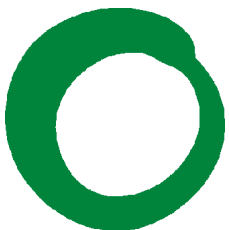


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Environmental Justice

Mapping transport and social
exclusion in Bradford



**Friends of
the Earth**

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Contents

	Executive summary	3
	Introduction	4
1	Results	6
	1.1 Deprivation	6
	1.2 Traffic impacts	7
	1.2.1 Air pollution	7
	1.2.2 Volume	8
	1.3 Transport access	9
	1.3.1 Car ownership	9
	1.3.2 Bus availability	9
2	Analysis	11
	2.1 Bradford and beyond	11
	2.2 Further work	11
	2.2.1 Impacts mapping	11
	2.2.2 Access mapping	12
3	Conclusions	13
4	Maps	A - L
	Appendix Methods	15
	References	17

Executive summary

Friends of the Earth believes transport problems exacerbate social exclusion in a number of ways. This report looks at a range of transport and social exclusion links in one area - the District of Bradford - and discovers strong correlations. National and local action is needed to overcome the problems of transport and reduce social exclusion.

The report concludes that local authorities should map and tackle social exclusion issues in their Local Transport Plans (LTPs). Government should make social exclusion objectives a priority in the review of *Transport 2010* - its 10-year transport plan - allocating sufficient financial resources to deliver on them, and give stronger and clearer direction for local authorities on social exclusion in local transport plan guidance.

This study shows that:

- **Negative traffic impacts are concentrated in more deprived areas.**
- **It is possible to pinpoint areas with multiple problems in access to services, by matching data sets such as on car ownership, poor public transport services, deprivation and traffic volumes.**

There are a number of priorities needed to tackle access-related transport exclusion. These are:

- improving public transport
- improve walking and cycling conditions
- reducing the need to travel by bringing services closer to people.

This report recommends that:

- **local authorities should be required to review their LTPs in terms of their contribution, negative and positive, to social exclusion; mapping transport impacts and access issues is a necessary first step**
- **Government and local authorities should use the LTP process to tackle the transport problems faced by socially excluded communities; the Department of Transport, Local Government and the Regions should give local authorities clear guidance on focusing their transport strategies and expenditure on tackling social exclusion problems**
- **the Government should re-assess the overall expenditure priorities of *Transport 2010* so it can ensure the plan will target the achievement of social exclusion objectives explicitly; the Government's 2002 Comprehensive Spending Review needs to redirect transport funding to address these major transport-social exclusion problems, and reduce health inequalities**
- **The Social Exclusion Unit must assess transport impacts as well as access issues.**

Introduction

Everyone should be able to get to basic services - such as shops, hospitals and jobs - easily, safely and affordably. The transport system should deliver this without damaging people's health and quality of life, either directly - through noise, danger and air pollution - or indirectly - through high carbon dioxide emissions which contribute to climate change. The transport system should deliver access for all, while ensuring its impacts do not damage people's health.

The UK's system fails on both counts. The main options for the tens of millions of people without access to a car - public transport, walking and cycling - are often expensive, inadequate, unpleasant or dangerous (as traffic volumes have increased, cycling and walking have become more dangerous). Distances to services have also increased over the last two decades - as witnessed by the growth of out-of-town superstores at the expense of local shops. Many people, particularly those without access to a car, find it difficult, therefore, to get to the services they need.

At the same time, there are enormous adverse health impacts from road transport. Government figures show that each year thousands of people die prematurely from air pollution from road traffic. Thousands more are killed or maimed in accidents. Busy roads sever communities, reducing the quality of neighbourhood life. An increasing number of (richer) children are driven to school, because parents say roads are too dangerous for them to walk or cycle. Danger and high car use contribute to the very low levels of physical exercise in the UK, which directly damages people's health. On top of all this, noise and congestion from heavy traffic erodes the quality of life for millions of people in cities across the country.

The transport system is also deeply unequal in its distribution. People living in more deprived areas tend to suffer the further hardship of the worst impacts from transport - road accidents, pollution and severance. They are also the people least likely to cause these problems: deprived people are less likely to own or have access to a car. Without a car they are also much more dependent on public transport, cycling and walking to get around, so are more severely affected by poor public transport and dangerous walking and cycling conditions. This has increased the inequality associated with social isolation. The impact is greatest for elderly people, women and disabled people¹. Transport access and impact problems exacerbate the social exclusion the Government is committed to tackling.

Despite these clear correlations, far more national transport spending still goes to improve the driving conditions for people who are already well-served by the transport system² than to the tens of millions of people who do not have adequate transport choices, or towards reducing transport's major health impacts.

Friends of the Earth believes an essential aim of transport policy should be to reduce these inequalities and ensure a basic and decent system for everybody.

This requires three things:

- * ensuring decent public transport for all people, particularly those without a car
- * making walking and cycling attractive and safe for all people
- * reducing the need to travel, by making sure that the places people need to go - shops, schools, doctors, leisure facilities - are near where they live.

This approach would also reap broader health, health inequality and environmental benefits. There should be a thorough re-assessment of the priorities in the 10-year plan to ensure that the transport system delivers for all people.

Next steps

At a local level, a first step towards an equitable transport system is to assess where the greatest problems lie. Assessing the distribution of health impacts from transport, and access to public transport, should be a priority. This will help local authorities design Local Transport Plans which will meet all people's transport needs.

This research attempts to begin this in one area. We chose the Metropolitan District of Bradford, because it has a wide range of affluence and deprivation, and covers urban and rural areas. Using a range of data sets, maps showing the distribution of deprivation and two types of transport exclusion - impacts and access - have been created. This report shows these results, and suggests how this type of work can be taken forward.

1 Results

1.1 Deprivation in Bradford

Map A	Bradford Metropolitan District
Map B	Index of Multiple Deprivation
Map C	Index of Multiple Deprivation - health, employment, income
Map D	Index of Multiple Deprivation - access to services

Bradford Metropolitan District Council covers 32 square miles of Yorkshire over Airedale, Wharfedale and the Worth Valley. It has a population of nearly 500,000, across 30 wards. It includes the city of Bradford, the towns of Shipley, Bingley, Keighley and Ilkley, and large areas of green, open space - such as the Pennine moors near Haworth³.

Bradford has extremes of deprivation. Nine wards are in the bottom 10 per cent of the UK Government's Index of Multiple Deprivation (IMD). A further ten are in the next most deprived 10 per cent. Yet six of the remaining 11 wards are in the least deprived 50 per cent of wards in the country. [see Table 1, and Map B].

Table 1: Index of Multiple Deprivation The ranks are based on a comparison with all wards in England - 1 is the most deprived ward in the country and 8,414 is the least deprived.			
Little Horton	42	Keighley North	1,354
Bradford Moor	81	Thornton	1,436
University	104	Wibsey	1,545
Bowling	132	Clayton	1,650
Toller	134	Queensbury	2,503
Tong	247	Bolton	2,525
Undercliffe	352	Shipley West	2,669
Keighley South	538	Idle	3,014
Heaton	672	Bingley	4,024
Eccleshill	988	Bingley Rural	4,482
Shipley East	993	Worth Valley	4,886
Odsal	1020	Baildon	5,166
Keighley West	1058	Craven	6,112
Great Horton	1102	Ilkley	7,627
Wyke	1289	Rombalds	7,836

The IMD is made up of six sub-indices⁴ - relating to measures such as income levels, employment and health. These sub-indices generally correlate strongly with overall deprivation levels [Map C]. A further sub-index - “Access to Services” is transport-related, however this indicator is at very early stages of development, and there are considerable problems with it at the moment [Map D].

1.2 Traffic impacts
1.2.1 Air pollution

This section relates to:
 Map E Air pollution - nitrogen dioxide and particulate (fine dust and soot) levels

The Government estimates that air pollution in the UK kills between 12,000 and 24,000 people prematurely each year⁵.

The West Yorkshire Local Transport Plan (LTP) notes that air pollution from transport is responsible for 145-457 premature deaths each year⁶. There are also 119- 432 extra hospital admissions. For each hospital admission there are a further 60 people who visit their GP with respiratory problems. Particulate pollution at levels similar to those in West Yorkshire reduces average life expectancy by a year⁷.

In the Yorkshire area of Leeds, Bradford and Huddersfield, most air pollution comes from road transport⁸ (see Table 2):

Table 2: Air pollution in West Yorkshire	
Air pollutant ⁹ :	Percentage from road traffic (Leeds, Bradford, Huddersfield)
Nitrogen dioxide	73
Sulphur dioxide	25
Carbon monoxide	95
Benzene	65
1,3 Butadiene	98
Particulates (PM10)	64

We mapped [Map E] predicted levels for 2004 and 2005 for two key pollutants - nitrogen dioxides and particulates¹⁰. It is mainly urban areas which have the highest pollution. Maps B and C show that areas with the worst pollution also have the worst health and highest deprivation. This research shows similar results to a study on London by the London School of Hygiene and Tropical Medicine¹¹ - that air pollution tends to be highest in the most deprived areas.

This suggests that policies to reduce air pollution generally would have direct health benefits and reduce health inequalities.

The levels predicted for 2005 are below current Government health standards. However, there are a number of reasons why these levels are likely to be unacceptable. These standards are not protective of health; health standards are met most of the time, yet still thousands of people die every year. Particulate¹² pollution is damaging to health at levels far lower than the standard of $50\mu\text{gm}^{-3}$, for example. These standards also get lowered over the years as more evidence comes forward about their health effects. In 1992, for example, the Government said that “levels of particulate matter are not thought to pose a significant threat to health”¹³, yet this is now agreed to be incorrect. Acceptable levels of pollutants are likely to fall further as knowledge of health effects increases, which means by 2005, the levels of pollution could exceed the then standards. It is also important to note that health standards are based on short-term exposure to health - the standards do not take into account long-term, chronic health effects of which little is known.

1.2.2 Volume

This study has not been able to look at data on accidents - a major transport health impact - although it should be possible to collect this data at reasonable cost. Traffic volume data, which were available, are not a good proxy for this information - a very busy or high-speed road may have fewer accidents, for example, because cyclists and pedestrians feel it is too dangerous to use. In urban areas in the UK with a 30 mph speed limit, more than 67 per cent of cars and 45 per cent of articulated HGVs exceed the limit¹⁴.

Traffic volumes are a reasonable proxy for other health problems, however. Heavy traffic means more noise, greater danger and increased community severance. These directly affect people’s health and quality of life¹⁵. High traffic volumes and speeds cut down the amount of social interaction in a community. A landmark study in San Francisco¹⁶ found a direct correlation between lower traffic flows and speeds and increased levels of social interaction - such as the numbers of local friends and acquaintances, the number of “interactions between neighbours”, levels of walking, and the size of an area considered by residents as their home territory. A large evidence base correlates low levels of social interaction and support with ill-health and health inequalities. A paper for the World Health Organisation argues that “*it is possible that poor social support has one of the largest absolute effects on population health and health inequality*”¹⁷.

This study attempted to map traffic volumes, but the data available includes only some of the major roads in the area. The data that does exist, however, shows current traffic volumes are likely to adversely affect people’s health. The San Francisco study showed major differences in social interaction between streets with 2,000 and 16,000 vehicles per day, and speeds of less than 32 km/h and more than 57 km/h. Data for Bradford’s¹⁸ main roads shows traffic volumes between 900 and 2,000 vehicles per hour, and average speeds ranging from 20 km/h to 60 km/h.

Beyond community severance, heavy traffic has other effects, such as reducing the likelihood of people walking and cycling. The West Yorkshire LTP notes that if everyone in West Yorkshire took the Government-recommended level of exercise, there would be 2,500 fewer deaths each year from reduced heart disease alone. Reducing traffic volumes will directly benefit health in a number of ways, therefore. And as traffic is generally heaviest in urban areas, this will benefit poorer areas most, reducing health inequalities.

1.3 Transport access

1.3.1 Car ownership

This section relates to:

Map F Car ownership and social class

Map G Car ownership and Areas of Stress

Car ownership across households is very unequal. Nationally, 78 per cent of the poorest 10 per cent of households don't have a car¹⁹. This compares with four per cent of the richest 10 per cent. Nationally, people in households without cars make 20 per cent of trips by bus, compared with three per cent in households with cars. Other modes of transport - buses, cycling and walking - are therefore far more important for poorer people.

This situation is clearly illustrated in Bradford. Maps F and G zoom in to look at the Bradford district in finer detail - at the "enumeration district" level of around 500 people. They show that there is a strong correlation between deprivation and low levels of car ownership. There are major areas in Bradford where car ownership is very low.

In these areas, adequate public transport and safe walking and cycling are a high priority to ensure that people have access to the services they need.

It is important to stress that universal car ownership is not a workable solution to the problem of access for all. Even if there was enough road space, or this could be achieved without major environmental and health costs, car use would not be an option for tens of millions of people - as children, many elderly people and many disabled people cannot drive cars. Access for all can only be achieved by making a wide range of travel options attractive.

1.3.2 Bus availability

This section relates to:

Map H Population density and bus routes

Map I Bus routes and car ownership

Map J Bus routes and Areas of Stress

Map K Areas further from bus routes, and population density

Map L Areas further from bus routes, and car ownership

As most areas of low car-ownership and deprivation are in the city of Bradford, these maps focused on this sub-area of the whole district.

Map H shows the frequency and location of bus services for the whole of the Bradford City area (20 wards). Bus services were graded into three categories - five buses an hour or better, between two and four buses an hour, and no more than one an hour.

The network coverage is broad - with most areas of the city well served. There are however a number of areas which are at least 200 metres away from a bus service, which may be fine for many people, but even 100 metres may be too much for some elderly people, or people with disabilities, or with small children and shopping.

Map I shows bus links and Bradford's Areas of Stress - areas Bradford Council categorises²⁰

as being deprived, using indicators such as unemployment levels, overcrowding and lack of amenities. It shows that these areas are on the whole well served, although some areas in the North and East have lower levels of service, and some of the outlying estates have good frequency of service, but they have circuitous routes which will take a long time to get to Bradford centre.

Map J shows bus routes mapped against car ownership levels. The bus routes cover a large number of areas where car ownership is very low. People in a large number of areas of below average car ownership, (but not the lowest), have a fair distance to travel to get to a bus service, particularly in South East parts and far North of the city.

Map K shows all the parts of the city which are more than 200 metres away from a bus service. Many of these are densely populated areas, and travel to a bus service may be a problem particularly for elderly or disabled people.

Map L shows the same areas, but coloured according to car ownership levels. It shows that many of the areas without a nearby bus route also have very low levels of car ownership. Even in a city like Bradford with good bus coverage, there are areas where it is difficult for people to get access to the services they need. This suggests that planning measures to bring services closer to people will also be an important way to tackle social exclusion and transport problems.

Overall, these five maps show it is possible to map areas where need for public transport will be greater, and overlay this with data on actual public transport coverage. Bradford has good bus coverage, although there are still areas where services will not be adequate.

Further studies should also look at where core services are, as well as issues such as price, reliability and safety.

2 Analysis

2.1 Bradford and beyond

This report shows strong links between transport's health impacts and social exclusion. Transport impacts should be a focus for the Government's Social Exclusion Unit, which is currently looking at transport issues.

The West Yorkshire LTP does have a focus on measures to reduce social exclusion. This report adds convincing arguments that this and subsequent plans should focus even further on tackling the social exclusion impacts of transport directly.

In Bradford, around 60 per cent of public expenditure on transport over the next five years will go on road building or road maintenance. £50 million (35 per cent) is on the Bingley relief road, which falls outside the LTP. Although there are excellent programmes in Bradford to tackle social exclusion, the West Yorkshire LTP notes that with more resources it could do far more to tackle these pressing issues: "An additional £10 million would enable a further 1,250 bus stops to be made fully accessible and equipped with a new, lit passenger shelter [and] an additional £10 million would enable the development of Safer Routes to Schools infrastructure at an additional 80 schools."

All children should have safe routes, not just to schools, but to all destinations. If the objectives of LTPs mean that not even safe routes to schools are priorities for funding, then the objectives and the strategy need changing. Local authorities should make a social-exclusion case to the Government for greater or diverted resources to put these sorts of schemes in place as soon as possible.

This exercise has shown that it is possible to overlay data on car ownership, frequency and extent of public transport and deprivation to pinpoint areas with multiple, inter-related problems: being poorly served by public transport, where car-ownership is low (reliance on public transport is higher), and where there is higher deprivation (so the need for quality access to services is greater). This sort of analysis should become the norm for determining priorities for action in LTPs.

2.2 Further work

2.2.1 Impacts mapping

This study did not map two other impacts of transport - noise and accidents. It should be possible to do both - the Government has mapped noise pollution in Birmingham²¹, and accidents have been mapped in London²².

It is very likely that accident maps would show correlations with deprivation. Nationally, children from social class V are five times more likely to be in road accidents than children in social class I²³. Recent DETR research²⁴ shows that children from ethnic communities are more likely to be knocked down than other children. Any areas of high deprivation and accident black spots should be priorities for action, as people in deprived areas are more likely to be reliant on walking and cycling, the most vulnerable modes. People in non-car households walk 67 per cent more than people in car-owning households²⁵. This issue should

also be a particular priority in West Yorkshire, where rates of accidents to pedestrians are much higher than nationally²⁶.

As Government and local strategies to reduce accidents sit alongside strategies to increase walking and cycling, it is important to reiterate that the most dangerous roads may have few accidents, as people are not prepared to walk across or cycle on them. To increase use of these modes while reducing accidents will mean reducing danger on busy roads. A detailed analysis of ease of walking and cycling²⁷ on busy roads is required. There should be a focus on deprived areas where walking and cycling are more important modes. A participatory approach with local communities is likely to be the best way of identifying dangerous routes.

2.2.2 Access mapping

Buses

This data is a useful start, but it is possible to construct more detailed measures of how good public transport is. This report mapped frequency and proximity of bus services, but even a frequent bus may take a long time to get to services, if it takes a circuitous route, for example. So, time is an important issue, as are punctuality, cost, safety and distance to services. Access to buses and other public transport may be constrained by price. This has become more of an issue in the past two decades, as public transport fares have risen by more than 50 per cent in real terms between 1974 and 1998²⁸.

Other measures look at some of these issues, such as the Local Index of Transit Availability (LITA), which has been used in California²⁹ - we have calculated a version of this LITA for Bradford (see methodology) - and the Public Transport Accessibility Level (PTAL) which is being calculated for London³⁰. But none cover the full range of “acceptability” of a bus service. This work needs to be developed.

Access to Services

Indicators of the adequacy of buses do not necessarily measure where the buses go. An alternative approach to mapping Access to Services would be to focus on the end-point, the services themselves. Time maps could be calculated. For all schools in a city, for example, or all shops selling fresh food, or all GP’s surgeries, time contours could be mapped for various methods of transport to show how accessible they are from residential areas. This would be a good area for future work.

Local authorities could undertake this and other mapping work with local communities. Government guidance on LTPs say that local authorities need to take participatory approaches in plan development. Local authorities could work with local communities to assess what constitutes “acceptable” travel times to various services, and map with them which areas are best and worst served. They can then use this community-based analysis to determine priorities in their LTPs.

Reducing the need to travel

As well as improving public transport, walking and cycling, there is a major planning role for reducing social exclusion. The West Yorkshire LTP notes that walking accounts for 82 per cent of journeys less than a mile. It follows that if more jobs, shops, and post offices were within one mile, walking would be a much more likely option. This would have a number of benefits for tackling social exclusion, for it would improve access to services, improve people’s health and reduce health inequalities.

3 Conclusions

This study has shown that:

- **Negative traffic impacts are concentrated in more deprived areas.**

This reinforces other evidence cited which shows that adverse impacts from transport are worse in more deprived areas. These impacts bring major health problems. Transport impacts exacerbate social exclusion as severely as access problems do.

- **It is possible to pinpoint areas with multiple problems in access to services, by matching data sets such as on car ownership, poor public transport services, deprivation and traffic volumes.**

There are a number of priorities needed to tackle access-related transport exclusion. These are:

- improving public transport
- improving walking and cycling conditions
- reducing the need to travel by bringing services closer to people.

In Bradford, this research suggests that coverage and frequency of buses to many Government- and Council-defined socially excluded areas is often good. There are other important determinants of an acceptable public transport system - such as cost, reliability, and safety. These data are needed to assess fully whether the buses are of a high enough standard.

Also, data are needed on whether walking and cycling conditions are safe, and on the distribution of core services - how far away these services are from people - particularly for those without access to cars.

This report recommends that:

- **Local authorities should be required to review their Local Transport Plans (LTPs) in terms of their contribution, negative and positive, to social exclusion. Mapping transport impacts and access issues is a necessary first step.**

LTPs must ensure everyone enjoys the benefits of a good transport system. There are major losers and winners from the current transport system, and poorer people suffer more. LTPs must address these inequalities, and this should start with a thorough assessment of which people are currently losing out³¹. This study has shown that data is available to conduct detailed analysis for relatively little cost. Local Authorities can also take a participatory approach with local communities to complement this assessment and ensure that local problems and priorities are properly identified.

- **Government and local authorities should actively use the LTP process to tackle the transport problems faced by socially excluded communities. The Department of Transport, Local Government and the Regions should give local authorities the clear guidance they need to focus their transport strategies and expenditure on tackling social exclusion problems.**

Current Government guidance on social exclusion in LTPs should be strengthened and given a

higher priority, and social inclusion objectives should also be included in the “minimum requirements” sections of guidance on objective setting, strategy development, performance indicators, targets and monitoring.

Local authorities should use equity assessments to ensure sufficient resources are devoted towards creating a decent transport system for everyone, without major health impacts. This may require making a case to Government for further or reallocated resources.

- **The Government should re-assess the overall expenditure priorities of the 10-year plan so it can be sure the plan will target the achievement of social exclusion objectives explicitly. The Government’s 2002 Comprehensive Spending Review needs to redirect transport funding to address these major transport-social exclusion problems, and reduce health inequalities.**

The Government has a number of good initiatives to tackle some social exclusion problems, such as the Urban Bus Challenge. But the resources devoted to these initiatives is only a small part of the 10-year transport budget of £180 billion, which contrasts with the enormous scale of the problems. The Government should as a priority divert resources to ensure that everyone has access to a decent public transport system. Public transport, walking and cycling should be in receipt of the majority of transport funding, not the minority. Social inclusion goals should be top-order objectives in a revised 10-year plan. Tackling transport impacts and access problems would make a large contribution to reducing health inequalities and social exclusion - both priorities for Government.

- **The Social Exclusion Unit must assess transport impacts as well as access issues.**

The Social Exclusion Unit (SEU) rightly notes the importance of ensuring everyone has access to a decent transport system. However if access is provided in a way that exacerbates traffic impacts, then the set of measures put in place to reduce social exclusion could well increase it in other ways, as traffic impacts tend to hit the poorest hardest. The SEU’s Autumn 2001 study needs to look at transport as a whole, not just one aspect of it.

Appendix - methods

1 Deprivation

Two measures of deprivation were used:

- * the Government's Index of Multiple Deprivation 2000, which is calculated for wards.
- * for the finer detail maps, Bradford Council's defined "Areas of Stress", calculated using 1991 census data at the enumeration district (ED) level.

2 Pollution

The estimated pollution concentration figures come from AEAT³², the agency with responsibility for pollution monitoring nationwide. They provide data for 1 kilometre squares. We took these estimates and calculated average levels of pollution for the Bradford wards. The estimates are for PM10 particulates projected to 2004, and nitrogen dioxide projected to 2005.

3 Traffic volumes

Measured and estimated traffic volume data were available for selected stretches of main road, from Bradford Council's Air Quality Assessment Report. However, in order to test any correlations with deprivation, a more comprehensive coverage of measurements would be needed, or alternatively the output of a traffic modelling program based on the known traffic counts. This was not possible within the scope of this study, but is recommended to local authorities or others who have the necessary data.

4 Car ownership

We used car ownership figures from the 1991 census. The census data is now somewhat dated, but allows us to examine data by census enumeration districts (EDs), which are areas typically of around 200 households.

Relating car ownership on this level directly to indices of deprivation is not possible because the indices are calculated at a ward level only. So a suitable proxy needs to be found in the census data. The best available, since income data is not gathered in the census, is the occupation-based social class of people living in an area. For this purpose, the proportion of ABC1 individuals in an area was used as a measure of affluence/deprivation.

The number of cars per capita is strongly positively correlated to the proportion of ABC1s in an ED. Nevertheless, there are identifiable areas with high car ownership yet lower proportion of ABC1, and vice versa. Those at risk of access deprivation are likely to be in areas with a low proportion of ABC1 coupled with the lowest car ownership. To identify these groups, a scatterplot is shown (Map F) with the data points divided into four categories by the national averages on the two axes. The colour coding of the points is also shown on the map to identify where the various groups are concentrated.

5 Bus availability

Combining information on bus routes and frequencies with demographic data has enabled us

to map the quality of bus access across the urban area of Bradford. Simply overlaying the routes onto population density, car ownership and Areas of Stress (all mapped at the ED level) enables the identification of concentrations of people for whom bus access may be important but who do not live near a bus route. The final maps, by using buffers around the bus routes, make it possible to pinpoint areas not served.

These initial results seem promising and in a full study could become very useful indicators of access to public transport. West Yorkshire Metro is planning a GIS study of social exclusion and transport³³. We recommend that they examine distance contours from bus routes as a means of identifying poorly served areas, and further to calculate contours of travel time to determine how long it takes people to reach the services they need. This approach may also help provide an alternative to the Access Deprivation score which is currently based on straight-line distance (see Map D).

One quantitative indicator of access to public transport was trialed. An American index - the Local Index of Transit Availability (LITA)³⁴ - uses information on frequency, bus capacity (number of seats), and bus-stop coverage to calculate an overall score for the connectedness of the area to the transport network.

We calculated a simplified score using this method considering only bus frequency. The results for wards in Bradford are inconclusive, and led us to question the value of the methodology. One factor which is missing is the distance that a passenger will have to walk to get the bus. If the route crosses your ward, then the ward score is increased, but the bus route may be too distant to be of use. If to counter this smaller areas such as EDs are considered, the opposite problem arises - an ED could score low even though a major bus route runs right next to it, because unless the route crosses the ED no addition is made to the score.

For these reasons we did not feel that the LITA score results gave a true picture of the quality of bus access in Bradford.

In addition to bus services, there is one relevant local rail line, from Bradford Forster Square to Frizinghall and Shipley. Service information was available for this route, but because of the difficulties of comparing the convenience of bus and train services this has not been included in this study.

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

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Map A

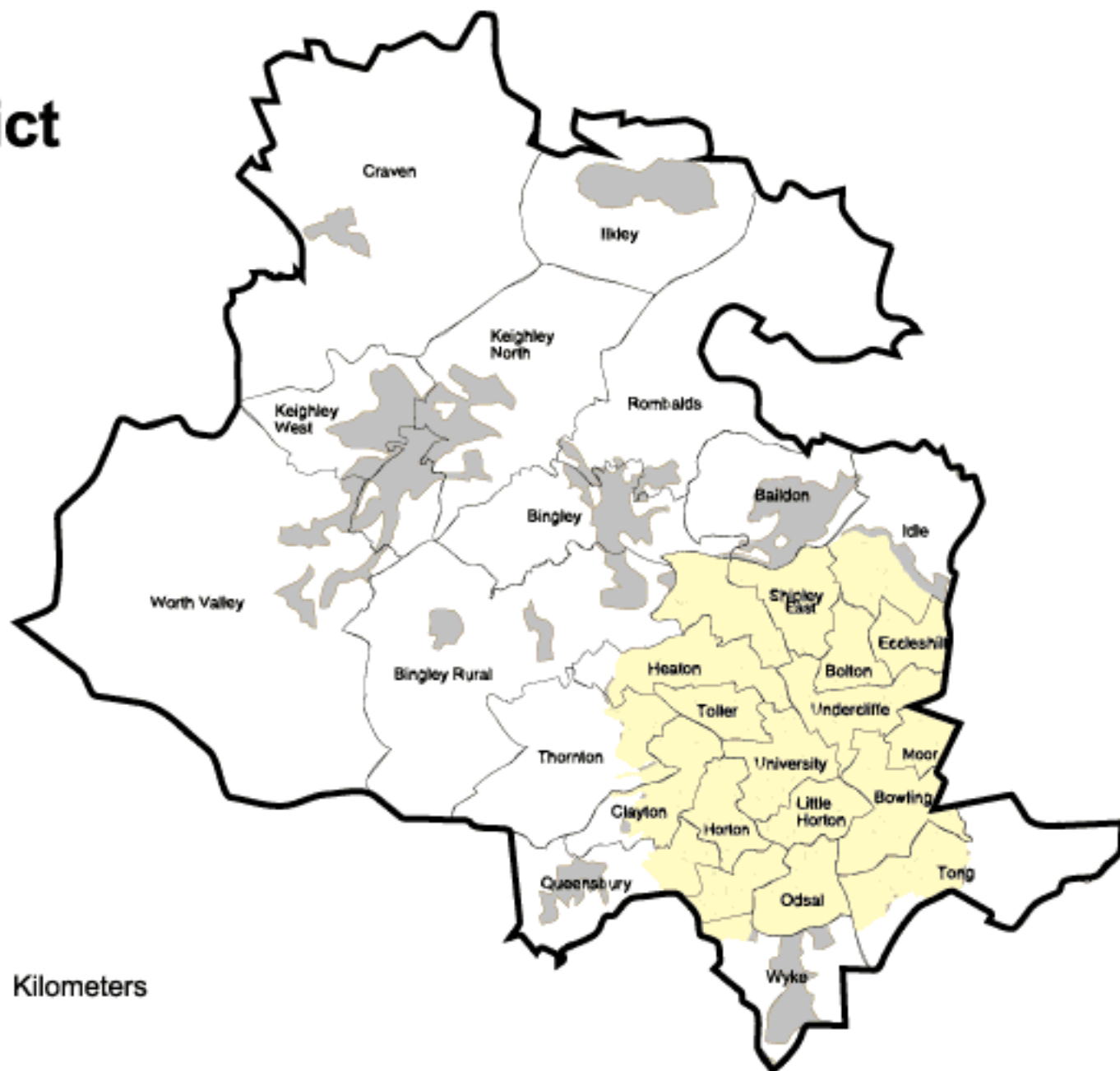
Bradford district

The map shows the 30 wards in the council district of Bradford.

The district covers 32 square miles of Yorkshire, across Airedale, Wharfedale and the Worth Valley. With a population of nearly 500,000 people, it includes the city of Bradford, the towns of Shipley, Bingley, Keighley and Ilkley, and more rural areas such as the Pennine moors near Haworth.

-  Bd_ward_gen4
-  District boundary
-  Bradford urban area
-  Other built-up area

0 5 10 Kilometers



Map B

Index of Multiple Deprivation

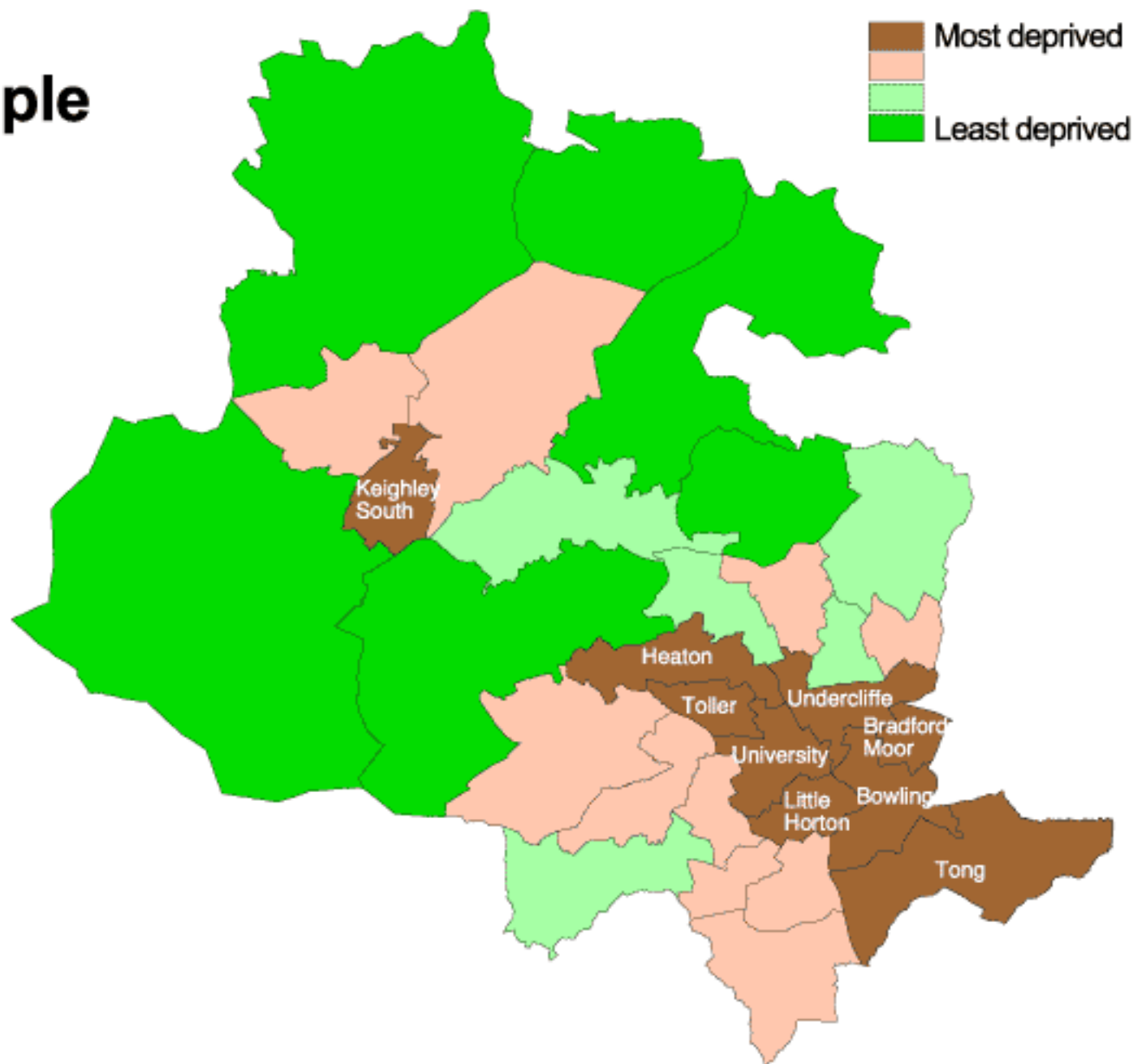
The map shows Bradford district wards grouped by deciles on the national Index of Multiple Deprivation (IMD).

The IMD is a composition of six indices of deprivation: education, housing, income, employment, health, and access to services.

Bradford district has extremes of deprivation. Nine wards (dark brown) are in the bottom 10 per cent of deprivation scores in England.

A further 10 wards (lighter brown) are in the next most deprived 10 per cent.

Seven of the remaining wards are among the least deprived 50 per cent of wards in the country.



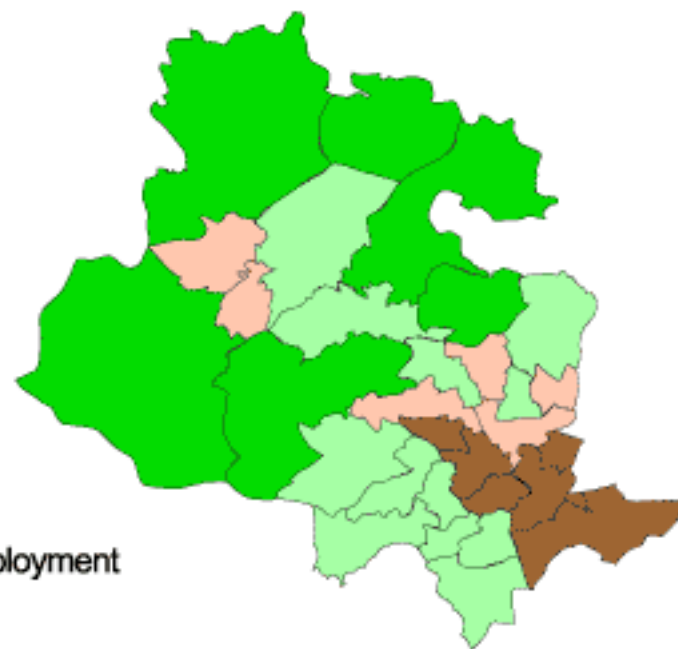
Map C

Indices of deprivation - individual components

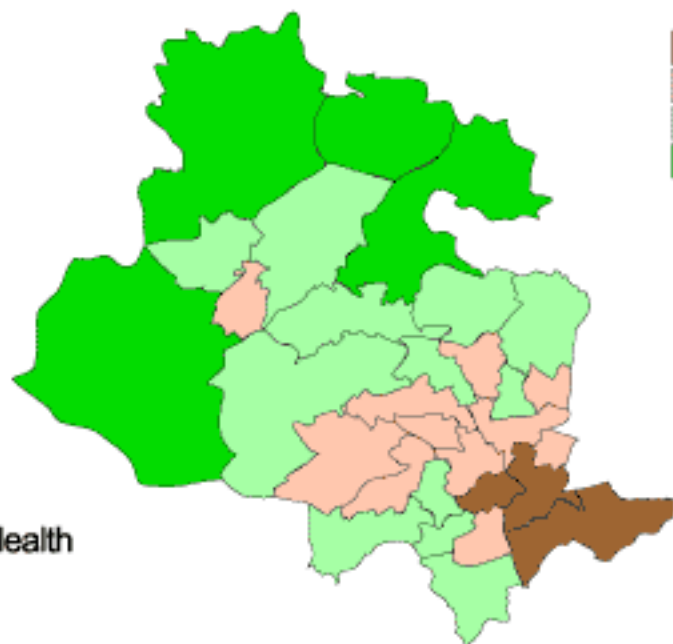
The Index of Multiple Deprivation (IMD) is calculated from a number of sub-indices, (called 'domain scores'), measuring for example income levels, education and health.

These sub-indices generally correlate strongly with overall deprivation levels. A multiply deprived area generally scores poorly in several or all domains.

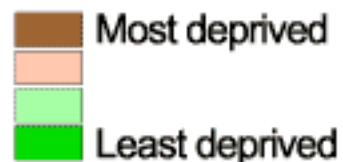
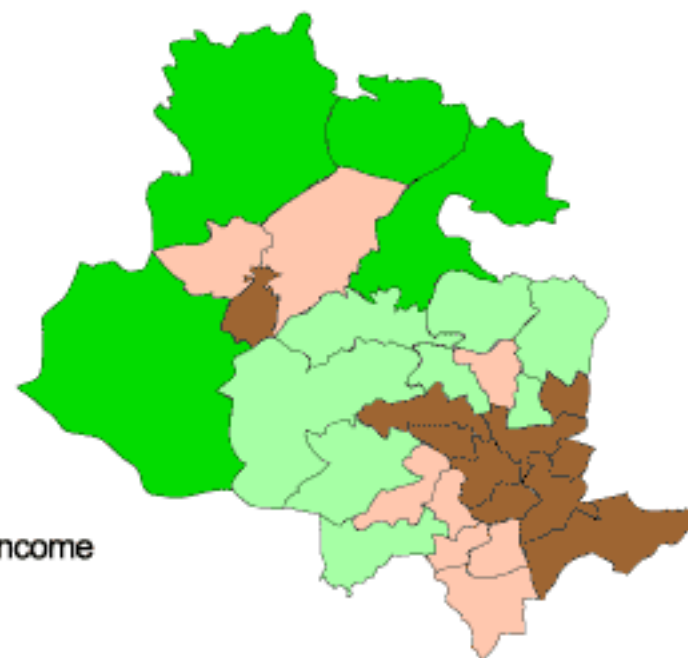
Employment



Health

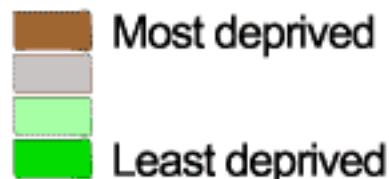


Income



Map D

Index of deprivation - Access to Services

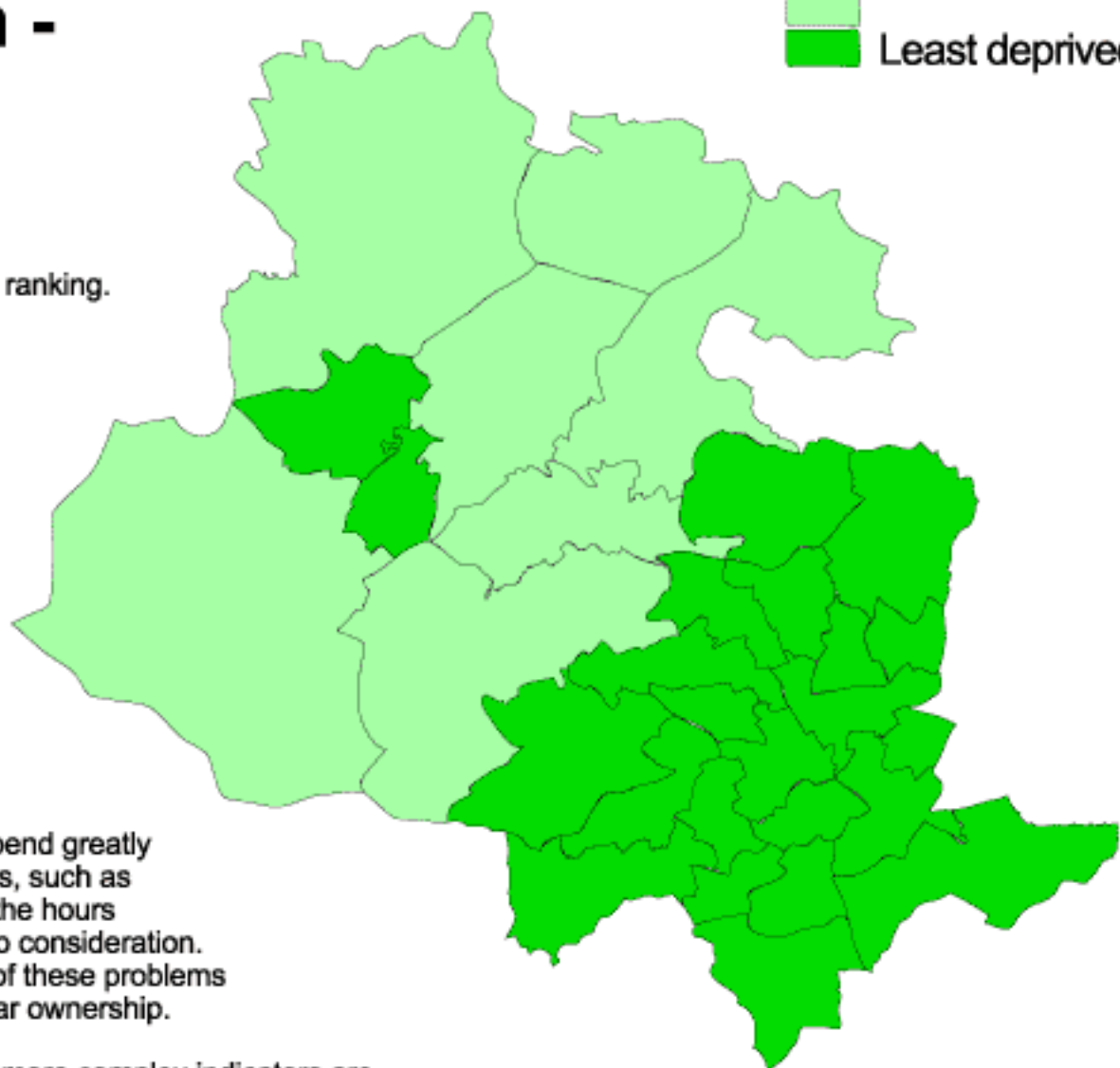


This map shows the component Access to Services which makes up to 10 per cent of a ward's total IMD ranking. On this measure, all wards score reasonably well. However, it is a deeply flawed indicator and so cannot be taken to show the true picture of access deprivation.

This score measures distance to services, automatically scoring larger areas less well and giving good scores to compact urban areas regardless of how easy it is to get to those services. The resulting pattern is opposite to that of all the other deprivation measures.

A better overall index might attempt to measure travel time, but this would be very different for those using cars and those using other modes of transport. Time taken by bus will depend greatly on how often and how reliably they run. Other factors, such as cost, mode quality, actual distance of the route and the hours of operation of public transport, need to be taken into consideration. If a ward has a high level of car ownership, then all of these problems affect fewer people compared with wards with low car ownership.

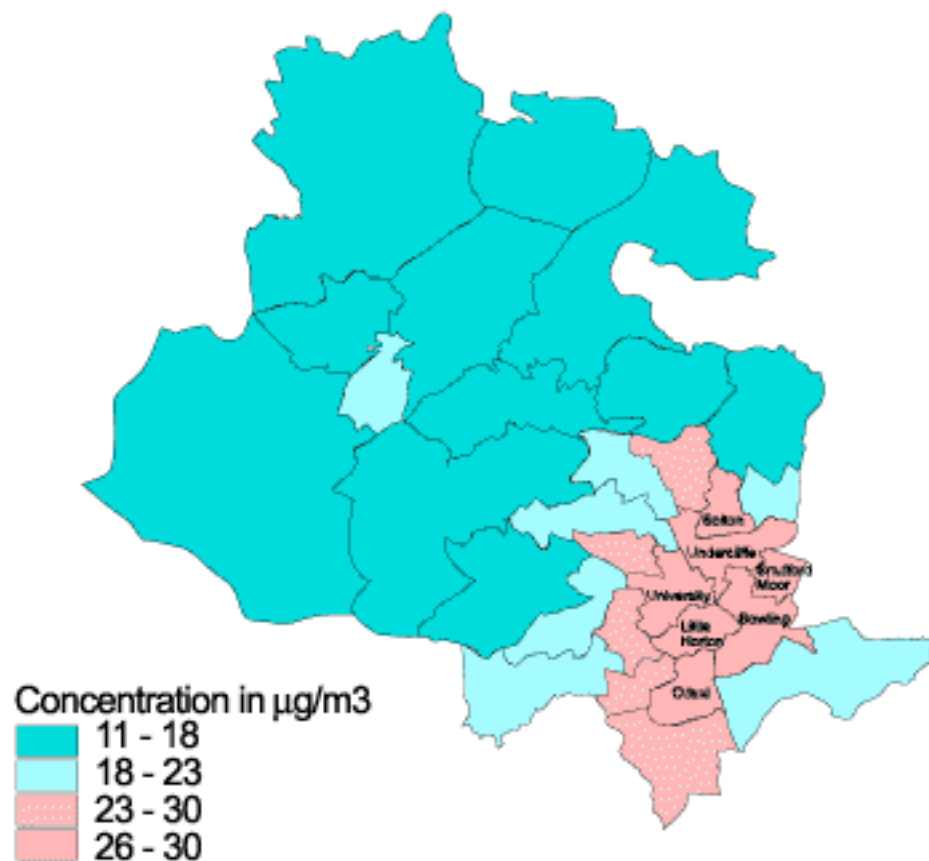
Access is an important measure of deprivation - but more complex indicators are needed to identify where the real problems lie.



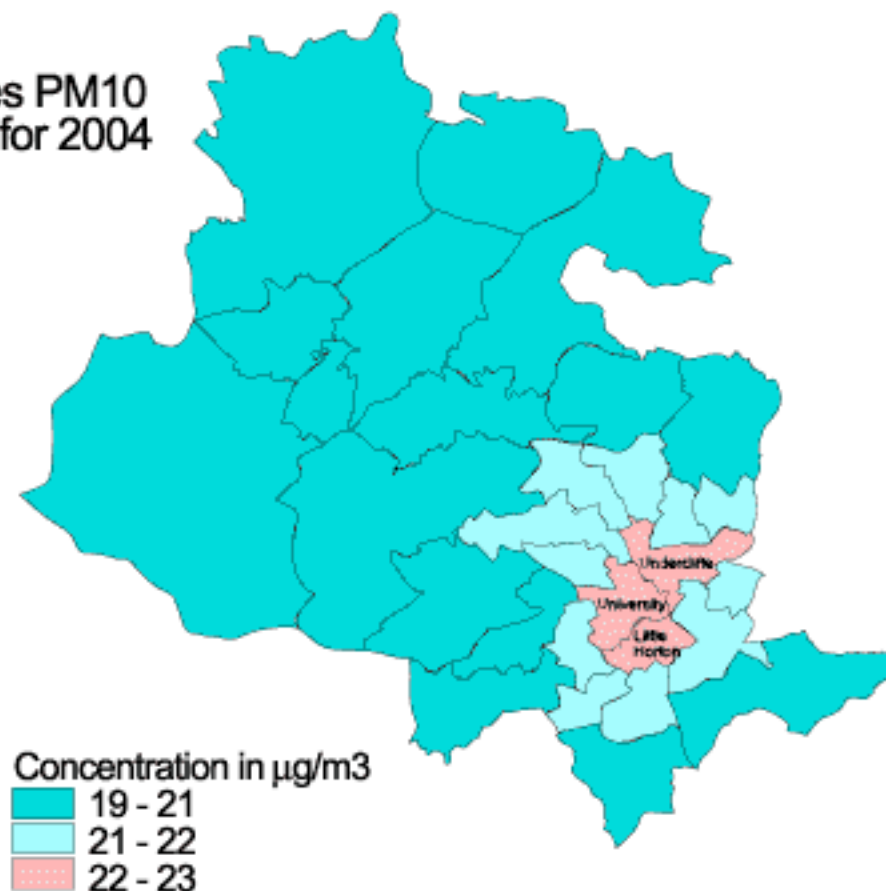
Map E

Air pollution

Nitrogen dioxide
estimated for 2005



Particulates PM10
estimated for 2004



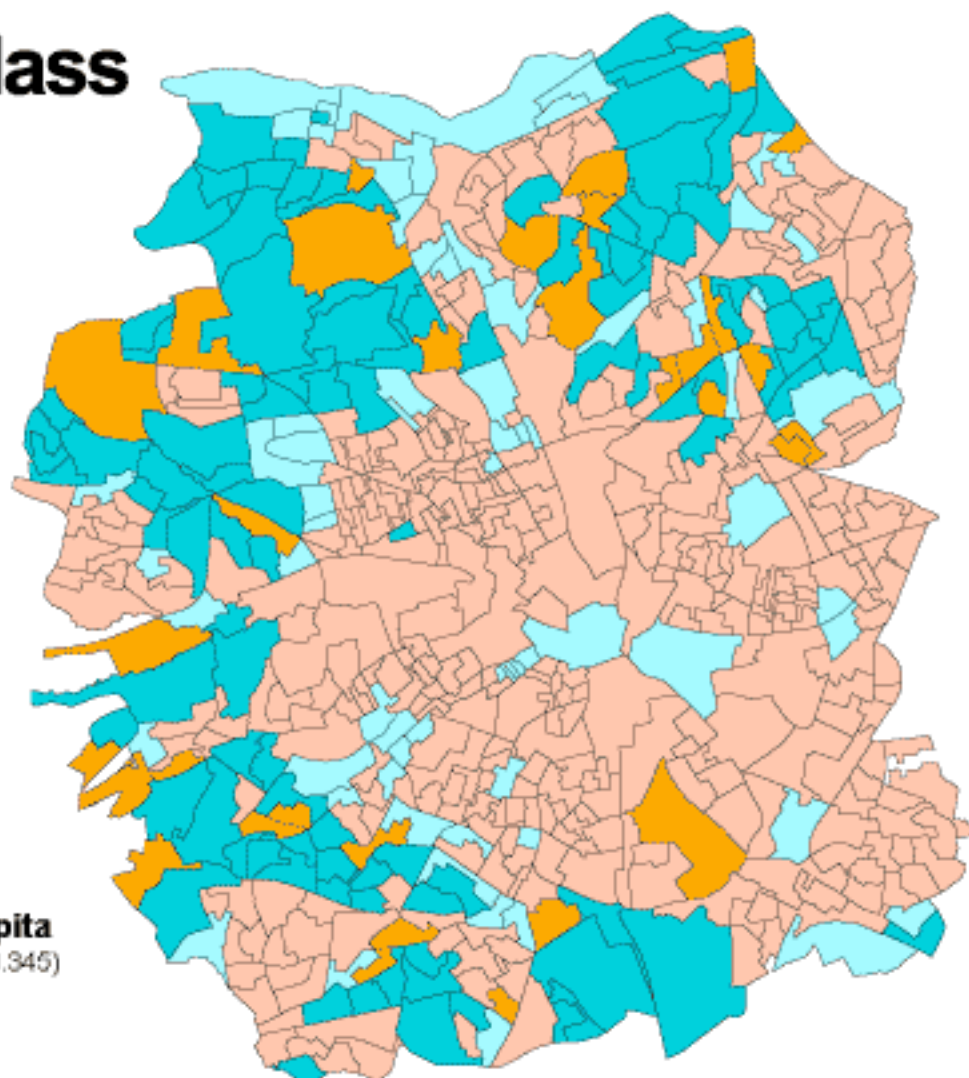
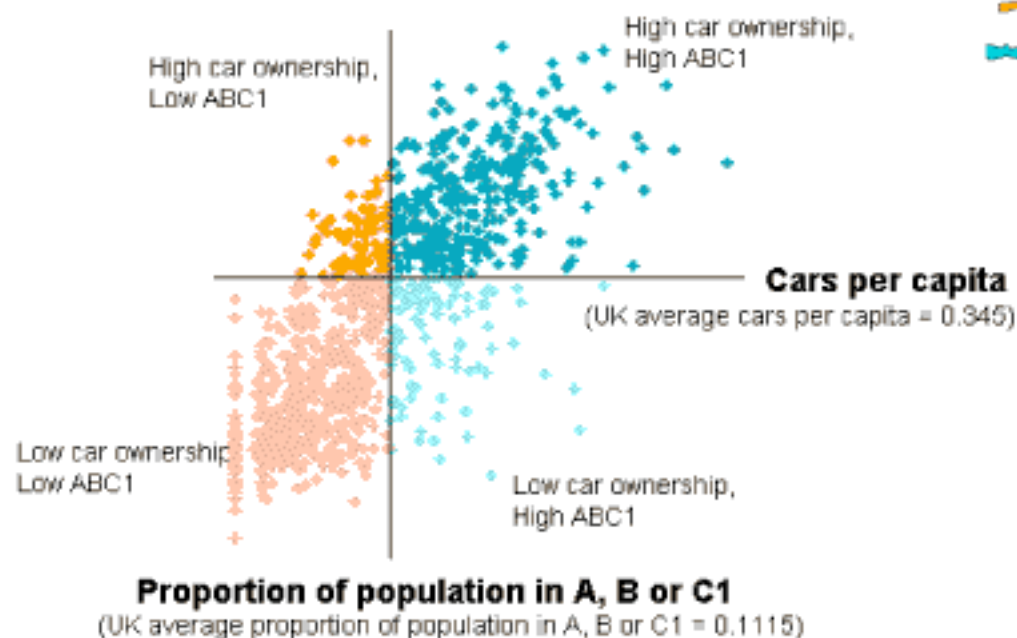
These maps show estimated levels of nitrogen dioxide in 2005 (annual average), and particulates - fine dust and soot - in 2004 (annual average). Most of this pollution comes from road transport. There is a strong correlation between high pollution and deprivation.

Map F

Car ownership and social class

This map shows links between car ownership and social class (as defined in the 1991 census) in the Bradford urban area. The proportion of people counted as ABC1 (as opposed to C2DE) is used here as a measure of the affluence of an area.

Generally, people classed as C2, D and E are less likely to own a car, while those classed as A, B or C1 are more likely to do so. This map enables exceptions to this pattern to be displayed, to help identify the areas where people may be less well off, and where car ownership is also low. People in these areas will be more dependent on public transport, walking and cycling.



0 1 2 3 Kilometers

Map G

Car ownership and Areas of Stress

This map shows that very low car ownership is strongly correlated with deprivation.

The areas shaded in dark grey have the lowest levels of car ownership (less than 50% of the national average, or no more than one car per 6 people). They correspond closely to Bradford Council's defined Areas of Stress, which score badly on indicators such as unemployment, overcrowding and lack of amenities. The Areas of Stress are hatched red, to show the overlap with the areas of lowest car ownership.

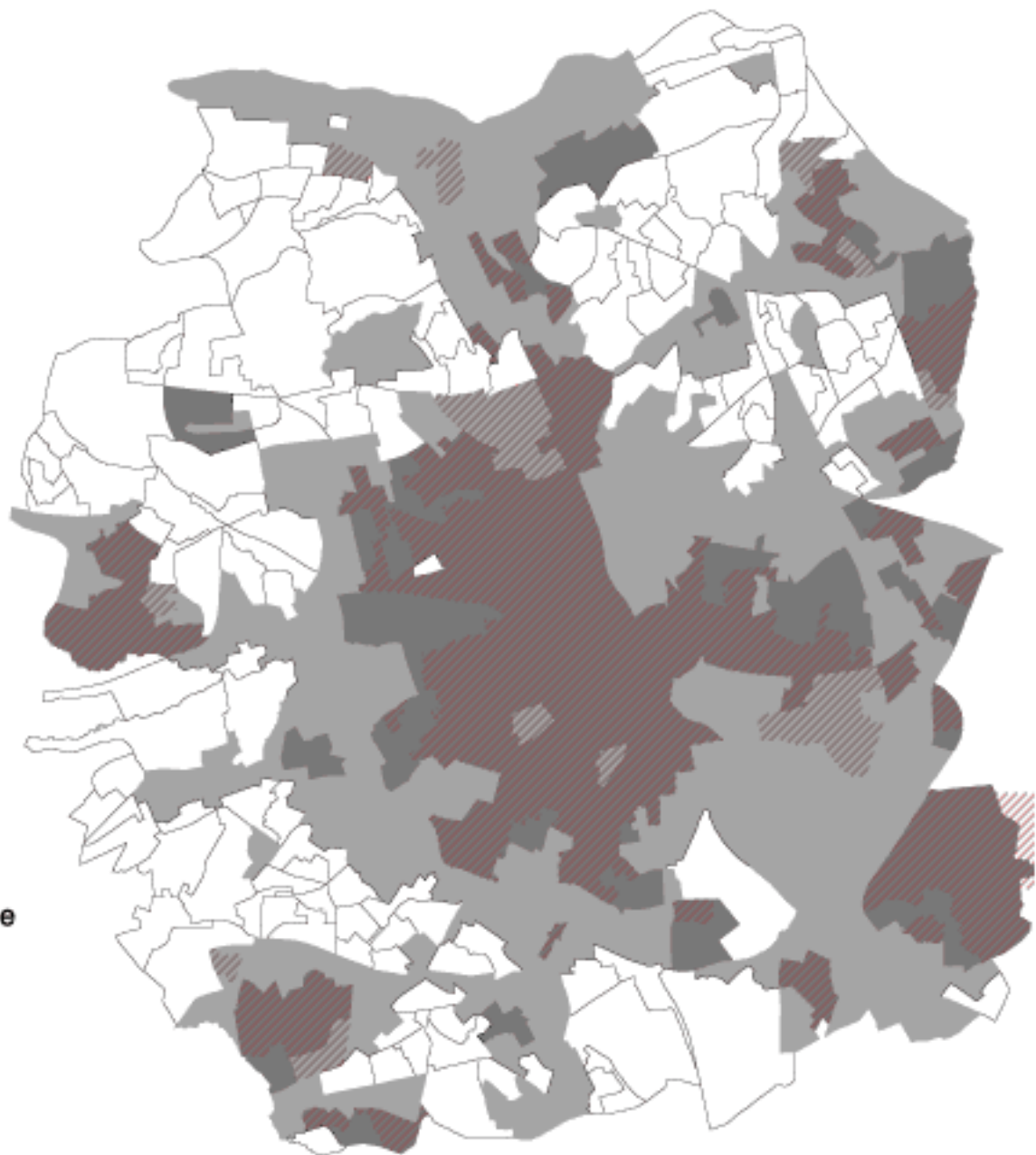
The lighter grey shaded areas have relatively low levels of car ownership, between 50% and 100% of the national average.

/// Areas of Stress

Level of car ownership

- Less than 50% of the national average
- Between 50% and 100% of the national average
- Above the national average




0 1 2 3 Kilometers







Map H

Population density and bus routes

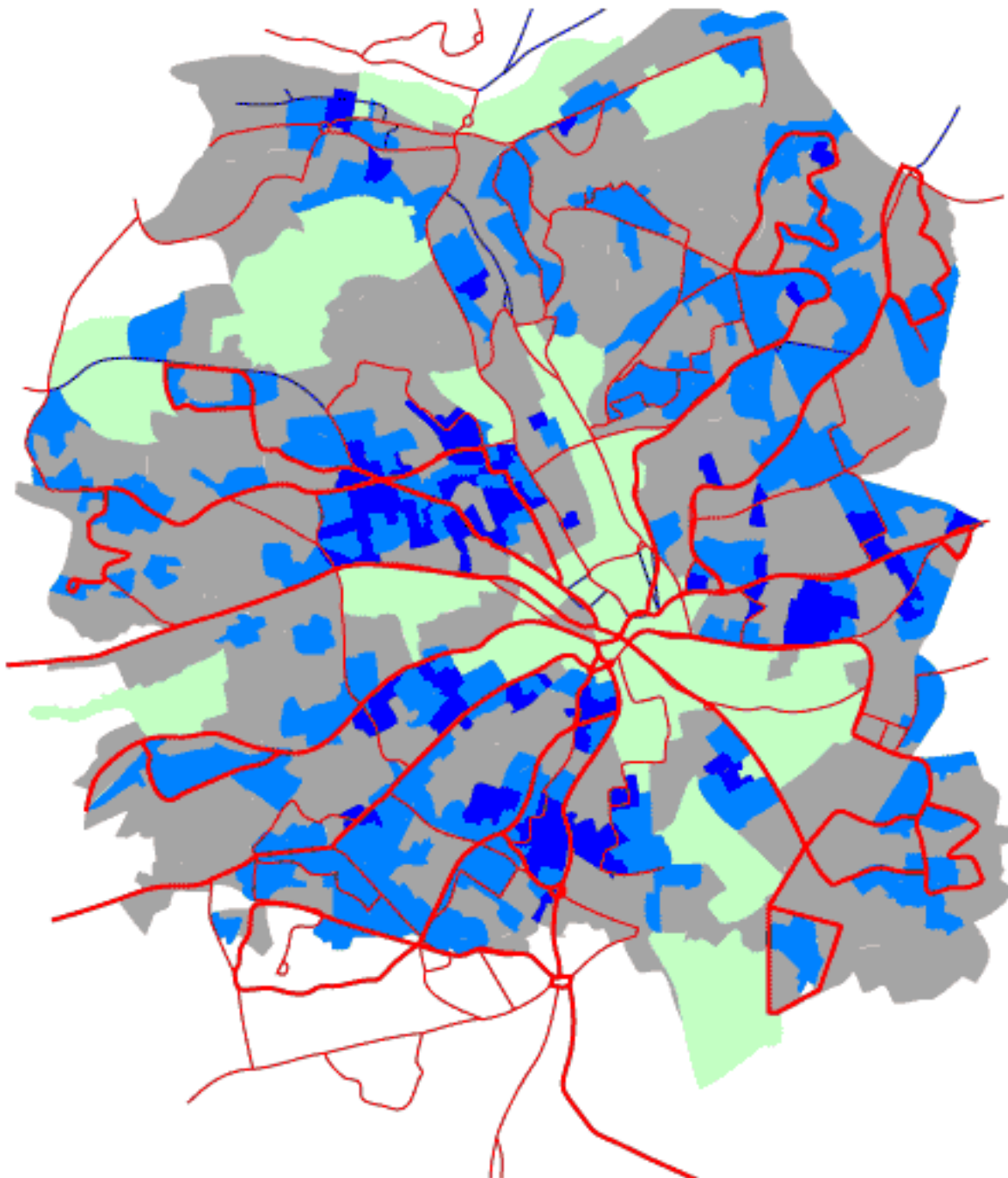
This map shows the routes that have at least five buses an hour, and those with lower levels of service. It also shows population density across the city: some areas don't have buses nearby - often because of low population density (park or industrial land). But this map can also pinpoint populated areas (coloured light and dark blue) not close to bus routes.

-  At least five buses per hour
-  Between two and four buses per hour
-  No more than one bus per hour

Population density per sq. km.

-  0 - 1,000
-  1,000 - 5,000
-  5,000 - 10,000
-  10,000 - 30,000




0 1 2 3 Kilometers





Map I

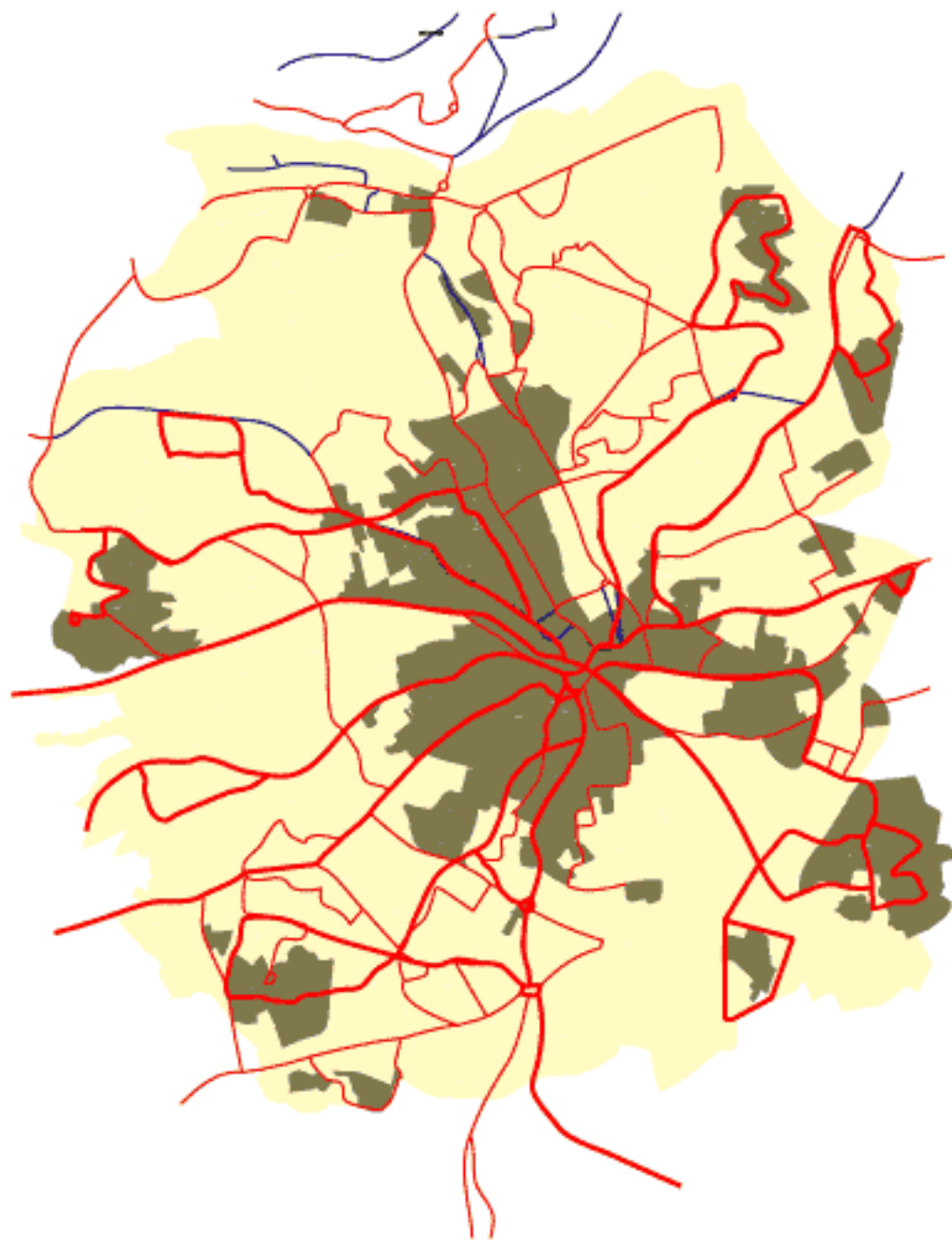
Bus routes and Areas of Stress

This map shows that Bradford's Areas of Stress - defined as deprived by Bradford Council - all have at least some level of bus services. Some places have less frequent services, or services which take long or circuitous routes.

-  At least five buses per hour
-  Between two and four buses per hour
-  No more than one bus per hour

-  Area of stress
-  Bradford urban area

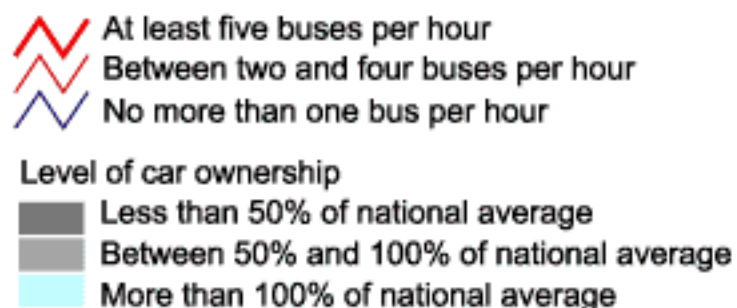
0 1 2 3 Kilometers



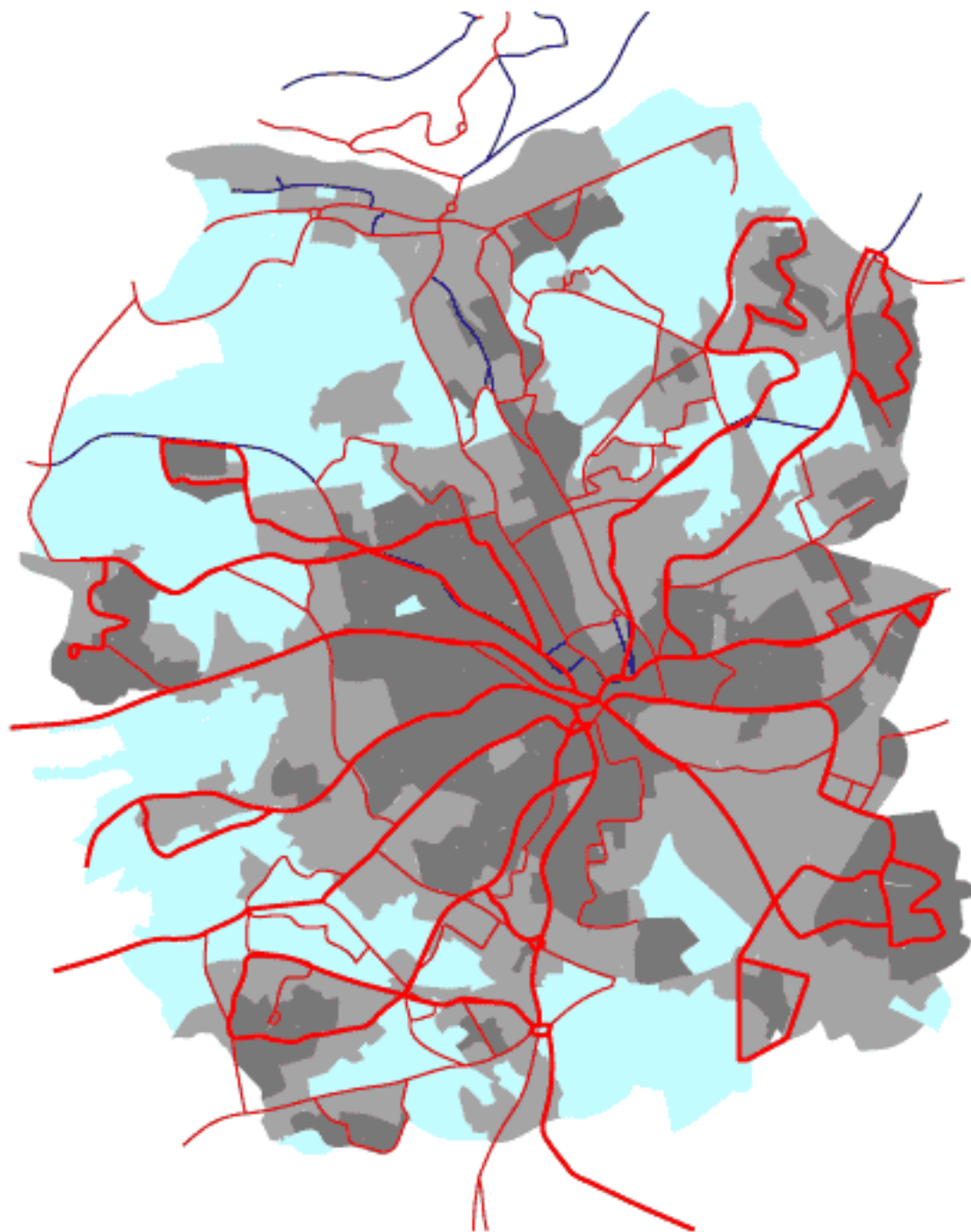
Map J

Bus routes and car ownership

This map shows that although most areas with low car ownership have a nearby bus service, there are a significant number that don't.



0 1 2 3 Kilometers






Map K





Areas further from bus routes - population density

This map highlights the areas which are not near to bus routes. Everywhere within 200 metres of the bus network is coloured white, while areas further than this distance from a route are shaded according to population density.

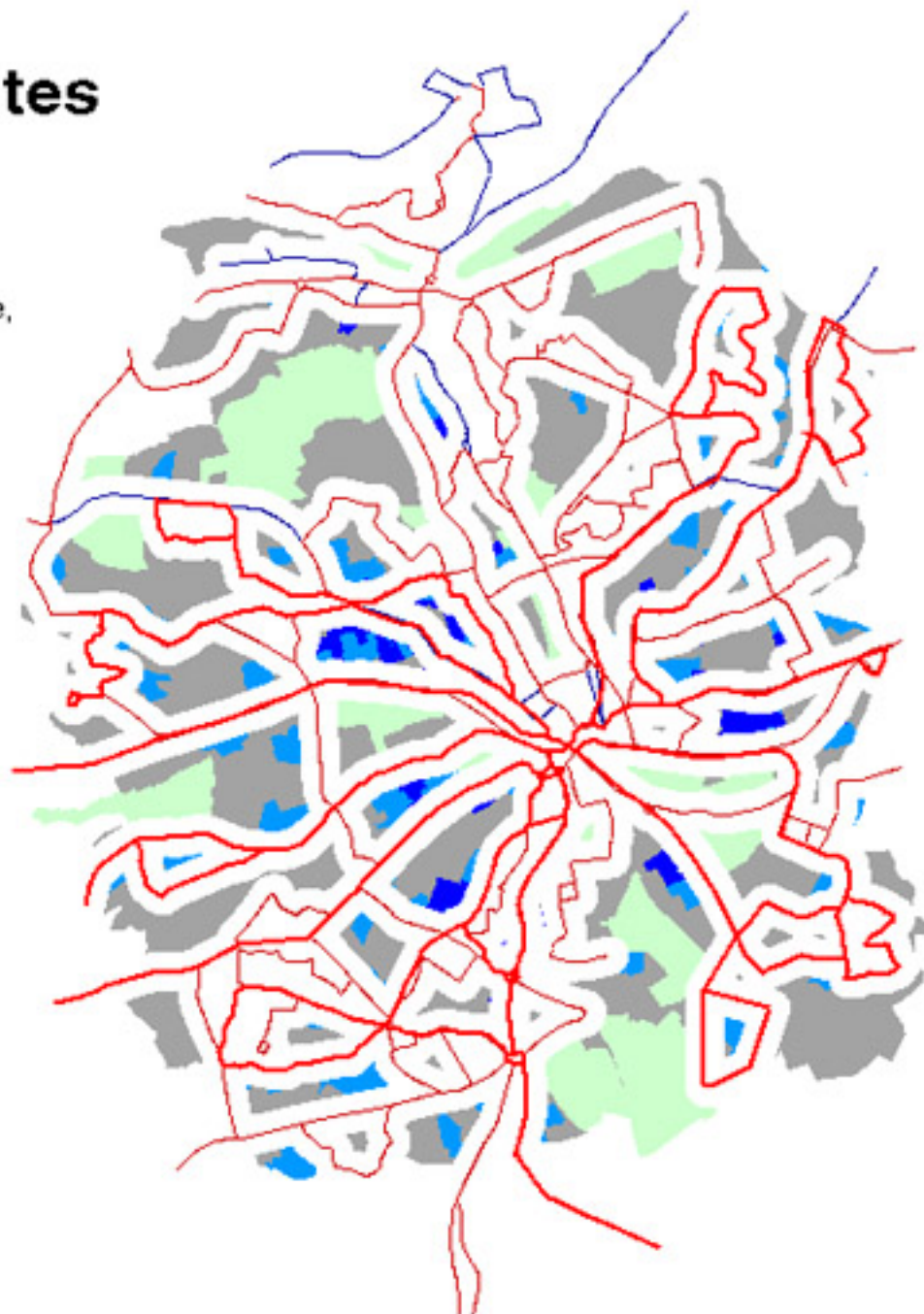
It shows that although the overall bus coverage is good, there are still a number of areas where it will be harder for many people to use buses.

-  At least five buses per hour
-  Between two and four buses per hour
-  No more than one bus per hour

Population per sq. km.

-  0 - 1,000
-  1,000 - 6,000
-  6,000 - 10,000
-  10,000 - 30,000

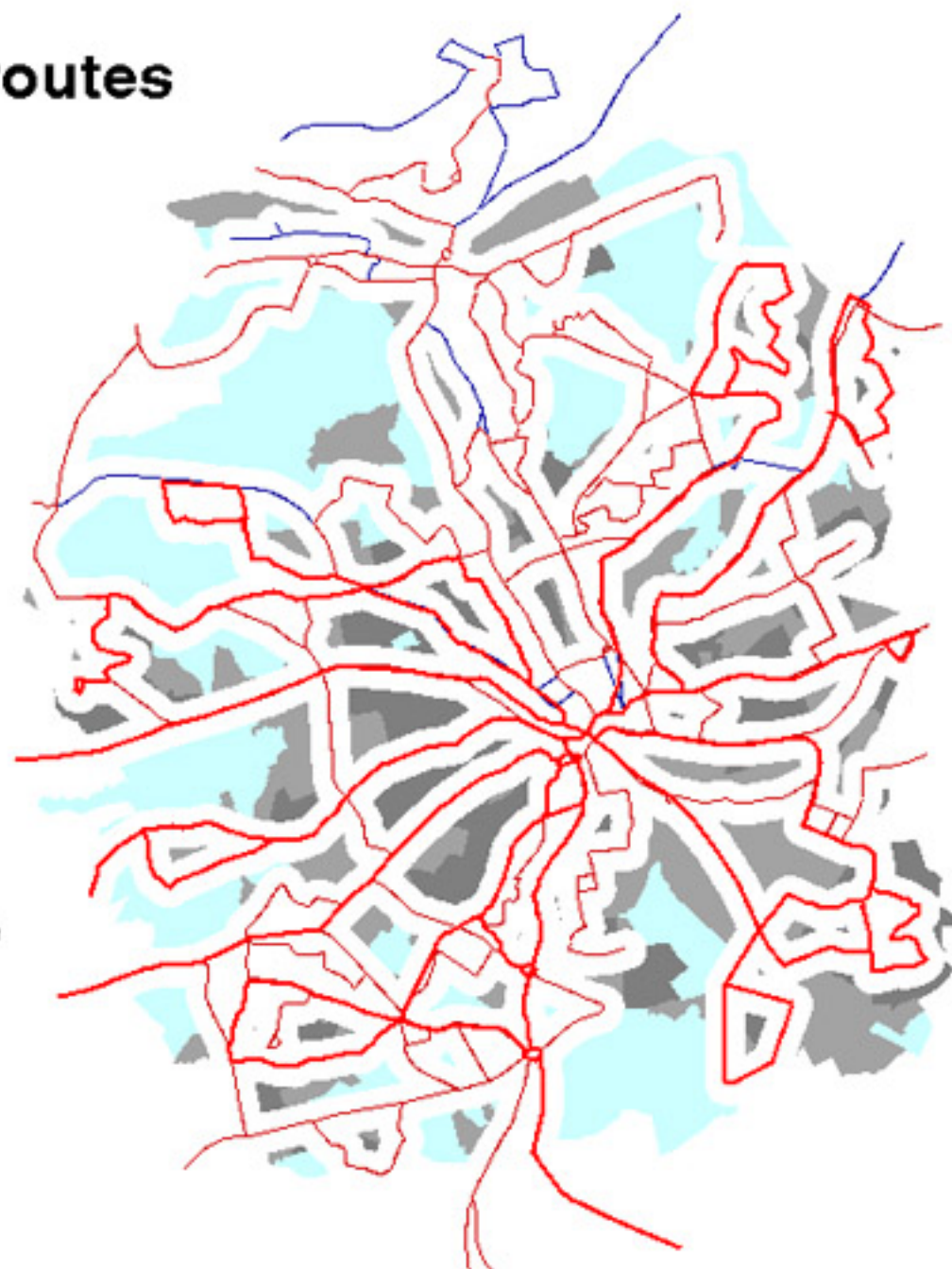
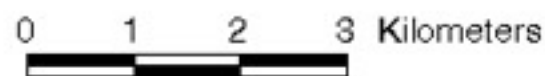
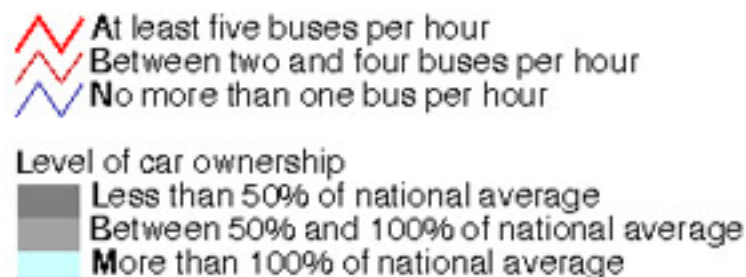
0 1 2 3 Kilometers



Map L Areas further from bus routes - car ownership

This similar map again shows areas which are further than 200 metres from a bus route, but shaded according to car ownership levels.

It shows that although the overall bus coverage is good, there are still a number of areas where it will be harder for many people to use buses. A number of these areas also have low levels of car ownership, so lack of a bus service will be more of a problem for people living there.



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