Leeds City Region

Demographic Forecasts 2012-31

Phase 1 Report

March 2014

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Acknowledgements

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Executive summary

Requirements

E1. The Leeds City Region (LCR) provides support on strategic spatial planning to its members, focusing in particular on the requirements of the 'duty-to-cooperate', as set out in the Localism Act and the National Planning Policy Framework (NPPF). The Heads of Planning group, representing each of the ten local authorities, has decided that the main priority for this work should be in respect of planning for housing.

E2. The LCR Partnership is due to respond to the government's Growth Deal proposals. The main component of the Growth Deal is the Strategic Economic Plan (SEP), which is due for submission by the end of March 2014. The SEP will set out the LCR's ambitions for growth, including an articulation of the scale of housing growth required to support the LCR's economic aspirations.

E3. This report provides a macro, LCR-level analysis of the scale of new housing development that is required to meet the economic ambition set out in the SEP and the Housing and Regeneration Plan.

E4. A range of scenario alternatives has been developed and tested for the LCR, based on the latest demographic evidence. This includes 'official' projections from ONS, updated 'migration-led' trend forecasts and a 'jobs-led' scenario which links to an employment forecast from the Regional Econometric Model (REM). All scenarios have been produced with a 2012 base year and a horizon of 2031.

Scenario outcomes

E5. The scenario analysis has produced a range of dwelling growth outcomes that considers a number of 'sensitivities' associated with; the historical impact of migration upon the trend forecasts; the variable impact of different household formation rates; and the impact of changes to rates of economic activity associated with the older age-groups.

E6. The 'X' scenarios have been included in the suite of forecasts to illustrate the degree to which adjustments to population statistics have affected trend projections. The 2011 Census has enabled a recalibration of previous mid-year population estimates and the basis for updated trend projections, with the 'X' scenarios now providing a less realistic perspective on growth given the historical demographic change that has occurred across the LCR since 2001.

E7. For the updated trend forecasts, the difference between the 'Migration-led(10yrs)' and 'Migration-led(5yrs)' scenarios is significant, reflecting both the effects of the post-2008 recessionary period upon demographic change and the continuing uncertainty with regard to the estimation of international migration throughout the 2001-11 period.

Leeds City Region scenario summary – annual dwelling growth estimates

Scenario	Average dwellings per year (2012-31)		
	A	B	*Average*
Migration-led(10yrsX)	12,593	15,270	*13,932*
Migration-led(10yrs)	11,573	14,200	*12,887*
Migration-led(5yrsX)	11,144	13,908	*12,526*
Jobs-led(REM)_EA1	**11,119**	**13,837**	***12,478***
SNPP-2010	10,835	13,255	*12,045*
Jobs-led(REM)_EA2	**10,239**	**12,948**	***11,594***
Migration-led(5yrs)	10,201	12,910	*11,555*
NaturalChange	8,186	10,313	*9,249*
NetNil	6,383	9,242	*7,813*

'EA1' - 2011 economic activity rates; 'EA2' - 2011 economic activity rates, accounting for changes to SPA

'A' - CLG 2011-based headship rates; 'B' - CLG 2008-based headship rates

E8. The analysis of scenario outcomes is complicated by the 'choice' of appropriate headship rates with which household (and dwelling) growth is estimated. The latest 2011-based rates (Option 'A') have been calibrated after a period of unprecedented economic change and stagnation in the housing market and thus suggest a slower rate of household formation than the previous 2008-based rates (Option 'B'), which were calibrated from data collected in a time period with very different market characteristics.

E9. The 'Migration-led(10yrs)', 'Migration-led(5yrs)' and 'SNPP-2010' scenarios suggest a wide range of dwelling growth outcomes, 10,239 – 13,837 per year over the forecast period. The 'NaturalChange' and 'NetNil' scenarios suggest a range of dwelling growth that should be considered even in the absence of a net migration impact, with average annual dwelling growth of 7,813 - 9,242 per year.

E10. The 'Jobs-led(REM)' scenario, with continuous jobs growth over the forecast period (2012-31) suggests a rate of dwelling growth that varies depending upon the assumptions that are made

with regard to age-specific economic activity rates across the LCR. The average annual dwelling requirement is greater when there is no change to economic activity rates ('EA1') over the forecast period (average of 12,478 dwellings per year). As the population naturally 'ages', a smaller resident labour force increases the requirement for additional in-migration to address the imbalance between residents and jobs. With an uplift to economic activity rates to account for SPA changes ('EA2'), a larger resident labour force is sustained, reducing the level of net in-migration required, with an average annual dwelling requirement of 11,594 per year

Interpreting the evidence

E11. There is no single, definitive perspective on future growth, with a mix of economic, demographic and national/local policy issues ultimately determining the speed and scale of change. In its interpretation of the evidence presented here, the LCR should give due consideration to a number of key issues.

E12. International migration is estimated to have been a significant driver of demographic change in the LCR since 2001 and trend forecasts assume that these drivers will continue. However, there remains a large degree of uncertainty with regard to its past and future impact. This should be borne in mind when considering the range of trend forecasts presented.

E13. Future rates of household formation are also a source of uncertainty. Consideration of the range of growth outcomes suggested by the 'A' and 'B' household formation rate alternatives is recommended.

E14. The process of population ageing implies a significant change to the age-structure of local authority populations. This has particularly important consequences for the size and shape of the LCR's resident labour force and its alignment to jobs growth ambitions; and also for the rates of household formation associated with an increasingly aged population.

E15. The alignment of demographic and economic forecasts continues to present a challenge, particularly in relation to longer-term assumptions on unemployment, commuting and economic activity. It is recommended that the LCR seeks further information from its REM on these specific assumptions to improve interpretation of the 'jobs-led' scenario outcomes that are presented here.

E16. The macro, LCR perspective presented here, hides a complex, sub-regional picture of demographic and economic change. Whilst this 'phase 1' evidence provides key inputs to support

the forthcoming SEP submission, it is recommended that local evidence forms the basis for future cooperation on housing growth ambition across the LCR local authorities.

E17. LCR should continue to review its underpinning demographic evidence when new population projections are released by ONS in summer 2014 and when new household projections are released by CLG later in 2014.

1. Introduction

Context

1.1 The Leeds City Region (LCR) Local Economic Partnership (LEP) consists of ten local authority district areas, overlapped to the north and east by the York, North Yorkshire & East Riding LEP and to the south by the Sheffield City Region LEP.

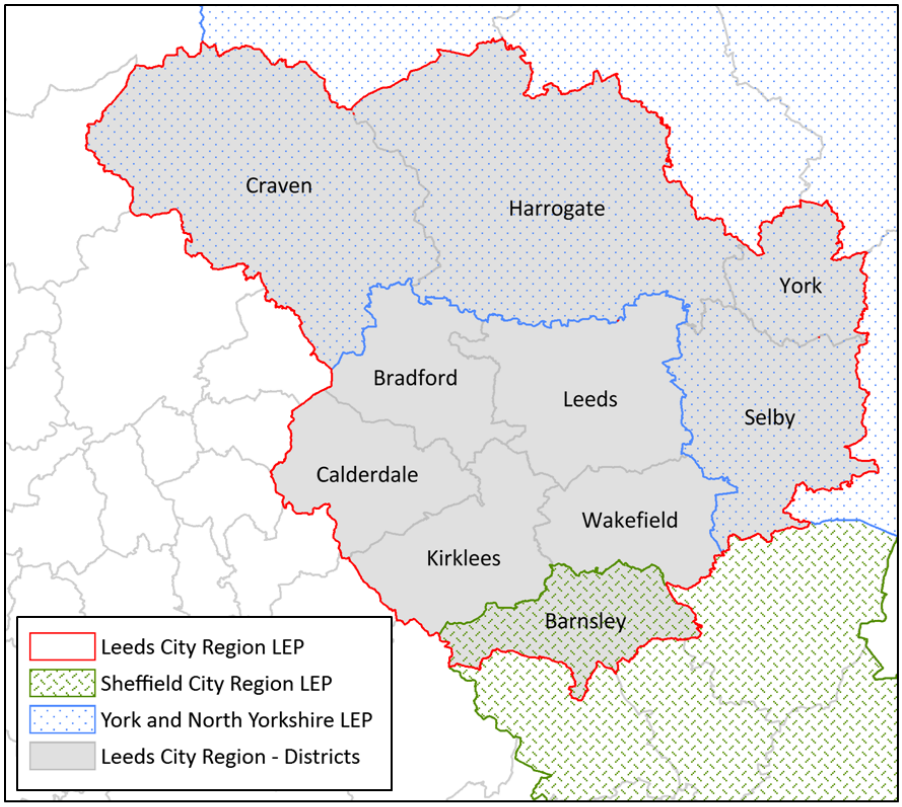


Figure 1: LCR and its over-lapping LEPs

1.2 The LCR provides support on strategic spatial planning to its members, focusing in particular on the requirements of the 'duty-to-cooperate', as set out in the Localism Act and the National Planning Policy Framework (NPPF). The Heads of Planning group, representing each of the ten local authorities, has decided that the main priority for this work should be in respect of planning for housing.

1.3 The LCR Partnership is due to respond to the government's Growth Deal proposals. The main

component of the Growth Deal is the Strategic Economic Plan (SEP), which is due for submission by the end of March 2014. The SEP will set out the LCR's ambitions for growth, including an articulation of the scale of housing growth required to support the LEP's economic aspirations.

Requirements

1.4 A preliminary phase of work identified an appropriate 'common methodology' for the objective assessment of housing need[1]. The LCR wishes to use the agreed common methodology to develop the work on shared and aligned evidence that underpins and provides the starting point for determining the objectively assessed need for housing across the LCR. This will allow authorities to be more effective in their strategic planning and help to meet the requirements of the duty to cooperate. It will also underpin the growth proposals in the SEP with up-to-date demographic evidence. Two phases of project development have been identified.

1.5 The Phase 1 requirement, reported on in this document, provides an analysis of the overall scale of need for housing in the LCR that is required to meet the economic ambition set out in the SEP and the Housing and Regeneration Plan. The scale of housing need is presented in the form of a 'range' of alternative growth scenarios for LCR to consider. Phase 1 has not sought to address delivery of affordable housing, general affordability, the backlog of unmet needs or market signals.

1.6 Phase 2 is to provide an update or review of work undertaken on the demographic and economic start point for understanding objectively assessed need for each local authority area. The scope of analysis will depend upon the stage that each authority is at in the planning process.

Forecasting methodology

1.7 Demographic forecasts have been developed using the POPGROUP suite of products. POPGROUP is a family of demographic models that enables forecasts to be derived for population, households and the labour force, for areas and social groups. The main POPGROUP model (Figure 2) is a cohort component model, which enables the development of population forecasts based on births, deaths and migration inputs and assumptions.

[1] Leeds City Region: The Objective Assessment of Housing Requirements – establishing a common methodological approach. Edge Analytics, November 2013

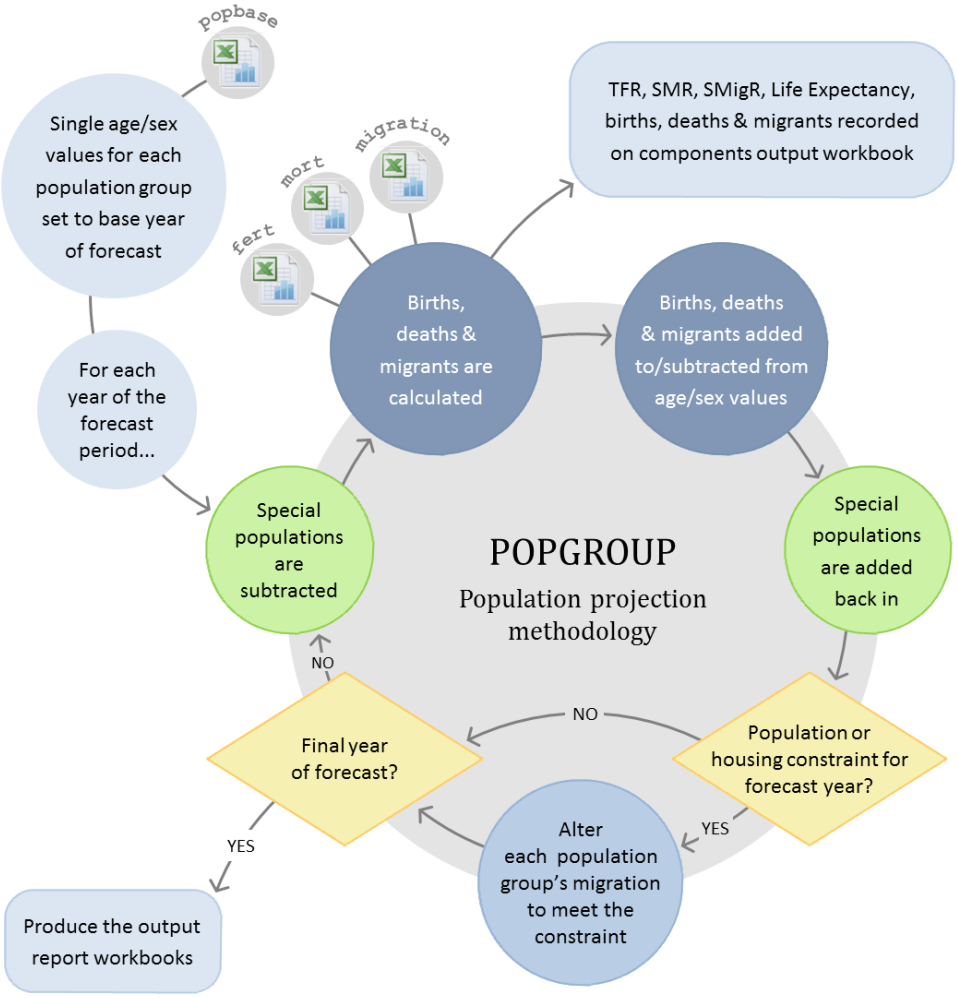
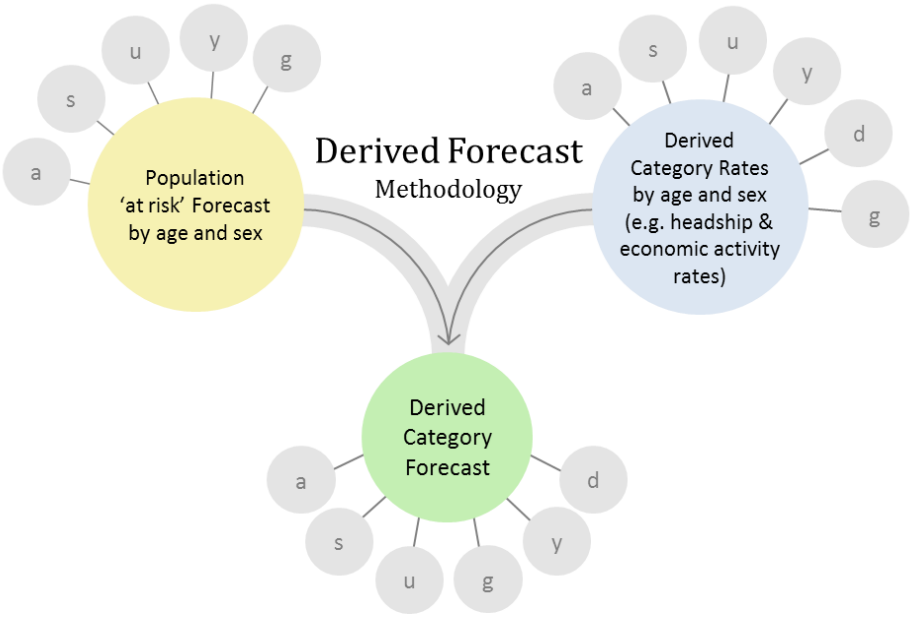


Figure 2: POPGROUP population projection methodology

1.8 The Derived Forecast model (Figure 3) sits alongside the population model, providing a headship rate model for household projections and an economic activity rate model for labour-force projections.

1.9 POPGROUP models are used extensively by local authorities across the UK, providing a desktop utility for the evaluation of alternative growth scenarios to support local planning. Under licence to the Local Government Association (LGA), Edge Analytics provides product development and technical support to the product suite and its user base.

1.10 For a more complete review of the functionality and methodology which underpin POPGROUP and the Derived Forecast model, users are referred to the respective user manuals, available from the POPGROUP website: http://www.popgroup.org.uk/.



$$D_{a,s,u,y,d,g} = \frac{P_{a,s,u,y,g} \quad R_{a,s,u,y,d,g}}{100}$$

D Derived Category Forecast
P Population 'at risk' Forecast
R Derived Category Rates
a Age-group
s Sex
u Sub-population
y Year
d Derived category
g Group (usually an area, but can be an ethnic group or social group)

Figure 3: Derived Forecast (DF) methodology

Report structure

1.11 Section 2 provides headline statistics to illustrate the extent to which the LCR has been affected by demographic change between the 2001 and 2011 Censuses.

1.12 Section 3 summarises the new demographic evidence that has been made available following the 2011 Census count and details the assumptions and outcomes of the latest household projections from the Department for Communities and Local Government (CLG).

1.13 Section 4 provides a short summary of the scenarios that have been tested in this LCR analysis, whilst Section 5 presents the outcomes of these scenarios, providing a perspective on population, household, dwelling and jobs growth for each forecast.

1.14 Section 6 provides a short summary to the report and links to the Phase 2 analysis, which will seek to evaluate scenario impacts for individual LCR local authority areas.

1.15 The Appendix to this document provides detail on the data and assumptions employed in the development of the scenario forecasts.

1.16 LCR should continue to review its underpinning demographic evidence when new population projections are released by ONS in summer 2014 and when new household projections are released by CLG later in 2014.

2. Demographic change 2001-11

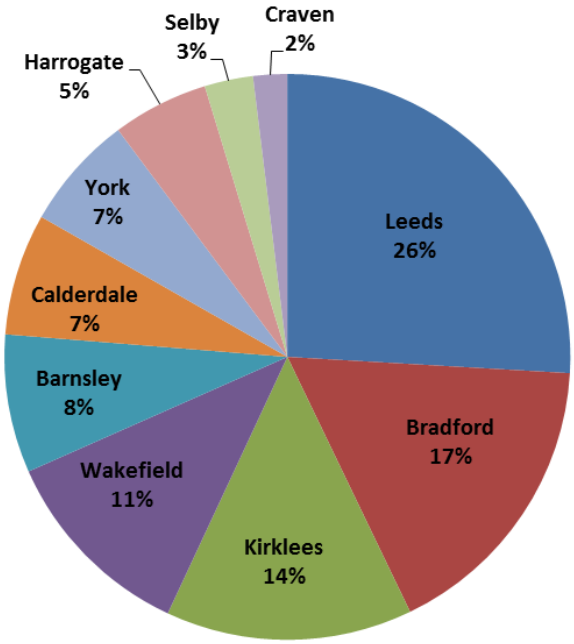
2.1 The 2011 Census recorded a resident population within the LCR of almost 3 million, a 7.0% increase over the 2001-11 decade. Household and dwelling growth was slightly higher at 8.2%, suggesting a reduction in average household size over the period (Table 1).

Table 1: LCR demographic change, 2001-11

Source: Census 2001 and 2011

Leeds City Region	Population		Change	
	2001	2011	Absolute	Percentage
Population	2,759,196	2,952,057	192,861	7.0%
Households	1,139,794	1,233,049	93,255	8.2%
Dwellings	1,186,126	1,283,886	97,760	8.2%

2.2 In 2011 the four local authority areas of Leeds, Bradford, Kirklees and Wakefield accounted for 68% of the LCR's population, approximately 1.9 million in total. The other six districts, Barnsley, Calderdale, York, Harrogate, Selby and Craven, contained the remaining 32% or 1 million people.



Source: Census 2011

Figure 4: Local authority share of the LCR population, 2011

2.3 Between 2001 and 2011, rates of population growth varied across the LCR. Bradford achieved the highest growth (11.8% over the decade); Craven and Wakefield the smallest change (3.4% growth).

Table 2: LCR population change, 2001-11

Source: Census 2001 and 2011

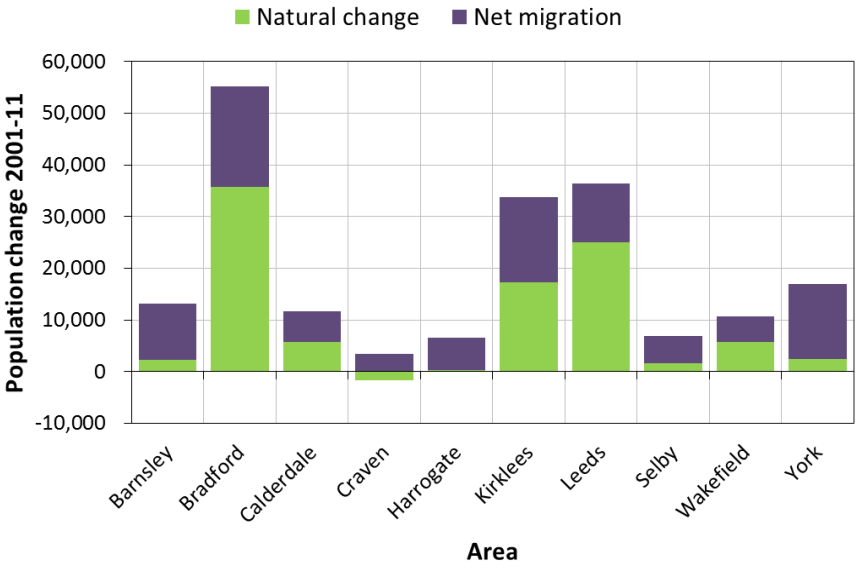
Area	Population		Change	
	2001	2011	Absolute	Percentage
Barnsley	218,101	231,221	13,120	6.0%
Bradford	467,305	522,452	55,147	11.8%
Calderdale	192,114	203,826	11,712	6.1%
Craven	53,578	55,409	1,831	3.4%
Harrogate	151,375	157,869	6,494	4.3%
Kirklees	388,720	422,458	33,738	8.7%
Leeds	715,160	751,485	36,325	5.1%
Selby	76,486	83,449	6,963	9.1%
Wakefield	315,192	325,837	10,645	3.4%
York	181,165	198,051	16,886	9.3%
Leeds City Region	**2,759,196**	**2,952,057**	**192,861**	**7.0%**

2.4 The largest absolute change occurred in Bradford, with a population increase of over 55,000 between Census years. Of the remaining areas, only Kirklees and Leeds achieved growth in excess of 20,000 people between 2001 and 2011.

2.5 Within each area population change has been driven by a mixture of natural change (the difference between births and deaths) and net migration (the overall balance of growth resulting from in-migration, out-migration, immigration and emigration).

2.6 Net migration has had a positive impact upon growth within all ten of the LCR local authority areas, with the most substantial net in-flow experienced in Bradford over the decade (Figure 5). Some of this net outflow will have resulted from an exchange of migrants between areas; some will have resulted from migration to/from outside the LCR and from the net effect of international migration.

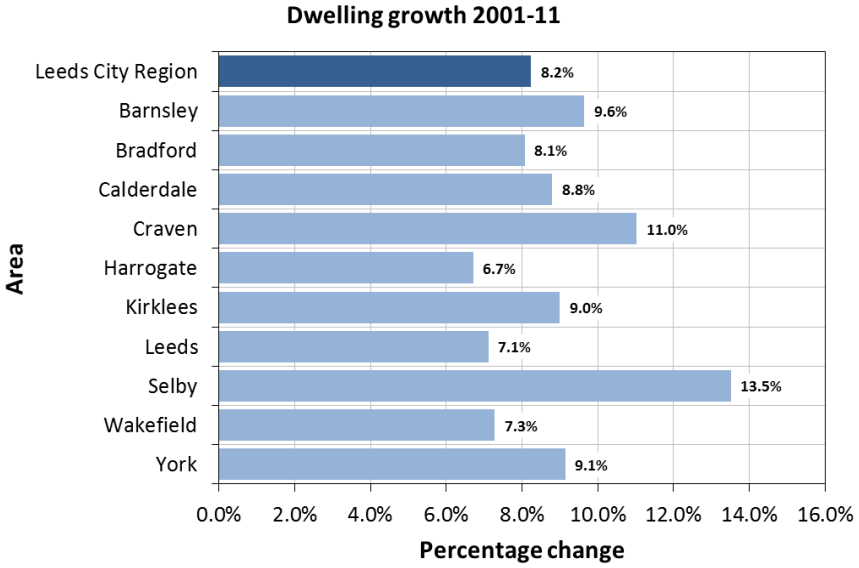
2.7 Whilst net migration has been consistently positive, the impact of natural change has been variable. Natural change made the largest contribution to growth in Bradford, Kirklees and Leeds, with smaller positive impacts in Barnsley, Calderdale, Harrogate, Selby, Wakefield and York. Conversely, in Craven, the excess of deaths over births resulted in a small population decline.



Source: Census 2001 and 2011

Figure 5: LCR components of population change, 2001-11

2.8 The 8.2% rate of growth in dwelling numbers across the LCR between 2001 and 2011 was a composite of more substantial variation between local authority areas (Figure 6). The 2001/2011 Census comparison suggests that the highest rate of dwelling growth was experienced in Selby (+13.5%), Craven (+11.0%) and Barnsley (+9.6%). In comparison, the rate of dwelling growth in Harrogate was lowest (+6.7%).



Source: Census 2001 and 2011

Figure 6: LCR dwelling growth, 2001-11

3. The latest demographic evidence

Official statistics

3.1 Robust and timely population statistics provide both an historical perspective on demographic growth and the basis for long-term projections of change. The current and evolving age structure of local populations drives the estimation of the likely levels of household formation and the changing size and shape of the resident labour force, providing the key evidence to support housing and economic growth ambitions.

3.2 The UK does not have a population register and so relies on the ten-yearly Census for its definitive statistics on local populations (Figure 7). Between Censuses, mid-year population 'estimates' are published by ONS, taking account of the impact of births, deaths, internal migration and international migration upon the population of each local authority area. International migration is the most volatile component of demographic change and the most difficult to estimate accurately. Its sub-national estimation methodology has been subject to significant revision, resulting in the re-calibration of mid-year population estimates over the course of the 2001-11 decade.

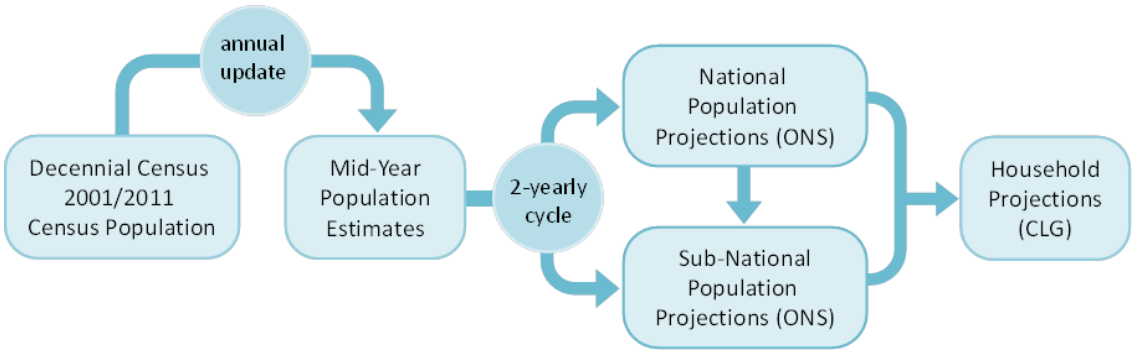


Figure 7: Official statistics on population and household estimates and projections

3.3 Every two years, ONS publishes a 'national' population projection for the UK and its constituent countries, including a 'principal' projection of growth and a series of 'variant' projections that test the sensitivity of fertility, mortality and migration assumptions upon growth outcomes. A national projection with a starting year of 2012 is referred to as the '2012-based' national projection.

3.4 The national projection is followed by the publication of 'sub-national' population projections, which provide an indication of likely growth in each local authority area over a 25-year projection horizon. No 'variant' alternatives are provided at a sub-national level, but migration assumptions are typically based upon the prior 5-year period, with the '2012-based' naming convention consistent with the national projections.

3.5 With a continuous cycle of new statistical releases, the release of 2011 Census data, plus a number of fundamental changes to estimation and projection methods over the last decade, the selection of demographic evidence on which to base the development of long-term housing plans has been a challenging proposition for local stakeholders. The timing at which the evidence is formulated can have an important bearing on growth outcomes.

Population estimates

3.6 The 2011 Census has provided a timely and definitive update on local population statistics. But it has also resulted in the 'recalibration' of previous mid-year population estimates[2]. This has important implications for both the interpretation of historical evidence on demographic change in local authority areas and on the derivation of projections of future growth based upon this evidence.

3.7 For the LCR, as a collection of ten local authority areas, the 2011 Census has suggested that previous mid-year populations over-estimated the scale of growth evident since the previous Census in 2001 (Figure 8).

3.8 As births and deaths are robustly recorded through vital statistics registers and internal migration is adequately measured through the process of GP registration, it is most likely that the 'error' in the mid-year population totals is associated with the mis-estimation of immigration and emigration impacts at a local level. It may be that there are issues associated with the accuracy of the 2001 and 2011 Census, but this is more difficult to prove.

3.9 A comparison of successive Census returns provides an indication of the variation in Census coverage by LCR local authority area (Table 3). All areas achieved in excess of 92% coverage in both the 2001 and 2011 Censuses, with the lower returns associated with the larger, urban areas.

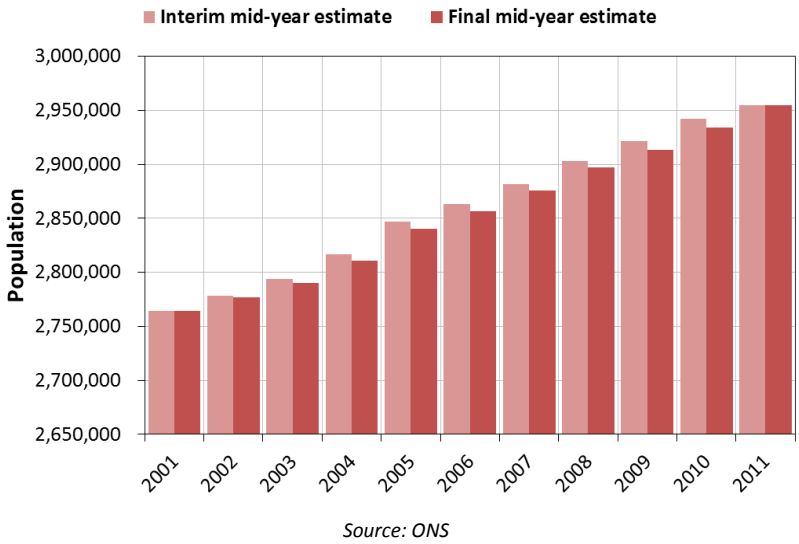
[2] ONS (2013). Methods used to revise the SNPP estimates for mid-2002 to mid-2010. http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2002-to-mid-2010-revised--subnational-/index.html.

Table 3: Census returns, 2001 and 2011

Source: Census 2001 and 2011

Census Returns		
Area	**2001 Response**	**2011 Response**
Barnsley	98%	96%
Bradford	95%	92%
Calderdale	94%	93%
Craven	97%	96%
Harrogate	97%	95%
Kirklees	95%	93%
Leeds	92%	94%
Selby	99%	96%
Wakefield	96%	95%
York UA	97%	94%

3.10 On the assumption that births, deaths and internal migration have been robustly measured (and that the 2001 Census provided a robust population count for the LCR), the downward 'adjustment' that resulted from the mid-year population estimate revisions is predominantly associated with the mis-estimation of international migration.

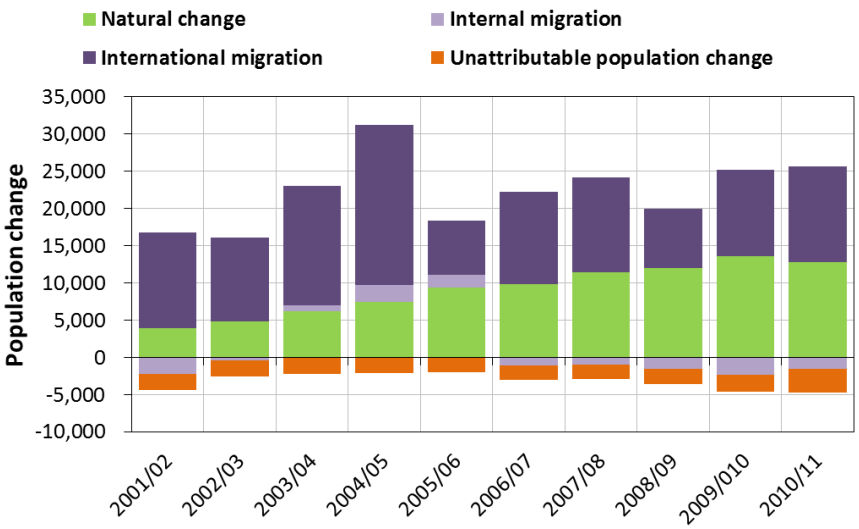


Source: ONS

Figure 8: LCR mid-year population estimates, 2001-11

3.11 The result of the mid-year population estimate recalibration for the LCR is that birth and death totals (and therefore natural change) remain largely unaltered. Small changes to internal migration are evident but not substantial. ONS has not explicitly assigned the mid-year estimate adjustment to international migration. Instead it has identified an additional 'unattributable population change' (UPC) component, suggesting that it has been unable to accurately identify

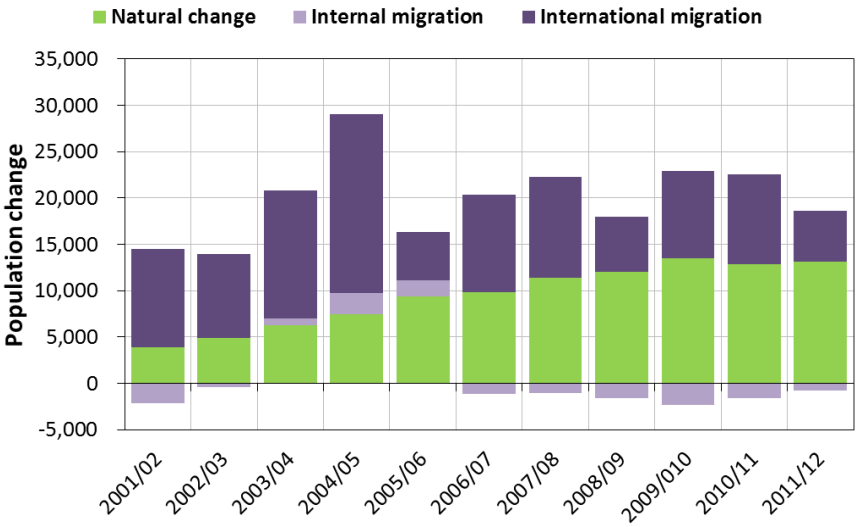
the source of the 2001-11 over-count (Figure 9).



Source: ONS

Figure 9: LCR components of change, 2001/02-2010/11

3.12 For demographic analysis, the classification of the UPC is unhelpful, but given the robustness of births, deaths and internal migration statistics compared to international migration estimates, it is assumed that it is most likely to be associated with the latter. With an assumption that the UPC component is assigned to international migration (for estimates to 2011) and with the inclusion of statistics from the 2012 mid-year population estimate from ONS, an eleven-year profile of the 'components of change' for the LCR is presented (Figure 10).



Source: ONS

Figure 10: LCR components of change, 2001/02-2011/12

3.13 Natural change has had an increasingly positive impact upon population growth in the LCR since 2001, with a growing excess of births over deaths. This contrasts to net internal migration (migration to and from other areas of the UK), which has varied considerably over the last eleven years. There was a net in-migration to the LCR between 2003 and 2006, reverting to a net outflow until 2011/12. Net international migration (the difference between immigration and emigration) had had a positive impact upon population growth in the LCR in all years since 2001.

ONS population projections

3.14 The significance of the changes to the historical estimates of population growth is that they form a key component of the derivation of migration assumptions in the official trend projections (Figure 11). A downward adjustment in the population estimate for 2001-11 will typically mean a lower growth trajectory in subsequent projections. Conversely, an upward adjustment will typically mean a higher growth trajectory in subsequent projections.

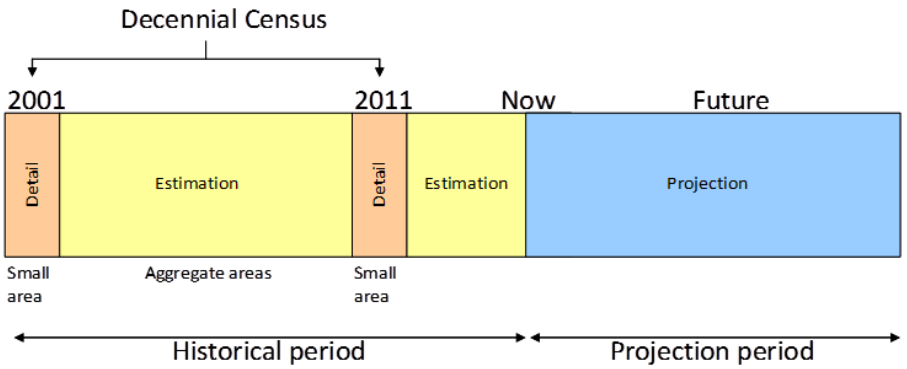


Figure 11: Census statistics, mid-year estimates and population projections

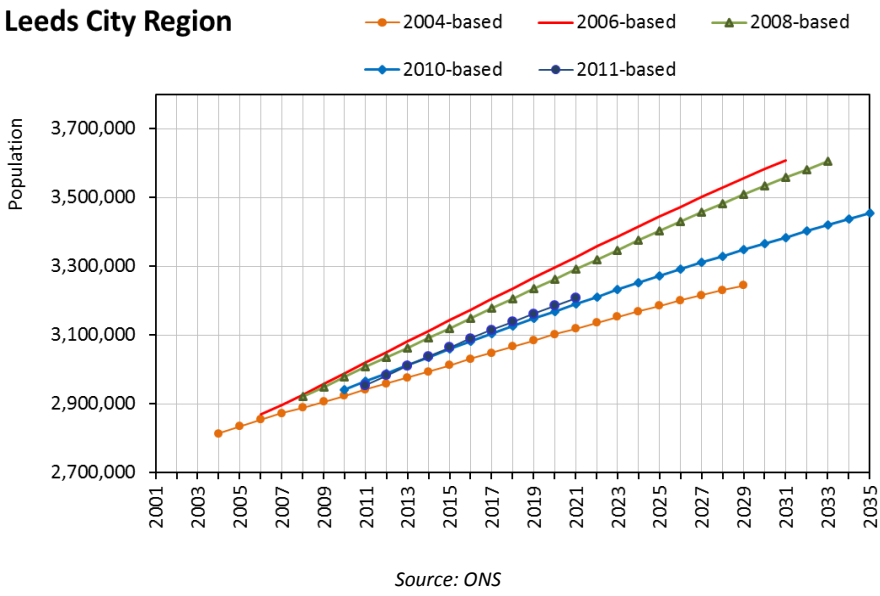
3.15 Any change to population projections will have an effect upon household projections, which ultimately provide the basis for the assessment of housing need linked to economic growth. It is therefore essential that due consideration is given to the full range of statistical evidence that has resulted from the definitive population counts derived from the 2011 Census.

3.16 The importance of historical evidence in shaping population projections is best illustrated with a comparison of the official sub-national population projections released by ONS with a 2004, 2006, 2008, 2010 and 2011 base period. An aggregate picture for the LCR local authorities is provided to illustrate the variation in growth outcomes that has resulted from successive projections (Figure 12).

3.17 The 2004-based projection suggests the flattest growth, with higher international migration effects yet to feature in the historical statistics on which migration assumptions are based. The 2006-based and 2008-based projections estimate a more substantial population change over the 25-year period, driven by higher growth assumptions for international migration.

3.18 Prior to the release of the 2010-based projections, ONS implemented a new methodology for the estimation of international migration, linking local estimates of immigration more closely to complementary evidence from a number of administrative sources (GP registrations, National Insurance Number registrations and Higher Education statistics).

3.19 For the LCR, the general impact of the recalibration of international migration estimates was for lower net immigration, producing a 2010-based projection that was lower than the previous 2006-based and 2008-based ONS projections.



Source: ONS

Figure 12: LCR population projections

3.20 With the publication of the 2011 Census, ONS released an 'interim' 2011-based population projection. Unfortunately, this projection failed to follow ONS' normally robust rules on the calculation of long-term assumptions. Instead it simply applied the migration, fertility and mortality assumptions from the 2010-based model to a 2011 Census base population. This was inappropriate for two key reasons:

- The revisions to the historical mid-year populations and the subsequent change in the historical impact of migration were not taken into account.

- The 2011 Census population had a different age structure to the 2010-based population.

Both of these issues resulted in a 2011-based projection that is not sufficiently robust to underpin any analysis of long-term housing and economic growth ambitions.

Household projections

3.21 During the 2001-11 decade, the household projection methodology has been subject to substantial review, with a new approach adopted between the 2006-based and 2008-based outputs. In April 2013, CLG released its 2011-based household projections for local authority areas in England, replacing the 2008-based projections[3,4,5].

3.22 The 2011-based projections provide an update on likely household growth trajectories (albeit to 2021 only), taking into account the unprecedented economic conditions that have affected local communities since 2008 and the substantial impact of population growth (particularly international migration) upon average household size.

3.23 The general trend of the 2011-based projections suggests a reduction in the anticipated rate of household growth from 2011 to 2021, compared to the 2008-based projections.

3.24 In a household projection model, rates of household growth are determined by two factors: first, the profile and change in household 'headship rates' (also referred to as household representative rates in CLG documentation) by household type, age and sex; and second, the underlying rate of population growth. Household headship rates define the likelihood of a particular household type being formed in a particular year, given the age-sex profile of the population in that year. Household-types are modelled within a 17-fold classification (see Appendix, Table 9).

3.25 Using the 2010-based population projection to define the underlying population growth (scaled to the 2012 mid-year population estimate) the number of households in the LCR is projected to increase by just 8.5% using the 2011-based headship rates, compared to 10.6% with the 2008-based headship rates (Table 4).

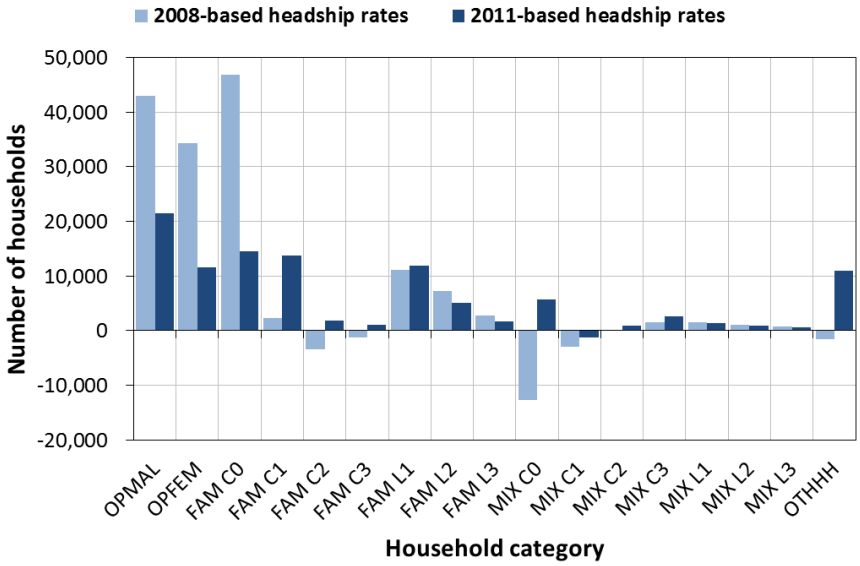
[3] CLG (2013). Household interim projections (2011 to 2021) in England.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182412/Stats_Release_2011FINALDRAFT.pdf.
[4] CLG (2013). 2011-based interim household projections: quality report.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182504/QualityFinalDraft_v3.pdf.
[5] CLG (2013). Updating DCLG's household projections to a 2011 base: methodology.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182417/MethodologyFinalDraft.pdf.

Table 4: LCR household change (2011-21) using 2008- and 2011-based headship rates

Source: CLG; Edge Analytics. Using 'SNPP-2010' population projection

	Households			Change 2011-21	
	2011	2016	2021	Total	%
2008-based headship rates	1,234,202	1,297,709	1,364,944	130,742	10.6%
2011-based headship rates	1,234,198	1,285,864	1,338,851	104,653	8.5%

3.26 The revised 2011-based headship rates have had the most significant impact upon single-person households (OPMAL, OPFEM) and family households with no children (FAM C0). This has been offset by increases in households comprising a couple and one or more other adults with no dependent children (MIX C0), family households comprising a couple with one or more children (FAM C1, FAM C2, FAM C3), family households comprising a lone parent with one child (FAM L1) and the miscellaneous 'Other' household classification (Figure 13).



Source: CLG; Edge Analytics. Using 'SNPP-2010' population projection

Figure 13: LCR household change (2011-21) using 2008- and 2011-based headship rates

3.27 Identifying the 'most likely' speed and scale of future household formation presents a challenge to planners. In providing its evidence on demographic change, Edge Analytics has typically used 'headship rate' assumptions from both the 2008-based and 2011-based household models. The use of assumptions from both the 2008-based and 2011-based models is in recognition of the uncertainty associated with future rates of household growth, given economic and demographic

conditions. This approach presents a 'range' of household growth outcomes for each population forecast.

3.28 Two alternative headship rate assumptions have been applied to the population growth scenarios presented in this report:

- **Option 'A'**: CLG 2011-based headship rates, with the 2011-21 trend continued after 2021.
- **Option 'B'**: CLG 2008-based headship rates, scaled to be consistent with the 2011 Census household total, but following the original trend thereafter.

Economic activity rates

3.29 The 2011 Census has provided an important update on evidence to support the evaluation of the demographic consequences of economic change. Economic activity rates provide an indication of the size of the labour force in each local authority area; the basis for the evaluation of the effect of anticipated jobs growth upon the resident population.

3.30 There have been important changes to economic activity rates over the last decade, with increasing labour force participation in the older age-groups (both males and female) and a general increase in female participation across all age-groups (aged 25+). Further changes are anticipated as accelerated changes to the State Pension Age (SPA) take effect and as larger, healthier cohorts of the population move into the 'traditional' 65+ retirement age groups.

3.31 The scenarios presented in this report incorporate the latest evidence on economic activity rates from the 2011 Census and evaluate the impact of changing rates of economic participation upon the size and profile of the resident labour force in the LCR.

3.32 Two alternative economic activity rate assumptions have been applied to the population growth scenarios presented in this report:

- **Option 'EA1'**: Economic activity rates remain fixed at current (2011) levels over the forecast period
- **Option 'EA2'**: Current (2011) economic activity rates change over time to take account of SPA changes.

More detail on these data inputs and assumptions is provided in the Appendix to this report.

4. Scenario definition

Scenario context

4.1 The National Planning Policy Framework (NPPF)[6] and the latest National Planning Practice Guidance (NPPG)[7] provide guidance on the formulation of a robust evidence base to support the development of local housing plans. For any local authority area, there is no single, definitive view on the likely level of future growth, with a mix of economic, demographic and national/local policy issues ultimately determining the speed and scale of change. NPPF guidance makes it clear that in developing the evidence, data inputs, assumptions and methodology should be suitably robust and should consider future growth potential from a number of perspectives.

4.2 The development of Local Plans is made considerably more challenging by the dynamic nature of key data inputs. Economic and demographic factors, coupled with the continuous release of new statistics, often undermine the robustness of underpinning evidence. This was a particular issue during 2013, with the release of new 2011 Census statistics, updated household projections and revisions to historical population estimates.

4.3 The use of a recognised forecasting product (POPGROUP), which incorporates industry-standard methodologies (i.e. a cohort component model for population forecasting and a headship rate model for household forecasting) ensures a robustness of approach and enables a focus on assumptions and output, rather than methods. Transparency is an important component of any forecasting analysis. It is necessary to ensure that all data inputs and assumptions are clearly documented and justified and that outcomes are benchmarked against the latest 'official' forecasts, wherever possible.

4.4 The scenarios that are presented for the LCR include the following:

- 'Official' projections from ONS.
- Updated 'migration-led' trend forecasts that use the latest demographic evidence.

[6] CLG (2012). National Planning Policy Framework https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf.
[7] CLG (2014) National Planning Practice Guidance http://planningguidance.planningportal.gov.uk/

- A 'jobs-led' projection that uses an employment forecast from the Regional Economic Model (REM) for the LCR LEP.

4.5 Each scenario has been evaluated using both 2011-based (Option 'A') and 2008-based (Option 'B') household headship rates, providing a range of household and dwelling growth options for consideration.

4.6 Each scenario has also been evaluated using alternative assumptions on age-specific economic activity rates that are associated with the LCR labour force. Two alternatives are tested, with economic activity rates remaining fixed at current (2011) levels over the forecast period (Option 'EA1') and economic activity rates changing over time to take account of planned changes to state pension age (Option 'EA2'). More detail on these assumptions is provided in the Appendix to this report.

4.7 All scenarios have been produced with a 2012 base year and a horizon of 2031. For context, historical data are included for 2001-12. Information on the data inputs and assumptions underpinning the scenarios is detailed in the Appendix to this document.

Official projection: SNPP-2010

4.8 In all scenario analysis it is important to benchmark any growth alternatives against the latest 'official' population projection. The most recent official projection is the ONS 'interim' 2011-based population projection (SNPP-2011), which was released following the publication of the 2011 Census. Despite being the most recent official projection, it is considered inappropriate as a growth benchmark as the normally robust rules on the calculation of long-term migration, fertility and mortality assumptions were not followed. Instead, ONS applied the assumptions from the previous official forecast (the 2010-based sub-national population projection - 'SNPP-2010') to a 2011 Census base population. This was inappropriate for two key reasons:

- The revisions to the historical mid-year populations and the subsequent change in the historical impact of migration were not taken into account.
- The 2011 Census population had a different age structure to the previous 2010-based population.

4.9 Both of these issues mean that the 2011-based projection is not sufficiently robust to underpin any analysis of long-term housing requirements. Therefore, the 2010-based sub-national population projection (SNPP-2010) from ONS is used in this analysis as the trend benchmark. This

scenario was developed using historical evidence from the period 2006-10 and incorporates long-term assumptions on fertility, mortality and international migration that were defined in the 2010-based national projection for England.

4.10 The SNPP-2010 scenario is scaled to ensure consistency with the 2012 mid-year population estimate for each district, following its designated growth trend thereafter. This ensures that the years 2010-12 are a replication of the revised mid-year population estimates for each LCR district.

4.11 Whilst not included in the detailed scenario summaries, the SNPP-2011 scenario is included for comparison on the output charts.

Alternative trend scenarios

4.12 During 2012/13, ONS released detailed statistics from the 2011 Census and followed this with a release of the revised mid-year population estimates for 2002-10. These new data provide the basis for the derivation of a number of alternative trend scenarios to complement the official (SNPP-2010) projection.

4.13 In determining the migration assumptions for a new 2012-based trend projection, historical data on the components of demographic change between 2001/02 and 2011/12 are a key consideration.

4.14 A five year historical period is a typical time-frame from which migration trend assumptions are derived (this is consistent with the ONS official methodology). However, given the unprecedented economic change that has occurred since 2008, it is important to give due consideration to an extended historical time period for assumption derivation.

4.15 A range of 'migration-led' scenario alternatives have been developed and tested for the LCR, based on the latest demographic evidence:

- **Migration-led (5yrs)**: internal and international migration assumptions are based on the last five years of historical evidence (2007/08 to 2011/12). The UPC component is integrated with international migration.
- **Migration-led (10yrs)**: internal and international migration assumptions are based on the last ten years of historical evidence (2002/03 to 2011/12). The UPC component is integrated with international migration.

- **NaturalChange**: in-migration, out-migration, immigration and emigration are set to zero.
- **NetNil**: in-migration, out-migration, immigration and emigration are maintained, but the net migration balance is set at zero.

4.16 Section 2 has discussed how the rebasing of mid-year population estimates has resulted in an element of uncertainty with regard to the components of population change during the 2001-11 inter-censal period. ONS has indicated that it does not intend to take explicit account of the important UPC component when deriving its forthcoming 2012-based SNPP[8].

4.17 The precise implications of this intention remain unclear, but the trend scenarios listed above assume that the UPC component is accounted for in the international migration assumptions. The uncertainty associated with the UPC component suggests that a sensitivity test on its importance is appropriate. Two further 'migration-led' scenarios have been developed as follows:

- **Migration-led (5yrsX)**: internal and international migration assumptions are based on the last five years of historical evidence (2007/08 to 2011/12), ignoring the UPC element of the ONS mid-year estimate rebasing exercise.
- **Migration-led (10yrsX)**: internal and international migration assumptions are based on the last ten years of historical evidence (2002/03 to 2011/12), ignoring the UPC element of the ONS mid-year estimate rebasing exercise.

Jobs-led scenario

4.18 The impact of an anticipated growth in employment can also be evaluated using a 'jobs-led' formulation of the forecasting model, which uses in- and out-migration to balance the relationship between the size of the labour force and the anticipated number of new jobs.

4.19 For the purposes of this report the impact of a single employment constraint has been evaluated with the following 'jobs-led' scenario:

- **Jobs-led (REM)**: population growth for the LCR is linked to a jobs growth trajectory of between 5,140 and 12,548 new jobs per year to 2031 (Figure 11).

[8] 2012-based Subnational Population Projections for England – Report on Unattributable Population Change. Office for National Statistics, January 2014. http://www.ons.gov.uk/ons/about-ons/get-involved/consultations/consultations/consultation-on-the-2012-based-subnational-population-projections-for-england/index.html.

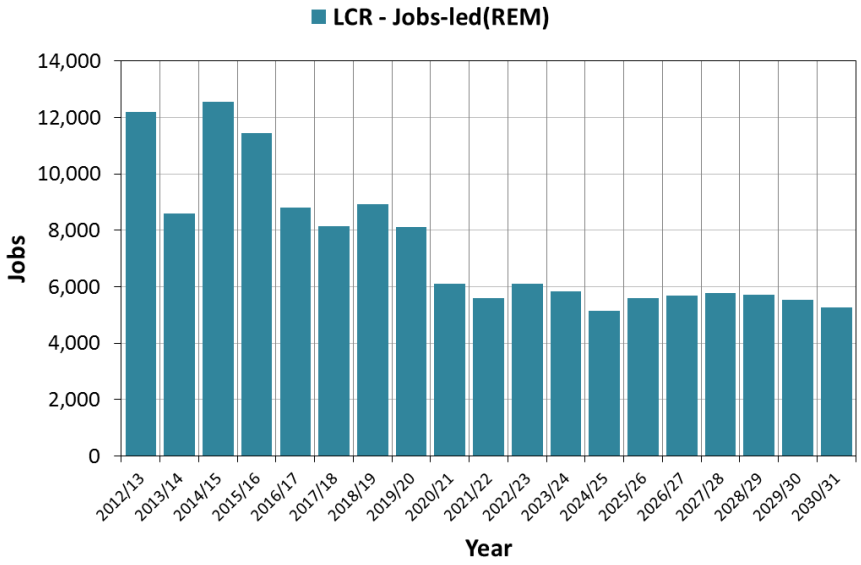


Figure 14: Jobs growth (2012/13-2030/31) used in the 'Jobs-led(REM)' scenario

4.20 In modelling the potential impact of jobs growth upon demographic change, three key parameters (for each district) are used: economic activity rates by age and sex, an unemployment rate and a commuting ratio. Further details on these assumptions are provided in the Appendix.

4.21 POPGROUP evaluates the impact of a jobs growth trajectory by measuring the relationship between the number of jobs in an area, the size of its labour force and the size of the resident population. Economic activity rates control the relationship between the size of the population and the size of the labour force. The unemployment rate and the commuting ratio determine the relationship between the size of the labour force and the number of jobs available. If there is an 'imbalance' between the 'target' number of new jobs and the resident population, then migration is used to redress the imbalance. For a given year, a higher level of net in-migration will occur if there is insufficient population to meet the jobs target. Conversely, a higher level of net out-migration will occur if the population is too high relative to the jobs target.

Scenario summary

4.22 The following suite of scenarios has been evaluated in this analysis:

Table 5: Scenario summary

		Household headship rates	
		Option 'A'	Option 'B'
Economic activity rates	Option 'EA1'	SNPP-2010_EA1_A Migration-led(5yrs)_EA1_A Migration-led(10yrs)_EA1_A Migration-led(5yrs-X)_EA1_A Migration-led(10yrs-X)_EA1_A NaturalChange_EA1_A NetNil_EA1_A Jobs-led(REM)_EA1_A	SNPP-2010_EA1_B Migration-led(5yrs)_EA1_B Migration-led(10yrs)_EA1_B Migration-led(5yrs-X)_EA1_B Migration-led(10yrs-X)_EA1_B NaturalChange_EA1_B NetNil_EA1_B Jobs-led(REM)_EA1_B
	Option 'EA2'	SNPP-2010_EA2_A Migration-led(5yrs)_EA2_A Migration-led(10yrs)_EA2_A Migration-led(5yrs-X)_EA2_A Migration-led(10yrs-X)_EA2_A NaturalChange_EA2_A NetNil_EA2_A Jobs-led(REM)_EA2_A	SNPP-2010_EA2_B Migration-led(5yrs)_EA2_B Migration-led(10yrs)_EA2_B Migration-led(5yrs-X)_EA2_B Migration-led(10yrs-X)_EA2_B NaturalChange_EA2_B NetNil_EA2_B Jobs-led(REM)_EA2_B

'EA1' - 2011 economic activity rates

'EA2' - 2011 economic activity rates, accounting for anticipated changes to State Pension Age

'A' - CLG 2011-based headship rates, with the 2011-21 trend continued after 2021

'B' - CLG 2008-based headship rates, scaled to be consistent with the 2011 Census household total, then following the original trend

5. Scenario results

5.1 A summary of the results of each scenario is provided in the form of a chart and an accompanying table of statistics (Figure 15 and Figure 16). The chart illustrates the trajectory of population change that results from each scenario. The table summarises the change in population and household numbers from 2012-31 that results from each scenario.

5.2 Within the tables, the scenarios are 'ranked' (high to low) according to the expected average annual dwelling growth requirement throughout the forecast period. The table also shows the average annual net migration associated with the forecast population change and the expected average annual jobs growth.

5.3 Scenario results are presented in two separate illustrations, each one relating to the application of different household headship rates:

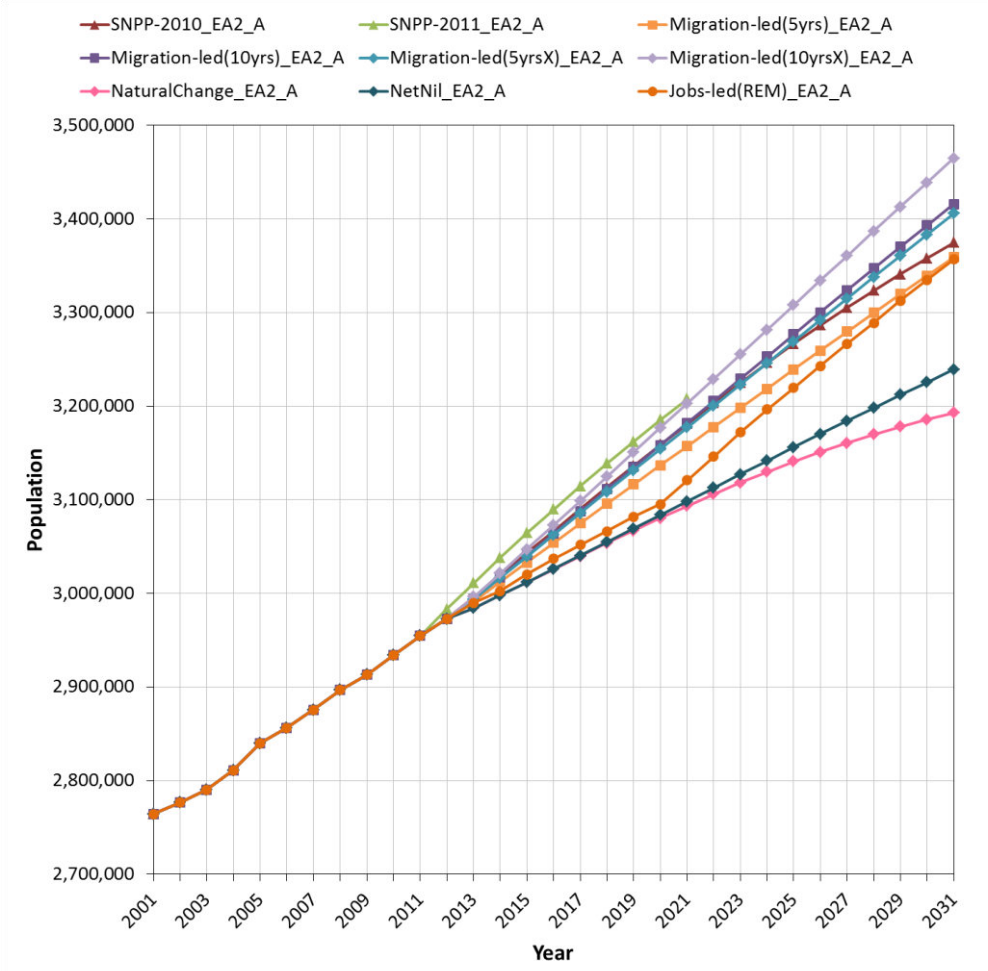
- **Option 'A'**: CLG 2011-based headship rates (Figure 15).
- **Option 'B'**: CLG 2008-based headship rates (Figure 16).

5.4 In each of these scenarios, 'EA2' economic activity rate profiles have been applied, taking account of planned changes to SPA. The sensitivity of scenario outcomes to these economic activity rates is explored in the 'Economic activity sensitivity' section, below.

Scenario outcomes ('A')

5.5 This first set of scenarios ('A') has been run using CLG's 2011-based household headship rates, trended after 2021. The scenario outcomes suggest a range of growth trajectories with estimated dwelling growth from +6,383 to +12,593 units per year (Figure 15).

5.6 All scenarios, with the exception of 'SNPP-2010', use the same historical data. The 'SNPP-2010' projection was developed by ONS using the, now out-dated, mid-year population estimates. It excludes any more recent information, although the forecast presented here has rescaled the 2010 trajectory to the 2012 mid-year population estimate, continuing its trend thereafter.



Scenario	Change 2012 - 2031				Average per year		
	Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	Jobs
Migration-led(10yrsX)_EA2_A	492,053	16.6%	230,117	18.5%	10,529	12,593	11,202
Migration-led(10yrs)_EA2_A	443,381	14.9%	211,296	17.0%	8,613	11,573	9,177
Migration-led(5yrsX)_EA2_A	433,105	14.6%	203,661	16.4%	8,482	11,144	8,845
SNPP-2010_EA2_A	402,100	13.5%	197,812	15.9%	6,708	10,835	8,699
Jobs-led(REM)_EA2_A	384,284	12.9%	186,685	15.0%	6,910	10,239	7,426
Migration-led(5yrs)_EA2_A	386,502	13.0%	186,251	15.0%	6,653	10,201	6,999
NaturalChange_EA2_A	220,141	7.4%	149,749	12.1%	0	8,186	2,406
NetNil_EA2_A	266,446	9.0%	116,645	9.4%	0	6,383	4,106

'EA2' - 2011 economic activity rates accounting for anticipated changes to State Pension Age
'A' - CLG 2011-based headship rates, with the 2011-21 trend continued after 2021

Figure 15: LCR 'A' scenarios with modified economic activity rates (EA2)

Official scenario

5.7 As it uses 'old' data the age profile of the 'SNPP-2010' scenario will differ from that of the other scenarios (all of which are based on the latest mid-year population estimates but more importantly on the 2011 Census single year population age profile for each local authority area in the LCR). This has implications for the comparison of the 'SNPP-2010' with other scenarios.

5.8 The 'SNPP-2010' scenario suggests population growth of +13.5% across the LCR to 2031 (equivalent to an additional +402,100 people), with an annual net migration estimate of +6,708 per year. The scenario suggests household growth of +15.9% over the forecast period, an annual dwelling requirement of +10,835 units and an estimated jobs growth requirement of +8,699 per year.

Trend scenarios

5.9 The 'Migration-led(10yrs)' and 'Migration-led(5yrs)' scenarios include UPC with the international migration assumptions, thereby taking full account of the LCR's estimated historical population change when setting migration assumptions. These scenarios result in population growth of +14.9% and +13.0% respectively over the forecast period, with the higher '10yrs' outcome reflecting the higher growth that was associated with international migration during 2003/4 and 2004/5.

5.10 The household growth associated with the 'Migration-led(10yrs)' and 'Migration-led(5yrs)' scenarios is +17.0% and +15.0%, with an average annual dwelling growth expectations of +11,573 and +10,201 units per year respectively.

5.11 Testing the sensitivity of the trend forecasts to the ONS 'UPC' adjustment, the 'Migration-led(10yrsX)' and 'Migration-led(5yrsX)' result in higher growth over the forecast period. Growth suggested by the 'Migration-led(10yrs)' scenario is particularly high given the peak in the estimate of international migration in 2003/4 and 2004/5.

5.12 The 'NetNil' and 'NaturalChange' scenarios are included to illustrate the hypothetical outcome of balanced net migration. The 'NetNil' scenario suggests that, if the net migration balance is set to zero (but in- and out-migration continue), the LCR population would grow by +9.0% between 2012-31, with household growth at +9.4% and an annual dwelling requirement of +6,383 units per year. The 'NaturalChange' scenario suggests that, if internal and international migration are set to zero, population growth would be +7.4% between 2012-31, with household growth at

+12.1% and an annual dwelling requirement of +8,186 units per year. So even without a population growth through migration, the LCR has an estimated dwelling growth requirement of between +6,383 and +8,186 units per year, driven by the changing age structure of the population.

Jobs-led scenario

5.13 For the 'Jobs-led(REM)' scenario, demographic change is linked to an annual jobs growth of between +5,140 and +12,548 new jobs per year (Figure 14). The scenario outcome suggests a +12.9% increase in population between 2012-31, with an increase in dwelling requirements estimated at +10,239 units per year.

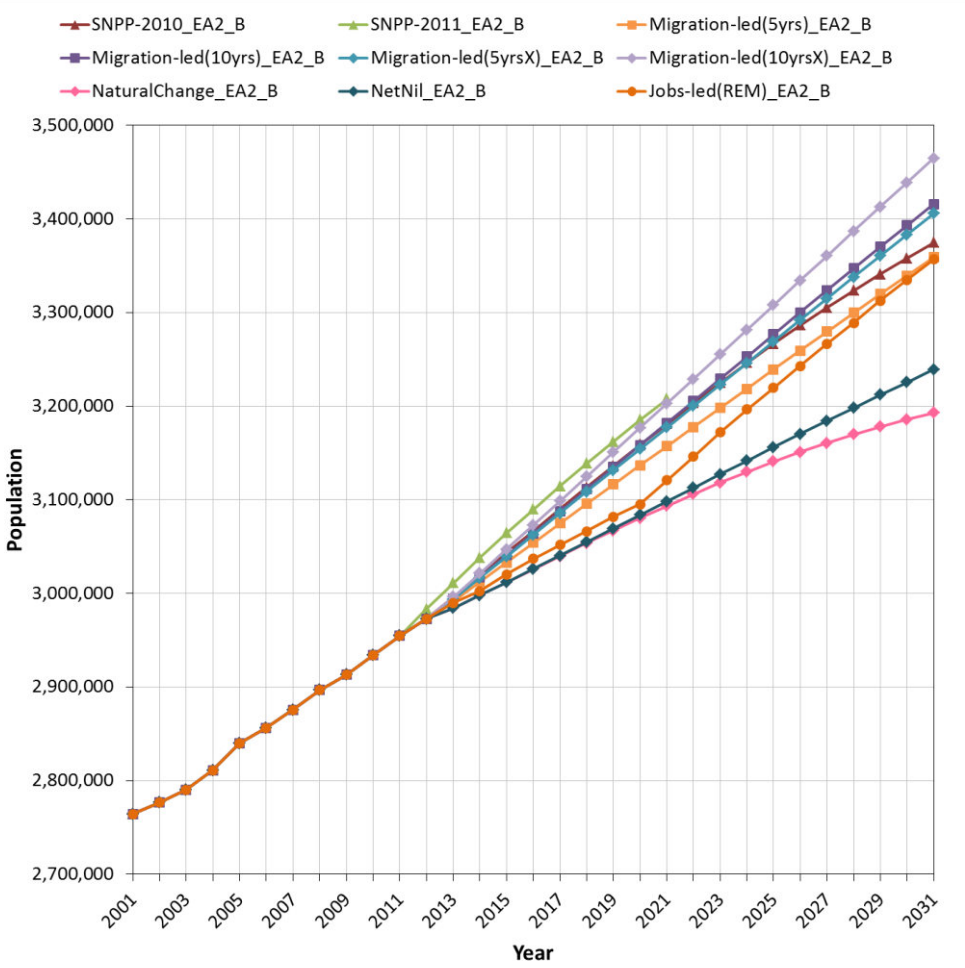
5.14 Growth levels for the 'Jobs-led(REM)' scenario are similar to those suggested by the 'Migration-led(5yrs)' and SNPP-2010 scenarios. The jobs growth is combined with a gradual reduction in unemployment to pre-recession levels by 2020. No changes to the LCR's overall commuting balance are made. Economic activity rates increase to accommodate SPA changes, resulting in greater labour force participation in the older age-groups to help meet the jobs growth aspiration.

Scenario outcomes ('B')

5.15 The second set of scenarios ('B') has been run using CLG's 2008-based household headship rates. The rates have been scaled to ensure that they reproduce the 2011 Census household totals but follow their original trend for the remainder of the forecast period. The 2008-based headship rates have higher rates of household formation and generate higher household growth forecasts than the 'A' alternatives

5.16 The scenario outcomes suggest a range of dwelling growth from +9,242 to +15,270 units per year (Figure 16).

5.17 For the 'Jobs-led(REM)' scenario, the estimated average annual dwelling growth rises to 12,948 per year using the 2008-based headship rates, compared to the 10,239 per year suggested when the 2011-based headship rates are applied to the same population growth scenario.



	Change 2012 - 2031				Average per year		
Scenario	Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	Jobs
Migration-led(10yrsX)_EA2_B	492,053	16.6%	278,990	22.4%	10,529	15,270	11,202
Migration-led(10yrs)_EA2_B	443,381	14.9%	259,242	20.8%	8,613	14,200	9,177
Migration-led(5yrsX)_EA2_B	433,105	14.6%	254,134	20.4%	8,482	13,908	8,845
SNPP-2010_EA2_B	402,100	13.5%	241,979	19.4%	6,708	13,255	8,699
Jobs-led(REM)_EA2_B	384,284	12.9%	236,138	19.0%	6,910	12,948	7,426
Migration-led(5yrs)_EA2_B	386,502	13.0%	235,722	18.9%	6,653	12,910	6,999
NaturalChange_EA2_B	220,141	7.4%	188,538	15.1%	0	10,313	2,406
NetNil_EA2_B	266,446	9.0%	168,866	13.6%	0	9,242	4,106

'EA2' - 2011 economic activity rates accounting for anticipated changes to State Pension Age
'B' - CLG 2008-based headship rates, scaled to the 2011 census household total, following the original trend thereafter

Figure 16: LCR 'B' scenarios with modified economic activity rates (EA2)

Economic activity sensitivity

5.18 Economic activity rates, unemployment rates and commuting ratios all play a key role in determining the outcome of the jobs-led scenario. For the LCR scenarios, the commuting ratio remains fixed over the forecast period, whereas the unemployment rate declines to achieve a pre-recession average by 2020, remaining fixed thereafter.

5.19 For the scenarios presented in Figure 15 and Figure 16, economic activity rates have been adjusted to account for changes to SPA. Given the influence of these rates in determining scenario outcomes, it is useful to compare the sensitivity of results to the SPA-related changes. To recap:

- **Option 'EA1'**: Economic activity rates remain fixed at current (2011) levels.
- **Option 'EA2'**: Current (2011) rates change over time to take account of SPA changes.

5.20 Summary tables of average annual net migration change and average annual dwelling growth are provided to illustrate the impact of changing economic activity rates upon scenario outcomes.

5.21 For the 'Jobs-led(REM)' scenario, average annual net migration is greater when the 'EA1' rates are applied (+8,592 compared to +6,910 per year). With fixed rates of economic activity, a smaller resident labour force increases the requirement for additional in-migration to address the imbalance between residents and jobs (Table 6).

Table 6: LCR scenario summary – annual net migration change

Scenario	Average annual net migration (2012-31)
Migration-led(10yrsX)	10,529
Migration-led(10yrs)	8,613
Jobs-led(REM)_EA1	**8,592**
Migration-led(5yrsX)	8,482
Jobs-led(REM)_EA2	**6,910**
SNPP-2010	6,708
Migration-led(5yrs)	6,653
NetNil	0
NaturalChange	0

'EA1' - 2011 economic activity rates ; 'EA2' - 2011 economic activity rates, accounting for changes to SPA
'A' - CLG 2011-based headship rates; 'B' - CLG 2008-based headship rates

5.22 In terms of anticipated annual dwelling growth, the economic activity rates sensitivity must also consider the variation in growth that is associated with the 'A' and 'B' household formation rate alternatives (Table 7).

Table 7: LCR scenario summary - annual dwelling growth

Scenario	Average dwellings per year (2012-31)		
	A	B	*Average*
Migration-led(10yrsX)	12,593	15,270	*13,932*
Migration-led(10yrs)	11,573	14,200	*12,887*
Migration-led(5yrsX)	11,144	13,908	*12,526*
Jobs-led(REM)_EA1	**11,119**	**13,837**	***12,478***
SNPP-2010	10,835	13,255	*12,045*
Jobs-led(REM)_EA2	**10,239**	**12,948**	***11,594***
Migration-led(5yrs)	10,201	12,910	*11,555*
NaturalChange	8,186	10,313	*9,249*
NetNil	6,383	9,242	*7,813*

'EA1' - 2011 economic activity rates ; 'EA2' - 2011 economic activity rates, accounting for changes to SPA
'A' - CLG 2011-based headship rates; 'B' - CLG 2008-based headship rates

5.23 For the 'Jobs-led(REM)' scenario, the average annual dwelling growth is higher when the 'EA1' rates are considered (+12,478 compared to 11,594). This reflects the higher average annual net migration statistics, evidence that with no change in economic activity rates, higher net in-migration is required to sustain a labour force that meets the jobs growth ambition.

6. Summary

Requirements

6.1 This report provides a macro, LCR-level analysis of the scale of new housing development that is required to meet the economic ambition set out in the SEP and the Housing and Regeneration Plan.

6.2 A range of scenario alternatives has been developed and tested for the LCR, based on the latest demographic evidence. This includes 'official' projections from ONS, updated 'migration-led' trend projections and a 'jobs-led' scenario that is linked to an employment forecast from the REM. All scenarios have been produced with a 2012 base year and a horizon of 2031.

Scenario outcomes

6.3 The scenario analysis has produced a range of dwelling growth outcomes that considers a number of 'sensitivities' associated with; the historical impact of migration upon the trend forecasts; the variable impact of different household formation rates; and the impact of changes to rates of economic activity associated with the older age-groups (Table 8).

Table 8: LCR scenario summary - annual dwelling growth

Scenario	Average dwellings per year (2012-31)		
	A	B	*Average*
Migration-led(10yrsX)	12,593	15,270	*13,932*
Migration-led(10yrs)	11,573	14,200	*12,887*
Migration-led(5yrsX)	11,144	13,908	*12,526*
Jobs-led(REM)_EA1	**11,119**	**13,837**	***12,478***
SNPP-2010	10,835	13,255	*12,045*
Jobs-led(REM)_EA2	**10,239**	**12,948**	***11,594***
Migration-led(5yrs)	10,201	12,910	*11,555*
NaturalChange	8,186	10,313	*9,249*
NetNil	6,383	9,242	*7,813*

'EA1' - 2011 economic activity rates ; 'EA2' - 2011 economic activity rates, accounting for changes to SPA
'A' - CLG 2011-based headship rates; 'B' - CLG 2008-based headship rates

6.4 The ‘X’ scenarios have been included in the suite of forecasts to illustrate the degree to which adjustments to population statistics have affected trend projections. The 2011 Census has enabled a recalibration of previous mid-year population estimates and the basis for updated trend projections, with the ‘X’ scenarios now providing a less realistic perspective on growth given the historical demographic change that has occurred across the LCR since 2001.

6.5 For the updated trend forecasts, the difference between the ‘Migration-led(10yrs)’ and ‘Migration-led(5yrs)’ scenarios is significant, reflecting both the effects of the post-2008 recessionary period upon demographic change and the continuing uncertainty with regard to the estimation of international migration throughout the 2001-2011 period.

6.6 The analysis of scenario outcomes is complicated by the 'choice' of appropriate headship rates with which household (and dwelling) growth is estimated. The latest 2011-based rates (Option ‘A’) have been calibrated after a period of unprecedented economic change and stagnation in the housing market and thus suggest a slower rate of household formation than the previous 2008-based rates (Option ‘B’), which were calibrated from data collected in a time period with very different market characteristics.

6.7 The ‘Migration-led(10yrs)’, ‘Migration-led(5yrs)’ and ‘SNPP-2010’ scenarios suggest a wide range of dwelling growth outcomes, 10,239 – 13,837 per year over the forecast period. The ‘NaturalChange’ and ‘NetNil’ scenarios suggest a range of dwelling growth that should be considered even in the absence of a net migration impact, with average annual dwelling growth of 7,813 – 9,249 per year.

6.8 The ‘Jobs-led(REM)’ scenario, with continuous jobs growth over the forecast period (2012-31) suggests a rate of dwelling growth that varies depending upon the assumptions that are made to age-specific economic activity rates across the LCR. The average annual dwelling requirement is greater when there is no change to economic activity rates (‘EA1’) over the forecast period (average of 12,478 dwellings per year). As the population naturally ‘ages’, a smaller resident labour force increases the requirement for additional in-migration to address the imbalance between residents and jobs. With an uplift to economic activity rates to account for SPA changes (‘EA2’), a larger resident labour force is sustained, reducing the level of net in-migration required, with an average annual dwelling requirement of 11,594 per year.

Interpreting the evidence

6.9 There is no single, definitive perspective on future growth, with a mix of economic, demographic and national/local policy issues ultimately determining the speed and scale of change. In its interpretation of the evidence presented here, the LCR should give due consideration to a number of key issues.

6.10 International migration is estimated to have been a significant driver of demographic change in the LCR since 2001 and trend forecasts assume that these drivers will continue. However, there remains a large degree of uncertainty with regard to its past and future impact. This should be borne in mind when considering the range of trend forecasts presented.

6.11 Future rates of household formation are also a source of uncertainty. Consideration of the range of growth outcomes suggested by the 'A' and 'B' household formation rate alternatives is recommended.

6.12 The process of population ageing implies a significant change to the age-structure of local authority populations. This has particularly important consequences for the size and shape of the LCR's resident labour force and its alignment to jobs growth ambitions; and also for the rates of household formation associated with an increasingly aged population.

6.13 The alignment of demographic and economic forecasts continues to present a challenge, particularly in relation to longer-term assumptions on unemployment, commuting and economic activity. It is recommended that the LCR seeks further information from its REM on these specific assumptions to improve interpretation of the 'jobs-led' scenario outcomes that are presented here.

6.14 The macro, LCR perspective presented here, hides a complex, sub-regional picture of demographic and economic change. Whilst this 'phase 1' evidence provides key inputs to support the forthcoming SEP submission, it is recommended that local evidence forms the basis for future cooperation on housing growth ambition across the LCR local authorities.

6.15 LCR should continue to review its underpinning demographic evidence when new population projections are released by ONS in summer 2014 and when new household projections are released by CLG later in 2014.

7. Appendix: Data inputs & assumptions

Summary

7.1 The development and evaluation of a suite of scenarios of demographic change is dependent on the collection of a range of data inputs and the derivation of a number of key assumptions. These provide an historical perspective on demographic change and the basis for the calculation of demographic parameters that determine future growth trajectories.

7.2 All data and assumptions are held within POPGROUP and Derived Forecast 'input' files, which are configured to enable the specific scenarios to be evaluated. To ensure transparency and to aid the interpretation of outputs, this Appendix provides a summary of the population, household and labour force data inputs and assumptions.

Population, births & deaths

Population

7.3 In each scenario, historical population statistics are provided by the mid-year population estimates for 2001-12, with all data recorded by single-year of age and sex.

7.4 These data include the revised mid-year population estimates for 2002-10, which were released by ONS in May 2013. The revised mid-year population estimates provide consistency in the measurement of the components of change (i.e. births, deaths, internal migration and international migration) between the 2001 and 2011 Censuses.

7.5 For the 'SNPP-2010' and 'SNPP-2011' scenarios, future population counts are provided for each area by single-year of age and sex, to ensure consistency with the trajectory of the official projections.

7.6 The 'SNPP-2010' scenario is scaled to ensure consistency with the 2012 mid-year population estimate total, following its designated growth trend thereafter. This enables the different scenario alternatives to be more easily compared (and does not alter the underlying assumptions or growth trajectory).

Births and fertility

7.7 Historical mid-year to mid-year counts of births by sex from 2001/02 to 2011/12 have been sourced from ONS Vital Statistics.

7.8 A national age-specific fertility rate (ASFR) schedule, which measures the expected fertility rates by age and sex for England in 2013/14, is included in the POPGROUP model assumptions. This has been derived from the ONS 2012-based national population projection and is used in combination with a local (i.e. district-specific) fertility differential to produce age-specific fertility rates for each area.

7.9 Long-term assumptions on changes in ASFRs are taken from the ONS 2012-based national population projection for England.

7.10 In combination with the age-specific population data, these provide the basis for the calculation of births in each year of the forecast period.

7.11 For the 'SNPP-2010' scenario, future birth counts are provided for each area by sex, to ensure consistency with the trajectory of the official projections.

Deaths & mortality

7.12 Historical mid-year to mid-year counts of deaths by age and sex from 2001/02 to 2011/12 have been sourced from ONS Vital Statistics.

7.13 A 'national' age-specific mortality rate (ASMR) schedule, which measures the expected mortality rates by age and sex for England in 2013/14, is included in the POPGROUP model assumptions. This has been derived from the ONS 2012-based national population projection and is used in combination with a local (i.e. district-specific) mortality differential to produce ASMRs for each area.

7.14 Long-term assumptions on changes in ASMRs are taken from the ONS 2012-based national population projection for England.

7.15 In combination with the age-specific population data, these provide the basis for the calculation of deaths in each year of the forecast period.

7.16 For the 'SNPP-2010' scenario, future death counts are provided for each area by age and sex, to ensure consistency with the trajectory of the official projections.

Migration

Internal migration

7.17 The original source of internal migration statistics is the Patient Register Data Service (PRDS), which captures the movement of patients as they register with a GP. This data provides an accurate representation of inter-area flows, albeit with some issues with regard to potential under-registration in certain age groups (young males in particular).

7.18 Historical mid-year to mid-year counts of in- and out-migration by five year age group and sex for 2001/02 to 2011/12 have been sourced from the 'components of change' files that underpin the ONS mid-year population estimates. Any 'adjustments' made to the mid-year population estimates to account for prisoner or armed forces movements are included in the internal migration balance.

7.19 For the 'SNPP-2010' scenario, age-specific migration rate (ASMigR) schedules for in- and out-migration are drawn directly from the ONS 2010-based assumptions. In combination with the population-at-risk the ASMigR schedules provide the basis for the calculation of internal migration flows in each year of the forecast period.

7.20 For the 'Migration-led(5yrs)' and 'Migration-led(10yrs)' scenarios, the ASMigR schedules are derived from historical data, using a five and ten year history to determine these assumptions. In combination with the population-at-risk the ASMigR schedules provide the basis for the calculation of internal migration flows in each year of the forecast period.

7.21 For the 'NaturalChange' scenario, in- and out-migration counts in each year of the forecast period are set to 0. For the 'NetNil' scenario, the in-migration counts are the set to be the same as the out-migration, so that the net internal migration flow in each year of the forecast is equal to 0.

7.22 The jobs-led scenarios, 'Jobs-led(REM)', calculates its own migration assumptions to ensure an appropriate balance between population, households and the labour force, given the jobs growth targets that are set by the scenario.

International migration

7.23 Historical mid-year to mid-year counts of total immigration and emigration for 2001/02 to 2011/12 have been sourced from the 'components of change' files that underpin the ONS mid-

year population estimates. Any 'adjustments' made to the mid-year population estimates to account for asylum cases are included in the international migration balance.

7.24 For the 'SNPP-2010' scenario the in- and out-migration counts are drawn directly from the ONS 2010-based assumptions.

7.25 For each of the 'Migration-led' scenarios, the in- and out-migration counts have been derived from historical data, using either a five or ten year history to determine these assumptions. Implied within the international migration component of change is a UPC figure, which ONS identified within its latest mid-year estimate revisions. In the derivation of international migration assumptions, the UPC figure has been both included and excluded from the historical evidence, to enable an assessment of its importance to trend growth outcomes. The 'X' suffix indicates that the UPC component has been excluded from the derivation of historical migration assumptions.

7.26 The 'NaturalChange' and 'NetNil' scenarios use alternative migration counts. For the 'NaturalChange' scenario the counts set the in- and out-migration flows to zero (for each year in the forecast period). For the 'NetNil' scenario the counts adjust the total outward flow of migrants (for each year in the forecast period) so that it equates with the total inward flow of migrants (for that year).

7.27 The jobs-led scenario, 'Jobs-led(REM)', calculates its own migration assumptions to ensure an appropriate balance between population, households and the labour force, given the 'constraints' on employment growth that are imposed in the scenario.

Household assumptions

For each scenario, the household and dwelling implications of the population growth trajectory have been evaluated through the application of headship rate statistics, communal population statistics and a dwelling vacancy rate. These data assumptions have been sourced from the 2001 and 2011 Censuses and the 2008-based and 2011-based household projection models from CLG.

Household headship rates

7.28 A household is defined as:

> "One person living alone, or a group of people (not necessarily related) living at the

same address with common housekeeping - that is, sharing a living room or sitting room or at least one meal a day." [9]

7.29 Household headship rates define the likelihood of a particular household type being formed in a particular year, given the age-sex profile of the population in that year. Household types are modelled within a 17-fold classification (Table 9).

Table 9: Household type classification

CLG code	DF label	Household type
OPM	OPMAL	One person households: Male
OPF	OPFEM	One person households: Female
OCZZP	FAM C0	One family and no others: Couple: No dependent children
OC1P	FAM C1	One family and no others: Couple: 1 dependent child
OC2P	FAM C2	One family and no others: Couple: 2 dependent children
OC3P	FAM C3	One family and no others: Couple: 3+ dependent children
OL1P	FAM L1	One family and no others: Lone parent: 1 dependent child
OL2P	FAM L2	One family and no others: Lone parent: 2 dependent children
OL3P	FAM L3	One family and no others: Lone parent: 3+ dependent children
MCZDP	MIX C0	A couple and one or more other adults: No dependent children
MC1P	MIX C1	A couple and one or more other adults: 1 dependent child
MC2P	MIX C2	A couple and one or more other adults: 2 dependent children
MC3P	MIX C3	A couple and one or more other adults: 3+ dependent children
ML1P	MIX L1	A lone parent and one or more other adults: 1 dependent child
ML2P	MIX L2	A lone parent and one or more other adults: 2 dependent children
ML3P	MIX L3	A lone parent and one or more other adults: 3+ dependent children
OTAP	OTHHH	Other households
TOT	TOTHH	Total

7.30 For the forecasting analysis presented in this report, two alternative headship rate assumptions have been applied:

- **Option 'A'**: CLG 2011-based headship rates, with the 2011-21 trend continued after 2021.
- **Option 'B'**: CLG 2008-based headship rates, scaled to be consistent with the 2011 Census household total, but following the original trend thereafter.

Communal population

7.31 Household projections in POPGROUP take account of the 'population-not-in-households'

[9] CLG. Household projections: notes and definitions for data analysts. https://www.gov.uk/household-projections-notes-and-definitions-for-data-analysts.

(communal population). This data has been drawn directly from the 2011 Census.

Vacancy rates

7.32 The relationship between households and dwellings is modelled using a 'vacancy rate' based on the ratio between household spaces (occupied, second homes and vacant) and dwellings (shared and unshared) from the 2011 Census. A 'household space' is the accommodation used (or available for use) by an individual household, whilst a 'dwelling' is a unit of accommodation that may comprise one or more household spaces.

7.33 The calculated vacancy rate for each LCR local authority district (where vacancy rate = 1-[total occupied household spaces in the local authority area / total dwellings in the local authority area]) is illustrated for 2001 and 2011 (Table 10). The 2011 value has been used in the scenario analysis, remaining constant throughout the forecast period.

Table 10: Vacancy rates, 2001 and 2011

Source: Census 2001 and 2011

Area	Vacancy rate (%)	
	2001	2011
Barnsley	3.7	4.0
Bradford	6.0	3.8
Calderdale	4.5	3.9
Craven	6.8	9.0
Harrogate	4.4	4.6
Kirklees	4.3	4.2
Leeds	2.6	3.4
Selby	3.5	4.8
Wakefield	3.1	4.1
York	2.9	3.4

Economic activity rates

The latest evidence

7.34 For each scenario (excluding the jobs-led scenarios), the labour force and jobs implications of the population growth trajectory have been evaluated through the application of three key data items: economic activity rates, a commuting ratio and an unemployment rate. In the jobs-led scenarios, these three data items are used to determine the population growth required by a

particular jobs growth trajectory.

7.35 'Economically active' refers to the population that is both employed and unemployed, i.e. the labour force. Economic activity rates determine the level of labour force participation associated with a particular age-sex category.

7.36 Economic activity rates by five year age group (ages 16-74) and sex have been derived from 2011 Census statistics for each of the LCR local authorities. The 2011 Census statistics include an open-ended 65+ age category, so economic activity rates for the 65-69 and 70-74 age groups have been estimated using a combination of 2011 Census tables, disaggregated using evidence from the 2001 Census (Table 11).

Table 11: Economic activity rates

Source: Census 2001 and 2011

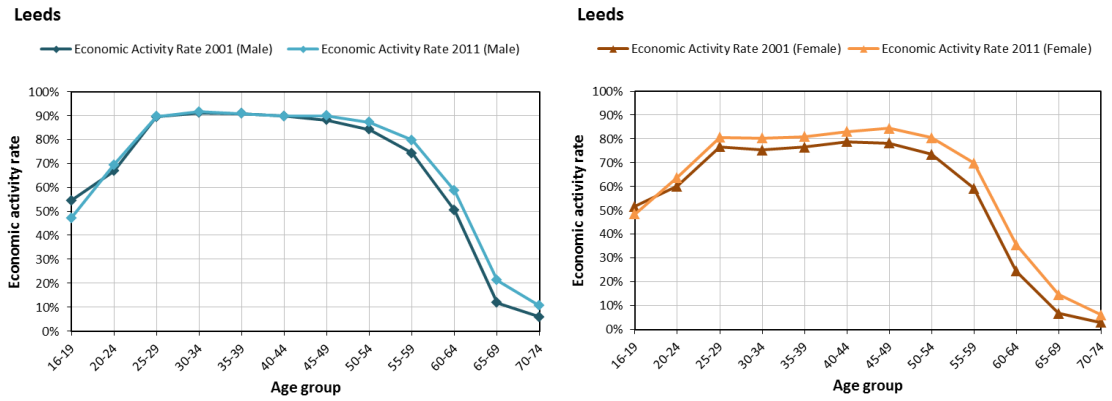
Area	Economic activity rates: males											
	16-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Barnsley	53%	88%	91%	90%	89%	89%	87%	82%	72%	48%	14%	7%
Bradford	43%	78%	90%	90%	89%	89%	89%	86%	77%	57%	22%	11%
Calderdale	49%	88%	92%	93%	92%	92%	91%	88%	79%	59%	22%	10%
Craven	52%	94%	96%	96%	95%	95%	94%	93%	86%	64%	30%	18%
Harrogate	56%	93%	96%	95%	96%	96%	94%	93%	86%	67%	34%	17%
Kirklees	48%	78%	90%	91%	91%	91%	91%	87%	80%	58%	22%	10%
Leeds	47%	69%	90%	92%	91%	90%	90%	87%	80%	59%	21%	11%
Selby	57%	94%	96%	96%	96%	96%	95%	92%	84%	61%	26%	12%
Wakefld	54%	89%	92%	91%	91%	90%	88%	85%	76%	53%	16%	9%
York	48%	63%	89%	93%	94%	94%	93%	90%	82%	59%	25%	11%

Area	Economic activity rates: females											
	16-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Barnsley	53%	76%	78%	79%	80%	81%	81%	76%	61%	29%	10%	5%
Bradford	42%	66%	66%	65%	69%	74%	79%	74%	63%	33%	13%	7%
Calderdale	50%	76%	78%	77%	81%	85%	86%	82%	72%	33%	15%	7%
Craven	59%	88%	86%	84%	86%	88%	91%	86%	75%	41%	20%	9%
Harrogate	55%	85%	87%	85%	84%	86%	88%	85%	76%	43%	23%	9%
Kirklees	47%	70%	73%	73%	76%	81%	82%	78%	67%	32%	14%	5%
Leeds	48%	64%	81%	80%	81%	83%	84%	81%	70%	36%	15%	6%
Selby	59%	84%	86%	85%	85%	88%	88%	83%	72%	38%	17%	6%
Wakefld	52%	78%	79%	79%	81%	84%	83%	78%	65%	31%	11%	5%
York	51%	61%	84%	85%	85%	87%	88%	86%	76%	40%	16%	7%

7.37 Prior to the release of the 2011 data, economic activity rates were derived from 2001 Census statistics. A comparison of the 2001 and 2011 economic activity rates indicates that there has

been a general increase in the older-age labour force participation for both males and females but particularly for females, for whom rates have seen a general increase across all groups aged 20+.

7.38 Figure 17 presents the 2011 economic activity rates by sex for Leeds alongside the 2001 economic activity rates for Leeds to illustrate the localised effect of this general trend. For males, the economic activity rate has increased by an average of 5.4% across the 45-74 age groups, with little change in the younger age groups (Figure 17). For females, the economic activity rate has increased by an average of 5.3% across all age groups (Figure 18).



Source: Census 2001 and 2011

Figure 17: Leeds economic activity rates, 2001 vs. 2011 (males and females)

7.39 With planned changes to the State Pension Age (SPA) taking effect between now and 2020, the trend towards greater participation in the labour force in the older age-groups will continue to change the profile of the economically active population. The incorporation of these assumptions into longer-term demographic forecasts is essential to enable the robust evaluation of job growth ambitions. LCR has sought to evaluate alternative growth scenarios using two alternative assumptions on the age-profile of economic activity within its local authority districts:

- **Option 'EA1'**: Economic activity rates for each local authority area in the LCR are maintained at the level recorded in the 2011 Census (Table 7).

- **Option 'EA2'**: Changes are applied to the age-sex specific economic activity rates to take account of planned changes to the SPA and to accommodate potential changes in economic

participation that might result from an ageing but healthier population in the older labour-force age-groups.

7.40 Results have been produced for all scenarios, using each of these economic activity rate variants.

Modifying economic activity

7.41 To take account of changes to the SPA and to accommodate potential changes in economic participation that may result from an ageing but healthier population in the older labour-force age-groups, changes have been made to the 2011 Census economic activity rates for each local authority area in the LCR.

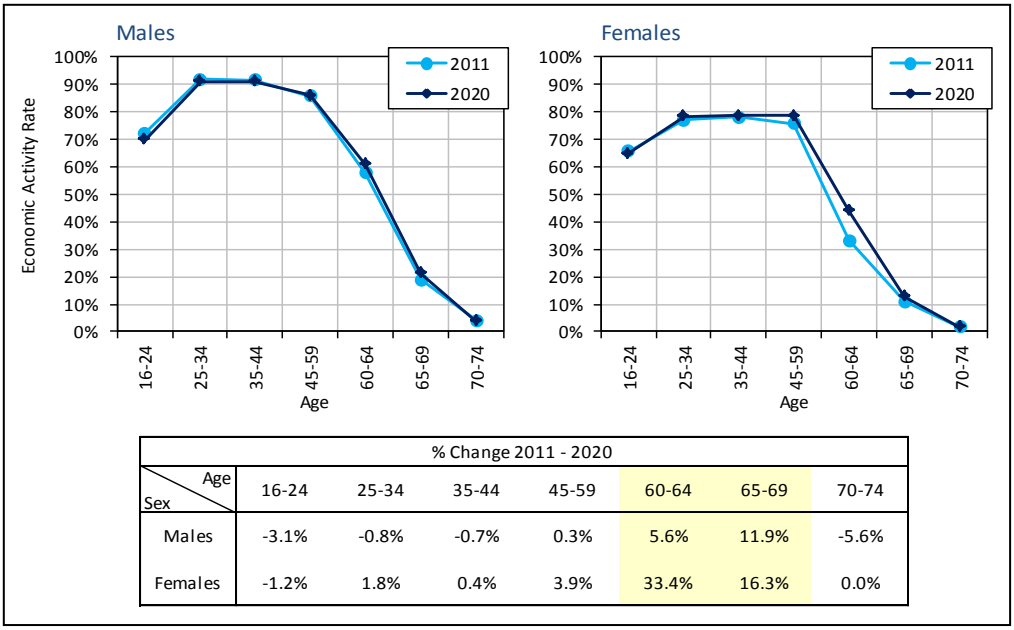
7.42 Employment forecasts routinely apply changes to older-age economic participation rates in the derivation of longer-term forecasts of jobs growth. It is therefore important to give these assumptions due consideration in the demographic assessment of these forecasts.

7.43 The SPA for women will increase from 60 to 65 by 2018, bringing it in line with that for men. Between December 2018 and April 2020, the SPA for both men and women will then rise to 66. Under current legislation, the SPA will be increased to 67 between 2034 and 2036 and 68 between 2044 and 2046. It has been proposed that the rise in the SPA to 67 is brought forward to 2026-28[10].

7.44 ONS published its last set of economic activity rate forecasts from a 2006 base[11]. These incorporated an increase in SPA for women to 65 by 2020 but this has since been altered to an accelerated transition by 2018 plus a further extension to 66 by 2020. Over the 2011-20 period, the ONS forecasts suggested that male economic activity rates would rise by 5.6% and 11.9% in the 60-64 and 65-69 age groups respectively. Corresponding female rates would rise by 33.4% and 16.3% (Figure 18). Given the accelerated pace of change in the female SPA and the clear trend for increased female labour force participation across all age-groups in the last decade, these 2011-20 rate increases would appear to be relatively conservative assumptions.

[10] https://www.gov.uk/changes-state-pension.

[11] ONS (2006). Projections of the UK labour force, 2006 to 2020
http://www.ons.gov.uk/ons/rel/lms/labour-market-trends--discontinued-/volume-114--no--1/projections-of-the-uk-labour-force--2006-to-2020.pdf.



% Change 2011 - 2020							
Sex \ Age	16-24	25-34	35-44	45-59	60-64	65-69	70-74
Males	-3.1%	-0.8%	-0.7%	0.3%	5.6%	11.9%	-5.6%
Females	-1.2%	1.8%	0.4%	3.9%	33.4%	16.3%	0.0%

Source: ONS

Figure 18: ONS Labour Force Projection 2006 – Economic Activity Rates 2011–2020

7.45 To take account of planned changes to the SPA, the following modifications have been made to the economic activity rates for England and Wales:

- Women aged 60-64: 40% increase from 2012 to 2020.
- Women aged 65-69: 20% increase from 2012 to 2020.
- Men aged 60-64: 5% increase from 2012 to 2020.
- Men aged 65-69: 10% increase from 2012 to 2020.

Note: a 10% increase implies a 10% change in the economic activity rate. So for example a 20% economic activity rate would be increased to 22%. A 10% change does not imply an increase from 20% to 30%.

7.46 The rates for women in the 60-64 age and 65-69 age-groups are higher than the original ONS figures, accounting for the accelerated pace of change in the SPA. No changes have been applied to other age-groups. In addition, no changes have been applied to economic activity rates beyond 2020. This is an appropriately prudent approach given the uncertainty associated with forecasting future rates of economic participation.

Unemployment rate

7.47 Within the forecasting methodology, the unemployment rate, together with the commuting ratio, controls the balance between the size of the labour force and the number of jobs available within an area.

7.48 The forecasting analysis presented here varies the underlying unemployment statistic to account for a period of recovery post-2013. The change in the rate of unemployment enables a recovery to an unemployment rate position that is equivalent to each local authority's 'average' position over the pre-recession period for which data is available (2004-08).

7.49 For each local authority, an initial unemployment rate is defined based upon the average for the last four years (2009-12) (Table 12). The initial unemployment rates reduce incrementally to a figure that is equivalent to the pre-recession average (2004-08) by 2020, remaining fixed thereafter.

Table 12: Unemployment rate, recession and pre-recession averages

Source: Annual Population Survey (NOMIS)

District	Unemployment rate	
	Average: 2004-2008	Average: 2009-2012
Barnsley	6.18	10.35
Bradford	6.46	10.43
Calderdale	4.52	8.30
Craven	3.08	5.53
Harrogate	1.83	5.90
Kirklees	5.04	8.45
Leeds	5.64	9.25
Selby	4.72	5.68
Wakefield	4.86	9.68
York	3.68	5.75

Commuting ratio

7.50 The commuting ratio, together with the unemployment rate, controls the balance between the size of the labour force and the number of jobs available within an area.

7.51 The most detailed travel-to-work statistics from the 2011 Census have yet to be published. Using a combination of statistics from the 2011 Census, commuting ratios have been derived for each of the LCR local authorities.

7.52 The commuting ratio is the balance between the number of workers living in a district (i.e. the resident labour force) and the number of jobs available in the district. The number of workers includes all economically active residents (i.e. all residents aged 16-74). The number of jobs has been calculated by subtracting the number of residents not in employment and the number of residents aged 0-15 and those aged 75+ from the district's 'workday population'.

7.53 The derived 2011 commuting ratios for all LCR local authorities are illustrated (Table 13). For comparison, these are presented alongside the 2001 commuting ratios, derived from 2001 Census statistics.

Table 13: Commuting ratios, 2001 and 2011

Source: Census 2001 and 2011

Area	Commuting ratio	
	2001	2011
Barnsley	1.19	1.26
Bradford	0.98	1.03
Calderdale	1.07	1.02
Craven	1.07	1.01
Harrogate	1.09	0.99
Kirklees	1.14	1.16
Leeds	0.85	0.86
Selby	1.24	1.23
Wakefield	1.04	1.00
York	0.94	0.96

7.54 A commuting ratio greater than 1.0 indicates that the size of the resident workforce exceeds the number of jobs available in the district, resulting in a net out-commute. A commuting ratio that is less than 1.0 indicates a net in-commute. In all scenarios commuting ratios are held constant for the duration of the forecast period 2013-31.