Transport Executive Group (2003) in terms of the following four themes:

'Cost of Transport

Public Transport fares are well above the European average, and continue to rise in real terms. PTEs are trying to target fares initiatives at low income groups, but difficulties in deregulated bus environment.

Services and activities located in inaccessible places

As traditional centres and sectors of employment have declined, new employment opportunities have sprung up in new and often peripheral locations. A range of facilities that used to be centrally located are moving out-of-town; including hospital, colleges and shopping centres..... At the same time many social housing estates are located on the edge of towns, remote from key services and poorly served by public transport. Many deprived areas are also short of key facilities, such as shops and healthcare centres.

Crime

Fear of crime is a significant deterrent to the use of public transport. This is often the case in deprived areas where people are around five times more likely than those in the least deprived areas to say that they are concerned about levels of crime.

Travel Horizons

People on low incomes can be reluctant to travel long distances. The average distance to work for people on low incomes is three miles compared with eight miles for the general population. This is a particular problem for job seekers, who may be unwilling to look for, or consider, job vacancies outside a narrow geographical area' (Passenger Transport Executive Group, 2003).

3.2.13 *Improving Public Transport in England Through Light Rail* provided a rather critical review of central government's role in funding and monitoring light rail schemes. The National Audit Office remit was to consider the proper expenditure by the Department for Transport in its evaluation and funding of light rail schemes, and on monitoring delivery and performance against original objectives to ensure value for money. In doing so, The National Audit Office reviewed the seven light rail schemes built since 1980, to which the DfT has contributed over £1 billion (out of a total cost of £2.3 billion), and concludes that, owing to lack of evaluation and measurement, the Department for Transport

> *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* (National Audit Office, 2004).

3.2.14 Specifically, the *Improving Public Transport in England Through Light Rail* concludes that it is not clear what impact light rail has had on regeneration and social inclusion:

> *The impact of light rail upon regeneration might take several years to become apparent and, to date, quantitative information about systems' impacts has been collected for only the Sheffield system. None of the evaluations has measured a system's impact on the inclusion of socially disadvantaged people, although social exclusion as an objective of light rail has been a relatively recent development. In measuring regeneration and social inclusion benefits, it is difficult to separate the impact of light rail from other regeneration programmes in the local or national economy* (National Audit Office, 2004).

3.2.15 *Improving Public Transport in England Through Light Rail* also highlighted some key differences between systems in England compared with those in France and Germany. Features in Europe that help improve the delivering of benefits to passengers and local communities include:

> *higher levels of segregation allowing 'faster, smoother and more reliable services'; full integration of buses, ticketing and timetables 'facilitating seamless journeys', and in France, 'all new systems involve improving the streets through which the light rail lines run' (National Audit Office, 2004).*

3.2.16 The National Audit Office also found that, in comparison with France and Germany, patronage levels in England are low. They identified three main reasons for this: fare subsidies (for example, 70% in Grenoble); larger patronage bases (through higher population densities and stop frequencies), and better connections to major generators such as hospitals, universities and commercial and shopping centres (whereas in England many routes are based in old railway lines remote from traffic generators) (National Audit Office, 2004). Five barriers hindering the wider take up of light rail and a range of issues that need to be tackled if future systems are to be improved were identified and are reproduced in Table 3.1.

3.2.17 The thirteen recommendations arising from *Improving Public Transport in England Through Light Rail* focus mainly on affordability. However, it also identified three areas where light rail has contributed to regeneration and the inclusion of socially disadvantaged people: Salford Quays and Eccles (on Manchester Metrolink); New Addington (on Croydon Tramlink), and Wednesbury (on Midland Metro). However, the impact of light rail on regeneration and social exclusion has not been fully evaluated, and the National Audit Office acknowledges that

> *the full impacts could take 'several years to achieve' and '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 (National Audit Office, 2004).*

3.2.18 The seven Passenger Transport Executives (PTEs), Tyne and Wear (Nexus), West Yorkshire (Metro), South Yorkshire, Greater Manchester, West Midlands (Centro) and Merseyside (Merseytravel), are responsible for the development of public transport for Britain's largest city regions. The Passenger Transport Executive Group, publishes research (and lobbying material), notably their *What*

Light Rail Can do for Cities (2005) and *Transport and Social Inclusion* (2003). The 2005 report *'What Light Rail Can Do For Cities',* gathered together a wide range of evidence on the advantages of light rail and modern trams in general.

Table 3.1: Summary of Barriers and Issues

Barriers	Issues
1. Cost – the most significant factor	lack of standardisation; application of heavy rail standards; expense of utilities diversions barriers to innovation
2. Poor financial performance	risk and procurement passenger demand forecasting revenue collection
3. Funding	limited availability of revenue funding other means of funding, e.g. congestion charging or developers
4. Uncertainty	planning approval process to be speeded up funding approval stability
5. Expertise	lack of knowledge in local authorities

Source: National Audit Office *(2004)*

3.2.19 The Passenger Transport Executives, conceded that 'the role of light rail in promoting social exclusion has not been well researched' (Passenger Transport Executive Group, 2005). They claim a special contribution that new tram and light rail projects have played in transforming formerly declining areas and perceptions of the areas they serve, opening up development sites and providing direct and high capacity access to city centres (Passenger Transport Executive Group, 2005). However, perhaps the clearest indication of the relative significance and understanding of the three key areas assessment and policy of economy, environment and society is reflected in the space afforded to these topics in their *'What Light Rail Can Do for Cities?'.* Whilst the evidence described from case studies on *'improving the image, improving the economy'* amounts to 23 pages and *'a better and safer environment'* is covered in eight pages, *'promoting social inclusion'* can be dismissed in merely five pages.

3.2.20 The latter topic is summarised as evidence that light rail promotes social inclusion by:

- *'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' (Passenger Transport Executive Group, 2005).*

3.2.21 Therefore, much of the case study evidence of the potential for light rail to promote social inclusion apparently arises from the accessibility of the systems and their infrastructure for those with physical difficulties, with provision of level entry, wheel chair access and comfortable ride, together with security surveillance, provided as standard. A summary of the case study evidence (but with no quantified impacts) put forward has been distilled in *'What Light Rail Can Do for Cities'* and summarised in Table 3.2. It is also notable that the Passenger Transport Executive Group's special report *Transport and Social Inclusion* (Passenger Transport Executive Group, 2003) contains many practical examples of local transport initiatives to improve social inclusion, yet none of these was directly or specifically related to use of trams in their areas. *What Light Rail Can Do for Cities* concludes on promoting social inclusion by lamenting the lack of evidence and experience, and identifying four 'key roles' that light rail can play:

- *Improving independent access and confidence in journey reliability for the mobility impaired;*

- *Access to jobs for deprived areas;*

- *Access to local community facilities and shops;*

- *Encouraging trips for groups particularly affected by personal safety concerns. (Passenger Transport Executive Group, 2005)*

3.2.22 Table 3.2 summarises the evidence put forward by The Passenger Transport Executive Group. However, it is clear that this evidence is neither overwhelming nor convincing, and certainly has no consistent measurable outputs or monitoring.

Table 3.2: UK Light Rail Experience on Promoting Social Inclusion

Case Study	Evidence Cited
Tyne and Wear Metro	• Provision of access to employment including for deprived areas • Promotion of public transport use at Jobcentres
Docklands Light Railway	• Evidence of contribution to *'the improvement of deprived areas'* • Social exclusion exacerbated by problems of increased house prices and new office employment resulting from regeneration, and 'not for us' opinions. • Provision of access to *'a range of local facilities for local people'* • Research undertaken in 2004 (with London Borough of Tower Hamlets) into 'barriers to use' perceived by excluded groups reported problems of service frequency; personal safety; passenger information; access to better jobs/homes; some stations 'cold and windy'; high fare levels perceived.
Manchester Metrolink	• Initial phase not driven by social inclusion objectives although subsequent extension to Eccles provides links between some relatively deprived areas with new job opportunities at Salford Quays
Sheffield Supertram	• Research evidence that the positive effects of Supertram on social inclusion envisaged have been undermined by fierce competition from buses.
Midland Metro	• Midland Metro was developed to assist achieving better social inclusion • Active promotion of use of Metro by job seekers • Links provided between areas of high unemployment with developing employment sites in Handsworth and Smethwick , and Wolverhampton and Birmingham city centres
Croydon Tramlink	• Evidence reported that Tramlink's reliability has had a positive impact on improving accessibility and mobility for disabled • Evidence reported that Tramlink has had a positive impact on access for socially excluded groups to retail, leisure, employment and community facilities • Key objective of system was to improve access for relatively deprived New Addington. Reported 'before and after' journey times to Croydon town centre 'almost halved' by some 22 minutes • Evidence of Jobcentre servicing a wider catchment within set time and cost • 'apparent' that system opened up opportunities for access to jobs in Croydon and Central London
Nottingham Express Transit	• Potential for access to new job opportunities in Nottingham from Hucknall suffering a decline in traditional primary industries • Tram serves pockets of deprivation in city and will improve access to job opportunities

Source: Distilled from Passenger Transport Executive Group (2005)

3.3   Light Rail, Economic Development and Land Use

3.3.1   Most of the debate in the literature regarding the impact of public transport systems on social exclusion is not explicit, but is wrapped up in general terms of economic development and regeneration. It is, therefore, important to review the motivation for promoting light rail projects in these terms. Investment in public transport is clearly seen as a significant factor in the economic success of cities. The implication is that an economically successfully city is likely to raise the general level of prosperity, reduce poverty and deprivation, and thereby reduce social exclusion. The Passenger Transport Executives claim that they are making a substantial contribution to regeneration through promotion of tram schemes.

> '*Light rail has a positive and catalytic effect on urban regeneration and city image – triggered by the tangible and permanent commitment to an area that light rail represents. For some brownfield regeneration areas it also provides the high capacity, high quality access fundamental to getting large scale redevelopment off the ground. Without Manchester Metrolink, for example, it is highly unlikely that the successful regeneration of Salford Quays would have taken place. The Salford Quays extension cost £150 million but created over 3,000 permanent jobs, stimulated £60 million of investment by business and boosted the economy of Greater Manchester by £70 million a year' (Passenger Transport Executive Group, 2004).*

3.3.2   Often a key catalyst cited for the development of a mass transit system is the need for economic regeneration. However, where mass transit systems have been implemented, the degree to which regeneration has been achieved, and the extent to which the mass transit system is itself responsible, remains a subject of debate. In part this is because such areas are also often targeted with investment to stimulate growth in employment and industry and thus it is not possible to separate out the effects of the mass transit system alone (Commission for Integrated Transport, 2005).

3.3.3   The most popular reason in the study by Mackett and Edwards (1998) summarised in Table 2.4 (13 times out of 25 cases) was to stimulate development. Clearly it is believed that light rail systems can help to stimulate development. However, it is not so clear what mechanism underlies that process, other than 'image', 'confidence' and so on (Balcombe, 2004). According to Hass-Klau (2004), economic effects are very difficult to attribute to one cause, such as the opening of a new light rail line. 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 (Passenger Transport Executive Group, 2005).

3.3.4 Branding and marketing of new light rail is now an integral part of any self-respecting city regeneration initiative as a symbol of the modern and 'European' lifestyle, and feature prominently in city marketing. Once any negative consequences of disruption during construction are overcome, in most cases immediate and discernable benefits appear to have been derived from a city being 'able to feel good about itself' (Passenger Transport Executive Group, 2005). Having reviewed the wide-ranging evidence from North America and Europe, Balcombe (2004) summarises the contribution of light rail to economic growth in the following terms:

> 'The stimulation of development is a key objective for the building of many light rail systems. A new light rail system will not, on its own, induce development, but it can form part of a package to facilitate development. It plays several roles in the process: it provides a modern, efficient way for residents to reach jobs outside the area, it provides access into the area for workers, shoppers and those on leisure trips, it demonstrates a commitment to the area by various levels of government, it provides a useful theme for marketing the area, and so on....It can be seen that light rail systems can be used with complementary policies to stimulate development in particular areas. In some cases this may be simply a matter of shifting development from one area to another, and therefore not necessarily adding to the overall level of economic development in the city. In other cases, it may be making the city served by the light rail system more attractive than other cities without such a system, and so adding to economic growth locally, but not at a regional or national level' (Balcombe, 2004).

3.3.5 As Balcombe (2004) observes, 'new systems are usually the subject of extensive marketing campaigns and branded with suitable names such as *Metrolink* or *Supertram*'. The tangible investment in the shape of light rail can come to symbolise less visible investments in regeneration programmes, and

> developers seem to 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' (Passenger Transport Executive Group, 2005).

3.3.6 Therefore, positive and unequivocal evidence of the impact of tram systems is rare. For example, Hylen and Pharaoh (2002, p15) state

> ....it would be difficult with the benefit of hindsight to conclude that the cities that have introduced such systems would have been better off without them. For some, the tram has given a boost to the city image, and given a lift to the image public transport and hence its overall ability to compete with the car...... There is also the prospect that systems will enable major regeneration of inner city and other areas, although it must be said that the evidence of direct causality in the respect is hard to find'.

3.3.7 The Passenger Transport Executive Group, unsurprisingly, is also upbeat about the positive economic effects of light rail, whilst also conceding that pinning down precisely quantified impacts attributable to new systems is impossible (Passenger Transport Executive Group, 2005).

3.3.8 Following an extensive comparative review of systems in England and France, the message from case studies is a mixed but fairly positive one:

> Tram and related systems can bring great benefits in the context of environmental and urban vitality objectives. Although the investment costs are higher than for bus transport, this can be offset by greater benefits, especially if the less tangible social and environmental benefits are given due weight' (Hylen and Pharaoh, 2002).

3.3.9 Promoters of schemes are, therefore, confident both that new public transport projects will confer significant benefits for the disadvantaged and that trams are the most effective mode to deliver them compared to buses and other intermediate modes. For example:

- the Cross River Tram

> ...would provide benefits in improving circulation in central London, assisting in the regeneration of a number of sites, improving public transport accessibility for a disadvantaged population and improving the environment. This can only be achieved by providing a high-quality, reliable public transport system. The studies showed that only the electric modes could provide the benefits, with trams giving the best overall balance' (Transport for London, 2000).

- It is clear that some schemes, such as Docklands Light Railway or Manchester Metrolink

> have had significant regeneration benefits, and that this perceived regeneration effect is the aspect of light rail that is most attractive to promoters, and to local authorities which hope their area will benefit

from a light rail scheme' (House of Commons Transport Committee, 2005).

- In evidence to the committee, Merseytravel noted that:

  'Businesses and communities know that light rail systems, once constructed, will remain in operation over the long-term in order to get a return on the initial capital costs. They will not easily be withdrawn, therefore. This permanence enables other investments to be made along the route of light rail systems, which bring major associated social and regeneration benefits. Light rail is a key driver for economic and social regeneration' (House of Commons Transport Committee, 2005).

3.3.10 It is also interesting to consider the 'before' studies of schemes whose chances of construction have recently receded owing to central government affordability and funding issues. For example, on the economic impacts of the proposed Leeds Supertram (a 28 kilometre system serving three corridors), the expectation is that light rail will 'provide a high degree of business confidence and generate significant jobs and investment in the city' (Shutt and Kumi-Ampofo, 2003). Furthermore, the scheme is described as

> *'vital to future economic growth in Leeds by providing a sustainable means of transport for people to access existing and forecast employment opportunities......In addition, Leeds Supertram serves a number of deprived communities in Leeds and will bring new travel opportunities, which if coupled with local training and skills initiatives, can further facilitate Leeds' regeneration programmes' (Shutt and Kumi-Ampofo, 2003).*

3.3.11 There is also, apparently, a competitive edge between cities with regard to their prospective light rail systems. Leeds, perceiving itself to be in rivalry with Edinburgh, Birmingham, Glasgow and Manchester for financial services is concerned that those cities will steal a march by developing their light rail systems before Leeds (Shutt and Kumi-Ampofo, 2003).

3.4 The Transport and Social Inclusion Debate

3.4.1 Transport is becoming a basic human necessity, and ensuring that everyone has adequate access to it is a valid area of concern for public policy (Lucas, 2004). Therefore, a further necessary dimension to the debate, and a rich seam for current thinking, policy and practice, is the broad area of social exclusion policy, practice and research in which the role of transport plays only a part:

> *'social exclusion is about our inability to keep everyone within reach of what we expect as a society. It is about our tendency to push the more vulnerable, less able and more difficult individuals into the least popular places, furthest from our common aspirations' (Rogers and Power, 2000).*

3.4.2 Even defining terms seems to be an onerous task for various authors and semantics and nuances of meaning, such as the relationship between poverty and deprivation, are debated at length in the literature concerning social exclusion and social inclusion. The debate obviously extends far outside transport planning into the realms of social policy theory and beyond. Much of the literature is therefore largely impenetrable for the non-expert, and this study does not attempt to explore that territory in detail.

3.4.3 For example, Church *et al* (2000) express the need for consistency in defining and distinguishing between social exclusion and poverty, otherwise meaning and measurement are not useful. They distinguish between the term 'poverty' which implies an absolute or relative access to material welfare, and 'social exclusion', a broader concept which usually implies that some people or households are not just poor, but they have additionally lost the ability to connect with many of the jobs, services, and facilities that they need to participate fully in society (Church *et al*, 2000). However, defining terms is only a part of the problem:

> *If disentangling poverty and social exclusion is conceptually difficult, establishing appropriate measures and indicators is even more challenging. Which indicators are chosen, and which are seen as the most important, depends on the views of both the nature of social exclusion and its causal connection to poverty, which frequently remain implicit rather than explicit (Levitas, 2006).*

3.4.4 Therefore, to provide a starting point, a secondary source interpretative summary (from the transport planning profession) will suffice:

> *The concept of social exclusion seems originally to have been proposed by social theorists as a portmanteau term to describe the coexistence and co-development of a number of social problems (such as unemployment,*

poor educational attainment, poor housing, poor health, low uptake of social service provision, failure to participate in political processes etc) associated with the fragmentation of traditional social structures and relations, the decline in participation in the normal institutions and processes of society and the growth of deprivation amongst particular social groups. These problems were seen as being both related to one another and related to, though not completely explained by, traditional notions of relative or absolute poverty' (Centre for Transport Studies, 2006).

3.4.5 The social costs of poor transport and the benefits of reducing these as part of a welfare agenda are often poorly understood and even more poorly monitored, with the result that

....increasingly essential services such as jobs, hospitals, schools and shops are situated in places that are virtually impossible to access without a car. This means that those people in the population that most need these services are often least able to reach them, and yet transport and access considerations rarely play a part in decisions about the location of these services. In the main, these considerations do not play a part in mainstream planning decisions either, and the shift away from a demand-led planning model has generally not facilitated wider consideration of the social costs of transport policy. Equally, transport policy has been seen as 'falling outside' of this realm of social policy inquiry, either because it has been overlooked as a basic commodity or because the market system of delivery, supported by the state subsidies that are already in place, are presumed to be adequate for meeting people's travel needs' (Lucas, 2004).

3.4.6 Alongside transport-related social exclusion, a further key concept in this debate is accessibility. 'Not only is there seen to be a tendency for social exclusion to be clustered spatially, but the properties of location and accessibility are seen as fundamentally important in determining the ability of individuals to participate in normal social institutions and processes' (Centre for Transport Studies, 2006). This is an issue that reaches beyond transport solutions: within this debate are broader issues around the spatiality of public services and other key locations, and land use policy. At the heart of this debate lies a new approach which seeks to integrate transport policy with more sophisticated spatial planning and land-use policy (Palmer and Adams, 2005). Rising car ownership and use, together with a mutually reinforcing circle of dispersal of activities evidenced by increasing trip lengths, have compounded the problem of transport-related social exclusion and confounded social policy in this area. 'The consensus is that public transport networks have failed to respond to changes in spatial policy, creating swathes of

people facing acute mobility and accessibility disadvantage' (Social Exclusion Unit, 2003).

3.4.7 Madanipour (1998) identifies three dimensions of social exclusion for analysis and understanding in which social inclusion and exclusion are manifested: the economic, political and cultural arenas. In the economic arena, the main form of inclusion is access to resources, which is normally secured through employment.

> *The main form of exclusion, therefore, is a lack of access to employment. Marginalisation and long-term exclusion from the labour market lead to an absence of opportunity for production and consumption, which can lead to acute forms of social exclusion. Exclusion from the economic arena is often considered to be a crucial and painful form of exclusion. Poverty and unemployment are therefore frequently at the heart of most discussions of social exclusion to the extent that poverty and economic exclusion are equated with social exclusion. It is important, however, to note that there are other forms of social exclusion in political and social spheres (Madanipour, 1998).*

3.4.8 Madanipour (1998) also observes that there is a spectrum of social exclusion between these interrelated arenas: the most acute impacts being felt when elements of economic, political and cultural arenas are simultaneous; the other end of the spectrum is occupied by citizens who are fully integrated into the mainstream of society, and in between there is a wide range of variations in which individuals and groups are included in some arenas but excluded in others. This concern focuses attention on the link between transport provision and activity participation, in particular on the way in which the physical, financial, spatial, temporal and psychological constraints imposed by the transport system may specifically and cumulatively affect particular target groups (Centre for Transport Studies, 2006).

3.4.9 'In a highly mobile society, a lack of adequate transport provision means that individuals become cut off from employment, education and training and other opportunities. This in turn perpetuates their inability to secure a living wage and thus to fully participate in society. Poor access to healthy affordable food, primary and secondary healthcare and social services exacerbate the health inequalities that are already evident among low income groups, further reducing their life chances. People can become housebound, isolated and cut off from friends, family and other social networks. This can seriously undermine their quality of life and, in extreme circumstances, may lead to social alienation, disengagement and, thus, undermine social cohesion' (Lucas, 2004).

3.4.10 'For those reliant on public transport services, there may be gaps in network coverage and other factors such as the timing of services and the cost of fares, which prevent people from travelling. Other factors such as fear for personal security and physical disability can also act as significant barriers for travel' (Lucas, 2004 p44).

3.4.11 However, there is a potential conflict between government policies to provide for increases in mobility and the goal of achieving accessibility, and the aim should be to provide accessibility without excessive travel. It may be argued that the aim should be to provide accessibility without excessive travel and the consequences that that brings (Simpson, 2005). However, not everybody has shared in increased mobility and have been left behind – socially excluded. They depend on services which have decayed or disappeared and have difficulty in reaching those further afield.

3.4.12 'In the past, transport policies have been blind to such issues because the theories and models that have informed them were more concerned with the efficient operation and maintenance of the system than meeting the accessibility needs of the people using it. Similarly, professionals concerning themselves with the anti-poverty and social welfare agenda have failed to recognise and address the important dynamic role of transportation in creating and reinforcing social and economic disadvantage' (Lucas, 2004 p291).

3.4.13 However, the situation is complex. 'Individual labour market activity is frequently promoted for its intrinsic benefits in providing an arena of social contact and interaction and as the basis of self-esteem and social recognition, as well as the instrumental benefit of affording a (potential) route to an adequate income' (Levitas, 2006). However, 'linking social exclusion to labour market activity can imply that adults of any age not in paid work are to be considered socially excluded, whether or not they live with other adults who are in paid work, and whether or not they are poor. Jobless households are at risk of poverty, and possibly other forms of social exclusion' (Levitas, 2006).

3.4.14 According to Gough et al (2006 p55), 'few poor households have cars, and for those who require one – for example in rural areas – the expense can *make them* poor. Bus and train fares as a proportion of their income are very high and limit access to important economic and social activities. Holidays and visits at a distance are usually unaffordable. The social interactions of the poor are thus

spatially limited, and they are often confined to their home and immediate neighbourhood, something that the stigma of poverty reinforces.'

3.4.15 Recent studies have highlighted the significance of the links between transport and social exclusion and presented evidence on the important role that public transport access can play in ameliorating aspects of social exclusion for non-car owning households. Work has also highlighted what happens when public transport fails to deliver an adequate service for the lower income and excluded groups (Hine, 2003).

3.5   Operationalising Transport and Social Inclusion

3.5.1 The use of IMD data to produce indicators of social exclusion, calculated at ward and enumeration district level using census data, have been used in one form or another by the UK government since the 1970s in order to target regeneration policies on the most deprived areas. 'These indices suggest a somewhat broader concept than poverty, including a range of measures covering six key 'domains' (income; employment; health and disability; education, skills and training; housing; geographical access to services), spanning both economic and social factors' (Centre for Transport Studies, 2006).

3.5.2 'Most definitions of social exclusion are far too vague to form the basis of operational measurement. The general approach adopted in developing operational measures is to define a number of functional dimensions (or 'domains') of social exclusion and for each domain to propose one or more measurable indicators. This process results in a set of indicators, which together constitute the measure of social exclusion' (Centre for Transport Studies, 2006).

3.5.3 There is a distinction between social exclusion based at the level of the individual compared to those based explicitly or implicitly on the aggregate characteristics of the population living within a spatial area (Centre for Transport Studies, 2006). The former individual-orientated measures, they contend, do not show a strong correlation between the dimensions of social exclusion.

3.5.4 A short-coming of the weighted combination of the Index of Multiple Deprivation was identified in London (Church, Frost and Sullivan, 2000) in development of the Capital model of transport and social exclusion in London that was augmented with additional indicators of local accessibility derived from the Railplan network transport model. The reason for the need to augment the model was because the Index of Multiple Deprivation contains very little information about transport-

related phenomena and consequently was not able to reflect the effects of transport policy measures on social exclusion (Centre for Transport Studies, 2006 p11). Subsequent improvements to the 'access to services' domain in the Indices of Deprivation using physical distance remain relatively insensitive to most transport policy interventions that tend to affect travel times and costs (Centre for Transport Studies, 2006).

3.5.5 The Centre for Transport Studies (2006), in reviewing the measures of social exclusion, poverty and deprivation proposed by various academics, government departments, the European Union and Joseph Rowntree Foundation, concludes that there remain weaknesses.

> *'Firstly, whilst social theorists have been at pains to assert the distinctiveness of the concept of social exclusion in contrast to earlier concepts of poverty, deprivation and well being, there turns out to be little difference between the indicators typically chosen to characterise social exclusion and those used to characterise these earlier notions. In so far as social exclusion is indeed a usefully distinctive concept, the currently proposed measures do not succeed in capturing this distinctiveness. A second weakness with the existing measures is that although social theorists have stressed the importance of capturing the cumulative effect of disadvantage in different dimensions, most of the measures proposed only consider each dimension separately. Only the IMD 2000 measure attempts to combine indicator values from different dimensions into an overall measure and even this takes no account of the possibility of interactions (positive or negative) across different dimensions. A third problem is that the current measures take no account of the persistence or accumulation over time of social exclusion; ie just as there is no means of systematically aggregating across dimensions so there is also no means of systematically aggregating over time. A final methodological difficulty, which is of particular importance in the context of the relationship between transport and social exclusion, is the apparent inconsistency that exists between the conceptual definition of social exclusion as a phenomenon operating at the individual level and the operational definition of most measures at the level of a geographical area. When the geographical area is small (eg in the case of IMD 2000, a census enumeration district), the effect of the implicit averaging may not be great. However, when measures are computed for larger geographical aggregates, the effects are unclear'* (Centre for Transport Studies, 2006).

3.5.6 'The inclusion of the fulfilment of social inclusion objectives to the tasks that transport planners must undertake is a not inconsiderable challenge. If the [Ten Year] Plan is to be successful, it will be necessary that the transport needs and deficits of the socially excluded are fully known and adequately defined. It will also be desirable, if not essential, to establish some benchmarks so that planners can evaluate the extent to which new and different transport services and

infrastructure contributes to facilitating levels of access which would be considered 'normal' to those in need of them' (Solomon, 2003, pp155-156).

3.5.7 However, Solomon notes that

> '...for policy-makers and for the suppliers of transport infrastructure, answers to the question of "who should be providing how much of what and for whom" are still extremely nebulous, for the quite simple reason that very few, if any, norms of 'transport inclusion' have been established' (Solomon, 2003).

3.5.8 Using National Travel Survey statistics, Solomon highlights the differential between car owning and non-car owning households, and able bodied and those with disability, in average journey times. But, as the she point out: *'there are types of transport social exclusion other than average journey times. For example: Difficulties in accessing places and facilities that other people use as a matter of course, e.g. out-of-town shops, jobs involving anti-social hours, centralised hospitals and education facilities, leisure facilities open on Sundays; Problems related to areas of low income where service provision is defined as "inadequate", causing residents to travel out of the area to access their basic needs possibly incurring significant time and money costs; The prevalence of main roads, which are often associated with disproportionately high pollution and noise etc through areas of low income and "transport poverty", victimising those already possibly disadvantaged; The prevalence of low travel horizons, which may lead to low aspirations and therefore low achievement in areas in which travel is not traditionally part of the culture; Limitation of access caused by physical, mental and language problems (Solomon, 2003).*

3.5.9 Should the aim be to provide infinite levels of mobility and accessibility? But one difficulty remains that '..it is not possible to measure how far transport affects social exclusion'. Nor is it possible to define 'how much access, and to what, and its cost and convenience, would constitute inclusion' (Solomon, 2003).

3.5.10 Solomon suggests developing 'benchmarks' as a possible method, such as "twice the average generalised cost in fulfilling any journey purpose is the maximum socially inclusive transport cost". For example, "if it takes the average person ten minutes and costs a pound to go to the doctor, then anybody taking longer than twenty minutes and spending more than two pounds is transport-poor as far as visiting the doctor is concerned? In this way 'it would be possible to locate individuals or groups in the hierarchy of "transport poverty"' (Solomon, 2003). An

alternative approach she proposes is to consider "expectations" to establish what amounts of accessibility and mobility might be considered "reasonable" or "normal".

3.5.11 Church et al (2000) describe the research on transport and exclusion in the UK as following into one of two approaches: the 'category approach' (focusing on the travel patterns, attitudes and needs of particular groups who are perceived to be disadvantaged in relation to the transport system, such as women, the unemployed, elderly), and the 'spatial approach' (that has tended to be mostly concerned with rural areas or urban housing estates poorly served by public transport).

3.5.12 However, they are concerned that the category approach may be limited since the particular social groups may not be homogeneous in terms of their material affluence, or activity patterns, which will affect their transport needs and accessibility preferences.

3.5.13 The spatial studies, according to Church *et al* (2000), are often based on local areas, such as in the New Deal for Communities policy areas, providing little wider understanding of the strategic role of transport planning in tackling social exclusion in major cities. In fact, Church *et al* were seeking to explore the issue for whole of London with its 'unique and complex morphology, socio-economic character, mix of housing tenure, and its relatively dense public transport networks'. They state that:

> *'the differences and connections between the 'category' and 'spatial' approaches are not simply theoretical issues. They lie at the heart of questions over how transport resources are used to tackle social exclusion and to what extent resources should be allocated to benefit particular social groups, or to specific geographical areas' (Church et al, 2000). .*

3.5.14 Church *et al* (2000) found a further problem in defining and measuring poverty and social exclusion to be the very 'fine grained' nature of exclusion within large cities. The importance of this is that the boundaries of statistical areas may arbitrarily bisect an area or otherwise mask local pockets of exclusion.

3.6 Accessibility Analysis: The Way Forward?

3.6.1 It is clear that the concept of social exclusion as presently used in Government has dimensions that extend well beyond the realm of what has conventionally been regarded as dependent upon, or for that matter potentially open to influence

by, transport policy. However, it is equally clear that transport provision can potentially play an important role in influencing many of the outcomes that are enveloped in the concept of social exclusion since, in most instances, *inclusion* implies *participation* in processes and activities (eg labour markets, social services, social networks, etc) and this participation will often in turn depend upon *physical access* to the relevant facilities. The notion of social exclusion can therefore usefully be conceived of as (at least in part) related to constraints on individuals' capacity to command the means and resources to access key facilities' (Centre for Transport Studies, 2006).

3.6.2 In practice transport policy makers have been slow to recognise the nature and process of social exclusion. This is reflected in the lack of suitable indicators with which to address the links between social exclusion and transport. This is clearly associated with problems associated with defining and measuring these phenomena more generally. Also if the relationship between the different dimensions of exclusion is unclear then it is also as difficult to measure spatially. (Hine, 2003 p44).

3.6.3 A key aim of the government's new strategy for addressing transport and social exclusion, as set out in the Social Exclusion Unit's report *Making the Connections* is to ensure that people experiencing these problems can reach opportunities such as work, education and health treatment by improving access to these opportunities. The report recognises that this not only about improving transport but cuts across many areas of policy delivery, for example changing where and how services are delivered, reducing fear of crime and providing better information and travel training. Consequently, the government introduced a new duty for local transport authorities in England to undertake Accessibility Planning as part of their Local Transport Plans (LTPs), due for submission in 2005, with the aim of ensuring 'a clear and consistent process for identifying groups and areas with accessibility problems, linked to an action plan for addressing these' (Lucas, 2004).

3.6.4 The key aims of accessibility planning, now required in Local Transport Plans, include:

- Close liaison between transport planners, land use planners, service providers (such as Primary Care and Hospital Trusts, Local Education Authorities, key employers);

- Validation of action plans with local communities experiencing transport poverty;

- Provide improved information to decision makers on where accessibility is poorest and the barriers to accessibility;

- Create transparent and equitable transport and land use decisions;

- Synchronise and collaboration with partner agencies;

- Ensure greater consistency between transport and other public policy objectives (such as, housing, health, education, local regeneration);

- Make evident the implications of other aspects of service delivery such as opening and closing public facilities such as schools and hospitals;

- Make more evident the need for development control decisions to improve access to the transport system;

- Provide a methodology for local communities to argue for new services and facilities (Lucas,2006).

3.6.5 Lucas goes on to set out the key benefits of accessibility planning as:

- *Allows consideration of needs of minority groups whose demand for transport may be suppressed;*

- *Allows government to systematically assess the extent and severity of poor transport and encourage all relevant departments to think about the effects of their wider policies on transport and access;*

- *Provides a robust tool at the local level to consider the effects of changes in the transport system on people's access to opportunities;*

- *Consistency between transport and public policy objectives, and for development control decisions;*

- *Explain proposals to the public. (Lucas, 2004)*

3.6.6 Titheridge (2004) provides a useful overview of social inclusion in the specification by central government of policy instruments for local government. She concludes that 'tackling social exclusion has moved up the agenda of national Government and steps are being taken to ensure that this is also given due attention at local level, namely through the requirement for accessibility planning to be incorporating into the next round of Local Transport Plans'. She calls for 'clear, comprehensive and robust methods of social exclusion appraisal and monitoring' (Titheridge, 2004).

3.6.7 'In summary, it is clear that the general thrust of all these studies is to highlight the fact that inadequacies in transport provision (either in terms of access to the system itself or the level of service provided by the system with respect to key destinations and facilities) may create barriers limiting certain individuals and groups from fully participating in the normal range of activities, including key

activities such as employment, education, health care, shopping and social interactions. This concern focuses attention on the link between transport provision and activity participation and the role of accessibility (both to the transport system itself and within the system from origin to destination), issues that have long been the focus of transport analysis' (Centre for Transport Studies, 2006 p17).

3.6.8 'None of the widely available indicator-based measures take explicit account of the details of transport provision, although IMD 2000 does at least include measures of the spatial proximity of key facilities. It therefore seems likely that, at least in the immediate future, transport analysts will need to augment these generic measures of social exclusion with additional measures, more directly related to transport provision and outcomes (Centre for Transport Studies, 2006 p21). This will require '...a significantly greater degree of socio-economic and spatial disaggregation in modelling....to be able to identify the differential impacts of policies on socio-economically and spatially specific population groups. Whereas most existing transport models provide a reasonably detailed treatment of the spatial dimension, the treatment of socio-economic dimensions (eg income, employment, family structure, etc) is usually very crude'. Furthermore, '...most existing models tell us little about the nature, frequency or duration of activity participation, beyond the purpose of the bracketing trips.' In addition, 'in order to capture the full range of issues associated with social exclusion, the concept of accessibility must be broadened to include temporal, financial and situational factors and to include consideration of access to the transport system, as well as access within it' (Centre for Transport Studies, 2006 pp21-22).

3.6.9 Together with accessibility analysis and presentation of socio-economic data, such as census data and deprivation indices, this new approach permits a much more spatially based assessment of the impacts of transport schemes and a departure from the more aggregate net benefits approach. An example of software for accessibility modelling is Accession (Citilabs and MVA, 2004). Accession is used to measure accessibility to and through the multi-modal transport system. It calculates indicators of accessibility and uses the indicators and travel time information to describe the quality of the transport system and how it serves the public. Accession produces accessibility contour maps that can be spatially combined with demographic data for an efficient, powerful and to the point accessibility analysis.

3.6.10 Lyons, citing Grieco (2003), notes that measurement of social exclusion associated with transport requires thought. For example, the requirement (in LTPs) for local authorities to conduct accessibility planning leads to plotting of 'levels of access' whereas it is 'quality of access' that is ultimately important. Citing Clifton (2003), Lyons also notes that care is needed in surveying socially excluded groups because of low response or participation rates, low trust levels and consequently data collection is likely to be highly resource intensive.

4 Analysis of Case Studies

4.1 Introduction

4.1.1 Following the review of literature on how transport and social inclusion are conceptualised, this section seeks to identify the possible role of light rail drawing upon empirical evidence from case studies. This section analyses the changes caused by the intervention of a selection of light rail schemes in England. Light rail is a 'new' mode and, therefore, its specific effects should be measurable and separable from other modes of transport in its impacts. For each case study, a selection of graphical outputs is presented to illustrate the character of the study area.

4.1.2 The planning history, design, specification, business case evaluation, procurement, funding and implementation of light rail schemes in these case studies have been extensively documented and reviewed in the literature, for example Hylen and Pharaoh (2002), Balcombe (2004), Brand and Preston (2005), Passenger Transport Executive (2005), Hass-Klau et al (2000, 2002, 2004), as well as the various 'before and after' and 'impact' studies for particular systems and consultants reports. Some basic information on the case studies is provided in Table 1.1, and on trends in the use of the schemes in Section 2. Therefore, it is not necessary or appropriate to provide an extensive narrative on how the recent light rail systems in England were implemented. However, it is useful to provide here a short introduction to each case study to provide some background on the local system and setting. This section presents each case study separately, with general findings discussed at the end.

4.1.3 Most of the published 'before and after' and impact' studies undertaken focus on issues such as regeneration, retail activity and house prices, for example the Royal Institute of Chartered Surveyors (2004). Ideally, the study of social inclusion should relate more closely to direct human and socio-economic factors revealed from data, not secondary effects such as property values, and these should be expressed spatially. A range of indicators are available, such as indices of deprivation. However, a potential pitfall is that, by their nature, the socially excluded may be under-represented or mis-reported in the official census and statistics.

4.1.4 Consideration has also been given to which light rail systems to explore as case studies. Of the 'new wave' of schemes listed in Table 1.1 in the introduction to this study, there are significant variations in specification. It is proposed that only

the modern, street-running characteristic systems are considered, thereby excluding the wholly segregated-running DLR and Tyne and Wear Metro. The DLR may also be excluded on the grounds that it was specifically targeted at a massive new development area, whereas the others were embedded mostly within existing city fabric on established transport corridors. This leaves Manchester, West Midlands, Sheffield, Croydon Nottingham that opened in the period 1992-2004.

4.1.5 Three forms of comparative analysis are presented. Firstly, the scheme opening years are staggered relative to the 2001 census year. This precludes a direct, between schemes comparison of impacts over a fixed period. However, it does offer the alternative of sampling (similar) schemes over different periods of change. The relationship to the 2001 census is shown in Table 4.1. It may be possible to identify how the degree of 'maturity' of the schemes compares on some criteria. For example, it might be expected that significant changes have occurred in Manchester, and only small changes in Croydon, and none in Nottingham?

Table 4.1: Years of Operation to 2001 Census of Sample Schemes

System	Opening Year	Years of Operation to 2001
Manchester Metrolink	1992	9
Sheffield Supertram	1994	7
West Midland Metro	1998	3
Manchester Metrolink (Eccles-Salford)	2000	1
Croydon Tramlink	2000	1
Nottingham NET	2004	-3

4.1.6 Secondly, an alternative conception is to consider changes relative to a 'control' area. The difficulty arises in selecting appropriate control areas which should have, as far as possible, similar conditions in the base year (eg levels of accessibility and socio-economic condition) and yet not have experienced other special changes. The simplest way to do this is to consider the relative changes to the average for the whole city, that is between 'on line' and 'off line' wards in the relevant metropolitan case study areas. Thirdly, a time series trend can be

analysed where appropriate data permit. In fact, a combination of these approaches has been used.

4.1.7 A major practical problem in interpreting the impact of light rail on social inclusion in the case study cities is that the possibly small effects are confounded by other significant transport infrastructure interventions such as road building. And, of course, all the case studies have peculiar local factors that render direct between-system comparisons difficult.

4.1.8 For this study, the relevant city case study areas selected have been dictated largely by administrative and census statistical areas. These boundaries are, to some extent, arbitrary in the context of transport and social patterns, but nevertheless permit a comparative study of relative changes. The boroughs, districts and unitary authorities forming the study areas are detailed in Table 4.2. Defining the overall study areas that contain both the 'on-line' and 'off-line' (control) sub-areas is also a significant factor that may affect the results. For example, Croydon Tramlink is embedded in a large conurbation, but it would be inappropriate to include the whole of Greater London and the study area was subsequently confined to the immediate London Boroughs of Bromley, Croydon and Merton. In contrast, the West Midlands, whilst mostly of continuously built up urban character, includes the free-standing city of Coventry and, it could be argued, this should be excluded. Nottingham has a fairly compact definition, but is surrounded by related contiguous suburbs and satellite towns.

Table 4.2: Study Area Boroughs

Study Area	Boroughs
Manchester Metrolink	Manchester, Bolton, Bury, Rochdale, Oldham, Trafford, Tameside, Stockport
Sheffield Supertram	Sheffield, Rotherham
West Midland Metro	Wolverhampton, Walsall, Dudley, Birmingham, Sandwell, Solihull, Coventry
Croydon Tramlink	Croydon, Merton, Bromley
Nottingham NET	Nottingham

4.1.9   The data is split into 'on line' wards and 'off line' wards. The former are those wards through which the light rail scheme passes, and the latter are the remainder of the wards in the respective metropolitan study areas. Clearly this is a crude and simplistic approximation to the area of immediate impact of the light rail systems: many studies use 'walk in' corridors of typically 400 or 800 metres. Nor does this simple approach relate directly to stop locations where passengers access the system. A more accurate representation could be obtained using finer spatial detail, such as statistical Output Areas, but the comparable data was not available at that scale. However, ward data does provide a level of spatial differentiation sufficient to identify some general trends.

4.1.10 It has proved difficult to identify appropriate spatially disaggregated time series data at a local (ward) level in order to assess spatial variations or trends. Series data covering the whole period of implementation of the schemes 1992 to 2004 is also limited. The NOMIS unemployment (claimant count) data is updated monthly and provides one useful source for use as an indicator of changes in what has been found to be one of the key contributory determinants of social exclusion.

4.1.11 This study is an initial comparative overview and no primary research was undertaken for this study. The data used is that available from published sources. In summary, the following presentation of information for each case study was limited to:

- Census data for 2001, including population, population density, car ownership and availability, and journey-to-work trip length and mode shares from the Office of National Statistics (accessed via CasWeb),

- IMD2000 data (Office of the Deputy Prime Minister, Indices of Deprivation 2000), focussing mainly on the IMD itself but also considering briefly some of the particular component domains such as access to services;

- NOMIS data on claimants at ward level giving a time series of spatial data for ten years between 1996 and 2006. Unfortunately, this does not embrace the full period of operation of all the case study schemes and ideally a period in anticipation of the opening would also be available. However, it does provide approximately four years prior to the opening of the West Midlands and Croydon light rail systems, and eight years prior to the opening of the Nottingham system.

4.1.12 The NOMIS data is presented in the form of a relative index between the 'on-line' and 'off-line' wards for each case study system. This format follows a similar approach to that presented in McIntosh (2005) and South London Partnership (2003) for the Croydon Tramlink system.

4.1.13 The Index of Multiple Deprivation (IMD) data for 2000 is based on 1998 Ward boundaries for England (Office of the Deputy Prime Minister, Indices of Multiple Deprivation 2000). The IMD score is based on the combination of indices from six weighted 'domains':

- Income (25%);
- Employment (25%);
- Health Deprivation and Disability (15%);
- Education, Skills and Training (15%);
- Housing (10%);
- Geographical Access to Services (10%).

4.1.14 The most deprived ward in England is ranked at 1 and the least deprived is ranked at 8414. In the following comparative analyses, the rank with respect to the national total is expressed as a percentile position between 1 and the 8414 wards in England, as well as a calculated local study area ranking for 'on-line' and 'off-line' wards.

4.1.15 The remainder of this section uses the data outlined above to explore the possible impacts of light rail on social inclusion in the five case study areas.

4.2   Manchester Metrolink

4.2.1 The origins of Metrolink go back to the mid-1980s when the [Passenger Transport] Authority carried out a review of the role of the local rail network (Hylen and Pharaoh, 2002), with problems at that time including deteriorating performance of services, the prospect of substantial infrastructure and rolling stock investment required, and the inability to attract more passengers to the network.

4.2.2 The current Manchester Metrolink service, opened in April 1992 and subsequently extended in March 2000, comprises 39 kilometres of route with 37 stops (at an average spacing of 1,054 metres). The first section of the Metrolink was 31 kilometres in length of which only 3 kilometres were newly built and the rest on existing rail lines. Metrolink started operation in 1992 with the conversion to light rail of the existing heavy rail lines between Altrincham and Bury, linked with cross-city street-running, removing the need to walk between the rail termini in the centre of Manchester, and a branch line to Manchester Piccadilly Station.

4.2.3 The second phase, which is 6.5 kilometres long, runs from Cornbrook to Eccles via Salford Quays and was opened in two stages between 1999 and 2000 (Hass-Klau et al, 2004). Phase 2 has coincided with new office and other development in the Salford Quays area; much of it in anticipation of the light rail scheme.

4.2.4 Current patronage is 19.7 million passengers per annum (Department for Transport, 2005b). Initially, forecasts were for 12 million passengers per year which was exceeded after three years and compared to previous heavy rail patronage of 7.5 million, demonstrating the positive perceptions of the new mode, and its ability to generate new trip opportunities. Although conceived primarily as a city centre commuter service, the particular success of Metrolink has been for off peak travel (Hylen and Pharaoh, 2002).

4.2.5 Metrolink serves a range of characteristically different areas within Greater Manchester (and this is borne out in the analysis). Whilst the Altrincham line was particularly middle-class with high car ownership, the proposed Phase 3 to Wythenshawe, in contrast, will serve areas of high unemployment and social exclusion (Hass-Klau et al, 2004), and there are other proposals to create more lines to create a city-wide network. The current diagrammatic route map is shown in Figure 4.1.

4.2.6 The 'on line' wards are listed in Table 4.3, and highlighted graphically in Figure 4.2, distinguishing between those for the original Bury-Altrincham line opened in 1992, and the Eccles Extension opened in 2000.

Figure 4.1: Manchester Metrolink Route Map
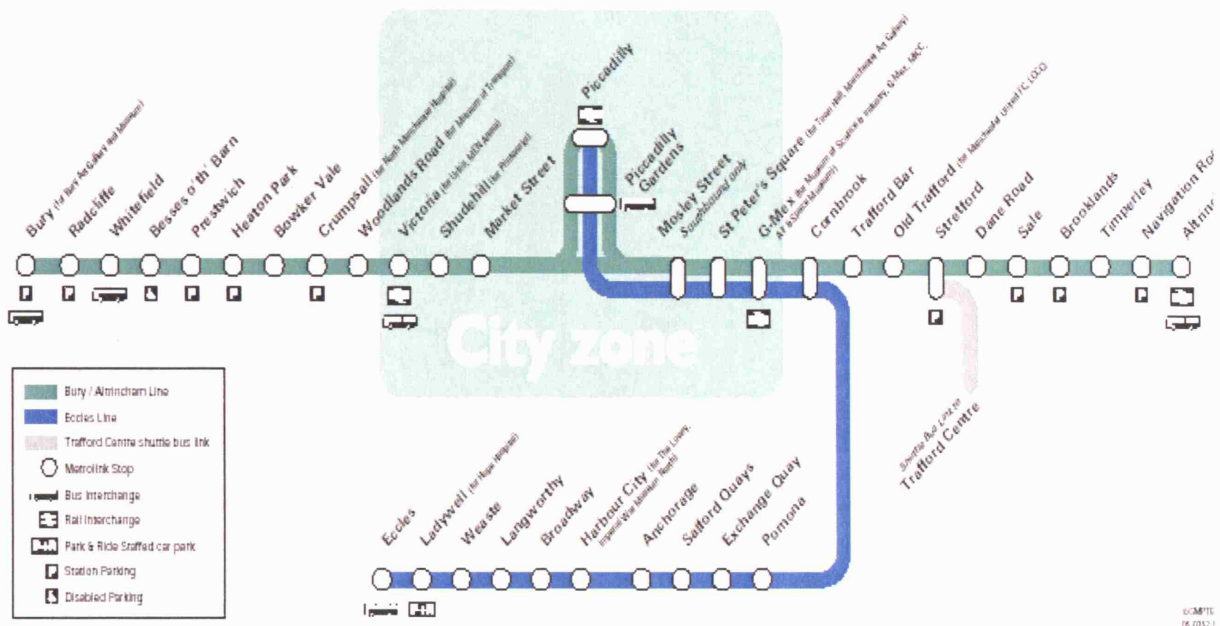
Source: www.metrolink.co.uk

Table 4.3: Metrolink 'On-Line' Districts and Wards

Bury-Altrincham			Eccles Extension
Bury	**Manchester**	**Trafford**	**Salford**
Elton	Crumpsall	Talbot	Ordsall
Church	Cheetham	Longford	Weaste and Seedley
Radcliffe North	Central	Stretford	Eccles
Radcliffe Central	Hulme	Priory	
Radcliffe South		Mersey St Mary's	
Pilkington Park		Brooklands	
Besses		Broadheath	
Holywood		Altrincham	

Figure 4.2: Metrolink 'On-Line' Wards

Legend
England_stwa_2001_area
Metrolink
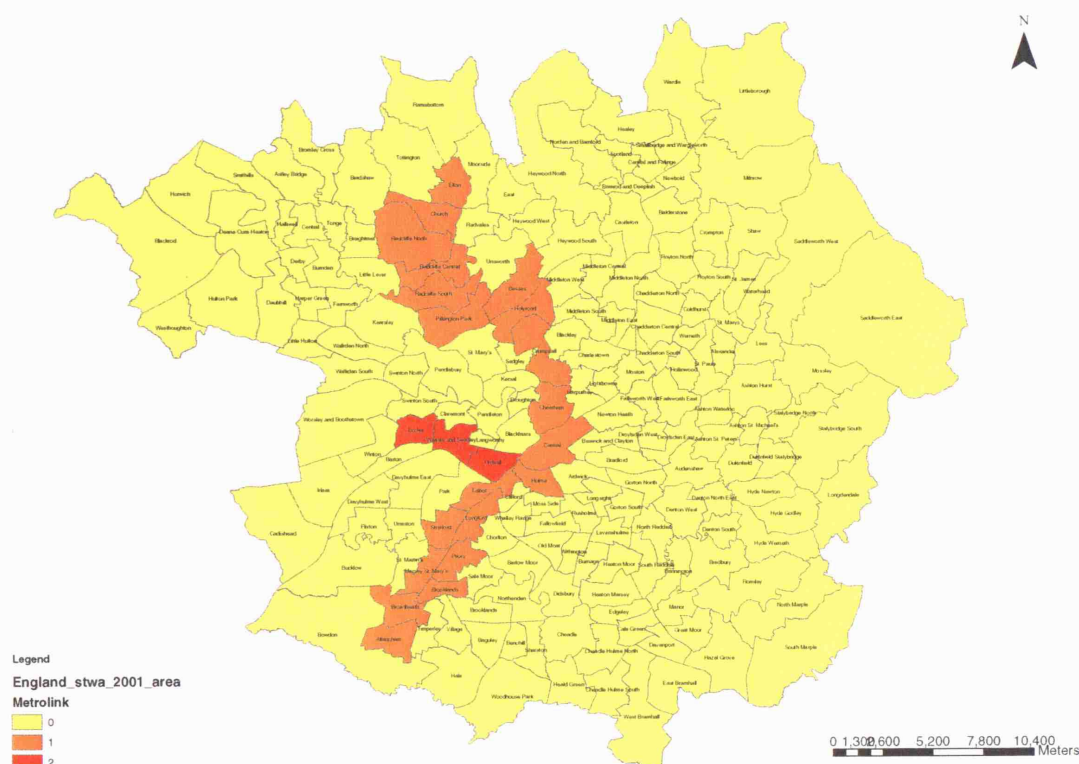
4.2.7 Figure 4.3 shows the distribution of light rail users in the Manchester area for their journey to work (as reported in the 2001 Census). Logically, this pattern generally conforms to the identified 'on line' wards identified. In the Census, the travel mode is the 'main mode' that is used for the longest distance. Each blue dot represents a user, based on their home origin: therefore there is a 'hole' in the city centre that represents the primary destination for many journey-to-work trips. It is estimated that 11% of the study area population lies in the 'on-line' wards.

4.2.8 Figure 4.4 shows the IMD2000 Score for wards in the Manchester study area, with the darkest tones highlighting the most deprived areas. In comparison with Figures 4.2 and 4.3 (the on line wards and journey to work by light rail), it can be seen that there is not a particularly apparent correlation between tram use and the most deprived areas outside the inner city: indeed the southern corridor to Altrincham passes through some of the least deprived wards. Figure 4.5 shows the local ranking of the IMD Score in the 190 study area wards. This confirms that the Altrincham branch is in the least deprived sector of the city (dark blue), whilst the most deprived sub-area, Bolton, does not enjoy the presence of Metrolink. The City of Manchester and Bury are, however, in the lower half.

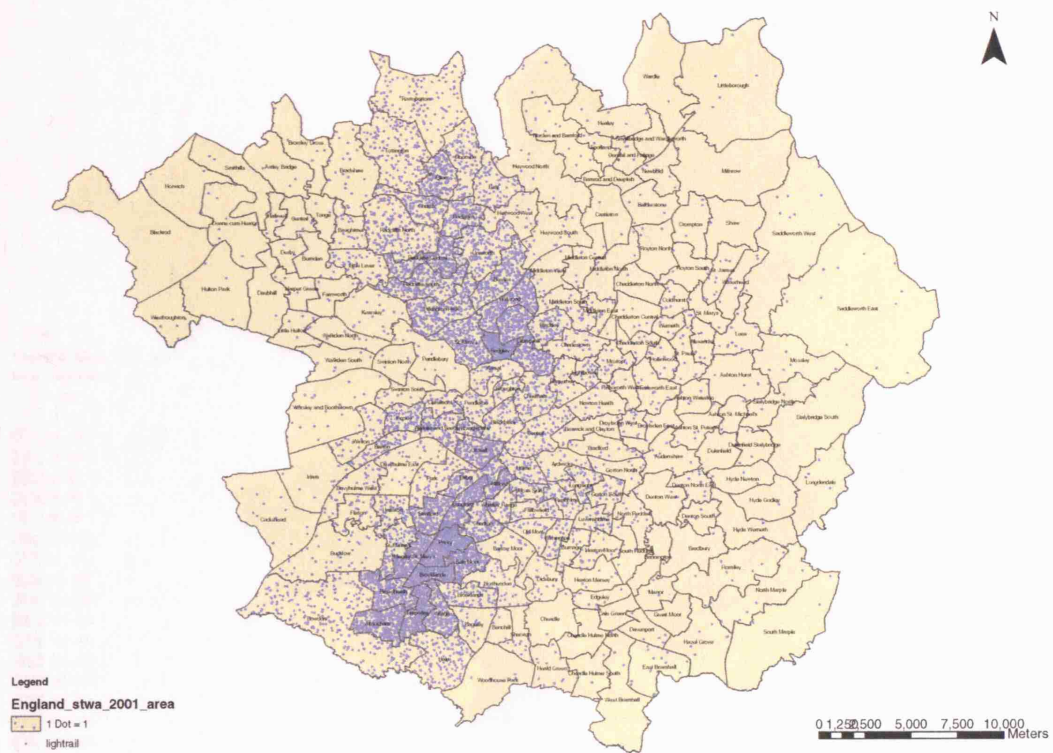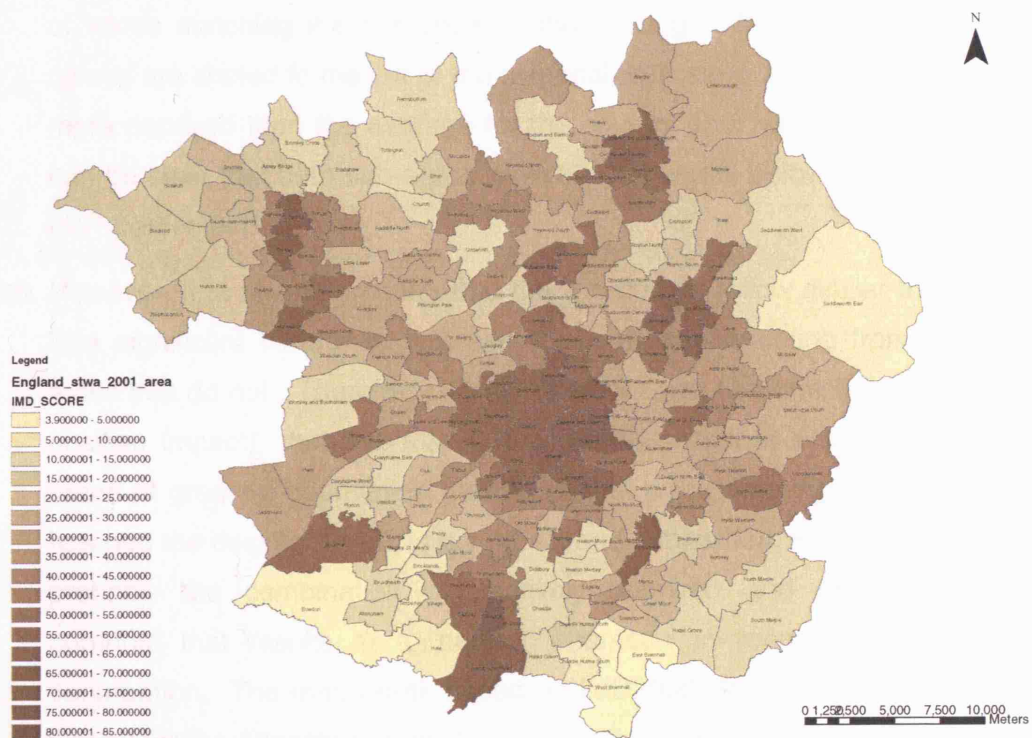**Figure 4.3: Manchester Journey to Work by Tram (2001)**

Legend
England_stwa_2001_area
• 1 Dot = 1
lightrail

0 1,250 2,500   5,000   7,500 10,000
Meters

Figure 4.4: Manchester IMD2000 Score

Legend
England_stwa_2001_area
IMD_SCORE
3.900000 - 5.000000
5.000001 - 10.000000
10.000001 - 15.000000
15.000001 - 20.000000
20.000001 - 25.000000
25.000001 - 30.000000
30.000001 - 35.000000
35.000001 - 40.000000
40.000001 - 45.000000
45.000001 - 50.000000
50.000001 - 55.000000
55.000001 - 60.000000
60.000001 - 65.000000
65.000001 - 70.000000
70.000001 - 75.000000
75.000001 - 80.000000
80.000001 - 85.000000

0 1,250 2,500   5,000   7,500 10,000
Meters

Figure 4.5: Manchester IMD2000 Score Local Ranking

4.2.9 Figure 4.6 compares the distribution of the national IMD ranking for Manchester study area wards, separately for on line and off line wards. A nationally-representative area would have curves following the diagonal with the percentage of wards matching the percentile of the ranking. Manchester shows that both curves are shifted to the left of the diagonal, indicating the study area is generally more deprived than the average for the country as a whole. From the graph, it can be seen that both sub-areas have 83% of wards below the national average (50th percentile).

4.2.10 However, it is also interesting that the two curves follow similar trajectories with little significant difference between those areas benefiting from the tram and those that do not. Therefore, it may be concluded (assuming that light rail has a positive impact), that the Manchester Metrolink either was not located in the areas of greatest deprivation (need), or that since opening in 1992, the system has had the desired 'levelling out' effect and diminishing inequalities. In fact, it is probably the combination of relatively deprived and relatively un-deprived corridors that results in a 'neutral' character in respect to the rest of the conurbation. The mean rank based on IMD2000 Scores (out of 190 study area wards) for the Altrincham branch is 71, for Bury 78, and for Eccles 136, whilst the
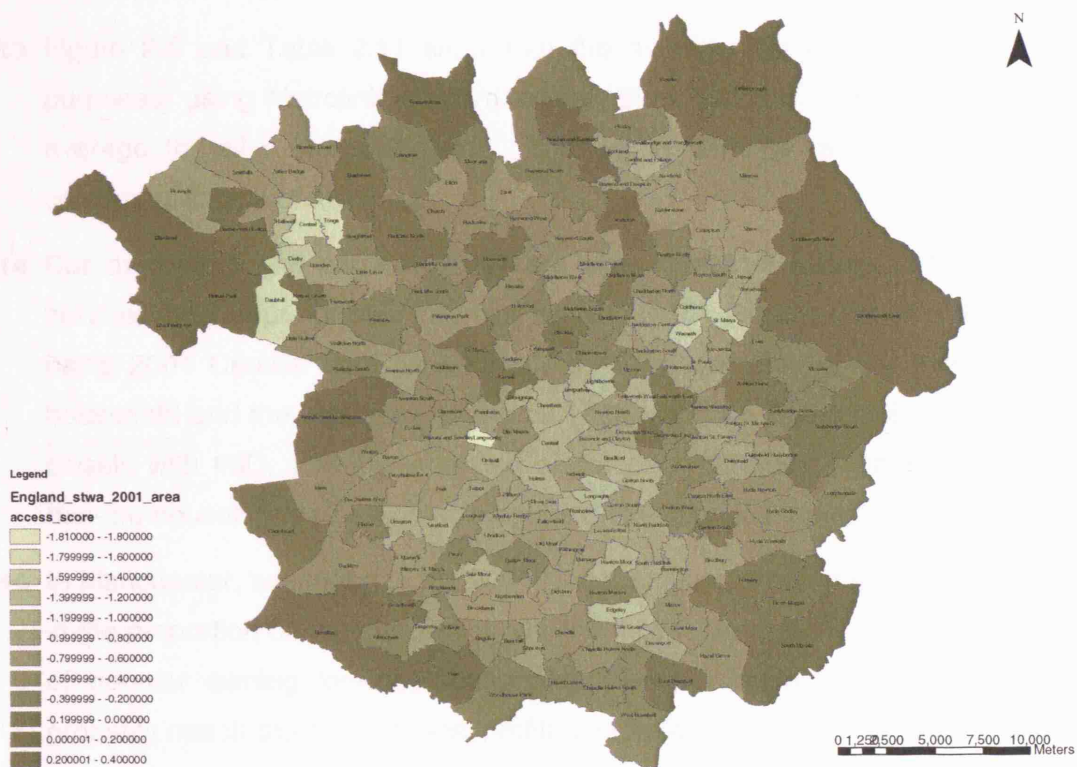
rest of the city is 97, reiterating that the original line in general serves relatively less deprived wards and the new Eccles branch serves typically more deprived wards in comparison to the rest of the city.

Figure 4.6: Manchester Wards IMD Rank
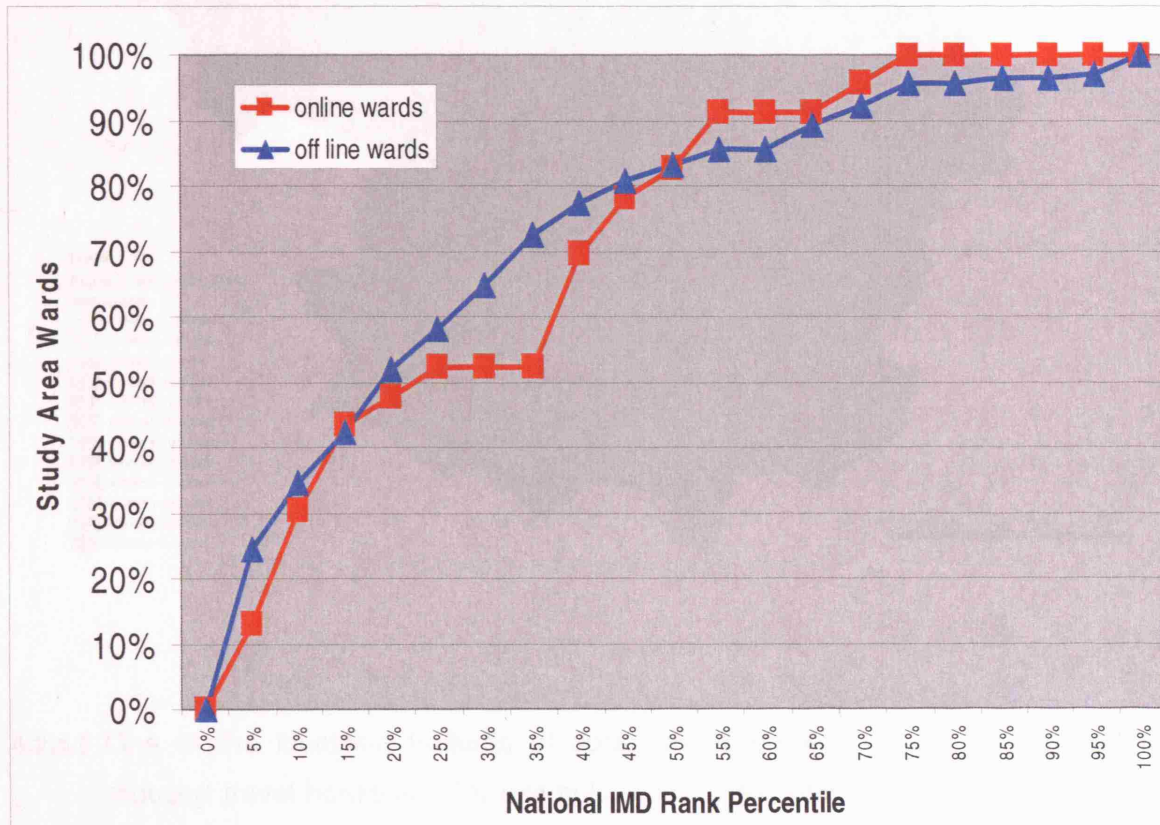
4.2.11 One of the component domains of the IMD is geographic access to services, shown in Figure 4.7 for Manchester. This shows a different kind of pattern that is the inverse of the general pattern with the central city and satellite centres enjoying the best access, and the peripheral, lower density areas having less access to services.

Figure 4.7: Manchester IMD Access Score 2000

Legend
England_stwa_2001_area
access_score
- -1.810000 - -1.800000
- -1.799999 - -1.600000
- -1.599999 - -1.400000
- -1.399999 - -1.200000
- -1.199999 - -1.000000
- -0.999999 - -0.800000
- -0.799999 - -0.600000
- -0.599999 - -0.400000
- -0.399999 - -0.200000
- -0.199999 - 0.000000
- 0.000001 - 0.200000
- 0.200001 - 0.400000

0 1,250 2,500 5,000 7,500 10,000 Meters

4.2.12 One of the identified features of social exclusion with regard to transport is reduced travel horizons. For example, socially excluded individuals and groups typically do not travel as far to employment and other opportunities typically because of higher rates of non-car ownership or availability. This would be expected to be alleviated by major new public transport interventions such as light rail systems. Using 2001 Census data, Figure 4.8 compares the journey-to-work trip length of the 'off-line' and 'on-line' wards in Manchester. In fact, there seems to be little significant difference in the journey lengths and the availability or otherwise of a light rail service (albeit with a limited range of destinations served across the city) seems to have little bearing. Analysis of the data shows that average trip length 'on-line' is 101% of that of 'off-line' wards, suggesting little significant difference and the overall similarity between the 'on-line' and 'off-line' wards in the study area. However, probably more significant than light rail availability is the distribution of car availability. This could be a reflection of the conversion from a well-defined rail travel corridor to light rail and little evolution of

this original journey-to-work pattern, with much of the new patronage being a possibly more diverse range of new off peak (non-work) travel destinations.

4.2.13 Figure 2.5 and Table 2.11 show that the average trip length (for all journey purposes) using Metrolink is approximately 9km, which is rather longer than the average for all systems (6.2km). This again perhaps reflects the suburban commuter origins of the line.

4.2.14 Car ownership and car availability are also important factors in the range of services and opportunities that can be attained. Figures 4.9 and 4.10 show, using 2001 Census data for each ward, the distribution of car ownership per household and the proportion of 'no car' households. These indicators correlate closely with IMD, with lowest levels of car ownership and highest incidence of non-car households closely matching the distribution in Figures 4.4 and 4.5.

4.2.15 In Manchester, according to the 2001 Census, there is apparently little difference in the proportion of non-car owning 'off-line' households (33%) and the proportion of non-car owning 'on-line' households (34%). Again, the reasons for this probably match the mix of typical profile characteristics of the Manchester system catchment area compared to the study area as a whole.

Figure 4.8: Manchester Journey to Work Trip Length Distribution 2001
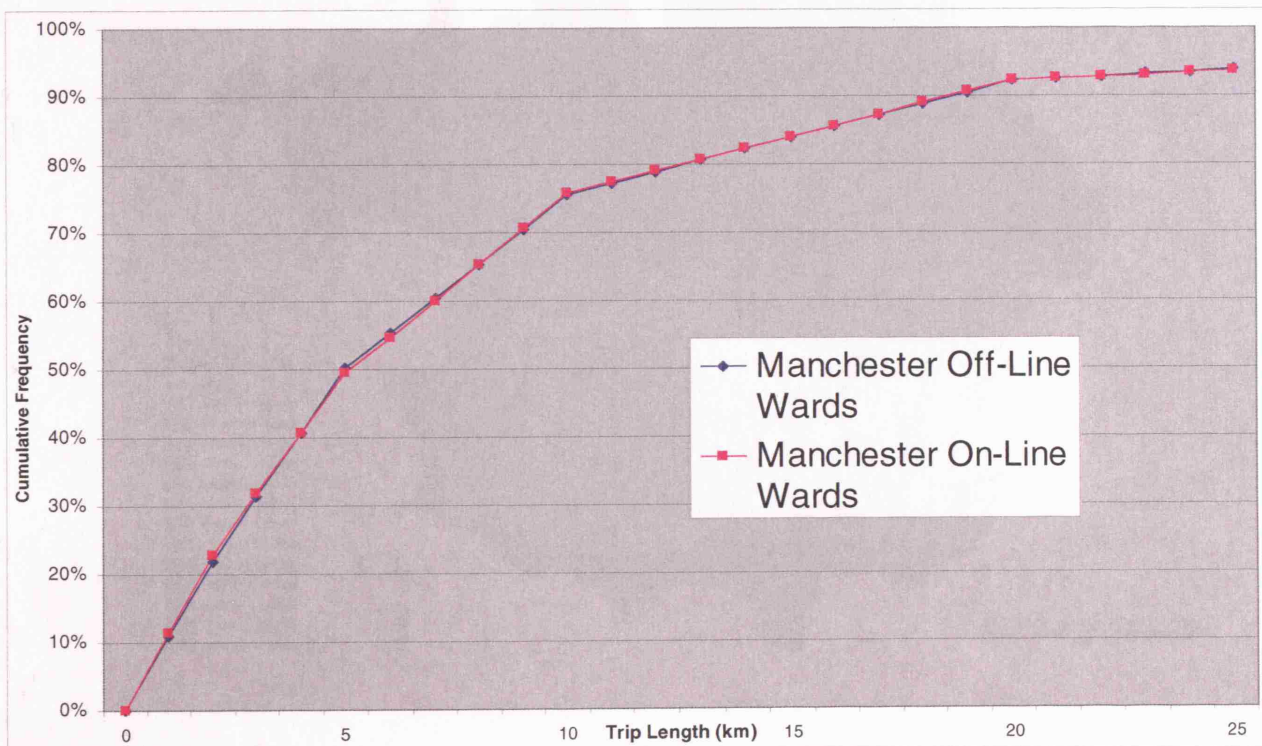
4.2.16 Figure 4.11 illustrates the differential between the 'off-line' and 'on-line' wards for 2001. There are many reasons that might contribute to an explanation of varying car ownership (including locational factors), but the correlation with the income domain of IMD (see Figure 4.12) is marked, and car ownership is possibly a pre-requisite for being regarded as socially included.

4.2.17 However, there is apparently a growing trend for less car dependent lifestyles in some cities and voluntary car-lessness. In contrast, some poor households spend a disproportionate amount of money on acquiring use of a car that they regard as essential. For comparison, Figure 4.13 shows the journey-to-work mode shares for 'off-line' and 'on-line' wards (Census 2001). However, even in the 'off-line' wards, tram accounts for only 6% of these journeys, suggesting that the system's attractions do not generally outweigh those of other modes (particularly the car), or reflects the narrow range of destinations served by what is a narrow corridor service. This may change with completion of a wider network to give access to a wider range of destinations in other parts of the city.

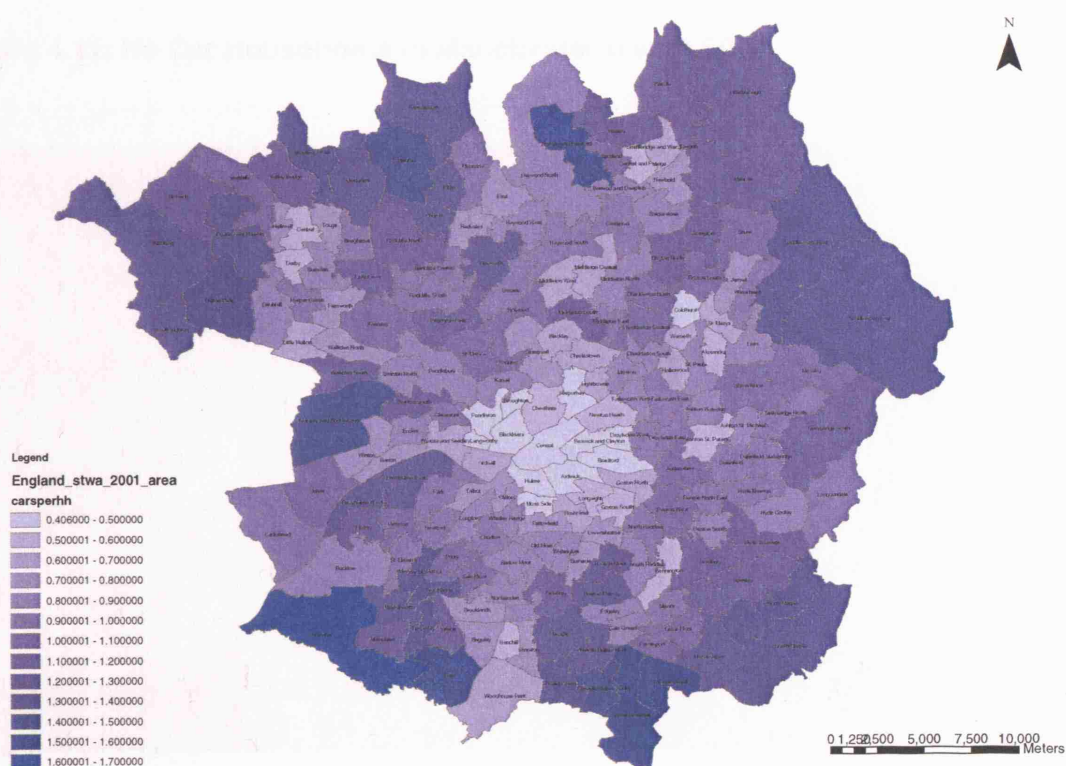**Figure 4.9: Manchester Cars per Household 2001**

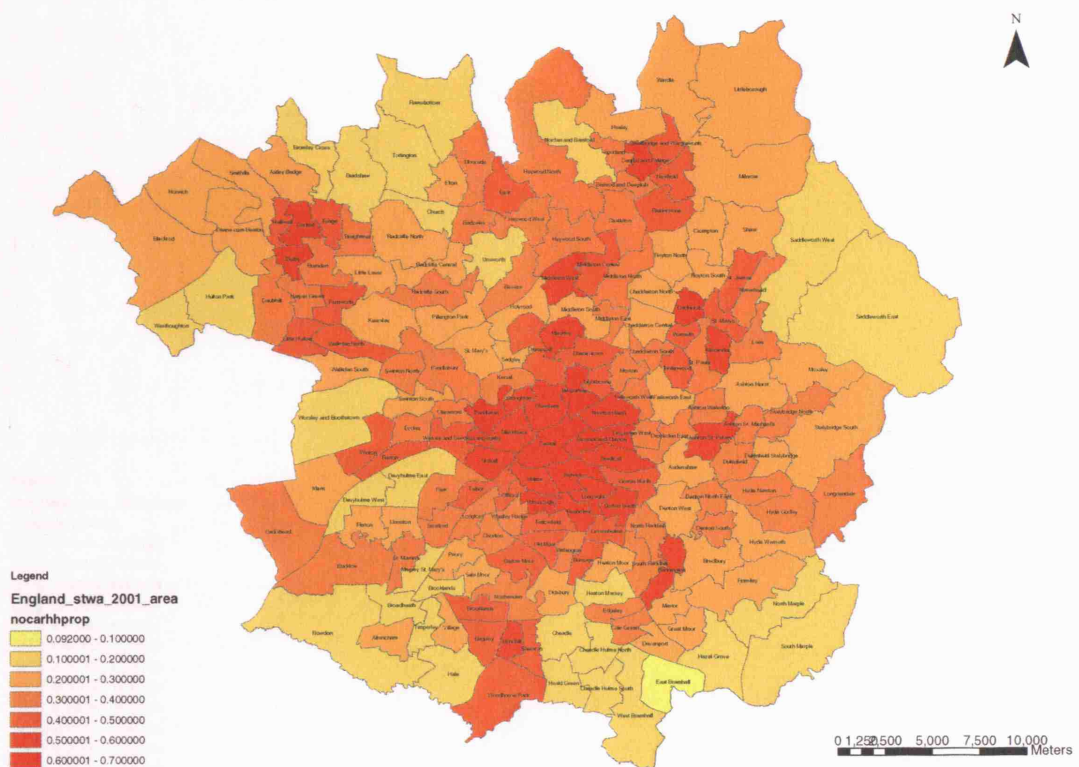**Figure 4.10: No Car Households in Manchester Wards 2001**

Legend

England_stwa_2001_area

nocarhhprop

- 0.092000 - 0.100000
- 0.100001 - 0.200000
- 0.200001 - 0.300000
- 0.300001 - 0.400000
- 0.400001 - 0.500000
- 0.500001 - 0.600000
- 0.600001 - 0.700000

Figure 4.11: No Car Households in Manchester Wards 2001
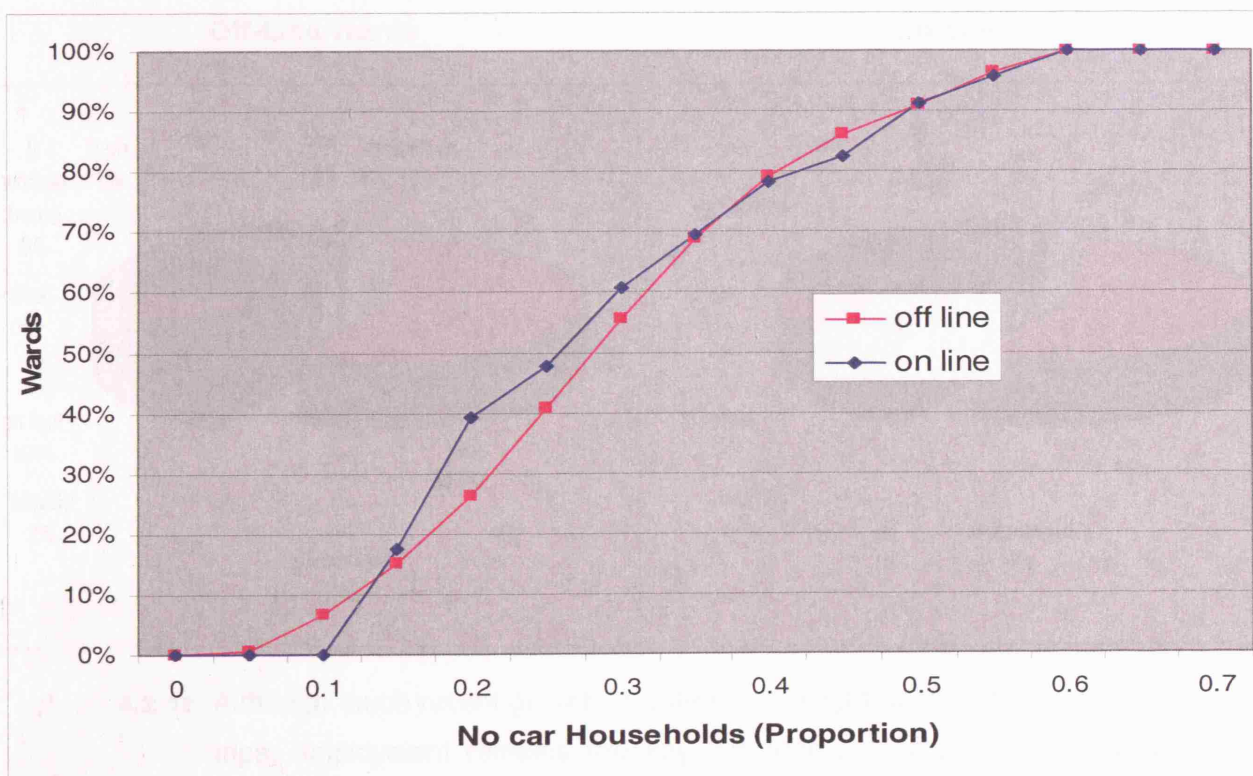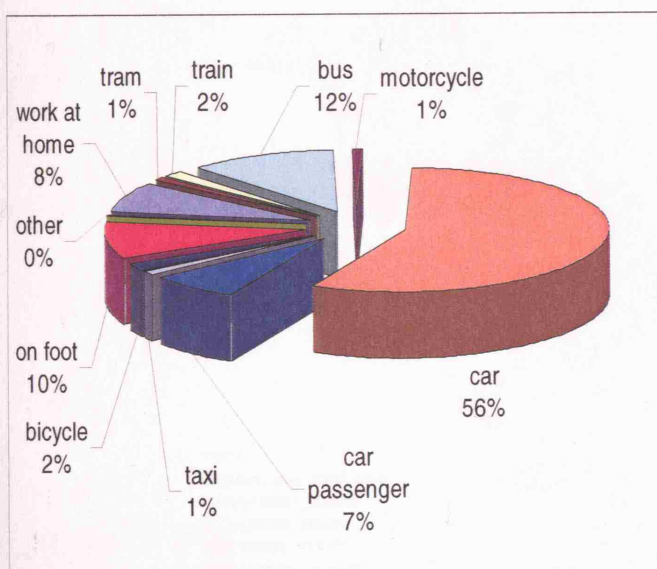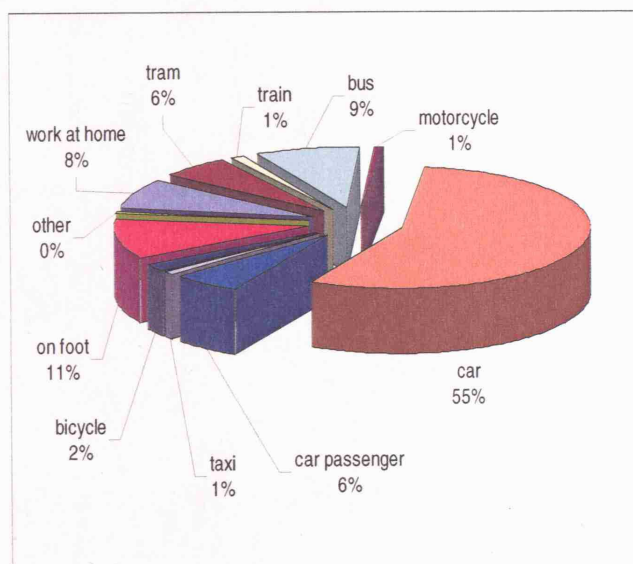
Figure 4.12: Manchester IMD Income Score 2000

Legend
England_stwa_2001_area
INCOME_SCORE

- 6.110000 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 25.000000
- 25.000001 - 30.000000
- 30.000001 - 35.000000
- 35.000001 - 40.000000
- 40.000001 - 45.000000
- 45.000001 - 50.000000
- 50.000001 - 55.000000
- 55.000001 - 60.000000
- 60.000001 - 65.000000
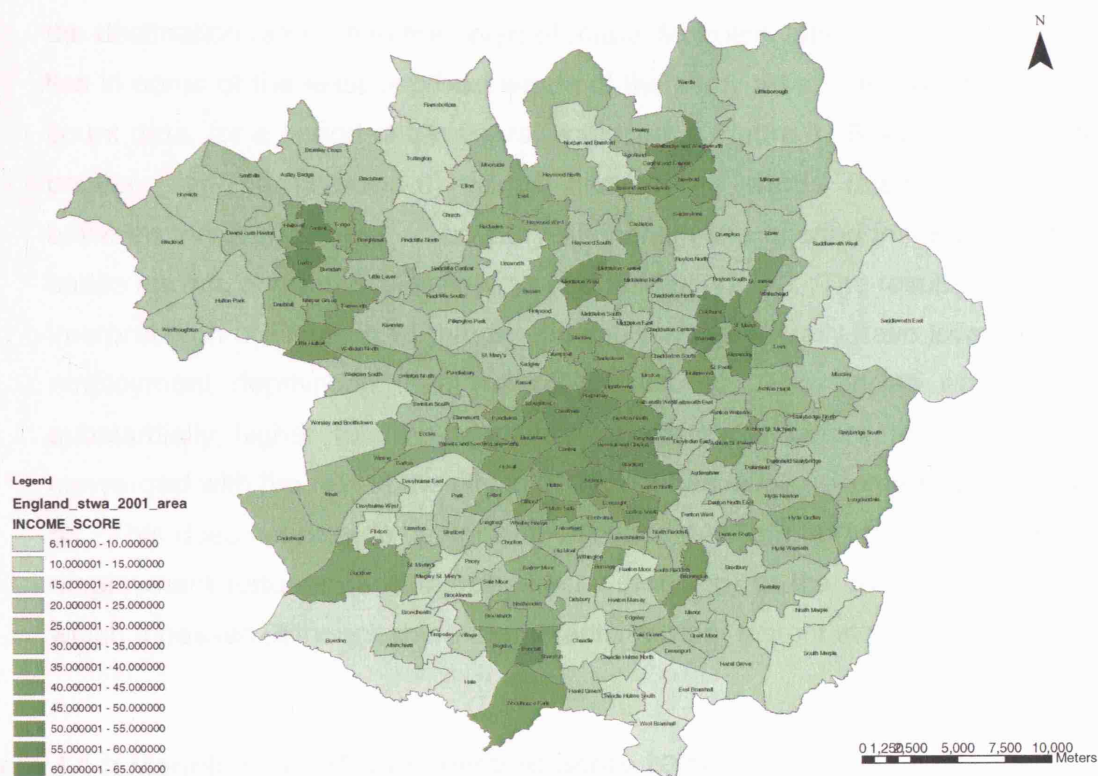
Figure 4.13: Manchester Journey-to-Work Modes Shares 2001

Off-Line Wards

tram 1% | train 2% | bus 12% | motorcycle 1% | work at home 8% | other 0% | on foot 10% | bicycle 2% | taxi 1% | car passenger 7% | car 56%

On-Line Wards

tram 6% | train 1% | bus 9% | motorcycle 1% | work at home 8% | other 0% | on foot 11% | bicycle 2% | taxi 1% | car passenger 6% | car 55%

4.2.18 Although much recent growth in patronage in light rail has been seen in off-peak trips, employment remains the key indicator of inclusion. The distribution of

employment deprivation in Manchester is shown in Figure 4.14. Again, this indicator of employment deprivation shows that, apart from the city centre that is the destination rather than the origin of many Metrolink trips, the light rail corridor lies in some of the least deprived wards of the study area. The NOMIS claimant count data, for a period of ten years, is plotted in Figure 4.15 as a relative index between off-line (index=1.0) wards and on-line wards (also disaggregated between three branches). The Bury-Altrincham line opened in 1992 before the series shown, and the Eccles line opened in March 2000. The results confirm the interpretation of Figure 4.14 that the on-line wards generally have lower levels of employment deprivation than the off-line wards. The Eccles wards had a substantially higher relative proportion of claimants before the line opened, converged with the rest of the city in 2001, but has since become relatively worse off. This does not provide compelling evidence that light rail improves the relative employment fortunes (and thereby social inclusion) of the communities through which it passes (although there are potentially other factors at work).

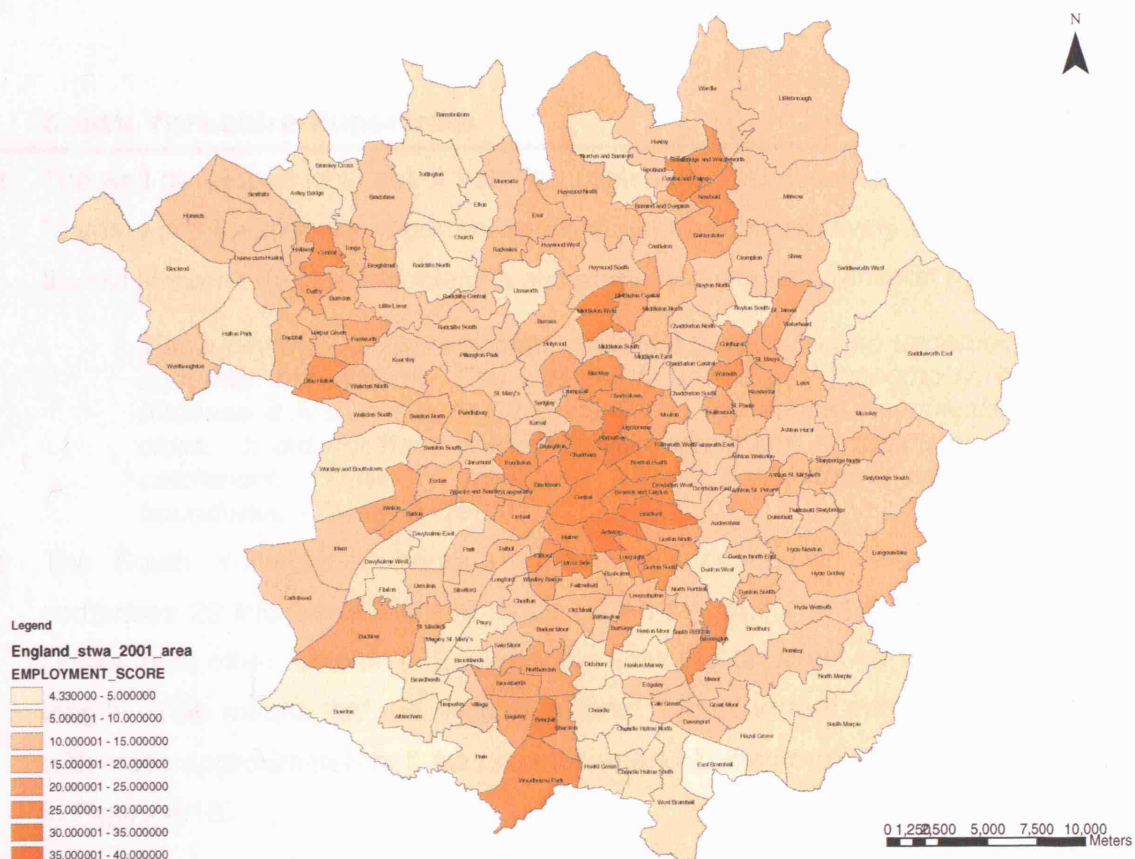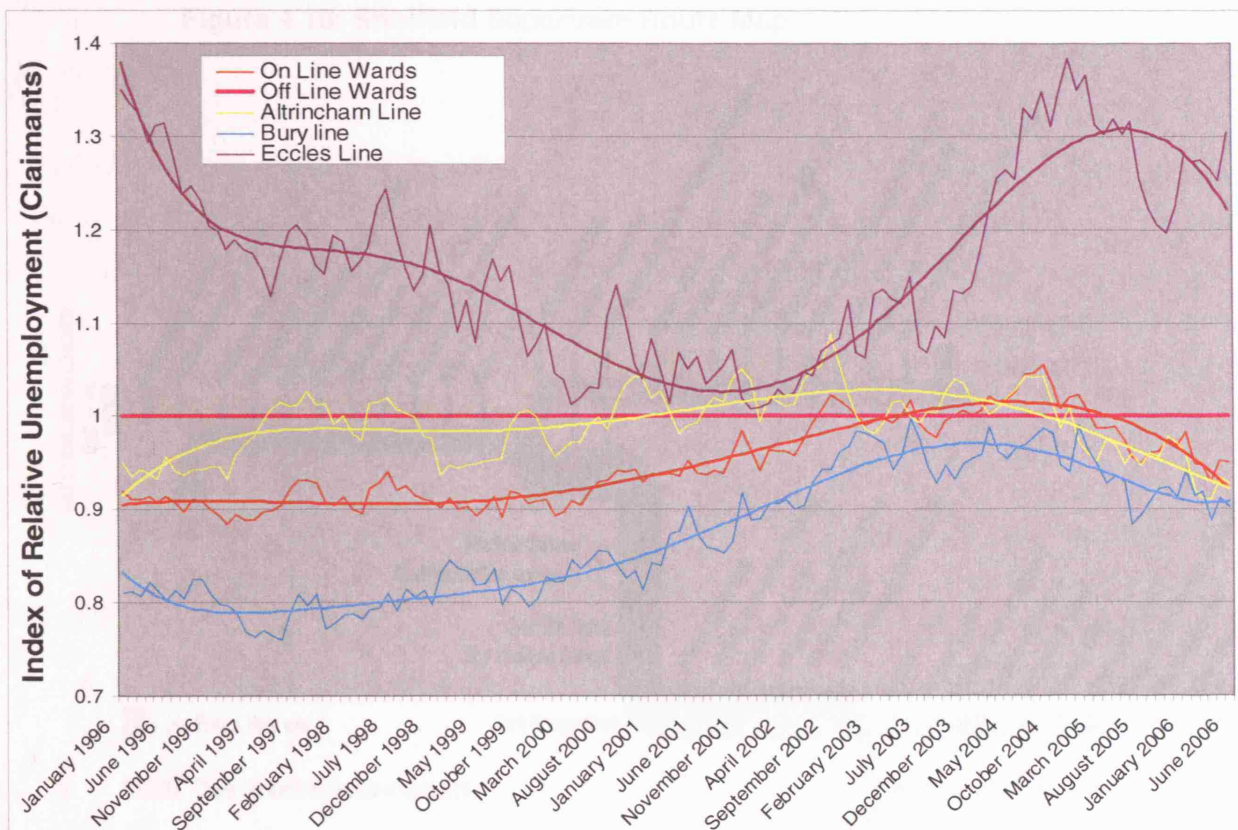**Figure 4.14: Manchester IMD Employment Score 2000**

Legend

England_stwa_2001_area

EMPLOYMENT_SCORE

- 4.330000 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 25.000000
- 25.000001 - 30.000000
- 30.000001 - 35.000000
- 35.000001 - 40.000000

0 1,250 2,500 5,000 7,500 10,000 Meters

Figure 4.15: Manchester Relative Index of Unemployment (Claimants)

4.3 South Yorkshire Supertram

4.3.1 The well developed local street tramway system in Sheffield was closed by 1960. Trams were traditionally important in Sheffield and the relatively late closure of the old system reflected the role of a self-contained city and transport system:

> 'For a city of 500,000 residents, Sheffield always had an underdeveloped suburban rail system. This was partly because of topography, but also because it was not a regional centre in the sense of equivalent-sized cities. It did not have a wide-spread commuter, shopping and service catchment. Travel to work was always concentrated within the city boundaries' (Townroe, 1995).

4.3.2 The South Yorkshire Supertram in Sheffield opened in March 1994 and comprises 29 kilometres with 48 stops (at an average spacing of 604 metres). Unlike most other systems in England, the lines are on-street for nearly half their length. This means that the system is more 'urban' in feel than in Manchester with stops approximately half the distance apart. The current route map is shown in Figure 4.16.
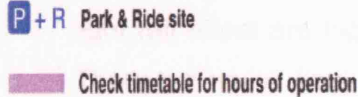
Figure 4.16: Sheffield Supertram Route Map

Source: www.supertram.com

4.3.3 The original plan was modified to re-route Line 1 out to the large municipal Manor housing estate, but more especially also to allow Line 2 to link the city centre with the large Meadowhall Shopping Centre….and regeneration of the Lower Don Valley… in a corridor of low residential density (Townroe, 1995). Original forecasts of 17-22 million passengers per year were subsequently revised to 12 million at the time of privatisation in 1997. Table 2.10 shows that actual ridership, has risen from 5.0 million in the first year to 10.9 million in 2000, and to 12.8 million in 2005 according to latest Department for Transport figures (Department for Transport, 2005b).

4.3.4 The reasons for the disappointing performance of modern trams in Sheffield include that it has failed to compete successfully in a competitive deregulated bus environment, with little integration of feeder services, poor acceptance of

premium fares on trams, slow street-running with little advantage over buses, and indirect routes with inconvenient stops. The system has also suffered from a lack of integration with land use policies leading to lower residential densities in the corridor, compounded by low levels of economic activity along the route.

4.3.5 Nevertheless, Supertram has been regarded as a means of boosting the economic redevelopment of the area by improving accessibility for employees and customers to the Lower Don Valley, although the reported studies suggest that the impact of Supertram on land use and regeneration was small compared to road investments, and the link to the Meadowhall out of town shopping centre has been cited as a cause of undermining the city centre's retail economy (Hylen and Pharaoh, 2002).

4.3.6 The study area selected for Sheffield Supertram includes Sheffield and Rotherham, although they are two distinct cities, in order to capture the impact over the combined contiguous urban area. For the purposes of analysis, the Sheffield wards that are deemed to be 'on line' for Supertram and have a direct light rail effect are highlighted graphically in Figure 4.17 and listed in Table 4.4. There are no 'on-line' wards in Rotherham.

Figure 4.17: Sheffield and Rotherham 'On-Line' Wards
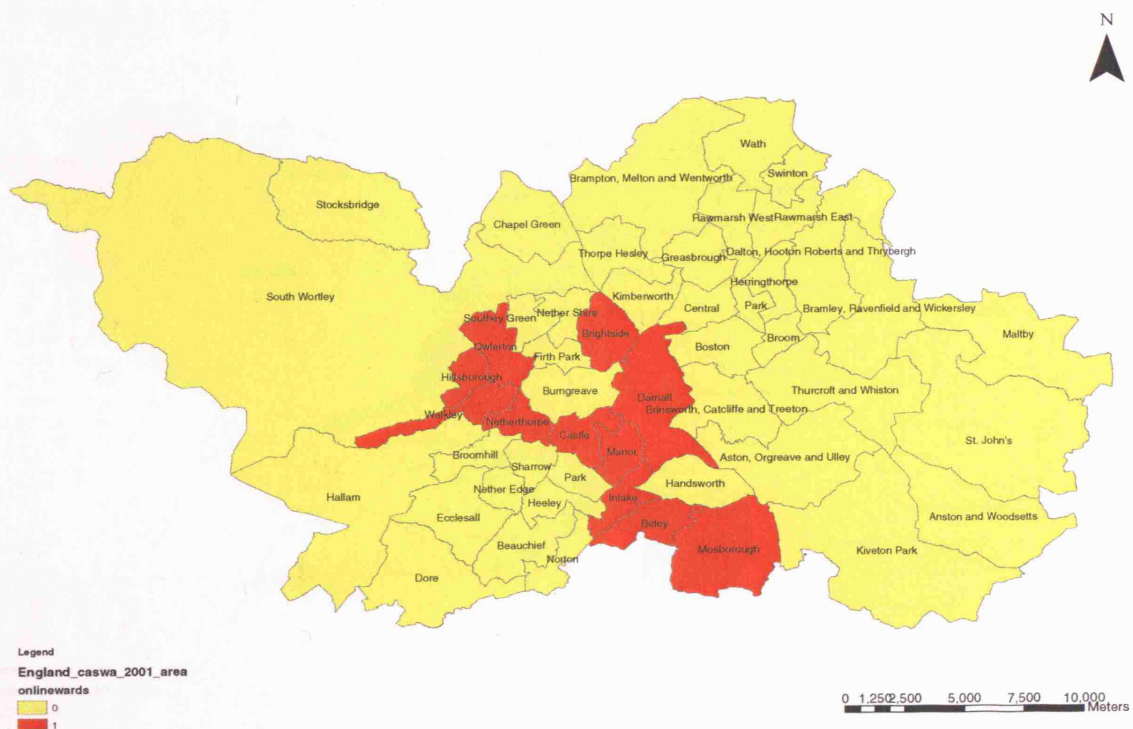
Table 4.4: Sheffield and Rotherham 'On-Line' Districts and Wards

Sheffield	
Owlerton	Intake
Hillsborough	Birley
Walkley	Mosborough
Netherthorpe	Darnall
Castle	Brightside
Manor	

4.3.7 Figure 4.18 shows the distribution of light rail users in Sheffield and Rotherham for their journey-to-work (as reported in the 2001 census). It is estimated that 26% of the study area population lies in the 'on-line' wards. This pattern generally conforms to the identified 'on line' wards and shows that significant light rail use is confined to a comparatively small part of the study area.

Figure 4.18: Sheffield and Rotherham Journey to Work by Tram (2001)

Legend
England_caswa_2001_area
1 Dot = 1
lightrail

0 1,250 2,500 5,000 7,500 10,000
Meters

4.3.8 Figure 4.19 shows the IMD2000 Score for wards in the Sheffield and Rotherham study area, with the darkest tones highlighting the most deprived areas. In comparison with Figures 4.17 and 4.18 (the on line wards and journey to work by light rail), there is a reasonable correlation apparent between tram use and the most deprived areas of Sheffield city centre, but the system does not reach the relatively deprived central wards of Rotherham. Figure 4.20 shows the local ranking of the IMD Score in the 51 study area wards. This confirms that the outer western wards of Sheffield contain the least deprived sector of the city (dark blue), whilst the most deprived sub-area of the city centre and the Don Valley enjoys the presence of Supertram. However, wards such as Burngreave and Southey Green that are also in the most deprived group of wards, lie in the 'off-line' category for the purposes of this study.

Figure 4.19: Sheffield and Rotherham IMD2000 Score

Figure 4.20: Sheffield and Rotherham MD2000 Score Local Ranking

N

Legend

England_caswa_2001_area
correct_local_rank_imd_score

- 1 - 4
- 5 - 9
- 10 - 13
- 14 - 18
- 19 - 23
- 24 - 27
- 28 - 32
- 33 - 37
- 38 - 41
- 42 - 46
- 47 - 51

0 1,250 2,500   5,000   7,500   10,000
Meters

4.3.9 The mean rank score (out of 51 wards in the study area) for the 'on-line' wards is 23 and for the 'off-line' is 27. Figure 4.21 compares the distribution of the national IMD ranking for Sheffield and Rotherham study area 'on-line' and 'off-line' wards. This shows that the study area, on the whole, is relatively deprived (with approximately two-thirds) of both the 'on-line' and 'off-line' wards in the most deprived 25% of wards in England. However, all 'on-line' wards are in the most deprived 40% in England, whereas some of the 'off-line' wards, remote from the city centre, are amongst the least deprived in the country. This is shown by the 'on-line' curve shifted above and to the left of the 'off-line' curve. It may be concluded, therefore, that Supertram has a strong and disproportionate presence in the most deprived and potentially socially excluded parts of the city and has the potential to make a positive impact to improve social inclusion in the study area.

Figure 4.21: Sheffield and Rotherham Wards IMD Rank
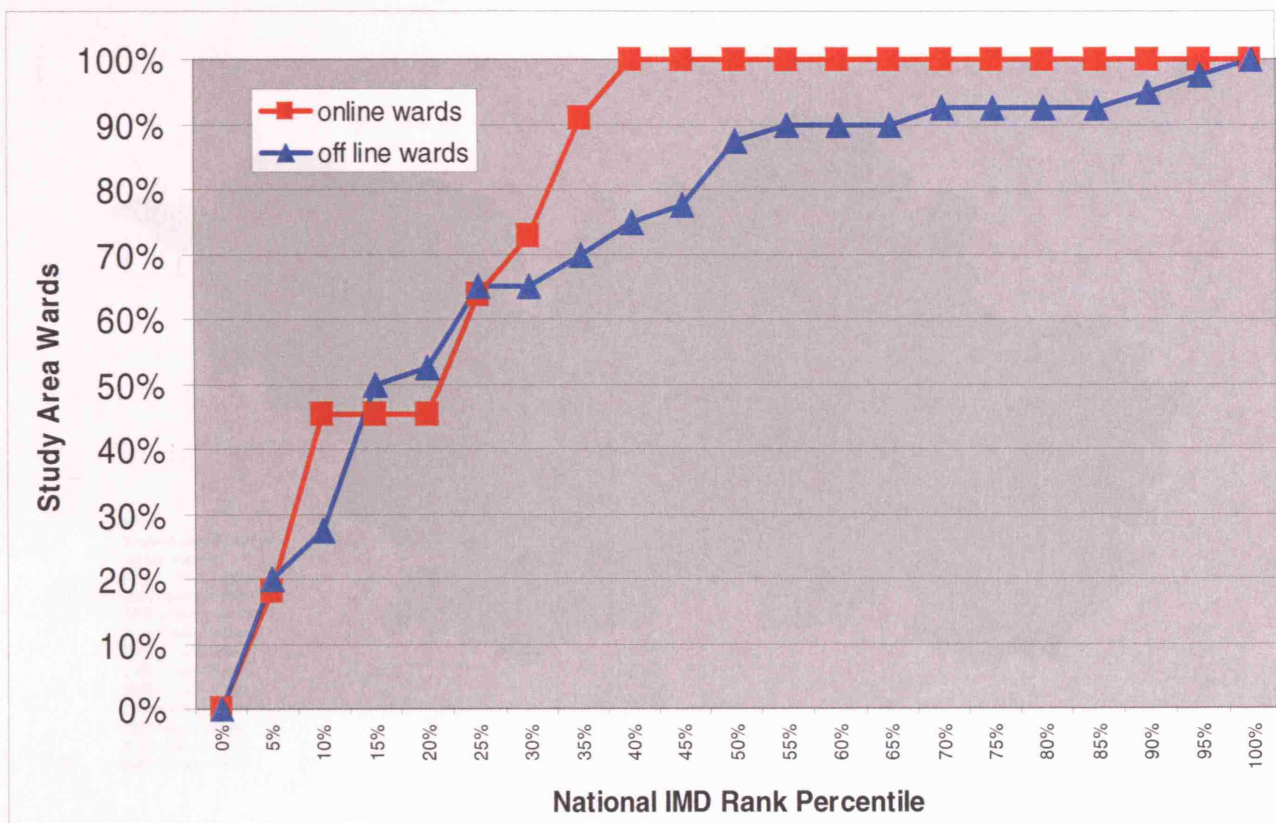
4.3.10 As in Manchester, Figure 4.22 shows that the access to services domain in Sheffield and Rotherham presents an inverse pattern to the IMD score. Using the 2001 Census data, Figure 4.23 compares the trip length of journey-to-work for the 'on-line' and 'off-line' wards. This shows that a greater proportion of trips up to 10km are made by residents of 'on-line' wards benefiting from the tram, whereas journeys-to-work beyond 10km are made more frequently by 'off-line' ward residents. In fact, analysis of the data in Figure 4.23 shows that average trip length for 'on-line' wards is only 86% of those in the rest of the study area. From Figure 2.5 and Table 2.11, we can see that the average trip length (for all trip purposes) by Supertram is only 3.4km, confirming that journeys-to-work by public transport are likely to be shorter than those by car, and that other trip purposes (such as off-peak leisure and shopping trips) will be generally local in nature. Apart from Blackpool, Supertram has the shortest average trip length of all the systems in England. This is another indication of the more urban character of Supertram (described above) compared to the more 'suburban' form of the Manchester system where average trip length by tram is a factor of nearly three times longer.

Figure 4.22: Sheffield and Rotherham IMD Access Score 2000
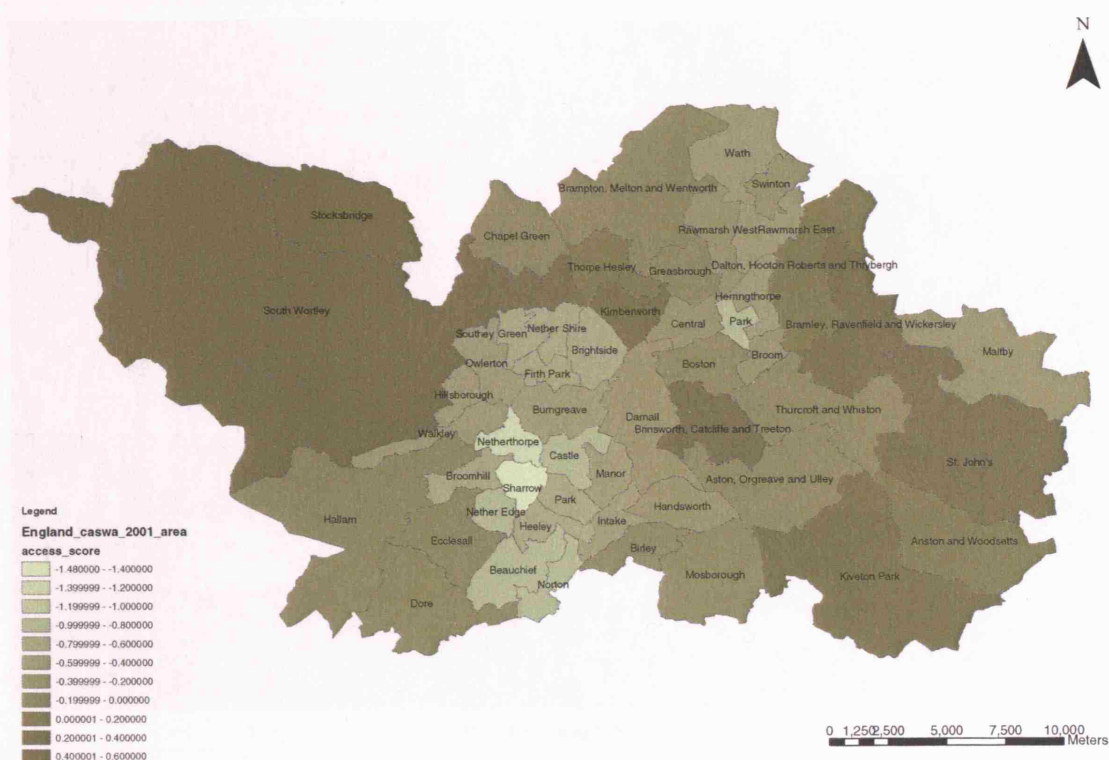
4.3.11 Car ownership and car availability are also important factors in the range of services and opportunities that can be attained. Figures 4.24 and 4.25 show, using 2001 Census data for each ward, the distribution of car ownership per household and the proportion of 'no car' households. These indicators correlate closely with IMD, with lowest levels of car ownership in the case of the metropolitan area. In Sheffield and Rotherham, the 2001 Census shows that there is a clearer difference in the proportion of non-car owning 'off-line' households (32%) and the proportion of non-car owning 'on-line' households (38%). Figure 4.26 illustrates the differential between the 'off-line' and 'on-line' wards for 2001. Also, there is a strong correlation with the income domain of IMD (see Figure 4.27) and, therefore, car ownership (and availability) as an indicator of social inclusion. For comparison, Figure 4.28 shows the journey-to-work mode shares for 'off-line' and 'on-line' Sheffield and Rotherham wards in 2001. However, this shows that even in the 'on-line' wards, tram accounts for only 6% of journeys-to-work and is not, therefore, either very attractive or serve a sufficient range of useful destinations.

Figure 4.23: Sheffield and Rotherham Journey to Work Trip Length 2001

Chart: Cumulative Frequency (y-axis, 0% to 100%) vs Trip Length (km) (x-axis, 0 to 25), comparing:
- Sheffield Off-Line Wards
- Sheffield On-Line Wards
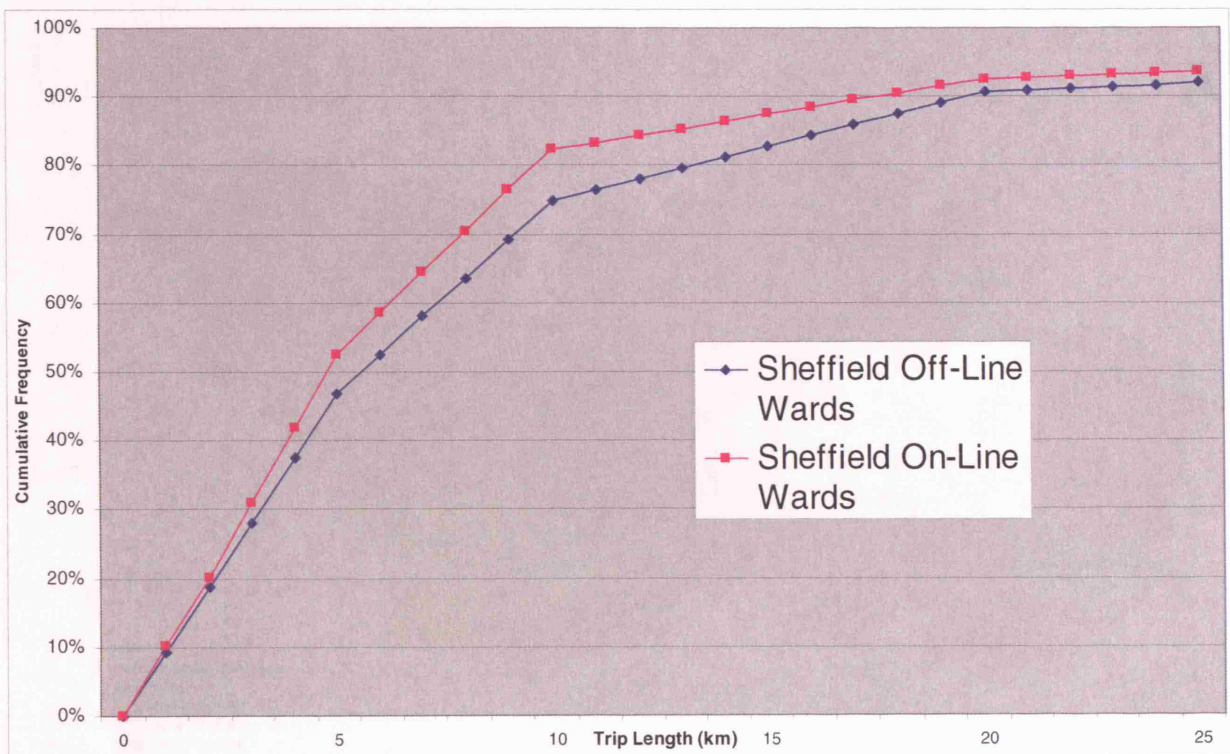
Figure 4.24: Sheffield and Rotherham Cars per Household 2001

Legend
England_caswa_2001_area
carsperhh
- 0.519000 - 0.600000
- 0.600001 - 0.700000
- 0.700001 - 0.800000
- 0.800001 - 0.900000
- 0.900001 - 1.000000
- 1.000001 - 1.100000
- 1.100001 - 1.200000
- 1.200001 - 1.300000
- 1.300001 - 1.400000
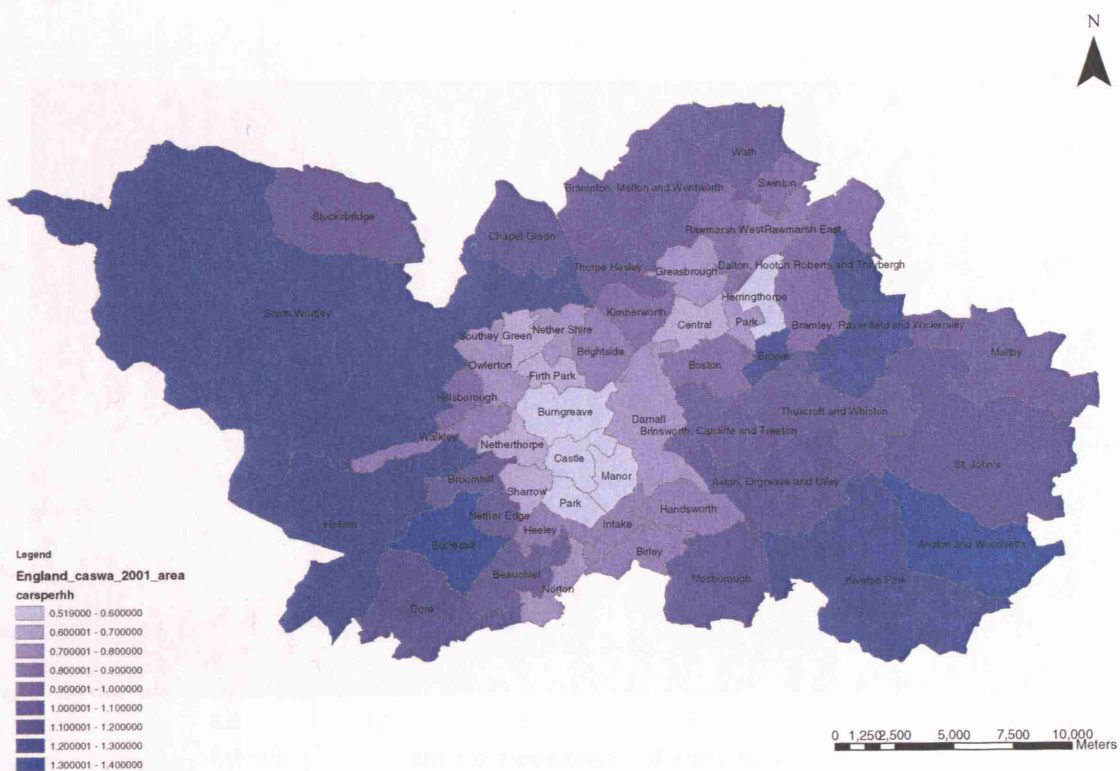
Figure 4.25: Sheffield and Rotherham No Car Households 2001

Legend

England_caswa_2001_area
nocarhhprop
- 0.150000 - 0.200000
- 0.200001 - 0.300000
- 0.300001 - 0.400000
- 0.400001 - 0.500000
- 0.500001 - 0.600000
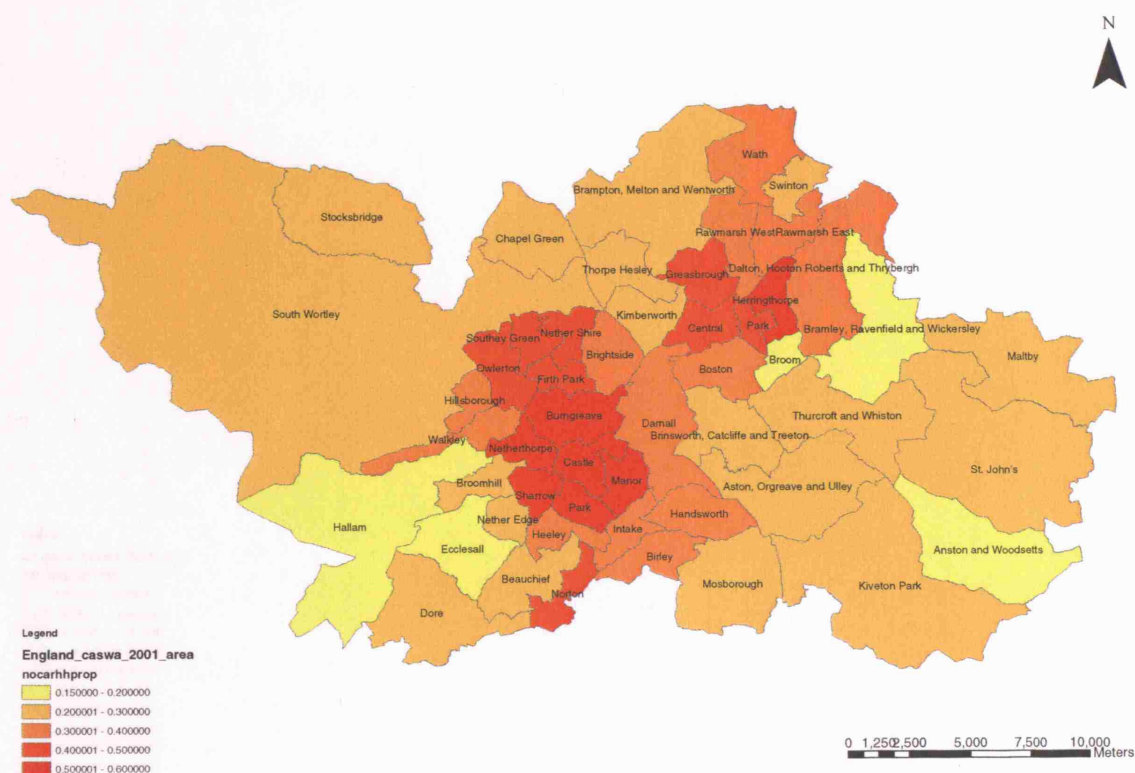
Figure 4.26: Sheffield and Rotherham No car Households 2001
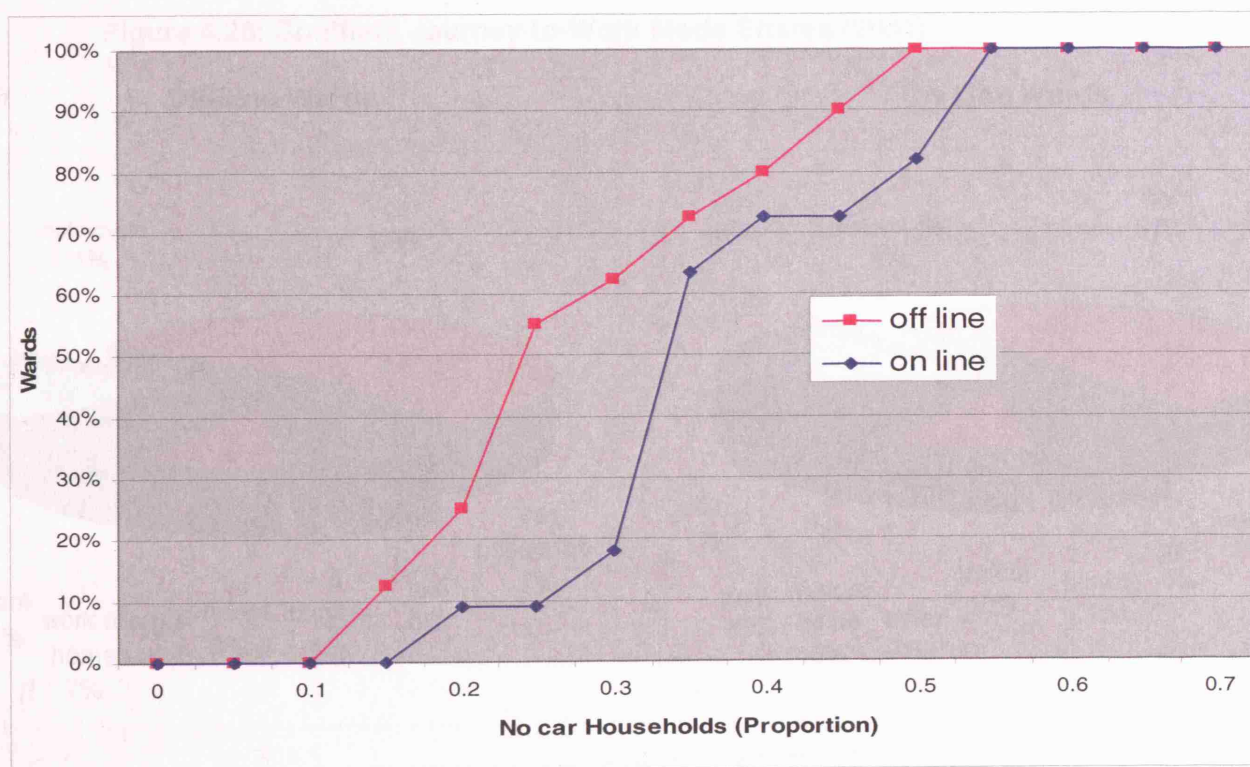
Figure 4.27: Sheffield and Rotherham IMD Income Score 2000

Legend

England_caswa_2001_area

INCOME_SCORE

- 8.800000 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 25.000000
- 25.000001 - 30.000000
- 30.000001 - 35.000000
- 35.000001 - 40.000000
- 40.000001 - 45.000000
- 45.000001 - 50.000000
- 50.000001 - 55.000000

0 1,250 2,500   5,000   7,500   10,000
Meters

Figure 4.28: Sheffield Journey-to-Work Mode Shares (2001)

Off-Line Wards

motorcycle 1%
bus 15%
car 58%
train 1%
tram 1%
work at home 7%
other 0%
on foot 9%
bicycle 1%
taxi 0%
car passenger 7%

On-Line Wards

bus 17%
motorcycle 1%
car 51%
train 1%
tram 6%
work at home 6%
other 0%
on foot 10%
bicycle 1%
taxi 0%
car passenger 7%

94
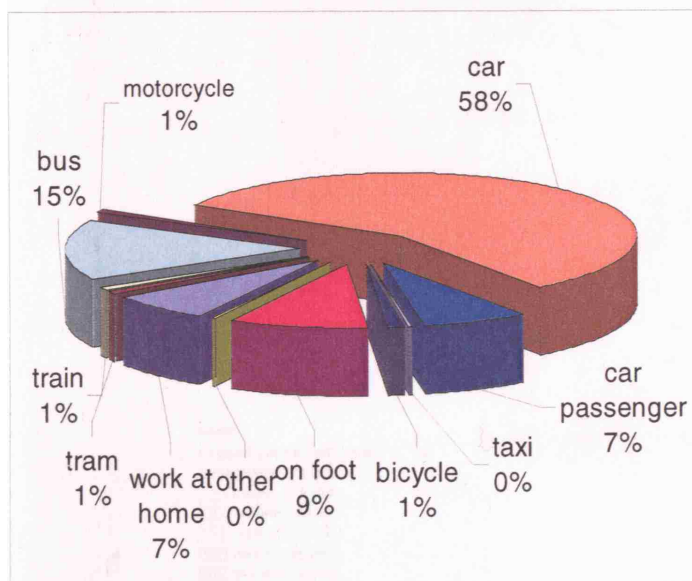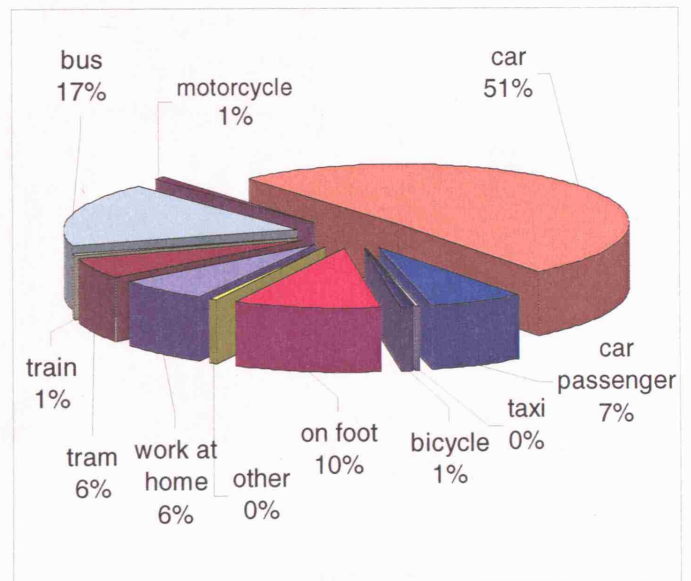
4.3.12 The distribution of employment deprivation in Sheffield and Rotherham is shown in Figure 4.29 and shows greatest levels of deprivation in the central areas of Sheffield and Rotherham. The NOMIS claimant count data, for a period of ten years, is plotted in Figure 4.30 as a relative index between off-line (index=1.0) wards and on-line wards. The system opened just before the series shown in March 1994. The NOMIS data shows that unemployment in the 'on-line' wards is relatively worse than the 'off-line' wards over the last decade, but since 2003 it has fallen to similar levels.

4.3.13 Although many other factors must be taken into account, such as disproportionate expenditure on other infrastructure (such as roads) and targeted regeneration initiatives following decline of industry, there is a correlation with the relative unemployment index. However, much of the narrowing of the relative difference has occurred since 2002 and it is not clear that this corresponds to any notable change in the Supertram system or service.

Figure 4.29: Sheffield and Rotherham IMD Employment Score 2000
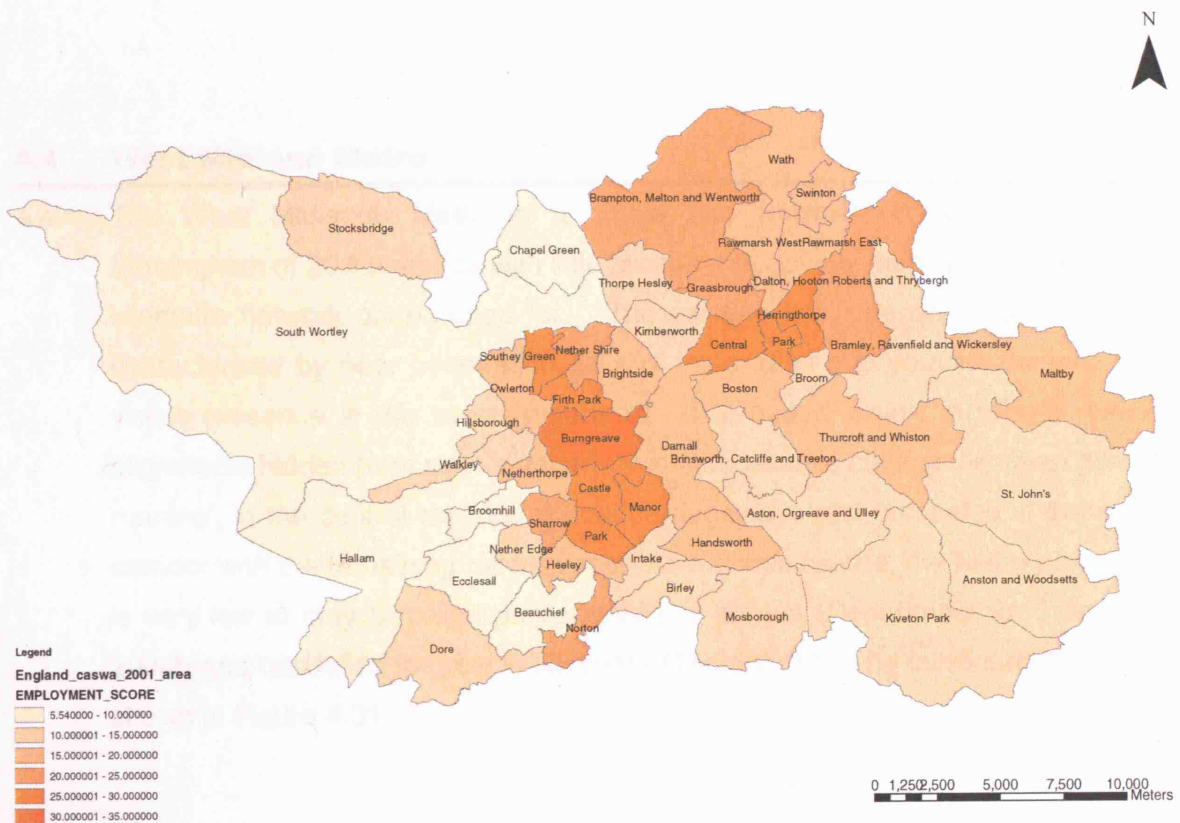
Figure 4.30: Sheffield and Rotherham Relative Index of Unemployment (Claimants)
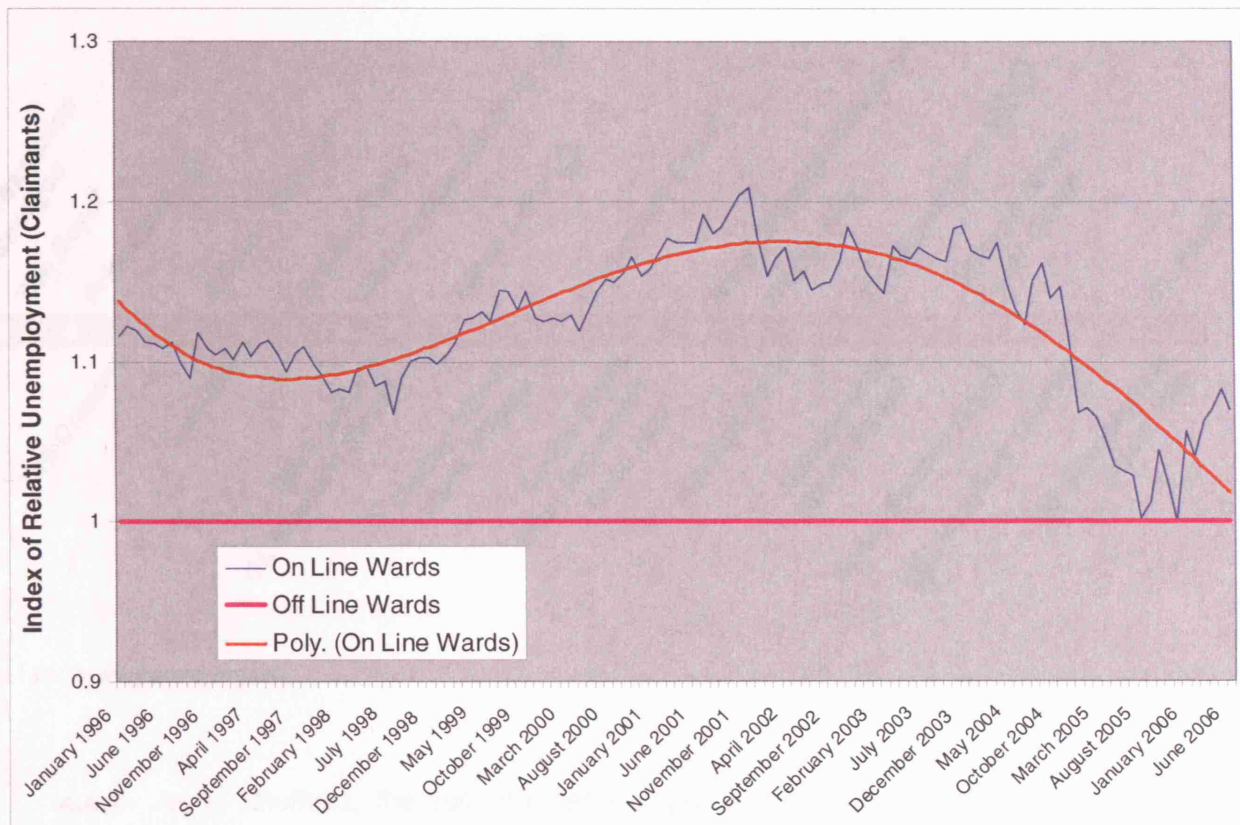
4.4 West Midland Metro

4.4.1 The West Midlands Metro is a single line between Wolverhampton and Birmingham of 20 kilometres with little prospect of development into the large 100 kilometre network once hoped for.   The existing line, opened in May 1999, is characterised by poor penetration, lack of integration and notable absence of a visible presence in the two city centres.   It is based mainly in former railway alignments hidden from view in relatively in inaccessible cuttings or, when 'street-running', in the central reserve of dual carriageways and competes in the same corridor with the remaining rail services. As a consequence, the Metro patronage is very low at only 5 million passengers per annum (Department for Transport, 2005b)and has failed to grow in six years (Table 2.10). The current route map is shown in Figure 4.31.

Figure 4.31: West Midlands Metro Route Map

Source: http://www.centro.org.uk

4.4.2   As in Sheffield, the scheme was delayed and opportunities for integrated land use planning were missed:

> '….in these two instances in particular, light rail schemes have served to highlight the disastrous shift of urban structure to serve American-style car-dependent lifestyles. The message is clear: light rail and scattered low density development do not mix.' (Hylen and Pharaoh, 2002).

4.4.3   The light rail line suffers from a lack of visibility and ridership is low. However, the light rail line has widened people's opportunities for shopping and leisure as well as commuting from sub-centres such as Wednesbury to Wolverhampton or Birmingham, and some of the potential of Line 1 took a social regeneration form with benefits based in housing improvement and labour market access, in areas such as West Bromwich where unemployment rates are very high and car ownership low (Hass-Klau et al, 2004).

4.4.4   For the purposes of analysis, the Midland Metro 'on line' wards are listed in Table 4.5, and highlighted graphically in Figure 4.32. It is estimated that only 5% of the study area population lies within the 'on-line' wards.

Table 4.5: West Midlands 'On-Line' Wards

Wolverhampton	Sandwell	Birmingham
St Peter's	Princes End	Soho
Ettingshall	Wednesbury South	Aston
Bilston East	West Bromwich Central	Nechells
	St Paul's	
	Soho and Victoria	

Figure 4.32: West Midlands Metro 'On-Line' Districts and Wards
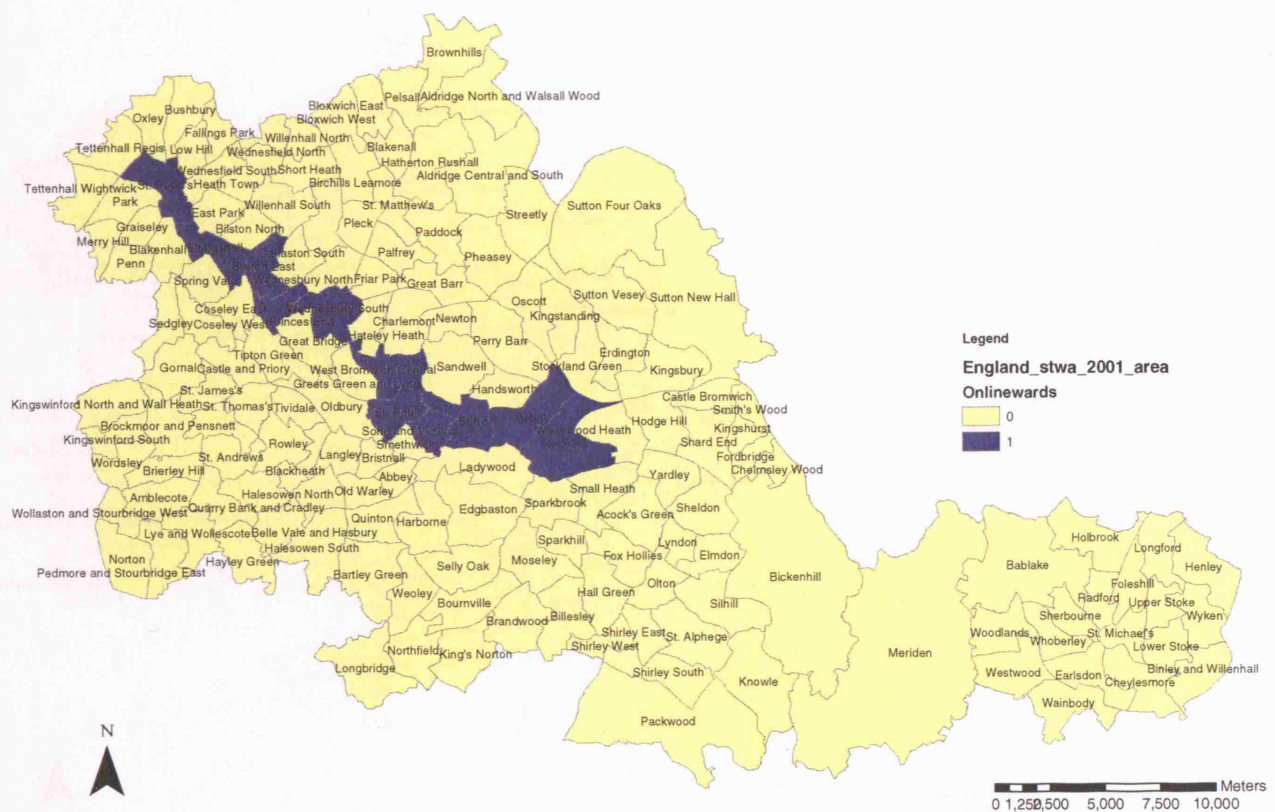
4.4.5 Figure 4.33 shows the distribution of light rail users in the West Midlands area for their journey to work (as reported in the 2001 Census). Logically, this pattern generally conforms to the identified 'on line' wards identified. It is estimated that 11% of the study area population lies in the 'on-line' wards in the study area.

4.4.6 Figure 4.34 shows the IMD2000 Score for wards in the West Midlands study area, with the darkest tones highlighting the most deprived areas. In comparison with Figures 4.32 and 4.33 (the on line wards and journey to work by light rail), it can be seen that there is a strong correlation between tram use and the most deprived areas.

Figure 4.33: West Midlands Journey to Work by Tram (2001)
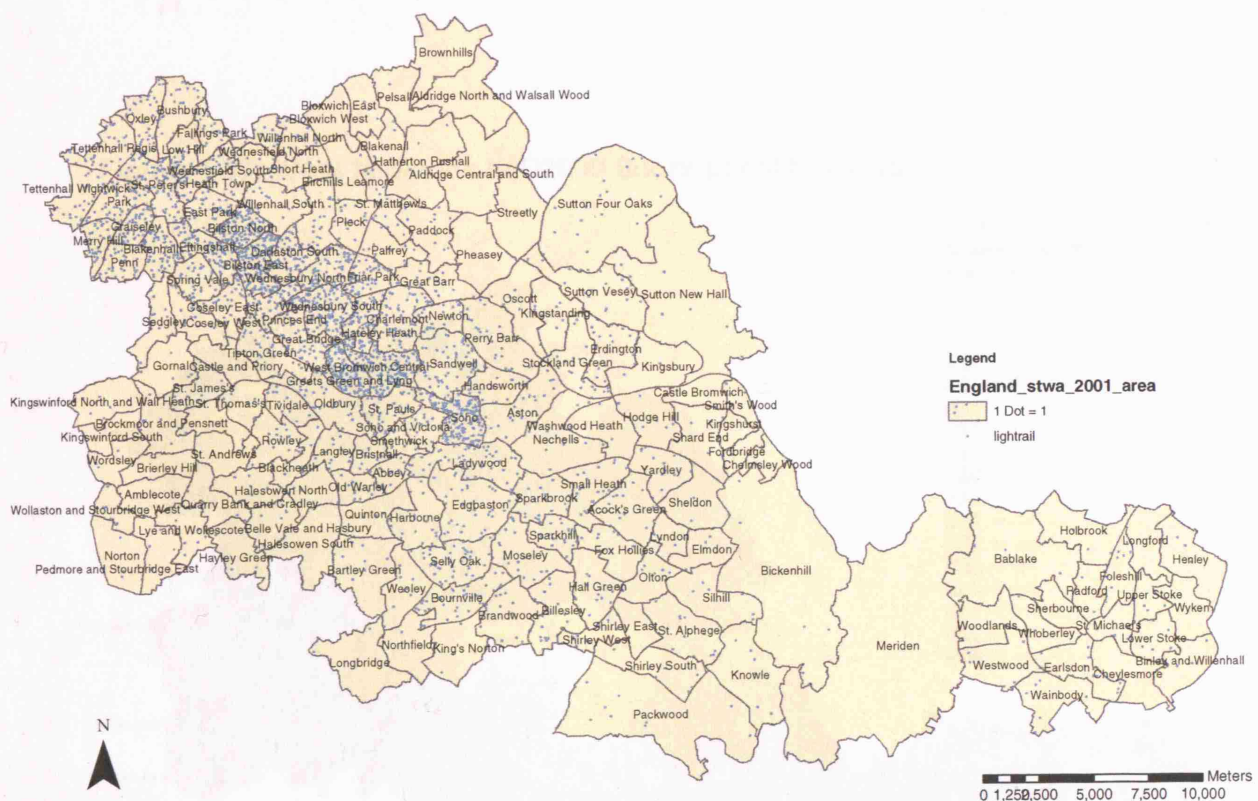
Figure 4.34: West Midlands IMD2000 Score

Legend

England_stwa_2001_area

IMD_SCORE

- 3.150000 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 25.000000
- 25.000001 - 30.000000
- 30.000001 - 35.000000
- 35.000001 - 40.000000
- 40.000001 - 45.000000
- 45.000001 - 50.000000
- 50.000001 - 55.000000
- 55.000001 - 60.000000
- 60.000001 - 65.000000
- 65.000001 - 70.000000
- 70.000001 - 75.000000
- 75.000001 - 80.000000
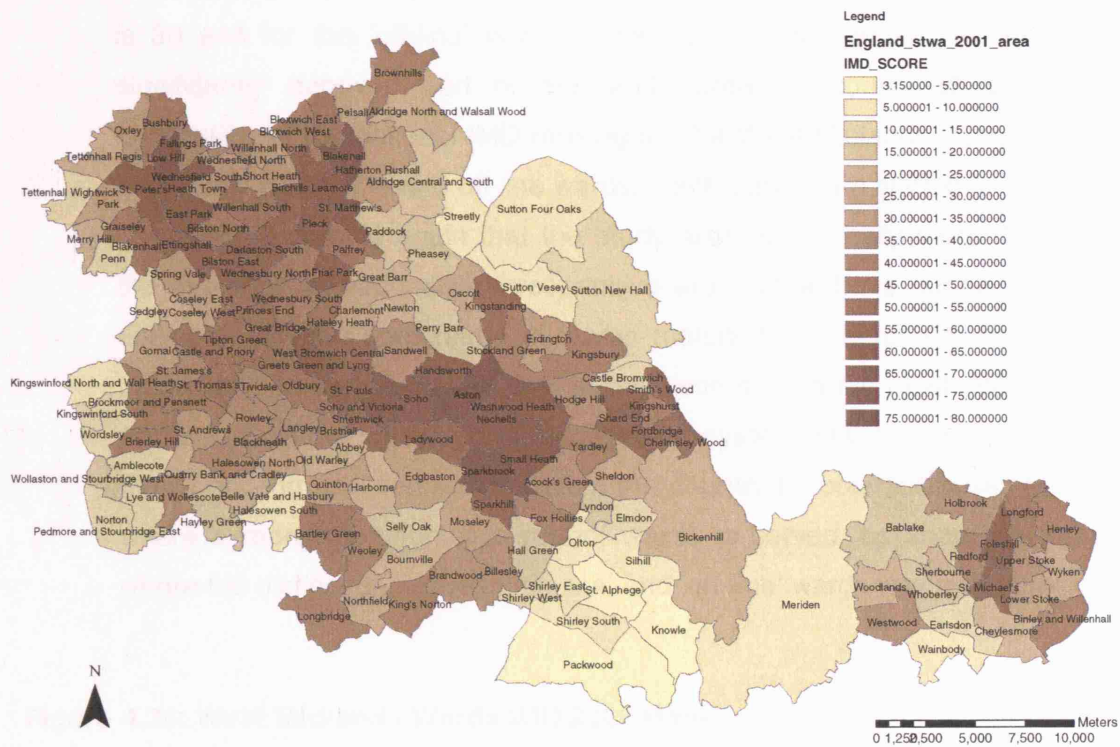
Figure 4.35: West Midlands IMD2000 Score Local Ranking

Legend

England_stwa_2001_area

local_rank_imd_score

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- 121 - 130
- 131 - 140
- 141 - 150
- 151 - 160
- 161 - 170
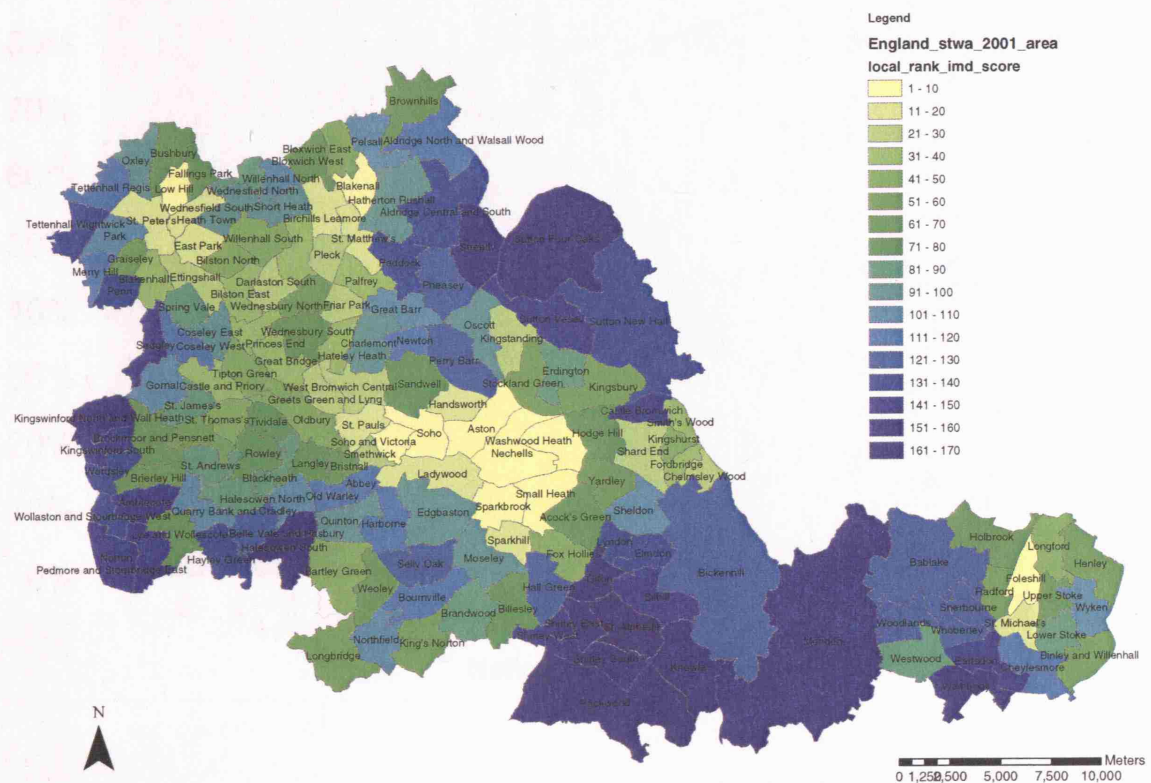
4.4.7 Figure 4.35 shows the local ranking of the IMD Score in the study area wards. The mean rank score (out of 162 wards in the study area) for the 'on-line' wards is 30 and for the 'off-line' is 85 indicating that the light rail system lies in a significantly deprived part of the study area. Figure 4.36 compares the distribution of the national IMD ranking for the West Midlands study area wards, separately for on line and off line wards. Both curves are shifted to the left of the diagonal, confirming again that the study area is generally more deprived than the average. A nationally-representative area would have curves following the diagonal with the percentage of wards matching the percentile of the ranking. Figure 4.36 shows that all of the 'on-line' wards lie in the most deprived 15% of wards in England showing that the light rail system passes through some of the most concentrated deprived wards in the country (in contrast to say Manchester where a more representative mix of wards is served, as shown in Figure 4.6 where the distinction between 'on-line' and 'off-line' wards was less marked).

Figure 4.36: West Midlands Wards IMD 2000 Rank
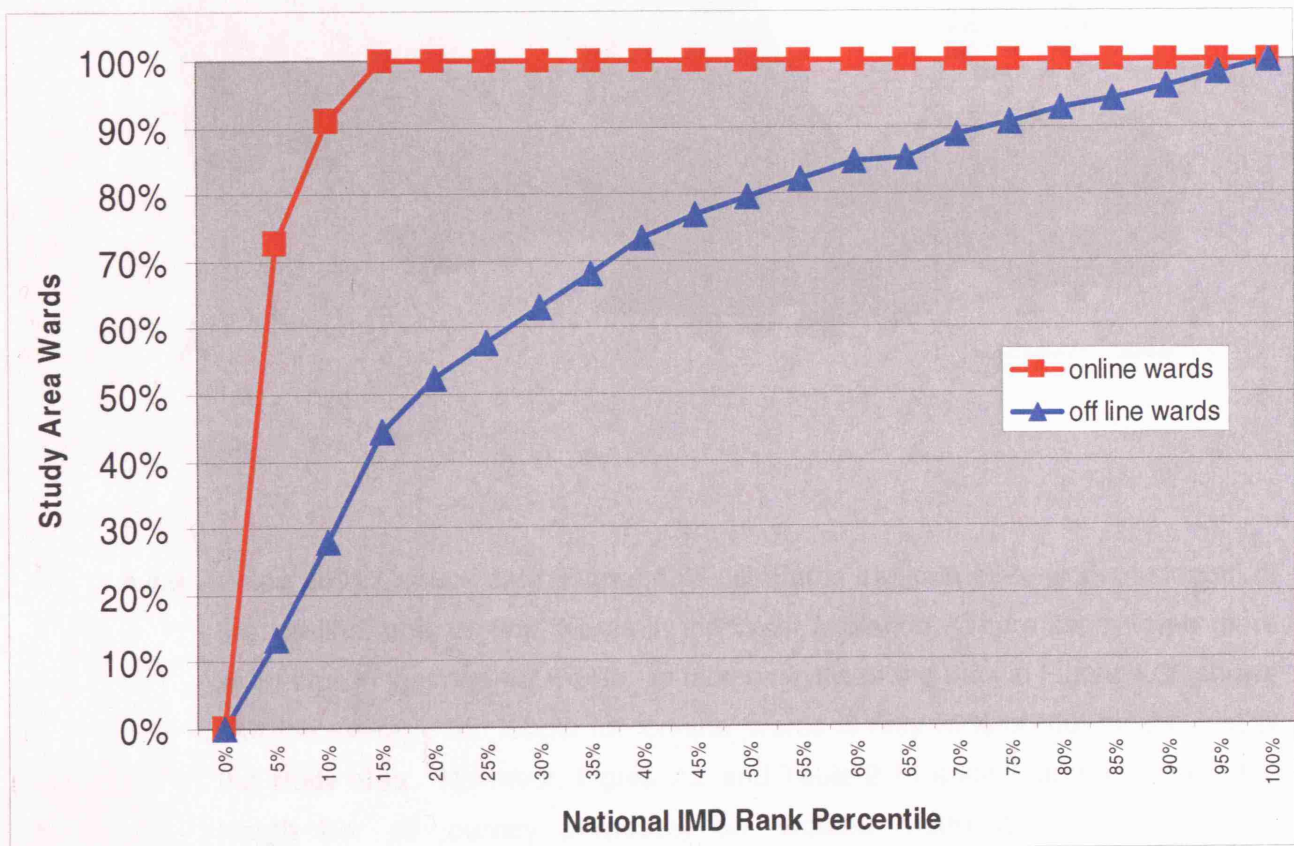
4.4.8 One of the component domains of the IMD is geographic access to services, shown in Figure 4.37 for the West Midlands. This shows a different kind of pattern that is the inverse of the general pattern with the central areas of Birmingham and Coventry enjoying the best access, and the peripheral, lower density areas having less access to services.

Figure 4.37: West Midlands IMD Access Score 2000
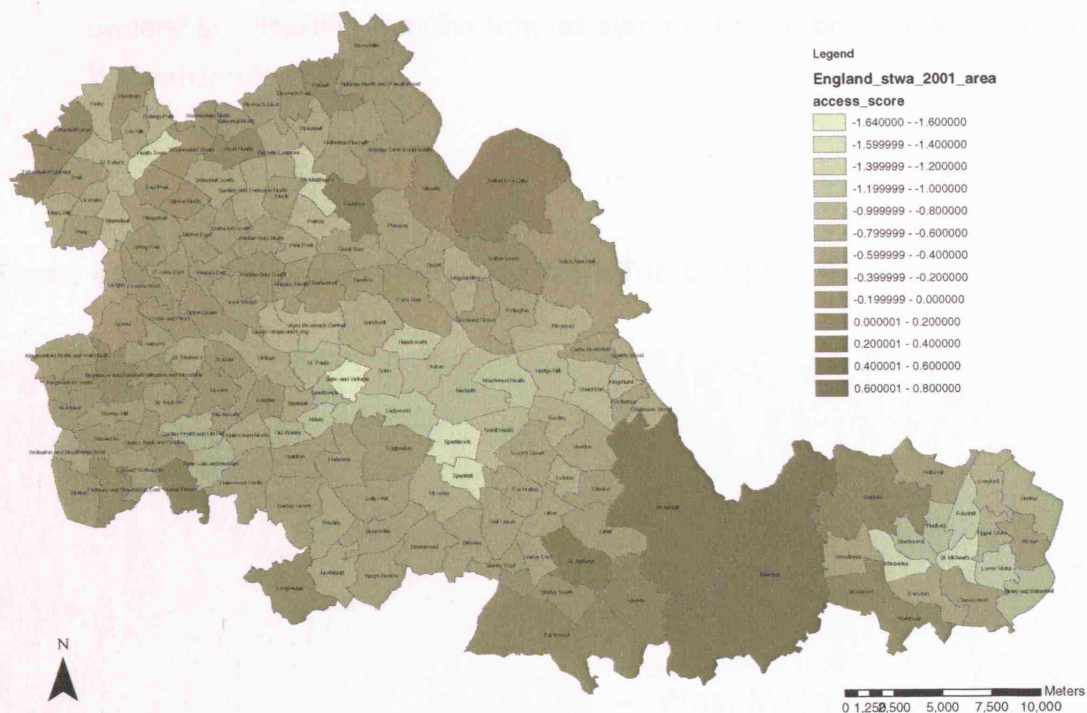
4.4.9 Using 2001 Census data, Figure 4.38 compares the journey-to-work trip length of the 'off-line' and 'on-line' wards in the West Midlands. There seem to be more short trips in the 'on-line' wards. In fact, analysis of the data in Figure 4.38 shows that the average trip length for 'on-line' wards is only 82% of that for the rest of the study area. However, Figure 2.5 and Table 2.11 show that the average trip length (for all journey purposes) on Midland Metro is relatively long at approximately 10.5km which is the longest of all the systems, and longer than the average for all systems (6.2km), reflecting the heavy rail origins of the route. The

average trip length is approximately half the route length (20km), suggesting that the system is not used for relatively local trips for which buses are more suitable and attractive than the low visibility trams.

4.4.10 In the West Midlands, the 2001 Census shows that there is a clear difference in the proportion of non-car owning 'off-line' households (33%) and the proportion of non-car owning 'on-line' households (50%). Car ownership and car availability are also important factors in the range of services and opportunities that can be attained. Figures 4.39 and 4.40 show, using 2001 Census data for each ward, the distribution of car ownership per household and the proportion of 'no car' households. These indicators correlate closely with IMD, with lowest levels of car ownership coinciding with the light rail system corridor between Birmingham and Wolverhampton.

Figure 4.38: West Midlands Journey to Work Trip Length 2001
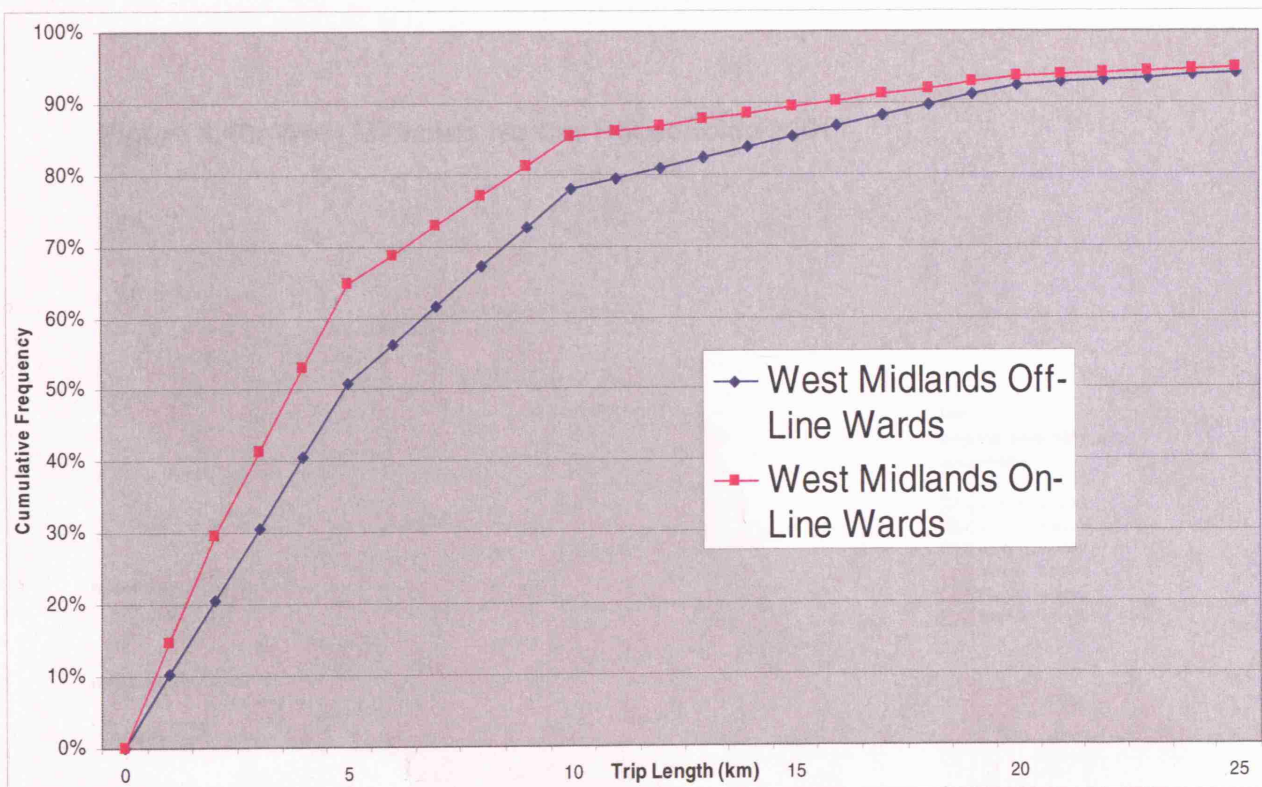
Figure 4.39: West Midlands Cars per Household

Legend

England_stwa_2001_area

carsperhh

- 0.471000 - 0.500000
- 0.500001 - 0.600000
- 0.600001 - 0.700000
- 0.700001 - 0.800000
- 0.800001 - 0.900000
- 0.900001 - 1.000000
- 1.000001 - 1.100000
- 1.100001 - 1.200000
- 1.200001 - 1.300000
- 1.300001 - 1.400000
- 1.400001 - 1.500000
- 1.500001 - 1.600000
- 1.600001 - 1.700000

Meters
0 1,250 2,500 5,000 7,500 10,000
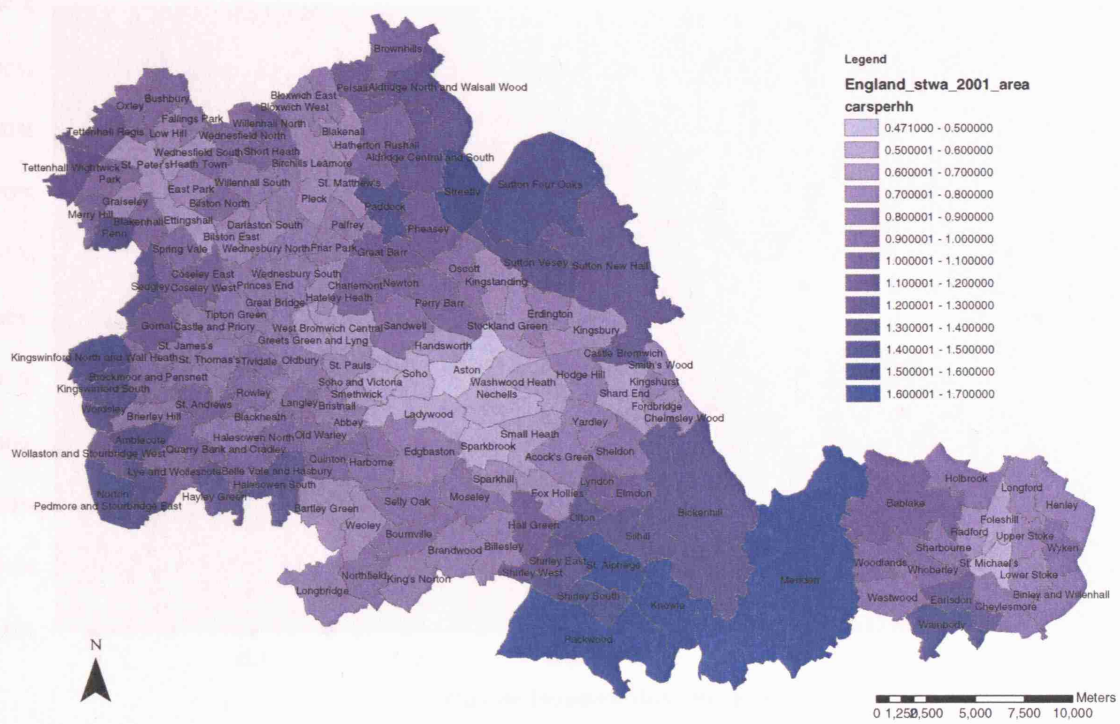
Figure 4.40: West Midlands No Car Households 2001

Legend

England_stwa_2001_area

nocarhhprop

- 0.079000 - 0.100000
- 0.100001 - 0.200000
- 0.200001 - 0.300000
- 0.300001 - 0.400000
- 0.400001 - 0.500000
- 0.500001 - 0.600000
- 0.600001 - 0.700000

Meters
0 1,250 2,500 5,000 7,500 10,000

Figure 4.41: West Midlands No Car Households 2001
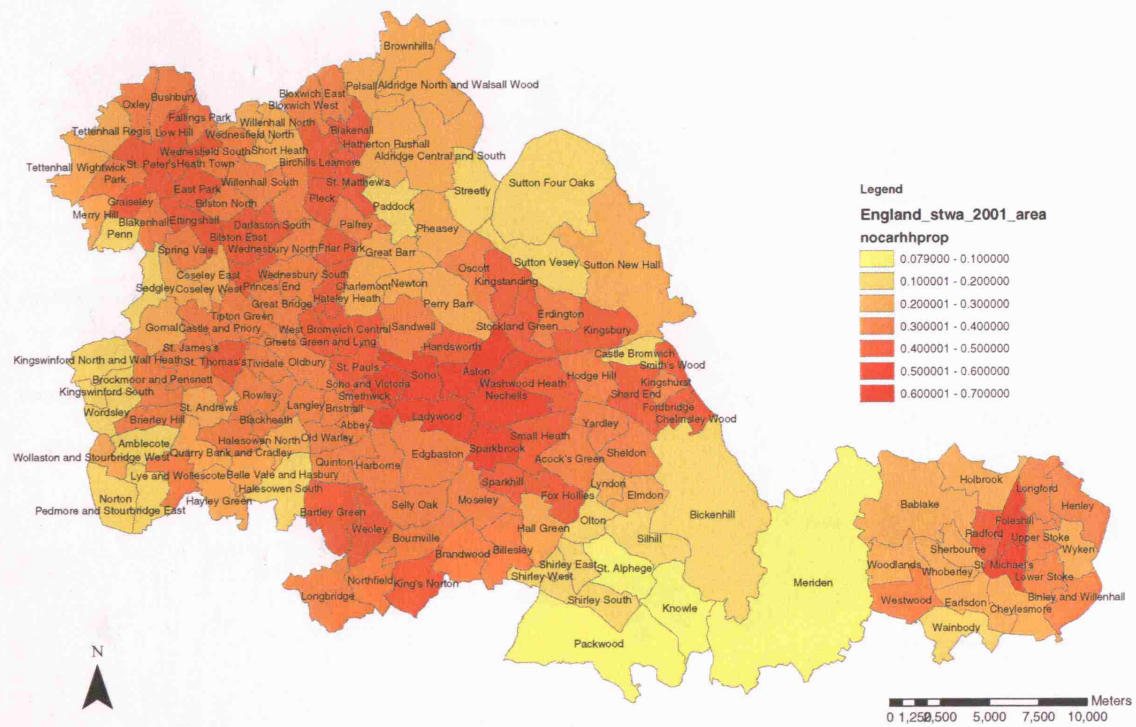
Figure 4.41: West Midlands No Car Households 2001

Figure 4.42: West Midlands IMD Income Score 2000
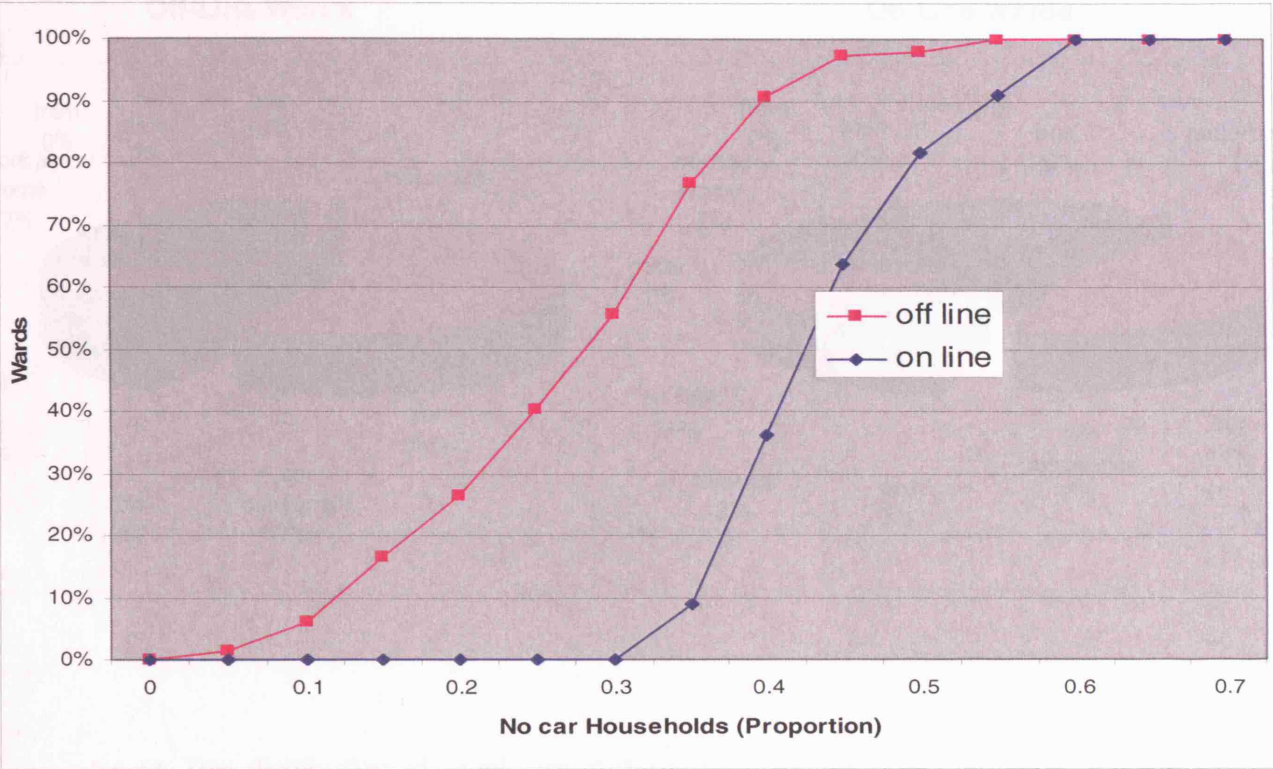
Figure 4.42: West Midlands IMD Income Score 2000
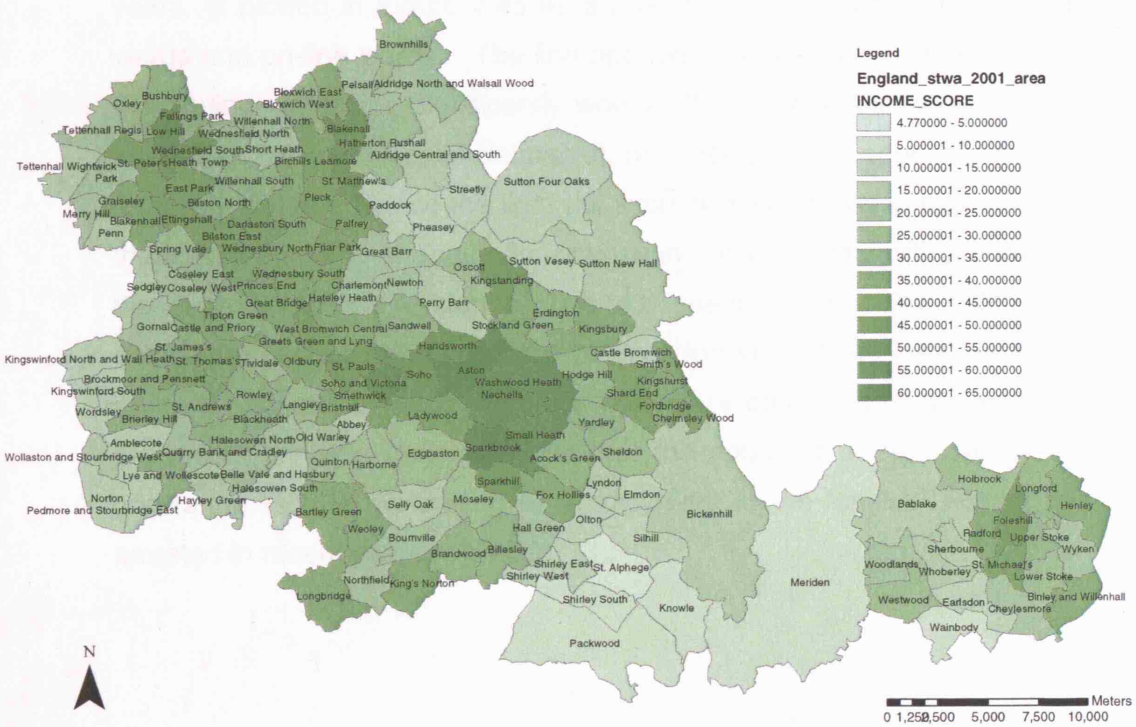
Figure 4.43: West Midlands Journey-to-Work Mode Shares 2001

Off-Line Wards

On-Line Wards
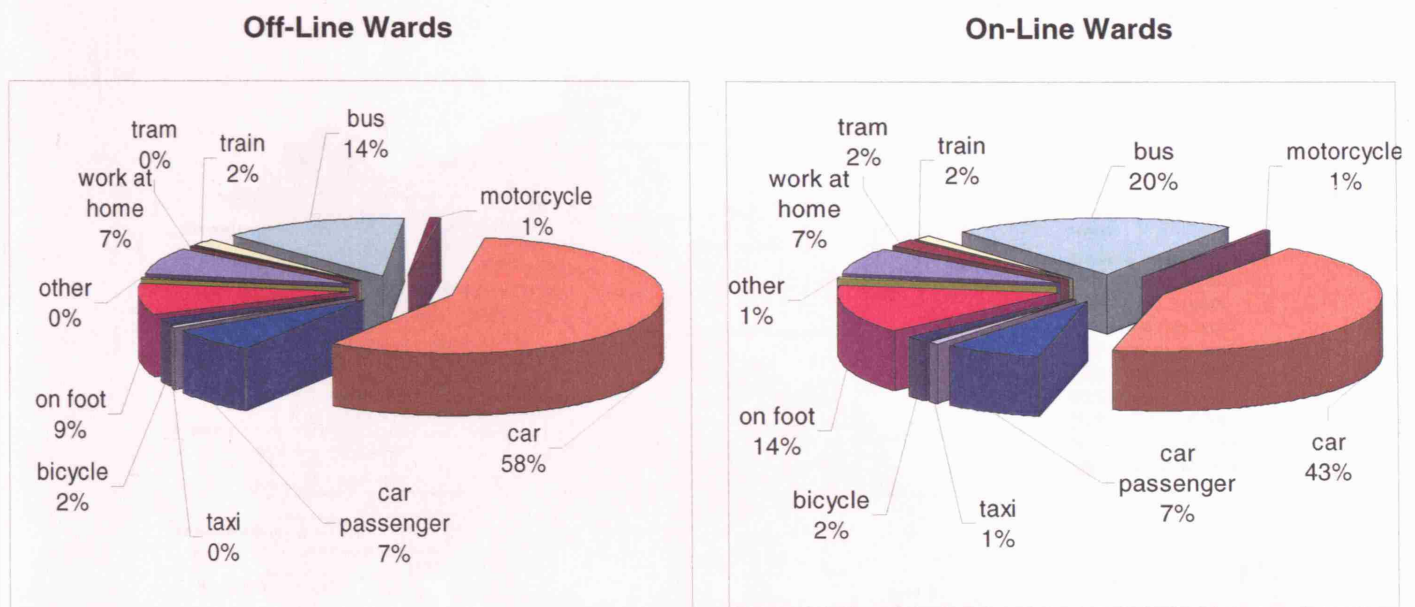
4.4.11 The distribution of employment deprivation in the West Midlands is shown in Figure 4.44 with the highest levels of deprivation again concentrated in the area served by the tram system. The NOMIS claimant count data, for a period of ten years, is plotted in Figure 4.45 as a relative index between off-line (index=1.0) wards and on-line wards. The line opened in May 1999. The results show that the on-line wards are significantly worse off relative to the 'off-line' wards (with more than twice the rate of claimants), and indeed these appear to have become relatively worse off since the light rail system opened. As in other case studies, there appears to be an upturn in fortunes in recent months with a convergence of the curves, but this evidence does not seem to show that light rail has an immediate impact to improve the relative fortunes of the communities through which it passes (although there are potentially other factors at work). Perhaps the most optimistic view would be that the apparent divergence of the curves (indicating relative worsening of employment in the 'on-line' wards) has been arrested in recent years.

Figure 4.44: West Midlands IMD Employment Score 2000

Legend

England_stwa_2001_area
EMPLOYMENT_SCORE

- 3.770000 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 25.000000
- 25.000001 - 30.000000
- 30.000001 - 35.000000
- 35.000001 - 40.000000

Meters
0 1,250 2,500 5,000 7,500 10,000
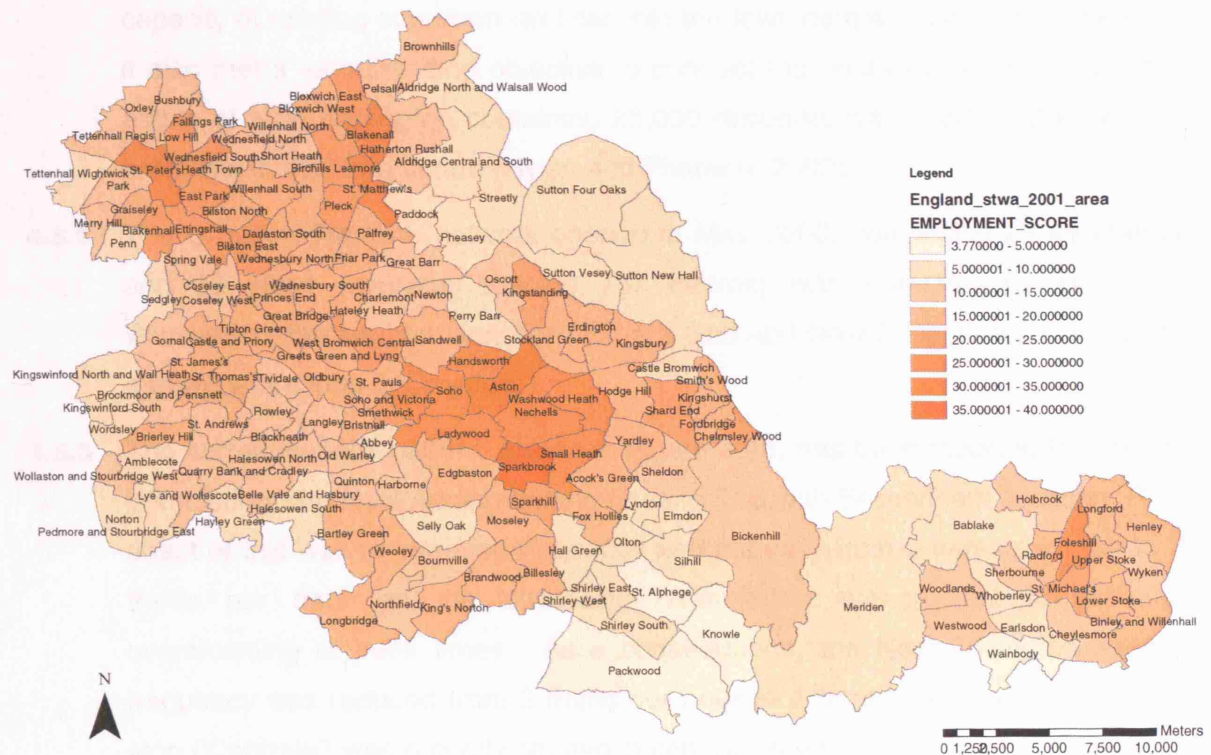
Figure 4.45: West Midlands Relative Index of Unemployment (Claimants)
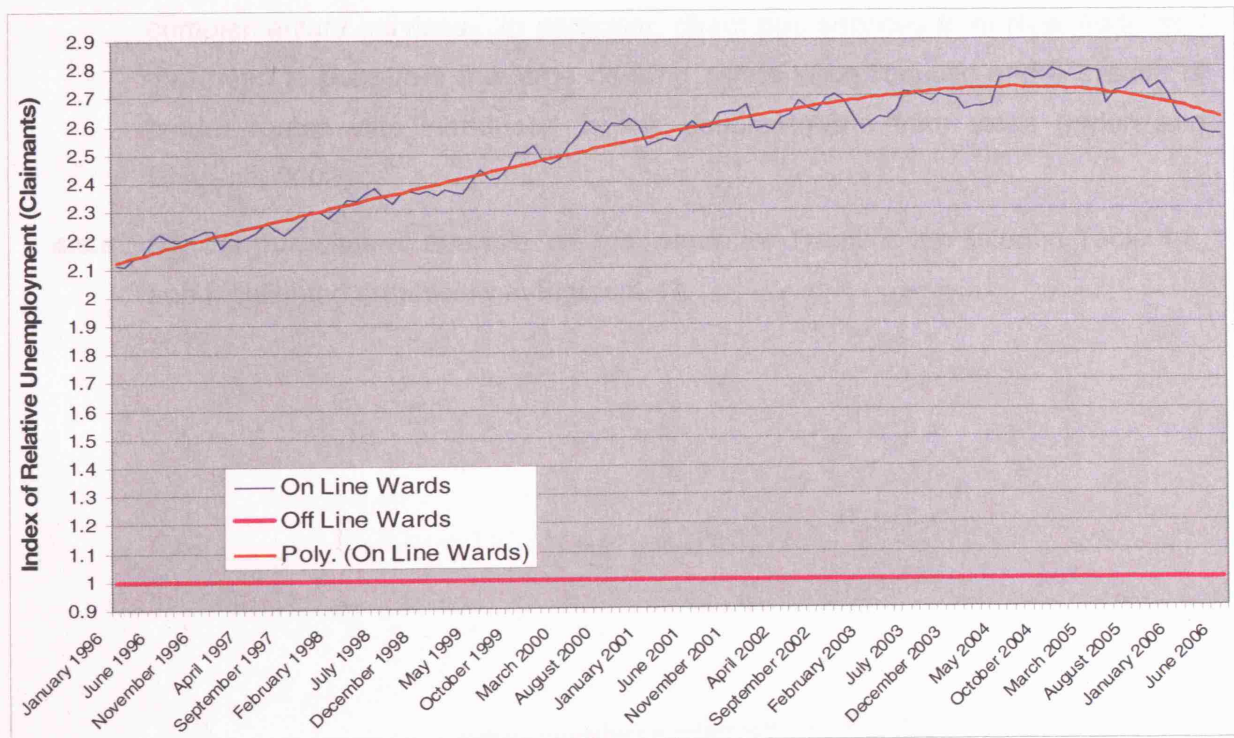
4.5   Croydon Tramlink

4.5.1   Light rail in Croydon was conceived as a means to increase the quality and capacity of existing suburban rail lines into the town centre. In addition, however, it also met a long-standing objective to connect the relatively remote residential estate of New Addington containing 25,000 residents with social and economic problems to the town centre (Hylen and Pharaoh, 2002).

4.5.2   The Croydon Tramlink network opened in May 2000, comprising 28 kilometres and 38 stops (average spacing 737 metres) with branches to termini at Wimbledon, Beckenham Junction, Elmer's End and New Addington connected to a town centre loop in Croydon.

4.5.3   The current service pattern, shown in Figure 4.46, has been modified to connect Wimbledon with New Addington and Elmer's End with Beckenham Junction. The effect of this was to increase frequency and capacity from 6 trams per hour to 8 trams per hour on the successful Wimbledon branch that is suffering overcrowding at peak times. As a consequence, the New Addington service frequency was reduced from 9 trams per hour to 8 trams per hour. A new 39th stop ('Centrale') was recently opened in central Croydon.

4.5.4   Being within Greater London, Tramlink did not suffer from deregulation and thereby benefited from coordination of public transport, and changes to local bus services in the area were planned to provide an integrated network of feeder and complementary services. In particular, direct bus services from New Addington that used to penetrate the large housing estate were reduced and a system of feeder routes was introduced to link people to the tram stops (Hylen and Pharaoh, 2002).

4.5.5   For the purposes of analysis 'on-line' wards for Tramlink are listed in Table 4.6, and highlighted graphically in Figure 4.47.

## Figure 4.46: Croydon Tramlink Route Map
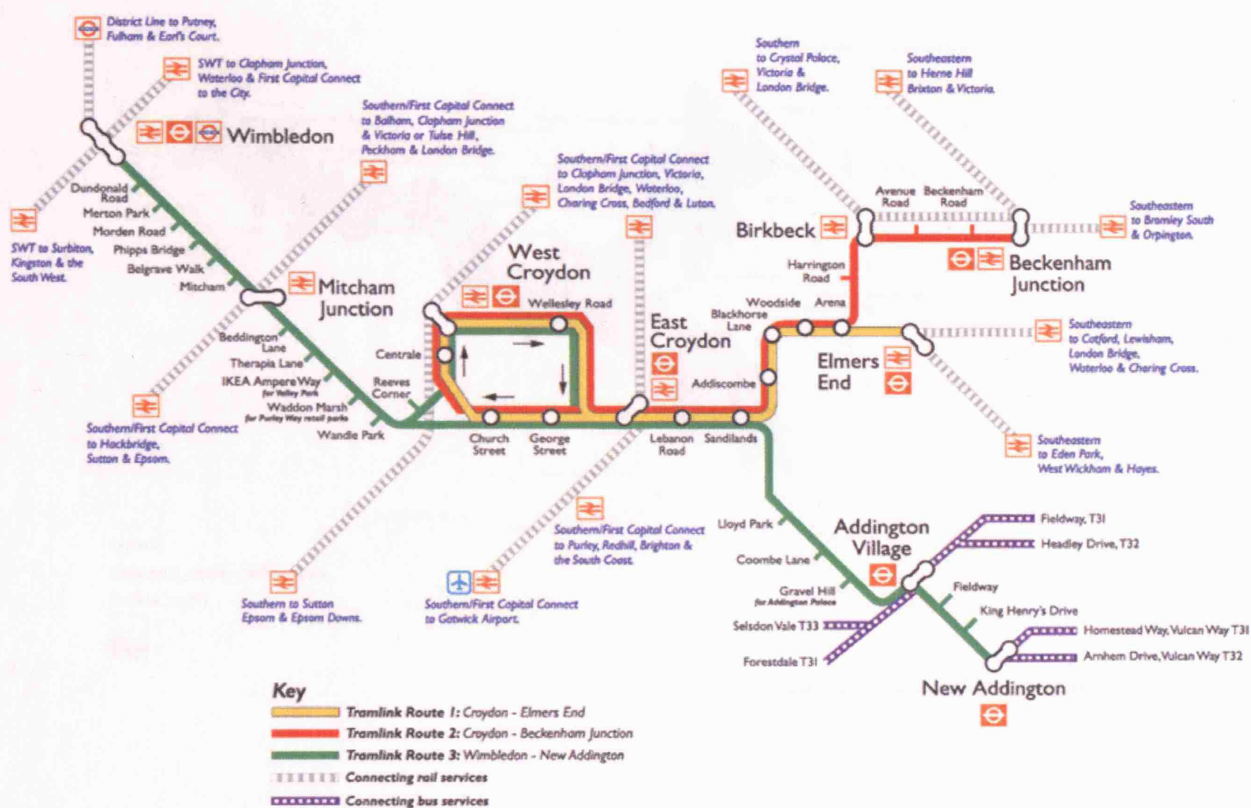
Source: www.tfl.gov.uk

Table 4.6: Croydon Tramlink 'On-Line' Districts and Wards

Croydon Tramlink		
Merton	**Croydon**	**Bromley**
Hillside	West Thornton	Clock House
Dundonald	Broad Green	Kelsey and Eden Park
Merton Park	Fairfield	Copers Cope
Abbey	Addiscombe	
Ravensbury	Ashburton	
Cricket Green	Heathfield	
Pollards Hill	Fieldway	
	New Addington	

Figure 4.47: Croydon Tramlink 'On-Line' Wards
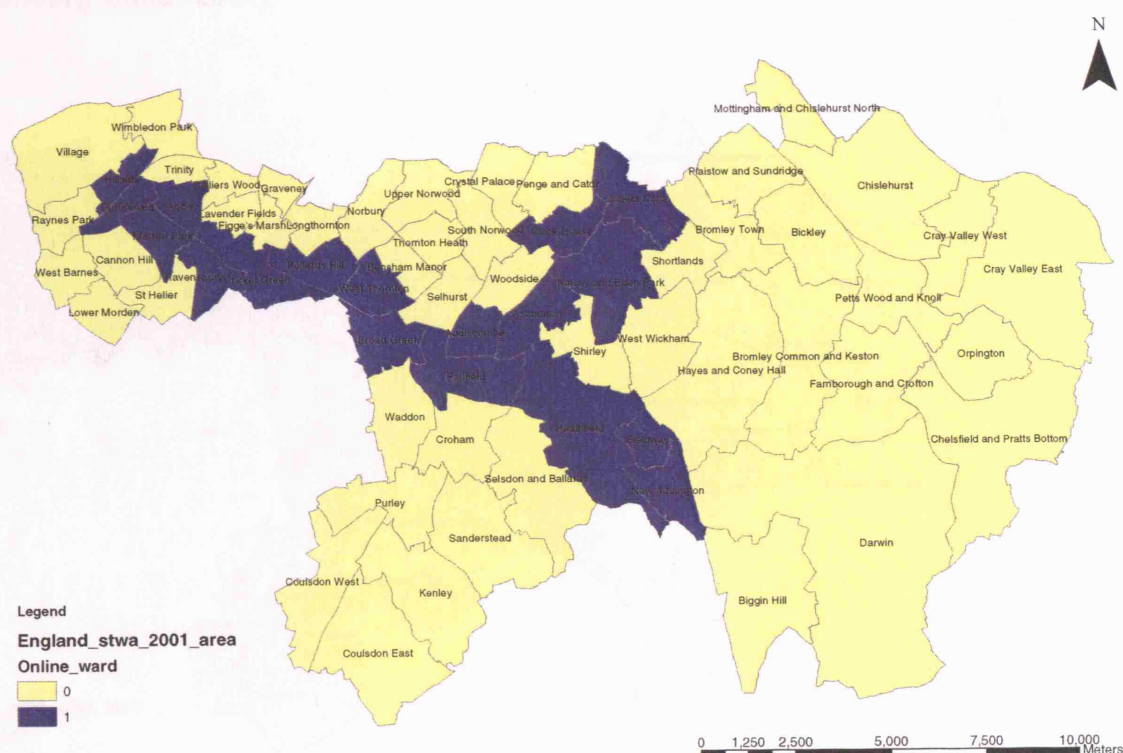
4.5.6 Figure 4.48 shows the distribution of light rail users in the Croydon Tramlink area for their journey to work (as reported in the 2001 Census). Logically, this pattern generally conforms to the identified 'on line' wards identified, and highlights the density of users in New Addington and Fieldway wards relative to the well-to-do surrounding suburban wards of southern Croydon and Bromley (and highlighted in Figures 49 and 50 for national IMD2000 Scores and local ranking. Unfortunately, the census data plotted in Figure 4.48 does not distinguish between 'light rail' and 'London Underground'. Although south London is generally poorly served by Underground, there are stations at Wimbledon and Wimbledon Park (District Line), and Morden, South Wimbledon and Colliers Wood (Northern Line) that account for the apparent dense usage in the extreme west of the study area. It is estimated that 27% of the study area population lies in the 'on-line' wards.

Figure 4.48: Bromley, Croydon and Merton Journey to Work by Tram and Underground (2001)

Legend

England_stwa_2001_area

1 Dot = 1

lightrail

0 1,250 2,500   5,000   7,500   10,000
Meters
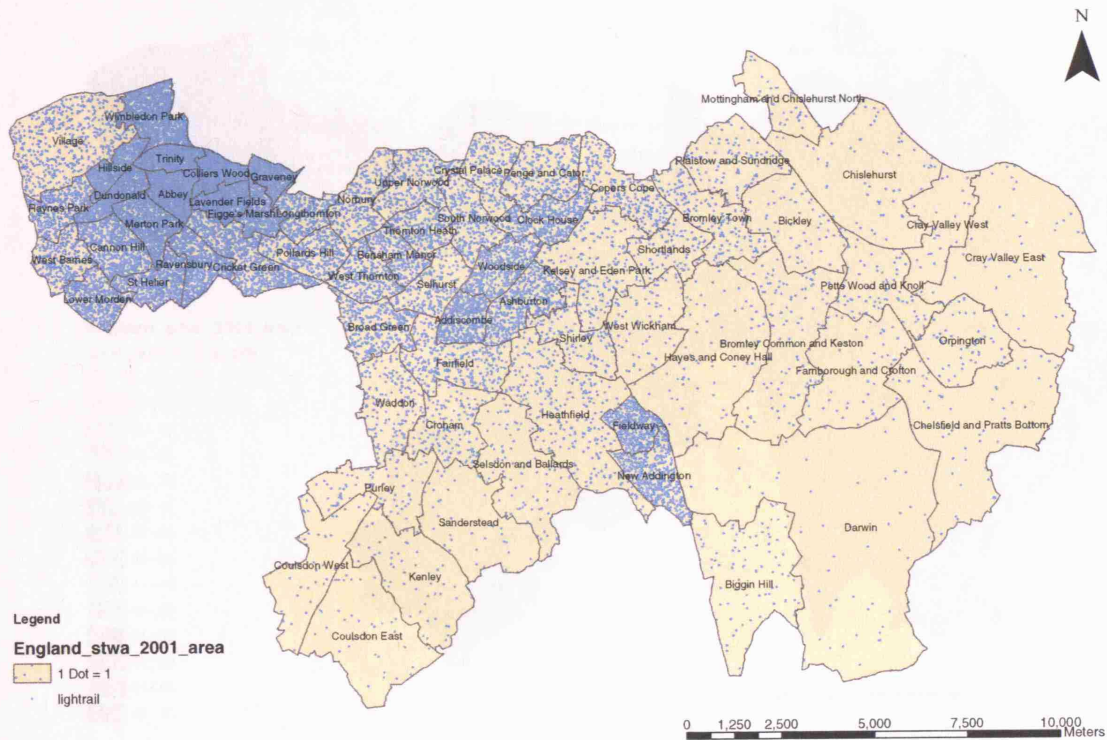
Figure 4.49: Bromley, Croydon and Merton IMD2000 Score

Legend

England_stwa_2001_area

IMD_SCORE

2.210000 - 5.000000
5.000001 - 10.000000
10.000001 - 15.000000
15.000001 - 20.000000
20.000001 - 25.000000
25.000001 - 30.000000
30.000001 - 35.000000
35.000001 - 40.000000
40.000001 - 45.000000
45.000001 - 50.000000

0 1,250 2,500   5,000   7,500   10,000
Meters
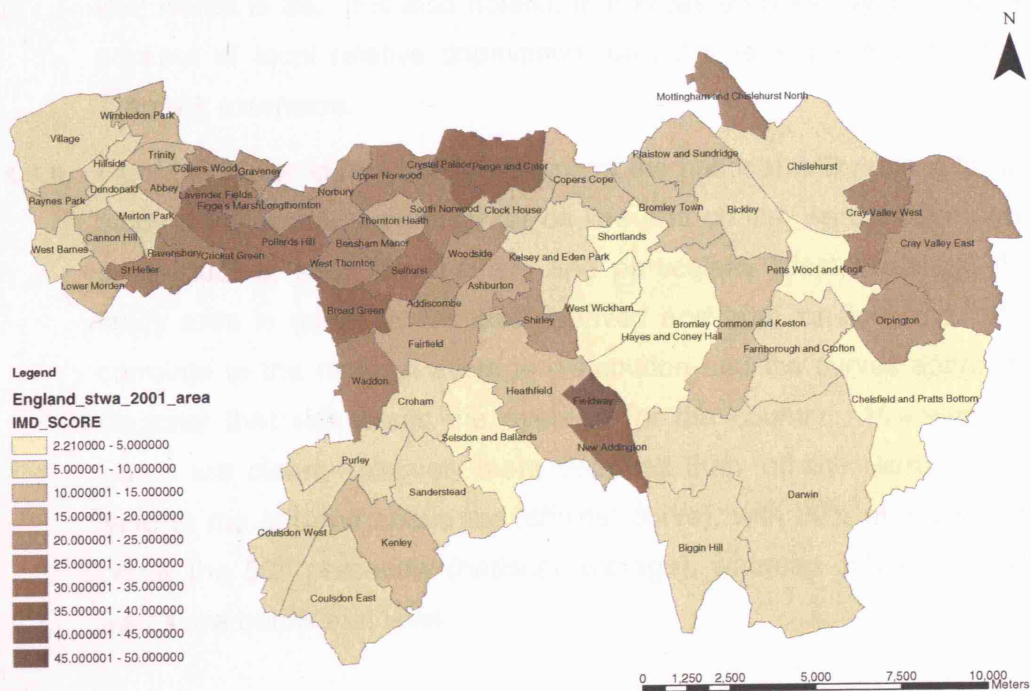
Figure 4.50: Bromley, Croydon and Merton IMD2000 Score Local Rank
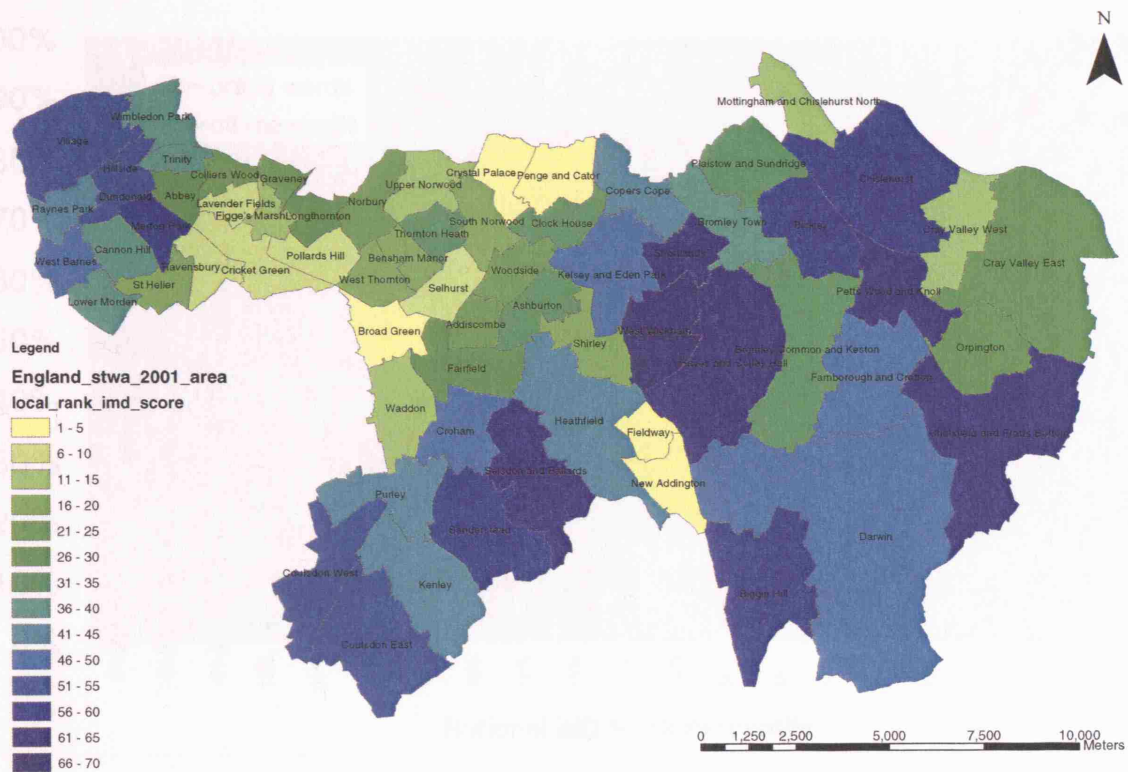
4.5.7 Figure 4.50 plots the local ranking of the national IMD2000 Score for the 66 wards. The mean rank score for the 'on-line' wards is 27, and that for the 'off-line' wards is 36. It is also notable that areas such as Crystal Palace are in the pockets of local relative deprivation, and this is a destination for a proposed Tramlink extension.

4.5.8 Figure 4.51 compares the distribution of the national IMD ranking for the Croydon study area wards, separately for on line and off line wards. Compared to other case studies, such as Sheffield and particularly West Midlands, the Croydon study area is generally far less deprived and both 'on-line' and 'off-line' wards correlate to the national average distribution and the curves approximate to the diagonal that represents the average for the country. However, the 'on-line' wards are clearly relatively more deprived than 'off-line' wards (with the curve lying to the left and above the 'off-line' curve), with 60% of 'on-line' wards lying below the 50th percentile (national average), whereas only 40% of the 'off-line' wards are below that level.

Figure 4.51: Croydon Wards IMD Rank
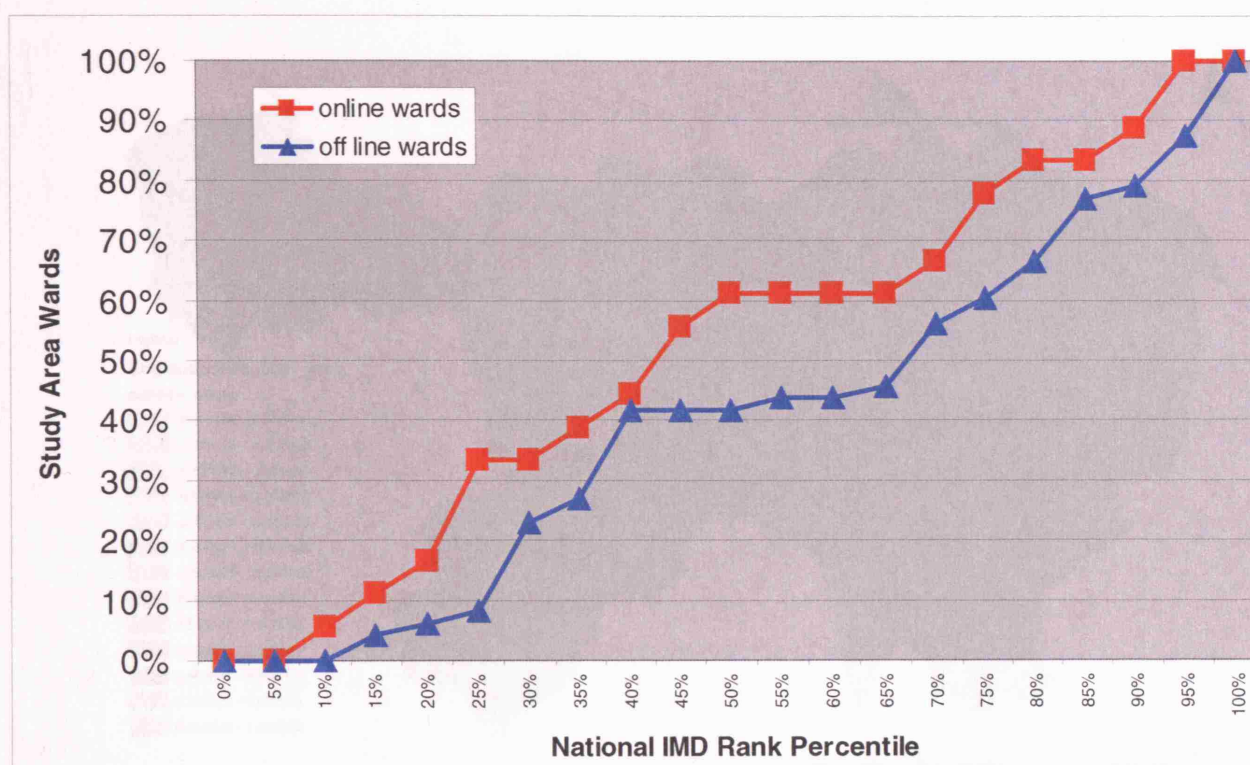
4.5.9 One of the component domains of the IMD is geographic access to services, shown in Figure 4.52 for Bromley, Croydon and Merton. This shows a different kind of pattern that is the inverse of the general pattern with the local town centres such as Wimbledon and Croydon enjoying the best access, and the peripheral, lower density areas such as the southern part of Bromley having less access to services.

4.5.10 Using 2001 Census data, Figure 4.53 compares the journey-to-work trip length of the 'off-line' and 'on-line' wards in Bromley, Croydon and Merton. Figure 2.5 and Table 2.11 show that the average trip length (for all journey purposes) Tramlink is approximately 5.1km which is shorter than the average for all systems (6.2km).

4.5.11 Car ownership and car availability are also important factors in the range of services and opportunities that can be attained. Figures 4.54 and 4.55 show, using 2001 Census data for each ward, the distribution of car ownership per household and the proportion of 'no car' households. These indicators correlate closely with IMD, with lowest levels of car ownership in the case of the metropolitan area.

Figure 4.52: Croydon IMD Access Score 2000

Figure 4.52: Croydon IMD Access Score 2000

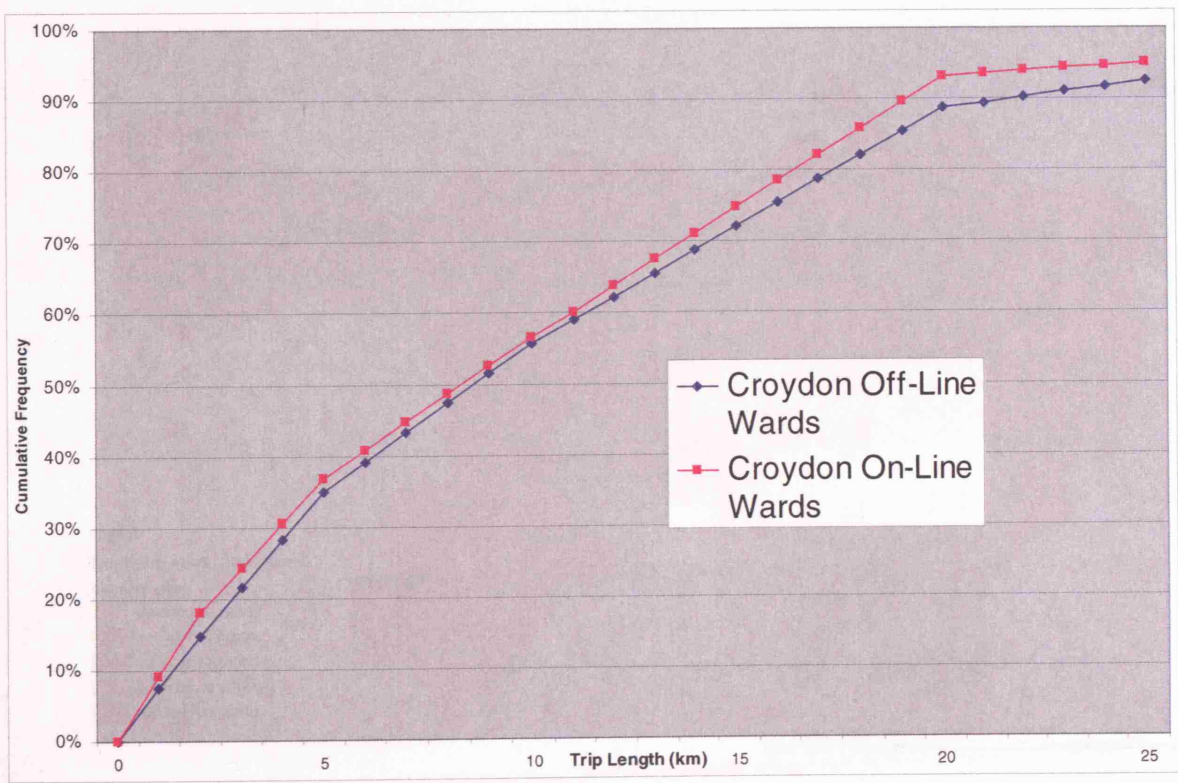**Figure 4.53: Croydon Journey to Work Trip Length Distribution (2001)**
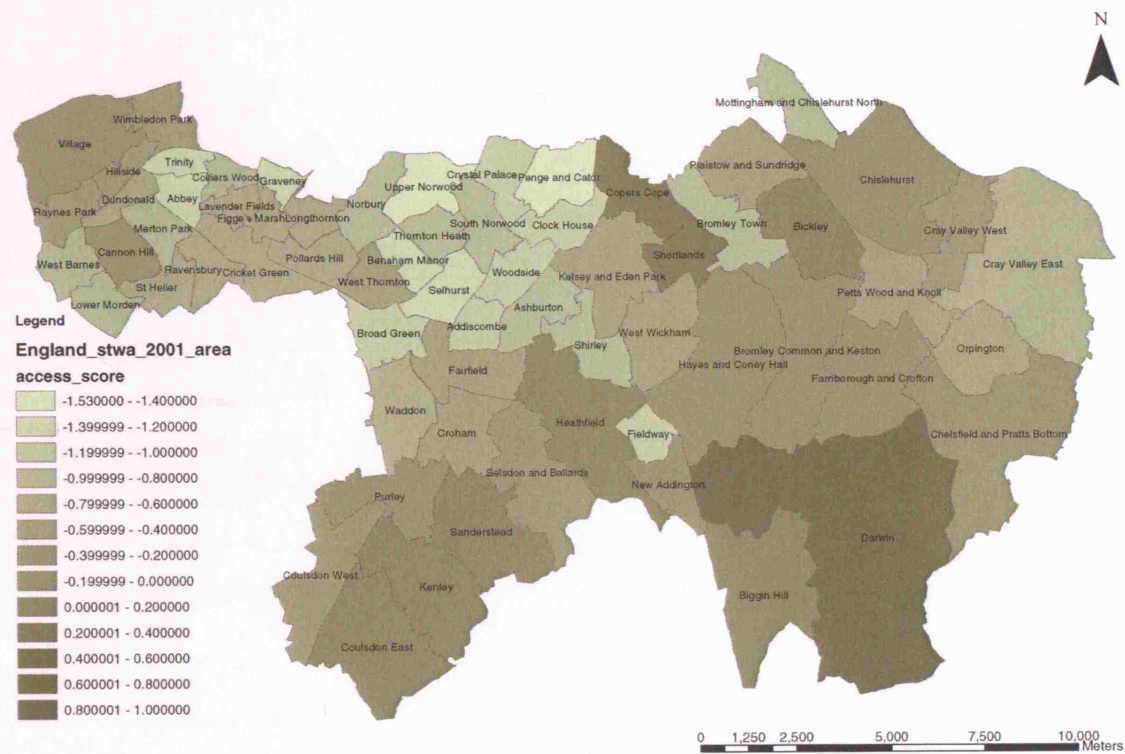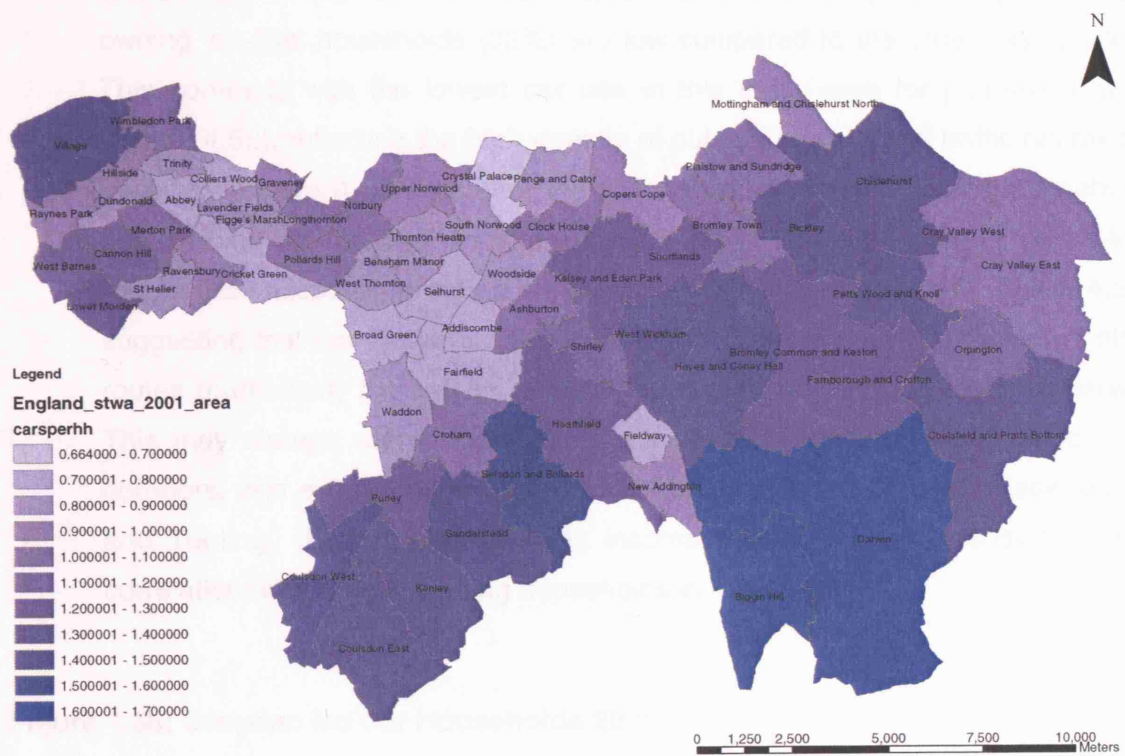

Figure 4.53: Croydon Journey to Work Trip Length Distribution (2001)

Figure 4.54: Croydon Cars per Household 2001

Legend

England_stwa_2001_area
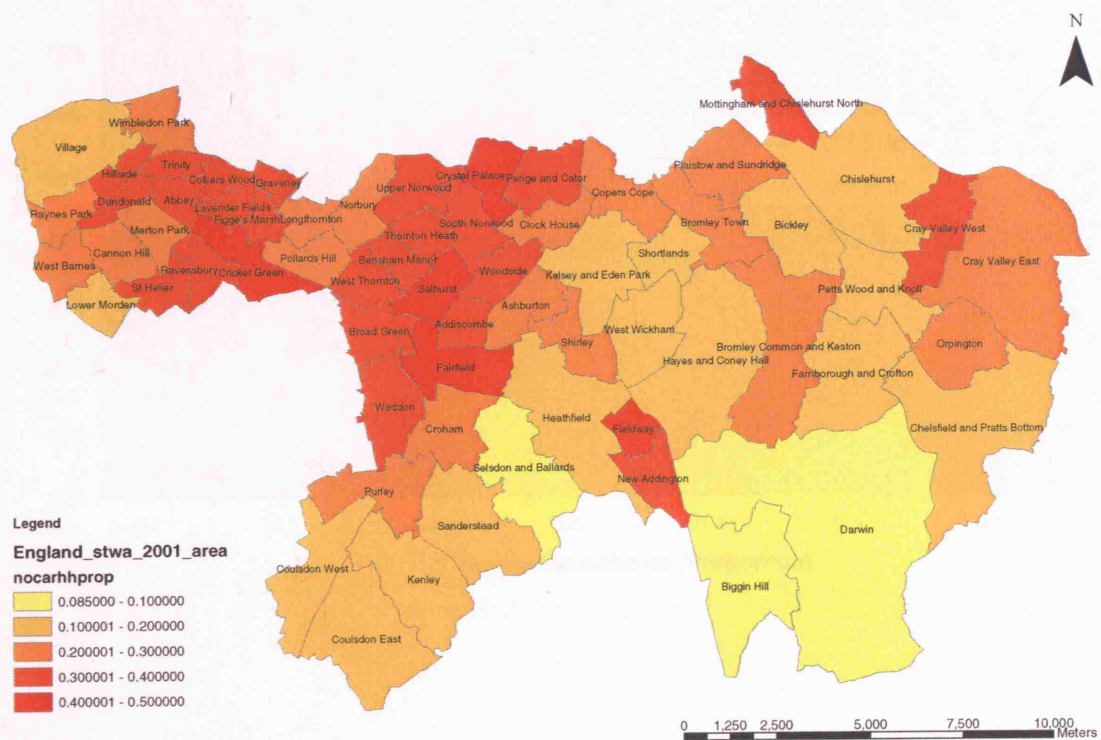
carsperhh

- 0.664000 - 0.700000
- 0.700001 - 0.800000
- 0.800001 - 0.900000
- 0.900001 - 1.000000
- 1.000001 - 1.100000
- 1.100001 - 1.200000
- 1.200001 - 1.300000
- 1.300001 - 1.400000
- 1.400001 - 1.500000
- 1.500001 - 1.600000
- 1.600001 - 1.700000

0   1,250   2,500   5,000   7,500   10,000
Meters

Figure 4.55: Croydon No Car Households 2001

Legend

England_stwa_2001_area

nocarhhprop

- 0.085000 - 0.100000
- 0.100001 - 0.200000
- 0.200001 - 0.300000
- 0.300001 - 0.400000
- 0.400001 - 0.500000

0   1,250   2,500   5,000   7,500   10,000
Meters

4.5.12 According to the 2001 Census, in Bromley, Croydon and Merton, the proportion of non-car owning 'off-line' households (26%) and the proportion of non-car owning 'on-line' households (32%) are low compared to the other case studies. This contrasts with the lowest car use in this study area for journeys-to-work (Figure 4.58), reflecting the high density of public transport and traffic restraint in London. Figure 4.56 illustrates the differential in non-car owning households between the 'off-line' and 'on-line' wards for 2001. However, even in the 'off-line' wards, tram accounts for only a small percentage of these journeys (Figure 4.58), suggesting that the system's attractions do not generally outweigh those of other routes (particularly the car) or reflects that narrow range of destinations served. This may change with completion of a wider network to give access to other corridors, with extensions proposed to Streatham, Purley, Crystal Palace, Sutton and Tooting. Figure 4.57, showing income deprivation, again shows a close correlation with non-car owning households in Figure 4.55.

Figure 4.56: Croydon No Car Households 2001
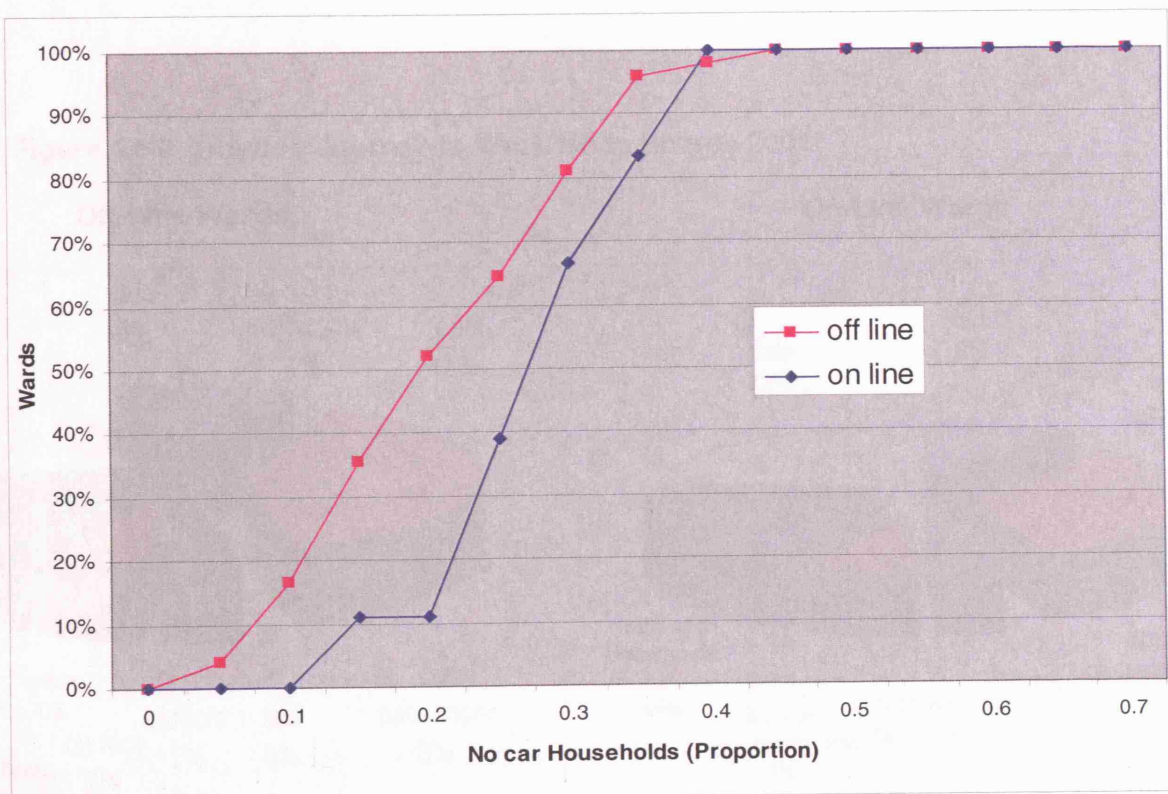
Figure 4.57: Croydon IMD Income Score 2000
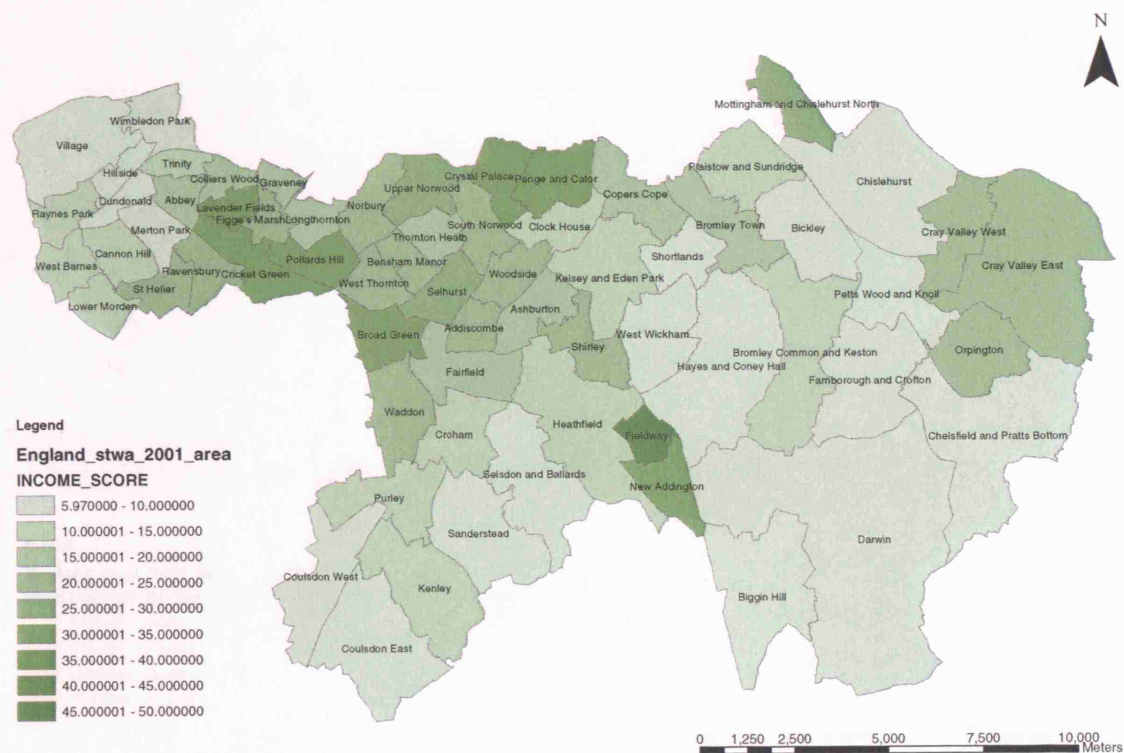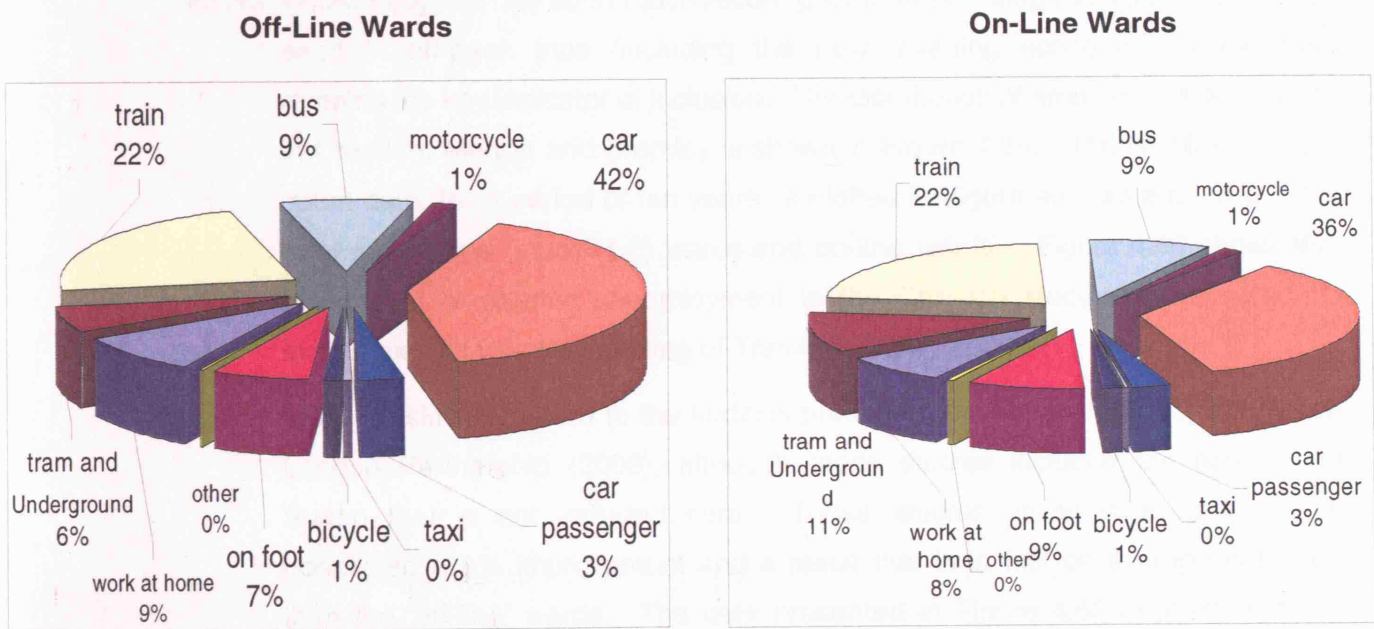

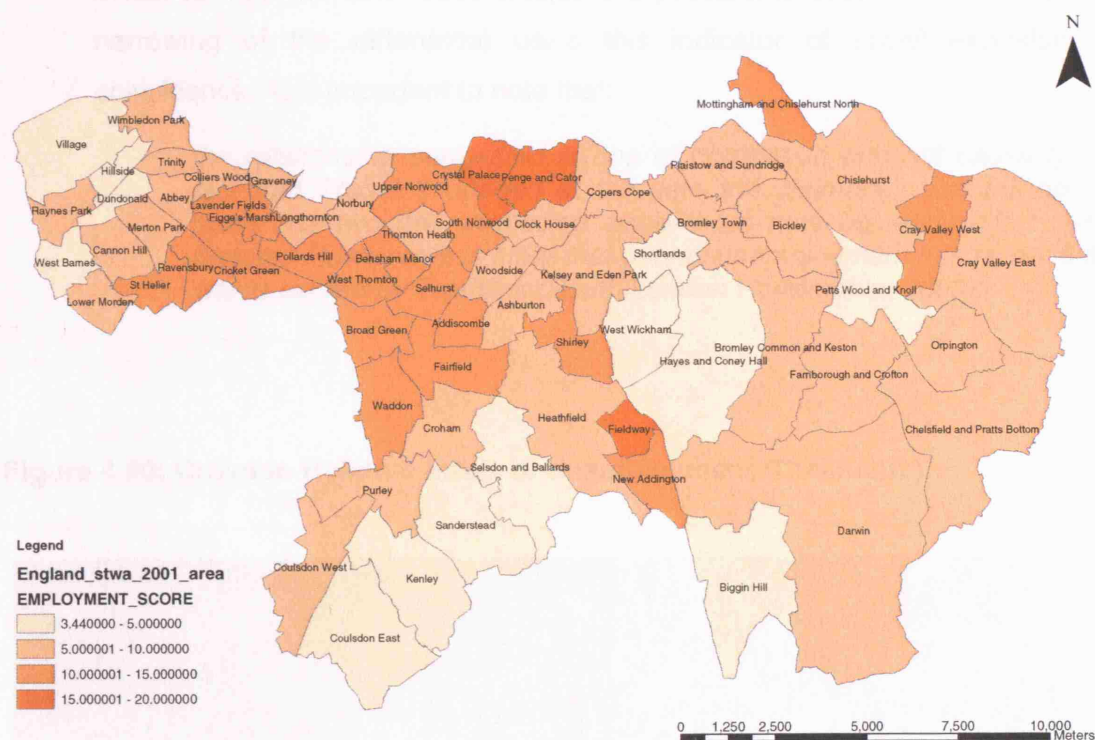## Figure 4.58: Croydon Journey-to-Work Mode Shares 2001

Figure 4.59: Croydon IMD Employment Score 2000

Legend

England_stwa_2001_area

EMPLOYMENT_SCORE

- 3.440000 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000

4.5.13 Whilst Croydon has seen much recent growth in patronage in light rail has been seen in off-peak trips (including the new 'evening economy'), employment remains the key indicator of inclusion. The distribution of employment deprivation in Croydon, Merton and Bromley is shown in Figure 4.59. The NOMIS claimant count data, for a period of ten years, is plotted in Figure 4.60 as a relative index between off-line (index=1.0) wards and on-line wards. Figure 4.60 shows that the impact of relative unemployment in the Croydon study area corresponds almost exactly with the opening of Tramlink in May 2000.

4.5.14 This is a similar pattern to the findings presented by McIntosh (2005) and South London Partnership (2003), although those studies included the borough of Sutton that is not included here. Those studies, using data up to 2003, postulated a 9% improvement and a result that is in fact on average better off than the 'off-line' wards. The data presented in Figure 4.60 appears to tell a similar story.

4.5.15 Whilst it is impossible to prove or otherwise a causal relationship, in view of the evidence from the other case studies it is possible to assume that this apparent narrowing of the differential using this indicator of social exclusion is a coincidence. It is important to note that:

> *the relationship suggested is one of correlation and not causality. The fact that Tramlink opened at the time the claimant count fell does not prove the two are connected since there may be many other relevant factors. However, it is clear that overall unemployment has fallen faster in wards served by Tramlink (South London Partnership, 2003).*

Figure 4.60: Croydon Relative Index of Unemployment (Claimants)
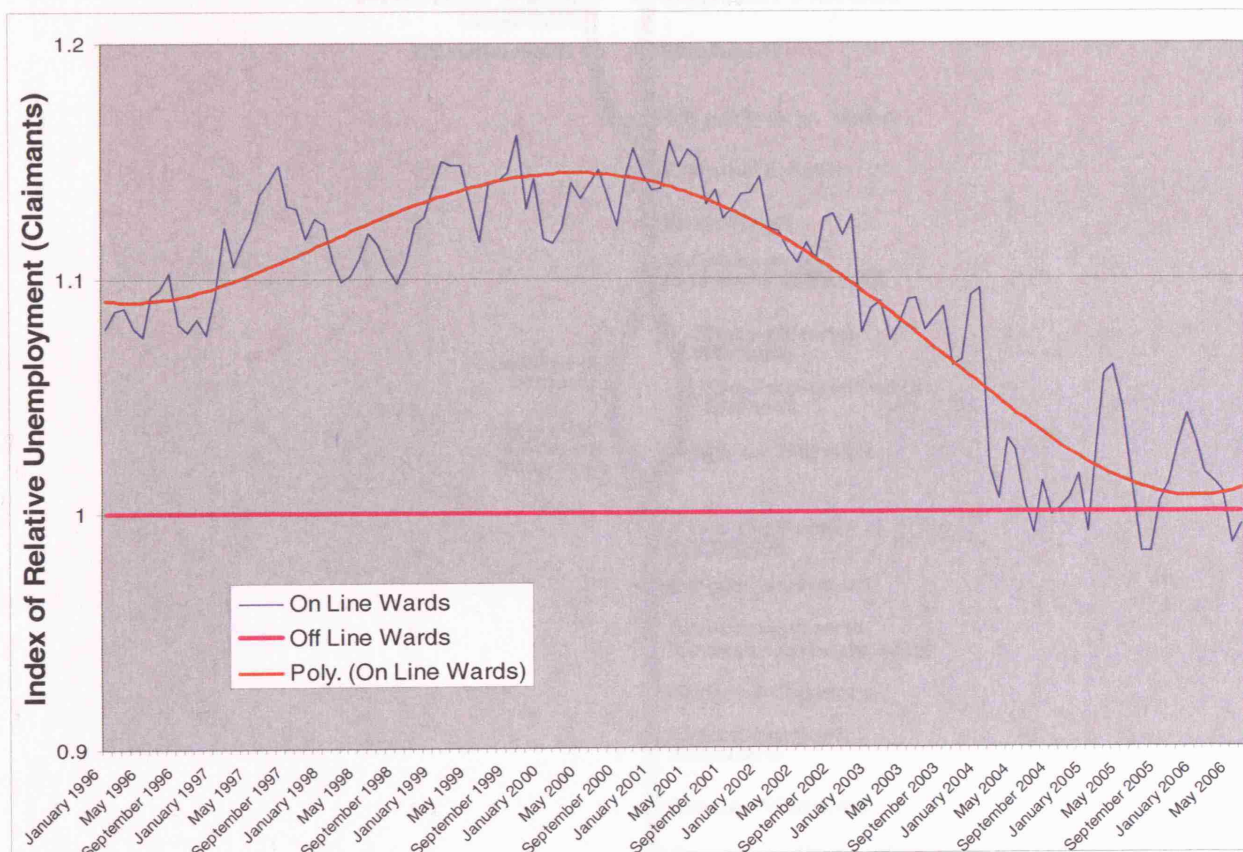
4.6   Nottingham NET

4.6.1 Nottingham NET, opened in March 2004, is the newest light rail system to be constructed in England. The system consists of a single 14km line northwards from the city centre to Hucknall (just beyond the city boundary), with a short spur from Highbury Vale to a park and ride stop at Phoenix Park. The line is on-street

for approximately 4km in the city centre before joining an existing rail corridor to Hucknall. In its first full year of operation, the system achieved a patronage of 8.5 million passenger journeys, significantly in excess of that achieved by Midland Metro after seven years of operation.

4.6.2   The current route map is shown in Figure 4.61.

**Figure 4.61: Nottingham NET Route Map**
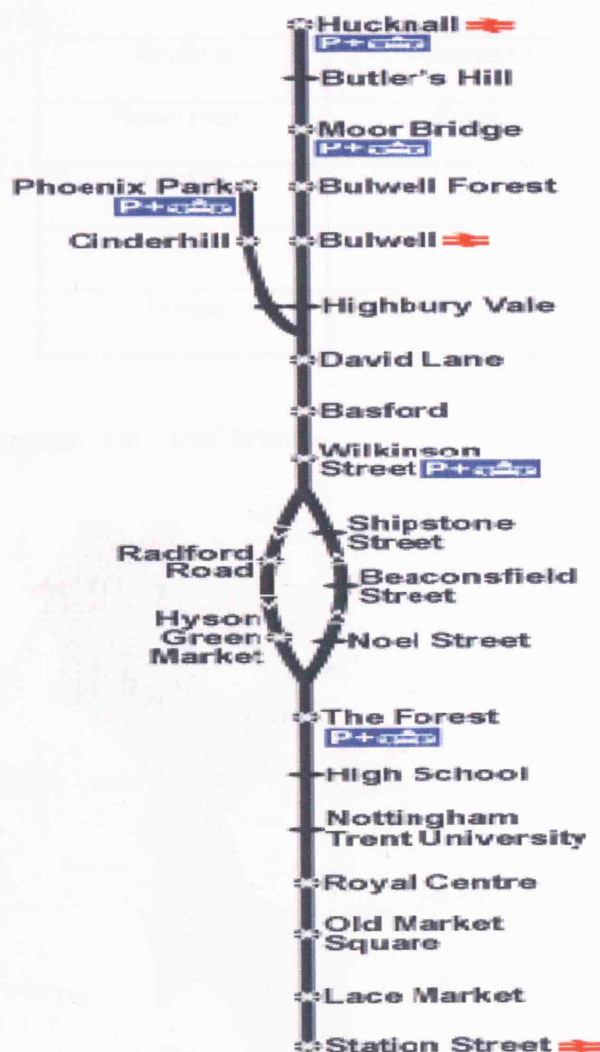
Source: www.the**tram**.net

4.6.3   For the purposes of analysis, the 'on line' wards are listed in Table 4.7, and highlighted graphically in Figure 4.62. It should be noted that there are different ward boundaries in Nottingham used for the IMD and Census analyses in this section.

Table 4.7: Nottingham NET 'On-Line' Wards

Nottingham IMD2000	Nottingham 2001 Census
Bulwell East	Bulwell
Bulwell West	Bulwell Forest
Portland	Basford
Basford	Berridge
Radford	Arboretum
Robin Hood	Bridge
Lenton	
Park	
Bridge	

Figure 4.62: Nottingham 'On-Line' Wards

Legend

England_wa_1991_area
ONLINEWARDS

- 0
- 1
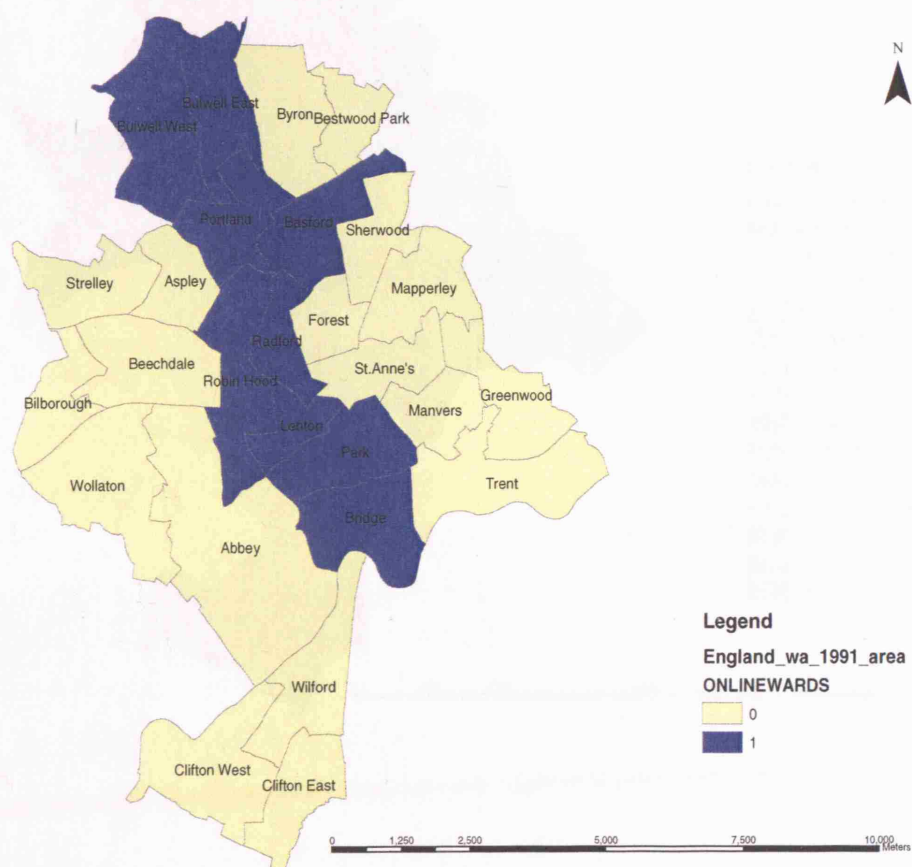
4.6.4 It is estimated that 30% of the population of Nottingham lies within the 'on-line' wards. However, since the system opened after the 2001 census, no information is available on the spatial distribution of the light rail passengers in Nottingham from that source. Figure 4.63 shows the national IMD2000 Score for the study area, with the most deprived areas in the city centre (but also the outlying ward of Strelley) and the relatively less deprived areas such as Wollaton to the west. However, the city boundary is quite closely drawn and does not include relatively better off suburbs and satellite towns that are functionally part of the city. Figure 4.64 plots the local ranking of the wards and highlights the wards of Manvers and Strelley as the most deprived. It is notable that the tram system embraces a range of levels of ward deprivation.

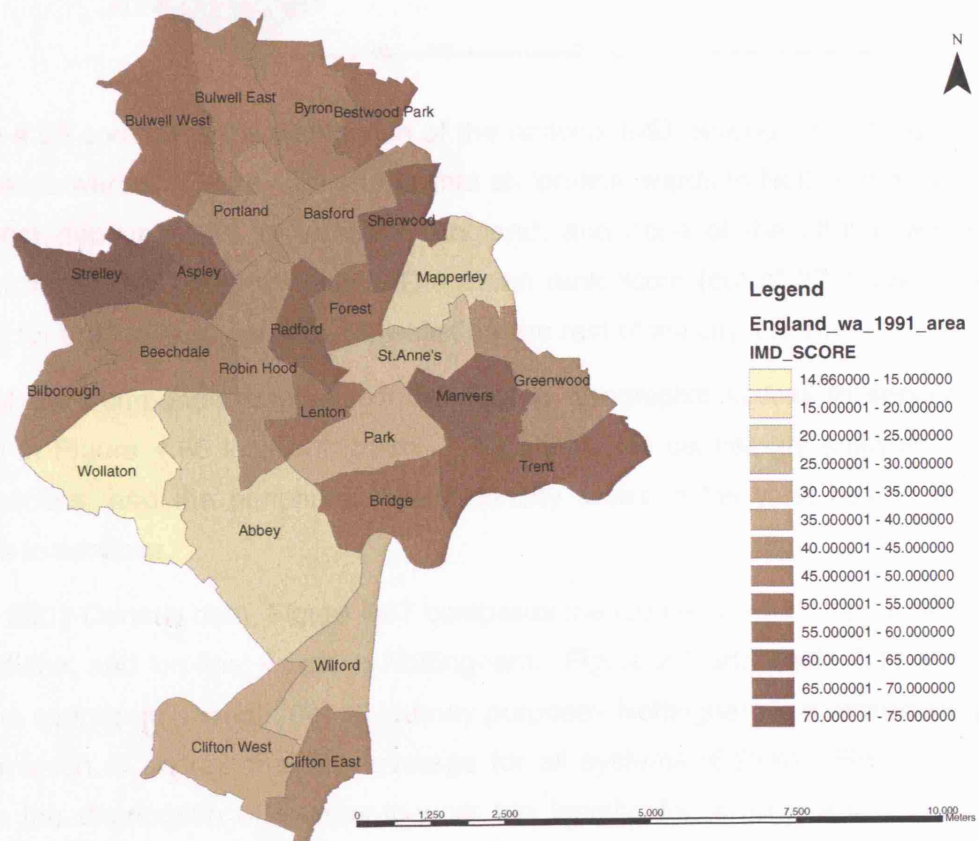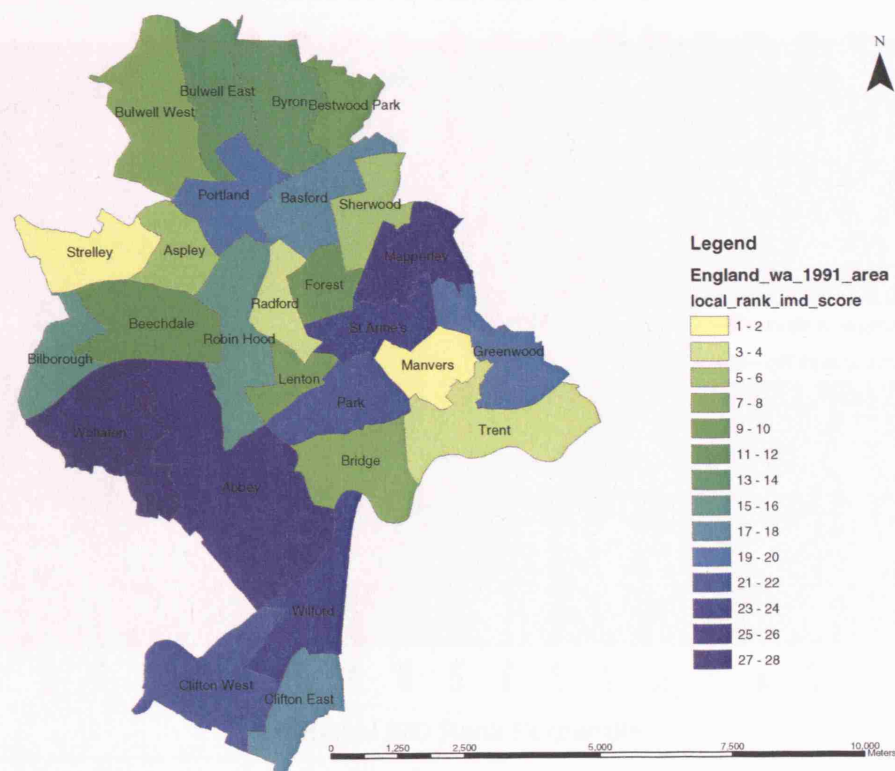**Figure 4.63: Nottingham NET IMD2000 Score**

Figure 4.64: Nottingham NET IMD2000 Score Local Rank

4.6.5 Figure 4.65 compares the distribution of the national IMD ranking for Nottingham study area wards. Figure 4.65 shows that all 'on-line' wards in Nottingham lie in the most deprived 20% of wards in England, and none of the off-line wards appear in the top 40% nationally. The mean rank score (out of 27 study area wards) for the 'on-line' wards is 15, whilst for the rest of the city it is 13.

4.6.6 One of the component domains of the IMD is geographic access to services, shown in Figure 4.66 for Nottingham. This shows the central city enjoying the best access, and the peripheral, lower density areas in the west having less access to services.

4.6.7 Using 2001 Census data, Figure 4.67 compares the journey-to-work trip length of the 'off-line' and 'on-line' wards in Nottingham. Figure 2.5 and Table 2.11 show that the average trip length (for all journey purposes Nottingham is approximately 4.4km which is shorter than the average for all systems (6.2km). Figure 4.67 shows the distribution of journey-to-work trip lengths for 'on-line' and 'off-line' wards in Nottingham. In fact, analysis of this data shows that the average trip lengths are approximately equal.
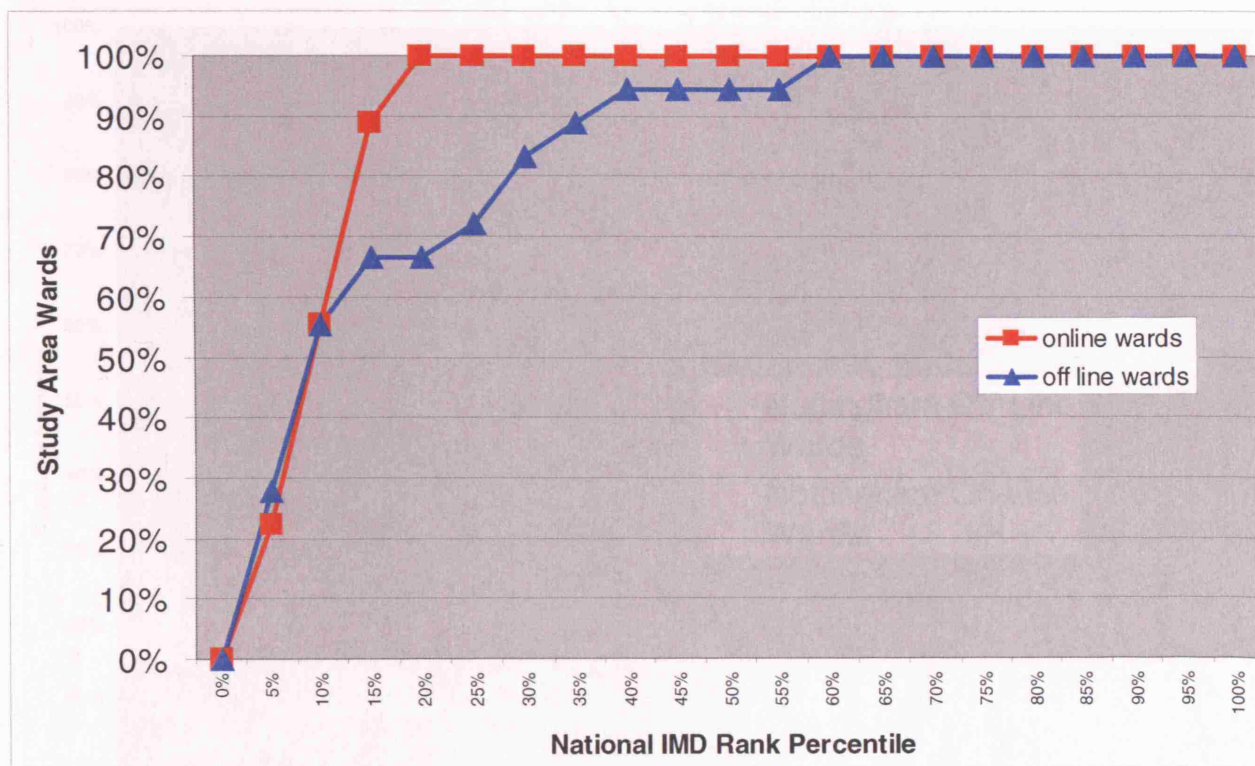
Figure 4.65: Nottingham Wards IMD Rank

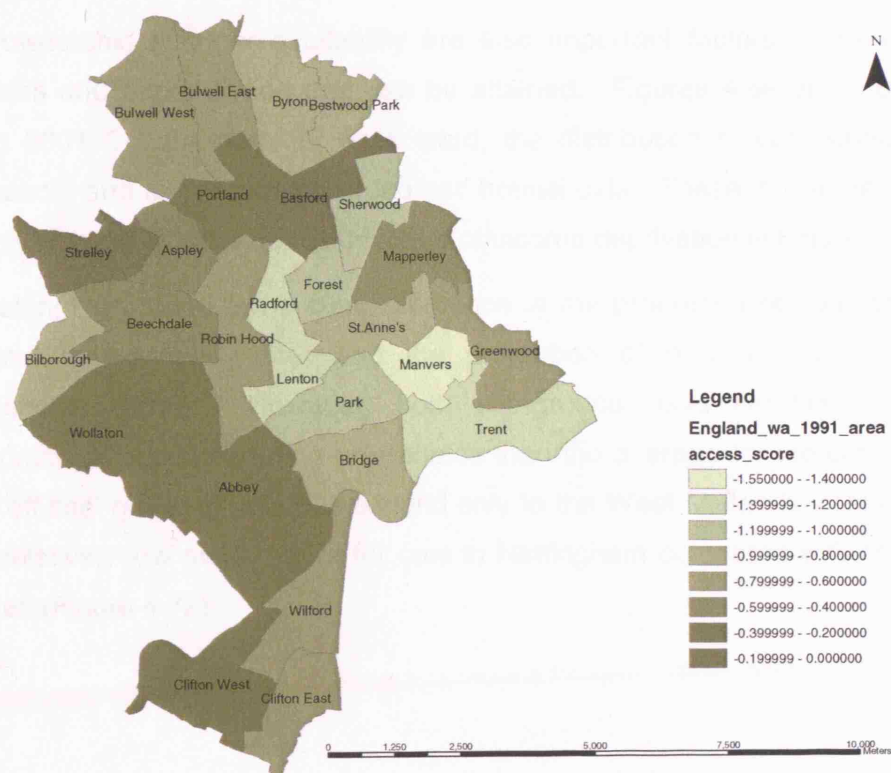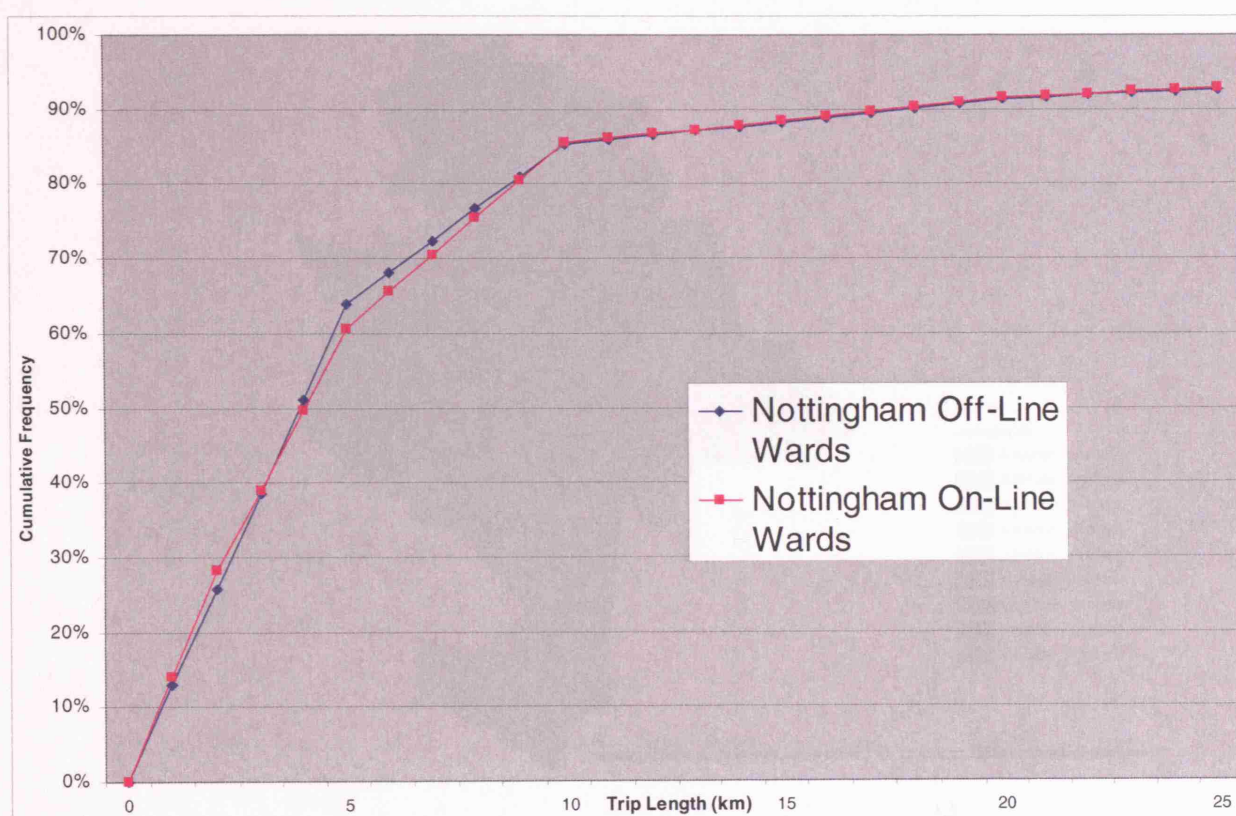**Figure 4.66: Nottingham IMD Access Score 2000**

Figure 4.67: Nottingham Journey to Work Trip Length Distribution

4.6.8 Car ownership and car availability are also important factors in the range of services and opportunities that can be attained. Figures 4.68 and 4.69 show, using 2001 Census data for each ward, the distribution of car ownership per household and the proportion of 'no car' households. These indicators correlate closely with IMD2000, and the indicator of income deprivation in Figure 4.71.

4.6.9 In Nottingham, there is no clear difference in the proportion of non-car owning 'off-line' households (45%) and the proportion of non-car owning 'on-line' households (46%). However, both sub-groups have significantly greater proportion of non-car owning households than the average for the case studies. The 'off-line' group of wards is second only to the West Midlands. This is borne in a relatively low mode share for cars in Nottingham compared with other case studies (Figure 4.72).
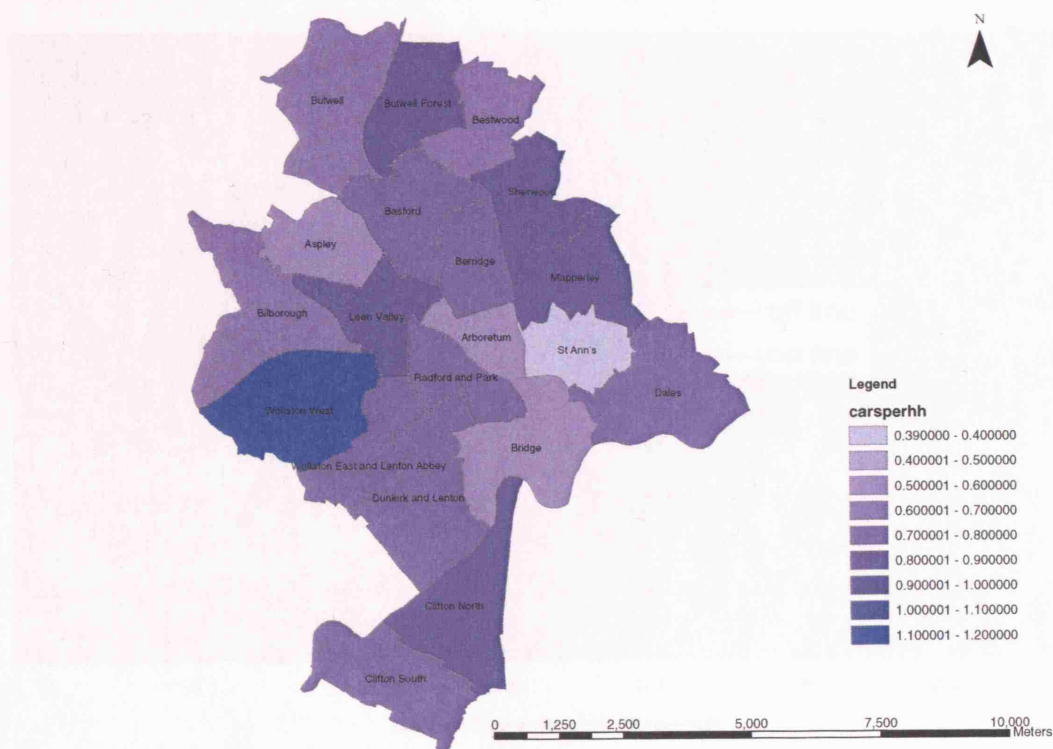
Figure 4.68: Nottingham Cars per Household 2001

Legend

carsperhh

- 0.390000 - 0.400000
- 0.400001 - 0.500000
- 0.500001 - 0.600000
- 0.600001 - 0.700000
- 0.700001 - 0.800000
- 0.800001 - 0.900000
- 0.900001 - 1.000000
- 1.000001 - 1.100000
- 1.100001 - 1.200000

Figure 4.69: Nottingham No Car Households 2001

Legend

nocarhhprop

- 0.227000 - 0.300000
- 0.300001 - 0.400000
- 0.400001 - 0.500000
- 0.500001 - 0.600000
- 0.600001 - 0.700000

126
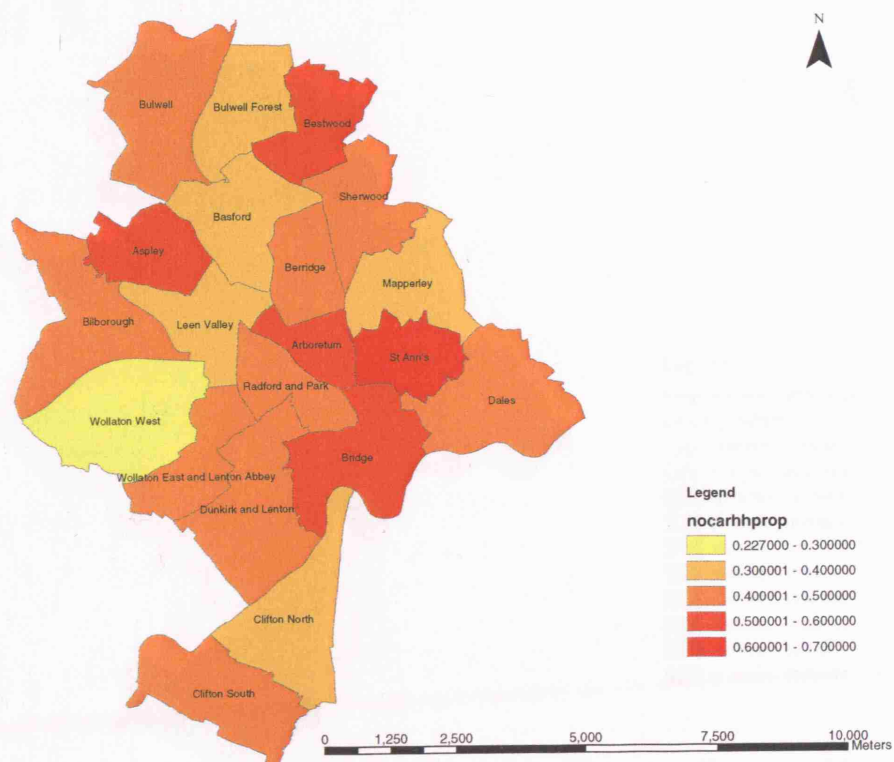
Figure 4.70: Nottingham No Car Households 2001
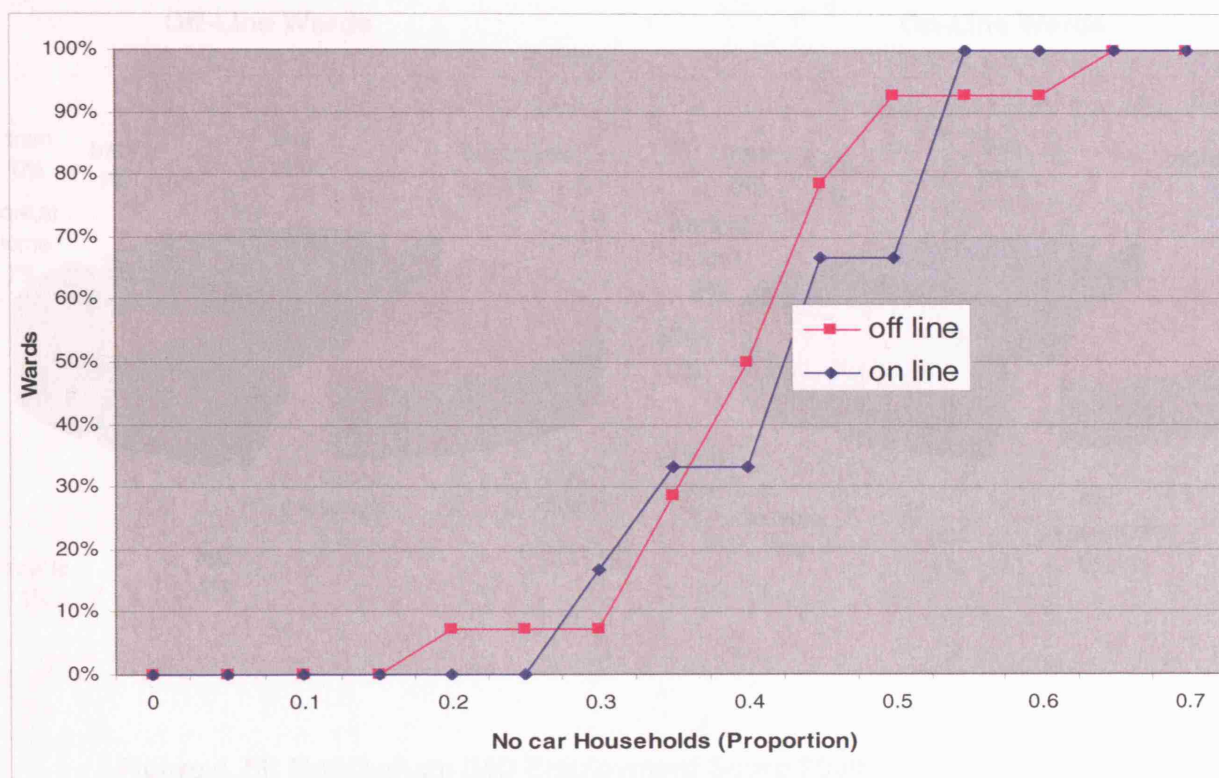
Figure 4.71: Nottingham IMD Income Score 2000

Legend

England_wa_1991_area
INCOME_SCORE

	13.980000 - 15.000000
	15.000001 - 20.000000
	20.000001 - 25.000000
	25.000001 - 30.000000
	30.000001 - 35.000000
	35.000001 - 40.000000
	40.000001 - 45.000000
	45.000001 - 50.000000
	50.000001 - 55.000000
	55.000001 - 60.000000
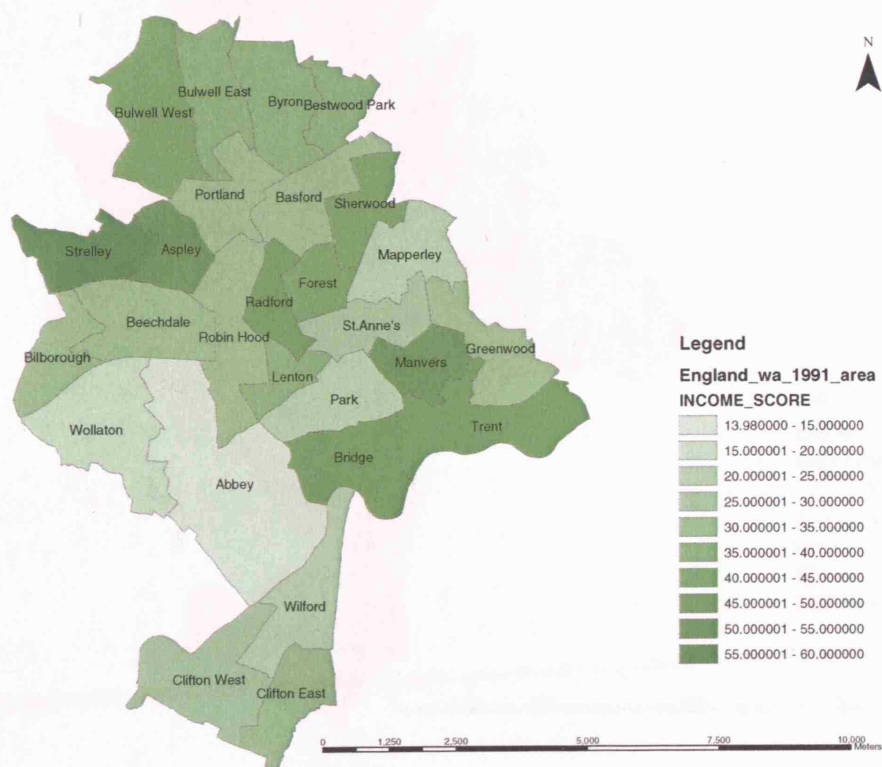
Figure 4.72: Nottingham Journey-to-Work Mode Shares (2001)

Off-Line Wards

tram 0%
train 1%
bus 21%
motorcycle 1%
work at home 7%
other 0%
on foot 14%
bicycle 4%
taxi 1%
car passenger 6%
car 45%

On-Line Wards

tram 0%
train 1%
bus 21%
motorcycle 1%
work at home 6%
other 0%
on foot 16%
bicycle 3%
taxi 1%
car passenger 6%
car 45%
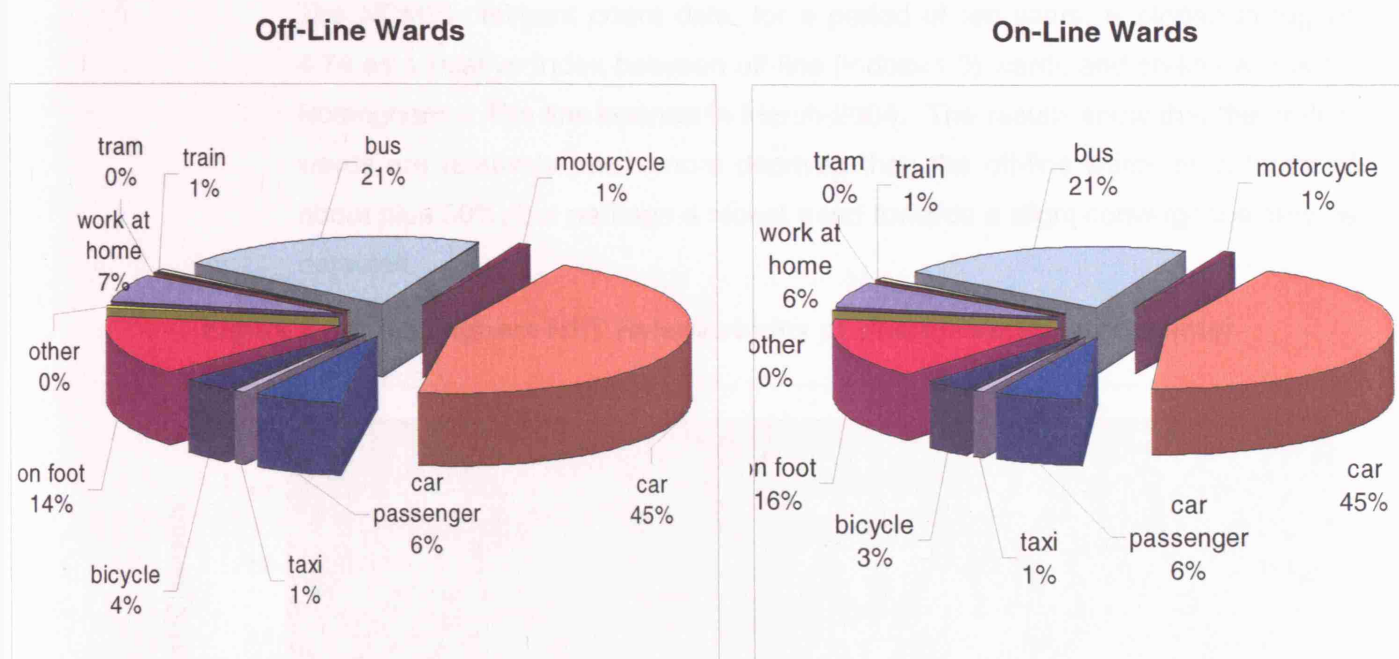
Figure 4.73: Nottingham IMD Employment Score 2000

N

Bulwell East
Bulwell West
Byron
Bestwood Park
Portland
Basford
Sherwood
Strelley
Aspley
Mapperley
Forest
Radford
Beechdale
Robin Hood
St.Anne's
Greenwood
Bilborough
Lenton
Manvers
Park
Wollaton
Trent
Abbey
Bridge
Wilford
Clifton West
Clifton East

Legend

England_wa_1991_area
EMPLOYMENT_SCORE

	9.590000 - 10.000000
	10.000001 - 15.000000
	15.000001 - 20.000000
	20.000001 - 25.000000
	25.000001 - 30.000000

0   1,250   2,500   5,000   7,500   10,000 Meters

4.6.10 The distribution of employment deprivation in Nottingham is shown in Figure 4.73. The NOMIS claimant count data, for a period of ten years, is plotted in Figure 4.74 as a relative index between off-line (index=1.0) wards and on-line wards for Nottingham. The line opened in March 2004. The results show that the on-line wards are relatively much more deprived than the off-line wards by a factor of about plus 50%, but perhaps a recent trend towards a slight convergence may be detected.

Figure 4.74: Nottingham NET Relative Index of Unemployment (Claimants)
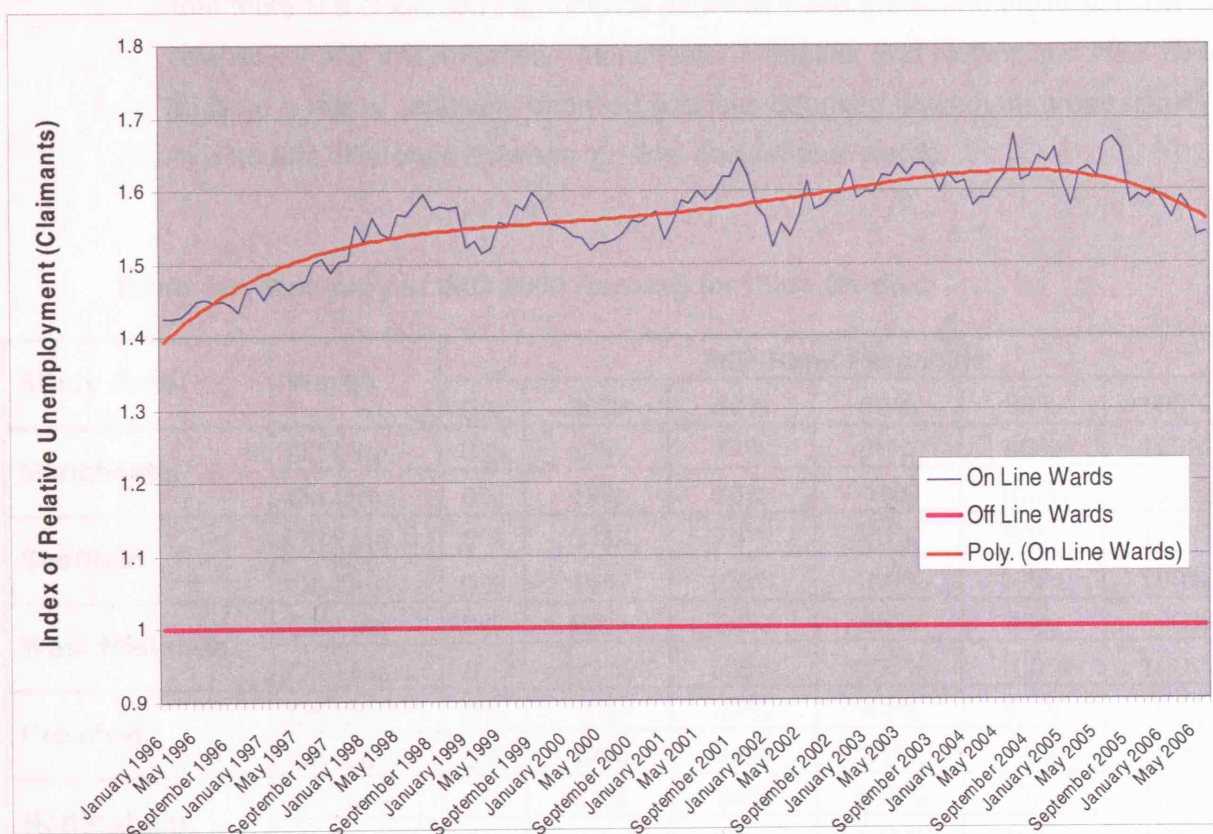
4.7 Summary of Case Studies

4.7.1 Finally in this section it is interesting to bring together the findings from the five case studies to examine what general trends and insights can be taken from the combined data.

4.7.2 The IMD ranking analysis is shown in Table 4.8 that summarises the IMD ranking for 'on line' and 'off line' wards by percentile, and the average for the five case studies. The average for the merged data is also shown graphically in Figure 4.75 and confirms that the study area cities are generally more deprived than the national average (left and above the diagonal line) with the 'on-line' wards shifted further left and above indicating that they are generally more deprived than their

surrounding wards. For example, Table 4.8 and Figure 4.75 show that 83% of 'on-line' and 72% of 'off-line' wards are in the 40% most deprived wards of the country. Croydon, located in the relatively prosperous London, is the exception, and if Croydon were excluded, then the percentages would be 93% and 80% respectively.

4.7.3 Clearly the light rail systems, with the possible exception of Croydon, are in the right kind of places to be able to have an impact on one of the primary indicators of the likely incidence of social exclusion. The analyses have also demonstrated that there is a close correspondence between these areas and those with low car availability and low incomes. Manchester Metrolink and Nottingham NET seem to have a mix of relatively deprived and less deprived catchment areas resulting in a neutral difference between 'on-line' and 'off-line' wards.

Table 4.8: Summary of IMD 2000 Ranking for Case Studies

Study Area	Wards	IMD Rank Percentile					
		0%	20%	40%	60%	80%	100%
Manchester	Off Line	0%	52%	77%	86%	96%	100%
	On Line	0%	48%	70%	91%	100%	100%
Sheffield	Off Line	0%	53%	75%	90%	93%	100%
	On Line	0%	45%	100%	100%	100%	100%
West Midlands	Off Line	0%	52%	74%	85%	93%	100%
	On Line	0%	100%	100%	100%	100%	100%
Croydon	Off Line	0%	6%	42%	44%	67%	100%
	On Line	0%	17%	44%	61%	83%	100%
Nottingham	Off Line	0%	67%	94%	100%	100%	100%
	On Line	0%	100%	100%	100%	100%	100%
Average of Case Studies	Off Line	0%	46%	72%	81%	90%	100%
	On Line	0%	62%	83%	90%	97%	100%

4.7.4 There are also strong indications that travel horizons in these areas are more limited, as illustrated by journey-to-work trip lengths being consistently shorter for the 'on-line' wards (Figure 4.76). Again, Croydon is an exception with longer average journey-to-work distances reflecting more distant opportunities, for example in central London,, and transport services available.

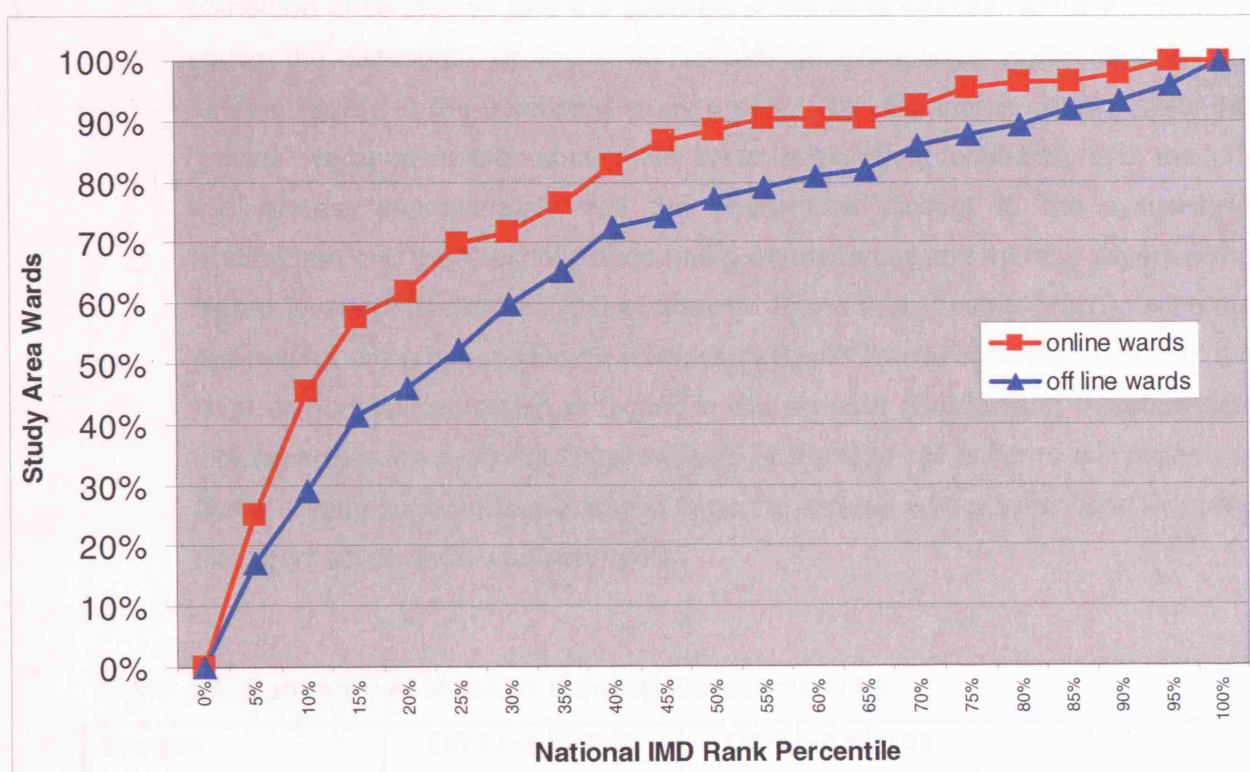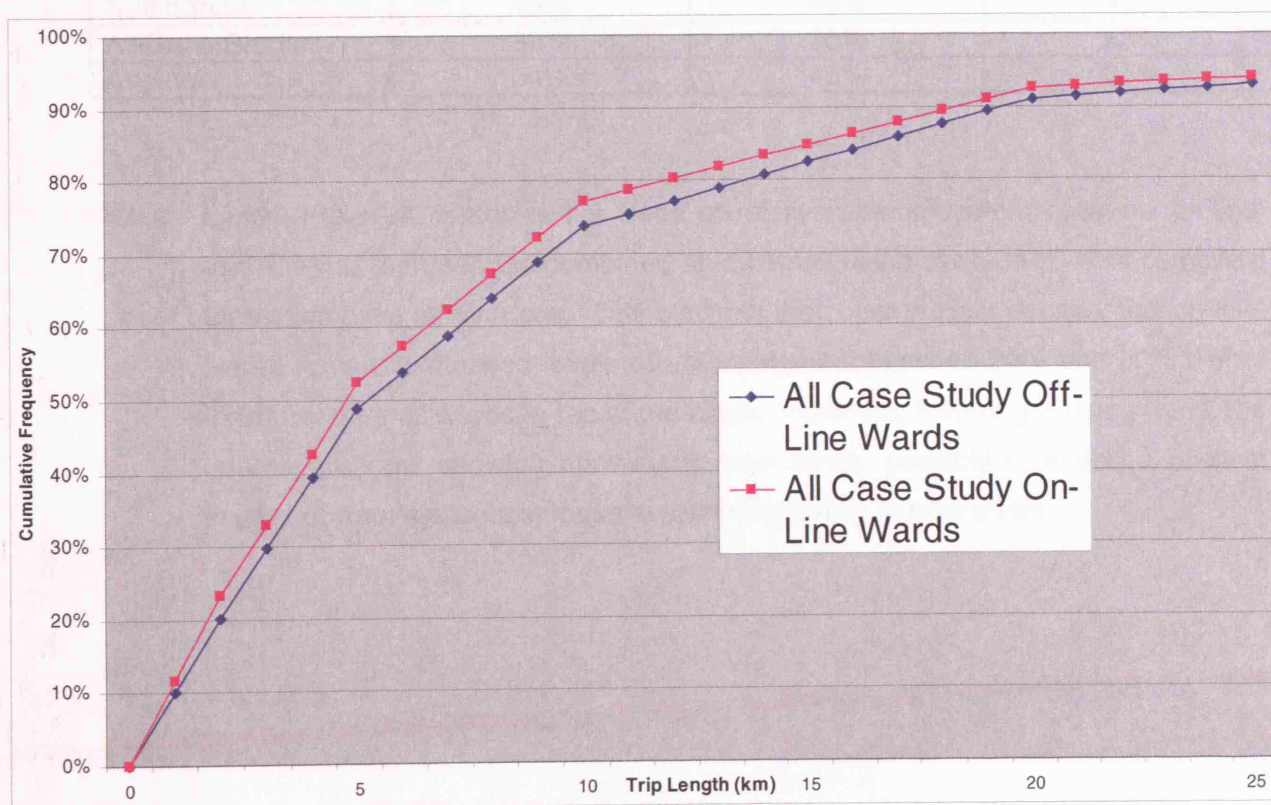**Figure 4.75: Summary of IMD 2000 Ranking for Case Studies**

Figure 4.76: Combined Case Studies Journey to Work Trip Length Distribution

4.7.5 Table 4.9 summarises the extent of car-lessness in the case study areas, the combined case studies and the average of the case studies, whilst Figure 4.77 shows the distribution of no-car households as a proportion of the 'on-line' and 'off-line' wards in the combined study areas. The disparity is obvious, with the 'on-line' wards revealing substantially lower levels of car availability than the 'off-line' wards: approximately half the households closest to the systems in Nottingham and the West Midlands being without a car and thereby experiencing higher levels of transport social exclusion. Brand and Preston (2005), using the example of the proposed South Hampshire Rapid Transit scheme, show that the level of non-car ownership is higher in the scheme corridor and therefore *'this indicates that the redistributional impacts of the light rail scheme are positive in terms of their social inclusiveness in targeting an area with greater need for public transport accessibility improvements'.*

Table 4.9: Summary of Non-Car Owning Households (%)

System	Off-Line Wards	On-Line Wards	All Wards
Manchester	33%	34%	34%
Sheffield	32%	38%	34%
Croydon	26%	32%	27%
West Midlands	33%	50%	34%
Nottingham	45%	46%	45%
All Case Studies	33%	38%	33%
Average	34%	40%	35%

4.7.6 Lastly, Figure 4.78 shows the trend of relative unemployment between 'on-line' and 'off-line' wards in the combined study areas using the NOMIS data combined for all five case study areas. This confirms that, over the last decade, the 'on-line' wards have experienced levels of unemployment between 20% and 30% higher than the 'off-line' wards in the same cities. However, following a rising trend, the curves are now showing converging trajectories, possibly indicated a positive impact of tram systems in these areas is beginning to take effect.

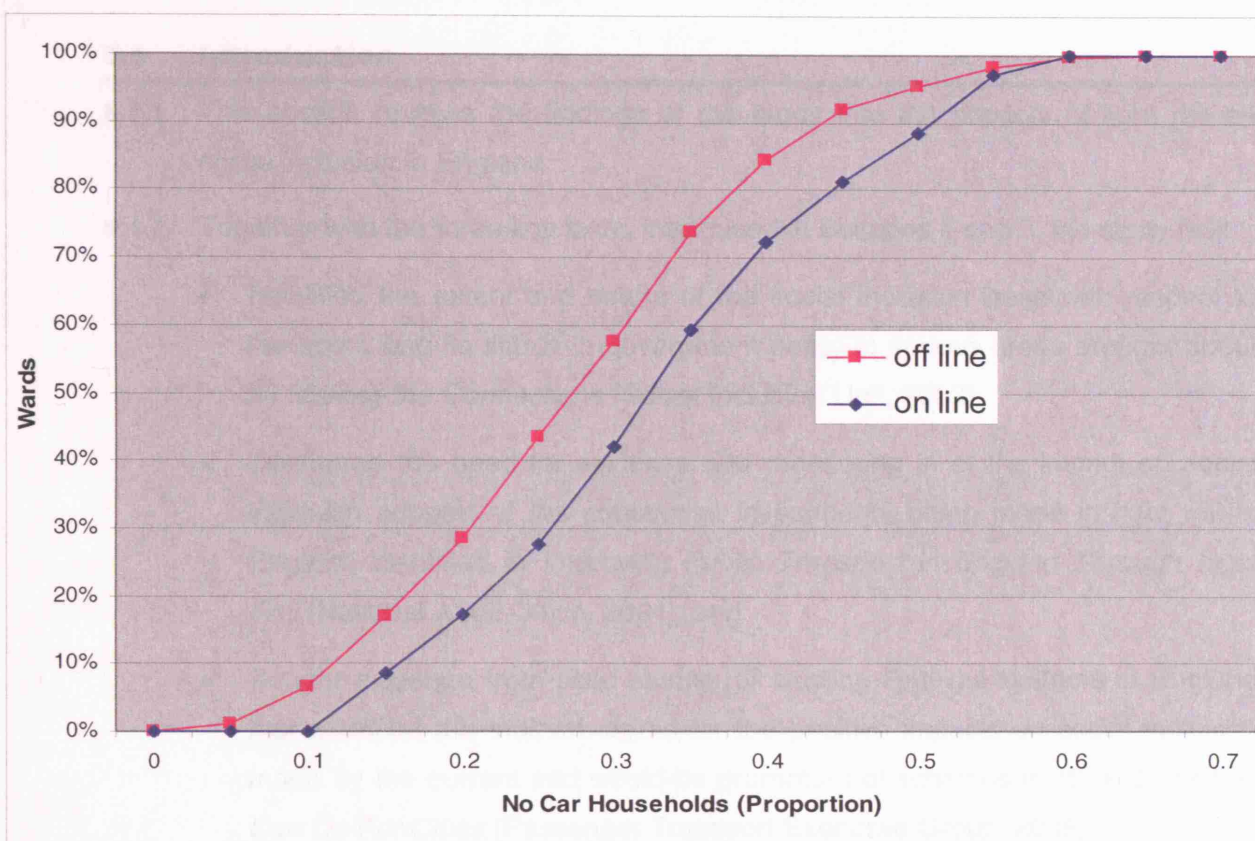## Figure 4.77: Summary of Non-Car Owning Households (All Case Studies)
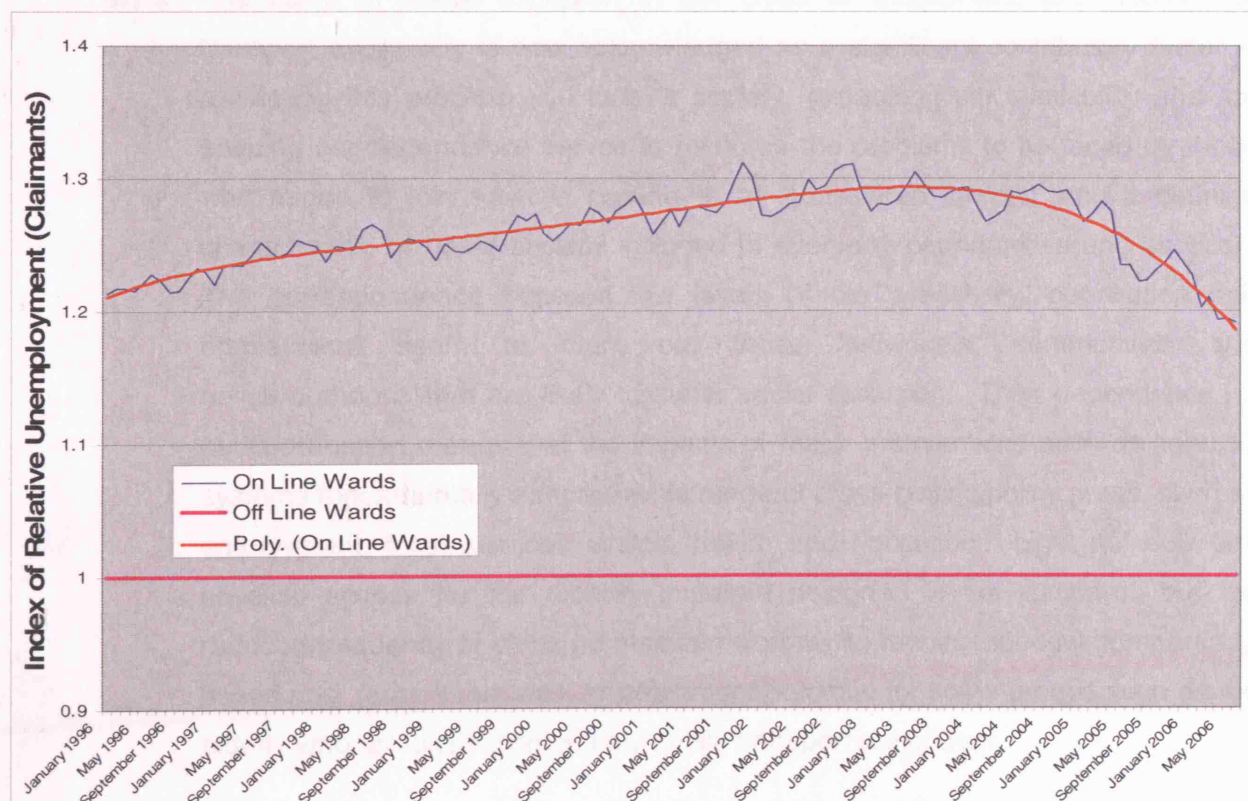

Figure 4.78: Summary of Relative Unemployment (Claimants)

5 Review of Findings

5.1 Introduction

5.1.1 This section reviews the findings of the study into the impacts of light rail on social inclusion in England.

5.1.2 Together with the three key texts, introduced in Sections 1 and 3, the study has:

- Identified the extent and nature of the social inclusion issue with respect to transport, and its status in government policy in various areas brought about by *Making the Connections* (Social Inclusion Unit, 2003);

- Confirmed the need for evidence and monitoring in of the impact on social inclusion support of the substantial investments being made in light rail in England identified in *Improving Public Transport in England Through Light Rail* (National Audit Office, 2004), and

- Sought evidence from case studies of existing light rail systems in England that matches the indirect claims for the positive impacts on social inclusion made by the current and would-be promoters of schemes in *What Light Rail Can Do For Cities* (Passenger Transport Executive Group, 2005).

5.1.3 The scale of social exclusion in our cities is widespread, and appropriate transport availability is now acknowledged as a significant contributory factor in alleviating this problem. In today's society, expanding car availability and the ensuing car-dependence serves to reinforce the problems to be faced by those who aspire to join what is coming to be considered 'normal' and a defining characteristic of being socially included in everyday opportunities and services. The correspondence between low levels of car availability, deprivation and employment seem to mark out those individuals, communities and neighbourhoods that are likely to suffer social exclusion. Their dependence on public transport means that the impacts of major interventions such as light rail systems fundamentally affects a wide range of cross-cutting policy areas, such as employment, local services, shops, health and education. Light rail now has physical access for the mobility impaired designed in 'as standard', but the reduced frequency of stops (to maintain worthwhile running speeds) compared to buses may reduce the 'walk in' catchment potential for some groups such as the elderly who are disproportionately public transport dependent.

5.2 Are the Light Rail Systems in the Right Places?

5.2.1 The most fundamental question to ask when considering the impact of light rail systems is whether or not they have been located in the places most likely to have the most positive effect on social inclusion. The case study examples considered seem to show that this is in fact the case: the Passenger Transport Executives are at pains to point out that their areas of transport responsibility embrace most of the most deprived neighbourhoods in England. Of the case studies examined, it is remarkable the extent of deprivation (based on IMD2000), compared to the national average, in both the 'on-line' study areas and the wider city 'control' study areas. For example, the West Midlands case study found that 80% of wards are more deprived than the average for the country, and in the light rail corridor itself all wards are in the most deprived 15% nationally (Figure 4.36). A similar pattern emerges in Sheffield and Rotherham (Figure 4.21) where 90% of wards are more deprived than the average and all the 'on-line' wards are in the most deprived 40%, and in Nottingham (Figure 4.65) where 95% of wards are more deprived than the average and all the 'on-line' wards are in the most deprived 20%. There seems little doubt that these areas are worthy of public transport interventions if a positive impact was the result. It is likely that similar results would be found for those cities such as Liverpool and Leeds that recently have come tantalisingly close to having their light rail proposals confirmed.

5.2.2 Manchester (Figure 4.6) qualifies on this criterion to the extent that about 80% of its wards are more deprived than the national average, but it may be queried whether the light rail corridor is best placed to improve the lot of the most deprived parts of the city since there is little on average to distinguish between the 'on-line' and 'off-line' wards on this basis. However, this general pattern masks some important underlying differences: the wards comprising the Bury and Altrincham lines are significantly less deprived than the average, whereas the Eccles branch is substantially more deprived than the city's and the country's average. Obviously the specific focus on social inclusion as a driving objective pre-dates the design and development of the original system that owes more to opportunism in the context of dealing with a declining suburban railway. Croydon (Figure 4.51) is the exception with generally lower levels of deprivation than the average for the country. Importantly, however, there are nonetheless local areas of deprivation (such as New Addington and Mitcham) and 60% of the 'on-line' wards are more deprived than the national average and, as elsewhere in the

generally perceived relative wealth of the capital city, there are significant pockets of local deprivation that may remain masked at ward level.

5.2.3 The fact that the existing systems in the main coincide with areas of relative deprivation and most were conceived before social inclusion was explicitly on the promotion and evaluation agenda, is fortuitous. Notwithstanding the recent introduction of the NATA approach, economic efficiency and a strong business case is likely to hold sway over social and environmental objectives if a scheme is to get off the drawing board with funding continuing to go to those projects that achieve journey time savings or modal shift from cars. Referring back to Mackett's (1998) analysis (see Table 2.5), social objectives do not feature explicitly in the (then) stated objectives for light rail systems.

5.2.4 It may be argued that whether or not the new systems directly serve the most deprived (socially excluded) areas, the boost to city-wide public transport supports the excluded because it sustains non-car dependency and services to deprived areas that would otherwise wither. In a climate of steeply declining public transport use (outside London), interventions that arrest or even reverse this trend must have wider spill-over benefits for all parts of the city. However, as Lucas (2003) points out, this may have the perverse effect of not only failing to benefit the travel poor, but may encourage the travel rich to travel more or further and faster with dubious benefits to the economy, the environment and social inclusion. Is there a social inclusion case for building a scheme or is it always going to be affordability? The emphasis should be on better public transport for those captive to public transport or car-less who are most likely to among the most isolated or socially excluded.

5.2.5 However, in general, new or enhanced public transport systems are most required and justified in those areas with an existing demand and inevitably these will tend to be in areas of low car availability and relative deprivation, and hence the preponderance of new light rail systems in the older industrial cities that have suffered structural change. The classic example is that of Tyne and Wear Metro where initially high patronage levels have fallen as car availability (and competition from deregulated buses) has increased and car dependency has facilitated dispersed trip destinations.

5.2.6 A further dimension of this question is what positive impacts, or even desired impacts, do the transport and planning authorities envisage. In the literature, such as the Social Exclusion Unit (2003) or Passenger Transport Executive

Group (2003), numerous examples are cited of how local transport initiatives alleviate social exclusion. However, none of these seems to have a direct or indirect association with light rail systems in particular. The examples given are generally bespoke initiatives targeting very local or special needs, such as demand responsive services, access to job centres or subsidising gaps in the commercial services, and this in itself is telling given that light rail functions at a different (more strategic) level in the provision of public transport hierarchy in cities.

5.2.7 Therefore, firm evidence of the positive impact of light rail, either in the literature or from the present case study analyses, is scant. The reported 'before and after' studies (not all of which are independent) focus on outcomes such as house prices or business location decisions or a 'general feeling' of economic improvement. Studies and forecasts point to changes in journey times of potential trips, but not an analysis of evidence of revealed changes in behaviour. The main reason for this is that 'social inclusion', as a concept, is difficult to define and measure, let alone forecast. Proxy indicators are therefore required, and unemployment (claimant) levels were used in this study to identify a before and after effect. The specific effect of transport schemes is notoriously difficult to pin down as wider changes in the local and national economy may obscure the attribution of genuine impacts. However, using the NOMIS data (albeit not for the entire period of the case studies), the comparison of the relative unemployment in 'on-line' and 'off-line' wards did not show convincingly that there was a positive association (although the result presented by others for Croydon for an earlier period was confirmed).

5.2.8 In conclusion, it seems that the schemes are indeed in the right kind of places, but that the evidence of (positive) impact is not clearly detectable, despite the promotional rhetoric and the relatively high cost of the systems.

5.3 Why Light Rail?

5.3.1 Table 2.3 compared some of the modal characteristics of buses (with varying levels of priority and segregation) and trams based on data from the Passenger Transport Executive Group (2005). This shows that a tram system is perhaps ten or twenty times more expensive than a maximum priority bus system and only fully segregated bus ways, such as the new Cambridge-St Ives system, require levels of new infrastructure comparable to light rail. Therefore, it seems sensible and pertinent to ask whether or not ten or twenty times as much (social inclusion)

benefit could be attained for the same level of expenditure as a typical light rail system? Table 2.3 also suggests light rail can be cheaper to run than buses, but this is only true at high volumes on the busiest routes: on lightly used routes or at off-peak times, the additional capacity of a tram is not required and the saving in cost (mainly of driver time) of providing three or four buses to every tram for equivalent capacity does not necessarily materialise.

5.3.2 Although the tram when running on fully segregated rights of way does benefit from significant advantages of speed and reliability over buses, the number of suitable rail replacement routes will soon be exhausted, and new extensions such as Streatham to Purley on Croydon Tramlink, will require extensive street-running. To achieve similar advantages, bus system will need to appropriate similar rights of way on the highway and displace road traffic. The public appetite, mainly car-based, for this should not be taken for granted, as has been found by Transport for London over its proposals for the West London Tram on Uxbridge Road, particularly through Ealing.

5.3.3 Although promoting the case for light rail in *What Light Rail Can Do For Cities* (Passenger Transport Executive Group, 2005), the arguments in its favour over bus-based systems beyond journey time improvements seem remarkably weak, amounting to ride quality; potential impact of road works; visibility; car users adverse perceptions; physical accessibility; personal security, and possible uncertainty caused by deregulation. These can be easily countered. In reality, total door-to-door journey time savings will not be as great as simple run time might imply (and will diminish in off-peak periods) for typical tram user trip lengths of 5 or 6 km (Table 2.11) when stop spacing will require, on average, probably twice the distance for access walk time. Furthermore, the additional penetration to local neighbourhoods provided by buses may outweigh the advantages of the tram: for example, the oft-quoted journey time improvement between New Addington and Croydon usually neglects to mention the bus feeder journey and perceived interchange penalty costs that can be particularly onerous or worrisome for the elderly and other socially excluded groups, and a slower 'through' service might suit them better. The investment in buses and success in London surely cannot pass unnoticed. Increased frequency and active enforcement of bus priorities on the street have been combined with a modern bus fleet that is at least the equal in quality in many respects to Croydon Tramlink, with high levels of ride quality, on-board CCTV surveillance, fully accessible low floors, and iconic high visibility in the street scene now the norm

for buses (try spotting a tram in Birmingham city centre). As far as social inclusion is concerned, achieving a modal shift from reluctant car drivers is not the primary objective.

5.3.4 The arguments for tram, except in the busiest of public transport corridors where it is appropriate and fewer trams can supplant the numerous buses, such as Uxbridge Road (West London Tram), always seem to revert to the intangible image and confidence boost factors that are so sought after for urban renewal and regeneration by the city marketers, rather than the tram being the right transport response to the expected volume and pattern of demand. A network of ten or twenty cross-city high quality, high priority bus lines on the London model serving a wide range of opportunities and destinations would do more for social inclusion in most English cities than a single isolated narrow light rail corridor. The issue of the preference for prestige projects is summarised by:

> *'In many cities, $200 million spent on a bus system would produce more improvement in accessibility than the same amount spent on a single light rail line, because the former system would cover a much larger area and so serve more people. However, it would not be so glamorous, and so the politicians and planners might not be so willing to plan and promote it. Nor would it be easy to finance under present funding regimes which are geared to individual projects rather than achieving maximum benefits'* (Mackett and Edwards, 1998).

5.3.5 It is also interesting to note that, whilst 'modern trams' are becoming more widespread and apparently attractive, there is also development taking place of alternative specifications at either end of the range. For example, trials are taking place of the 'bus that thinks it is a tram' in York (the f-t-r) that seeks to capture the benefits of conventional street-running buses with the image factor of a tram. At the other end of the scale, systems in Germany are developing the train-tram concept that fulfils the suburban railway role akin to Manchester Metrolink whilst still being able to penetrate the city centre.

5.3.6 Yet, in reality, new tram systems will continue to be promoted with social policy benefits accruing as an added bonus. Where trams are the appropriate mode in the functional hierarchy of urban transport systems, their design and specification should be adapted to fit better with broader social objectives rather than just suburban commuting in mind. There are now signs of a shift from light rail to bus-based systems, following on from the earlier shift from metro to light rail, but there are still examples of more sophisticated technology being used than is necessary (Mackett and Edwards, 1998).

5.3.7 The English schemes rarely have the intense urban character of street trams in cities such as Amsterdam, Milan or Zurich (Hylen and Pharaoh, 2002 p19), and reflects the fact most English cities tend to have relatively small city centre resident populations (although this is beginning to change). The French model of tram design and specification that incorporates a much more urban feel with complete urban design treatment and general traffic exclusion seems more favourable to social objectives:

> *English schemes, mainly following former suburban heavy rail routes with relatively isolated stops, do not necessarily penetrate local neighbourhoods and contrast with many European examples that tend to be mainly street-running with frequent and convenient (Hylen and Pharaoh, 2002),*

and

> *French cities are starting to provide the most appropriate role models for urban design, new light rail investment and traffic restraint. The contribution of these three traditions is the best that Europe is currently offering, not only in the large cities but also in middle-sized and small cities too – and not only for light rail systems themselves, but also the necessary synergy with other policies, without which success is much more difficult to achieve* (Hass-Klau and Crampton, 2002).

5.3.8 This could have a significant bearing on the potential effectiveness of light rail projects in England reaching those in most need in deprived localities who would benefit from greater inclusion and participation that the schemes would otherwise afford. Based on Hylen and Pharaoh's (2002) comparative analysis, some of the typical differences between the English and European urban tram systems, exemplified in Amsterdam, Milan or Zurich, are summarised in Table 5.1.

Table 5.1: Comparison of English and European Light Rail Systems

Feature	Typical English System	Typical European System
Route length	Long and suburban	Within built up city
Population Density served	Relatively Low	Mostly high density throughout
Stop spacing	Widely-spaced	Frequent
Stop design	Elaborate, formal 'stations'	Informal or simple stops
Trip type served	Mostly city centre commuters	Intra-neighbourhood as well as city centre for a range of trip purposes

Source: Hylen and Pharaoh (2002)

5.3.9 These differences could conspire against the current light rail schemes in England being effective at the 'fine grain' required to alleviate local isolation and social exclusion. It is also noticeable that the glossy brochures (such as the Passenger Transport Executive Group's recent *What Modern Trams Can Do for Cities, 2006*) only show vibrant 'new-urban' settings for their images and artist's impressions with trams mixing easily with young trend-setters in swish city centres, and not the more representative dismal railway cuttings and remote stations that are a feature of the English light rail systems.

5.3.10 In conclusion, the tram systems being promoted are not appropriate in all cases and, if reducing social inclusion is really the objective as it is now increasingly frequently stated, an equivalent investment might be redirected elsewhere, including more buses or subsidising (or insisting that developers provide) 'affordable public transport' in the same fashion as affordable housing is now required by the planning system. The biggest draw back on light rail in the current English experience must be delivery. Table 2.6 shows that only 100km of new route has opened in a decade, of which about 90% is heavy rail line conversion. This represents a real commitment to changing the face of urban public transport of about 1km per year.

5.3.11 Buses, on the other hand, and not withstanding deregulation outside London, require no special powers, can be implemented almost immediately and are affordable, with little risk of creating a white elephant (which is the real paranoia for both central and local government). Light rail schemes in the UK take between ten and fifteen years to deliver, whereas the Lyon LRT scheme took only four years from inception to development (House of Commons Transport Committee, 2005), by which time the world, though possibly not the socially excluded, has moved on.

5.3.12 However, Hass-Klau et al (2000) point to a possible paradox that the main advantages of light rail turn out to be what are often considered its disadvantages – its high cost and inflexibility:

> *'In political terms, these attributes give it a high profile as a symbol of commitment in the early stages, and make it a confident, futuristic symbol of the city when it is implemented (Hass-Klau et al, 2000).'*

5.4 Who Uses Trams?

5.4.1 The existing tram systems are used by remarkably few people for a small proportion of journeys, and this is in the context of a declining market for urban public transport outside London (see Figure 2.3). Nationally, the mode share is only 2.3% (see Table 2.7). For a selection of metropolitan areas (in Table 2.9) the ratio of local bus to light rail journeys is 11 in Greater Manchester, 10 in South Yorkshire and 67 in the West Midlands. Even within their catchment areas (although these were rather crudely drawn for this study), the pie-charts presented for each system in Section 4 show mode shares for journey-to-work trips in 2001 of only 6% in Greater Manchester, 6% in Sheffield and Rotherham, 2% in West Midlands, and 11% in Croydon (but includes London Underground). On this basis of passenger volumes alone, the likely current contribution of light rail to social inclusion is probably small, largely by virtue of the limited network of destinations available and these are unlikely to be expanded significantly in the foreseeable future. Logically, only when most areas or at least principal corridors and trip generators are connected, will more trip opportunities arise.

5.4.2 However, of those who do use the tram, are the systems providing enhanced levels of mobility and accessibility for the already-mobile, or are they creating genuinely new opportunities for those isolated or excluded? The South London Partnership (2003) report that the Croydon Tramlink's passengers closely reflect the socio-economic mix of the area. However, the same probably cannot be said of the Altrincham branch of Metrolink.

5.4.3 Together with environmental objectives, such as air quality, and more latterly 'sustainability' and improving urban spaces for pedestrians, there has been a focus on mode shift from the car. However, the focus of the most often quoted statistics is also skewed: for example, '20% of passengers are former car users' (South London Partnership, 2003) translates into a tiny (if measurable) reduction of cars on the road and, owing to release of capacity, they're probably all too soon replaced by latent demand for car use, and are rapidly over taken by underlying travel growth trends. There are few cases in England, unlike France, where trams physically exclude car traffic: the physical restraint element is probably more important in the resulting mode shift than the inherent advantages of a new mode. Hylen and Pharaoh (2002) report that there was only a 3% reduction in car trips, which is probably the equivalent of deferring road traffic growth pressures for barely a year.

5.4.4 There seems to be less reported evidence on new trips that would not otherwise have been made (or less frequently made). There is reported increased 'off peak' activity that could in part reflect the emergence of the growing significance of the 'evening economy' that has apparently contributed to recent rises in patronage in Croydon. Hylen and Pharaoh (2002) quote a figure of 9% of Supertram users in 1999 'did not make this journey at all' before the tram became available. Although more information would be desired as to the origin and destination and purpose of such trips, these are the statistics that are more informative with regard to tackling social exclusion by transport than simply considering trams as public transport for car drivers. But there certainly seems to be potential for growing or creating a market for public transport as the growth on the Wimbledon branch and Metrolink demonstrate – particularly for off-peak (non-commuting travel demand activities) that the former heavy rail lines were less focused on meeting.

5.4.5 Recent population change in cities reflects gentrification where small households or single people are increasingly seeking out core city residential options. The weakening public transport market in terms of total residential population should be seen in the context of a recovering professional and middle-class population in the core cities, although this is normally concentrated in very specific upmarket neighbourhoods (Hass-Klau, et al, 2004).

5.4.6 A further consideration is that much of the transfer, particularly in peak hours, are the car borne commuters of the higher socio-economic classes: are trams a premium public transport service for well-to-do car users, and in this sense not a direct mechanism for social inclusion of deprived individuals, groups or neighbourhoods? The emphasis on mode shift from cars is not an important issue relevant to the socially excluded who, in all probability, don't have a car available. Detailed research is required to understand whether or not new light rail users are, or were formerly, socially excluded, or do those individuals and groups remain masked and hidden in the spatial statistics by apparent local improvements to an area?

5.5 Forecasting and Evaluation

5.5.1 Traditionally, transport scheme evaluation and business cases are driven by modelling a representation of system performance to estimate aggregate time savings to potential users. The NATA requirements, that now include environment and social objectives as well as economic outcomes, and the

GOMMMS (Department for Transport, Environment and the Regions, 2000) approach that emerged with the multi-modal studies following the *New Deal for Transport: Better for Everyone* (Department for Transport, Environment and the Regions, 1998), demanded a more disaggregate approach that addresses the question of identifying winners and losers, and how they might be distributed spatially and in their socio-economic circumstances. The Centre for Transport Studies (2006) has recently studied how social inclusion objectives may be incorporated in the NATA appraisal summary tables (ASTs), but encountered significant difficulties in determining what to measure and operationalising objectives for social inclusion, together with a paucity of information at the extremely disaggregated level of detail required. Therefore, analysis of proposed systems in terms of impact on social inclusion will rely on the current approach of segmenting the demand for the systems from the conventional more aggregate estimates of origins and destinations, trip purposes, and so on, with none of the subtlety that could emerge from truly disaggregate data.

5.5.2 The processes of social exclusion are complex and should not necessarily be expected to be tractable using traditional approaches. Since the advent of the Social Exclusion Unit's advocacy in *Making the Connections* (2003) for the use of accessibility planning as a part of developing Local Transport Plans (effective since 2005), this has become the primary means to test and evaluate the implications of a wide range of transport and location decisions. In principle, this approach is applicable to the development of light rail systems. However, accessibility modelling is rather indirect and, in the absence of data, focuses on the quantity of potential connectedness rather than the quality of real journey opportunities. Conventional modelling approaches are already too simplistic as means to address complex travel behaviours associated with social exclusion issues. Lyons (2003) expects that travel behaviour research will have to continue to evolve. He describes the shift from 'trip-based' analysis to 'activity-based' choices and the need to evolve one stage further to 'accessibility-based' where it is recognised that patterns of activity and travel in time and space are governed by an individual's resources for and aspirations concerning social participation (Lyons, 2003).

5.5.3 Understanding the complexity of the cross-departmental issues is a two-way agenda, requiring:

> *...not only that transport policy makers consider the impact of their decisions on the social welfare of citizens, but also that those concerned with the delivery of the welfare agenda consider transport and accessibility as a vital element in encouraging people from welfare to work, reducing health inequalities, improving educational attainment and achieving neighbourhood renewal' (Lucas, 2004).*

5.5.4 There may be a problem that the prevailing engineering and economics culture (especially so in the field of planning for light rail systems) within conventional transport planning is not sufficiently or appropriately skilled to respond in the most effective manner to these issues.

6 Conclusions

6.1 Introduction

6.1.1 This research set out to identify the impact on social inclusion in response to (or anticipation of) light rail schemes by reference to a sample of cities in England. The hypothesis was that there is a positive relationship between these schemes and improved social inclusion, and a range of evidence from the literature and the case studies was reviewed. This concluding section summarises the discussion identified in this thesis, and ends by presenting a SWOT analysis that summarises how light rail systems may impact on social inclusion in England. Firstly, however, this section provides a brief critical consideration of the approach to this research and how further research might develop this topic.

6.1.2 There are inevitably some shortcomings in the approach and methods adopted for this study. This study presents a very broad overview of the general impacts and sought to find evidence in the case studies at a relatively coarse ward spatial level. A possible problem is that the 'grain' of the social exclusion problem is quite fine and a very detailed local analysis may be more fruitful and is required to provide more detailed insights to assess very local, group or community hardships that remain masked in the aggregate data at a ward level. Further analysis could be made, for example, at a finer Output Area level where data permits. A quite limited range of published data was used and a more in-depth analysis of richer primary data, elicited from local surveys at a micro level such as household interviews or travel diaries, would be very revealing to test the hypothesis. A further problem was availability of suitable before and after indicators of transport social exclusion (inevitably indirect measures of deprivation, car availability or employment) and the approach relied heavily on comparing with and without comparative study areas.

6.1.3 A further consideration that would need to be addressed by any study was the ability to attribute changes to the impacts of the light rail system and to separate them from other factors, including other forms of intervention such as road building or regeneration initiatives that may be strongly correlated with the defined light rail study areas and confound the analysis. The most important action would be to identify suitable key measurable criteria with which to define changes in social inclusion that will serve to provide the most useful indicators for evaluation and prediction of impacts. This study was based, for practical purposes, on readily available data such as national statistics. Having

established indicators and an assessment methodology, steps should be taken to undertake the necessary 'before' baseline surveys and investigations in cities such as Leeds, Liverpool, Portsmouth or 'South Central' London where new systems may be on the horizon.

6.2 The Impact of Light Rail on Social Inclusion

6.2.1 The lesson from the review of the literature and analysis of the case studies is that the evidence of a large and discernable impact of light rail on social inclusion could not be identified. Although social inclusion has only latterly become a key policy objective and justification for public transport schemes, and exactly what indicators to measure is not fully determined, more demonstrable evidence of positive impacts of light rail is required to substantiate and support the claims for light rail that are now being made. The literature, including those who are advocating new systems, does not seem to be able to confirm the positive specific contribution of light rail. Improvement to social inclusion is not necessarily synonymous with urban regeneration and urban renewal success stories.

6.2.2 What can be said is that the existing light rail systems are in the right sort of places where they ought to make a positive impact if they can. Part of the problem is that appropriate before and after evidence is required and the studies undertaken in place such as Sheffield, Tyne and Wear, and Croydon were more concerned with other types of regeneration or economic impact. If combating social inclusion is to be a key justification for new systems, properly designed and specified studies are now required in places where new systems may be imminent, such as Leeds and Merseyside, in order to quantify and describe the baseline situation and to monitor impacts.

6.2.3 Investment in light rail is not cheap and the planning approval and funding process is long. Therefore, a legitimate question is not only what contribution did the light rail case study schemes make towards improving social inclusion, but also could better value for money solutions be used in future? Can the schemes that have been implemented be regarded as a costly experiment in this regard? The Social Exclusion Unit's (2003) review of improving transport services highlights the need for flexibility and responsiveness to local needs, and that bus is the most widely used mode of transport for people on low incomes. It is difficult to imagine light rail systems becoming 'demand responsive', 'flexibly routed' or on

a 'community, not for profit basis' that the SEU suggests as solutions for meeting the local challenges of social exclusion.

6.2.4 Although light rail is fully accessible and offers a high quality of ride, the character of most English systems converted from former suburban rail routes is not ideal: a more urban and street-running character would probably have a greater impact on social inclusion and in planned schemes such as Cross River Tram in London this should become increasingly the case. This model would serve to avoid the problems encountered in West Midlands, although much of Manchester's proposed expanded network, for example to Oldham and Rochdale, will continue to use former heavy rail alignments.

6.2.5 Those schemes that are currently being planned offer the chance to ensure that the objective of meeting social needs is met through a coordinated range of policies, for example:

> *The opportunity is currently available in Leeds to bring greater coherence to transport, planning, housing regeneration and environmental policy into the most deprived wards through which the tram will penetrate and to link these communities better to the city centre regeneration and employment opportunities which exist' (Shutt and Kumi-Ampofo, 2003).*

6.2.6 Therefore, the new generation light rail schemes are probably more likely to have a positive impact on social inclusion and other aspects of urban renewal than the existing systems. However, probably the most important limiting factor of the present systems is the extent of the reach of the networks. When these are developed to provide access to a significantly wider range of destinations and opportunities beyond a narrow corridor, then they will become the agent of much more significant changes in travel possibilities and behaviours, reinforcing all modes of public transport in a virtuous circle, and thereby exerting much greater influence on the fortunes of those vulnerable to becoming socially excluded.

6.3   SWOT Analysis

6.3.1 Table 6.1 presents a summary of the 'Strengths, Weaknesses, Opportunities and Threats' presented by light rail with regard to having an impact on social inclusion.

6.3.2 Light rail is an attractive mode of urban transport and it fulfils a practical role in appropriate circumstances. However, the greatest problems and weaknesses with the existing systems and proposed extensions in the pipeline concern the ability to fund and deliver in a reasonable timescale. The greatest opportunities

lie in properly coordinating with complementary public transport modes; the restraint of car use in cities; the diversion of new sources of revenue into local public transport initiatives, including trams, and the reform of the planning process to achieve speedier delivery of new lines to help to respond to current problems. The greatest threat to developing light rail in support of social inclusion objectives is a lack of political will and stamina to resist the private motorist and create fairer, more inclusive, cities.

6.4   Conclusion

6.4.1 The question of the impact of light rail on social inclusion in England can be addressed in two ways. Firstly, based on the existing evidence and the systems studied, the response to the question 'does light rail make a positive impact?' is probably 'no'. However, if the question is broadened to 'can it make a difference in the future?', then the answer is probably 'yes', dependent upon:

- Extensions to systems to provide coverage of all areas of the cities with useful networks for a wide range of trip purposes and activities, including, but not confined to, employment;

- A shift to a more street-based urban style of system rather than heavy rail conversions that will be entail a reallocation of road space and require a less car-dependent urban form and urban lifestyles;

- Speedier planning approval, funding and delivery to achieve a quicker impact;

- Full recognition of social impacts in the route selection and evaluation of proposed systems and extensions;

6.4.2 However, it must be remembered that assisting social inclusion is but one objective of light rail systems being advocated in England, and the measures of 'success' of these other objectives must be acknowledged:

> *Success is of course a multi-dimensional concept and may include economic, financial, social, technical, mobility, congestion, environmental and equity concerns. However, there is a simple underlying requirement that the system is well-used since 'unless a light rail system is capable of attracting a good number of passengers, it is difficult for it to contribute well to any of the broader objectives (Hass-Klau and Crampton, 2002).*

Table 6.1: The Impact of Light Rail on Social Inclusion SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
• Physical access for mobility impaired	• Generally poor local access, penetration and visibility of current rail conversion systems	• Proper integration with complementary modes outside London following re-regulation of buses	• Planning process and lead times – too slow for electoral cycles and political will
• Speed, reliability, frequency	• High and uncertain implementation costs	• Full urban design and environmental treatment in second wave of 'street trams'	• Continued cost and delivery uncertainty
• Low operating costs when passenger loading is high	• Negative impact of badly performing systems such as West Midlands	• Traffic restraint/reduction creates imperative for new public transport and releases redundant street capacity	• Undiminished car ownership aspirations
• Comfort, security, permanence	• Inflexibility of services	• Support major development in car-less city centre locations	• Government wavering and vacillations – preference for buses?
• Widened travel horizons and accessibility levels	• Very long lead times for planning, approvals and delivery cannot keep up with policy agendas and current objectives	• Funding: developer contributions, local taxes, work place levies, congestion charging	• Further deregulation and competitive operation of buses
• Image and confidence boost to urban renewal and inward investment	• Causes uncertainty for other investments and initiatives	• Streamlining of planning and funding approvals process	• Dispersal of development and perpetuated car dependency 'locking out' viable public transport
• Complements environmental agenda/sustainability	• Funding/affordability: the value for money with regard to social inclusion outcomes is probably very weak.	• Full recognition of value of social impacts of affordable public transport in business cases for new systems	• Political and public opposition to new infrastructure, particularly on-street.
• Suburban rail conversions boost public transport patronage and revenues	• Conflicting objectives of planning to attract car users rather than non-car users		

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