

Delivering DaSTS in Leicestershire:

A report for the Leicestershire LTP3 evidence base

June 2010

Produced by the Research and Information Team, Chief Executive's Department, Leicestershire County Council

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Whilst every effort has been made to ensure the accuracy of the data contained in this report, the County Council can accept no responsibility for any errors or omissions.

The views expressed in this document are those of the authors.

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I. Introduction

I.1 Local Transport Plans and this report

The Transport Act 2000 introduced the requirement on local authorities in England to produce a Local Transport Plan (LTP) for their area which takes account of statutory guidance issued by the Secretary of State, a requirement retained in The Local Transport Act 2008. The aim of LTPs is to encourage high quality transport planning and effective delivery of local transport proposals, and to define the basis for monitoring transport performance. Since 2000, the LTP process has accelerated the concept of transport as an enabler and led local authorities to consider directly how well their transport networks contribute to the delivery of wider strategic priorities, such as maximising equality of access and improving quality of life for all residents.

Taking the concept of transport as an enabler a step further, the Government's current thinking on transport planning in England, *Delivering a Sustainable Transport System* (DaSTS), has at its foundation the work of both the *Stern Review* (which predicted the economic costs of climate change and for the first time truly began to reflect the link between man-made, transport-related CO₂ emissions and climate change) and the *Eddington Transport Study* (which analysed the long-term links between transport and the economic performance of the UK). The DaSTS concept is based around transport helping to enable five principle goals:

- Supporting economic growth;
- Promoting greater equality of opportunity;
- Contributing to better safety, security and health;
- Reducing emissions of carbon dioxide and other greenhouse gases; and
- Improving quality of life.

These goals do not relate to transport and travel *per se*, but to outcomes which transport intervention can help to enable. For example, an effective transport system gives people freedom of choice, enabling them to get to and from work, education, healthcare, shopping and social activities in a way that minimises negative impacts on people's lives and the environment. Good quality transport planning also facilitates the safe movement of people and supports the economy. Through the DaSTS goals, the concept of transport as an enabler has become fundamental to transport delivery at the national, regional and local levels, and is the principle on which Leicestershire's LTP3 will be based.

Leicestershire's LTP3 will come into place from the start of April 2011, and will build on the Leicestershire LTP2, which runs from April 2006 to the end of March 2011. Developing an LTP3 that ensures transport meets the needs of wider national, regional and local strategic priorities is a significant challenge and one that must be informed by robust evidence. Similarly, with public spending cuts imminent, the development of an LTP3 that can demonstrate value for money by prioritising investment in the most appropriate areas will only be possible if it is built on robust evidence.

This report is therefore designed, along with the rest of our evidence base, to help inform the agenda for Leicestershire's LTP3. Recognising the key policy drivers LTP3 must plug into, the report is structured around the five national DaSTS goals, as well as the broad thematic areas of the Leicestershire *Sustainable Community Strategy*. In looking strategically at the transport implications of these key policy drivers, the report is necessarily broad-reaching and it may be the case that, on the back of it, more detailed analysis of specific issues will be required.

At the same time, the report is not meant to be a reference book of statistics nor a compendium of everything we know about transport in Leicestershire and its impacts on wider goals. Rather, drawing on national research and local data sets, it highlights issues which we believe are key to delivering LTP3. Sources of evidence that have not been considered in depth here, but which are relevant to LTP3 and could be looked at alongside this work, are referred to throughout the report.

Work to produce this research report has been led by the County Council's Research & Information Team, working in close conjunction with the Environment and Transport Department. Input to its development has also been obtained from relevant staff throughout the County Council as well as key partners from the Leicestershire Local Strategic Partnership and the Leicester and Leicestershire Multi-Area Agreement Partnership.

1.2 Structure of the report

As with any piece of research, it is difficult to neatly reduce a substantial amount of analysis down into a convenient two-page summary. Instead, this section gives an indication of the scope and content of each chapter. Since they are written around the DaSTS goals, many of the chapters are cross-cutting. What follows, then, also aims to define where each chapter begins and ends.

Chapters 2 and 3 (and 10), Overview and Methodology.

These chapters have been written in an accessible way and aim to guide readers through the research report. The *Overview* chapter sets out the policy context behind LTP3, relevant trends in the transport sector and the implications of this given Leicestershire's social and economic situation.

In preparing the evidence base, a number of different and complex data sets have been used. To make sense of these, we have drawn on various analytical techniques, contextual data sets and methods for visualising data spatially. Many of these may be new to some readers, and the *Methodology* chapters (see also Chapter 10) provide a guide to reading and understanding them.

Chapter 4, Economic Growth, starts with a review of literatures around the changing economic geography of the UK and what this has meant for the transport sector. It discusses these transformations in the context of Leicestershire's economic structure and, on the back of this, focuses on two areas which should be of concern to local transport planners: road traffic congestion and labour market movements.

In order to identify where congestion is at its highest, local Automatic Traffic Count data for the last 6 years are analysed on major routes in the county. The section also reports on findings of the local 6 Cs *Congestion Management Study*.

The second, more substantive, part of the chapter uses Census 2001 data and a method based on work by economic geographers at Wawrick University to better understand the geography of Leicestershire's labour market. It identifies where in the county employment centres (containing jobs) and residential areas (containing workers) are concentrated, and the level and nature of commuting between the two. Remembering that not all workers in the county can travel equally, it then calculates a measure for how easy low-skilled jobs in each ward in the county can be filled based on the spatial distribution of jobs and workers.

The chapter concludes by suggesting where in the county, as a result geography and workers' ability to travel, labour markets might be inflexible and therefore where the provision of cheap and efficient transport services may be essential.

Chapter 5, *Equality of Opportunity*, considers the extent to which residents in Leicestershire can easily access four vital services: employment, further education, healthcare and foodstores. It measures access in two ways. Using a GIS-based network analysis, residents' geographical/physical access to these services is summarised and broken down by key target groups. Secondly, using findings from Leicestershire's 2008 Place Survey, residents' perceived access to the four key services is considered. Using statistical analysis, 'priority groups' who suffer from poor perceived access and/or 'real' (geographical) access are identified and located geographically. This analysis is substantive and the chapter concludes by suggesting some of the implications from it.

Chapter 6 *Safety, Health and Security*. Following the DaSTS report, this chapter is split into three parts. It considers safety in the sense of road traffic accidents; the beneficial effects of physical activity through improved travel choice; and security in terms of crime and anti-social behaviour mainly on public transport.

The section on road safety draws on a range of national research and local Police reports. It aims to understand how casualties have changed over time, the physical conditions which give rise to road casualties and the extent to which casualties are experienced differently by different social-demographic groups.

The health section then draws on medical and academic research to articulate the health benefits of physically active travel. There is unfortunately limited detailed evidence on levels of, and attitudes

towards, cycling and walking in Leicestershire. Instead, various national consultations are considered. The section concludes by suggesting possible approaches to better understanding walking and cycling behaviours.

The final section, on security, starts with a discussion of 'fear of crime' as a concept. Referencing an extensive body of work by criminologists, it delineates between three fear of crime types:

- i. fear as an intense and quite understandable response to high levels of crime and disorder;
- ii. as a way of expressing anxieties which are not just about crime, but other social changes and economic circumstances;
- iii. and instances where general worry/anxiety is very rare, even if individuals are exposed to genuine 'fearful' events.

Using local survey evidence, it identifies the extent to which these three fear of crime types exist in Leicestershire and, this time drawing on national surveys, considers how they can relate to experiences on the public transport system. Based on local Police reports and analysis of perceptions in Leicestershire's 2008 Place Survey, it concludes by tentatively suggesting where and who in Leicestershire might suffer from high levels of fear.

Chapter 7, *Tackling Climate Change*, aims to examine the role of the transport sector in reducing emissions that contribute to global warming. The chapter adopts the consensus view that, even if emissions are dramatically reduced today, the Earth's climate is still likely to change in the future. It starts by exploring what some of these changes might mean at a national and regional level and, in particular, to the stability of current transport infrastructure. It then summarises emission targets that are in place to slow the onset of climate change, paying attention to National Indicator 186, which monitors Local Authority performance in reducing CO₂ emissions.

Transport's specific contribution to emissions is reported based on vehicle type, journey purpose and length. As part of this, public attitudes to congestion are examined using local evidence from the 2008 Leicestershire Place Survey. Using *National Atmospheric Emissions Inventory* (NAEI) gridded data, maps of the distribution of CO₂ emissions across Leicestershire are presented at a 1km² resolution for road transport. Statistical breaks are used to band these data. Comparisons of the proportion of high emissions areas in Leicestershire, the East Midlands and UK are then made. Similar comparisons are presented on the contribution of road transport and other sectors across these varying geographies.

The final aspect of the chapter is concerned with understanding more about public attitudes to climate change and changing transport behaviours. Evidence is again drawn from the Place Survey 2008. Concern about pollution is used to define demographic groups who might be willing to adopt more carbon-friendly transport habits. Since there are limited local data, findings at a local level are supported by auxiliary findings from the DfT report on attitudes to climate change and transport at a National level.

Chapter 8 Quality of Life:

This chapter examines aspects of quality of life that are affected by the transport system. The chapter covers three broad areas that are outlined in the DaSTS report. It covers transport's role in allowing access to the natural environment; transport's impact on the local environment; and travel itself as an experience.

Accessibility to green space is examined in the first section of the chapter in the context of its mediating effects for reducing the impact of the transport infrastructure. Data recorded from the Place Survey are used to profile demographic groups who view

parks and open spaces as important in making somewhere a good place to live, against groups who struggle to access public green spaces.

The second section part of the chapter looks at the impact of transport on the local environment. Data from the NAEI are interrogated to identify which communities across the entirety of Leicestershire are most vulnerable to experiencing high to very high ground-level concentrations of emissions, whilst the impact that traffic emissions have on health is discussed.

The final section, 'travel experience', draws on Place Survey data to examine who prioritises certain aspects of travel experience such as 'Road and Pavement repairs' and 'Public Transport'. Additionally, data from the annual 'Highways Satisfaction Survey' is examined to aid understanding of factors that may have the most bearing on overall journey experience within Leicestershire.

Finally, **Chapter 9, What people in Leicestershire say about transport**, summarises some of the county's most substantive pieces of consultation evidence on highways and transport issues. In order to gauge relative levels of satisfaction, it first presents results from the National Highways and Transport (NHT) Benchmarking Satisfaction Survey. It then uses relevant sections of the Place Survey 2008 and the Leicester and Leicestershire Businesses Survey to consider how much of a concern three important transport-related issues are: levels of traffic congestion, public transport and road and pavement repairs. Restating some of the more detailed analysis in Chapter 8 and 9, it considers the social and personal circumstances of those individuals in the county significantly more likely to see each of these issues as a concern. The chapter concludes by reflecting on these 'priority' or 'target' groups in the context of the rest of the research report.

2. Overview

Introduction

This overview section provides a context for the rest of the report. It sets out current challenges facing Leicestershire's transport system, before giving a social and economic profile of the county.

2.1 Policy context and national transport trends

The two most significant challenges facing the UK's transport system are best summed up in the *Eddington Transport Study* (2006)¹ and the *Stern Review: The Economics of Climate Change* (2007)². Both state that the latter half of the 20th and early 21st centuries have seen unprecedented levels of population growth, wealth, and so demand for travel. At the same time, and in part as a consequence of this, they cite as a global threat the issue of climate change and how the transport sector is under serious pressure to contract and reduce its emissions. These challenges leave local transport authorities in a particularly difficult position. There are genuine economic and social reasons for increasing local transport capacity in a fair and equal way; on climate change, authorities must work to change local travel behaviours and use; and they must also deliver on a number of more traditional responsibilities, most notably around road safety. These responsibilities are discussed at length in the DfT's report, *Delivering a Sustainable Transport System* (DaSTS), but since they dictate the focus of this report, it makes sense to summarise them now.

Economic transition and the transport system

The *Eddington Review* links recent changes in the use of local transport networks with globalisation. Economic restructuring which took place from the 1970s onwards, for example, meant that the nature, shape and crucially geography of local economies changed³. Businesses needed to reach global markets, which meant that moving their goods across borders as cheaply and efficiently as

possible became a priority. At the same time, the most productive businesses of the last 30 years have been close to dense labour markets, academic institutions and their competitors: in other words, usually in cities. This, coupled with rapid population growth, has resulted in unprecedented pressure on road and rail links into cities and congestion emerging as a genuine concern. The second consequence has been that, to be competitive, those businesses which located outside of cities needed to be within reach of diverse labour markets. The quality of transport links to those businesses therefore became critical. Finally, the last 20-30 years were characterised by a polarisation in the economic opportunities available to workers. Jobs requiring intermediate-level skills with moderate financial rewards reduced significantly and instead a number of highly paid jobs opened up for professional workers. At the bottom end of the labour market (and pay scale), jobs requiring entry-level skills also expanded. Often these new opportunities were concentrated in specific locations and the latter group of workers - those working in low-skilled jobs with irregular hours - have depended on low cost and regular public transport services in order to access them⁴.

Changes in transport use and demand

Given this imperative for socially-inclusive transport, changes in the use and cost of transport are interesting. Whilst fuel has become progressively more expensive over the last decade, the cost of rail and bus fares has grown at a faster rate than for motoring (figure 2.1a). Probably related to this, car dependency in the UK is still burgeoning. In 1987, 36 percent of the UK's population did not have access to a car; by 2007 this had reduced to only 23 percent⁵. According to the *Joseph Rowntree Foundation*⁶, greater levels of car dependency have coincided with cuts in public transport provision, and the consequence has been 'transport poverty' - or growing isolation - for those without the physical and financial capability to travel privately⁶.

Climate change and the transport system

The threat of climate change is relatively recent and the role of local transport authorities in reacting to it is perhaps more hazy. It will be important to understand how resilient local transport surfaces are to more extreme temperatures. But, more practically, local authorities will also need to take an active role in reducing emissions. Since emissions of greenhouse gases from vehicles are regarded to be greater when those vehicles are stationary (in traffic), curbing congestion may be a means of reducing local emissions. Increasing the supply of road space is the most common way of reducing congestion, but this would make little impression on traffic volumes and so probably emissions¹. Instead, it has been recognised that, as well as understanding their own contribution to greenhouse gases, transport authorities should try to redirect demand on their local network. According to the DaSTS report, the best way of doing this is by changing travel behaviours - by encouraging greater levels of walking and cycling or greater use of public transport⁷. An initial challenge would be to understand who and where in their authority is most, or least, predisposed to making such changes.

Figure 2.1a: Growth in passenger transport prices: 1987-2008



Source: ONS 2008, Transport Trends

Changes in transport use and climate change

Again, trends in the use of transport over the last few decades suggest there is a significant challenge here. As population and wealth grows, people's demand to travel also increases¹. Overall traffic on the UK's roads has swelled in the last three decades and this trend has continued into the 21st Century. Traffic flows in 2008, for example, were 23 percent higher than they were in 1993⁵. If government is to encourage more sustainable transport modes, then current trends in travel behaviour will also need to be reversed. Between 1991 and 2007, total annual miles travelled by bike in the UK shrank by 20 percent, and between 1996/1997 and 2006/2007, the total number of trips made on foot and by bike reduced by 15 and 14 percent respectively⁸.

All of this may have had some effect on climate change. The transport sector is estimated to emit around 14 percent of the world's greenhouse gases² and, excluding aviation, transport emissions of CO₂ (the most significant contributor to climate change) increased from 85 to 117 million tonnes between 1980 and 1990¹. That demand to travel continues to rise, and with car dependency at an unprecedented high, calls on the sector to keep its emissions in check can therefore only intensify.

Other responsibilities: road safety, transport security, travel experience and health effects

As well as paying attention to changes in the demand for transport, local authorities still need to deliver on more traditional areas of responsibility. Many of these overlap with other policy areas, but the most obvious are around road safety, fear of transport-related crime, the quality of local transport assets and the health implications of the transport sector.

On road safety, it has been argued that local authorities should understand the causes of road accidents in their local area, as well as whom, and where, might be the focus of investment¹⁰. Exploring local crime rates and more importantly whether, where and for whom, fear of crime prevents residents from travelling is the first step in acting on transport security. Identifying where air and noise pollution from the transport system is highest and where this matters most, might be the best means of understanding transport's negative health effects. And on journey experience, it first makes sense to find out what influences residents' overall satisfaction with local transport assets⁶.

Changes in air quality and road safety

It is difficult to find evidence for national trends on all these areas over time. However, the last three decades has seen considerable improvements in both air quality and road safety. Since 1980, emissions of pollutants such as Carbon Monoxide and Nitrous Oxides have reduced by 81 and 37 percent respectively⁹. The withdrawal of four-star petrol in 2000 has meant that lead emissions are now negligible and, although levels of sulphur dioxide have increased since 2002, they are 25 percent below those measured in 1980.

In terms of safety, road casualties in Great Britain shrank by 24 percent between 1980 and 2007. This is encouraging given the fact that traffic volumes increased by 87 percent over the same period⁹. Reductions in the numbers of fatal injuries have nevertheless been slower than for all casualties, particularly amongst motorcyclists¹⁰. In addition, most accidents are still caused by poor driving behaviour and casualties have been consistently overrepresented in certain social-demographic groups¹⁰.

2.2 What this policy context means for Leicestershire

The rest of this report has been written with this policy background in mind. Its main chapters are titled under the five DaSTS goals: supporting economic growth, promoting equality of opportunity, contributing to better safety, security and health, reducing carbon emissions and improving quality of life. The aim of each is to identify issues, people and places most important to transport planners. To provide further context to these chapters, the next section tries to locate Leicestershire's social and economic geography within the five DaSTS goals. First though, it makes sense to describe Leicestershire and its transport system.

Location

Located almost exactly in the middle of the country, Leicestershire borders with Derbyshire, Nottinghamshire, Staffordshire, Warwickshire, Northamptonshire, Rutland and Leicester City. Leicestershire is part of the Leicester and Leicestershire sub-region, with Leicester City at its economic and geographical core. Built up areas which start in Leicester extend beyond the city's borders into the districts of Oadby and Wigston, parts of Blaby, Charnwood and Harborough. Almost half the sub-region's (Leicester and Leicestershire's) population of roughly 916,000 live within this Principal Urban Area. Although Leicester City and Leicestershire are administratively separate, then, both interact heavily in terms of their economy and labour market, school catchment areas, housing markets and transport systems.

Transport and infrastructure

Road

Leicestershire benefits from excellent road transport links. It is at the intersections of the M1, M6 and M69/A42 motorways. It is considered to be a leading location for the logistics and distribution industry¹¹. The East Coast ports, which provide access to continental Europe, are easily accessible via the A14, and 95 percent of England's population is accessible within four hours' drive of Lutterworth¹¹. London, the South East and West Midlands are all in commuting distance of Leicestershire.

Rail

In terms of rail links, regular high speed services run direct to London St. Pancras from Leicester, Loughborough and Market Harborough via the *Midland Mainline*. In addition, following the

Figure 2.2a: Leicestershire's road network



Source: Economic Baseline Study, 2006

transfer of the *Eurostar* terminal to St. Pancras, a journey from Leicester to Paris can now take as little as four hours¹¹. Within the region, the *South Leicestershire Line* runs east-to-west from Nuneaton (Warwickshire) to Leicester, the *Syston and Peterborough Line* runs from Leicester to Peterborough and the *Leicester and Burton Line* connects Leicester with Burton upon-Trent (currently freight only).

Bus routes

Bus and coach services in Leicester and Leicestershire are comprehensive. There are currently 75 main bus routes running hourly from Monday to Saturday (36 services run every 30 minutes or better). A network of inter-urban bus services provide linkages between the main settlements in the sub-region and to/from East Midlands Airport. Services typically operate hourly or half-hourly, and journey times vary considerably between settlements. Services also operate in each of the county towns. Three quarters of households in rural areas, and 95 percent of all people in Leicestershire, have access to an hourly daytime bus service. Away from this hourly bus network, the most isolated/rural areas are provided for by less frequently scheduled buses and an increasing number of 'Rural Rider' and 'Demand Responsive' services.

There are two Monday to Saturday Park and Ride sites in the sub-region. The first site at Meynell's Gorse, on the A47 West just inside the city boundary, holds 500-spaces with frequent bus services running into Leicester City. A second site opened close to M1 Junction 21 at Enderby in November 2009. This site has 1,000 spaces and buses travel into central Leicester every 10 minutes. Two Saturday-only Park and Ride sites also operate from Oadby Racecourse and County Hall, Glenfield.

Air

Finally, East Midlands Airport (EMA) lies in the north west of the county and is one of the UK’s major freight airports. The Airport has seen significant growth in both passengers and cargo in recent years. In addition to serving businesses within the sub-region, it supports a range of markets across much of England, especially in relation to the Airport’s express freight hub. The airport also obviously provides a point of access for international business travellers and tourists.

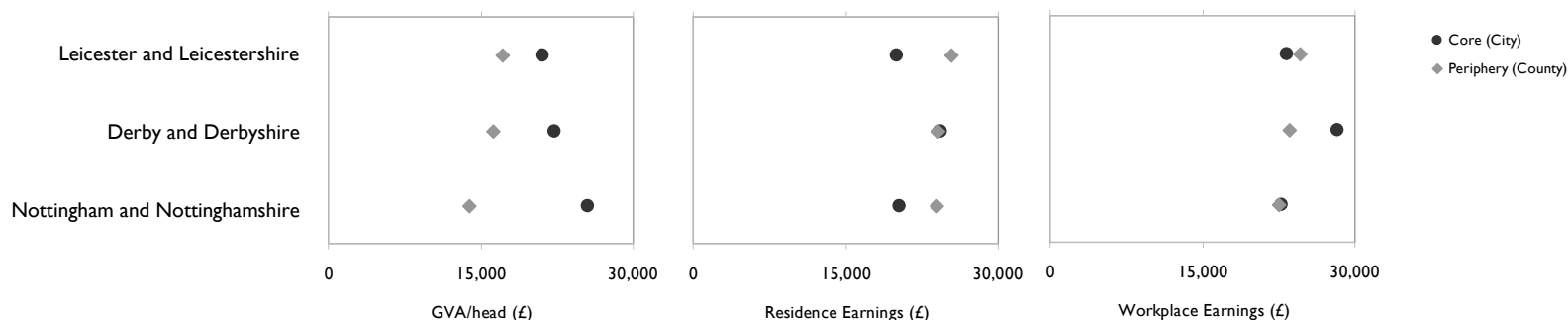
The background information on Leicestershire’s transport system is extremely useful, and that the county and sub-region is well connected with the rest of the UK (and beyond) is clearly important. This research report will nevertheless attend to how residents, workers and businesses in Leicestershire use their transport system and how routes affect residents’ everyday lives. Crucially, it will consider Leicestershire’s transport assets in the context of its economic and social structure. The following pages of this Overview chapter therefore account for Leicestershire’s social geography. Where possible, reference is made to the themed chapters which appear later in the document.

Economic structure

Leicestershire is a relatively diverse and successful economy. The county went through economic transition from the 1970s onwards and, to an extent, exited out of heavy industry. Between 1971 and 2005, manufacturing jobs shrank by 60 percent whilst services jobs grew by 170 percent¹². Despite this shift, manufacturing remains a significant sector by national standards, and the county’s transport and communications sector, which takes up 8 percent of all jobs and 17 percent of North West Leicestershire’s jobs, also stands out¹².

It is normally taken for granted that economic activity in sub-regions is concentrated in cities. Workers tend to live in more peripheral parts of a sub-region (a county), where there also tend to be fewer employment opportunities, and then commute into their nearest city for work. This means that, compared to county areas, cities will be considerably more productive - will generate more output per head of their resident population - than county areas. As a result, workplace earnings will also be typically higher in cities than in counties. The flipside is that, since rural and semi-rural locations tend to offer a better quality of life than in cities, earnings of residents will be higher in county rather than urban areas.

Figure 2.2a: Gross Value Added per head and Earnings in Leicestershire, Derbyshire and Nottinghamshire



Source: ONS Local GVA, 2006; ASHE, 2008

When looking at data on local output per head, this is loosely the case in Leicester and Leicestershire (figure 2.2a previous page). Compared to neighbouring sub-regions, however, the distinction between Leicester City and Leicestershire is less marked: businesses in Leicestershire are almost as productive as those in Leicester City. As expected, residential earnings are higher in Leicestershire County than Leicester City. More interestingly, though, median workplace earnings - the earnings paid by local jobs - are higher in Leicestershire than in Leicester City. These data suggest that, for a peripheral area, Leicestershire is relatively productive. Its businesses offer comparatively generous financial compensation and by implication as an economic core, Leicester City is relatively weak¹¹.

All of this is important when thinking about local labour market movements - about where residents live and where jobs are. It is not always the case that the best employment opportunities are in Leicester City, and there will be demand to access a number of jobs in parts of Leicestershire County. So far, little is known about the geography of these employment opportunities but, taking for granted the fact that transport links to Leicester City are fairly comprehensive, it may be the case that some of these jobs in the county are difficult to access. The geography of Leicestershire's labour market, and its implications for transport planning, will be dealt with in some detail in Chapter 4.

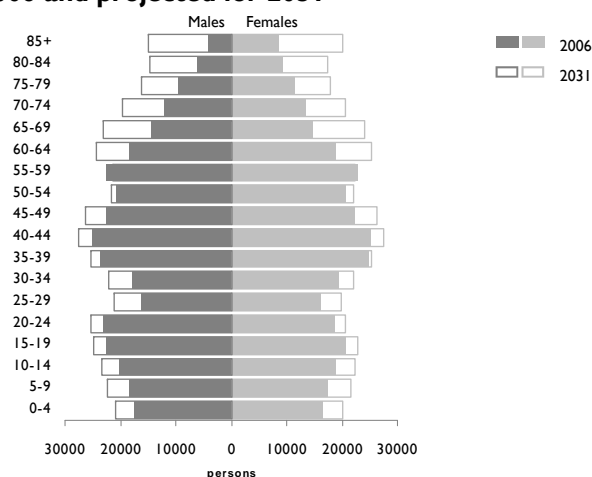
Population structure

With a population of around 641,000, Leicestershire was the twenty-fourth largest county/unitary authority in England in 2007. Over the last two decades the county's population has grown at a faster rate than regionally and nationally. As a result, housing growth to 2026 is expected to exceed national averages. Current

Regional Plan policy for housing provision in districts across the sub-region is for 80,400 additional dwellings between 2006 and 2026. Much of this housing is likely to be delivered through the extension of existing urban areas, including Leicester, Melton, Loughborough, Market Harborough, Hinckley and Coalville¹³.

Importantly, Leicestershire's population structure is changing. Increasing life expectancy and slower birth rates have led to an ageing of the population. The county is not unique here, but it is ageing faster than regional and national averages. This trend is also expected to continue. Between 2006 and 2031, the number of people aged 75-79 and 80+ is forecast to more than double (figure 2.2b), whilst the number of 15-19 year olds and 20-24 year olds is predicted to grow by just 10 percent¹⁴.

Figure 2.2b Leicestershire's Population Structure: 2006 and projected for 2031



Source: ONS Population Estimates, 2008

These arguments are now well-rehearsed, but since older people are key users of public services, an ageing population brings a number of challenges to local authorities and their transport systems. Quality of life for older people, for example, often depends on their ability to access essential services and social opportunities¹⁵. As residents get older, they become less able to travel independently and if local public transport routes are inaccessible, or if older people's personal circumstances mean that public transport is inaccessible, then social isolation and loneliness can become a reality.

Social structure

Social disadvantage is not just experienced amongst the elderly; the last three decades have seen a polarisation in the economic, social and physical well-being of the UK¹⁶. As alluded to earlier, de-industrialisation has had a lot to do with this growing divide. Structural changes in the 1970s resulted in a hollowing out of the labour market whereby demand increased for professionally-skilled workers and, in order to service this growing population of professionals, a number of opportunities opened up requiring elementary skills. The flipside has been that people and places who did not sit comfortably with this new labour market structure - usually skilled machine operatives working in manufacturing - suffered from long-term economic inactivity and poor living standards¹⁶.

Although Leicestershire is an affluent county, there are a few areas where long-term unemployment, low levels of education, relatively high crime and poor living standards are part of everyday life. These small geographical areas can be labelled as 'deprived' because the people living in them share similar characteristics. Although they are not always next to each other, that they are discrete areas is

important. They confirm what might seem obvious: that people with similar economic and social characteristics tend to live close together and, therefore, that certain parts of the county will be less economically, socially and physically mobile than others.

This realisation is not new. The *Office for National Statistics* has introduced two key data sets - the Census Output Area Classification (OAC) and Indices of Multiple Deprivation (IMD) - which aim to describe, or account for, the UK's social-geography (the methodology behind them is discussed in chapter 3). Most sections of this research report draw on these contextual data sets to understand how different people in Leicestershire are affected by various transport issues. Chapter 5, *Equality of Opportunity*, is the most obvious here. It attempts to understand access to vital services based on geography, residents' personal circumstances and what residents actually say about their experiences of accessing those services.

Health

In advanced economies like the UK, diseases of the past - cholera, tuberculosis and typhoid - are no longer a threat. Contemporary lifestyles are, however, increasingly sedentary and food is now cheaper and more convenient than ever. The upshot has been that so-called chronic illnesses, particular obesity and other related conditions, have emerged as substantial health threats.

In 2007/8 it was estimated that a quarter of Leicestershire's population were clinically obese¹⁷. This is not exceptional and compared with other authorities, levels of participation in recommended levels of physical activity in the county are encouraging. Despite this, in Leicestershire's most recent Joint Strategic Needs Assessment¹⁹, obesity is cited as a substantive concern for local service providers. Government policy and medical

research¹⁹ usually suggests that, beyond changes in diet, taking exercise is one of the best means of combating obesity. The benefits of, and possibilities for encouraging, more physically active travel are therefore important and will be discussed in Chapter 6 (*Safety, Health and Security*).

Security

Leicestershire is a relatively safe place to live. According to the county's most recent crime audit, total recorded crime rates are considerably lower than national and regional averages. Rates in 2008/9 were 7 percent under an already low 2003/2004 base²⁰. These figures nevertheless hide the fact that there is usually a gap between real levels of crime and what people feel about crime. The local crime audit identifies instances where this gap is true for Leicestershire²⁰. In the county's 2008 Place survey, for example, 23 percent of respondents were in some way dissatisfied with local crime levels. Whilst this might have something to do with actual levels of crime and intimidating behaviour, negative perceptions were found to be concentrated amongst those sharing specific social-demographic characteristics²⁰.

Public anxieties about crime are not new, nor is the fact that they may not relate to actual risk²¹. Criminologists, for instance, see them as being extremely personal. They cite empirical studies which show distinct types or experiences of anxiety common to certain members of society. These range from a specific reaction to growing levels of disorder, to a more diffuse, general anxiety about a deteriorating social and moral fabric²¹. Differentiating between such fears is important because where they are more acute or intense, they can be disabling and can lead people to withdraw from society. Chapter 6 therefore attempts to understand the fear of crime on and around public transport. It loosely identifies the personal characteristics of users who might suffer from the more extreme, disabling fears.

Climate Change

There is now almost a consensus that recently observed changes in climate are partly a result of human activity²². For some time, everyday emissions from business and households have altered naturally occurring levels of carbon gases, and the outcome has been an acceleration in the earth's warming. The negative consequences of this warming effect will be felt most in more extreme latitudes of the globe. At the same time, however, the UK is likely to experience drier summers, wetter winters and greater incidences of extreme weather events²².

Carbon dioxide (CO₂) is the most significant gas which leads to the earth's warming. In Leicestershire, emissions of CO₂ from transport contribute to around 55 percent of all the county's CO₂ emissions¹. When compared to the rest of the UK, this level of contribution is significantly higher than expected. Since climate change is considered one of the world's most pressing threats, efforts to reduce emissions from transport currently have a high profile. Some hope is placed on technological innovation - on developing better, more fuel efficient engines, or engines which find their energy from zero-carbon sources. Notwithstanding the importance of these developments, redirecting demand on the local transport network, and changing public attitudes or behaviours towards travel, will help.

As well as making efforts to reduce emissions, there is some recognition that changes in climate are inevitable and humans will need to anticipate and react to these changes. In transport terms this will mean understanding how local networks will cope with more frequent flooding events and, with higher summer temperatures and more intense rainfall, accepting that road structures may have a shorter lifespan²².

Chapter 7, *Tackling Climate Change*, attends in detail to local emissions of CO₂ from Leicestershire's transport sector. The latter half of the chapter attempts to understand who and where in Leicestershire is most predisposed to changing their transport behaviours.

Quality of Life

Quality of life is a relatively fluid concept with no single, agreed measure of it. Often quality of life is reduced to a people's material well-being. The United Nations' Human Development Index (HDI), for example, gives a composite value which refers to the wealth, longevity and literacy rates of a nation²³. This makes sense when drawing a line between the world's richest and poorest countries, but there are a number of non-economic aspects of quality of life which the HDI forgets. Some of these are relatively clear-cut and easy to measure. Levels of air and noise pollution, for example, are not necessarily confined to the asset or income poor, but do affect most people's quality of life. Others are more personal and complicated. They might relate to the quality of an individual's social networks, how a person feels about their economic status relative to the people around them or, related to this, anxieties around the extent to which they should substitute leisure or family-related activities over time spent working. Concepts such as 'social capital', 'affluenza' and 'work-life balance' have all been used to understand these various emotions²⁴.

The most obvious quality of life benefits that the transport system brings - access to work, health, education and vital services - would probably sit comfortably with the HDI's understanding of quality of life. These are dealt with in Chapter 5 (*Equality of Opportunity*). There are still, however, a number of other transport-related considerations. The first two are again relatively straightforward.

Noise and air pollution from transport, as well as the availability of leisure- or green- space, can clearly affect a resident's health and well-being. Also though, since the amount of time a person can expect to spend travelling is ever increasing²⁵, the quality of everyday commuting/journey experience cannot be neglected. These issues are discussed and made specific to Leicestershire in Chapter 8 (*Quality of Life*).

Overview conclusion

In aiming at a sustainable transport system, local transport planners need to negotiate a number of difficult and competing issues. The most obvious are around balancing a growing demand to travel with the need to reduce carbon emissions. Also crucial, however, is delivering a transport system which is convenient, accessible (physically and financially), safe to use and which supports people's health and well-being. This chapter has restated these responsibilities and, based on its current social and economic structure, alluded to what they might mean for Leicestershire. The rest of the report uses local and national data to understand where, and amongst which people in the county, policy interventions might be best focussed. The chapters in it are by no means exhaustive. It may be the case that deeper research and consultation is needed before detailed interventions are agreed. Nevertheless, each chapter does focus substantively on issues and concludes with some implications for local transport planning.

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3. Methodology: a guide to reading the evidence base

This evidence base is necessarily broad-reaching and draws on a number of local and national data sets. However, in order to understand the extent to which different groups in Leicestershire experience, or are affected by, different themes within the data - to make this information meaningful - various techniques have been employed to analyse and represent it. Some of these techniques may not be familiar to all readers. This section therefore introduces them and explains why they are important for social researchers. It also discusses two contextual data sets which feature regularly in our analysis. Rather than a formal methodology section, then, the chapter should be seen as more of a guide to reading the evidence base.

3.1 Contextual data

In Chapter 2 (*Overview*), we spoke about two data sets which can be used to describe and understand the social-geography of an area: the Indices of Multiple Deprivation and the Census 2001 Output Area Classification. Both data sets are defined below.

Indices of Multiple Deprivation

The English Indices of Multiple Deprivation (IMD) is the most comprehensive measure of disadvantage available to public policy makers. IMD takes a broad view of poverty. It accepts that multiple, in this instance seven, forms of deprivation can be experienced by individuals living in an area. These seven deprivations are: income, employment, health, education, skills and training and income deprivation. In total, 38 indicators* make up the seven deprivation domains and, since certain themes are likely to have a greater affect on an individual's life chances than others, each domain is weighted (figure 3.1a).

*For details of the data which make up the indicators, and a more detailed definition of IMD, see: Radburn, R. (2008) 'Key results from the Leicestershire Indices of Deprivation 2007', (Leicestershire County Council's Research and Information Team). Available at: <http://www.lsr-online.org/reports/>

IMD scores are published at lower level Super Output Area - or LSOA - level. LSOAs are small neighbourhoods which have roughly 1,500 people living in them. There are 32,482 LSOAs in England and 396 in Leicestershire. In order to make sense of IMD scores for all these 32,482 small areas, each LSOA is ranked; 1 being the most deprived and 32,482 being the least deprived. Where IMD is used in this report, national ranks are broken up into 5 or 10 equal groups (called quintiles and deciles). The first quintile or decile represents the 20 and 10 percent most deprived LSOAs in the country, and the fifth quintile, or tenth decile, consists of those within England's 20 and 10 percent least deprived LSOAs. A useful profile of Leicestershire based on these bandings is in Chapter 10.

It is probably worth mentioning that IMD is a measure of deprivation based on a prescribed basket of indicators. It is not a measure of how affluent or successful that LSOA is. The least deprived LSOAs on IMD should therefore be viewed cautiously; they may have comparatively low levels of deprivation but that does not mean they are necessarily affluent. IMD also, again deliberately, tries to generalise based on the characteristics of people living in LSOAs. It does not reflect the fact that the levels of deprivation, wealth and life chances of individuals living in those LSOAs will vary. Despite this, paying attention mainly to the extremes of deprivation ranks is a useful way of differentiating between communities.

Figure 3.1a IMD 2007 domain

	Domain weight
Income	22.5%
Employment	22.5%
Health deprivation and disability	13.5%
Education, skills and training	13.5%
Barriers to housing and services	9.3%
Crime	9.3%
Living Environment	9.3%

IMD is used in most chapters of this evidence base to identify whether or not the people of interest (usually those who think a certain way, or are most affected by a particular issue) live in areas of social-economic deprivation.

Output Area Classification (OAC)

Another way of understanding the social geography of a small area is the 2001 Census Output Area Classification (OAC). OAC is a form of geo-demographic classification which tries to label small areas - Census Output Areas which contain around 120 households - based on the people living in them. Like with IMD, the labels are not total. They are defined using 50 Census 2001 variables and a technique called *k-means cluster analysis* (for a definition see Chapter 10). The clusters do not suggest that all people in an OA are the same, but that there are significant numbers of people living in those OAs with certain similar social-economic characteristics compared to the national average. At its most general level, there are seven broad clusters under which the 1,993 OAs in Leicestershire are defined. These, and their distinctive social characteristics (census variables), are set out in figure 3.1b. As with IMD, a profile of Leicestershire based on the OAC supergroups is in Chapter 10.

OAC is an important tool for analysis because it accepts that people with similar characteristics often live close together - that socio-economic differences tend to be expressed spatially. In policy terms this is extremely useful as it allows researchers to understand and make generalisations based both on geography and personal circumstances. Whilst OAC supergroups are used in most chapters of this report, Leicestershire County Council's research team has also recently developed its own classifications based on the existing OAC (and Census 2001 data). This 'locally tailored'

OAC appears in chapters 5 and 6. It is useful because Leicestershire's human geography means that, when defined in terms of the OAC clusters, a high proportion of its Output Areas are dominated by particular supergroups. Almost half the county's population, for example, lives within neighbourhoods classified as 'prospering suburbs'. Clearly not all these small areas will look and feel the same, and the locally tailored OAC therefore sub-divides supergroups in order to better account for this difference. A definition of the locally tailored OAC, and a profile of the size and spatial distribution of its classifications, is available at: (*Forthcoming on LSR-online*).

Figure 3.1b Key characteristics (census variables) which classify OAs in Leicestershire

Classification	Census variables significantly above the national average	Census variables significantly below the national average
Prospering Suburbs	% 2+ car ownership households % detached housing	% public housing % terraced housing % all flats % households with no central heating % privately rented housing
Typical Traits	% terraced housing	% public housing
Countryside	% 2+ car ownership households % residents working from home % residents in agriculture/fishing employment % detached housing	population density % residents using public transport network % all flats
Blue Collar Communities	% terraced housing % public housing	% all flats % higher education qualifications
Constrained by Circumstances	% public housing % all flats	% detached housing % 2+ car ownership households % higher education qualifications
Multicultural	% all flats % public housing % Indian, Pakistani or Bangladeshi % Black African, Black Caribbean or Other Black % born outside the UK	% 2+ car ownership households % detached housing
City Living	% all flats % privately rented housing	% detached housing % households with non-dependent children

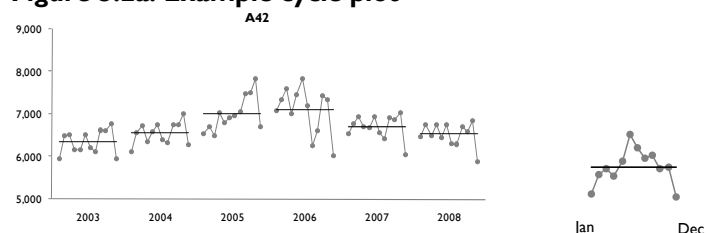
Source: ONS, 2005

3.2 Data Analysis

To identify key issues, people and places, the evidence base draws on a number of tools for analysing data. In most cases, statistical techniques have been used to find themes or trends which are statistically significant. If an outcome is statistically significant, we can usually assume that there is something determining that outcome, rather than it occurring by chance. Statistical testing is therefore useful because it draws attention to the real relationships in a data set and forgets more random fluctuations or events. It also allows us to make assumptions about, predict and explain, certain occurrences/phenomena. If, for instance, a portion of residents in Leicestershire feel that it is difficult to access their nearest GP, we can look at statistical differences in the social/situational characteristics of those people to identify combinations of circumstances which are most likely to give rise to that view. The methods of analysis used in this evidence base are defined and explained in Chapter 10. In some instances, visual techniques for analysing data are also used. To help readers with interpretation, those which appear in this report are explained below.

Cycle plots display two hierarchies of time-series data. In this report they show annual and seasonal change. The example below appears in Chapter 4. Monthly flows are plotted in time order (Jan-Dec) and the monthly average for a year is denoted by the horizontal line.

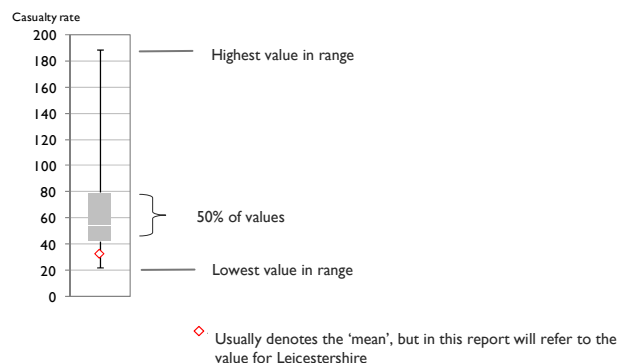
Figure 3.2a: Example cycle plot



Source: ATC Count Data, 2009

Boxplots are used to show the distribution and range of values in continuous data. After identifying the median value in a data set, box plots group data points into quartiles. They also identify statistical outliers - data points that are numerically distant from the normal data range.

Figure 3.2b: Example of a boxplot



Source: DfT, 2008

Domino Plots

Domino plots display the outputs from statistical significance tests such as Pearson's Chi-square (see Chapter 10). The general rule is: the more ink the variable under consideration has, the more statistically overrepresented it is within the sample; the less ink it has, the more statistically underrepresented it is within the sample.

Figure 3.2c: Example domino plot

- very significantly higher proportion
- ◐ significantly higher proportion
- no difference
- ◑ significantly lower proportion
- ◒ very significantly lower proportion

3.3 Data Visualisation

Finally, two new ways of representing spatial data are included in this evidence base. These, and the reasons they have been used, are set out below.

Cartography and trying to account for human geography

For some time, cartographers have struggled to convincingly represent data on people. The standard and by far the easiest way of mapping data is to generate a ‘choropleth’ or thematic map. Data is aggregated into a small number of similar groups; these groups are then mapped (usually with colour) to a pre-defined geography, such as ward boundaries. There are two problems with this approach. Firstly, some administrative geographies, notably electoral wards, have populations that vary substantially in size. This makes comparison across wards problematic. Some of the newer Census geographies help to some extent with this. Output Areas, for example, are a more consistent geography containing around 120 households. So too are Lower-level Super Output Areas (LSOAs), which contain around 1,500 people. Secondly, however, even geographies with similar populations will produce maps with a bias towards the larger spatial units. Take a look at figure 3.3a. It is a familiar representation of Leicestershire, but since it is sized to the physical geography of the county, it necessarily overemphasises areas where few people live. All maps to some extent lie, but all maps need to account for the zones they use.

One solution, which appears in this document, is a **cartogram** (see *Glossary* and also in Chapter 6). Cartograms provide a trade-off between real (physical) geography and a more abstract view of Leicestershire. In the cartogram on page 113, each LSOA (containing around 1,500 people) is represented as a hexagon of equal size, and each of these hexagons is ordered spatially and as

closely as possible to (physical) reality. Since LSOAs are a resident based geography, cartograms give a better representation of the human geography of the county. They begin to give greater spatial importance to areas where people live.

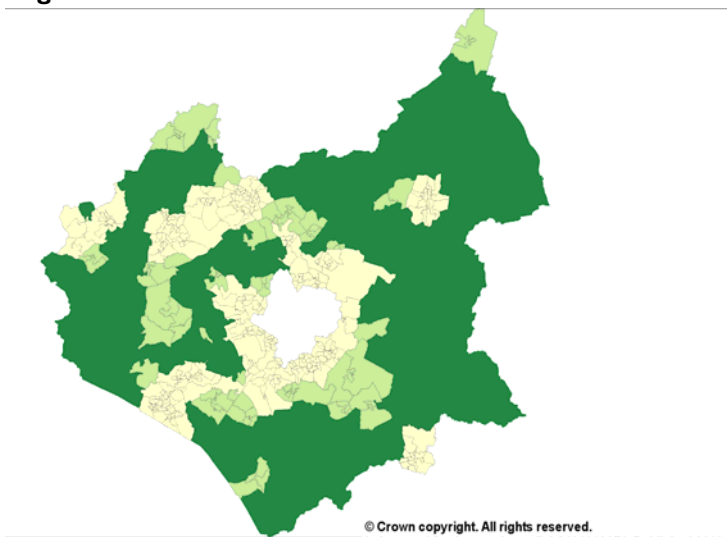
In Chapter 4, *Economic Growth*, we introduce a new and more flexible alternative. **Spatial treemap** graphics have recently been developed by City University*. They can show multiple hierarchies of data in a space efficient way. Figure 3.3b displays the urban-rural data presented in figure 3.3a using a treemap. They are quite simple to understand. Each geographical area is assigned a rectangle which is sized, in this case, by population, and then grouped together by district. The spatial position of areas is maintained as well as it can be, so as you can see, Melton Sysonby ward is to the North East and within Melton district, Bottesford is to the far north. In sizing areas by population, the treemap gives us a different interpretation of the county: most people in Leicestershire live in urban areas.

The advantage of using a spatial treemap over the cartogram, is that any variable (people, jobs, workers) and any geographical area (so wards, OAs, LSOAs) can be used. We mentioned earlier that a problem with presenting data at ward level on a conventional map was that each ward can vary markedly in population size. Spatial treemaps, however, are a way round this. Although the middle layer rectangles in figure 3.3b are grouped by ward, their size, and so their visual prominence, is determined by the unit of interest - so the number of people in each ward.

Details of the methodology behind spatial treemaps, along with examples used in different contexts, is at: <http://www.treemappa.com/>.

*See Wood, J. and Dykes, J. (2008) Spatially ordered treemaps. To appear in *IEEE Transactions on Visualization and Computer Graphics*, 14(6)

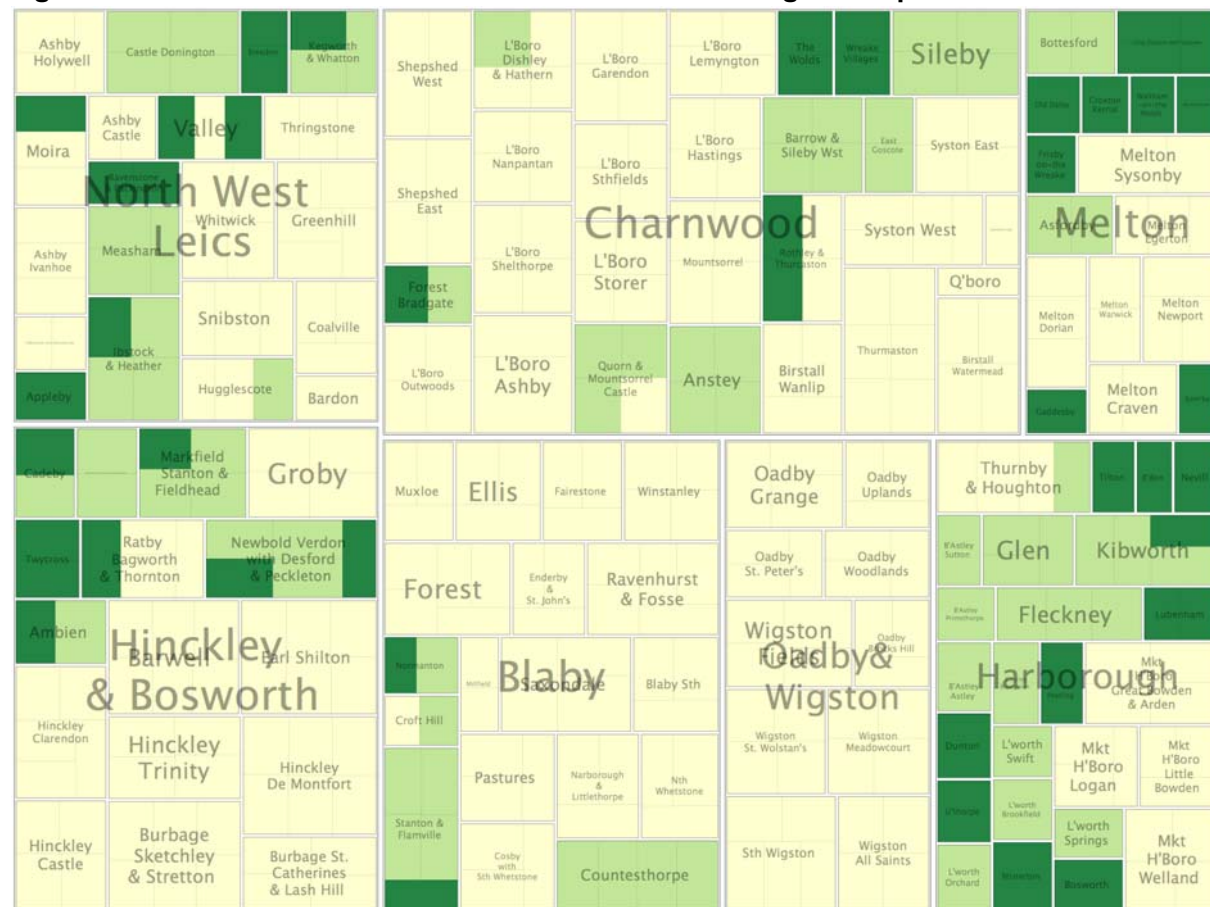
Figure 3.3a The urban rural classification for LSOAs 2004



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- Village
- Town and fringe
- Urban

Figure 3.3b The urban rural classification for LSOAs 2004 using treemaps



Source: Urban-Rural Classification, 2004