



# Landscapes

OF INEQUALITY

REPORT OF THE DIRECTOR OF PUBLIC HEALTH FOR DUDLEY

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**“ THIS REPORT... IS INTENDED TO STIMULATE  
DEBATE AND PROVOKE FURTHER INVESTIGATION  
... TO TAKE ACTION WHERE THE EVIDENCE  
SHOWS THE NEED.”**

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# Foreword

My retirement date of September 2014 sees the end of twelve and a half years as Director of Public Health in Dudley. I grew up in Dudley and it has been my privilege to serve my own home borough. I have had the good fortune to serve the public with a dedicated set of colleagues within the NHS, Council and Voluntary Sector, as well as being the head of a team of professional, inspiring staff whose commitment to excellence hasn't wavered. Thank you.

This report turns the spotlight on the impact of the environment on health and the spatial distribution of environmental hazards and benefits in Dudley. It is intended to stimulate debate; provoke further investigation; and take action where the evidence shows the need. My recommendations cover all of these and I commend them to you.

VALERIE A LITTLE  
DIRECTOR OF PUBLIC HEALTH

I took over from Valerie for a 6 month interim period, and am looking forward to being able to implement the recommendations from this report in Dudley.

As a borough, the impact of the environment on the health and wellbeing of our residents has been a key priority for a number of years. We have looked to improve the health enabling aspects of the environment, by developing active green spaces through our healthy towns programme. This has seen the development of healthy hubs and out-door gyms in 5 of our parks with active travel corridors linking the hubs to the main residential areas. We have also developed a supplementary planning guide for health to tackle the growing number of takeaways on our high streets and we administer a food for health award for local caterers offering healthy food choices. We have developed smoke free school play grounds and smoke free places.

However, there is much more we can do and this report will show us where we need to focus our attention to continue to enable Dudley borough to be a place that promotes positive health and wellbeing.

KAREN JACKSON  
INTERIM DIRECTOR OF PUBLIC HEALTH

# Introduction

“IF YOU WANT TO LEARN ABOUT THE HEALTH OF A POPULATION, LOOK AT THE AIR THEY BREATHE, THE WATER THEY DRINK AND THE PLACES WHERE THEY LIVE”

So said Hippocrates in the 5th century BC and his words have a powerful resonance today (Editorial *American Journal of Public Health* 2011). The environments in which people live matter. They have both the potential to be hazardous to health and the ability to promote good health.

We know that good health and longevity varies greatly between different communities and Dudley is no exception (Little V Dudley *PCT* 2010). While some of this variation may be rooted in individual differences (for example genetic cause or predisposition) we now know, as Hippocrates surmised, that the environment in which people live profoundly affects their current and future health.

Health inequalities can be understood in terms of place as well as people and the interaction between the two. The geographical concept of ‘landscape’ as ‘a system of factors and processes that interact in particular settings to produce geographical variation’ (Curtis S 2004) helps explore this interaction and is the focus of this report.

It has long been recognised that the quality of the environment people live in can vary a great deal between communities both at international and national level. This report, however, examines environmental variation at the local level within Dudley.

It has also been observed that communities who are socially and economically disadvantaged often live in the worst environments. Environmental hazards are often unevenly distributed between social groups. For example it has been shown (Friends of the Earth 2001) that of the 11,400 tonnes of cancer causing chemicals emitted by large factories in England, 82% were from factories in the most deprived wards. Repeated observation that the most disadvantaged communities suffer the most environmental degradation has given rise to the environmental justice movement.

Environmental justice has been defined (Cutter S 1995) as equal access to a clean environment and equal protection from environmental harm irrespective of race, income, class or any other differentiating features of socio-economic status. The environmental justice movement had its origins in civil rights activism in the United States (US) but has since developed to encompass a broader definition. A Presidential Executive Order

(President 1994) now mandates federal agencies to identify and address adverse human health or environmental impacts which fall disproportionately on low income or minority populations; though it should be noted that the institutionalisation of environmental justice has not led inexorably to its elimination (Boardman et al 1999).

In the UK, environmental injustice was recognised in one of the UK’s most searching analysis of health inequality (Marmot 2010) but there have been relatively few attempts to monitor distributional impacts of environmental policies. Environmental Impact Assessments (EIAs), Strategic Environmental Assessments (SEAs) and Sustainability Appraisals all have legislative status in the UK, but none contain a major mandate to consider distributional issues (Walker G P 2007). As part of the UK’s sustainable development strategy the Government’s Department for Environment, Food and Rural Affairs (DEFRA) developed and published a composite environmental equality indicator but has not updated this since 2010. It is unclear whether a future indicator will be published, despite campaigns to retain publication (Bell K 2014).

Initially, analyses of environmental justice focussed on the extent to which environmental health harms are unequally distributed across different socio-economic groups and communities. It has since been developed in terms of ‘deprivation amplification’ (MacIntyre S 2000). In those places where people have fewer personal resources, the local facilities which enable people to lead healthy lives are often poorer than places where the affluent

and non-deprived live. Socio-economic deprivation is amplified by increased barriers to healthy living. So it is important to look at the distribution of health enhancing features of the environment as well as environmental hazards.

The origins of the environmental justice movement in civil rights has ensured that attention is paid not only to matters of spatial distribution but also to decision-making on environmental issues and the relative influence and access that different groups have. In other words, procedural justice.

Thus a more recent definition of environmental justice (Bell K 2014) is formulated as ‘a healthy environment for all; an equitable distribution of

“ ENVIRONMENTAL SOLUTIONS ARE NOT CONSIDERED ‘JUST’ IF THEY MERELY DISPLACE THE PROBLEM OR DISADVANTAGE FUTURE GENERATIONS...”

environmental 'goods'; and fair participatory and inclusive structures and processes of environmental decision-making'. Environmental solutions are not considered 'just' if they merely displace the problem or disadvantage future generations.

The maps in this report can only show the extent to which material deprivation is co-located with potential hazards to health. That premature mortality and preceding illness are, or will be, caused by geographical association with an environmental hazard is a much more complex question. It requires not just evidence that the hazard can harm health, but also a plausible model of causation and measurement of exposure. The degree of exposure to a hazard may be different for different members of the same community. For example, someone who is housebound may well have less exposure to road traffic emissions than, say, a child walking locally to school every day. Hazardous emissions to air from an industrial source may affect those living immediately adjacent to the source less than some more distant populations if the emissions are discharged through a stack. Personal exposure monitoring is the ideal but is costly, so proxies such as proximity often continue to be used, albeit with caution. For some hazards, for example emissions to air, dispersion modelling may assist in a more accurate assessment of exposure. In relation to air and waterborne contamination some international standards have been defined. In particular the World Health Organisation (WHO) has identified 1km as an area of potential inhalation and up to 2km as an area of potential drinking water contamination

(WHO quoted in Saunders P 2013). The Public Health Department in Sandwell, UK, have experimented with the use of 'walking distance' as a more accurate proxy than iso-distance lines and this seems a promising approach given that walking distances are readily available from the widely used map software in, for example, a smartphone.

As well as the objective measures of health harm, access to health benefit and place already identified, we need to consider how these are understood by communities themselves. Perceptions of risk and benefit differ between individuals and social groups. They may be socially constructed and/or dependent on properties other than the causative agent. A Canadian study (Wakefield S et al 2001) showed how perception of risk from air pollution was dependent on whether or not it could be sensed (for example by sight or smell). Equally, perceptions of place differ and places often carry significant symbolic meaning (Gieryn T F 2000). People's perception of the local environment can have an effect on their health independent of objectively measured environmental indicators.

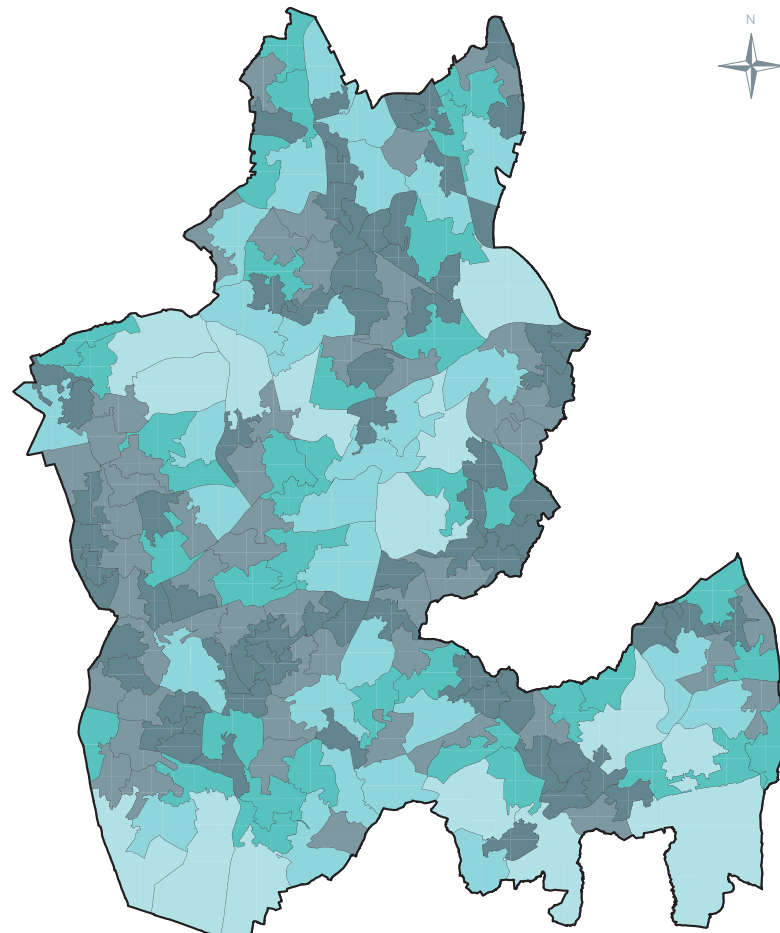
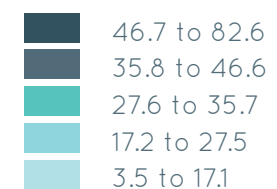
This report, then, presents spatial analyses of deprivation alongside a range of environmental indicators to explore whether there appears to be associations which point towards environmental injustice in Dudley - alerting the need for further work and action. It discusses how people perceive the environment and aspects of procedural justice as they might apply to Dudley.

## Background landscapes

The maps in this report use 'Lower Layer Super Output Areas' (LSOAs) as the geographical level of analysis. LSOAs are areas which contain approximately 650 households/1,500 people. They are not of uniform geographical area, as will be seen from the maps. The Dudley resident population of approximately 313,000 is not evenly spread across the Borough, as the population density map overleaf shows. Also shown is a population density map for children, as these are a particularly vulnerable group when considering environmental hazard. There is some tendency for more LSOAs with higher density of children in the north of the Borough than the south. The data used is the latest available, which is from the 2011 census. There is likely to have been some changes in some LSOAs since then, but these are not likely to affect the overall pattern. The report examines a range of environmental variables against deprivation. For the most part the deprivation measure used is the 'income domain' of the English Indices of Deprivation 2010 (Department for Communities and Local Government 2011). A count of income deprived individuals per LSOA has been derived by combining the numbers of adults and children in Income Support families; Income

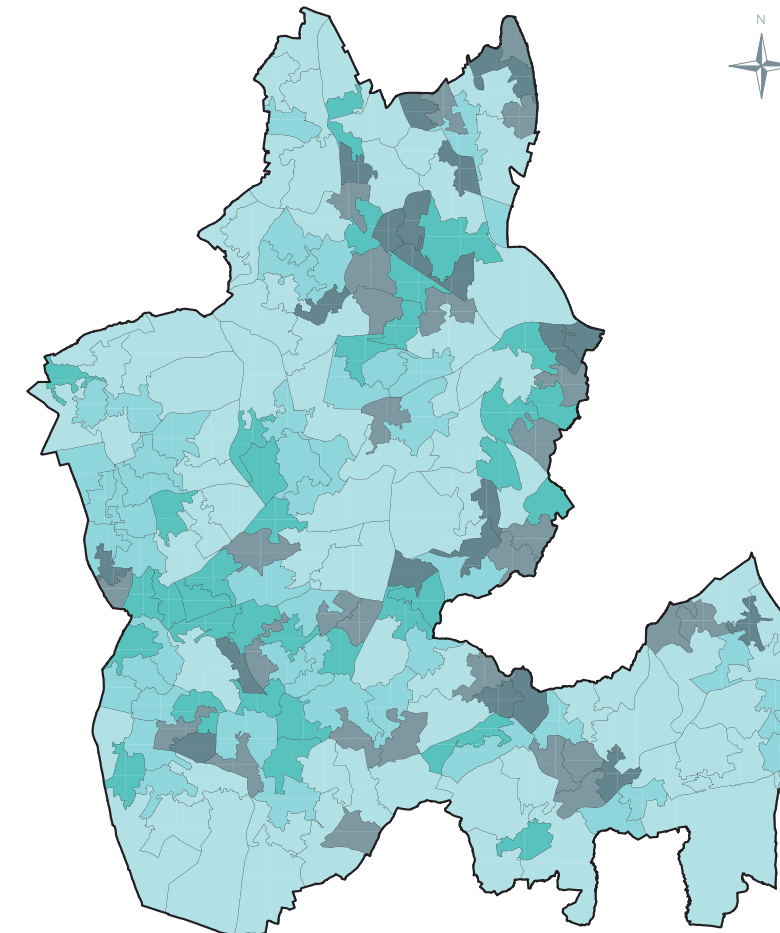
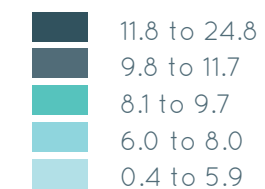
based Jobseekers Allowance families; Pension Credit (Guarantee) families; families receiving child tax credit whose equivalised income is below 60% of the median before housing costs; asylum seekers in receipt of income and/or accommodation support. The income deprivation map overleaf shows in which national decile the LSOAs in Dudley fall, indicating which areas of the Borough suffer the most material deprivation. Material deprivation is, in the main, concentrated in an inner core with some pockets of high deprivation in the more affluent outer areas. The map of those income-deprived households with children (Income Deprivation Affecting Children - IDACI) indicates the spatial distribution of child poverty in the Borough. Both of the deprivation indices were published in 2010 and at the time of writing there is no published update. Whilst this may not have a major impact on the whole population index, there is a possibility that the pattern for children may have changed. Examination of more up to date data from HM Revenue and Customs on personal tax credits, though of less high quality (there is no data for some LSOAs), suggests that the spatial distribution has remained broadly the same.

Population Density  
Number of Persons  
per Hectare



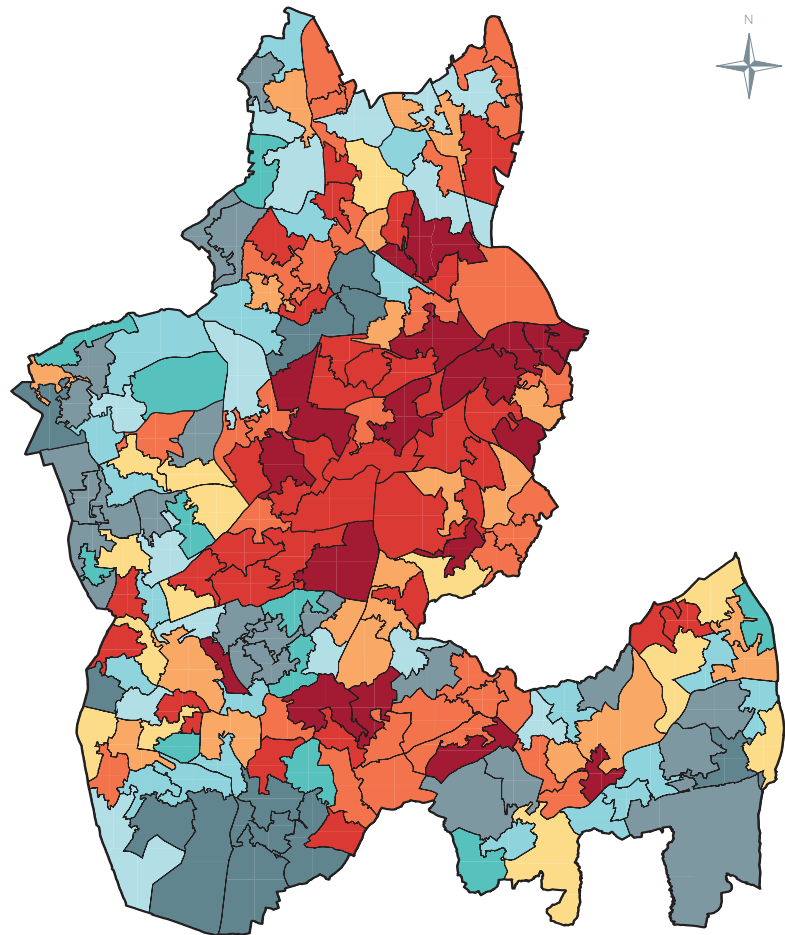
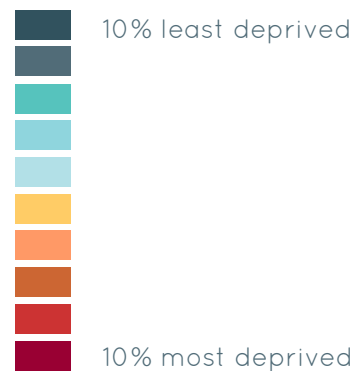
Source: Population Density All Ages, Census 2011, QS102EW  
Map created by Public Health Intelligence, Office of Public Health  
Dudley, Topographic data © Crown copyright and Database Rights  
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Population Density  
Aged Under 16 Years Number of  
Persons per Hectare



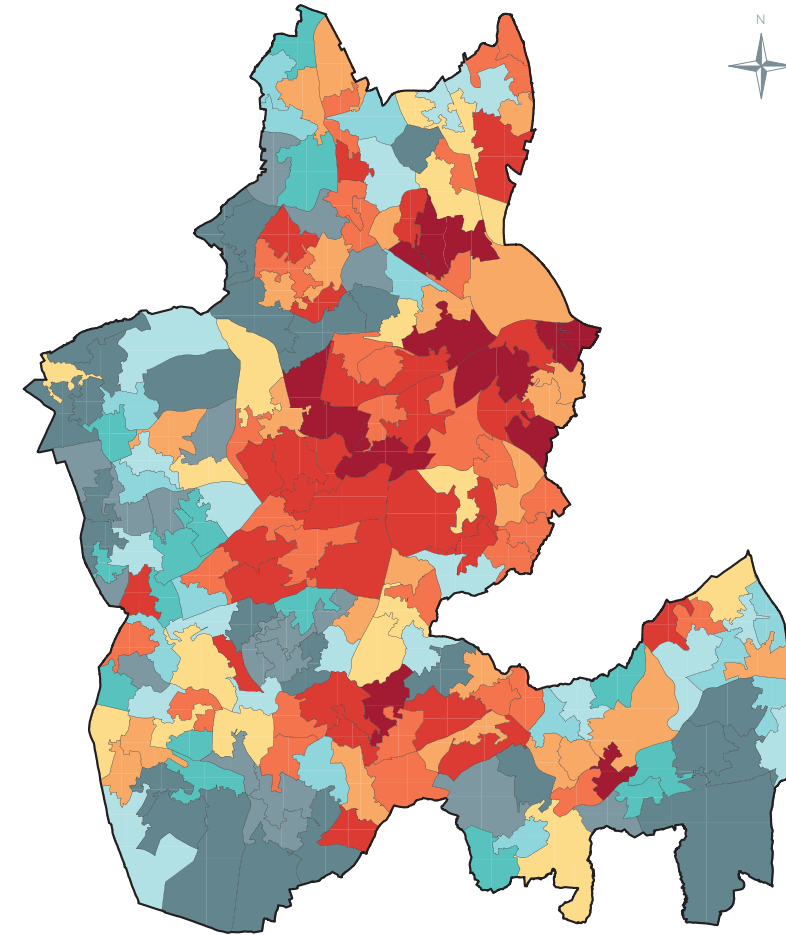
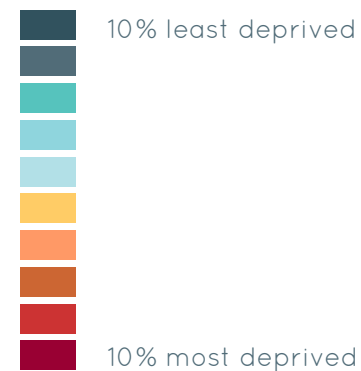
Source: Population Density All Ages by single year, Census 2011,  
QS103EW  
Map created by Public Health Intelligence, Office of Public Health  
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Income Deprivation 2010  
National Deciles



Source: English indices of deprivation 2010; Income Domain, Department for Communities and Local Government.  
Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566

Income Deprivation Affecting Children (IDACI) IMD 2010



Source: English indices of deprivation 2010; Income Deprivation Affecting Children Index (IDACI), Department for Communities and Local Government.  
Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566

# Flood risk

The Environment Agency has estimated that 5 million people in 2 million homes are at risk of flood in England and Wales. Flooding is a natural hazard which poses potential risks to health (Caldin H, Murray V 2011). Depending on the nature and severity of the flood, health impacts can include death and injury (13 people died in the UK floods of 2007 (Paranjothy et al 2011) ); vector borne disease; water borne disease; and chemical contamination. These effects are immediate and direct. Other health impacts may be less immediately apparent but develop and last over the longer term, particularly harm to mental health. Studies have suggested that two thirds to three quarters of the population affected by a flood will experience some impact on their mental health (Caldin H, Murray V 2011). A study of Worcestershire and South Yorkshire populations after the 2007 floods (Paranjothy et al 2011) found that the prevalence of mental health symptoms was significantly higher among individuals who reported floodwater in the home, compared with individuals whose homes had no water ingress. These findings related to psychological distress; probable anxiety; probable depression; and probable post traumatic stress disorder (PTSD). Water above ground floor level was associated with a 2-5 fold increase in adverse outcomes. Perception of exposure had similar effects on general distress and symptomology

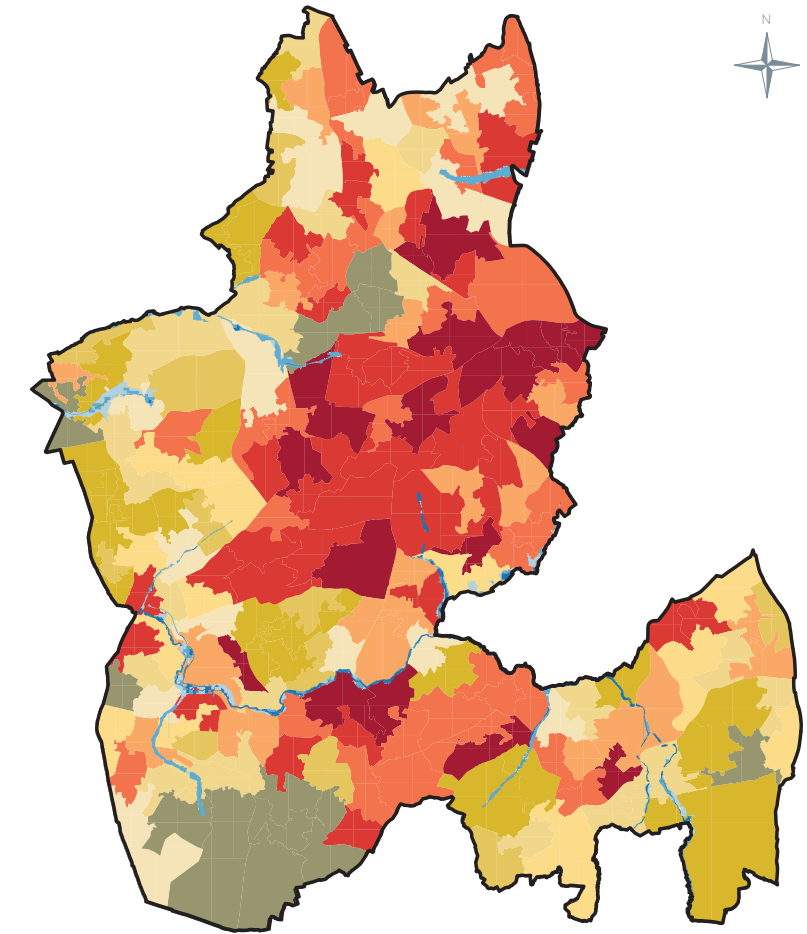
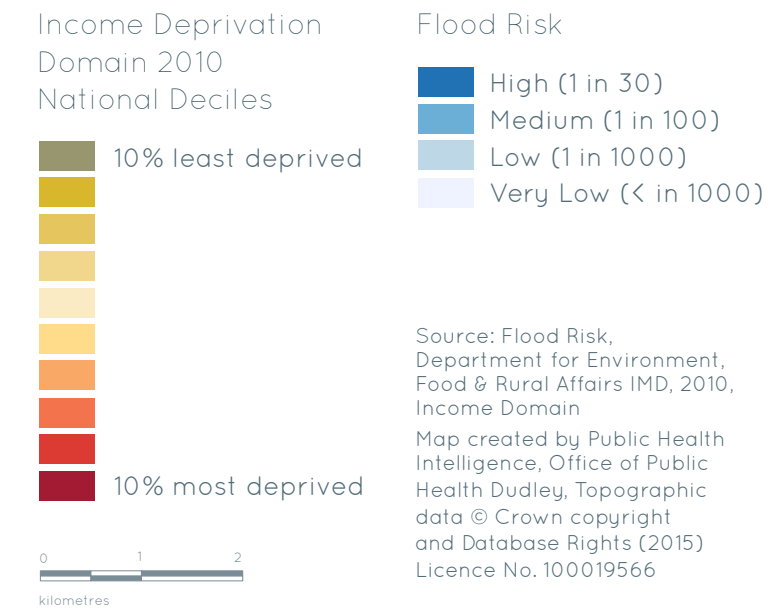
as actual exposure. There was a greater risk of mental health impacts associated with evacuation and financial issues.

In the short term poorer people are less likely to have the financial wherewithal to cover them during an emergency; may be less able to carry on with their jobs; and may be less likely to be adequately insured. So from an environmental justice point of view it is important to understand the social distribution of the risk of flooding. Earlier studies (Walker G P et al 2006) found no disproportionate representation of deprived populations in fluvial (river) plains, though this was observed in tidal (coastal) flood plains. A later study (Fielding J 2007) did find an association in fluvial plains but not in the Midlands region.

Owing to the Borough's topography, most areas of Dudley face little or no fluvial flood risk. The map opposite shows flood risk areas with medium/high (annual chance of flooding less than 1 in a hundred) flood risk indicated. Visually there is no particular alignment of flood risk and deprivation. The number of current properties estimated to be in a medium/high risk flood area is approximately 650.

It is important to ensure that new developments do not add to the potential for harm from floods,

either through inappropriate siting of development or by adding to pluvial (rainwater run off) flood risk. At the time of writing there is no published flood risk management strategy for Dudley. The flood risk areas in Stourbridge shown on the maps are acknowledged in the adopted Stourbridge Area Action Plan, which requires from developers site specific flood risk assessment and mitigation measures for schemes in specified flood risk areas. The other medium/high risk areas shown on the maps are not the subject of Area Action Plans and a flood risk management and mitigation strategy is needed to ensure that these areas, too, are covered.





# Air pollution

It has long been recognised that air pollution has an adverse effect on people's health. In the UK, dependence on coal for energy for both industry and the home was a major contributory factor to the life threatening smogs experienced in urban areas in the 19th and first half of the 20th centuries. The landmark 1956 Clean Air Act and subsequent legislative controls, coupled with diversification of energy sources and decline of certain industries, has led to decline in overall levels of air pollution in the UK. The nature of air pollution has changed. Smoke and sulphur dioxide levels have declined and received less attention as concern has increased over emissions generated from motor vehicle traffic – oxides of nitrogen and particulate matter. There is also increasing concern relating to ground level ozone – a secondary pollutant whose levels are likely to rise if global climate change is not halted.

Epidemiological studies have now firmly established an association between levels of ambient nitrogen dioxide (NO<sub>2</sub>) and increased hospital admissions for a range of conditions. Association with decrease in lung function measures, increased respiratory symptoms; and increased asthma prevalence and incidence have been demonstrated, as have

associations with premature mortality. In recent years there has been ongoing debate as to whether these adverse effects are caused by the NO<sub>2</sub> itself or some other pollutant with which it is associated in ambient air. The UK Government's scientific advisory body on these matters has recently concluded that it is 'sensible' to regard NO<sub>2</sub> as causal (COMEAP 2015). The largest source of oxides of nitrogen in the UK is road transport, followed by industrial combustion and power generation (National Atmospheric Emissions Inventory 2015).

Particulate matter (PM) is a further air pollutant which impacts adversely on health. PM is a mixture of solid and liquid droplets found in ambient air. PM has a natural component and a human-made (anthropogenic) component. Natural sources make a small contribution to the total concentration. Particles are a wide range of sizes but the smaller particles are of special concern as they can penetrate deep into the lungs. Long term exposure to fine particles (PM<sub>2.5</sub>) is estimated to result in a 6% increase in overall population mortality risk; a 9% increase in cardiopulmonary mortality risk; and an 8% rise in lung cancer mortality risk, though the uncertainty around these estimates needs to

be recognised (COMEAP 2009). The Government's scientific advisory body for air pollution has estimated that, with some simplifying assumptions, the 2008 burden of anthropogenic particulate matter air pollution is an effect on 2008 mortality equivalent to nearly 29,000 deaths in the UK at typical ages and a loss of total population life of 340,000 life years (COMEAP 2010). UK emissions of PM<sub>2.5</sub> have declined since 1990, mostly due to a reduction in coal use. Road transport has become an increasingly important source, particularly diesel engines.

Ground level ozone is a secondary pollutant created by chemical reactions between oxides of nitrogen and volatile organic compounds. It is of increasing concern because of the potential for its increase due to climate change. Though concentrations increase on hot sunny days in urban areas, increased concentrations have been observed in cold months and the recommended metric for monitoring is annual average daily maximum 8 hour running mean. Epidemiological studies have demonstrated adverse health effects of short-term exposure to ambient concentrations of ozone for all cause mortality, and hospital admissions for respiratory conditions. There is an association with cardiovascular admissions, but

not as strong. There is no evidence of a threshold. It has been estimated that for every 10microgram per cubic metre increase in ozone concentration there is a 0.34% increase in all age all cause mortality, a 0.75% increase in respiratory hospital admissions and 0.11% increase in cardiovascular hospital admissions (COMEAP 2010). Effects of long-term exposure are less clear. Ozone levels are not routinely reported by Local Authorities.

Though results of studies across Europe on the association between deprivation and exposure to poor air quality have been mixed (Deguen S & Zmirou-Navier D 2010), there is now emerging agreement between studies in the UK on evidence for a U shaped curve – more deprived areas have greatest exposure but very affluent areas have a greater than average exposure (see e.g. Walker G P et al 2003). The association between deprivation and poor air quality holds true for urban areas.

European Union (EU) air quality limit values are legally binding EU parameters for individual pollutants. The UK Air Quality Strategy sets out air quality objectives which are policy targets. In some instances these are less than the WHO guideline

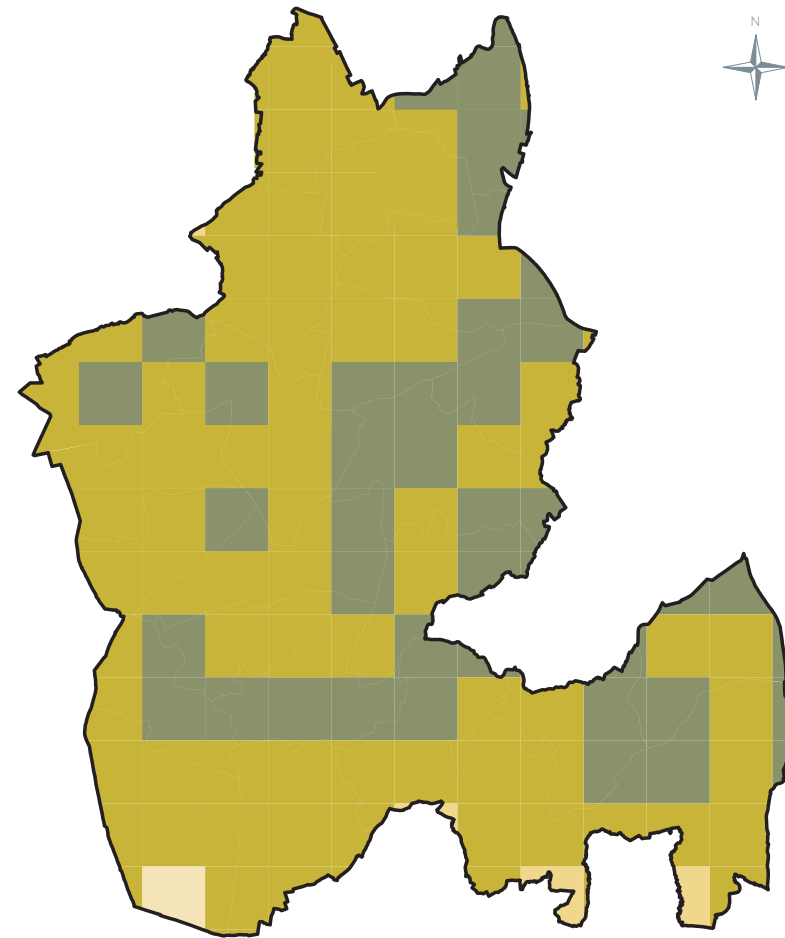
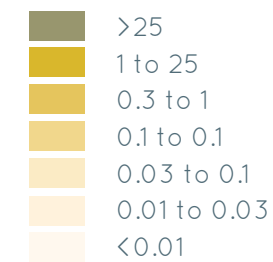
levels. The low ambition for PM<sub>2.5</sub> has been the subject of recent criticism (Editorial Lancet 2015).

The maps overleaf show concentrations for 2012 modelled to 1km squares for NO<sub>2</sub> and PM<sub>2.5</sub> from all sources and modelled estimates of concentrations originating from road sources. As the maps show, the estimates suggest that, for all NO<sub>2</sub> sources, almost all of Dudley experiences air quality at the worse end of the scale, with deprived areas experiencing some of the worst. For road emissions, the bulk of the Borough is estimated to have similar concentrations, with the exception of areas around a section of the Birmingham New Road and adjacent to the M5 where concentrations are the highest. There are small areas of low concentration on the southern boundary – areas of low population density.

For PM<sub>2.5</sub> there is a greater difference between the total concentration map and the road source map than that seen previously for NO<sub>2</sub>. For all source PM<sub>2.5</sub> there may be some higher concentrations in deprived areas but this is less clear than for NO<sub>2</sub> and only further statistical analysis would determine this. Road PM<sub>2.5</sub> estimates show somewhat higher concentrations in the same two areas highlighted for NO<sub>2</sub>, with the addition of Stourbridge and Dudley town centres.

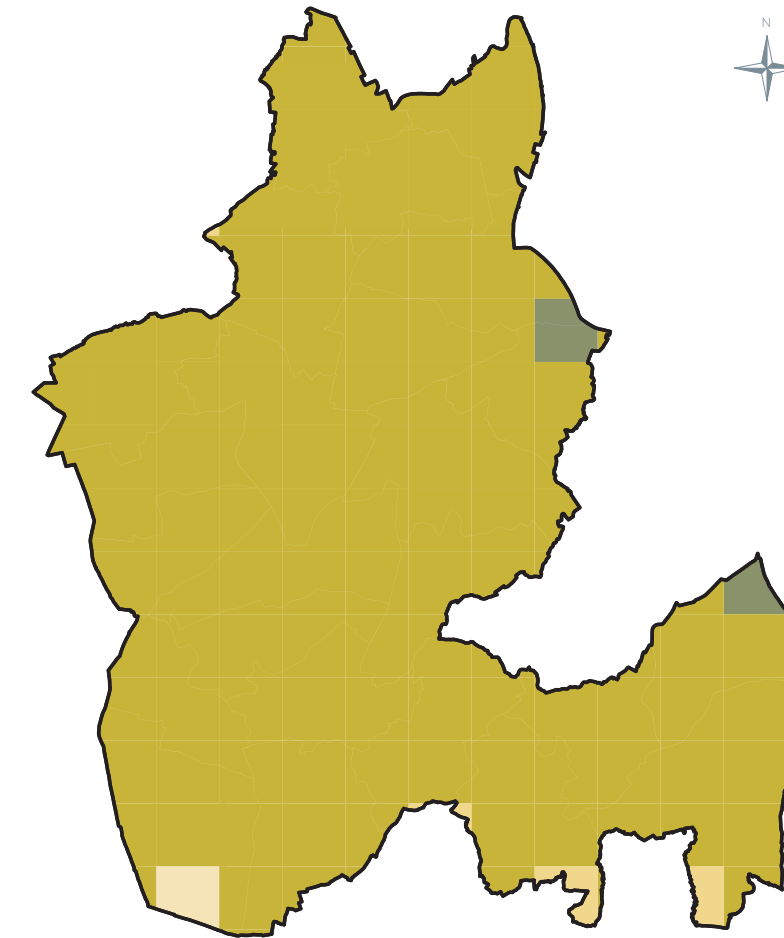
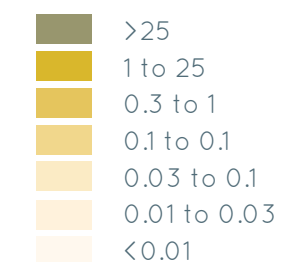
“ THE NATURE OF AIR POLLUTION HAS CHANGED. SMOKE AND SULPHUR DIOXIDE LEVELS HAVE DECLINED... AS CONCERN HAS INCREASED OVER EMISSIONS... FROM MOTOR VEHICLE TRAFFIC.”

Air Quality NO<sub>2</sub>  
Total t per 1x1km



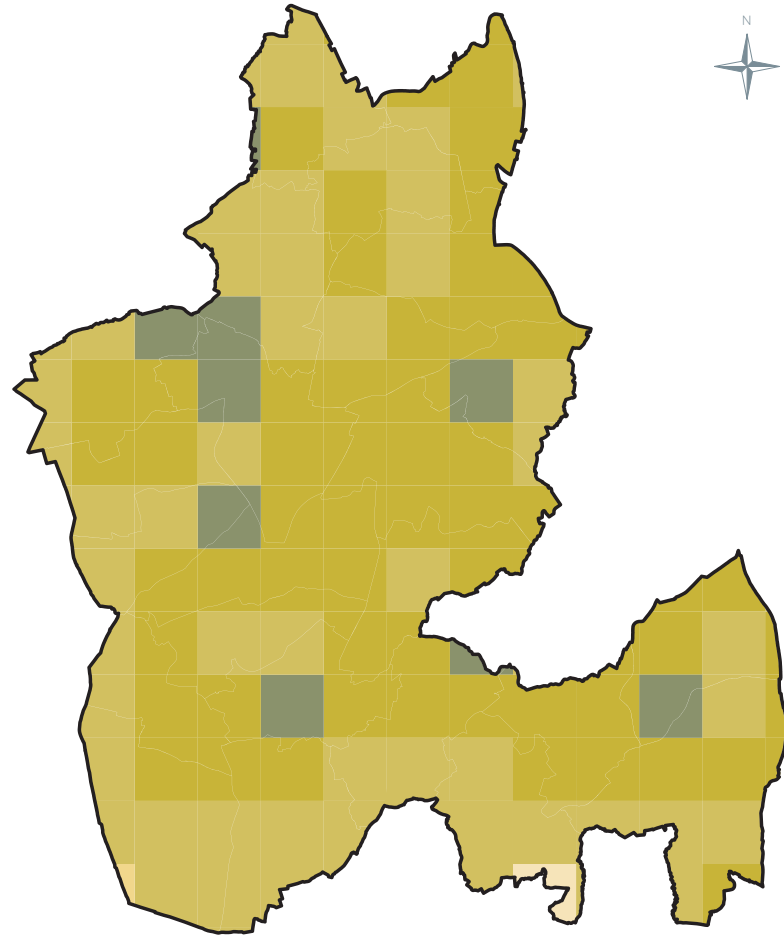
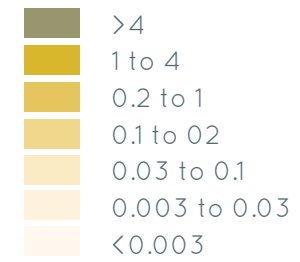
Source: Department for Environment, Food and Rural Affairs 2012.  
Map created by Public Health Intelligence, Office of Public Health  
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Air Quality NO<sub>2</sub> Road  
Transportation Total t per 1x1km



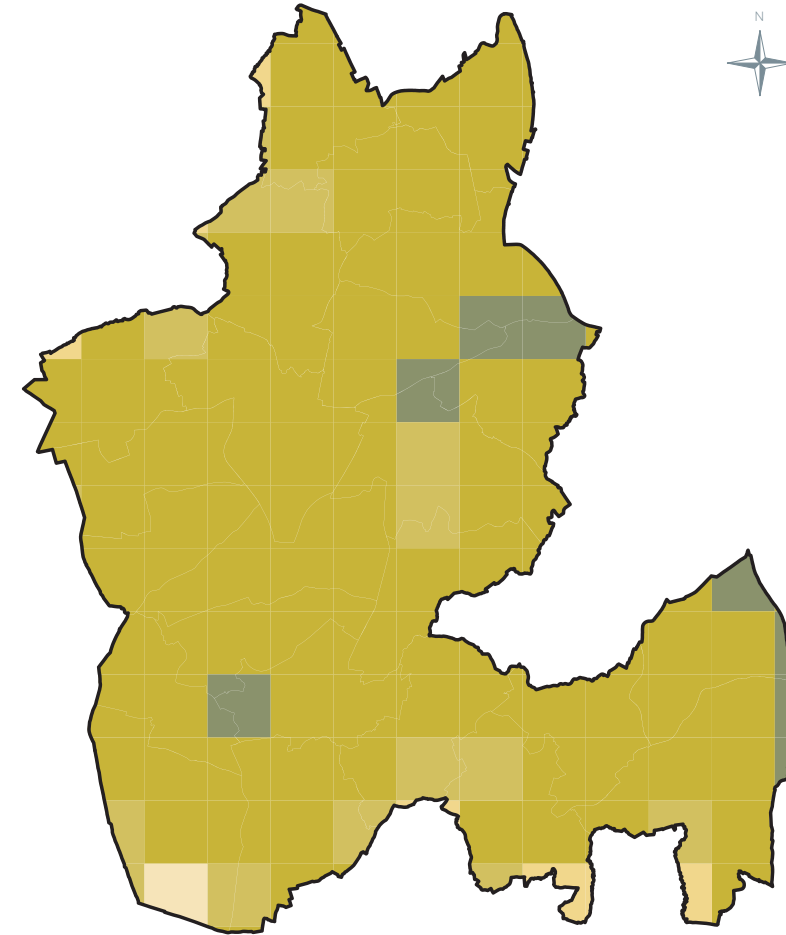
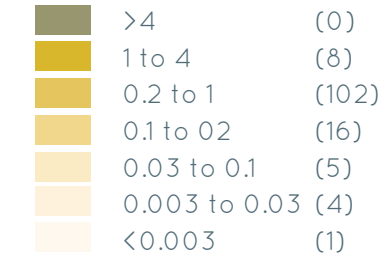
Source: Department for Environment, Food and Rural Affairs 2012.  
Map created by Public Health Intelligence, Office of Public Health  
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Air Quality PM<sub>2.5</sub>  
(Particulate Matter  
2.5 µm) Total



Source: Department for Environment, Food and Rural Affairs 2012.  
Map created by Public Health Intelligence, Office of Public Health  
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Air Quality PM<sub>2.5</sub>  
(Particulate Matter  
2.5 µm) Road Transportation



Source: Department for Environment, Food and Rural Affairs 2012.  
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# Air pollution continued

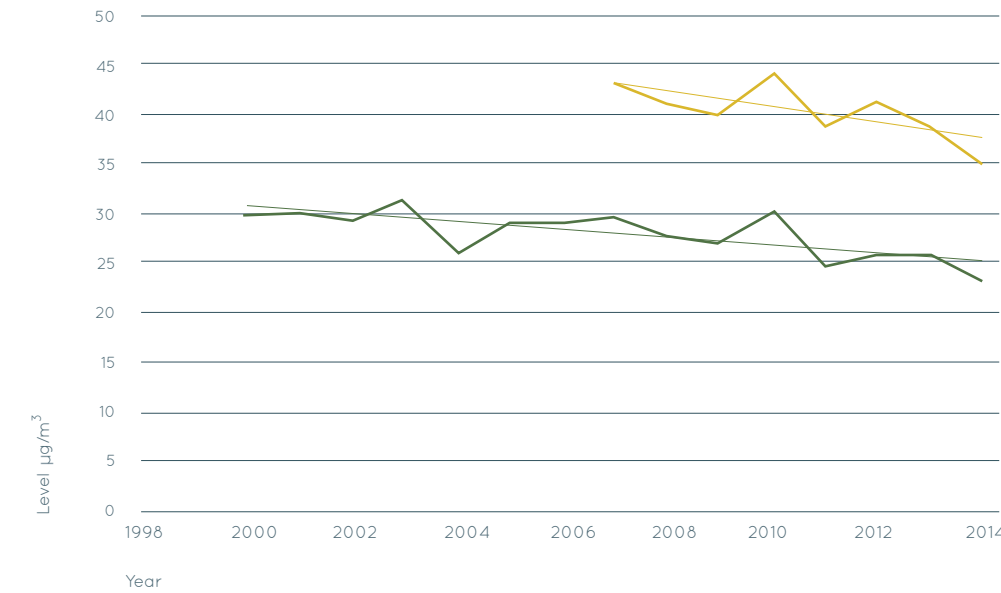
The modelled estimates are based on monitoring data from a national network of automatic monitoring stations (page 24). Dudley MBC also has further in situ diffusion tube monitoring equipment and maps of the location of these are shown (page 25).

During 2014 Dudley had four automatic monitoring sites, monitoring a range of air pollutants and a further network of 51 non-automatic diffusion tube sites monitoring NO<sub>2</sub>. Data from the monitoring stations on the maps (page 24 to 25) has been used in the monitoring of Dudley's Air Quality Action Plan. The latest report (DMBC 2015) presents monitoring data for 2014. Annual trends for both types of monitoring site are shown opposite. There have been continuing exceedances of national air quality standards for NO<sub>2</sub>.

The trend graph for DMBC's two longest running automated monitoring sites shows a downward trend over each respective evaluation period.

The results for diffusion tube sites also show a downward trend. Following a sharp initial decrease there has been a continuing downward trend since 2003. The slight upward trend from 2012 may be due to rationalisation of monitoring sites. A greater fraction of tubes are now located at problematic roadside locations.

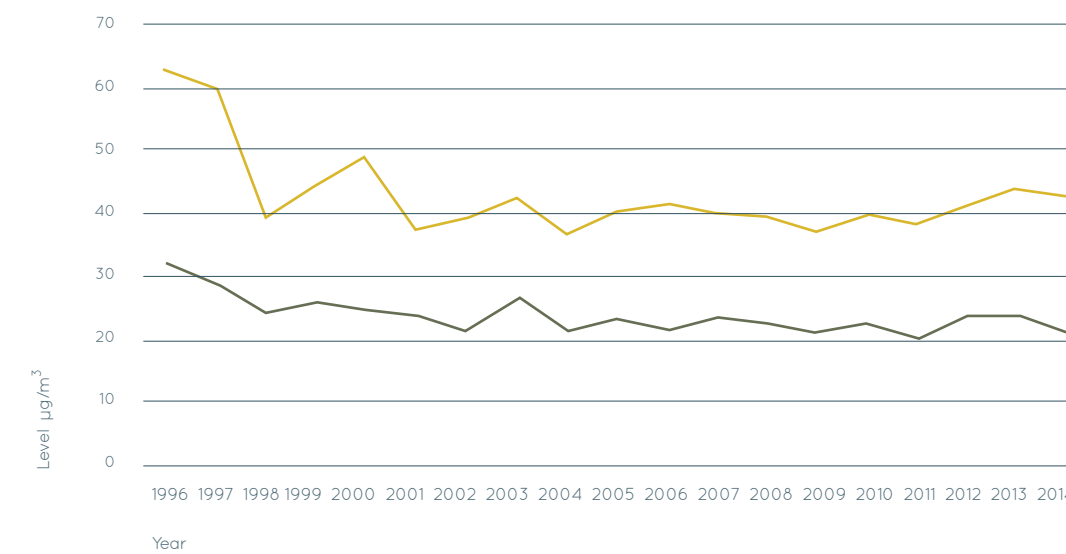
Dudley reports ongoing exceedances of the national air quality standard at 12 locations of which 9 are in some of the most deprived areas of the Borough. Improvements were recorded in 7 areas which failed to meet national air quality standards in previous years. There is a relatively even distribution of these across deprived/non-deprived locations. Air quality monitoring reports for Dudley do not currently address socio-economic equity considerations. Inclusion of these would assist in monitoring the impact of interventions on environmental inequity in the Borough



Annual Trends: Average NO<sub>2</sub> Levels at Dudley MBC Automated Sites

Colley Gate  
Central Dudley

Source: Dudley MBC Air Quality Monitoring Report 2015 Updating and Screening Assessment for Dudley MBC.



Annual Trends: Average NO<sub>2</sub> Levels at Dudley MBC Diffusion Tube Sites

Average of all roadside sites  
Average of background monitoring sites

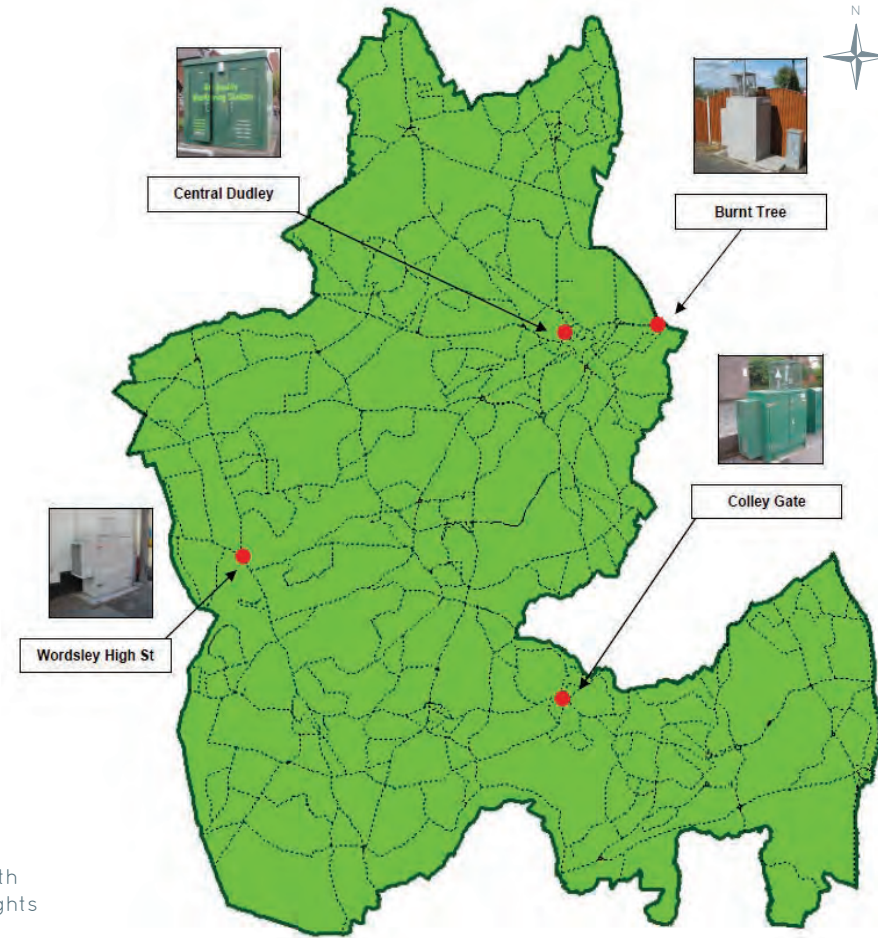
**Tube History:** 1996 to Mar 2001 50% TEA in acetone, supplier A  
Apr 2001 to Dec 2001 50% TEA in acetone, supplier B  
Jan 2002 to date 20% TEA in water, supplier B

Source: Dudley MBC Air Quality Monitoring Report 2015 Updating and Screening Assessment for Dudley MBC.

● Automatic Monitoring Station Site



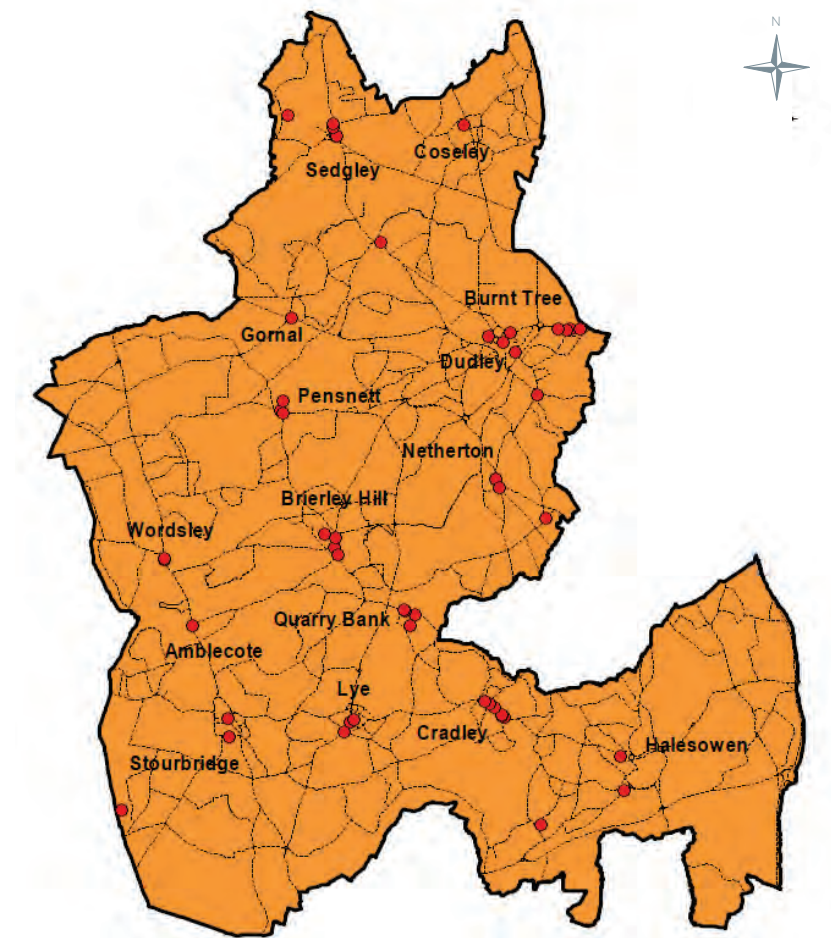
Source: Dudley MBC (2015)  
 Map created by Public Health Intelligence, Office of Public Health  
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● Non Automatic Diffusion Tube Sites



Source: Dudley MBC (2015)  
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# Chemical incidents: fires

Whilst the immediate danger to life of fires is readily evident, it is not commonly recognised that uncontrolled fires constitute a public health chemical incident, given the air pollutants produced as the products of burning.

Data from the Environment Agency's National Incident Reporting System shows that 70% of all recorded incidents in 2006-7 involved emission of air pollutants as 'smoke' to the atmosphere. Just over a quarter of these (27%) related to 'waste' premises. 'Tyre' premises accounted for 7% (Environment Agency 2009). Tyres accounted for a much higher proportion (40%) of fires reported to the Health Protection Agency in the three years 2006 -09 (Kibble A 2010). There were 20 fires within the Dudley boundary reported to Public Health England (pers com) for 2010-mid 2015 of which 3 (15%) were tyre fires. The map opposite shows the location of fires reported, both within Dudley and immediately adjacent. Locations are not disproportionately clustered in deprived areas. However it is important to understand that the extent to which any given community is

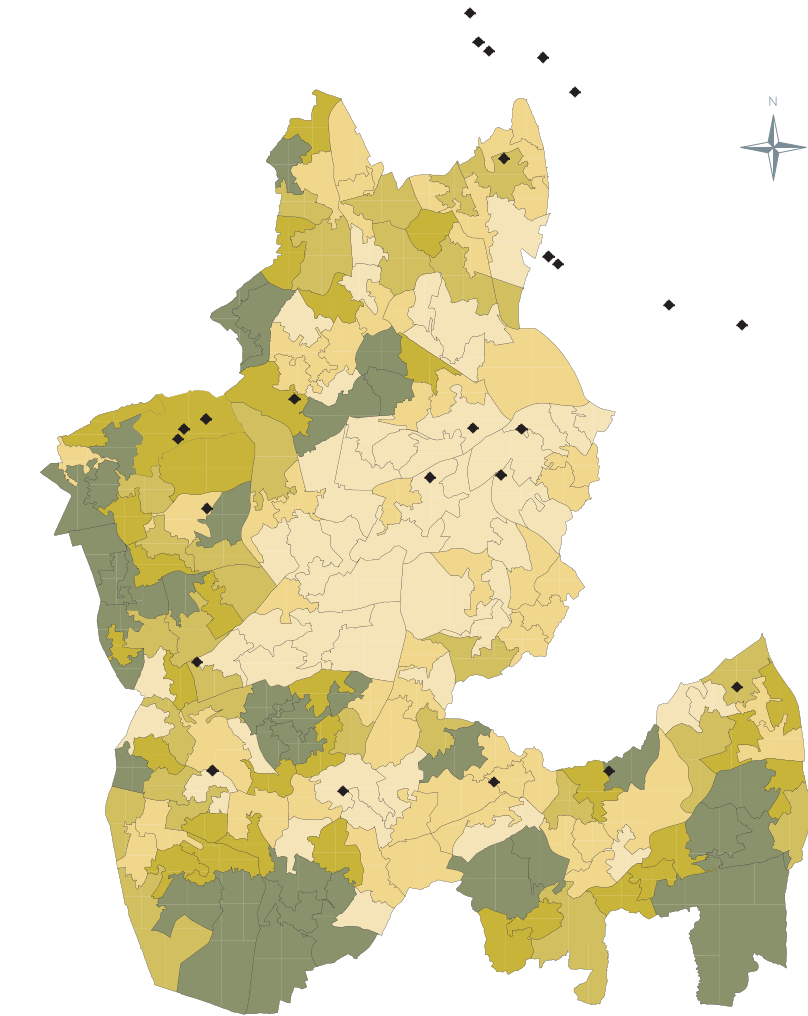
exposed to pollution as the result of a fire is dependent on the particular circumstances, wind direction and weather conditions prevailing at the time of the fire. For example, the Met office maps relating to a fire at a recycling depot in Smethwick (Sandwell UK) in 2013 show the extent which a plume can reach (Leadbetter S et al 2014). The fire was large and extremely hot so the plume rose above the height of the atmospheric boundary layer - an estimated height of up to 2kms and visible from space satellite images. Weather conditions were dry and the prevailing wind was westerly so the plume travelled a considerable distance to the east. Dudley residents were not affected in this instance because of the wind direction.

Fire prevention at industrial sites is an important public health measure.

LSOAs by Income Domain  
National Quintile the Index  
of Multiple Deprivation 2010

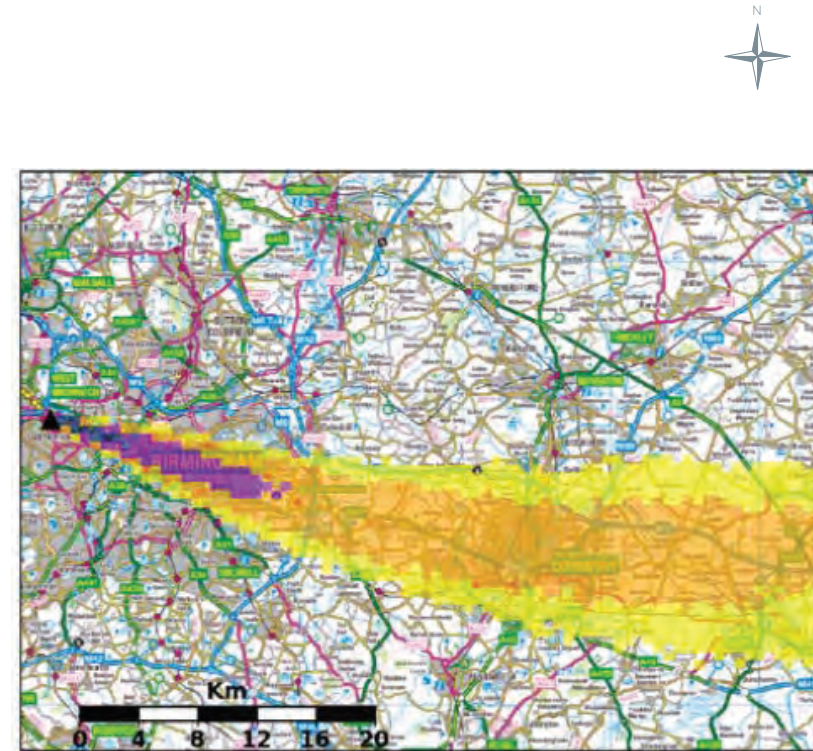
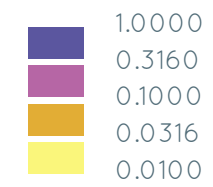


Source: Chemical Incident data 2010-2015, Public Health England Index of Multiple Deprivation 2010, Income domain.  
Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566



Recycling Fire in Smethwick, UK 2013

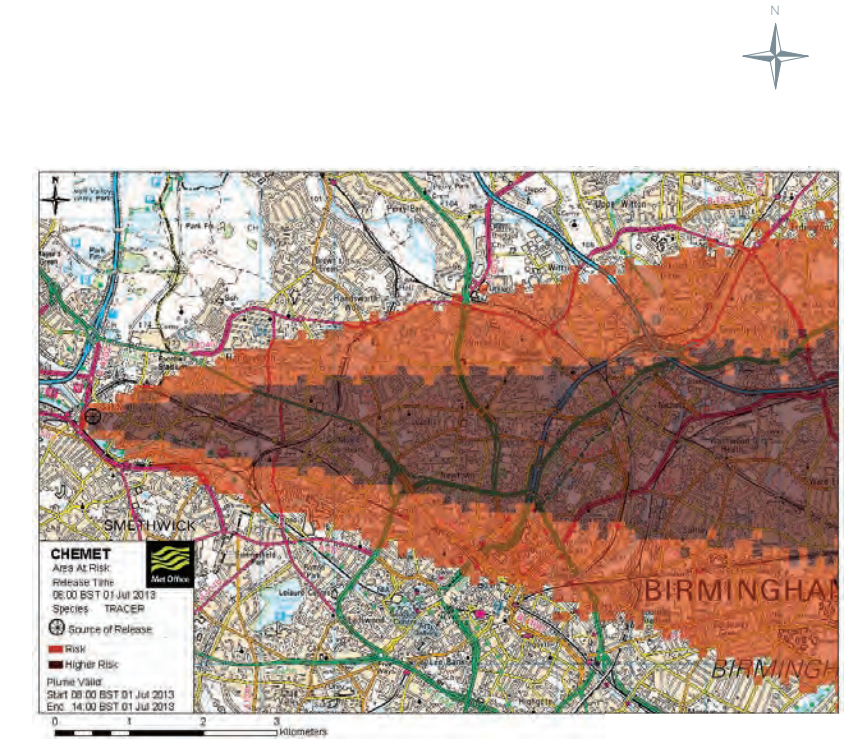
001 HR Time Averaged Air  
Concentration From 500-1000m  
Above Ground  
VALID FROM 0700 01/7/2013 TO 0800 01/07/2013



Source: Chemical Hazards and Poisons Report September 2014, Issue 24. By Public Health England.  
Map Created by Met Office/NOAA © Crown copyright.

Recycling Fire in Smethwick, UK 2013

Source: Chemical Hazards and Poisons Report September 2014, Issue 24. By Public Health England.  
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Met Office (100008414) 2009





# Industrial pollution

Many industrial processes produce emissions or waste products which can be hazardous to health. In the UK such installations and processes are subject to regulation. If a company wishes to carry out processes that may cause emissions to land, air or water, it must apply for an environmental permit from either the Environment Agency or the relevant Local Authority. The Environmental Permitting Regulations for England and Wales were introduced under the Pollution Prevention and Control Act 1999 and derive from the European Integrated Pollution, Prevention and Control (IPPC) Directive (European Community 1996). The Environment Agency regulates industrial processes with the greatest potential for causing pollution to land, air or water. Local Authorities regulate those with lesser potential. So the Environment Agency regulates type 'A1' processes such as large iron and steel foundries, chemical production, waste disposal. Local Authorities regulate 'A2' activities, which are usually similar but on a smaller scale. They also regulate 'Part B' activities (for example timber manufacturing, animal rendering,

quarrying). The regulator can place conditions on the permit (for example limits to emissions), but must set them on 'Best Available Technique' (BAT). The regulatory regime does not eliminate potentially toxic emissions and waste. Its aim is to prevent, where possible and, where this is not practicable, to reduce to 'acceptable levels' (Department for Environment, Food And Rural Affairs 2010). As has been pointed out, (Saunders P 2013) not all emission standards are protective of health. There are some substances for which there is no proven level of exposure at which effects do not occur. Installations subject to IPPC are potential point sources of hazard to health.

Much of the environmental justice research and campaigning in the US has been concerned with the spatial association of hazardous industrial sites with deprived socioeconomic and/or black and minority ethnic communities. The main emphasis has been on race and industrial polluting sites and the extent to which these result from discriminatory practice in original siting.

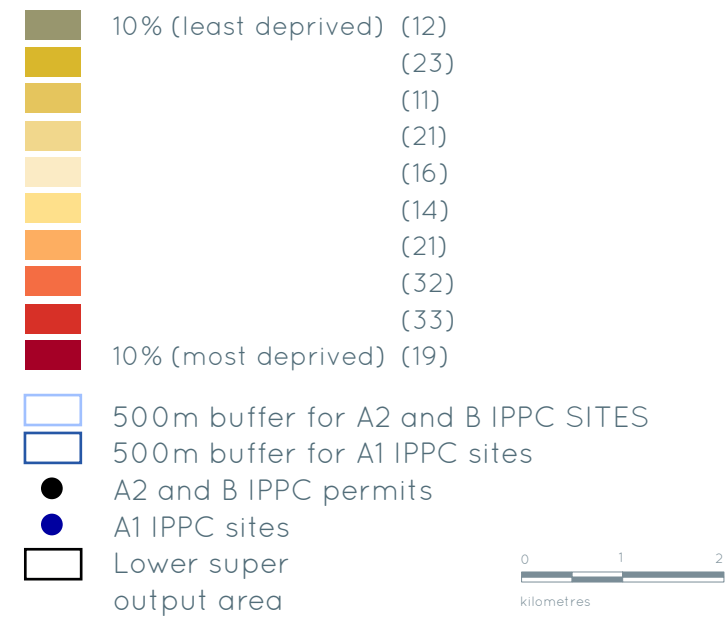
The UK has a much smaller body of research on this, but there have been a number of studies of the socio-spatial distribution of IPPC installations. One study (Friends of the Earth 2000) found that 82% of carcinogen emissions from processes regulated by the Environment Agency occurred in the most deprived 20% of wards, though the study has acknowledged limitations. Another (Environment Agency 2002) found that the density of IPPC sites per km<sup>2</sup> within wards was positively associated with deprivation. A larger, more rigorous study (Walker G P et al 2003) confirmed the general direction of the earlier smaller studies for England. IPPC sites were disproportionately located in more deprived wards. IPPC sites were more clustered together in deprived wards and, on average, produced greater numbers of emissions in deprived wards. Wards in the most deprived decile were the location for five times as many sites and authorisations and seven times as many emission sources compared with the least deprived. The study also examined the data for Wales and found, by contrast, no association of sites with deprivation. Proximity to multiple sites

and levels of emissions were associated with more affluent deciles. An analysis for Scotland (Fairburn J et al 2005) showed that the most deprived were three times more likely to be living within 1km of an IPPC site than the least deprived. There was a concentration of sites within deprived communities and a disproportionate clustering of sites near to more deprived populations. However, sites with reportable emissions were not disproportionately found in deprived areas.

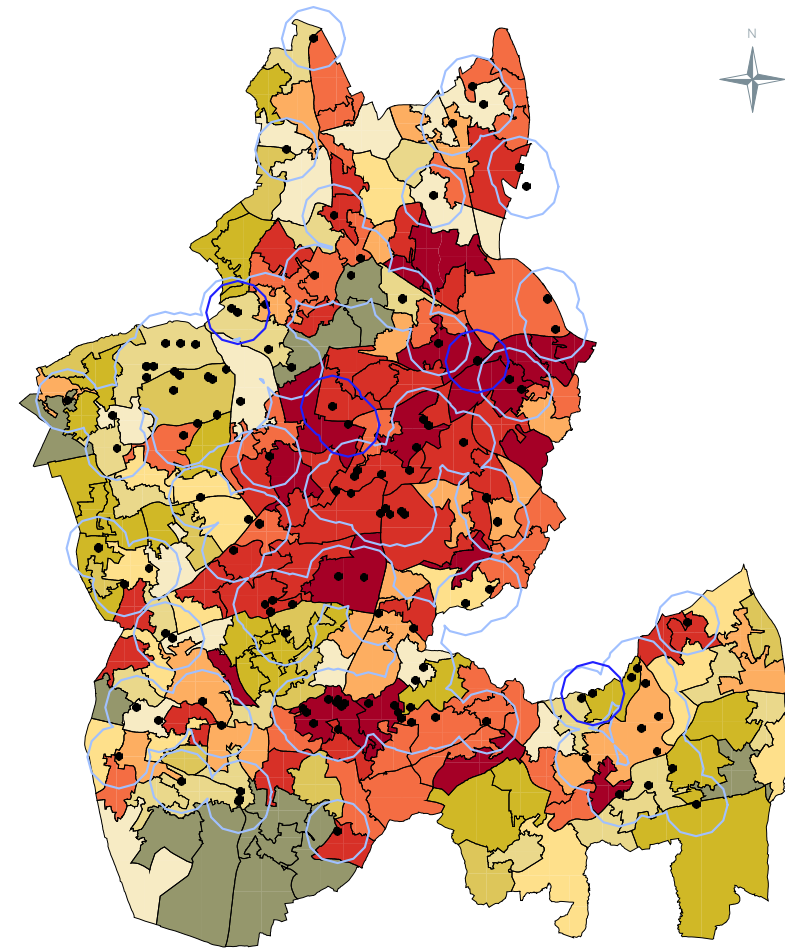
The map overleaf shows the location of IPPC sites in Dudley with 500m zones around them. Three of the five A1 sites are located in a more deprived area with the other two in more affluent areas. Whilst found in areas of varying deprivation, the A2 and B sites do show, on visual inspection, some bias towards the more deprived areas in the Borough. Further statistical analysis is needed to confirm this. Proximity gives only a very crude indication of where there may be population exposure – more detailed work is required to understand exposures properly.

IMD 2010 National Deciles

LSOAs BY INCOME DOMAIN NATIONAL DECILE  
THE INDEX OF MULTIPLE DEPRIVATION 2010



Source: Environmental Services Dudley MBC Index of Multiple Deprivation 2010.  
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“ THE REGULATORY REGIME DOES NOT ELIMINATE POTENTIALLY TOXIC EMISSIONS AND WASTE.”

# Noise pollution

Noise pollution is an oft-neglected environmental hazard to health. Both the phenomenon and its measurement are complex (Maynard R 2010). 'Noise' is characterised not simply by the physical aspects of sound itself (which can be measured objectively) but also by the human reaction to it. So, 'noise' is often defined as 'unwanted sound'; or sound in the wrong place at the wrong time (Maynard R 2010). Sources of noise may be occupational or environmental (both neighbourhood and transportation). It is measured using a decibel scale, usually with an 'A' weighting to mimic the frequency response of the human ear (dBA). In general, 0dBA is the level of hearing; 90dBA is the level of background noise at which there is a need to shout to be heard from 1m away; and 130dBA is the threshold of ear pain. International guidelines (WHO 1999) suggest that sound pressure level in outdoor living areas should not exceed 55 dBLA<sub>eq</sub> in the day and 45 dBLA<sub>eq</sub> during the night. National Incidence Surveys (NIS) have estimated that in 2000/01 55% of the UK population lived in dwellings exceeding the daytime guideline level and 67% the night time level; though this was a decrease from the survey a decade earlier.

Noise can have adverse effects on both auditory and non-auditory aspects of health (Basner M et al 2014). It is the single biggest preventable cause of hearing loss, though this is almost exclusively found in occupational and military settings. Environmental noise can lead to

annoyance, sleep disturbance, loss of performance and has been implicated in cardiovascular disease.

There is debate about whether or not annoyance lies along a causal pathway to ill health. It is often associated with negative responses such as anger, displeasure and exhaustion. An ISO standard has been developed to assist in its consistent measurement (ISO 2003). There is considerable individual variation in the extent to which given sound levels and sources result in annoyance, but it is generally found that the proportion of a population reporting noise annoyance increases with increasing sound levels and vice versa (Maynard R 2010). WHO have estimated annoyance as the second biggest contributor to the burden of noise-induced disease in Europe (Basner M et al 2014). The single biggest contributor was sleep disturbance. Though there can be habituation to noise, sound levels as low as 33 dBLA<sub>max</sub> can induce physiological reactions during sleep (Basner M et al 2014). Elderly people, children, shift workers and people with a pre-existing sleep disorder are considered to be at most risk.

There is now substantial evidence to show that environmental noise can adversely affect the cognitive performance and learning outcomes for children, with evidence of a linear dose-response relationship (Stansfeld S A 2005, Clark C et al 2006). Psychological stress response is suggested as the mechanism.

Children have a less mature ability to develop coping strategies to deal with perceived threat. Given the impact of environmental noise on tasks with high cognitive demand (eg reading and problem solving), WHO guidelines suggest that sound pressure levels should not exceed 35 dBLA<sub>eq</sub> during teaching sessions.

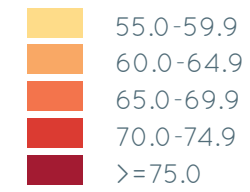
Evidence of adverse independent effects of noise pollution on the cardiovascular system continues to grow (Basner M et al 2014). Epidemiological studies have shown higher prevalence and incidence of cardiovascular disease and mortality associated with high noise exposure. Laboratory studies in human and animal models have suggested plausible biological mechanisms via the general stress model (both indirect and direct pathways). Risk estimates differ dependent on the source and acoustic characteristics of the noise. A meta analysis derived risk estimates of between 7% and 17% increased risk per 10dBLA<sub>eq</sub> for cardiovascular endpoints (hypertension and ischaemic heart disease). Derived exposure response relationships were linear for road traffic noise with thresholds at 46-50dBLA<sub>eq</sub> for hypertension and 56-60 dBLA<sub>eq</sub> for myocardial infarction (Basner M et al 2014). A recent epidemiological study of the London population (Halonen J I et al 2015) found long-term exposure to daytime road traffic noise was associated with increased hospital admissions for stroke in the elderly and was suggestive of association with stroke mortality. The findings are consistent with previous evidence linking noise pollution and hypertension.

The London study found no evidence for noise health association with area deprivation levels. A 2004 study in Birmingham UK examined inequalities in

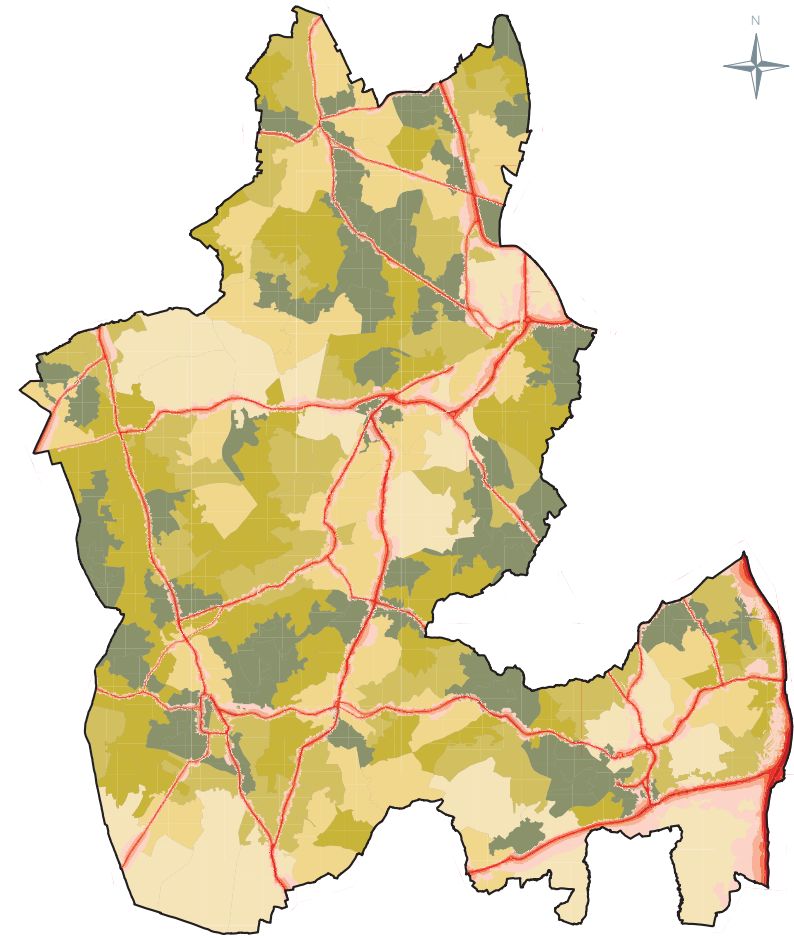
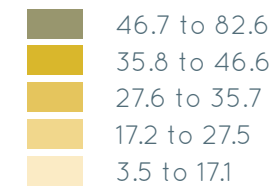
noise exposure in the city and found only a weak relationship (Brainard J S et al 2004).

Noise arising from transportation is exempt from 'statutory nuisance' but is covered by the European Noise Directive (European Union 2002) and the Environmental Noise (England) Regulations 2006, which require strategic noise mapping. The map overleaf shows the DEFRA map of probable levels of noise from road sources in Dudley. Comparisons of the percentage of population exposed to transportation noise above WHO guidelines for day time and night time are publicly available via the online published 'Public Health Outcomes Framework' (PHOF) (Public Health England). The 2011 data (most recent available at time of writing) shows Dudley to have 5.2% of its population exposed to noise greater than guideline levels in the day and 7% at night. This is similar to the values for England as a whole (5.2% and 8%) but less than neighbouring Sandwell MBC (6.2% and 13.4%). The strategic mapping noise estimates are derived from modelling, rather than direct measurement. Whilst they give an overall strategic view, they cannot be used for individual specific sites. Nevertheless the road noise map does give a picture of where road noise levels in Dudley are likely to exceed guideline levels and the likely populations affected. There is substantial exposure to noise levels above daytime guideline in Halesowen, with the sides of major arterial road routes, particularly along the sides of the Southern By Pass and the Birmingham New Road. Overall visual inspection shows no apparent association with deprivation.

Road Noise Probable Level of Noise From Road Sources (dBA)



Population Density Number of Persons Per Hectare



Source: Road Noise, Defra, contains public sector information licensed under the Open Government Licence V3.0. Population density all ages, Census 2011, QS102EW

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“EPIDEMIOLOGICAL STUDIES HAVE SHOWN HIGHER PREVALENCE AND INCIDENCE OF CARDIOVASCULAR DISEASE AND MORTALITY ASSOCIATED WITH HIGH NOISE EXPOSURE.”

“ IN INTERPRETING THESE RATES IT IS WORTH REMEMBERING THAT PEOPLE’S PROPENSITY TO MAKE A FORMAL COMPLAINT VARIES; NOT ALL COMPLAINTS CAN BE OBJECTIVELY VERIFIED; AND THAT LOCAL AUTHORITIES MAY DIFFER IN THE EXTENT TO WHICH MULTIPLE CALLS ABOUT A SINGLE ISSUE ARE COUNTED AS SEPARATE COMPLAINTS.”

The map opposite shows the location of statutory nuisance complaints relating to noise over a three year period in Dudley. At 4.7 nuisance complaints relating to noise per 1,000 population per annum, Dudley is well below England (7.4), but higher than neighbouring Sandwell (3.4) (PHOF). In interpreting these rates it is worth remembering that people’s propensity to make a formal complaint varies; not all complaints can be objectively verified; and that Local Authorities may differ in the extent to which multiple calls about a single issue are counted as separate complaints. The map for Dudley shows no apparent association between noise complaints and deprivation. The area with the highest concentration is Stourbridge. There is scope for implementing a system for further analysis of action taken as a result of a complaint and subsequent tracking of changing complaint rates over time – a system already piloted in Sandwell MBC (Saunders P 2013).

Complainants Per 1,000 Households  
Dudley Census Wards 2012/13-2014/15

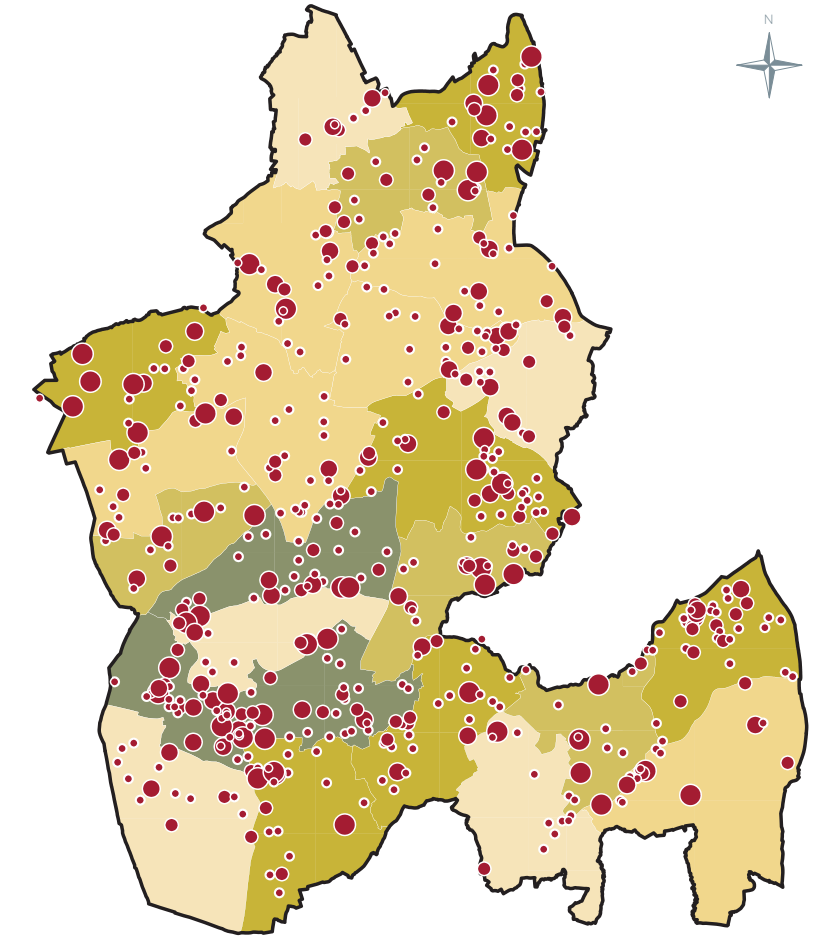
- 11.3 TO 16.4 (3)
- 9.3 TO 11.3 (6)
- 7 TO 9.3 (4)
- 5.6 TO 7 (6)
- 2.6 TO 5.6 (5)

Noise Complaints Location of  
the Noise 2012/13-2014/15

- 1 to 2 (305)
- 2 to 3 (89)
- 3 to 5 (57)
- 5 to 30 (50)



Source: Domestic Nuisance Complaints, locations of the complaints, 2012/13 -2014/15 and the number of complainants per 1,000 households, Environmental Health and Trading Standards, Dudley MBC.  
Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566



# Statutory nuisance

The Environmental Protection Act 1990 places a duty on Local Authorities to take reasonable steps to detect statutory nuisance and, where found, to take action to abate it (often, though not exclusively, by the issuing of an Abatement Notice on the person(s) responsible). The range of matters constituting nuisance is set out in the Act and includes, among others, fumes/odour, accumulations/deposits, animals kept in a manner which may prejudice health – all of which reduce amenity and contribute to environmental degradation. Direct impacts of statutory nuisance on health are not well researched but there is some limited evidence that the immediate local environment can impact on self perceived health and anxiety/depression (Ellaway A et al 2009, Bowling A et al 2006).

Statistical analysis of nuisance complaint data in neighbouring Sandwell Borough found a strong association between rates of nuisance complaint and deprivation (Saunders P 2013).

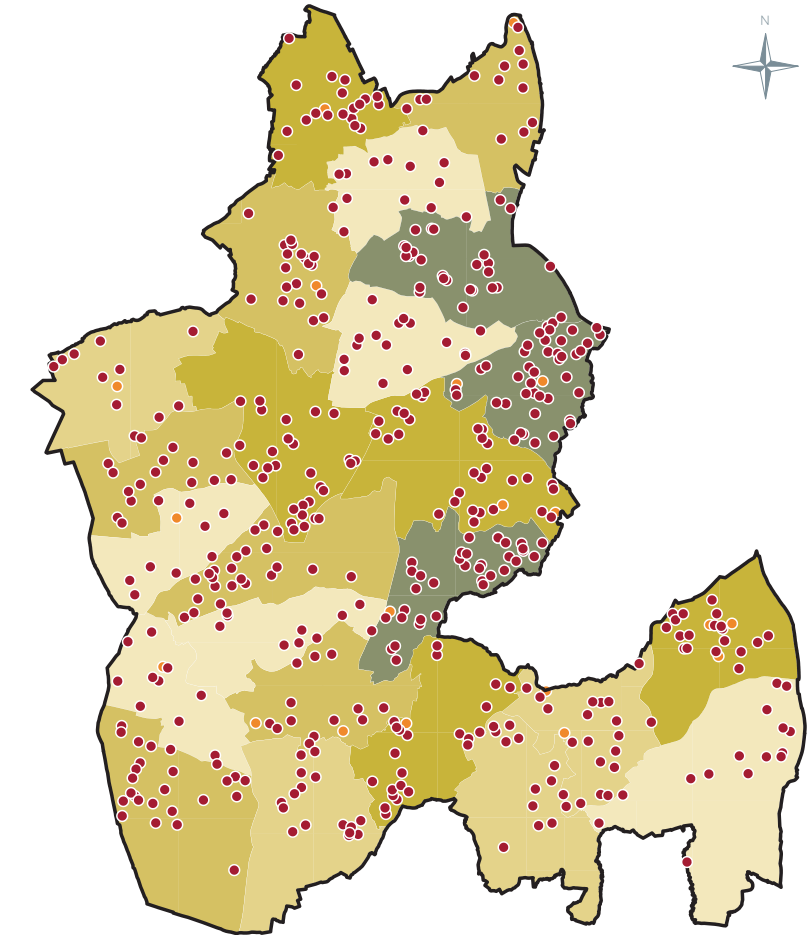
The map opposite shows location and rates of domestic nuisance complaints in Dudley for the three years 2012/13 to 2014/15. Visual inspection shows the highest rates of domestic nuisance complaints to be in some of the most deprived areas of the Borough. This association needs further statistical verification. Monitoring over time would assist in evaluating the efficacy of action taken and improve targeting of local interventions. The use of statistical process control charts as a novel way of tracking complaints over time has been demonstrated in Sandwell (Saunders P 2013).

## Domestic Nuisance Complaints

- Smoke
- Odour

## Domestic Nuisance Complaints Per 1,000 Household Complaints Other Than Noise

	6.11 to 9.1	(3)
	4.67 to 6.11	(5)
	3.46 to 4.67	(6)
	2.92 to 3.46	(4)
	1.43 to 2.92	(6)



Source: Domestic Nuisance Complaints, locations of the complaints, 2012/13 -2014/15 and the number of complainants per 1,000 households, Environmental Health and Trading Standards, Dudley MBC.

Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566

# Vacant premises

Whilst direct health impacts of derelict property have not been documented, vacant premises can contribute to overall environmental degradation. If not well maintained and secure, they can produce a negative visual and aesthetic impact. In extremis they can pose public nuisance, attract crime and catalyse disinvestment in an area leading to a downward spiral into further degradation ('The First broken Window Theory' Kelling G L and Wilson J Q 1982).

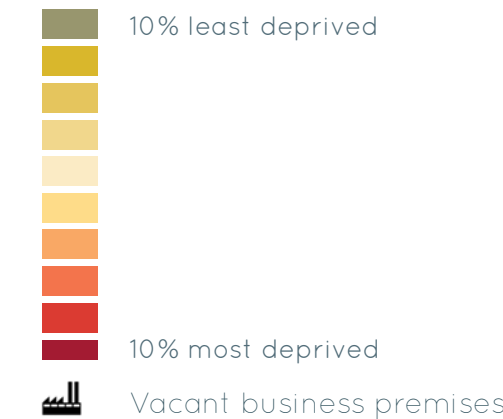
Such problems have become acute in some major urban areas in the US and, to tackle this, formal policies of 'urban shrinkage' have been advocated and implemented. Urban form and the planning legislation in the UK have meant that such problems are less widespread and much less acute than the US. Nevertheless vacant business premises represent underuse of the physical infrastructure and can become attractors for anti social behaviour, downgrading local neighbourhood environmental quality.

While there has been national and local focus on bringing empty residential property back into use, not all Local Authorities have explicit strategies or focus on empty commercial property. For example, Dudley MBC has a published 'Empty Homes Strategy' but no comparably focussed strategic document in relation to empty commercial property.

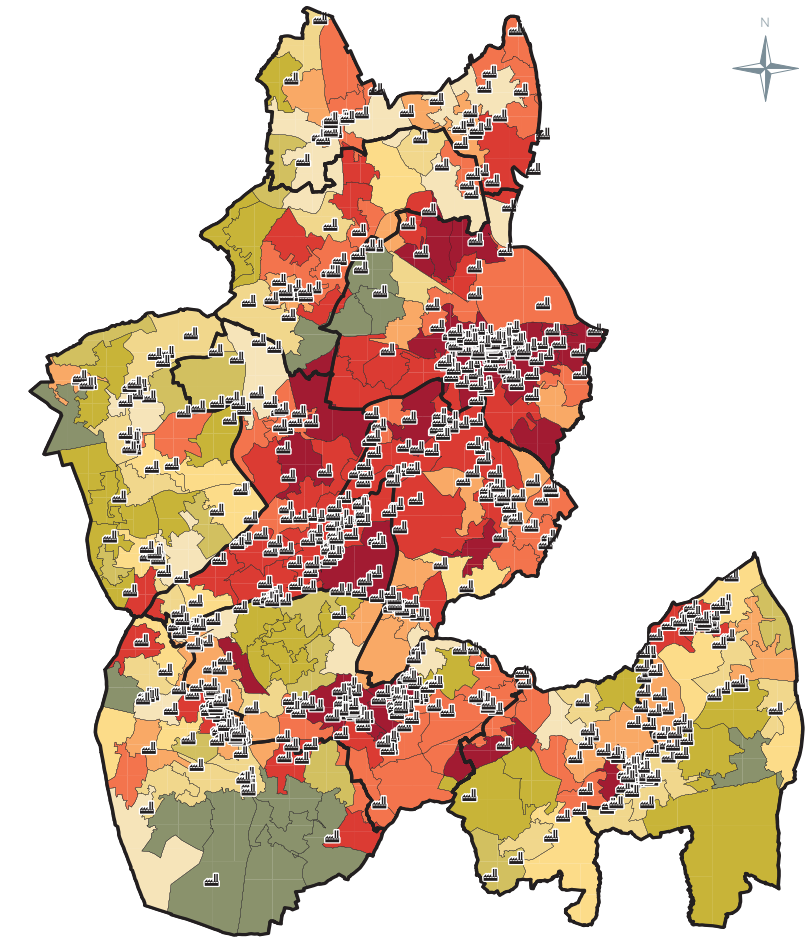
Changing patterns in retail shopping and economic trends are leading to lower demand for retail and office space and the concept of 'shrinkage' of these types of infrastructure and conversion to residential space has much to offer if applied in a strategic, systematic and monitored fashion.

The map opposite shows vacant business premises in Dudley at the time of writing. There is substantial alignment with Dudley's deprived areas. So the consequential loss of amenity impacts more heavily on the most deprived.

Income Deprivation Domain  
2010 National Deciles



Source: Vacant Business Premises April 2015, Revenue Services Division, Dudley MBC, English indices of deprivation 2010 Income Domain, Department for Communities and Local Government, Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566



# Road traffic casualties

A road traffic injury is a fatal or non-fatal injury incurred as a result of a collision on a public road involving at least one moving vehicle. Road traffic crashes (WHO eschews the word 'accident') exert a preventable toll of death, illness, and disability, with further effects on families, health services and the economy. For the injured, severe impairment may be a lifetime consequence. Psychological disturbance and illness is common and may be severe in as many as 1 in 10 victims (Mayou R et al 1993, Li L et al 2001).

WHO estimate that, worldwide, for every road death there are 15 injuries requiring hospital treatment and 70 minor injuries. Road traffic injury is the leading cause of death for 5-19 year olds in Europe (WHO 2004). In 2012 in England, one in every 1,250 young people between the ages of 15-24 years suffered a serious or fatal traffic injury. An analysis of five years data for England for this age group showed the risk for males to be three times that of females (PHE 2014).

Though there has been a secular trend of decline in reported road deaths and injury in Great Britain over recent decades, 2014 saw a 4% rise in road deaths and a 6% rise in reported casualties of all severities. Three quarters of the increase in road deaths was accounted for by fatalities in pedestrians. This is associated with increased exposure, as traffic volumes have increased.

At 31.3 per 100,000, Dudley's rate of killed or seriously injured casualties for 2011-13 is significantly lower than the England average (39.7) and lower than neighbouring Birmingham (38.9) and Sandwell (34.7), though on a par with Wolverhampton (31.2) and higher than Walsall (26.1). Admissions of Dudley residents to hospital totalled 328 in 2014 – almost 1 a day.

There is a strong association between the rate of road traffic death/injury and deprivation. Analysis of England road traffic data for the years 2008-2012 has shown that among pedestrians in the 5 to 9

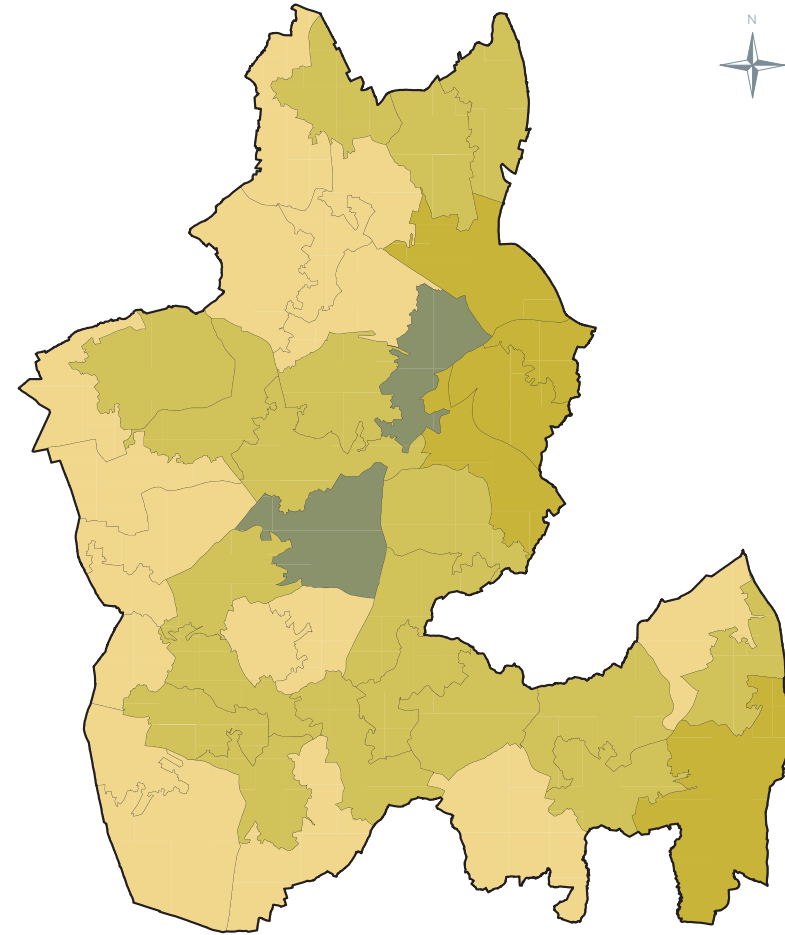
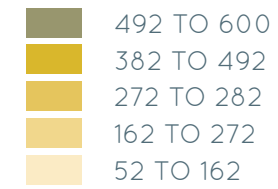
years age group, the rate of fatal and serious injuries to children living in the 20% most deprived areas is nine times higher than to children in the 20% least deprived (24 killed or seriously injured (KSI) per 100,000 and 2.6 per 100,000 respectively). Among 10 to 14 year old pedestrians, there was a 3.7 times greater rate, with respectively 37 KSI per 100,000 compared with 10 KSI per 100,000. Among those aged 10 to 14 years there were 4 fatal or serious injuries per 100,000 people in the least deprived 20% of areas, compared with 10 KSI per 100,000 in the 20% most deprived (PHE 2014).

The maps overleaf show rates of all casualties and rates of death and serious injury from road traffic for middle super output areas in Dudley for the years 2005-2013. In both instances the highest rates are in the deprived inner core of the Borough. Measures to reduce road traffic crashes would contribute to reducing health inequalities in the Borough.

**“AMONG PEDESTRIANS IN THE 5 TO 9 YEARS AGE GROUP, THE RATE OF FATAL AND SERIOUS INJURIES TO CHILDREN LIVING IN THE 20% MOST DEPRIVED AREAS IS 9 TIMES HIGHER THAN TO CHILDREN IN THE 20% LEAST DEPRIVED...”**

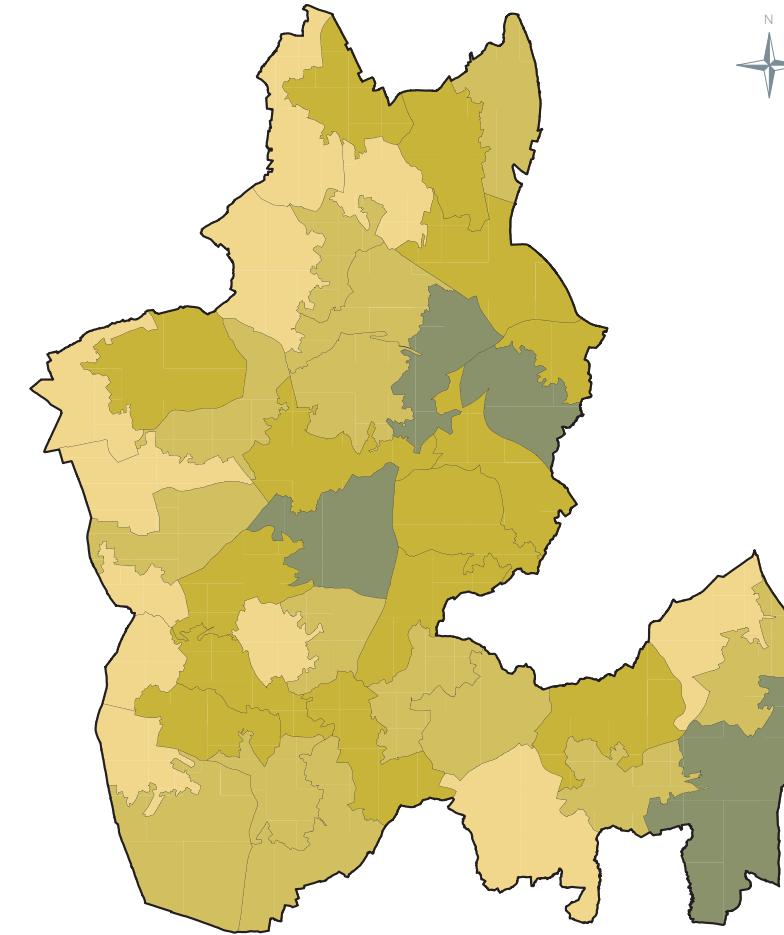
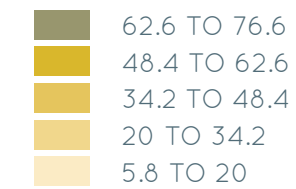


Rate of All Casualties Per 100,000 Population by Middle Super Output Area



Source:ONS Mid-year Small Area Population Estimates 2005-2013  
 Road Accident Data 2005 - 2013, Department for Transport.  
 Map created by Public Health Intelligence, Office of Public Health  
 Dudley, Topographic data © Crown copyright and Database Rights  
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Rate of Fatal or Serious Road Casualties per 100,000 Population by Middle Super Output Area



Source:ONS Mid-year Small Area Population Estimates 2005-2013  
 Road Accident Data 2005 - 2013, Department for Transport.  
 Map created by Public Health Intelligence, Office of Public Health  
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# Takeaways

The number of fast food takeaways has grown rapidly in recent years. For example, in Coventry, despite the number of fish and chip shops dropping from 61 to 31 between 1978 and 2008, the total number of fast food outlets increased from 27 to 141 (McDonalds and Allegra 2009). Concentration of fast food outlets varies from Local Authority to Local Authority and a greater concentration in deprived areas has been observed, though this is not universally the case (CIEH 2014).

Whilst takeaways provide easily accessible convenient food, it has been found that the meals provided are often energy dense, with high levels of sugar, fat, saturated fat and salt. Trans fatty acids (TFA) have been of particular concern. The consumer magazine *Which* rated a selection of takeaway portions against recommended daily intakes and found that one 'Indian' takeaway could contain as much as 23.2g of saturated fat – more than the recommended 20g maximum for a woman for the whole day. A more extensive and systematic sampling of takeaway meals has been conducted in Sandwell, UK (an immediately adjacent borough to Dudley) (Saunders P and Saunders A 2014). Samples were analysed for total fat, saturated and unsaturated fats, TFAs and salt. Fats and fatty acid levels are of particular concern because of their

implication in causation of obesity and coronary heart disease and salt in the production of hypertension – all of which are major contributors to the disease burden in Dudley (Dudley MBC 2014). The Sandwell study found that not only were products mis-sold (eg in fish and chips 'hake' was actually Pangasius), many of the meals exceeded guideline daily allowances (GDA). It has been recommended (Wellard L 2012) that a single meal should not exceed 30% GDA. 71 out of 104 of the Sandwell samples did so for at least one measure and pizzas exceeded the recommendation for all measures (one being 203% GDA saturated fat for women and children). The authors conclude that there are hazardous levels of exposure to fats, saturated fats and salt in takeaways particularly in Sandwell.

So, areas with high concentrations of takeaways where the nutritional composition of the meals sold is poor represent a potentially health harming hazardous environment. It is for this reason that some Local Authorities have sought to use the powers available to them to limit the spread and density of fast food takeaway outlets. Dudley is one of these. In 2013 it adopted a Supplementary Planning Document (SPD) (Dudley MBC 2013) which recognises the need to reduce the proliferation of hot food takeaways. The policy includes 400m

'exclusion zones' around schools and youth centres. Any proposals for new hot food takeaways (use class A5) within these zones will not be granted planning permission. There is further guidance on 'protected frontages' which is designed to reduce the concentration of hot food takeaway outlets (no more than 5% of units to be A5 use; no more than 2 A5 uses adjacent to one another; no adverse impact on public or highway safety). In residential areas consideration has to be given to a range of impacts on residential amenity. Since 2013 no planning applications for hot food takeaways near schools have been approved. It is important to ensure that the impact of this planning policy continues to be systematically monitored.

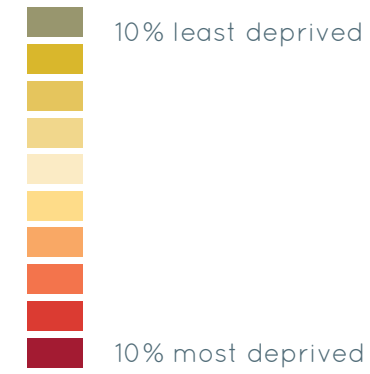
Of course the existing outlets remain and, as the point map of outlets in relation to income deprivation overleaf shows, almost all areas of Dudley are within close proximity. The thematic map shows where takeaway outlets are concentrated relative to child poverty and a degree of clustering in the deprived areas can be observed. Visual observations of association of fast food outlets with deprivation have been confirmed by a more rigorous statistical analysis (Rudge G et al in press). The major cluster in the centre of the Borough is, in part, attributable to the Merry Hill shopping centre which has a concentration of outlets.

The extent to which takeaway meals represent a hazard to health in Dudley remains inadequately understood, given that there is no sampling and nutritional analysis of the meal composition. This

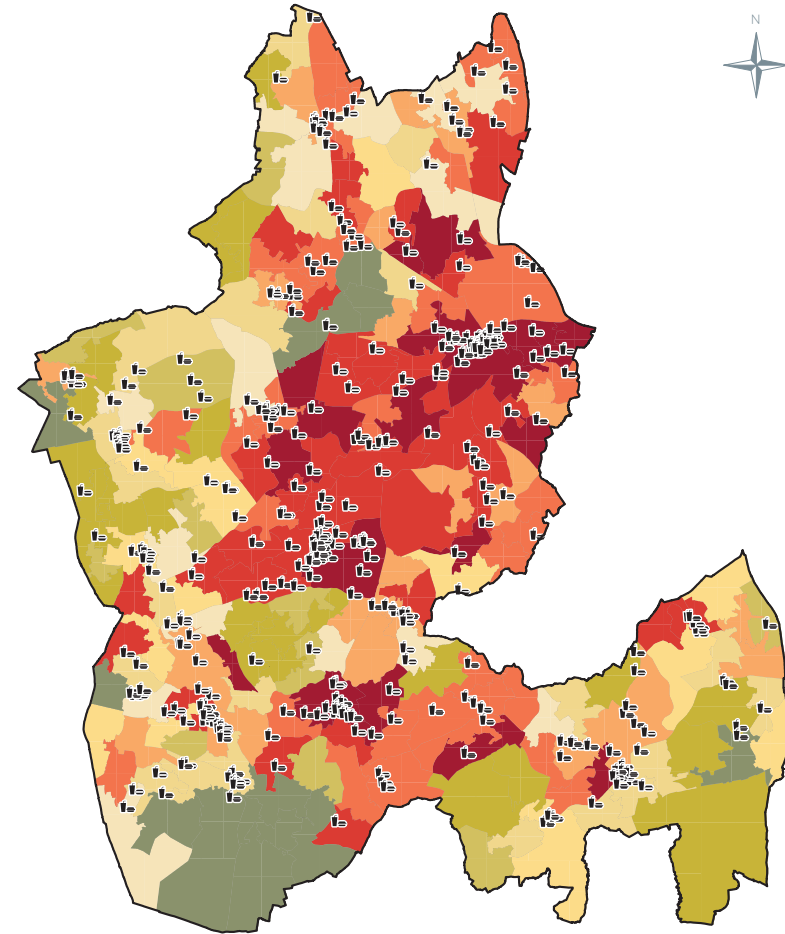
could be readily remedied by a revision of the current 'Healthy Food Award' scheme to embrace sampling with follow on advice to businesses where the composition is likely to form a public health threat. For obvious reasons mobile hot food outlets are not shown on these maps but a similar approach, coupled with a re-examination of licensing policy could be adopted.

**“FATS AND FATTY ACID LEVELS ARE OF PARTICULAR CONCERN BECAUSE OF THEIR IMPLICATION IN CAUSATION OF OBESITY AND CORONARY HEART DISEASE AND SALT IN THE PRODUCTION OF HYPERTENSION – ALL OF WHICH ARE MAJOR CONTRIBUTORS TO THE DISEASE BURDEN IN DUDLEY...”**

Income Deprivation Domain  
2010 National Deciles

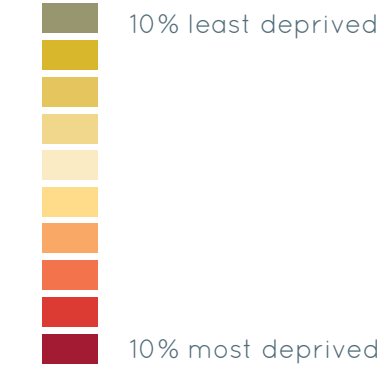


Takeaways

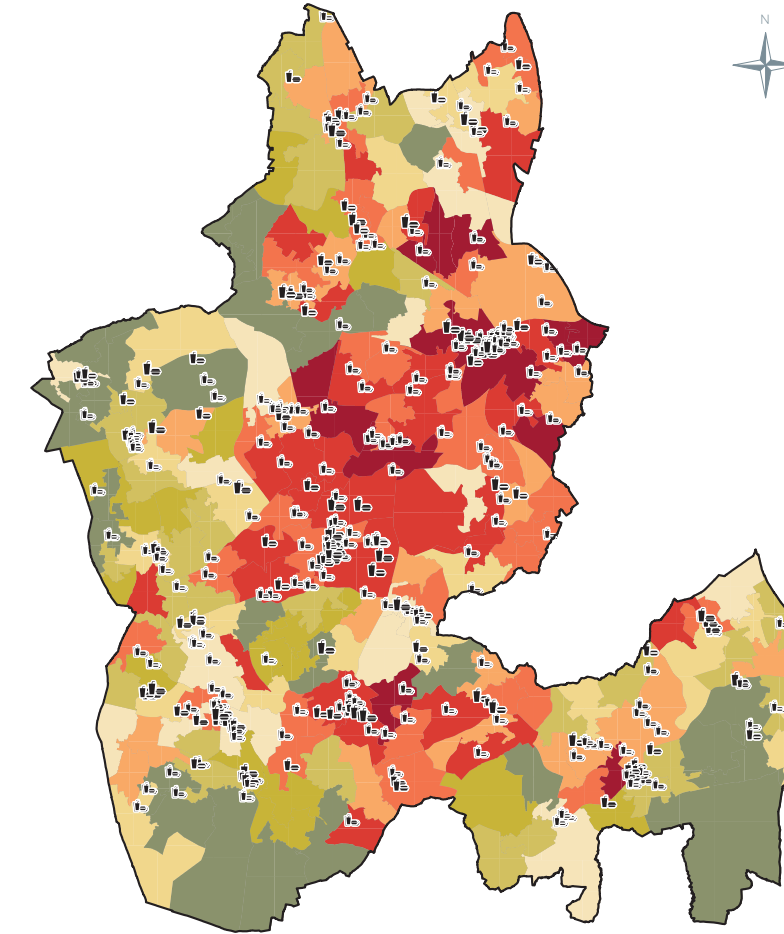
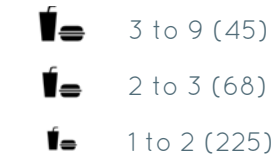


Source: Environmental Health and Trading Standards, Dudley MBC, English indices of deprivation 2010 Income Domain, Department for Communities and Local Government  
Map created by Public Health Intelligence, Office of Public Health Dudley, Topographic data © Crown copyright and Database Rights (2015) Licence No. 100019566

Children Under 16 Years in  
Low-income Families National Deciles



Numbers of Takeaways



Source: Environmental Health and Trading Standards, Dudley MBC, personal tax credits: Children under 16 years in low-income families  
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# Green spaces

There is a growing epidemiological literature demonstrating a positive association between access to green space and better health outcomes. The most recent evidence review (Balfour R & Allen J 2014) concluded that access to quality green space has been found to be associated with better self-rated health; lower Body Mass Index (BMI) scores; improved mental health; and increased longevity in older people.

For example, one large scale study (Astell-Burt T et al 2014) investigated the rate of type 2 diabetes in middle to old age Australians and found (after controlling for demographic, cultural and neighbourhood factors) that the risk of developing type 2 diabetes decreased consistently in greener areas. The risk was significantly lower in areas with 40% or more green space land use. Similar findings have been demonstrated for cardiovascular (CVD) risk (Richardson E A et al 2013) where with every 15% of green space availability the risk of CVD decreased, though a dose-response relationship was not demonstrated. Whilst epidemiological association is well documented, causal pathways have yet to be fully elucidated. It seems reasonable to hypothesise, though, that the risk reduction effect for vascular disease is mediated through increased physical activity, for which green space provides enhanced opportunities.

Further studies show positive association between better mental health and proximity to green space (Balfour R, Allen J, 2014). For example, a panel study recording General Health Questionnaire (GHQ) scores (White M P et al 2013) showed that people living in greener areas experienced significantly lower levels of mental distress. There is systematic review evidence (Coon JT et al 2011) that exercising outdoors in green spaces (as opposed to indoors) is associated with additional benefits to wellbeing. Many of the studies cited are cross sectional.

A more recent longitudinal study using British Household Panel data examined the effects of green space on mental health over time (Alcock I et al 2014) by comparing mental health scores in people moving to greener or less green urban areas. On average, movers to greener areas experienced an immediate improvement in mental health which was sustained for at least three years after moving. Movers to less green areas showed an immediate decline in mental health followed by a return to baseline levels.

Green space confers health benefits but these will not accrue to all if access is unequally distributed. Equally, accessibility to green space may ameliorate some of the adverse health impact of income inequality (Mitchell R and Popham F 2008).

Not all green space is of equal quality and there may be barriers to access other than distance, for example, perceptions of personal safety. In assessing the potential for green space to contribute to improved health, the quality and maintenance of the space needs to be factored in. Dudley's government-funded Healthy Towns programme demonstrated that improving facilities in urban parks led to increased park use and the value placed on them by users, with evidence suggesting increased attainment of physical activity guideline recommendations in communities local to the improved parks (Peters D M & Jones C V 2011).

Proximity is a first measure of accessibility. Natural England's Green Space Standard states that all people should have accessible natural green space of at least 2 hectares (ha) in size no more than 300m (estimated 5 minute walk) from home; and at least 1 accessible 20ha site within 2km of home. The maps overleaf show these standards applied to Dudley.

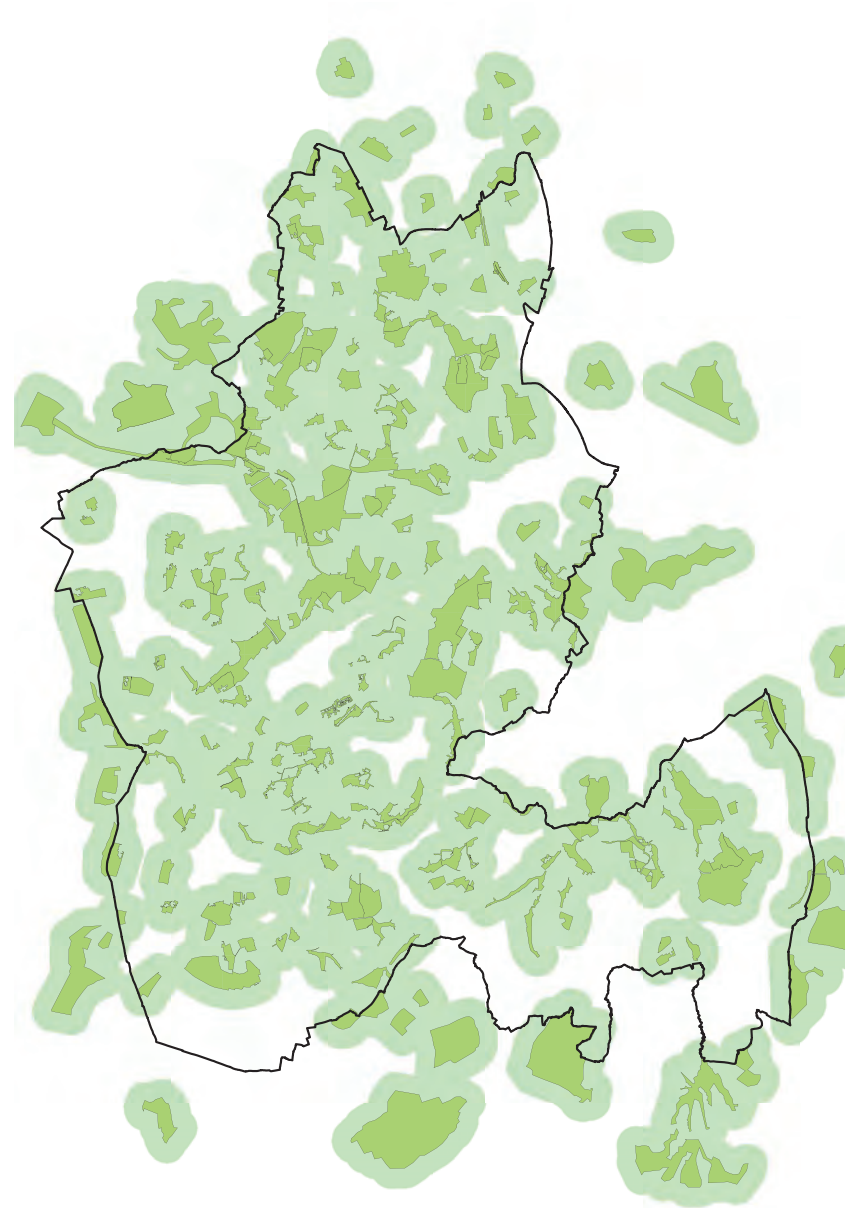
The 2ha site standard is met for the majority of the Borough, but there remain areas where it is not. Some of these are areas of low population density but most are not. Future spatial plans for the Borough need to address this deficit. The 20ha site standard is met for the Borough, with

the exception of a deprived area along the formerly heavily industrialised Lye valley and a small highly income deprived area on the northeast tip of Coseley. Again this needs to be remedied in the spatial planning for the Borough if all residents are to have the opportunity to gain the health benefits which accessible green space confers.

**“ ACCESS TO QUALITY GREEN SPACE HAS BEEN FOUND TO BE ASSOCIATED WITH BETTER SELF-RATED HEALTH; LOWER BODY MASS INDEX (BMI) SCORES; IMPROVED MENTAL HEALTH; AND INCREASED LONGEVITY IN OLDER PEOPLE.”**

Green Spaces  
2 Hectares or More

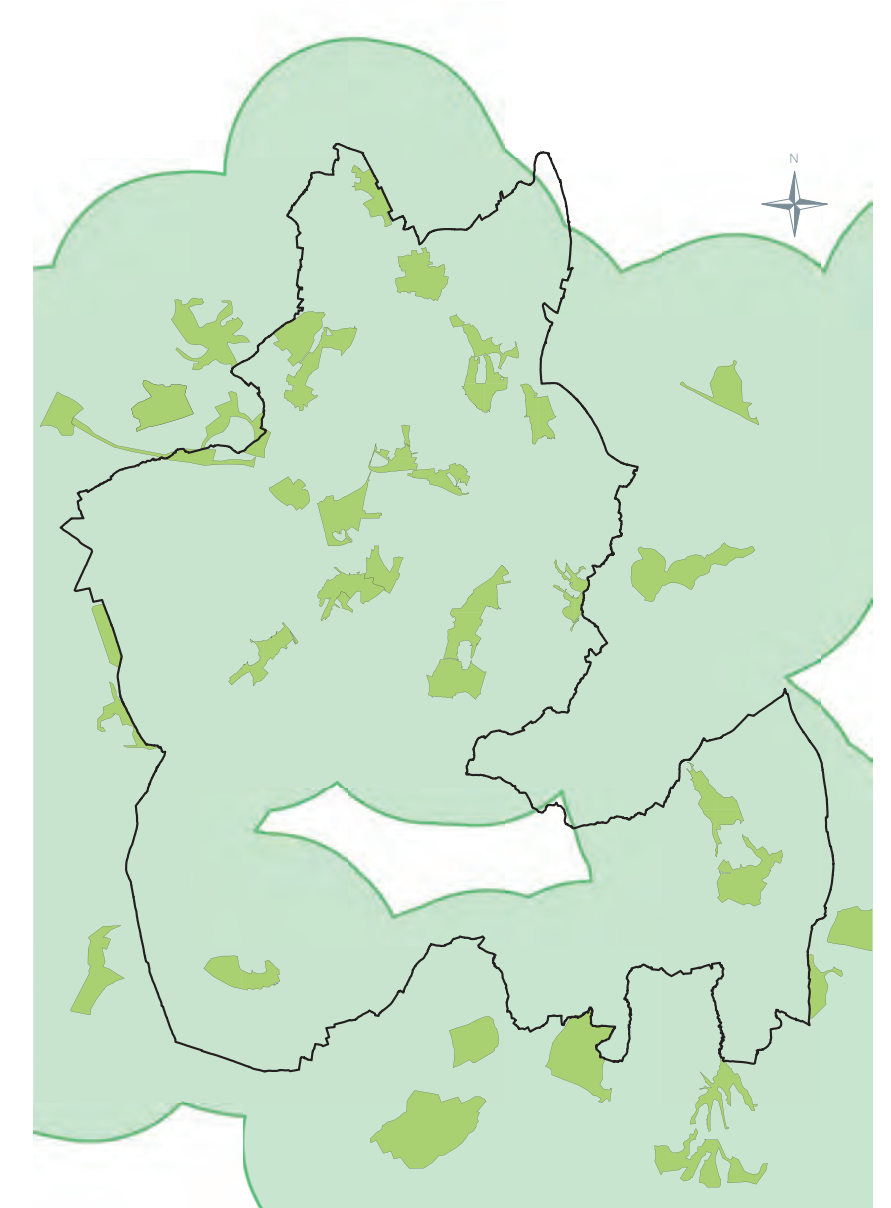
- Green space
- 300m buffer



Source: Dudley MBC website (<http://www.dudley.gov.uk/see-and-do/parks-open-spaces/play-facilities/>)  
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Green Spaces  
20 Hectares or More

- Green space
- 2km buffer



Source: Dudley MBC website (<http://www.dudley.gov.uk/see-and-do/parks-open-spaces/play-facilities/>)  
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# Allotments

In the UK, allotments derive from the enclosure legislation of the eighteenth and nineteenth centuries. The General Inclosure Act of 1845 required provision for the landless poor in the form of field gardens (Select Committee on Environment, Transport and Regional Affairs 1998). Allotments are a particular class of green space, semi public in character, where the plots of land are cultivated by individuals and their families (as distinct from community gardens which are cultivated collectively).

Major increases in allotment land occurred during the first and second world wars, with decreases after each war end. There remains a legal requirement for Local Authorities to provide allotment gardens where demand exists. Not all allotments are on Local Authority land. There has been concern over a decrease in land allocated for allotments over recent decades, with loss of land to developers despite the element of statutory protection which applies to allotment land. Legislation to protect and enhance allotments is patchy and generally recognised as needing to be overhauled. There were an estimated quarter of a million plot holders in England when a select committee of the House of Commons reported on the subject in 1998. More recent surveys (Campbell M & Campbell E 2013) suggest that, at an

estimated average of 52 people waiting per 100 plots in England, demand remains high. A local study of five allotments in Newcastle UK has suggested that the profile of allotment holders is changing (Ferres M & Townshend T G 2012), with interest in gardening starting at a younger age and the proportion of female gardeners increasing.

Qualitative and ethnographic studies have provided some evidence of the benefits of allotment gardening (Ferres M & Townshend T G 2012, Schoneboom A 2010) through stimulating physical activity; facilitating relaxation and stress reduction; and facilitating social interaction. There is speculation that the latter may contribute to increased individual and community resilience, facilitating adaptive response to adversity (Ferres M & Townshend T G 2012). One field experimental study in the Netherlands (Van Den Berg A E & Custers M H 2011) has shown the stress relieving effects of allotment gardening. 30 allotment gardeners performed a stressful task and were then randomly allocated to 30 minutes outdoor gardening or indoor reading on their own allotment plot. Repeated measurement of salivary cortisol levels and self reported mood showed that both reading and gardening led to reduced cortisol levels, but the decreases were significantly stronger

in the gardening group, who also showed positive mood restoration compared with the affective deterioration in the reading group.

Further evidence from the Netherlands (Van Den Berg A E et al 2010) has shown that, after adjusting for income, education level, gender, stressful life events, physical activity in winter and access to a garden at home, both younger and older allotment gardeners reported higher levels of summer physical activity than their age matched groups of non-allotment gardening neighbours. Health and wellbeing measures were significantly higher in older (62+ years) gardeners, though the same difference was not found in the younger group. The findings of this single study are consistent with the proposition that allotment gardening promotes an active lifestyle and may contribute to healthy ageing. There appear to be no studies in the English language which examine the quantitative relationship of allotment accessibility and deprivation.

The map overleaf shows allotment sites in Dudley, with a 1km boundary around them to indicate accessibility. This equates to approximately 15 minutes walking. The walking time was identified in a Dudley residents survey as the time people would

be prepared to walk to local green spaces (Dudley MBC 2009). A Dudley green spaces audit conducted in 2008 identified 41 allotment, community garden and urban farm sites in the Borough covering a total of 41.13 ha of land – just under 2% of the Borough's land area and only 0.13 ha per 1,000 head of population (Dudley MBC 2009). The audit identified under provision of allotment space in the Borough citing evidence from waiting lists as suggesting unmet demand. The residents survey referred to earlier showed that approximately one third of respondents knew little about allotments, indicating potential for latent demand if public knowledge were greater.

The map shows that there is poor accessibility to allotments in the centre of the Borough, particularly in the income deprived areas of Brierley Hill and Bromley Pensnett. There is also underprovision in parts of Stourbridge. Given the health and social benefits of allotment gardening, remedying the identified underprovision should be an early focus for the Borough, prioritising Brierley Hill and Bromley Pensnett.

Allotments

- Allotments
- 1km buffer



Source: Dudley MBC website (<http://www.dudley.gov.uk/see-and-do/parks-open-spaces/play-facilities/>)  
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“THE MAP SHOWS THAT THERE IS POOR ACCESSIBILITY TO ALLOTMENTS IN THE CENTRE OF THE BOROUGH, PARTICULARLY IN THE INCOME DEPRIVED AREAS OF BRIERLEY HILL AND BROMLEY PENSNETT. THERE IS ALSO UNDERPROVISION IN PARTS OF STOURBRIDGE. GIVEN THE HEALTH AND SOCIAL BENEFITS OF ALLOTMENT GARDENING, REMEDYING THE IDENTIFIED UNDERPROVISION SHOULD BE AN EARLY FOCUS FOR THE BOROUGH.”

# Play areas

That play is crucial to a child's healthy development is now well evidenced. Active play has a major role in the achievement of physical activity guidelines (Department of Health 2011). Walking pre-school children should be physically active for at least three hours spread throughout the day. Children and young people (5-18 years) should engage in moderate to vigorous intensity activity for at least 60 minutes and up to several hours a day, with vigorous intensity activities at least three days a week. All children should minimise the amount of time being spent sedentary (sitting). Achievement of guideline activity for all children in Dudley would make a major contribution to reducing the unacceptably high levels of childhood obesity in Dudley, where one in 10 children entering school in 2013-14 and almost a quarter of year 6 primary school children were obese (National Obesity Observatory 2015).

A developing body of research on children and the outdoors (Munoz A 2009) includes the finding that there is a relationship between time spent outdoors and physical activity and it is increasingly recognised that play outdoors can provide enhanced benefits for children. It is

generally more physically demanding and may contribute to motor development, as well as development of strength, balance and co-ordination (Fjortoft I 2004). A US longitudinal study suggests that 'greenness' or degree of contact with nature in a child's everyday environment is conducive to enhanced cognitive functioning of children residing in poor urban neighbourhoods (Wells N M 2000). Children with Attention Deficit Hyperactivity Disorder (ADHD) have been found (Taylor A F et al 2001) to function better than usual after activities in green settings and the 'greener' a child's play area the less severe the attention deficit symptoms during and immediately after play.

Parents are the boundary setters for children's outdoor play (Munoz A 2009). Their assessment of the suitability and safety of outdoor spaces will determine the amount of outdoor play which children engage in. It appears that there are increasing restrictions on children's independent mobility in outdoor environments (Mackett R and Paskins J 2004) connected with parental perception of a lack of safety. Whilst children themselves may prefer to play in natural spaces (White R 2006) designated play areas with their safety features may be more

attractive to parents and hence incentivise outdoor play by removing the barrier of parental safety fears.

The map overleaf shows the distribution of open access designated play areas in Dudley with 300m (5 minute walking distance) zones around them. In general they are spread relatively evenly across the Borough and there does not appear to be any correlation with deprivation geography. What this short review has highlighted, though, is the need to examine more closely the extent to which play areas offer children an encounter with nature and natural materials, but in a setting perceived by parents to be 'safe'; thus gaining the enhanced health benefits for Dudley's children which this type of provision can bring. The health benefits of children's play areas can potentially be increased by making them smoke-free. This measure, in the form of a voluntary code, has already been implemented by some Local Authorities in England and early evaluation suggests 'overwhelming support' from the public with observed behaviour change in the play areas themselves (Bennett A M 2014). Similar measures could be implemented in Dudley to further enhance the health benefits of the Borough's play areas.

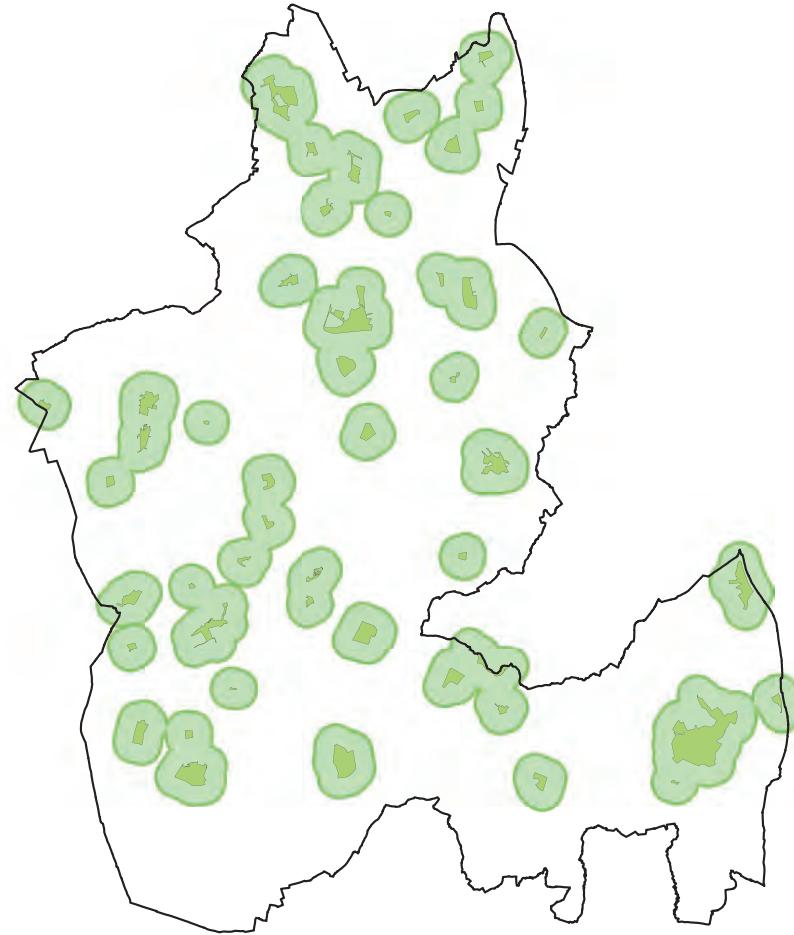


Play Areas

- Play areas
- 300m buffer



Source: Dudley MBC website (<http://www.dudley.gov.uk/see-and-do/parks-open-spaces/play-facilities/>)  
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“ WALKING PRE-SCHOOL CHILDREN SHOULD BE PHYSICALLY ACTIVE FOR AT LEAST THREE HOURS SPREAD THROUGHOUT THE DAY. CHILDREN AND YOUNG PEOPLE (5-18 YEARS) SHOULD ENGAGE IN MODERATE TO VIGOROUS INTENSITY ACTIVITY FOR AT LEAST 60 MINUTES AND UP TO SEVERAL HOURS A DAY, WITH VIGOROUS INTENSITY ACTIVITIES AT LEAST THREE DAYS A WEEK.”

# Walking and cycling routes

Physical inactivity is now a threat to health worldwide (Hallal P C et al 2012). The UK is no exception. National population surveys have shown that around one in two women and a third of men in England are putting their health at risk through lack of physical activity. Physical inactivity has been estimated to contribute to one in six deaths in England (Varney J et al 2014).

A third (33%) of adults in Dudley are estimated to undertake less than 30 minutes of moderate intensity physical activity in a week (Public Health England Public Health Outcomes Framework 2014).

The Chief Medical Officers Guidelines (Department of Health 2011) for physical activity recommend that adults should aim to be active daily. Over a week, activity should add up to at least 150 minutes (2.5 hours) of moderate intensity activity in bouts of 10 minutes or more – one way to approach this is to do 30 minutes on at least 5 days a week. Alternatively, comparable benefits can be achieved through 75

minutes of vigorous intensity activity spread across the week or combinations of moderate and vigorous intensity activity. Adults should also undertake physical activity to improve muscle strength on at least two days a week. All adults should minimise the amount of time spent being sedentary (sitting) for extended periods. Brisk walking and cycling are examples of moderate intensity physical activities.

Walking and cycling may be for recreation or for purposive travel from place to place (eg home to work, home to shops). The latter provide the opportunity to incorporate walking and cycling into everyday life.

Travel survey data (1985-2010) shows that there has been a decline in England in the number of walking trips made. Similarly, cycling has declined over the decades from 13% modal share in 1952 to just 1% in 1970 and has remained at that level since. (Cabinet Office 2009). While just over half (53%) of all Dudley schoolchildren walk to school, 35% of Dudley

schoolchildren still travel by car (Dudley MBC 2014). Data from evaluation of Travel Town demonstration sites in England suggests that about half of all trips currently made by car in urban areas could, in principle, be shifted to walking, cycling, or public transport. In depth interviews with people who have used their car for short trips (under five miles) found that alternatives to car use could be identified for 78% of short trips (Mackett R L and Ahern A 2000).

Attitudinal research amongst Londoners (Transport for London 2014A) found that 72% of respondents say that they would increase their walking if there were 'new and improved walking routes for pleasure'. The key barrier to cycling among Londoners was concern about safety (cited by 80% of respondents) (Transport for London 2014B).

The iConnect study aimed to measure and evaluate the changes in travel, physical activity and carbon emissions related to Sustrans' Connect2 programme, which was a UK-wide project to increase active local travel by creating new crossings and bridges to overcome barriers such as busy roads, rivers and railways, giving people easier access to common destinations such as schools, shops, parks and countryside. The five-year iConnect study (2008-2013) involved evaluation of the whole programme, coupled with detailed investigations at specific sites. Evaluation at three sites (Goodman A et al 2014) examined the effects of providing these new high quality traffic free routes for walking and cycling on overall levels of walking, cycling and physical activity. Transport difference from home to infrastructure

defined intervention exposure and provided the basis for controlled comparisons. Living near the new routes was not a predictor for changes at one year, but did predict increases in physical activity at two years relative to those living further away. For every 1km nearer to the route an additional 15.3 minutes per person per week were found for walking and cycling. Effects were greater for participants with no car. This suggests that while, in the short term, there may have been trip displacement, in the longer term new trips were generated. The findings support the potential for traffic free walking and cycling infrastructure to increase physical activity.





Association between deprivation and access to designated walking and cycling routes does not seem to have been the subject of substantive research to date. National survey data indicates that those living in income deprived areas are twice as likely to be physically inactive as those living in more affluent areas (Varney et al 2014). Siting walking and cycling routes through deprived areas would provide opportunities for easier access to safe and convenient outdoor recreational physical activity, but there is a need for further substantive research into the impact of increased walking and cycling infrastructure on health inequalities.

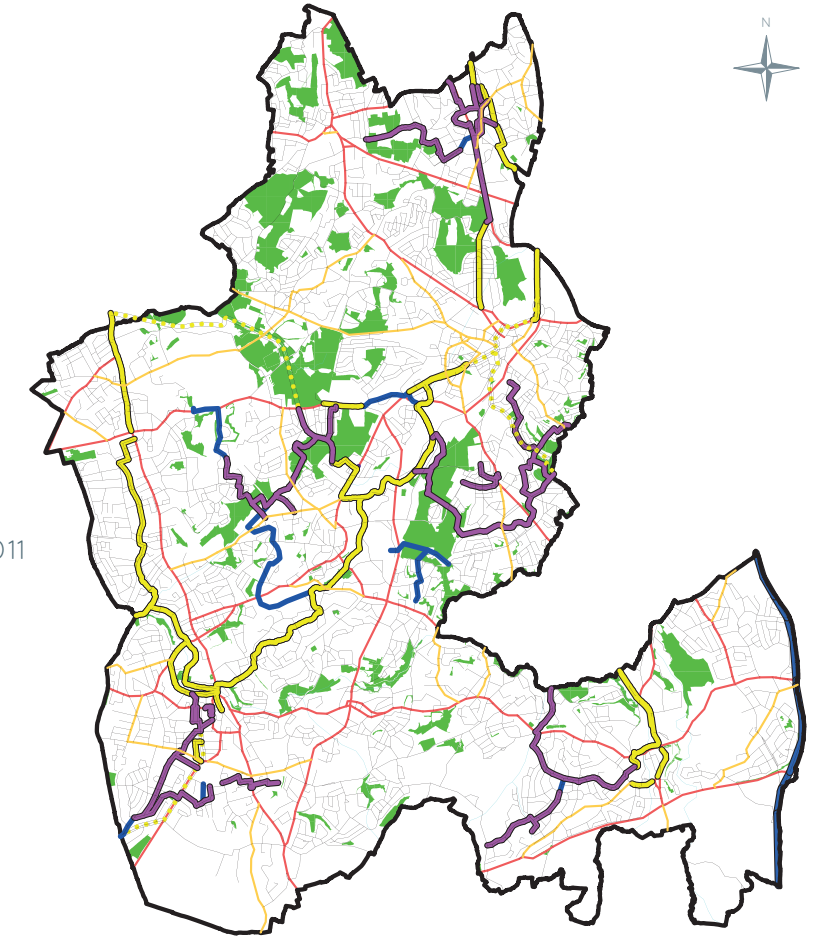
In 2014 Dudley had 210 kms of footpaths of various types and bridleways. There were approximately 13 kms of cycle paths (Dudley MBC 2014). The map opposite shows those routes which are designated walking and cycling routes in Dudley. The routes include part of the national cycle network. The

“ THE LOW LEVELS OF PHYSICAL ACTIVITY ASSOCIATED WITH PEOPLE LIVING IN DEPRIVED AREAS SUGGESTS THAT PRIORITY SHOULD BE GIVEN TO ESTABLISHMENT OF NEW ROUTES IN DEPRIVED AREAS.”

2007 network was added to in 2011 as part of the Government funded 'Healthy Towns' project, which funded walking and cycling routes to designated 'Healthy Hubs' in local parks. There has been some addition to the network since 2011, though some routes proposed in 2007 remain to be completed. Overall there is no bias towards more affluent areas. The Lye valley and north Sedgley areas are notable gaps. The low levels of physical activity associated with people living in deprived areas suggests that priority should be given to establishment of new routes in deprived areas.

Cycle/Walking Routes

-  Cycle/walking routes 2007
-  Cycle routes proposed 2007
-  Cycle/walking routes added healthy towns 2011
-  Cycle/walking routes added since 2011



Source: Dudley MBC, Traffic & Transportation  
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# Public transport

Incorporating walking and cycling in to everyday life delivers the health benefits of physical activity (Varney J et al 2014). The beginning and end of a public transport trip often involve some walking to the next destination. Regular public transport provides an important opportunity for physical activity. Quantification of that opportunity has received relatively little research attention. A systematic review of physical activity associated with public transport use (Rissel C et al 2012) found 9 papers reporting a range of 8-33 minutes additional physical activity per day associated with regular transport use. Switching trips from cars to public transport use can also provide indirect population health benefits by contributing to reduction of harmful emissions to air.

Following a period of decline, nationally, rail journeys in Great Britain have shown increases since the mid 1990s, doubling between 1994/95 and 2013/14 (Department for Transport 2014). Rail passenger

journeys in the West Midlands conurbation have increased annually since 1998 and, at 10.1m journeys per 100,000 population in 2013/14, were the second highest metropolitan journeys per head (Centro 2014).

However buses remain the most frequent form of public transport used. Bus trips constitute two thirds of all public transport trips in England. Trends in bus use have varied dramatically between London and the rest of England. Decades of decline in bus use have been halted and reversed in London yielding an overall increase of 10% between 1985/86 and 2014/15. By contrast, outside London bus use has declined by 37% over the same period (largely due to a 10% reduction in mileage on Local Authority supported services outside London). West Midlands conurbation bus use has declined by 40% over the same period. In Dudley, subsidised routes accounted for 17% of annual bus service kms in 2013/14. Since 2012/13 there have been more annual bus passenger

journeys in London than in the whole of the rest of England (Department for Transport 2015). The major users of buses are young people and older people. Recent years have seen a rise in bus use by 17-20 year olds and those over 60 years.

Price is a barrier to modal shift (Department for Transport 2012). Concessionary travel has been a major driver of increased use of public transport. Concessionary journeys now make up approaching a third (30%) of all bus journeys outside London. Overall, though, fiscal incentives do not support the healthy choice. Between 1997 and 2015 motoring costs decreased by 10% in real terms while rail fares increased by 23% and bus fares by 25% (Department for Transport 2015).

The contribution of concessionary fares to population health benefit should be included in any assessment of policy changes in their level.

The maps overleaf show bus/rail routes in Dudley and calculated zones of the Borough with a population living within 400m of a high frequency bus service (a minimum of a bus every 30mins 07.00-12.00hrs and 16.00-18.00 hrs). 97% of the Dudley Borough's population lives within these zones. There does not appear to be a deprivation bias in access to public transport.

Over a fifth (23%) of households in Dudley had no car at the time of the 2011 census and so are reliant on public transport. The differential fiscal incentives will bear more heavily on these households.

**“SWITCHING TRIPS FROM CARS TO PUBLIC TRANSPORT USE CAN ALSO PROVIDE INDIRECT POPULATION HEALTH BENEFITS BY CONTRIBUTING TO REDUCTION OF HARMFUL EMISSIONS TO AIR.”**

Bus and Rail Routes

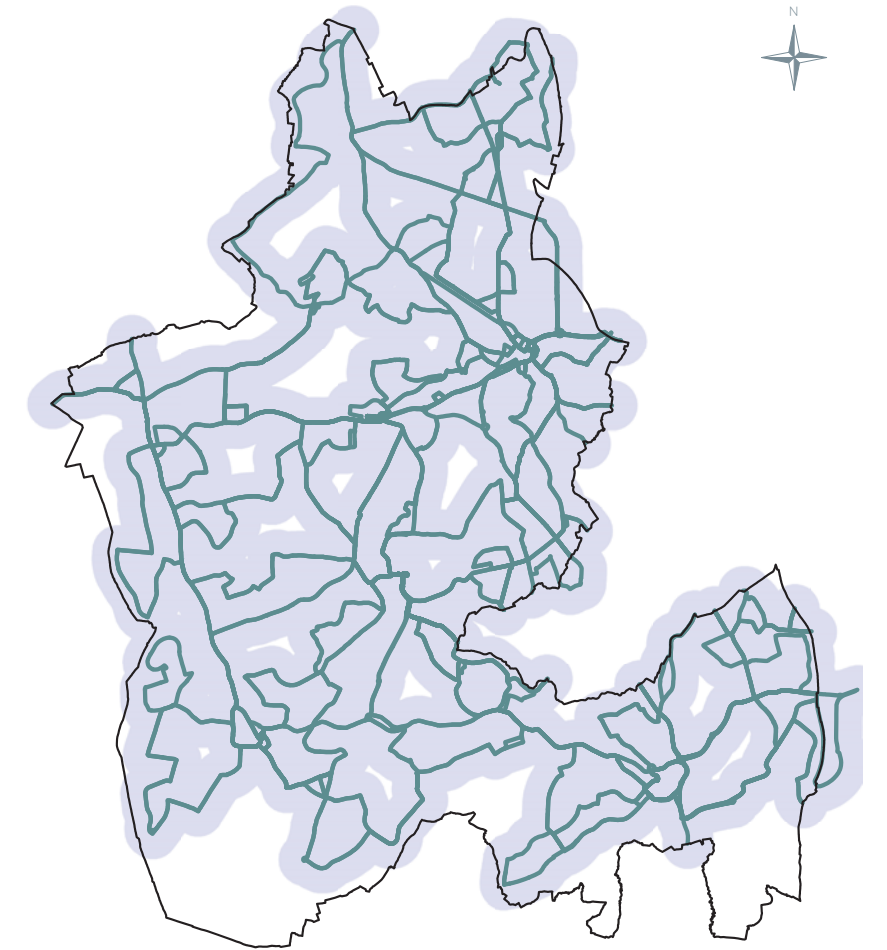
- ◆ Bus Stop
- Low frequency bus route
- High frequency bus route
- ◆ Railway Station
- Standard
- Not Current



Source: Centro, OS Open Data, Meridian  
 Map created by Public Health Intelligence, Office of Public Health  
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High Frequency Bus Routes

- High frequency bus routes
- 400m buffer of a bus route  
 (with a frequency of at least 1  
 bus per 30 minutes from 7.00 -  
 12.00 and 16.00 - 18.00)



Source: Centro  
 Map created by Public Health Intelligence, Office of Public Health  
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# 20mph streets

Measures to reduce traffic speed in residential streets are health improving and can substantially reduce the burden of death, injury, disability and hospital admissions arising from road traffic crashes.

Lower speed limits prevent death and injury by lowering the likelihood of collision and reducing the severity of injury.

A large proportion of crashes resulting in death or serious injury occur on residential roads. The majority of child and adult pedestrian casualties occur in built up areas (RosPA 2015). Though absolute risk estimates vary, studies have shown a sharp increase in pedestrian injury between 20 mph and 30mph (Rosen E et al 2011). A Great Britain study (Cuerden R et al 2007) estimated risk of death at 20mph as approximately 2% compared with 12% at 30mph.

Measures for reducing speed in urban areas include both speed limits (repeater signs at intervals) and limits supported by physical calming measures (such as speed bumps and chicanes).

The default speed limit on UK roads has generally been set at 30 mph. However, Local Authorities have

the power to set lower local limits (Department for Transport 2013). At the time of writing over 20 Local Authorities had introduced widespread 20 mph limit zones, effectively making the default limit 20 mph in residential areas (RosPA 2015). Early evaluations show these to have been effective in reducing speed, with a longer monitoring period required for assessment of impact on casualty rates (Department for Transport 2010, Bristol City Council 2012). An increase in public support for 20mph was observed in areas where 20 mph limits were introduced.

There is evidence to show that supporting speed limits with traffic calming measures increases the effectiveness of intervention and 20mph zones have been shown to mitigate widening deprivation differentials in injury from road traffic crashes in London (Grundy C et al 2009) and can have a major impact on health inequalities (Steinbach et al 2011).

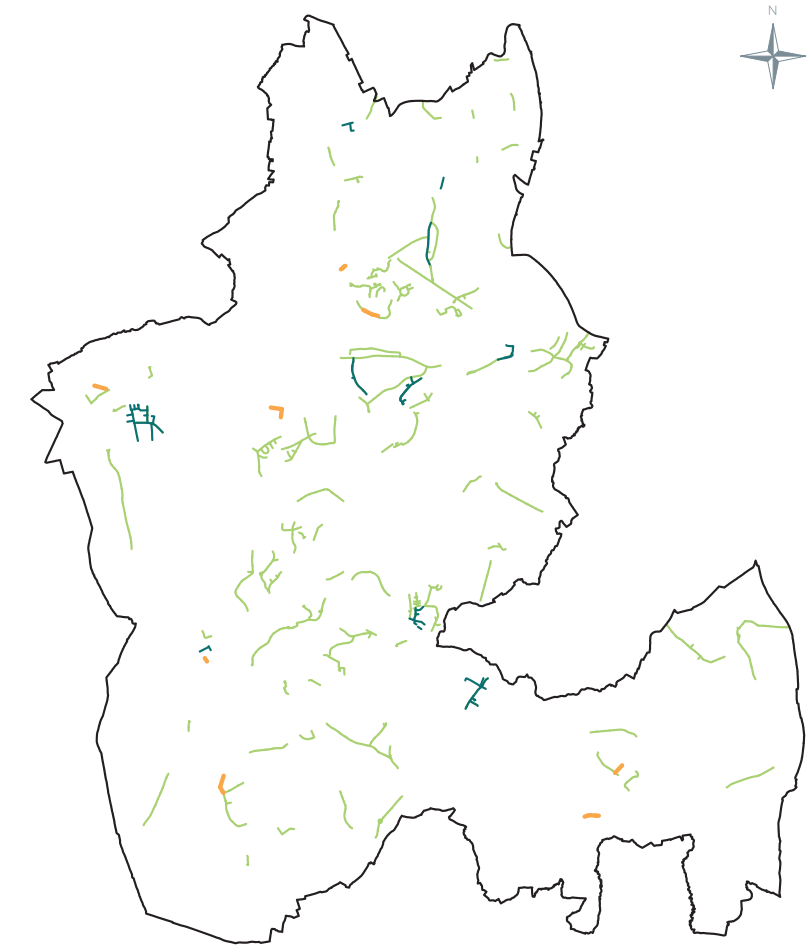
The map opposite shows the extent of 20mph speed limits in Dudley, differentiating those which are advisory and those which are supported by traffic calming measures. 20mph coverage and connectivity is generally low. There are no wider residential areas which could be described as 20mph

'zones'. There is no bias towards or away from deprivation. There is both the need and scope to improve population health by creating additional 20mph limits in residential areas, supported by traffic calming measures and providing the connectivity to create 'zones'. Prioritising deprived areas for these developments will contribute to the reduction of health inequalities in the Borough.

## 20mph Streets

- 20mph speed limit
- Traffic calming measures in place
- Advisory Restrictions

0 1 2  
kilometres



Source: Dudley MBC

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# Landscapes of perception

Whilst much of the examination of the spatial distribution of environmental health hazards and benefits has focussed on objective indicators, somewhat less research attention has been paid to the way in which people perceive and subjectively interpret their local environments. Attempts to understand and measure this have looked at neighbourhood satisfaction/dissatisfaction. Other explorations have considered how a 'sense of place' (Curtis S 2004) results from the ways in which individuals and communities imbue certain geographical settings with social significance and values, both positive and negative. Greater insight into this aspect of landscape is found using qualitative methods though it is still possible to measure attitudes and opinions.

The importance of residential satisfaction for overall life satisfaction has been known for some three decades now (Fried M 1984). The English Housing

Survey is one of the few UK national surveys that contained a substantial module of questions on neighbourhood perceptions (though recent changes have curtailed this data source). A consistent finding of the survey over the decade to 2008 has been that low-income households are more likely than richer households to feel dissatisfied with the area they live in, though it is still a minority (11-12%) who are.

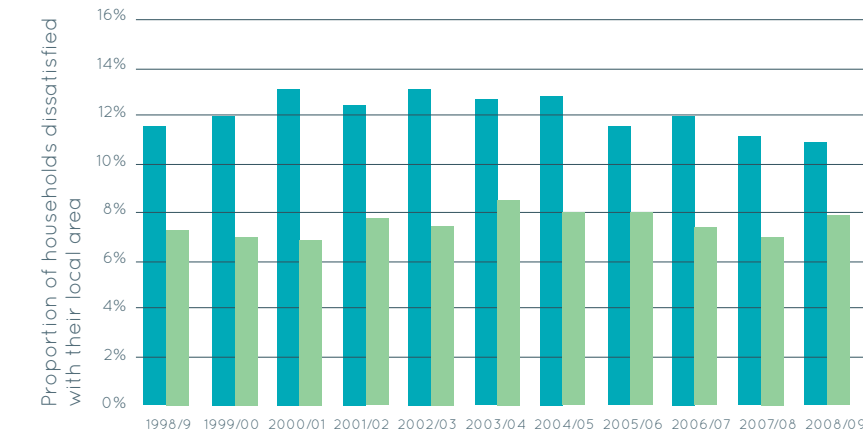
**SEE BAR CHART FIGURE 1**

In addition, in the 2008/9 survey, the perception that there are serious problems in the area was more prevalent in deprived areas than non-deprived, with litter/rubbish most often being cited as a problem.

**SEE BAR CHART FIGURE 2**

This was mirrored in a 2008 'Place Survey' in Dudley conducted as part of an Audit Commission performance assessment of Dudley MBC (Ipsos MORI 2008).

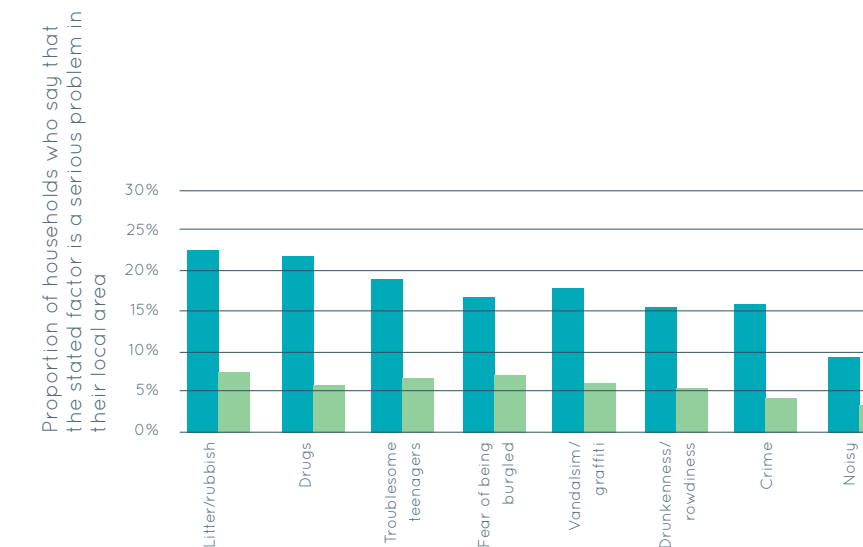
**SEE BAR CHART FIGURE 3**



**FIGURE 1** Low-income households are more likely than richer households to feel dissatisfied with the area they live in, but the proportion is still small.

■ Households with an income of less than £200 per week  
■ Households with an income of more than £200 per week

Source: English Housing Survey, DCLG; England; updated Jan 2011



**FIGURE 2** The perception that there are serious problems is more prevalent in deprived areas than in non-deprived areas, with litter/rubbish being the subject most often cited as a problem.

■ In the most deprived fifth of small areas  
■ In other areas

Source: English Housing Survey 2008/9, DCLG; England; updated Jan 2011

FIGURE 3 Across the Dudley social scale - overall/general satisfaction with the local area.



Source: Place Survey 2008

“IT IS NOT SUFFICIENT TO KNOW THAT THERE IS DIFFERENTIAL NEIGHBOURHOOD DISSATISFACTION. THE QUESTION IS WHAT DRIVES IT?”

There have been no further surveys of this type since then. Levels of residents' satisfaction with the area may have changed but in the absence of any further data this remains unknown.

It is not sufficient to know that there is differential neighbourhood dissatisfaction. The question is what drives it? Parkes et al (2002) analysed 1997/8 English Housing Survey data in more depth and found that perceived neighbourhood attributes were a much better guide to understanding residential satisfaction than personal or housing characteristics. Satisfaction with housing and the general appearance of the area were the factors most closely related to neighbourhood satisfaction, with noise, schools, friendliness of people and community spirit all being strong influencers. They also found that residents of different types of neighbourhood vary in the importance they attach to different aspects of their local area, which argues for more locally sensitive data gathering.

Later studies have found a similar range of influences, though not always the exact same variables. Common to all studies is the finding that neighbourhood dissatisfaction is influenced by more than a single factor. Perceived neighbourhood attributes are more likely to be a more accurate guide to understanding residential satisfaction and are strongly linked to socially constructed perceptions of place.

As well as the view of residents themselves there is a need to consider the perceptions of others outside of the place in question. It has been noted (Keene D E and Padilla M B 2014) that analyses of 'neighbourhood effects' tend to concentrate on characteristics inherent or internal to neighbourhoods as predictors or causes of poor outcomes. For example, US studies of urban 'ghettos' (Sampson R J and Raudenbush S W 2004) in major cities have illustrated that areas can acquire and carry socially constructed negative reputations not wholly consistent with their material conditions - a point not lost on estate agents. In effect the area (and all residents within it) become stigmatised. Such reputations may centre on the social composition of the area - as found in the US studies - or may be based on physical aspects of the location such as hazardous industry as Bush et al (2001) found in their study of Teeside, UK.

If socially constructed perceptions of place are important and may be intimately bound up with individual self identity, do they have an independent impact on health? The literature on this is sparse.

Looking beyond the UK, an Australian study (Kelaheer M D et al 2010) found that among residents of socially disadvantaged Australian neighbourhoods, perceptions of neighbourhood stigma were associated with poor self-rated health independent of neighbourhood socio-economic status. Tabuchi

et al (2012) found that perceived 'geographic discrimination' among residents of a disadvantaged locale in Osaka, Japan was associated with depressive symptoms and mental illness. A British study (Bowling A et al 2006) examined this question for older people. A cross sectional survey of older people looked at the effects of self-efficacy; social contact and support; and perceived neighbourhood environment on self-rated health. Whilst self-efficacy had the strongest independent association with health, unexpectedly, social contact and support did not attain significance, while perceived environment variables were strong independent predictors. Better health was associated with perceived facilities in the area, perceived neighbourliness and less perceived problems in the neighbourhood. For this study the neighbourhood was defined as 'within about a 15 or 20 minute walk or drive from your home'.

From all of the work on perceived environments it is clear that data and analyses need to be undertaken at the very local level. At the time of writing there is no systematically collated data - qualitative or quantitative - on Dudley residents' perceptions of their local environment.



# Procedural justice: a note

The preceding maps in this report show how environmental hazards and benefits are distributed spatially in Dudley. They open up discussion and further investigation of the extent to which people and communities already disadvantaged by poverty may or may not bear a disproportionate share of environmental disadvantage. These are considerations of environmental distributive justice.

A further component of environmental justice is procedural justice. This concerns the extent to which decisions on the environment are made according to fair processes; looking at how decisions are made and who is involved. It implies a fair distribution of political power, but what constitutes fairness in this context remains debateable. Does it mean an equal distribution of political power: or a proportionate distribution of power based on participants' stake in the outcome (Davoudi S, Brooks E 2012)?

The characteristics of a fair procedure have been variously defined with a general agreement that they are (Burgess H Cast S 2013):

**CONSISTENT**  
like cases are treated alike

**UNBIASED**  
decision-makers are neutral and trusted to be so

**TRANSPARENT**  
procedures are open with no secrecy or deception

**REPRESENTATIVE**  
those affected have a voice and representation in the process.

Fair procedures are seen to increase the legitimacy of the decision and its outcome.

If the process is to be fair it is necessary to ensure that those affected by the decision have not only the opportunity to participate but also the capacity. This requires ready access to relevant information and removal of barriers to participation – barriers such as overly complex procedures, inaccessible language, or high legal fees when recourse to the courts is necessary.

Procedural environmental justice has been enshrined in an international legal framework. In Europe, the Aarhus convention (to which the UK is a signatory) sets out rights of access to information, public participation in decision-making and access to justice through the courts, on environmental matters (United Nations Economic Commission for Europe UNECE 1998).

This doesn't mean that participation/community involvement is always present in practice. It's difficult to assess the degree of community involvement in environmental decision-making in Dudley because of the differing agencies involved, their differing procedures and differing degrees and styles of reporting. For example, there is a legal framework for the production of land use plans and this requires a report on consultation for each of a set of defined statutory plans, but there is no common framework for analysing the type of responder ie who is and isn't engaged. For Dudley

the published consultation report on the 'Black Country Core Strategy' (a major strategic land use plan covering Dudley) presents clear quantitative data on the categories of responders, but published consultation reports on other statutory reports do not present the same type of data or, if they do, the categorisation is different. There would be merit in introducing a standardised data categorisation and presentation of the type of consultation responders. The analysis that is available in the Black Country Core Strategy response shows the largest single category of responders to be private sector organisations.

Black Country Core Strategy Consultation responders	
	%
Individuals	11
Groups	12
Vol. orgs	16
Public bodies	20
Private sector org.s	41
n= 165	

Despite the lack of data, anecdotal reports show that community activism on environmental issues is present in Dudley with successful community campaigns (Express & Star 2015).











“ THIS REPORT... IS INTENDED TO STIMULATE  
DEBATE AND PROVOKE FURTHER INVESTIGATION  
... TO TAKE ACTION WHERE THE EVIDENCE  
SHOWS THE NEED.”

