



Brownfield residential development: what happens to the most deprived neighbourhoods in England?

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Brownfield residential development: what happens to the most deprived neighbourhoods in England?

Context of Study

Dereliction and vacancy have been an intrinsic part of inner city problems in the UK since the early 1970s following the legacy of rapid deindustrialisation. The problems had further escalated in many deprived northern industrial cities throughout the 1980s, which was epitomised by the image of Mrs Thatcher's famous 'walk in the wilderness' on the devastated landscape on the banks of the Tees in 1987 (Harrison, 2010). Besides industrial dereliction, low housing demand in many deprived neighbourhoods also led to high vacancy rates and deterioration of housing stock. Physical regeneration instruments tend to be adopted to deal with these problems. This can be traced back to the targeted slum clearance programmes in the 1950s (Yelling, 2000) through to the use of derelict land grant in the 1980s (Greenhalgh and McCafferty, 1996), and the more recent housing market renewal pathfinders programme (Cameron, 2006). However, it was not until the late 1990s that the policy of regenerating vacant and derelict land became part of a more comprehensive brownfield development strategy.

The Conservative government announced plans to see 50% of new housing to be built on reused sites in 1995. The new Labour Government announced a more ambitious target in 1998 that at least 60% of all new built housing in England would be on brownfield land by 2008 (Adams, 2004). This target was subsequently achieved eight years ahead of schedule. Since then the

1
2
3 share of new housing built on brownfield land has been consistently rising,
4
5 reaching a provisional estimate of 80% in 2008 and remaining unchanged in
6
7 2009 (CLG, 2010a). The new Coalition government made major changes to
8
9 brownfield development policy in 2010. Gardens were excluded from the
10
11 brownfield definition to avoid the side-effects of 'garden grabbing' for
12
13 housing developments (CLG, 2010b) and all existing regional housing and
14
15 brownfield targets were abolished. The new policy approach is to make
16
17 local planning authorities responsible for establishing the level and location
18
19 of housing provision for the local area. It remains to be seen to what extent
20
21 this will lead to a major change in the level of brownfield reuse.
22
23
24

25
26 Brownfield land in England is officially known as previously-developed
27
28 land (PDL) as defined in *Planning Policy Statement 3 (PPS3): Housing*
29
30 (CLG, 2006) as land 'which is or was occupied by a permanent structure,
31
32 including the curtilage of the developed land and any associated fixed
33
34 surface infrastructure'. This comprehensive definition covers different types
35
36 of land ranging from desirable public green space (e.g. playing fields and
37
38 gardens) to former housing sites and vacant and derelict land (which
39
40 includes contaminated industrial sites). However, a narrower definition
41
42 tends to be adopted in the international arena. For example, the US
43
44 Environmental Protection Agency¹ defines brownfield sites as 'real
45
46 property, the expansion, redevelopment, or reuse of which may be
47
48 complicated by the presence or potential presence of a hazardous substance,
49
50 pollutant, or contaminant'. A pan-European survey in 2005 showed that
51
52 some European countries follow the US definition of real and perceived
53
54 contamination. The broader definition of PDL tends to be found in Western
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3 Europe, including Austria, Belgium, France, Germany, the Netherlands and
4
5 the UK. These countries all have a heavy industrial legacy and high
6
7 population densities and thus an interest in reusing land instead of
8
9 developing greenfield sites (Oliver et al. 2005).
10

11
12 The emphasis on brownfield regeneration is not just about regenerating
13
14 individual sites and their immediate neighbourhood, but also the wider
15
16 policy context of adopting a more sustainable approach to curb urban sprawl
17
18 and to reduce the loss of agriculture and rural land (e.g. Dixon, 2006; Dull
19
20 and Wernstedt, 2010; Longo and Campbell, 2007; National Round Table on
21
22 Environment and the Economy, 2003; Spaans et al., 2011). There has been a
23
24 long tradition of using urban containment policy in England since the post-
25
26 war years. The green belt is the key instrument to define the boundary of
27
28 urban growth and to restrict overspill development into rural areas (Hall,
29
30 1974). Similar but less restrictive measures are also found across Europe to
31
32 restrict greenfield development (Uhel, 2006). The recent strategic reuse of
33
34 brownfield land is a policy instrument deployed in the UK to achieve
35
36 multiple objectives (DETR, 2000a; English Partnership, 2003). On the one
37
38 hand it is an extension of established urban containment policies aiming at
39
40 curbing urban sprawl and greenfield development and concentrating
41
42 housing development on brownfield sites with increased density
43
44 requirements (Urban Task Force, 1999). On the other hand, it is positively
45
46 used to contribute to the delivery of the sustainable communities agenda
47
48 (ODPM, 2003) by regenerating deprived urban areas. The notion of
49
50 bringing people back to towns and cities by removing environmental
51
52 degradation (HM Government, 2005) and exploiting the untapped 'urban
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2
3 capacity' (Barker, 2003; English Partnerships, 2003) has been politically
4
5 appealing.
6

7
8 In spite of the rhetoric of embracing sustainable development and
9
10 community capacity-building in brownfield regeneration strategies over the
11
12 last decade (Raco and Henderson, 2006), little is known about the actual
13
14 economic and community impacts, intended and unintended, brought by
15
16 brownfield development to deprived neighbourhoods. Previous studies,
17
18 mostly relying on qualitative data and local authority case studies, tend to
19
20 focus on examining the barriers and drivers of brownfield regeneration (e.g.
21
22 Greenberg et al., 2001 and Wernstedt et al., 2006 for the US and Adams and
23
24 Watkins, 2009; Dixon et al., 2006 and English Partnerships, 2006 for the
25
26 UK) rather than on its wider policy impacts. The only exceptions are Paull's
27
28 (2008) case studies in the Northeast and Midwest of the US and Pauleit's
29
30 (2005) research on Merseyside in England. The only study that adopted an
31
32 extensive quantitative GIS approach to analyse brownfield regeneration in
33
34 England was carried out by Longo and Campbell (2007), though their use of
35
36 hedonic models aims to identify the drivers and determining conditions of
37
38 brownfield development. This highlights the lack of comprehensive and
39
40 detailed spatial analyses of policy impacts brought by brownfield
41
42 development. This highlights the lack of comprehensive and
43
44 detailed spatial analyses of policy impacts brought by brownfield
45
46 development.
47

48 Notwithstanding the recent policy changes and the removal of national
49
50 brownfield targets after nearly a decade's application, it is worth
51
52 investigating the cumulative economic and community impacts of
53
54 brownfield residential reuse on housing and neighbourhood change across
55
56 England. While brownfield housing developments have impacts over all
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3 urban area, this study particularly focuses on the most deprived
4
5 neighbourhoods. This is because the objective of regenerating deprived
6
7 areas was deeply entrenched in the UK government's brownfield strategy
8
9 (Dixon and Adams, 2008). The findings will also provide transferable
10
11 lessons to other international contexts by offering a comprehensive
12
13 assessment of the impacts and performance of brownfield residential reuse
14
15 on achieving sustainable urban regeneration.
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18
19 This study aims at addressing a number of key research questions:
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- 21
22 ■ What are the most relevant and robust indicators for measuring
23
24 economic and community impacts of residential brownfield
25
26 regeneration?
27
- 28
29 ■ What types of economic and community impacts are identified over
30
31 different time periods?
32
- 33
34 ■ What are the spatial patterns of residential brownfield regeneration
35
36 impacts across different types of deprived neighbourhoods?
37
- 38
39 ■ Which are the impacts of increased density requirements on
40
41 residential brownfield regeneration in different types of deprived
42
43 areas?
44

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46 The next section discusses the methodological issues of measuring policy
47
48 impacts of brownfield residential development. The paper then analyses the
49
50 nature and extent of different types of policy impact on different types of
51
52 deprived neighbourhoods. Some conclusions are drawn on the effectiveness
53
54 of brownfield redevelopment to accomplish the task of tackling deprivation
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3 problems and the relevance of these findings for the international debate
4
5 about land use policies and urban regeneration.
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10 Methodology

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12 A major GIS analytical exercise was carried out to link datasets of different
13
14 spatial and temporal scales to provide a consistent data structure for very
15
16 fine-grained analysis of the pattern and scale of brownfield reuse and their
17
18 relationships to different socio-economic indicators at the Super Output
19
20 Area² (SOA) level. This section discusses the key concepts and methods
21
22 used to ascertain brownfield reuse patterns and impacts.
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27 *Brownfield-led regeneration and deprivation*

28
29 Large scale physical regeneration is often an important factor to break into
30
31 the spiral of decline in inner cities and older industrial areas because
32
33 businesses tend to hold back from investment in declining areas to avoid
34
35 exploitation by free-riders (Bennett and Krebs, 1991). Physical blight
36
37 caused by dereliction also bears a direct impact on the quality of living of
38
39 local residents (Wong et al., 1991). Successive government policies have
40
41 linked deprivation indicators with physical regeneration (Wong, 2006), for
42
43 example, the '1981 Deprivation Index' (DoE, 1983) was used to inform the
44
45 eligibility of local authorities to receive various physical regeneration grants
46
47 including the Derelict Land Grant under the Urban Programme (DoE, 1983:
48
49 para. 2). The brownfield land housing development target introduced in the
50
51 late 1990s had since become an important component of the UK
52
53 government's wider urban regeneration and housing policy agenda
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3 throughout the 2000s. This included area based initiatives such as the New
4 Deal for Communities programme and the Neighbourhood Renewal Fund,
5 which focused on socio-economic and physical regeneration. Other
6 programmes such as the Housing Market Renewal programme tended to
7 orientate towards physical regeneration to target areas of high vacancy rates
8 and low housing demand.

9
10
11
12 The official Index of Multiple Deprivation (IMD) for England, first
13 published in 2000, is the main index used to identify areas in need of
14 regeneration. This index contains a living environment domain, but does not
15 include any indicators on vacant and derelict sites (Deas et al, 2003). When
16 developing the national brownfield strategy, English Partnerships (2008)
17 demonstrated the strong spatial correlation between brownfield land
18 location, as a sign of physical degradation, and socio-economic deprivation.
19 The analysis linked the centroid of registered brownfield sites to its
20 corresponding³ deprivation index ranking. It shows that more than 20% of
21 recorded brownfield sites were located inside the 10% most deprived areas
22 of the IMD2007. This analysis, nevertheless, fails to examine the extent and
23 location of regeneration activities taking place within each brownfield site
24 and the resulting changes in the housing market and the living quality of
25 local residents. Further research by Schulze Bäing (2010), with detailed *site*
26 based data from the National Land Use Database (NLUD), found that
27 residential brownfield reuse in the most deprived areas only reached
28 comparable levels of less deprived areas under very buoyant property
29 market conditions in 2005/06.

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2
3 In order to provide a temporal and detailed investigation of the brownfield
4 regeneration process and its economic and community impacts, this study
5 focuses on examining the time period of 2001 to 2008 as these are the years
6 when the policy prioritising residential brownfield reuse was implemented.
7
8 For analytical reasons, the research on residential brownfield development
9 was further split into two periods, 2001-04 and 2005-08, because there was
10 a clear shift in the uptake of brownfield land nationally in 2005 (see Wong
11 and Schulze Bäing, 2010: 9).

21 *Measurement of brownfield residential development*

22
23 The main challenge to ascertain the policy impact of brownfield
24 redevelopment is to collate and adjust data for consistent analysis across
25 different spatial units over time. The National Land Use Database of
26 Previously Developed Land and Buildings (NLUD-PDL), containing site-
27 specific information on vacant land and derelict land and buildings across
28 England, was the key data source used in the analysis. The NLUD-PDL data
29 is collected via an annual survey of local authorities and the first survey was
30 conducted in 1998 by incorporating sites from the 1993 Derelict Land
31 Survey. The data has been updated annually since 2001.

32
33 Since not all local authorities are able to provide site-specific information
34 for all sites, they are asked to provide a completeness estimate. The average
35 completeness level was about 83% in the 2007 NLUD report. These
36 completeness estimates were subsequently used to extrapolate figures to
37 produce estimates for the number and amount of land cover of brownfield
38 sites across England. With the survey-based data, the non-response of a few
39 local authorities in different years means that certain adjustments and
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3 estimations have to be made for temporal analysis in this study. Another
4
5 shortcoming of the data is that local authorities may not continue to provide
6
7 information on sites that have been reused and left the database. Therefore,
8
9 the analysis here only included individual sites that were reported to the
10
11 NLUD with detailed information for 2001-04 and 2005-08⁴.
12

13 14 *Different types of deprived neighbourhoods*

15
16
17 The characteristics and impact of brownfield housing development in the
18
19 most deprived neighbourhoods were focused on the 10% and 20% most
20
21 deprived areas based on the ranking of IMD2004. The use of IMD2004,
22
23 which was largely constructed with 2001 data, is deemed as more
24
25 appropriate than the latest IMD for the analysis because it provides a useful
26
27 *baseline* to ascertain the government's brownfield development strategy, as
28
29 the 60% brownfield target should have started to have an impact in 2002/03.
30
31

32
33 Different deprived areas can vary significantly in terms of their role within
34
35 wider housing markets, even though they might show similar levels of
36
37 deprivation as measured by the IMD. The impact of residential brownfield
38
39 reuse on different types of deprived neighbourhoods was examined with a
40
41 *dynamic functional* typology (Robson et al, 2008). Based on the ranking of
42
43 IMD2004, the 20% most deprived areas were classified into four area types
44
45 according to their migration characteristics recorded in the 2001 Population
46
47 Census. This rather novel typology, originally developed for an evaluation
48
49 study of the National Neighbourhood Renewal Initiative, was subsequently
50
51 adopted by the government in its national framework for regeneration in
52
53 England (CLG, 2008). Knowing where people in the most deprived areas
54
55 moved from, and moved to, provides a better grasp of the roles played by
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1
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3 different neighbourhoods in the wider housing and labour markets, which is
4
5 argued by the government as a more robust functional framework for
6
7 examining neighbourhood change. The four dynamic neighbourhood types
8
9 are:
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- 11
12 • Escalator: in these areas, the incomers come from similar or more
13
14 deprived areas and the out-movers go to less deprived areas. This
15
16 neighbourhood type represents upward progression through housing and
17
18 labour markets. About 27% of their housing stock was flats in 2001.
19
20 Examples are areas to the north of Sefton Park in Liverpool, to the east
21
22 of Oxford Road (around Manchester University) in Manchester and
23
24 Bordesley in Birmingham (1,212 areas).
25
26
- 27
28 • Gentrifier: the social composition of these areas is altered by incomers
29
30 from less deprived areas and out-movers to similar or more deprived
31
32 locations. Flats constituted 36% of the housing stock in 2001. Examples
33
34 are areas around Liverpool's Anglican Cathedral, the southern area of
35
36 Manchester city centre and Castlefield and Brookfields in Birmingham
37
38 (521 areas).
39
40
- 41
42 • Isolate: these are areas with fewer inward and outward migration links to
43
44 other less deprived areas; hence they are socially more isolated. Only
45
46 24% of the housing stock in these areas was flats. Examples are Anfield
47
48 in Liverpool, Moss Side in Manchester and Newtown in Birmingham
49
50 (2,030 areas).
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- 53
54 • Transit: most incomers and out-movers of these areas, typically young
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56 people moving onto the housing ladder, come from and go to less
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3 deprived areas. The housing stock in these areas was dominated by flats
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5 (41% in 2001). Examples are areas in northern Liverpool city centre, the
6
7 Northern Quarter in Manchester and Birmingham city centre (2,519
8
9 areas).
10

11 *Measuring policy impacts*

12
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15 The preference for at least 60% of new housing to be built on brownfield
16
17 land had an impact across many urban areas. Since there is a strong spatial
18
19 correlation between the location of brownfield land and deprivation,
20
21 brownfield residential development is therefore closely associated with
22
23 regeneration programmes such as the New Deal for Communities, the
24
25 Neighbourhood Renewal Fund and the Housing Market Renewal Pathfinder
26
27 Programme. Hence, the analysis here focuses on the economic and
28
29 community impacts of brownfield reuse on deprived areas. These impacts
30
31 are ascertained via a number of indicators (an approach advocated by Dana,
32
33 2005): house price, planned residential density, population size,
34
35 employment level and economic conditions.
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39
40 Housing market performance, in terms of house price level and change,
41
42 provides a good indication of brownfield redevelopment impact because the
43
44 process is closely entwined with the objectives of improving housing supply
45
46 and tackling low market demand in deprived neighbourhoods. A revitalized
47
48 neighbourhood should see improved investment confidence and popularity,
49
50 which tends to lead to an increase in property values. Property value was
51
52 also used by Paull (2008) to measure the economic and community impacts
53
54 of brownfield redevelopment in the US. Land Registry housing transaction
55
56 data was used here to measure the level and change of house prices⁵ in areas
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3 with brownfield reuse activities. Through a GIS, house price data can be
4
5 analysed in conjunction with the registered residential brownfield activities
6
7 between 2001 and 2008. This allows us to assess the extent areas with
8
9 residential brownfield reuse performed differently to those without such
10
11 development.

12
13
14 The brownfield residential development policy was carried out in
15
16 conjunction with an increase in density requirement. The Urban Task Force
17
18 Report (1999) set out to accommodate an extra 4 million new households in
19
20 towns and cities over the 25 year period. The figure was later revised
21
22 upwards to an annual target of 240,000 by 2020. In order to achieve these
23
24 numbers under the constraint of land supply, successive planning policy
25
26 guidance documents (DETR, 2000b; CLG, 2006) stipulated densities for
27
28 new homes of 30-50 dwellings per hectare (ha), and even higher in urban
29
30 areas with good public transport links. However, this new form of high
31
32 density urbanization has been criticised by some as 'new urban colonialism'
33
34 (Atkinson and Bridge, 2005) and 'new build gentrification' (Davidson and
35
36 Lees, 2005) that brings destructive and unsettling changes within the
37
38 neighbourhood. The potential impact of high density brownfield
39
40 development was examined via the planned dwelling density for those sites
41
42 that have been redeveloped as reported in previous NLUD surveys (in some
43
44 cases the planned density could differ from the actual build density).

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49
50 It would be ideal if the official IMD could track changes in the deprivation
51
52 level brought by brownfield redevelopment in different neighbourhoods.
53
54 However, many indicators used to construct the IMD are based on
55
56 administrative and survey data estimates (Tomlinson and Kelly, 2003)
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1
2
3 which are not sufficiently robust to perform temporal change analysis of
4
5 small areas (SDRC, 2004; Wong, 2006). Since there is little scope for
6
7 making meaningful comparison of successive deprivation indices, other
8
9 more reliable indicators such as population change (e.g. Coombes and
10
11 Raybould, 1989; Wong, 2002) and employment level change (e.g. Green
12
13 and Champion, 1989; Piedad, 1995; Paull, 2008) as well as the more direct
14
15 measure of income deprivation change (e.g. BERR, 2009) are used.
16
17

18
19 Population change was measured with the Office for National Statistics'
20
21 postcensal small area population estimates. Although being classified as
22
23 experimental statistics, this data source provides a good indication of
24
25 population change in most areas. For the change analysis of employment
26
27 and income, the Economic Deprivation Index (EDI) was used. The EDI,
28
29 consists of the employment and income domains of the IMD, is based on
30
31 government benefit claimant counts (rather than survey estimates) and thus
32
33 provides a robust means to track changes in the level of economic
34
35 deprivation. EDI data is available annually between 1999 and 2005. The
36
37 analysis here focuses on changes in the mean rank of the EDI and its
38
39 associated income and employment domains between 2001 and 2005.
40
41
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43
44 These indicators were analysed to ascertain whether brownfield residential
45
46 development has brought any economic and community impacts to the
47
48 deprived neighbourhoods, and whether such impacts vary between different
49
50 types of neighbourhoods. While other brownfield regeneration studies
51
52 adopted hedonic analysis (e.g. Adams and Watkins, 2009; Longo and
53
54 Campbell, 2007) to develop regression models to estimate the determining
55
56 conditions of successful brownfield reuse, this study measures the impact of
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1
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3 brownfield reuse directly with the identified indicators. Furthermore, one-
4
5 way analysis of variance (ANOVA) is used to perform statistical testing on
6
7 the indicator to find out whether or not the mean values of different
8
9 neighbourhood groups are all equal. The ANOVA statistical procedures
10
11 compare the within group variations and the between group variations to test
12
13 whether significant differences exist between different groups on that
14
15 particular indicator.
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22 **Impact of Brownfield Residential Reuse in Deprived Neighbourhoods**

23 *Brownfield redevelopment take-up*

24
25
26 The NLUD figures in Table 1 show the dynamics of brownfield
27
28 development in deprived areas. A total of 2,833 hectares of brownfield land
29
30 was recycled for housing development in the 20% most deprived
31
32 neighbourhoods between 2001 and 2008. The number of sites and land area
33
34 for brownfield housing development in England had decreased in the period
35
36 2005-08 when compared to 2001-04. This was probably due to the
37
38 exhaustion of the most viable and profitable brownfield land supply⁶.
39
40 Nevertheless, in the most deprived neighbourhoods, the development trend
41
42 was reversed with more sites and land area recycled for housing use in the
43
44 period 2005-08. About 24% of England's brownfield land reused for
45
46 housing development was located in the 20% most deprived
47
48 neighbourhoods in 2005-08, compared to 17% in 2001-04. Indeed, the
49
50 amount of recycled brownfield land for housing use increased most rapidly
51
52 (by 25%) in the 10% most deprived neighbourhoods between these two
53
54 periods.
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1
2
3 Insert table 1
4

5 **Regions in England** with the **larger** share of population in deprived areas
6
7 also have a larger share of 'vacant and derelict' land stock according to
8
9 Land Use Change Statistics (**LUCS**): with a strong statistical relationship
10
11 (Pearson's product-moment correlation $r=0.80$, $p<0.01$) in the 10% most
12
13 deprived areas; and an even stronger correlation ($r=0.85$, $p<0.01$) in the 20%
14
15 most deprived areas.
16
17

18
19 **A more detailed investigation of different types of deprived areas** in Table 1
20
21 shows that most brownfield land recycled for residential use was
22
23 concentrated in Isolate and Transit areas, which partly reflects the fact that
24
25 72% of the 20% most deprived neighbourhoods fell into these two
26
27 categories. Gentrifiers (9.8%) and Isolates (36.1%) were doing relatively
28
29 well in their share of recycling brownfield land in the 2001-04 period,
30
31 though only Isolates (45.3%) continued the momentum during 2005-08.
32
33 Meanwhile, the activities in Transit areas (with a 41.2% share) accelerated
34
35 in 2005-08. Interviews with planners and regeneration experts in the North
36
37 West of England (see Schulze Bäing, 2009) confirmed that developers
38
39 tended to pick areas with stronger gentrification potential and the highest
40
41 profit yields in the earlier period. When the more desirable land ran out,
42
43 together with the incentives of government regeneration initiatives,
44
45 developers started venturing into the wider market of Transit and Isolate
46
47 areas. It is also interesting to note that the level of residential reuse of long-
48
49 term brownfield land, which is deemed as difficult to shift, shows very
50
51 similar patterns to those of all brownfield reuse in different types of
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53 neighbourhoods.
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Housing market

In spite of the absolute increase in the price differential between the most deprived areas and the average in England (Table 2), the relative house price gap between them has narrowed since 2001. This was due to a relatively higher level of house price increase between 2001 and 2008 in deprived areas: an increase of 102% and 96% respectively in the 10% and 20% most deprived neighbourhoods. Between 2005 and 2008, bearing in mind that there was a major slow down in the property market, the level of house price increase in the deprived neighbourhoods actually outperformed that of the English average. When examining price changes in terms of the presence/absence of brownfield reuse activities during 2001-08, the mean price increase across England only marginally varied. However, the increase in prices was stronger in areas with brownfield reuse (61%) than those without (57.6%) during 2001-05, but this change reversed during 2005-08 when areas without brownfield reuse (16.6%) performed better than areas with such redevelopment (13.7%). ANOVA tests confirm that the price change differentials between the presence/absence of brownfield reuse are statistically significant for the periods of 2001-05, 2005-08 and 2001-08.

Insert table 2

The analysis **turns to** examine to what extent the strong market performance in the deprived areas was related to brownfield residential development. While the absolute price levels of the most deprived areas with brownfield reuse are found lower than areas without such activities, the relative house price performance was nevertheless stronger in deprived areas with

1
2
3 brownfield development (an increase of 113.5% and 105.7% respectively in
4
5 the 10% and 20% most deprived areas) throughout 2001-08. This was
6
7 mainly due to the strong housing market performance of brownfield housing
8
9 development between 2001 and 2005, though the trend had reversed since
10
11 2005. The differentials in house price change between areas with and
12
13 without brownfield residential development were all statistically significant
14
15 for both 10 and 20% most deprived areas.
16
17

18
19 The level of house price inflation varied between different types of deprived
20
21 neighbourhoods that had brownfield reuse (see Table 2). Isolate areas had
22
23 the highest level of house price inflation of 122%, rising from a very low
24
25 level of £53,000 to £118,000 during 2001-08. On the other hand, Transit
26
27 areas had the lowest level of house price inflation (93%) when compared to
28
29 the other neighbourhood types, which was partly related to the fact that
30
31 these areas commanded the highest house price level among the most
32
33 deprived locations. What is counter-intuitive is that neither the house price
34
35 level nor the relative price change (99%) was that high in Gentrifier areas.
36
37 This suggests that gentrification has not necessarily created any major
38
39 negative impact on housing affordability in these neighbourhoods (as they
40
41 tended to be small enclaves of development) when compared to other
42
43 deprived neighbourhood types.
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48
49 As many brownfield housing development schemes are very high density
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51 apartments and flats, it is important to specifically examine the patterns of
52
53 house price changes for flats. The analysis of housing stock distribution
54
55 with the 2001 Census data shows that about 19% of households in England
56
57 lived in flats. Within the 20% most deprived areas (IMD 2004) the share of
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3 households living in flats was much higher (32.5%), though there were great
4
5 variations among different types of neighbourhoods. While the proportion
6
7 was lower in Isolates (24%) and Escalators (27%), the figure was higher in
8
9 Gentrifier (36%) and Transit areas (41%), reflecting the different functional
10
11 role that these areas play within the wider housing markets. On the whole,
12
13 the price levels of flats were slightly lower than the average prices of all
14
15 house types in the four deprived neighbourhood groups; which were also
16
17 true in terms of house price inflation levels between 2001 and 2008. While
18
19 Isolates gained most from the average house price inflation during 2001-08,
20
21 Escalators (101%) had the highest level of price increase for their flat
22
23 markets. It is also noticeable that higher levels of house price appreciation
24
25 were found for flats in Transit (15.6%) and Gentrifier (13.5%) areas during
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27 2005-08 than the average house price increase in these areas (9.6% and
28
29 11.6% respectively).
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34 *Planned residential density*

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37 According to LUCS, the overall housing density in England increased from
38
39 31 to 42 dwellings per hectare when comparing the periods of 2001-04 with
40
41 2005-08. The figures were higher for all previously developed land, with an
42
43 increase from 35 to 48 dwellings per hectare; and stark increases were found
44
45 in vacant and derelict land as the average density rose from 39 to 68
46
47 dwellings per hectare. Since the LUCS are spatially aggregated data, the
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49 NLUD data was used to further examine the density patterns in the most
50
51 deprived areas.
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56 Insert figure 1
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3 Figure 1 shows that there was an increase in planned dwelling density of
4 reused brownfield sites since 2001, though this trend halted in 2007
5 following the downturn in the property market. It is interesting to note that
6 the level of planned density had been much higher in the most deprived
7 neighbourhoods (98 and 93 dwellings per hectare for the 20% and 10%
8 most deprived neighbourhoods respectively) than the England average (59
9 per hectare) during 2001-08. Nonetheless, the patterns of planned density
10 change tended to be more erratic in the most deprived areas: with a decrease
11 in the early 2000s, followed by a major increase in 2005 and 2006 and then
12 a decline since 2007.

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26 Among the deprived neighbourhoods, Transits had the highest planned
27 density, with 96.5 dwellings per hectare during 2001-04 and a sharp
28 increase to 147.8 during 2005-08. These areas tend to associate with rental
29 locations for students and young professionals in high rise flats. When
30 considering the large amount of brownfield land uptake and the extreme
31 high density of residential development, Transit areas have undergone major
32 physical transformation throughout the last decade. Another neighbourhood
33 type that also had very high density development is the Gentrifier (a rise
34 from 76.8 to 117 dwellings per hectare between the two periods), which was
35 related to their market potential as up and coming locations. Despite their
36 good performance in recycling a large amount of brownfield land, the
37 housing density in Isolate areas tended to be at the lower end of the
38 spectrum (a slow rise from 60.1 to 74.9 dwellings per hectare). This is
39 attributed to the fact that new build schemes in these areas tended to focus
40 more on the renewal of family homes for existing residents rather than
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3 building high rise flats. Escalators also had lower density of development in
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5 2001-04 (55.8 dwellings per hectare), though it rose to a higher level (90.2)
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7 since the latter half of the 2000s. The findings suggest that brownfield
8
9 housing development has intensified the already high densities in Transit
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11 and Gentrifier areas by further increasing the stock of flats.
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13 14 *Population growth*

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17 One of the government's brownfield regeneration objectives was to bring
18
19 back people to live in town and cities. The data in Table 3 shows that
20
21 residential brownfield reuse is statistically related to population growth
22
23 across all neighbourhood types. Between 2001 and 2007, the total
24
25 population had increased by 6.6% and 7.2% respectively in the most
26
27 deprived 10% and 20% areas with brownfield activities; while the figures
28
29 were 2.6% and 2.4% for these areas without brownfield development.
30
31 Transit areas (4.5%) experienced most (estimated) population growth
32
33 between 2001 and 2007, which was followed by Gentrifiers (3.5%). On the
34
35 other hand, both Isolate (0.9%) and Escalator (1.6%) areas had lower levels
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37 of population growth.
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43 Insert table 3

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45 There are, however, marked (statistically significant) differences in terms of
46
47 the level of population growth in areas that had benefited from brownfield
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49 development across all neighbourhood types. Despite the higher take-up rate
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51 of brownfield development in Isolates (see Table 1), it had the lowest level
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53 of population growth (3.8%). This was largely related to the low density
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3 development that focused more on improving the living conditions of the
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5 original residents rather than on attracting new migrants.
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8 *Employment and income*

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11 Economic change was gauged by tracking the shift of the EDI mean rank
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13 (see Table 3). The level of improvement in economic deprivation conditions
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15 between 2001 and 2005 tended to be higher (statistically significant) in the
16
17 20% most deprived areas (an improvement of 320 EDI rank) and all
18
19 neighbourhoods (an improvement of 132 rank) that had benefited from
20
21 brownfield housing development. However, such differentials were found
22
23 statistically insignificant in the top 10% extremely deprived areas.
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27 These changes were very much related to the inflow of new residents to the
28
29 neighbourhoods taking up the newly developed housing units on brownfield
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31 land. These residential dynamics of population growth can also explain the
32
33 much stronger improvement in the employment deprivation rankings of
34
35 areas with residential brownfield reuse, and some improvement over the
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37 income domain. The findings suggest that brownfield redevelopment did not
38
39 seem to improve the economic conditions of the extremely deprived
40
41 neighbourhoods. However, this could be related to the fact that developers
42
43 tended to cherry pick the best locations for development first (see Table 1),
44
45 thus more brownfield reuse activities in the 10% most deprived areas were
46
47 actually taking place during the latter half of the decade. Since the EDI data
48
49 is only available up to 2005, the improvement in the 10% most deprived
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51 areas was probably not being reflected in the 2001-05 change analysis and
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53 should be followed up in future research.
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3 The analysis in Table 3 clearly shows that most improvement in the overall
4 EDI ranking was found in Gentrifiers, which also experienced high levels of
5 brownfield reuse activities during 2001-05. Despite the fact that
6 employment deprivation in Transit areas had got relatively worse, it is worth
7 noting that those areas with brownfield reuse activities had shifted their
8 position significantly in a positive direction. Isolates also made major
9 improvements in their relative position on income and employment
10 conditions, though brownfield activities were not found to make any
11 significant difference in improving **their** deprivation rankings. Escalators
12 experienced the least improvement in terms of income deprivation mean
13 rank and the overall EDI, and were actually getting worse in the
14 employment deprivation ranking. Similar to Isolates, brownfield
15 redevelopment did not have much of a booster effect to improve the
16 economic conditions in the Escalator group.
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35 *Which deprived neighbourhoods benefit most?*

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37 The analysis shows that the uptake of brownfield land (including difficult to
38 shift stock) for housing development in areas with severe deprivation
39 problems had **been** high since 2001. These redevelopment activities had
40 successfully reignited the housing market in these neighbourhoods and led
41 to house price increases. There had also been a relatively higher level of
42 improvement in the EDI and its associated income and economic domains in
43 areas with brownfield residential regeneration activities, specifically in
44 Gentrifier and Transit neighbourhoods. However, different neighbourhood
45 types exhibited different characteristics of change.
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- Gentrifiers: these areas performed best in terms of the uptake of brownfield land in the early 2000s and the improvement in their EDI. This was related to the high level of population growth and thus a change in the social composition of these areas by the incomers. However, it is surprising to find that the overall house price and relative house price change in this group were not as high as in other deprived area types. This was partly related to the fact that Gentrifier areas tended to have small enclaves of development.
 - Transits: these areas tended to have high levels of brownfield development and, since the mid-2000s, house building was at extremely high density. Transit areas also experienced high population growth and improvement in their economic deprivation ranking. These areas, however, did not experience the highest level of house price inflation as they commanded relatively high price levels throughout the 2000s.
 - Isolates: the new residential development in these areas was not built at such high density levels as seen in Gentrifier and Transit neighbourhoods. The relatively low density of development also means that the population was stabilised rather than showing much growth during 2001-07. Nevertheless, this group showed the highest level of house price inflation, from an extremely low base, when compared to other deprived areas. It is also intriguing to note that while major improvement in the EDI was found in Isolates with brownfield activities, similar improvement was also found in areas without brownfield development. This suggests that the improvement in economic deprivation cannot be purely attributed to brownfield

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3 development during 2001-05. More importantly, residential brownfield
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5 development accelerated in the latter part of the 2000s, but the EDI data
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7 is not yet available after 2005 to capture the impact.
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- 10 • Escalators: this area group tended to perform well in terms of house
11 price increases, but more modestly in terms of estimated population
12 growth and had the least improvement in the EDI and income
13 deprivation rankings. This partly reflected the fact that Escalator
14 neighbourhoods tended to be located in more popular locations and had
15 a much lower level of brownfield residential reuse in comparison with
16 other area types. This, together with the relatively lower density of
17 development, means that the impact of brownfield residential
18 development had been relatively less significant.
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31 Conclusion

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34 Unlike previous case-study based research on the socio-economic impact of
35 brownfield regeneration, this study used the extensive survey data of the
36 NLUD-PDL to identify impacts across England and within different types
37 of deprived areas. A number of key findings are identified:
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- 42 • The uptake of brownfield land across different types of deprived
43 neighbourhoods for housing development had been high, even in
44 areas with long term vacant and derelict land. The market for flats in
45 particular has grown since the mid 2000s.
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- 52 • The new housing developments had altered the socio-economic
53 dynamics of their neighbourhoods, with population growth evident
54 in the most deprived areas between 2001 and 2007.
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- These areas had seen improvements in economic and income deprivation rankings when compared to neighbourhoods without brownfield housing development.
- The analysis of brownfield reuse trends and patterns in the four types of deprived neighbourhoods suggests mixed outcomes and different development trajectories.

The analysis shows that high levels of brownfield reuse activities had successfully accomplished the objective of injecting dynamics into the housing markets in the most deprived areas, particularly the market for flats, since the mid 2000s. This shift was related to the spatially targeted activities of the National Neighbourhood Renewal Initiatives and the Housing Market Renewal Pathfinder programmes.

In terms of economic impacts, the outcomes were mixed. While major improvement in the EDI was found in the 10% most deprived areas as well as in Isolates and Escalators, similar improvement was also found in areas with and without brownfield development. The mixed messages from the analysis are also closely associated with the socio-demographic change of the neighbourhoods. Gentrifiers and Transits had the highest level of population growth and their EDI rankings shifted significantly in comparison with similar neighbourhoods without brownfield regeneration activities; while significant change in population growth and EDI rankings were not found in Isolate and Escalator areas. This suggests that the improvement in economic deprivation is associated with the process of 'social upgrading' by the incoming new residents of brownfield housing developments (Davidson and Lees, 2005).

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3 The positive signs of brownfield development in the most deprived
4 neighbourhoods imply that they had undergone some major restructuring
5 process in their housing markets and the wider neighbourhoods. These
6 broad patterns suggest signs of policy success in regenerating declining
7 neighbourhoods through brownfield residential development, though this
8 brought with it negative impacts on local housing affordability as well as
9 changing the socio-economic dynamics and the physical fabric of the
10 neighbourhoods. This is particularly true in neighbourhoods that have
11 undergone major socio-spatial restructuring brought by new forms of high
12 density housing schemes. Critics argue that such high density urbanization
13 brings destructive and unsettling changes within the neighbourhood, which
14 are coined as 'gentrification-induced social change' (Davidson and Lees,
15 2005). However, it is very likely that the dynamics of change vary between
16 neighbourhoods and it would therefore be difficult to use a small number of
17 case studies to derive clear conclusions about the interactive outcomes
18 brought by brownfield residential reuse.

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21 This paper has a clear focus on England. Despite the specific housing
22 market conditions and planning system in England, the findings can shed
23 light on the international debate on the application and performance of
24 brownfield development strategy to achieve the objectives of urban
25 containment and sustainable regeneration. The findings suggest that to some
26 extent such policies have helped to reduce greenfield development rates and
27 have contributed towards urban regeneration. While there are signs of policy
28 success, they can also be interpreted as a function of the interaction of
29 policy and housing market dynamics - with developers selecting areas with

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3 greatest brownfield development potential, especially when there has been
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5 much less prospect of obtaining planning permission for greenfield
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7 development.
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10 The use of NLUD and other data at micro spatial scales **in this study** has
11
12 proved to be robust to **establish policy** impacts, though the process of
13
14 integrating different databases into a coherent data structure was
15
16 challenging. The use of ANOVA method was very valuable as the
17
18 statistically testing goes beyond the superficial mean values by comparing
19
20 the variations between and within different neighbourhood groups.
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22 However, the analysis here only provides a snapshot of what has happened
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24 to the neighbourhoods with different socio-economic dynamics in the
25
26 baseline year of 2001, but is unable to show what has happened to the
27
28 residents living in these neighbourhoods in later years due to the lack of
29
30 updated migration and population statistics at such micro level. These issues
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32 could be re-examined when the 2011 Population Census data becomes
33
34 available, but meanwhile, further research can only resort to the collection
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36 of primary data via a case study methodology.
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41 **Acknowledgement**

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45 Removed for review
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20 Yelling, J. (2000) The incidence of slum clearance in England and Wales,
21 1955-85, *Urban History*, 27(2), 234-254
22

23 ¹ Defined in Section 101 of the Comprehensive Environmental Response, Compensation,
24 and Liability Act of 1980 (42 U.S.C. 9601)

25 ² SOAs, intermediate in size between Output Areas and Local Authorities, are of consistent
26 size across the country. They were built with 2001 Census data for the collection and
27 publication of small areas statistics. There are two layers of SOA and each layer nesting
28 inside the layer above. (<http://www.idea.gov.uk/idk/core/page.do?pageId=7175806>)

29 ³ IMD 2007 ranking are produced for the lower layer SOAs. There are 32,482 lower layer
30 SOAs in England and each has a minimum population of 1000. See
31 [http://www.ons.gov.uk/about-statistics/geography/products/geog-products-area/names-](http://www.ons.gov.uk/about-statistics/geography/products/geog-products-area/names-codes/soa/index.html)
32 [codes/soa/index.html](http://www.ons.gov.uk/about-statistics/geography/products/geog-products-area/names-codes/soa/index.html)

33 ⁴ The analysis of NLUD-PDL here only included authorities that have reported their data
34 for either 2003 or 2004 and for either 2007 or 2008. As a result, these local authorities were
35 excluded from the analysis: Allerdale, Aylesbury Vale, Barrow-in-Furness, Bracknell
36 Forest, Bradford, Broadland, Broxtowe, Camden, Caradon, City of London, Colchester,
37 Derbyshire Dales, Dudley, East Devon, Eastbourne, Erewash, Gateshead, Greenwich, Hart,
38 High Peak, Isles of Scilly, Leeds, Lewes, Maldon, North Shropshire, North Tyneside, North
39 Wiltshire, Nuneaton and Bedworth, Oadby and Wigston, Ryedale, South Oxfordshire, St.
40 Edmundsbury, Teesdale, Torridge, Vale of White Horse, and West Devon.

41 ⁵ The geography chosen for this analysis is medium layer super output areas (MSOA).
42 There are 6,780 MSOAs in England and they were built from groups of Lower Layer SOAs
43 and constrained by the 2003 local authority boundaries used for 2001 Census outputs. They
44 have a minimum population of 5,000. Smaller geographies such as lower layer super
45 output areas or postcode sectors were not used for house price analysis because it would
46 have contained too many cases with no registered transactions and made the tracking of
47 change less robust.

48 ⁶ When interpreting these absolute figures, one has to consider that the 2001 and 2002 data
49 includes some sites that have been reused in the period since the previous NLUD in 1998.
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Table 1 Brownfield land residential reuse in the most deprived neighbourhoods

	2001-2004		2005-2008					
	Reused sites	Reused land (ha)	Reused sites	Reused land (ha)				
England	9834 (100%)	8259 (100%)	8668 (100%)	6479 (100%)				
20% most deprived IMD04	1702 (17.3%)	1288 (15.6%)	2053 (23.7%)	1532 (23.7%)				
10% most deprived IMD04	881 (9.0%)	723 (8.8%)	1178 (13.6%)	905 (14.0%)				
Deprived area types	land reused 2001-04		land reused 2005-08		long-term land reused 2001-04		long-term land reused 2005-08	
	ha	%	ha	%	ha	%	ha	%
Escalator 19.3%	214	16.2	257	9.5	109.4	14.5	40.4	9.5
Gentrifier 8.3%	130	9.8	104	4.0	70.1	9.3	16.9	4.0
Isolate 32.3%	479	36.1	492	45.3	295.3	39.2	193.7	45.3
Transit 40.1%	504	38.0	652	41.2	278.4	37.0	176.1	41.2
Total 100%	1328	100.0	1505	100.0	753.2	100.0	427.2	100.0

Source: NLUD-PDL

Note: These figures cover only those local authorities included in this analysis and those sites where detailed site data was reported.

Table 2 House price level and change

	Mean house prices (£)								
	2001			2005			2008		
	All	BF	No BF	All	BF	No BF	All	BF	No BF
England	121769	117714	129082	192274	189504	203368	220310	215464	237028
20% most deprived IMD04	78536	68382	82436	133065	124249	136449	154211	140660	159414
10% most deprived IMD04	67780	61530	70491	118087	114940	119450	137125	131370	139618
	Mean house price change %								
	2001-2005			2005-2008			2001-2008		
	All	BF	No BF	All	BF	No BF	All	BF	No BF
England	57.9	61.0**	57.6**	14.6	13.7*	16.6*	80.9	83.0**	83.6**
20% most deprived IMD04	69.4	81.7**	65.5**	15.9	13.2**	16.8**	96.4	105.7**	93.4**
10% most deprived IMD04	74.2	86.8**	69.5**	16.1	14.3*	16.9*	102.3	113.5**	98.1**
	2001 (£)	2005 (£)	2008 (£)	2001-05 % change	2005-08 % change	2001-08 % change			
All house types (BF):									
Escalator	62,117	117,761	133,116	89.6	13.0	114.3			
Gentrifier	72,057	128,446	143,316	78.3	11.6	98.9			
Isolate	53,333	104,223	118,310	95.4	13.5	121.8			
Transit	81,388	143,586	157,431	76.4	9.6	93.4			
Flats only (BF):									
Escalator	62,939	113,159	126,275	79.8	11.6	100.6			
Gentrifier	73,047	120,103	136,306	64.4	13.5	86.6			
Isolate	56,471	102,222	110,808	81.0	8.4	96.2			
Transit	73,010	120,248	138,964	64.7	15.6	90.3			

Source: Land Registry House Price Data, Office for National Statistics Small Area Population Estimates and Economic Deprivation Index

Notes:

1. These figures cover only those local authorities included in this analysis and those sites where detailed site data was reported.
2. BF: areas with brownfield housing development
3. The larger the change in the mean rank, the bigger the improvement made in an area's relative position; and a negative change means an area is getting more deprived in relative terms.
4. **ANOVA test significance level at 0.01 or less and * for significance level at 0.05 or less between areas with and without brownfield housing reuse.

Table 3 Change in population and EDI by deprived neighbourhood types and by brownfield redevelopment

	Population change % 2001-07			EDI mean rank change 2001-05			Income domain mean rank change 2001-05			Employment domain mean rank change 2001-05		
	All	BF	No BF	All	BF	No BF	All	BF	No BF	All	BF	No BF
England	3.3	7.0 **	2.5 **	0	132 **	-30 **	0	97 **	-22 **	0	169 **	-38 **
20% most deprived IMD04	2.6	7.2 **	1.7 **	147	320 **	113 **	215	363 **	186 **	69	287 **	25 **
10% most deprived IMD04	2.4	6.6 **	1.5 **	166	176	164	213	192	218	127	182	115
Escalator	1.58	5.18 **	0.99 **	91	168	79	169	259	154	-1	90	-16
Gentrifier	3.52	8.15 **	2.51 **	197	542 **	122 **	185	493 *	117 *	216	556 *	142 *
Isolate	0.89	3.78 **	0.35 **	207	261	197	227	265	220	192	261	179
Transit	4.54	10.2 3 **	3.20 **	122	390 **	60 **	242	458 **	192 **	-20.8	339 **	-105 **

Source: Land Registry House Price Data, ONS Small Area Population Estimates and Economic Deprivation Index

Notes:

1. BF: areas with brownfield housing development
2. The larger the change in the mean rank, the bigger the improvement made in an area's relative position; and a negative change means an area is getting more deprived in relative terms.

**ANOVA test significance level at 0.01 or less and * for significance level at 0.05 or less between areas with and without brownfield housing reuse.

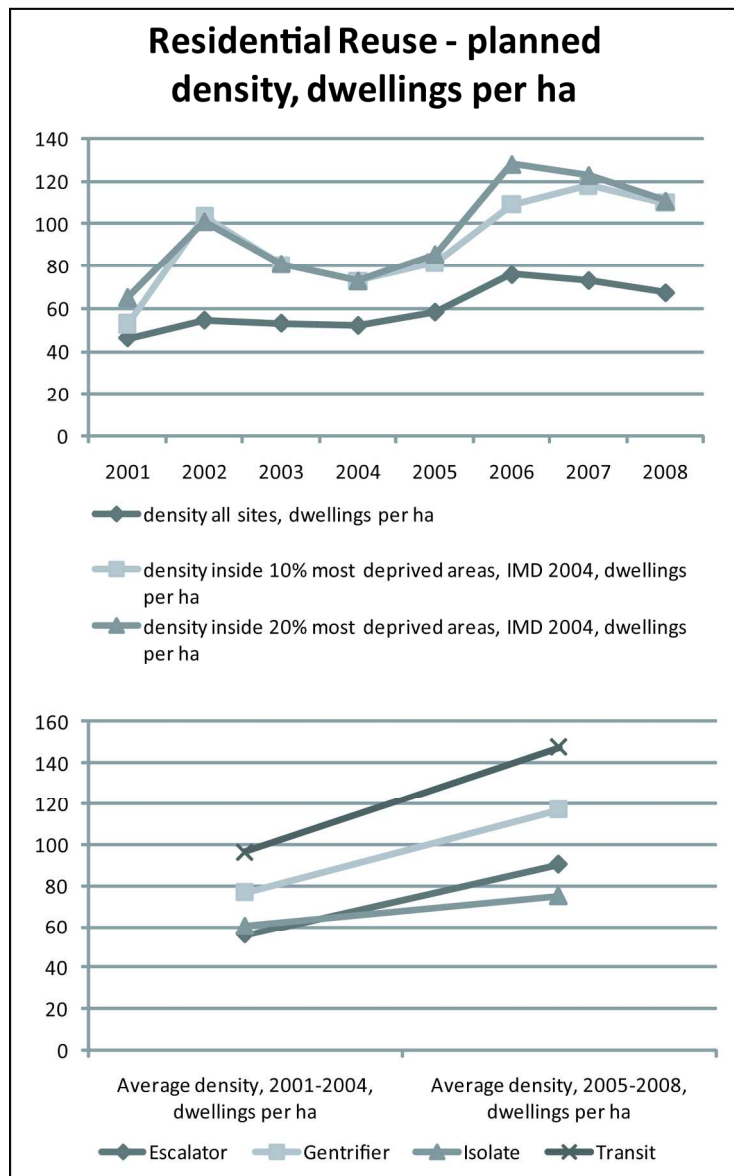


Figure 1 Planned density of residential reuse in most deprived neighbourhoods
 Source: own calculations based on the National Land Use Database for Previously Developed Land
 Note: The density figures show the planned density reported in previous NLUD years for sites that have been reused, which are not necessarily the same as the actual density in the redeveloped sites.

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